QUALIFICATION HANDBOOK

SVQ in Fabrication and Welding Engineering at SCQF Level 6

Qualification reference number: GP07 46

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1. Introduction

1.1 This qualification has been developed to seek to ensure that those working as welders, fabricators or sheet metal workers (including apprentices) meet minimum requirements of technical competence and health and safety.

1.2 These requirements have been specified in the National Occupational Standards (NOS) developed by the Sector Skills Council (SSC) SEMTA in liaison with employers and industry/ sector representatives. This qualification is based upon those NOS and incorporates the Qualification Structure approved by SQA Accreditation.

1.3 Successful completion of this qualification will allow candidates to show they have sufficient knowledge, understanding and skills to demonstrate competence in fabrication and welding engineering

1.4 This Handbook provides the information required to assist approved centres in delivering the qualification and preparing candidates for assessment. This includes some template forms that may be used / adapted by centres. Note that you are able to create your own, or use existing forms for this purpose. Alternatively, QFI makes its E-Portfolio system available to its approved centres.

This document should be read in conjunction with QFI's policies and the Centre Handbook.

2. Qualification objective(s)

2.1 The qualification is suitable for apprentices / those already in employment that wish to develop their knowledge and skills in fabrication and welding engineering. This includes those working as welders, fabricators or sheet metal workers.

2.2 In order to do this, the qualification covers technical and health and safety standards, and supports roles relating to fabrication and welding engineering through a number of optional pathways.

3. Progression

3.1 This qualification is primarily designed to allow candidates to progress to employment in roles relating to fabrication and welding engineering. These roles may be in addition to other related roles. Successful completion of this qualification may therefore lead to additional employment opportunities.

3.2 Candidates achieving this qualification may also wish to progress to higher level qualifications. Candidates may also choose to undertake qualifications in more generic subjects such as a health and safety in the workplace.

4. Entry requirements

4.1 Candidates must be at least 16 years of age to be able to undertake this qualification.

4.2 There are no other specific entry requirements, though the National Careers Service does recommend physical fitness.

4.3 Candidates taking this qualification must be made fully aware of what this entails. Centres must be satisfied that candidates have the experience and skills and will have sufficient assessment opportunities within their job role to provide evidence of competence for this qualification. Where this may not be the immediate case, candidates should check with their employer whether they are able to go out with departmental or immediate job role boundaries to gain the necessary assessment opportunities.

4.5 A sample induction checklist is included at Appendix 1.

5. Qualification structure

5.1 The structure for this qualification was set by the Sector Skills Council SEMTA and approved by SQA Accreditation.

5.2 To achieve this qualification candidates must achieve:

- 3 mandatory units

Plus one of the following optional routes/ pathways:

1. Pipe and tube fabrication
2. Manual welding
3. Welding machine setting and operating
4. Plateworking (3mm upwards)
5. Sheet metalworking (3mm or less)
6. Structural steelwork

Mandatory Units
All candidates must complete the following <u>three units</u>

SSC code	Title of mandatory unit (must complete all five units)	SCQF level	SCQF credits
SEMMAN123-01	Complying with Statutory Regulations and Organisational Safety Requirements	5	5
SEMMAN23-02	Using and interpreting engineering data and documentation	5	5
SEMMAN3-03	Working Efficiently and Effectively in Engineering	5	5

Plus one of the following optional routes/ pathways:

1. Pipe and tube fabrication route (total 8 units)			
SSC code	**Group A (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE322	Marking Out Components for Metalwork	6	47
SEMFWE327	Developing and Marking Out Templates for Metalwork	6	49
SSC code	**Group B (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE333	Cutting and Shaping Materials using Portable Thermal Cutting Equipment	6	35
SEMFWE334	Cutting Materials using Saws and Abrasive Discs	6	32
SSC code	**Group C (must complete 2 units)**	**SCQF level**	**SCQF credits**
SEMFWE344	Forming Pipework by Machine Bending	6	40
SEMFWE345	Producing Pipe Fabrications	6	40
SEMFWE337	Producing and Finishing Holes using Drilling Machines	6	36
SSC code	**Group D (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE328	Joining Fabricated Components using Mechanical Fasteners	6	36
SEMFWE346	Producing Socket and Flange Fillet Welded Joints in Pipe using a Manual Welding Process	6	49
SEMFWE329	Bonding Engineering Materials using Adhesives	6	38
SEMFWE339	Slinging, Lifting and Moving Materials and Components	6	29

2. Manual welding route (total 4 units)			
SSC code	**Must complete 1 unit**	**SCQF level**	**SCQF credits**
SEMFWE304	Welding Materials by the Manual Metal Arc Process	6	57
SEMFWE305	Welding Materials by the Semi-automatic MIG/MAG and flux cored arc Processes	6	57

SEMFWE306	Welding Materials by the Manual TIG and Plasma Arc Welding Process	6	57
SEMFWE307	Welding Materials by the Manual Oxy/fuel Gas Welding Process	6	57
SEMFWE308	Welding Pipe/Tube using Multiple Manual Arc Welding Processes	6	64
SEMFWE309	Welding Plate using Multiple Manual Arc Welding Processes	6	64

3. Welding machine setting and operating route (total 5 units)			
SSC code	**Group A (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE310	Preparing Mechanised Arc Welding Equipment for Production	6	48
SEMFWE311	Preparing Resistance Spot, Seam and Projection Welding Machines for Production	6	48
SSC code	**Group B (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE316	Welding Materials with Mechanised Arc Welding Equipment	6	40
SEMFWE317	Welding Materials using Resistance Spot, Seam and Projection Welding Machines	6	40

4. Plateworking 3mm upwards route (total 9 units)			
SSC code	**Group A (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE322	Marking Out Components for Metalwork	6	47
SEMFWE327	Developing and Marking Out Templates for Metalwork	6	49
SSC code	**Group B (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE332	Cutting Plate and Sections using Shearing Machines	6	30
SEMFWE333	Cutting and Shaping Materials using Portable Thermal Cutting Equipment	6	35
SEMFWE334	Cutting Materials using Saws and Abrasive Discs	6	32
SEMFWE366	Operating CNC Fabrication Equipment	6	44

SSC code	Group C (must complete 2 units)	SCQF level	SCQF credits
SEMFWE335	Bending and Forming Plate using Press Brakes or Bending Machines	6	36
SEMFWE336	Forming Platework using Power Rolling Machines	6	36
SEMFWE337	Producing and Finishing Holes using Drilling Machines	6	36
SEMFWE338	Producing Platework Assemblies	6	40
SSC code	**Group D (must complete 2 units)**	**SCQF level**	**SCQF credits**
SEMFWE328	Joining Fabricated Components using Mechanical Fasteners	6	36
SEMFWE331	Producing Fillet Welded Joints using a Manual Welding Process	6	50
SEMFWE339	Slinging, Lifting and Moving Materials and Components	6	29

5. Sheet metalworking 3mm or less route (total 9 units required)

SSC code	Group A (must complete all 3 units)	SCQF level	SCQF credits
SEMFWE322	Marking Out Components for Metalwork	6	47
SEMFWE323	Cutting Sheetmetal to Shape using Hand and Machine Tools	6	49
SEMFWE324	Forming Sheetmetal using Hand and Machine Tools	6	50
SSC code	**Group B (must complete 2 units)**	**SCQF level**	**SCQF credits**
SEMFWE325	Producing Sheetmetal Assemblies	6	47
SEMFWE326	Heat Treating Materials for Fabrication Activities	6	38
SEMFWE327	Developing and Marking Out Templates for Metalwork	6	49
SSC code	**Group C (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE328	Joining Fabricated Components using Mechanical Fasteners	6	36
SEMFWE329	Bonding Engineering Materials using Adhesives	6	38
SEMFWE330	Joining Materials by Resistance Spot Welding	6	38

SEMFWE331	Producing Fillet Welded Joints using a Manual Welding Process	6	50
SEMFWE339	Slinging, Lifting and Moving Materials and Components	6	29
SEMFWE366	Operating CNC Fabrication Equipment	6	44

6. Structural steelwork route (total 8 units required)

SSC code	Group A (must complete 1 unit)	SCQF level	SCQF credits
SEMFWE322	Marking Out Components for Metalwork	6	47
SEMFWE327	Developing and Marking Out Templates for Metalwork	6	49
SSC code	**Group B (must complete 1 unit)**	**SCQF level**	**SCQF credits**
SEMFWE332	Cutting Plate and Sections using Shearing Machines	6	30
SEMFWE333	Cutting and Shaping Materials using Portable Thermal Cutting Equipment	6	35
SEMFWE334	Cutting Materials using Saws and Abrasive Discs	6	32
SEMFWE366	Operating CNC Fabrication Equipment	6	44
SSC code	**Group C (must complete 2 units)**	**SCQF level**	**SCQF credits**
SEMFWE340	Forming Structural Sections using Machines	6	38
SEMFWE341	Producing Structural Steel Ancillary Components	6	40
SEMFWE342	Producing Major Structural Components/Sub-assemblies	6	42
SEMFWE337	Producing and Finishing Holes using Drilling Machines	6	36
SSC code	**Group D (must complete 2 units)**	**SCQF level**	**SCQF credits**
SEMFWE328	Joining Fabricated Components using Mechanical Fasteners	6	36
SEMFWE331	Producing Fillet Welded Joints using a Manual Welding Process	6	50
SEMFWE339	Slinging, Lifting and Moving Materials and Components	6	29
SEMFWE343	Erecting Structural Steelwork	6	42

All units are included at Annex 2.

6. Assessment

6.1 Roles and responsibilities

There are a number of people involved in the assessment process and the role of each needs to be clearly understood by each.

Candidates – must familiarise themselves with the content of the units that they are taking and how these are to be assessed. They should co-operate with the assessment process, looking for opportunities to evidence the elements and gathering evidence where this arises. Candidates must take on board feedback from their assessor and work with their assessor to develop realistic plans for assessment. An Assessment Plan and Review template is included at Appendix 3.

Assessors - must familiarise themselves with the content of the units that they are assessing and how these are to be assessed. They must assist candidates in identifying assessment opportunities, gathering, and presenting evidence. Assessors must assess all elements and record these assessments. Templates for recording elements, and for unit achievement, are at Appendix 4. Assessors must feedback and work with candidates to identify any gaps and develop realistic plans for assessment. They must also work with the Internal Verifier and External Verifier to ensure a common standard of assessment.

Internal Verifiers – sometimes known as Internal Quality Assurers (IQAs), their role is to ensure that the assessment process is appropriate, consistent, fair and transparent; that assessors receive on-going support and that they are assessing to a common standard; and that awards are valid, reliable and consistent. IVs must develop a strategy that includes standardisation activities such as reviewing samples of evidence from each assessor, and countersigning the decisions of unqualified assessors.

External Verifiers - sometimes known as External Quality Assurers (EQAs), are appointed by QFI and are independent of the centre. Their role is to check that internal processes are in place to ensure robust, consistent assessment. This includes sampling assessment evidence.

6.2 SCQF level 6 descriptors

This qualification is pitched at SVQ level 3/ SCQF level 6. The following are descriptions of what a candidate should be able to do or demonstrate at SCQF level 6. These are for guidance only – it is not expected that every point will be covered.

Knowledge and understanding

Demonstrateand/or work with: An appreciation of the body of knowledge that constitutes a subject/discipline/sector; A range of knowledge, facts, theories, ideas, properties, materials, terminology, practices and techniques about, and associated with, a subject/discipline/sector; Relating the subject/discipline/sectorto a range of practical and/or commonplace applications.

Practice: Applied knowledge, skills and understanding

Apply knowledge, skills and understanding: In known, practical contexts; In using some of the basic, routine practices, techniques and/or materials associated with the subject/discipline/sector; In exercising these in routine contexts that may have non-routine elements; In planning how skills will be used to address set situations and/or problems and adapt these as necessary.

Generic cognitive skills

Obtain, organise and use factual, theoretical and/or hypothetical information in problem solving; Make generalisations and predictions; Draw conclusions and suggest solutions

Communication, IT and numeracy skills

Use a wide range of skills, for example: Produce and respond to detailed and relatively complex written and oral communication in both familiar and unfamiliar contexts; Select and use standard ICT applications to process, obtain and combine information; Use a wide range of numerical and graphical data in routine contexts which may have non-routine elements.

Autonomy, accountability and working with others

Take responsibility for carrying out a range of activities where the overall goal is clear, under non-directive supervision; Exercise some supervisory responsibility for the work of others and lead established teams in the implementation of routine work within a defined and supervised structure; Manage limited resources within defined and supervised areas of work; Take account of roles and responsibilities related to the tasks being carried out and take a significant role in the evaluation of work and the improvement of practices and processes.

6.3 The assessment process

Assessment for this qualification, and for individual units that comprise the qualification, must take place in accordance with the *'SEMTA Engineering Assessment Strategy for SVQs in Engineering'* (approved by ACG 13/01/2016).

This document translates the requirements of the assessment strategy and gives guidance to ensure that centres meet these.

Centres delivering the qualification must ensure that assessors and Internal Verifiers are aware of the assessment strategy and how to access this. External Verifiers may check this requirement during monitoring visits to centres.

Assessment involves the following key stages: planning; producing evidence; assessing evidence; recording. Each of these is considered in more detail below.

6.3.1. Planning

The assessor must create an Assessment Plan with each candidate that he/ she will be assessing. The Assessment Plan will need to be reviewed as the candidate progresses through the units. A template for assessment planning and review is at Appendix 3 of this document.

A wide range of assessment methods exist that can be used to assess knowledge and skills. Methods of assessment that are commonly used for assessing competence-based qualifications such as N/SVQs include the following:

- Product evidence – this relates to the outcome of the candidate's work, and the actual product that is generated as a result of their work.
- Direct observation – where an assessor (or credible witness) will directly observe the candidate undertaking certain tasks/ creating products that occur as part of their role. Observations must be referenced to the elements covered
- Question/ answer – these will often supplement the methods above, for example the assessor may ask the candidate a number of questions whilst they are undertaking a task. Questioning is a useful way to establish knowledge and to generate evidence of this
- Witness testimony – credible witnesses may be identified who can for example testify that the candidate can successfully undertake certain tasks
- Personal statement – declaration made by the candidate that should be referenced to elements

Centres should ensure that their Assessors use the methods above to assess candidates for this qualification.

Template assessment documents including an Assessor Report can be found at Appendix 3.

6.3.2 Producing evidence

The methods of assessment must generate evidence to demonstrate the candidates' competence. Evidence produced in the workplace is central to the Assessment Strategy. Workplace evidence is vital to ensuring that the candidate is competent to industry standards and a suitable way of recording this must be used.

The following indicates the type of evidence generated by the methods on the section above:

- Product evidence –Photographic or video evidence is often used to record this, or it may also be recorded via the method below. Labelled photographs and/or videos that clearly show the candidate are sources of evidence for this purpose.
- Performance evidence –observations must be recorded via an Assessor or other report (e.g. witness statement)
- Question/ answer –both the questions and the candidate's responses to these must be recorded either in writing or via some audio or visual device (e.g. part of a video recording).
- Witness testimony – this may be written, audio or visual recordings
- Personal statement – the declaration made by the candidate must be recorded

All of the above must be referenced to the evidence that they cover. Templates that may be used for recording evidence are at Appendix 3.

For this qualification, performance evidence must be the main form of evidence. In order to demonstrate consistent, competent performance for a unit, a minimum of three different examples of performance must be provided, and must be sufficient to show

that the performance requirements of the unit have been carried out to the prescribed standards.

Feedback should be given to the candidate on an on-going basis and where there are any gaps or shortfalls in evidence then these should be incorporated into the Assessment Plan.

Assessment must meet the requirements of the performance criteria, knowledge and understanding documented for each unit of assessment. Methods of assessment must ensure coverage of all elements, scope and range, and generate sufficient evidence to demonstrate competence. A holistic approach towards the collection of evidence is encouraged. The focus should be on assessing activities generated by the whole work experience rather than focusing on specific tasks. This would show how evidence requirements could be met across the qualification to make the most efficient use of evidence.

Direct evidence produced through normal performance in the workplace is the primary source for meeting these requirements. This includes naturally occurring evidence, direct observation of activities and witness testimony as relevant, all of which must be recorded.

Workplace evidence must be supported by the required evidence of knowledge and understanding. This evidence may be identified by:

- questioning the candidate
- recognised industry education and training programme assessment or professional interview assessment that has been matched to NOS requirements
- performance evidence/ completed work

All of which must be recorded and made available for verification purposes.

SEMTA strongly recommends that the majority of assessment evidence for the mandatory units is gathered during the performance of the optional units. Evidence should be obtained as a whole, where practically possible, since competent performance in the optional units is often dependent on competence in the mandatory units.

6.3.3 Assessing evidence

Evidence must be assessed against the units/ elements to establish whether the candidate is competent with regards to their performance and knowledge. In order to achieve the qualification candidates must achieve a 'pass'. The evidence must show that the candidate consistently (i.e. on more than one occasion) meets all of the elements across the scope/range of each unit.

If there is insufficient evidence to make this judgement then plans must be made as to how the candidate can produce further evidence in order to demonstrate competence.

Assessors must check that the evidence produced is sufficient in volume, relevant and current. They must also be confident that the evidence has been generated by the candidate. Assessors and candidates normally sign documentation to declare that the evidence produced is that of the candidate and no other.

6.3.4 Recording evidence

Evidence (or reference to where certain evidence is located) is normally kept in a portfolio. This may be paper-based or electronic. All evidence contained within the portfolio must be clearly referenced to the units and elements. Candidates' progress can therefore be tracked. Note that certain pieces of evidence can be recorded across more than a single element. Tracking is important to show where this is that case.

It is helpful to give each piece of evidence a number so that this can be mapped across elements. See the template forms at Appendix 4. Assessment decisions made against the evidence must also be recorded so that an IV or an EV can see these. All evidence must be kept for internal and external verification.

6.3.5 Simulation

The evidence put forward for this qualification can only be regarded valid, reliable, sufficient and authentic if demonstrated in the working environment. Evidence put forward for assessment must be obtained from the working environment and be clearly attributable to the candidate.

However, in certain circumstances, simulation/replication of work activities may be acceptable. Where simulation/replication is considered necessary, assessors must be confident that the environment simulates/replicates the workplace to such an extent that competencies gained will be fully transferable to the workplace. In this case assessors must clearly identify those aspects of the workplace that are critical to performance, and make sure that they have been replicated satisfactorily.

Where simulation/replication is involved, assessors must obtain agreement with internal and external verifiers before assessing any candidates. Examples of critical aspects could be:

- environmental conditions such as, noise levels, lighting conditions and the presence of hazards
- the use of industrial equipment and procedures
- quality standards to be achieved
- pressure of work such as time constraints and repetitive activities
- carrying out work on actual work pieces and the consequences of making mistakes
- customer/supplier/departmental relationships

7. Assessors

7.1 The occupational competence of assessors is defined in SEMTA's Assessment Strategy.

7.2 The roles and responsibilities of assessors is outlined in the section above.
Assessors must competent to perform their role and either hold the qualifications needed to carry out assessment – or achieve within 18 months of commencing their role:

- D32 or D33
- A1

- Level 3 Award in Assessing Competence in the Work Environment
- Level 3 Award in Assessing Vocationally Related Achievement
- Level 3 Certificate in Assessing Vocational Achievement
- an appropriate Assessor qualification as identified by SQA Accreditation

Assessors must also:

- have a sound, in-depth knowledge of, and uphold the integrity of, the relevant NOS and Assessment Strategy to enable them to carry out assessment to the standards specified
- either hold a relevant technical qualification or by proven industrial experience of the technical areas to be assessed. The assessor's competence must, at the very least, be at the same level as that required of the candidate(s) in the units being assessed
- only assess in their acknowledged area of occupational competence
- maintain the currency of this for the duration of their role
- know QFI's requirements for recording assessment decisions and maintaining assessment records
- know SQA's regulatory requirements

7.3 Holders of A1 and D32/33 must assess to the current National Occupational Standards (NOS) for Learning and Development.

7.4 Assessors must be registered with QFI. The Centre Handbook provides details.

7.5 The assessment decisions of unqualified assessors must be countersigned by the IV.

8. Internal verification

8.1 Centres' internal assessment processes and practices must be effective and support the integrity and consistency of the qualification. This is achieved through the internal quality assurance that is undertaken by the approved centre, and the external quality assurance that is undertaken by QFI. Centres must operate explicit, written internal quality assurance procedures to ensure the accuracy and consistency of assessment decisions between assessors operating at the centre and that assessors are consistent in their interpretation and application of the qualifications or unit(s) learning outcomes

8.2 Centres must appoint IVs who will be responsible for:

- regular sampling evidence of assessment decisions made by all assessors across all aspects of assessment for the qualification. Sampling must include direct observation of assessment practice

- maintaining up-to-date records of IV and sampling activity (what was evidence was sampled or assessors / IV observed where there is more than one) and ensuring that these are available for external quality assurance
- establishing procedures to ensure that all assessors interpret the learning outcomes in the same way
- monitoring and supporting the work of assessors
- facilitating appropriate staff development and training for assessors
- providing feedback to the EV on the effectiveness of assessment
- ensuring that any corrective action required by QFI is carried out within agreed timescales.

8.3 Centres must ensure that the decisions of unqualified IVs are checked, authenticated and countersigned by an IV who is appropriately qualified and occupationally expert. QFI will monitor a centre's compliance with these requirements through monitoring visits and certification claims.

8.4 The IV is also responsible and accountable for arranging the checking and countersigning process. IVs may verify only evidence that they did not assess themselves. Further guidance on internal quality assurance/verification is provided in the Centre Handbook. Appendix 5 of this document indicates suggested content for an IV strategy, and a template for sampling assessment evidence.

9. Internal verifiers

9.1 The occupational competence of IVs is defined in the Assessment Strategy for these qualifications

9.2 The roles and responsibilities of IVs is outlined above. IVs must competent to perform their role and either hold the qualifications needed to carry out internal verification – or achieve within 18 months of commencing their role:

- D34
- V1
- Level 4 Award in the Internal Quality Assurance of the Assessment Process and Practice
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Process and Practice
- an appropriate Internal Verifier qualification as identified by SQA Accreditation

9.3 It is strongly recommended that IVs also hold assessor qualifications (see section above). Holders of V1/D34 must quality assure to the current National Occupational Standards (NOS) for Learning and Development.

9.4 IVs must be registered with QFI. The Centre Handbook provides details.

10. External verification

10.1 External verification of this qualification ensures that the requirements are met for the Assessment Strategy.

10.2 Centre visits will normally take place on an annual basis, though these could be more frequent if deemed necessary as a result of QFI's risk assessments. The **Centre Handbook** provides further details on external verification including to prepare for centre visits.

11. Certification

11.1 Note that there is a lapsing period of four years for this qualification. This means that when the qualification expires, is withdrawn or replaced by a revised version, candidates registered have four years from the expiry date in which to complete the qualification. This will allow sufficient time for candidates to compete and allow for currency of evidence.

12. Equality and diversity

12.1 This qualification must be assessed in English.

12.2 Assessment must be inclusive and where appropriate reasonable adjustments made to ensure equality of access in line with QFI's Equality and Diversity Policy. Full details are included in the QFI Centre Handbook**.**

12.3 Special consideration is not normally given for competence based qualifications as it is necessary for candidates to demonstrate that they have the necessary skills and knowledge to achieve the qualification and operate safely in the workplace.

12.4 Equality data will be collected at the point of registration. This is for monitoring purposes only and will include age, gender, ethnicity, and disability.

13. Fees

13.1 The current fees for this qualification, and for individual units, are included in the QFI Fees and Invoicing document. This document also details what is/ is not included in fees.

13.2 Fees may be broken down to a reasonable level upon request to QFI.

APPENDIX 1 - CANDIDATE TEMPLATE DOCUMENTS

Sample Form
Induction checklist

This document indicates what may be covered as part of a candidate's induction. This list is not exhaustive.

	Tick
Qualification information: • Units • Structure • Summary of assessment • Awarding body	
Roles and responsibilities: • Candidate • Assessor • Internal Verifier • External Verifier	
Training and assessment process: • Planning • Collection of evidence (including methods) • Review of evidence • Feedback on evidence • Verification of evidence • Certification	
Policies: • Complaints • Appeals • Malpractice • Data protection • Health and safety • Equality (including reasonable adjustments/ additional support)	
Forms: • Enrolment • Other	
I confirmation that I have received this induction and the associated documents: Candidate name: …….. Candidate signature: ……..…. Date: ……	

APPENDIX 2

UNITS

SEMMAN123-01 Complying with statutory regulations and organisational safety requirements

Overview

This standard identifies the competencies you need to deal with statutory regulations and organisational safety requirements, in accordance with approved procedures. You will be required to comply with all relevant regulations that apply to your area of work as well as your general responsibilities as defined in the Health and Safety at Work Act. You will also need to be able to identify the relevant qualified first aiders or appointed person, and must know the location of the first aid facilities. You will have an understanding of the procedures to be adopted in the case of accidents involving injury, and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. You will also need to be fully conversant with the organisation's procedures for fire alerts and the evacuation of premises.

You will be required to identify the hazards and risks that are associated with your job. Typically these will focus on your working environment, the tools and equipment that you use, materials and substances that you use, working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

Your responsibilities will require you to comply with organisational policy and procedures for the statutory regulations and organisational safety activities undertaken, and to report any problems with the safety activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the way in which you carry out the required engineering activities.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying statutory regulations and organisational safety requirements and procedures. You will understand the safety requirements and their application, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

Performance criteria

You must be able to:

P1 comply with your duties and obligations as defined in the Health and Safety at Work Act
P2 present yourself in the workplace suitably prepared for the activities to be undertaken
P3 follow organisational accident and emergency procedures
P4 recognise and control hazards in the workplace
P5 use correct manual lifting and carrying techniques
P6 apply safe working practices and procedures

Knowledge and understanding

You need to know and understand:

K1 the roles and responsibilities of yourself and others under the Health and Safety at Work Act 1974 and other current legislation (eg, The Management of Health and Safety at Work Regulations; Workplace Health and

Safety and Welfare Regulations; Personal Protection at Work Regulations; Manual Handling Operations Regulations; Provision and Use of Work Equipment Regulations; Display Screen at Work Regulations)
K2 the specific regulations and safe working practices and procedures that apply to your work activities
K3 the warning signs for the seven main groups of hazardous substances defined by Classification, Labelling and packaging of Dangerous Substances and mixtures Regulations
K4 how to locate relevant health and safety information for your tasks, and the sources of expert assistance when help is needed
K5 what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile or toxic materials, unshielded processes)
K6 your responsibilities for dealing with hazards and reducing risks in the workplace (such as hazard spotting and safety inspections; the use of hazard check lists, carrying out risk assessments, COSHH assessments and safe systems of working)
K7 the risks associated with your working environment (the tools, materials and equipment that you use, spillages of oil and chemicals, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)
K8 the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard check lists, carrying out risk and COSHH assessments)
K9 control measures that can be used to eliminate/reduce the hazard (such as lock-off and permit top work procedures, provision of safe access and egress, use of guards and fume extraction equipment, use of personal protective equipment)
K10 the first aid facilities that exist within your work area and within the organisation in general, and the procedures to be followed in the case of accidents involving injury
K11 what constitutes dangerous occurrences and hazardous malfunctions, and why these must be reported even when no one was injured
K12 the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report your presence at the appropriate assembly point
K13 the organisational policy with regard to fire fighting procedures; the common causes of fire and what you can do to help prevent them
K14 the protective clothing and equipment that is available for your areas of activity
K15 the need to observe personal protection and hygiene procedures at all times (such as skin care (barrier creams, gloves), eye protection (safety glasses, goggles, full face helmets), hearing protection (ear plugs, ear defenders), respiratory protection (fume extraction, face masks, breathing apparatus), head protection (caps with hair restraints, protective helmets), foot protection (safety footwear), dangers of ingestion and the importance of washing hands)
K16 how to act responsibly within the working environment (such as observing restricted area notices, complying with warning signs, walking not running, using equipment only for its intended purpose, not interfering with equipment or processes that are not within your job role, following approved safety procedures at all times)
K17 how to lift and carry loads safely, and the manual and mechanical aids available
K18 how to prepare and maintain safe working areas; standards and procedures to ensure good housekeeping
K19 the importance of safe storage of tools, equipment, materials and products
K20 the extent of your own authority and whom you should report to in the event of problems that you cannot resolve

Additional information
Scope/ range relating to performance criteria

1. demonstrate your understanding of your duties and obligations to health and safety by carrying out all of the following: 1.1 applying, in principle, your duties and responsibilities as an individual under the Health and

Safety at Work Act and other relevant current legislation 1.2 identifying, within your working environment, appropriate sources of information and guidance on health and safety issues, to include eye protection and personal protective equipment (PPE), COSHH regulations and risk assessments 1.3 identifying the warning signs and labels of the main groups of hazardous or dangerous substances 1.4 complying with the appropriate statutory regulations at all times and specified regulations to your work
2. comply with all emergency requirements, to include: 2.1 identifying the appropriate qualified first aiders or appointed person and the location of first aid facilities 2.2 identifying the procedures to be followed in the event of injury to yourself or others 2.3 following organisational procedures in the event of fire/fire drills and the evacuation of premises/work area 2.4 identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment, processes or machinery
3. identify the hazards and risks that are associated with all of the following: 3.1 your working environment (such as working at heights, confined spaces, environmental conditions) 3.2 the tools and equipment that you use (such as machine tools, power tools, cutting tools) 3.3 the materials and substances that you use (such as fluids, oils, fluxes) 3.4 using working practices that do not follow laid-down procedures
4. demonstrate the following method of manual lifting and carrying techniques: 4.1 lifting alone Plus one from: 4.2 with assistance of others 4.3 with mechanical assistance
5. apply safe working practices in an industrial environment, to include all of the following: 5.1 maintaining a tidy workplace with exits and gangways free from obstructions 5.2 using tools and equipment safely and only for the purpose intended 5.3 observing organisational safety rules, signs and hazard warnings 5.4 taking measures to protect others from harm resulting from any work you are carrying out 5.5 observe personal protection and hygiene procedures at all times

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Validity: Current Status: Original
Originating organisation: SEMTA Original URN: MAN123.01
Relevant occupations: Engineering; engineering and manufacturing technologies; Engineering and manufacturing technologies; Manufacturing technologies; Process; Plant and Machine Operatives; Process Operatives; Corporate managers and senior officials; Engineering and Manufacturing technologies; Engineering; Functional managers
Suite: AERONAUTICAL ENGINEERING SUITE 2 2006 AERONAUTICAL ENGINEERING SUITE 3 2008 AERONAUTICAL ENGINEERING SUITE 3 2009 AUTOMOTIVE ENGINEERING SUITE 3 2008 BUSINESS IMPROVEMENT TECHNIQUES SUITE 2 2008 BUSINESS IMPROVEMENT TECHNIQUES SUITE 3 2008 BUSINESS IMPROVEMENT TECHNIQUES SUITE 4 BUSINESS IMPROVEMENT TECHNIQUES SUITE 5 2006 Composite Engineering Suite 3 ELECTRICAL AND ELECTRONIC ENGINEERING SUITE 3 2004 ENGINEERING LEADERSHIP SUITE 3 ENGINEERING MAINTENANCE AND INSTALLATION SUITE 2 2008 ENGINEERING MAINTENANCE SUITE 3 2008 Engineering leadership and management suite 4 ENGINEERING TECHNICAL SUPPORT SUITE 2 2007 ENGINEERING TECHNICAL SUPPORT SUITE 3 2009 ENGINEERING TOOLMAKING SUITE 3 2005 ENGINEERING WOODWORKING, PATTERN AND MODEL MAKING SUITE 3 2002 s SEMMAN123-01 Complying with statutory regulations and organisational safety requirements 8 Fabrication and welding suite 2 Fabrication and Welding Engineering Suite 3 INSTALLATION AND COMMISSIONING SUITE 3 2003 MARINE ENGINEERING SUITE 2 MARINE ENGINEERING SUITE 3 MATERIALS PROCESSING AND FINISHING SUITE 2 AND 3 2003 MECHANICAL MANUFACTURING ENGINEERING SUITE 2 2008 MECHANICAL MANUFACTURING ENGINEERING SUITE 3 2008 Performing Engineering Operations Suite 1 Performing Engineering Operations Suite 2 PERFORMING MANUFACTURING OPERATIONS SUITE 1 AND 2 2003; MATERIALS PROCESSING AND FINISHING SUITE 2; MATERIALS PROCESSING AND FINISHING SUITE 3 METAL PROCESSING AND ALLIED OPERATIONS SUITE 2 METAL PROCESSING AND ALLIED OPERATIONS SUITE 3 Electrical and Electronic Engineering suite 3 Engineering and Manufacture Suite 4
Key words: working safely, engineering environment, manufacturing, safe working practices, health and safety, hazard control, risk assessment, COSHH Regulations, hazards; materials; processing; finishing; Leadership; Engineering Manufacture

SEMMAN23-02 Using and interpreting engineering data and documentation

Overview

This standard identifies the competencies you need to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from engineering documentation such as drawings, technical manuals, reference tables, specifications, charts or electronic displays, in accordance with approved procedures. You will be required to extract the necessary information from the various sources, data and documentation, in order to establish and carry out the work requirements and to make valid decisions about the quality and accuracy of the work produced.

Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the data and documentation. You will be expected to report any problems with the use and interpretation of data and documentation that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of the types of data and documentation used, and will provide an informed approach to applying and communicating instructions and procedures. You will be able to read and interpret the data and documentation used, and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Performance criteria

You must be able to:

P1 use the approved source to obtain the required data and documentation
P2 correctly interpret the data and documentation
P3 identify, extract and interpret the required information
P4 use the information obtained to ensure that work output meets the specification
P5 deal promptly and effectively with any problems within your control and report those which cannot be solved
P6 report any inaccuracies or discrepancies in data and documentation

Knowledge and understanding

You need to know and understand:

K1 the information sources used for the data and documentation that you use in your work activities
K2 how documents are obtained, and how to check that they are current and valid
K3 the basic principles of confidentiality (including what information should be available and to whom)
K4 the different ways/formats that data and documentation can be presented (such as drawings, job instructions, product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information)
K5 how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding electrodes, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation)
K6 the importance of differentiating fact from opinion when reviewing data and documentation
K7 the importance of analysing all available data and documentation before decisions are made
K8 the different ways of storing and organising data and documentation to ensure easy access

K9 the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents
K10 the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done
K11 the care and control procedures for documents, and how damage or graffiti on documents can lead to errors in work produced
K12 the importance of returning documents to the designated location on completion of the work activities
K13 the basic drawing conventions that are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams
K14 the types of documentation that are used and how they interrelate (such as first and third angle component drawings, assembly drawings, production data, circuit and wiring diagrams, block and schematic diagrams)
K15 the imperial and metric systems of measurement, tolerancing and fixed reference points (where applicable)
K16 the meaning of the different symbols and abbreviations found on the documents that you use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)
K17 the extent of your own responsibility, when to act on your own initiative to find, clarify and evaluate information, and whom you should report to if you have problems that you cannot resolve

Additional information
Scope/ range related to performance criteria

1. use approved sources to obtain the necessary data and documentation, and carry out all of the following: 1.1 check the currency and validity of the data and documentations used 1.2 exercise care and control over the documents at all times 1.3 correctly extract all necessary data and information in order to carry out the required tasks 1.4 seek out additional information where there are gaps or deficiencies in the information obtained 1.5 deal with or report any problems found with the data and documentation 1.6 make valid decisions based on the evaluation of the data and documentation 1.7 return all documentation to the approved location on completion of the work 1.8 complete all necessary documentation on completion of the work activity
2. use information extracted from one from the following: 2.1 drawings (such as component drawings, assembly drawings, modification drawings repair drawings, welding/fabrication drawings, distribution and installation drawings) 2.2 diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams, operational diagrams) 2.3 manufacturers' manuals/drawings 2.4 approved sketches 2.5 technical illustrations 2.6 photographic representations 2.7 visual display screens information 2.8 technical sale/marketing documentation 2.9 contractual documentation 2.10 other specific documents or drawings
3. use information extracted from related documentation, to include two from the following: 3.1 instructions (such as job instructions, drawing instructions, manufacturers' instructions) 3.2 specifications (such as material, finish, process, contractual, calibration) 3.3 reference materials (such as manuals, tables, charts, guides, notes) 3.4 schedules 3.5 company procedures 3.6 operation sheets 3.7 service bulletins/test information 3.8 planning documentation 3.9 quality control documents 3.10 company specific technical instructions 3.11 national, international and organisational standards 3.12 health and safety standards related to the activity (such as COSHH) 3.13 other specific related documentation such as airworthiness directives and routine technical instructions
4. extract information that includes three of the following: 4.1 materials or components required 4.2 dimensions 4.3 tolerances 4.4 build quality 4.5 installation requirements 4.6 customer requirements 4.7 time scales 4.8 financial information 4.9 operating parameters 4.10 surface texture requirements 4.11 location/orientation of parts 4.12 process or treatments required 4.13 dismantling/assembly sequence 4.14 inspection/testing requirements 4.15 fault finding procedures 4.16 safety/risk factors 4.17 environmental controls 4.18 number/volumes required 4.19 repair/service methods 4.20 method of manufacture 4.21 weld

type and size 4.22 operations required 4.23 connections to be made 4.24 surface finish required 4.25 shape or profiles 4.26 other specific related information

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Validity: Current Status: Original
Originating organisation: SEMTA Original URN: MAN23.02
Relevant occupations: AERONAUTICAL ENGINEERING SUITE 2 2006 AERONAUTICAL ENGINEERING SUITE 3 2008 AERONAUTICAL ENGINEERING SUITE 3 2009 AUTOMOTIVE ENGINEERING SUITE 3 2008 Composite Engineering Suite 3 ELECTRICAL AND ELECTRONIC ENGINEERING SUITE 3 2004 ENGINEERING MAINTENANCE AND INSTALLATION SUITE 2 2008 ENGINEERING MAINTENANCE SUITE 3 2008 ENGINEERING TECHNICAL SUPPORT SUITE 2 2007 ENGINEERING TECHNICAL SUPPORT SUITE 3 2009 ENGINEERING TOOLMAKING SUITE 3 2005 ENGINEERING WOODWORKING, PATTERN AND MODEL MAKING SUITE 3 2002 Fabrication and welding suite 2 Fabrication and Welding Engineering Suite 3 INSTALLATION AND COMMISSIONING SUITE 3 2003 MARINE ENGINEERING SUITE 2 MARINE ENGINEERING SUITE 3 MATERIALS PROCESSING AND FINISHING SUITE 2 AND 3 2003 MECHANICAL MANUFACTURING ENGINEERING SUITE 2 2008 MECHANICAL MANUFACTURING ENGINEERING SUITE 3 2008 MATERIALS PROCESSING AND FINISHING SUITE 2; MATERIALS PROCESSING AND FINISHING SUITE 3; METAL PROCESSING AND ALLIED OPERATIONS SUITE 2; METAL PROCESSING AND ALLIED OPERATIONS SUITE 3 Electrical and Electronic Engineering suite 3
Key words: Engineering data, engineering drawings, engineering documentation, general assembly drawing, technical manuals, technical specifications, schematic layouts; Materials; Processing; Finishing

SEMMAN3-03 Working efficiently and effectively in engineering

Overview

This standard identifies the competencies you need to work efficiently and effectively in the work place, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, you will be required to carry out all necessary preparations within the scope of your responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring you have the appropriate job specifications and instructions, and ensuring that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

On completion of the engineering activity, you will be required to return your immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.

In order to be efficient and effective in the workplace, you will also be required to demonstrate that you can create and maintain effective working relationships with colleagues and line management. You will be expected to review objectives and targets for your personal development and make recommendations and communicate any opportunities for improvements that could be made to working practises and procedures. Your responsibilities will require you to comply with health and safety requirements, organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, tools or equipment that you cannot personally resolve, or are outside your permitted, authority to the relevant people.

Working with minimal supervision you will be expected to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to working efficiently and effectively in an engineering environment. You will understand the need to work efficiently and effectively, and will know about the areas you need to consider when preparing and tidying up the work place, how to recommend

improvements, deal with problems, maintain effective working relationships and agree your development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly. You will understand the safety precautions required when carrying out engineering activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
P2 prepare the work area to carry out the engineering activity
P3 check there are sufficient supplies of materials and/or consumables and that they meet work requirements
P4 ensure completed products or resources are stored in the appropriate location on completion of the activities
P5 tidy up the work area on completion of the engineering activity
P6 deal promptly and effectively with problems within your control and report those that cannot be resolved
P7 contribute to and communicate opportunities for improvements to working practises and procedures
P8 maintain effective working relationships with colleagues
P9 review personal training and development as appropriate to the job role

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be followed whilst preparing and tidying up your work environment
K2 the correct use of any equipment to protect the health and safety of you and your colleagues
K3 the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity
K4 the action that should be taken if documentation received is incomplete and/or incorrect
K5 the procedure for ensuring all tools and equipment are available prior to undertaking the activity
K6 the checks to be carried out to ensure tools and equipment are in full working order, prior to undertaking the activity
K7 the action that should be taken if tools and equipment are not in full working order
K8 the checks to be carried out to ensure all materials and resources required are correct and complete, prior to undertaking the activity
K9 the action that should be taken if materials/resources do not meet the requirements of the activity
K10 whom to inform when the work activity has been completed
K11 the information and/or documentation require to confirm with others that the activity has been completed
K12 what materials, resources, equipment and tools can be re-used
K13 how any waste materials and/or products are transferred, stored and disposed of
K14 where tools and equipment should be stored and located
K15 the importance of making recommendations to improving working practises
K16 the procedures and format for making suggestions for improvements
K17 what the benefits are to you and the organisation if improvements can be identified and implemented
K18 the importance of maintaining effective working relationships within the workplace
K19 the procedures to deal with and reporting any problems that can affect working relationships
K20 the difficulties that can occur in working relationships and how to resolve them
K21 the regulations that affect how you should be treated at work (such as Equal Opportunities Act, Race, Disability and Sex Discrimination, Working Time Directive)
K22 the benefits of continuous personal development
K23 the training opportunities that are available in the workplace

K24 the importance of reviewing your training and development
K25 with whom to discuss training and development issues
K26 the extent of your own responsibility and whom you should report to if you have any problems that you cannot resolve

Additional information
Scope/ range related to performance criteria

1. prepare to carry out the engineering activity, ensuring all of the following, as applicable to the work to be undertaken: 1.1 the work area is free from hazards and suitably prepared for the activities to be undertaken 1.2 any required safety procedures are implemented 1.3 any necessary personal protection equipment (PPE) is obtained and is in a usable condition 1.4 tools and equipment required are obtained and checked that they are in a safe and useable condition 1.5 all necessary drawings, specifications and associated documentation is obtained 1.6 job instructions are obtained and understood 1.7 the correct materials, components or resources are obtained 1.8 storage arrangements for work are appropriate 1.9 appropriate authorisation to carry out the work is obtained
2. complete work activities, to include all of the following as applicable to the work undertaken: 2.1 returning tools and equipment 2.2 returning drawings and work instructions 2.3 arranging for the safe disposal of waste materials 2.4 completing all necessary documentation accurately and legibly 2.5 identifying, where appropriate, any unusable tools, equipment, components or other resources
3. make recommendations for improving two of the following: 3.1 working practises 3.2 working methods 3.3 quality 3.4 safety 3.5 tools and equipment 3.6 supplier relationships 3.7 internal communication 3.8 customer service 3.9 training and development 3.10 teamwork 3.11 other specific opportunity
4. deal with problems affecting the engineering process, to include two of the following: 4.1 materials 4.2 job specification 4.3 timescales 4.4 tools and equipment 4.5 quality 4.6 safety 4.7 drawings 4.8 people 4.9 activities or procedures
5. maintain effective working relationships, to include two of the following: 5.1 colleagues within own working group 5.2 line management 5.3 people outside your normal working group 5.4 external contacts
6. review personal development objectives and targets, to include one of the following: 6.1 dual or multi-skilling 6.2 understanding of company working practices, procedures, plans and policies 6.3 training on new equipment/technology 6.4 increased responsibility 6.5 other specific requirements

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Originating organisation: SEMTA Original URN: MAN3.03
Relevant occupations: Engineering; engineering and manufacturing technologies; Manufacturing Technologies; Process; Plant and Machine Operatives; Process Operatives
Suite: AERONAUTICAL ENGINEERING SUITE 3 2008 AERONAUTICAL ENGINEERING SUITE 3 2009 AUTOMOTIVE ENGINEERING SUITE 3 2008 Composite Engineering Suite 3 ELECTRICAL AND ELECTRONIC ENGINEERING SUITE 3 2004 ENGINEERING MAINTENANCE SUITE 3 2008 ENGINEERING TECHNICAL SUPPORT SUITE 3 2009 ENGINEERING TOOLMAKING SUITE 3 2005 ENGINEERING WOODWORKING, PATTERN AND MODEL MAKING SUITE 3 2002 Fabrication and Welding Suite 3 INSTALLATION AND COMMISSIONING SUITE 3 2003 MARINE ENGINEERING SUITE 3 MATERIALS PROCESSING AND FINISHING SUITE 3 2003 MECHANICAL MANUFACTURING ENGINEERING SUITE 3 2008 MATERIALS PROCESSING AND FINISHING SUITE 3 METAL PROCESSING AND ALLIED OPERATIONS SUITE 3 ELECTRICAL AND ELECTRONIC ENGINEERING SUITE 3
Key words: Engineering, working effectively, working efficiently, effective working practices, working methods, effective use of materials, working with others company practices and procedures

SEMFWE322
Marking out components for metalwork

Overview

This standard identifies the competencies you need to mark out sheet and plate work (including simple templates), and rolled sections in accordance with approved procedures. You will be required to select the required materials to use and the appropriate marking out tools and equipment based on the information presented to you and the accuracy to be achieved. Marking out will be the preparation required for cutting, shaping and forming sheet materials, plate and sections as is appropriate to the application and will include marking out workpiece datums, centre lines, angles and curved details, cutting and bending details including bending allowances and hole centring and outlining details.

Materials to be marked out may include ferrous and non-ferrous. Certain materials will require you to take the grain flow or rolling direction into account to avoid later production process problems.Your responsibilities will require you to comply with organisational policy and procedures for the marking out activities undertaken and to report any problems with the materials, equipment or marking out activities that you cannot resolve yourself, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying marking out procedures. You will understand the marking out process, and its application, and will know about the materials as well as the care and use of tools in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety procedures required when using marking mediums, and when carrying out the marking out activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 obtain and use the correct information for marking out

P3 obtain the appropriate marking out equipment and check that it is in a usable condition
P4 prepare suitable datums and marking out surfaces
P5 produce marked out components using appropriate methods
P6 check that the marking out complies with the specification
P7 complete relevant paperwork in accordance with organisational requirements
P8 deal promptly and effectively with problems within your control and report those that cannot be resolved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment with sheet, plate or rolled section materials (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting sheet, plate and rolled section materials
K4 the hazards associated with marking out fabricated components and how they can be minimised (such as working in a fabrication environment, lifting and handling sheet/fabricated components, slivers/burrs on sheet materials, using marking out mediums, using laser marking out equipment)
K5 the procedures to be adopted to obtain the necessary drawings and job instructions
K6 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K7 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K8 visualising how to produce a three dimensional shape from the two dimensional material
K9 the preparations that need to be carried out on the material prior to marking out to enhance clarity and accuracy, and safety
K10 principles of marking out, developing basic shapes (flat, rectangular and cylindrical) from flat sheet, plate or rolled section materials
K11 the effective use and care of tools/instruments
K12 use of marking out conventions (such as datum edges/lines, centre lines)
K13 the material characteristics and process considerations that need to be taken into account when marking out sheet, plate or rolled section materials
K14 how to calculate and mark out true lengths, bend allowances and circumferences
K15 geometrical construction methods for straight and radius bends, curved or circumference sections, pyramid or cone sections
K16 ways of laying out the shapes/patterns to maximise the use of plate or sheet material
K17 setting and adjusting tools, such as squares and protractors
K18 methods of marking out large or long shapes
K19 marking out and transferring information from templates
K20 how to transfer information to the underside of the sheet or plate
K21 the importance of using tools only for the purpose intended, the care that is required when using the equipment and tools, the proper way of preserving and storing tools and equipment between operations.
K22 the need for clear and dimensional accuracy in marking out to specifications/drawings
K23 the problems that can occur in marking out fabrication components, and how these can be avoided

K24 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K25 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Mark out sheet, plate or section materials on two materials from the following:
1.1 hot rolled mild steel
1.2 aluminium
1.3 lead
1.4 cold rolled mild steel
1.5 brass
1.6 titanium
1.7 coated mild steel (such as primed, tinned or galvanised)
1.8 copper
1.9 stainless steel
1.10 non-metallic materials
2. Mark out sheet or plate for three of the following forms/shapes of component:
2.1 flat covers and plates
2.2 fish plates, gussets
2.3 square and radial bends
2.4 brackets
2.5 square/rectangular/box sections
2.6 structural support pads, bed plates
2.7 cylindrical sections (such as trunking, pipes, tanks)
2.8 columns, beams or struts
2.9 frames or structures
2.10 simple seatings (such as boiler saddles, tank cradles)
3. Mark out directly onto sheet or plate from drawings using six of the following tools and instruments:
3.1 scriber
3.2 protractor
3.3 centre punch
3.4 dividers or trammels
3.5 rule and tape
3.6 chalk, bluing or paint
3.7 straight edge
3.8 etching
3.9 laser
3.10 square
4. Mark out material to include five of the following features:
4.1 datum and centre lines
4.2 curved profiles
4.3 square/rectangular profiles
4.4 cutting and bending detail (including allowances)
4.5 angles
4.6 hole centring and outlining (circular and linear)
4.7 circles

5. Produce marked out component which meet all of the following quality and accuracy standards:
5.1 company/customer standards and codes of practice
5.2 dimensionally accurate (to drawing or specification)
5.3 clearly defined for required processes
5.4 uses recognised marking out conventions
6. Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:
6.1 build records
6.2 log cards
6.3 job cards
6.4 quality documentation
6.5 other specific recording methods

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Originating organisation SEMTA
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Suite: Fabrication and Welding Engineering Suite 3
Key words: engineering; welding; fabrication; marking out; sheet materials; plate; section materials; equipment; methods; shapes and forms

SEMFWE327
Developing and marking out templates for metalwork

Overview

This standard identifies the competencies you need for developing and marking out templates prior to cutting and/or shaping the material in accordance with approved procedures. You will be required to select the appropriate materials and equipment to use based on the information presented to you and the accuracy required to be achieved. The templates produced may be used for marking out, setting of fabrications or pipe arrangements or preparing (setting) heavy plate for rolling.

Your responsibilities will require you to comply with organisational policy and procedures for the marking out and template making activities, seeking out relevant information and reporting any problems with the equipment, materials or template making activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to template making. You will understand the marking out and template making process and its application, and will know about the equipment, materials and processes

to be carried out in sufficient depth to provide a sound basis for carrying out the activities, correcting faults and producing the templates to the required specification. You will understand the safety precautions required when carrying out the template making activities and when using the associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 obtain and use the correct information for marking out
P3 obtain the appropriate marking out equipment and check that it is in a usable condition
P4 prepare suitable datums and marking out surfaces
P5 develop templates that comply with quality and accuracy standards
P6 mark out using appropriate methods
P7 check that the marking out complies with the specification
P8 deal promptly and effectively with problems within your control and report those that cannot be resolved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment with sheet or plate materials (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting sheet or plate materials
K4 the hazards associated with fabrication work and how they can be minimised (such as handling sheet/fabricated components; using dangerous or badly maintained tools and equipment)
K5 how to obtain the necessary drawings, template specifications and job instructions
K6 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)

K7 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K8 principles and techniques for marking out templates
K9 geometrical methods for developing of complex shapes (such as square to round, lobsterback sections) from sheet metal
K10 how to produce a three dimensional shape from the two dimensional material
K11 use of marking out conventions (such as datum edges/lines, centre lines)
K12 the preparations that need to be carried out on the material prior to marking out to enhance clarity and accuracy, and safety
K13 the component material characteristics and process considerations that need to be taken into account when marking out templates
K14 allowances for joint and weld preparations for different materials and thicknesses
K15 how to calculate true lengths, bend allowances and circumferences
K16 the effective use and care of tools/instruments
K17 how to mark out and preserve the template for maximum clarity, accuracy and ease of transfer
K18 ways of laying out the shapes/patterns to maximise the use of plate or sheet material
K19 setting and adjusting tools, such as squares and protractors
K20 how to transfer information to the underside of the sheet or plate
K21 the importance of using tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of preserving and storing tools and equipment between operations
K22 the need for clear and dimensional accuracy in marking out to specifications/drawings
K23 the problems that can occur in marking out templates and how these can be avoided
K24 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Mark out plate or pipe setting for two of the following:
1.1 angular setting
1.2 large radius section
1.3 plate setting
1.4 burner template
2. Mark out templates for six of the following:
2.1 radiused and mitred corners
2.2 ball corner or spherical section
2.3 concentric cones
2.4 fish plates
2.5 offset cones
2.6 bed plates
2.7 truncated cones
2.8 gusset plates
2.9 square/rectangular to round
2.10 structural components
2.11 fishtail
2.12 simple seating (tank cradles)
2.13 segmented bends (lobsterback)
2.14 box edges

2.15 other specific shapes
3. Use all of the following tools and instruments to mark out directly from drawings onto sheetmetal:
3.1 scriber
3.2 square
3.3 centre punch
3.4 protractor
3.5 rule or tape
3.6 dividers or trammels
3.7 straight edge
3.8 chalk, bluing or paint
3.9 laser (where applicable)
4. Mark out material to include all of the following features:
4.1 datums and centre-lines
4.2 cutting detail and allowances
4.3 square and rectangular profiles
4.4 bend/fold allowances
4.5 angles
4.6 hole centres and outlining (linear)
4.7 circles and curved profiles
4.8 hole centres and outlining (on pitch circles)
5. Develop templates that meet all the following quality and accuracy standards:
5.1 template profile complies with drawing or job requirements
5.2 dimensional accuracy meets drawing/specification tolerances
5.3 suitably marked or labelled to identify purpose
5.4 marking out uses recognised conventions

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SEMFWE333
Cutting and shaping materials using portable thermal cutting equipment

Overview
This standard identifies the competencies you need for cutting and shaping plate (3mm thickness and above), rolled sections, pipe and tube for fabrications using portable thermal cutting equipment in accordance with approved procedures. The equipment to be used will include hand

held oxy/fuel gas cutting equipment, plasma cutting equipment and simple portable machines running on tracks. You will be required to assemble and set up the appropriate equipment to be used for the material and thickness to be cut, the type of operation to be carried out and the accuracy required to be achieved. Materials to be cut and shaped may include mild steel, stainless steel, special steels and other appropriate materials and will include guided cuts, vertical cuts, overhead cuts, external curved contours, round and square holes and demolition work as is appropriate. This will call for care in selecting the right equipment and tools so as to avoid damage to the material and tools, and danger to oneself

Your responsibilities will require you to comply with organisational policy and procedures for the cutting operations, seeking out relevant information for the thermal cutting activities undertaken and to report any problems with the equipment, materials, consumables or cutting activities that you cannot personally resolve yourself, or are outside your personal responsibilities, to the relevant authority. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying thermal-cutting procedures. You will understand the processes, and will know about the equipment and its application, and the materials and consumables, in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will need to understand the safety precautions required when working with the thermal cutting equipment, especially those with regard to fire and potential explosion, and the safeguards necessary for undertaking the activities safely and correctly. You will be expected to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the machine is set up and ready for the machining activities to be carried out
P3 manipulate the machine tool controls safely and correctly in line with operational procedures
P4 produce cut components to the required quality and within the specified dimensional accuracy
P5 carry out quality sampling checks at suitable intervals

P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with thermal cutting equipment in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume control; accident procedure; statutory regulations)
K2 the personal protective clothing and equipment that needs to be worn when working with fabrications and thermal cutting equipment (such as leather aprons and gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting plate materials and components
K4 the hazards associated with thermal cutting and how they can be minimised (including naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, elevated working, enclosed spaces)
K5 safe working practices and procedures for using thermal equipment in line with British Compressed Gas Association (BCGA) codes of practice, to include setting up procedures, permit to work procedures and emergency shut down procedures
K6 how to obtain the necessary drawings and thermal cutting specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 the thermal cutting process (basic principles of thermal cutting and related equipment; the various techniques and their limitation; care of the equipment to ensure that it is safe and ready to use)
K10 the various types of thermal cutting equipment available and typical applications
K11 the accessories that can be used with hand held thermal cutting equipment to aid cutting operations (such as guides, trammels, templates) and arrangements for attaching cutting aids to the equipment
K12 the gases used in thermal cutting, gas identification and colour codes, their particular characteristics and safety procedures
K13 how to set up the thermal cutting equipment (including connection of hoses, regulators and flash back arrestors, selection of cutting torch and nozzle size in relationship to material thickness and operations performed)
K14 preparations prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece, checking cleanliness of materials used)
K15 the holding methods that are used to aid thermal cutting and equipment that can be used
K16 setting of operating conditions; flame control and the effects of mixtures and pressures associated with thermal cutting.
K17 the correct procedure for lighting and extinguishing the flame, and the importance of following the procedure
K18 procedures to be followed for cutting specific materials, and why these procedures must always be adhered to
K19 material thermal cutting characteristics and material preparation requirements
K20 the terminology used in thermal cutting in relation to the operations being performed

K21 the problems that can occur with thermal cutting and how they can be avoided; causes of distortion during thermal cutting and methods of controlling distortion
K22 the effects of oil, grease, scale or dirt on the cutting process
K23 the causes of cutting defects, how to recognise them and methods of correction and prevention
K24 quality requirements of the type of work being undertaken
K25 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe and fit for purpose by carrying out all of the following checks:
1.1 the equipment selected is suitable for the operations to be performed
1.2 regulators, hoses and valves are securely connected and free from leaks and damage
1.3 the correct gas nozzle is fitted to the cutting torch
1.4 that a flash back arrestor is fitted to gas equipment
1.5 appropriate gas pressures are set
1.6 the correct procedure is used for lighting, adjusting and extinguishing the cutting flame
1.7 hoses are safely routed and protected at all times
1.8 gas cylinders are handled and stored safely and correctly
2. Use two of the following thermal cutting methods:
2.1 hand held oxy-fuel gas-cutting equipment
2.2 hand held plasma gas-cutting equipment
2.3 simple portable track driven cutting equipment (electrical or mechanical)
3. Perform thermal cutting operations to produce six of the following features:
3.1 down-hand straight cuts freehand
3.2 square/rectangular shapes
3.3 round holes
3.4 straight cuts track guided
3.5 irregular shapes
3.6 square holes
3.7 vertical cuts
3.8 angled cuts
3.9 rough cutting (demolition)
3.10 overhead cuts
3.11 external curved contours
3.12 bevelled edge - weld preparations
4. Produce thermal cuts in four of the following forms of material (metal of 3mm and above and two different thickness):
4.1 plate
4.2 rolled sections
4.3 fabricated sections
4.4 extrusions
4.5 bar
4.6 pipe/tube
5. Produce cut profiles for one type of material from the following:
5.1 mild steel
5.2 special steels

5.3 stainless steel
5.4 other appropriate material
6. Produce thermally cut components which meet all of the following quality and accuracy standards:
6.1 dimensional accuracy is within the tolerances specified on the drawing/specification or within +/- 3mm
6.2 angled cuts are within specification requirements (perpendicular/angularity)
6.3 cuts are clean and smooth with minimal drag lines

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SEMFWE334
Cutting materials using saws and abrasive discs

Overview

This standard identifies the competencies you need to cut and shape materials using saws and abrasive discs in accordance with approved procedures. You will be required to select the appropriate equipment for the operations to be carried out and check that it is in a safe and usable condition. In carrying out the cutting and shaping operations you will be expected to use both saws and abrasive discs to cut and shape the materials to the required accuracy and specification.

Your responsibilities will require you to comply with organisational policy and procedures for the cutting activities undertaken and to report any problems with the equipment or the cutting activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying cutting procedures when using saws and abrasive discs. You will understand the suitability of the cutting processes, and their applications, and will know about the characteristics of the materials and the appropriate processes and techniques in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when carrying out the cutting and shaping activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
P2 confirm that the machine is set up and ready for the machining activities to be carried out
P3 manipulate the machine tool controls safely and correctly in line with operational procedures
P4 produce cut components to the required quality and within the specified dimensional accuracy
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when working with power operated saws and abrasive disc cutting machines (statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment (PPE) that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 safe working practices and procedures to be observed when working with the machines including emergency shutdown procedures
K4 the correct methods of moving or lifting heavy plate or rolled sections
K5 the hazards associated with fabrication work and cutting operations and how they can be minimised (such using dangerous or badly maintained tools and equipment; airborne particles; hot metal; burrs and sharp edges)
K6 how to obtain the necessary drawings, specifications and work instructions
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions (such as cutting lines, centre lines)
K10 the range of machine saws available (such as power hacksaws, circular saws and band saws)

K11 the abrasive cutting equipment available to include hand held portable machines and bench type radiac cutting machines
K12 the selection and fitting of abrasive cutting discs, cutting disc identification markings and how to identify the correct type of disc for the type of material being cut
K13 statutory regulations regarding the fitting and use of abrasive discs
K14 the material cutting characteristics and process considerations that need to be taken into account when cutting materials
K15 the use and care of tools and equipment such as checking that trailing leads, plugs and sockets are in a safe, tested and usable condition
K16 the use of safety screens to protect other uses from flying sparks whilst using abrasive cutting discs
K17 the importance of ensuring that the machine guards are correctly fitted and positioned before using the equipment
K18 how to set and adjust power saws for the various operations being performed
K19 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K20 the problems that can occur when cutting materials using saws or abrasive discs, and how these can be avoided
K21 inspection techniques that can be applied to check shape and dimensional accuracy is to specification and within acceptable limits
K22 the extent of your own responsibility and who you should report to if you have problems that you cannot resolve
K23 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure that the equipment is fit for purpose and used safely by carrying out all of the following:
1.1 selecting the appropriate equipment/machine for the operation being performed
1.2 checking the machine guards and safety devices are in position and function correctly
1.3 checking cutting discs/blades are in a serviceable condition (free from damage or chips; sharp)
1.4 isolating the equipment from its power supply whilst changing blades or discs
1.5 using the equipment safely and correctly and only for its intended purpose
2. Use two of the following types of cutting equipment:
2.1 machine saw
2.2 hand held portable abrasive disc
2.3 band saw
2.4 radiac abrasive disc
3. Carry out all of the following cutting and shaping activities:
3.1 straight sawing
3.2 abrasive disc cutting
3.3 contour shaping using saws
4. Cut and shape components which contain all of the following features:
4.1 straight parallel cuts
4.2 curved contours
4.3 square cuts
4.4 angled/mitred cuts

5. Cut and shape three of the following forms of material:
5.1 flat plate
5.2 solid bar (square, round, hexagonal)
5.3 rolled sections (angle, channel, RSJ)
5.4 pipe/tube
5.5 rail section
5.6 non-ferrous materials
5.7 other specific form
6. Produce components that comply with all of the following quality and accuracy standards:
6.1 dimensional accuracy is within specification tolerances
6.2 cuts are square and clean and free from excessive burrs
6.3 angled cuts are within specification requirements

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SEMFWE344
Forming pipework by machine bending

Overview

This standard identifies the competencies you need to bend and form pipes using pipe-bending machines in accordance with approved procedures. You will be required to select the most appropriate type and size of machine and former, based on the pipe type, size and operations to be performed. In producing the pipework you will be required to operate the equipment safely and correctly, or direct operations for their effective use, to bend and form the pipe to the required profile without flats or deformations. The pipe bending and forming operations to be performed will include bending at right angles, bending to other angles, producing offsets, producing bridge sets, producing curved sections and producing expansion loops.

Your responsibilities will require you to comply with organisational policy and procedures for the use of the machines and the process activities undertaken and to report any problems with the pipe forming equipment, materials or forming activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to forming pipework using machine procedures. You will understand the

equipment being used, the forming principles, and their application, and will know about the processes involved and their limitations in sufficient depth to provide a sound basis for carrying out the activities, correcting any faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the forming machines and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the equipment is set up correctly and is ready for use
P3 manipulate the machine controls safely and correctly in line with operational procedures
P4 produce pipework components to the required specification
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the forming activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with pipe bending equipment bending machines in a fabrication environment
K2 the general workshop and site safety requirements, statutory regulations; risk assessment procedures and COSHH regulations
K3 the safe working practices and procedures required for operating power operated bending and forming machines
K4 the specific personal protective equipment (PPE) that needs to be worn when carrying out the pipe bending activities (such as gloves, eye protection, safety helmets, ear protection)
K5 the handling precautions and correct methods of moving or lifting long lengths or heavy pipes
K6 the hazards associated with the pipe bending activities and how they can be minimised (handling long pipe lengths; using power operated bending equipment; using dangerous or badly maintained tools and equipment; using heating equipment)

K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 principles and methods of marking out pipework and the type of equipment used (direct marking, use of templates, use of set wires)
K10 marking out conventions applicable to the bending process (such as centre lines, bending lines)
K11 allowances that need to be made in the marking out for the bending and forming activities
K12 how to prepare the pipes in readiness for the bending and forming activities (visually checking for defects, cleaning the materials, removing burrs and sharp edges)
K13 the characteristics of the various materials that are to be used with regard to the bending operations and why some materials may require the addition of heat to aid the bending process
K14 the various types of pipe bending machines used to bend and form the pipe (including the use of hand bending machines, hydraulic bending equipment, power operated equipment and heating methods)
K15 how to prepare and set up the machine for a range of different bends (angled bends, curved sections, twisted sections and straightening of sections)
K16 how to produce the various bends required (such as angled bends, dog-leg sets, bridge sets and expansion loops)
K17 ways of limiting distortion, wrinkles, marking and creases in the finished workpiece
K18 the problems that can occur with the bending and forming activities, and how they can be avoided
K19 the organisational quality control procedures that are used, and how to recognise defects in the bends that you produce
K20 how to make dimensional and forming inspection checks and the tools and equipment that can be used
K21 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe to use and fit for purpose by carrying out all of the following checks:
1.1 the appropriate machine is selected for the operation being performed
1.2 the machine guards and safety devices are in position and function correctly
1.3 forming tools are appropriate and in a serviceable condition (secured, correct diameter, free of damage)
1.4 machine settings are suitable for the pipe diameter, material thickness and operations to be performed
2. Use one of the following types of pipe bending machines:
2.1 hand operated manual bending machines (small diameter pipe)
2.2 hydraulic operated bending machines
2.3 powered pipe bending machines
2.4 CNC bending machines
2.5 power press with different former radii and sizes (pipe diameter)

3. Bend and form one of the following types of pipework:
3.1 small bore lubrication/fuel piping
3.2 structural pipes
3.3 cable ducting pipework
3.4 high pressure pipes
3.5 heavy duty pipes
4. Produce pipework forms that includes four of the following:
4.1 right angled bends
4.2 bridge sets
4.3 angular bends
4.4 expansion loops
4.5 offsets
4.6 curved sections
4.7 other specific form
5. Bend and form pipes made from one of the following types of material:
5.1 ferrous steel
5.2 non-ferrous
5.3 special metals
6. Produce pipe bends and forms which comply with all of the following quality and accuracy standards as is applicable:
6.1 meet drawing, specification, template or job requirements
6.2 meet customer requirements
6.3 have the required dimensional accuracy within specified tolerances
6.4 the form or sharpness of the bend conforms to best practice and or specification without deformation or cracking
6.5 the bend conforms to the required shape/geometry (to the template profile)

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SEMFWE345
Producing pipe fabrications

Overview

This standard identifies the competencies you need to produce pipe fabrications such as flanged pipes, elbows, tee pieces, reduction pieces and segmented bends to specification and in accordance with approved procedures. You will be required to cut, form, lay out and secure parts of the pipe fabrication in the correct orientation and configuration for fixing using tack welding or

mechanical securing methods as is specified or appropriate to the application and in a manner that is fit for purpose.

Your responsibilities will require you to comply with organisational policy and procedures for the manufacture and assembly of the pipe fabrications and the associated activities to be undertaken and to report any problems with the activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach producing fabricated pipe components and their assembly and fixing procedures. You will understand the techniques used and the requirements of the manufacturing and assembling procedures and their application. You will know about the methods of producing pipe components of the required strength. That are fit for purpose and meet the requirements of pressure tests, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with pipe fabrications/components and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant instructions, assembly drawings and any other specifications
P3 ensure that the specified pipework components are available and that they are in a usable condition
P4 use the appropriate methods and techniques to assemble the pipework components in their correct positions
P5 secure the pipework components using the specified connectors and securing devices
P6 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a pipe fabrication environment and when producing fabricated pipe components (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the pipe fabrication activities (such as leather gloves, eye protection, safety helmets, ear protection)
K3 safe working practices and procedures needed for producing fabricated pipe components
K4 the correct methods of moving or lifting long or heavy pipe fabrications
K5 the hazards associated with pipe fabrication work and assembly operations and how they can be minimised (such using dangerous or badly maintained tools and equipment; lifting and handling long and heavy components; slips, trips and falls)
K6 how to obtain the necessary pipe fabrication drawings and joining specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions (such as cutting lines, centre lines)
K10 the preparations that need to be carried out on the pipe components prior to assembling them
K11 the various methods of securing the pipe components (temporary tack welding methods and techniques, self securing methods such as knocked up, paned down, swaged and joggled, adhesive bonding of components)
K12 how to prepare the pipe ends ready for welding (clean, correct shape, appropriate weld preparations)
K13 how to set-up and align the various components and the tools and equipment that is used (such as jigs, fixtures, templates)
K14 the material cutting characteristics and process considerations that needs to be taken into account when producing pipe fabrications
K15 the use and care of tools and equipment, and control procedures
K16 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations.
K17 the problems that can occur when producing pipe fabrications and assemblies, and how these can be avoided
K18 inspection techniques that can be applied to check shape (including roundness, straightness and dimensional accuracy) is to specification and within acceptable limits
K19 how to pressure test completed assemblies and the tools, equipment and techniques that are used
K20 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K21 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the pipework assembly operations:
1.1 fabricate the pipe components in the correct order and manner
1.2 produce suitable weld preparations on the pipe ends
1.3 correctly prepare and set up the pipe components and faces to be joined
1.4 check that the fabrication has the required configuration
1.5 use the specified or appropriate fixing method
1.6 produce a pipe fabrication which meets the required specification
2. Produce three of the following pipe fabrications/assemblies:
2.1 flanged pipe
2.2 straight reduction piece
2.3 elbow
2.4 equal tee piece
2.5 reduction tee piece
2.6 segmented bend
3. Produce pipe fabrications from one of the following materials:
3.1 ferrous
3.2 non-ferrous
3.3 non-metallic
4. Assemble the components using two of the following methods:
4.1 bolted
4.2 riveted
4.3 self secured (knocked up, paned down, swaged, joggled)
4.4 temporary tack welded
4.5 adhesive bonding
5. Produce pipe fabrications which meet all of the following quality and accuracy standards:
5.1 all components are correctly assembled and aligned in accordance with the specification
5.2 overall dimensions are within specification tolerances
5.3 assemblies meet appropriate geometric tolerances (square, straight, angles free from twists)
5.4 pitch of flange holes meet specification requirements (where appropriate)
5.5 assemblies are leak and pressure tested (where appropriate)
5.6 completed assemblies are secure, clean and free from burrs or flash

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SEMFWE337

Producing and finishing holes using drilling machines

Overview

This standard identifies the competencies you need to produce holes using drilling machines in sheet, plate, rolled section or pipe in accordance with approved procedures. You will be required to select the appropriate drilling equipment to use based on the operations to be performed and the size of the component worked on. You will be expected to use appropriate workholding methods and techniques to secure the workpiece for the drilling operations and this will include the use of jigs, clamps, machine vice and other appropriate holding devices. In drilling the holes you will need to accurately position the drill bits and use appropriate speeds and feeds to drill and finish the holes to the required specification. Drilling and finishing operations will include through holes, blind holes, counter-bored holes, countersunk holes, spot facing, reaming and tapping.

Your responsibilities will require you to comply with organisational policy and procedures for the drilling activities undertaken and to report any problems with the equipment or drilling activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying the drilling and finishing procedures. You will understand the drilling equipment used and its application, together with the material characteristics and the appropriate tooling for carrying out the drilling and finishing process. You will know about the basic principles and requirements of securing the work piece prior to carrying out the process in adequate depth to provide a sound basis for carrying out the drilling activities, correcting faults and ensuring the work output meets the required specification. You will understand the safety precautions required when carrying out the drilling and finishing activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 confirm that the machine is set up and ready for the machining activities to be carried out

P3 manipulate the machine tool controls safely and correctly in line with operational procedures

P4 produce drilled components to the required quality and within the specified dimensional accuracy
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when carrying out drilling and finishing operations on materials used in fabricating (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting materials
K4 the safe working practices and procedures to be used when using portable power operated tools and drilling machines, including emergency stop procedures for the machines
K5 the hazards associated with drilling work and how they can be minimised (such as using dangerous or badly maintained tools and equipment; insecure or poorly clamped workpieces; airborne metal particles; sharp edges and splinters)
K6 how to obtain the necessary drawings, specifications and work instructions
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions (such as cutting lines; centre lines)
K10 the various types and application of drilling machines (including portable power tools, bench and pedestal machines and radial arm machines)
K11 the range of drilling and hole finishing tools available (including twist drills, reamers, counter-bore tools, countersink tools, spot facing tools, taps) and how to check their serviceability
K12 the methods of holding and securing the drills and finishing tools into the machine spindle (including chucks, taper shank sleeves, collet chucks)
K13 the methods of holding and securing workpieces for drilling (including jigs and fixtures, machine vices, clamps and restraining devices)
K14 methods used to align the drill with the workpiece and the use of centre drills and pilot drills
K15 how to check that the drill hole is in the correct position before drilling to the full diameter, and how to correct a drill that has been started off centre
K16 the selection of speeds and feeds for drilling, reaming and finishing operations
K17 the selection of cutting fluids and compounds for drilling, reaming and tapping of holes
K18 setting and adjusting tools and equipment such as the use of depth stops
K19 the material characteristics and process considerations that need to be taken into account when carrying out drilling operations
K20 the care and control of tools and equipment; checking portable power tool leads, plugs and sockets are in a safe and usable condition
K21 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations

K22 the problems that can occur with drilling operations, and how these can be avoided
K23 inspection techniques that can be applied to check the dimensional accuracy and finish is to specification and within acceptable limits
K24 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K25 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure that the equipment is fit for purpose and used safely by carrying out all of the following:
1.1 selecting the appropriate drilling equipment/machine for the operation being performed
1.2 checking the machine guards and safety devices are in position and function correctly
1.3 checking drill bits and cutting tools are in a serviceable condition (including free from damage or chips; sharp)
1.4 isolating the equipment from its power supply whilst changing drill bits
1.5 securely clamping/restraining the components during the drilling operations
1.6 using the equipment safely and correctly and only for its intended purpose
2. Use two of the following drilling machines:
2.1 hand held drilling machine
2.2 pillar/bench drill
2.3 radial arm drill
2.4 other types of clamped drills (such as magnetic, vacuum)
3. Use two of the following workholding devices:
3.1 jigs/fixtures
3.2 machine vice
3.3 clamps
3.4 other types of clamps (such as magnetic, vacuum)
4. Carry out five of the following drilling and finishing operations:
4.1 drilling through holes
4.2 centre drilling
4.3 drilling holes to a depth
4.4 spot facing
4.5 counter-boring holes
4.6 trepanning holes
4.7 countersinking holes
4.8 tapping holes
4.9 reaming holes
4.10 jig or template drilling
4.11 tapered reaming
4.12 component alignment drilling
5. Produce drilled holes in three of the following material types:
5.1 ferrous sheet metal
5.2 stainless steel plate or components
5.3 stainless steel sheet metal
5.4 non-ferrous plate or components
5.5 non-ferrous sheet metal
5.6 non-metallic materials
5.7 ferrous plate or components

5.8 composite materials
5.9 other specific material
6. Produce drilled and finished components which meet all of the following quality and accuracy standards as is applicable to the process:
6.1 dimensional and positional accuracy is within specification tolerances
6.2 drilled holes are correctly formed and free from excessive tool marks
6.3 reamed holes are of the correct fit and have a smooth surface finish free from tool marks
6.4 tapped holes are of the correct type, threads are correctly formed and have a good fit
6.5 counter-bores, countersinks and spot facings meet job requirements

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SEMFWE328
Joining fabricated components using mechanical fasteners

Overview

This standard identifies the competencies you need to undertake the preparation and making of joints between fabricated components using mechanical means in accordance with approved procedures. You will be required to produce suitable and appropriate joints using appropriate methods for the materials to be joined that meet the specified conditions and subsequent operating conditions to be demanded of the joint. Particular attention will be needed in the preparation and finishing of the materials so that the finished component is fit for purpose and meets the level of accuracy required. The mechanical fastenings used will include rivets, self-tapping screws, bolts and screwed fittings, anchor nuts and proprietary fasteners as is appropriate to the application and/or specification. The joint will be of two or more materials and may include non-metallic materials and joints of dissimilar metals.

Your responsibilities will require you to comply with organisational policy and procedures, or those of the fastener manufacturers. You will be expected to seek out the relevant information and to report any problems with the mechanical fasteners or the joining activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to the joining activities carried out. You will understand the basic characteristics of the materials to be joined, the various processes used and the appropriate

procedures that go with them in adequate depth to provide a sound basis for achieving a sound and cohesive joint that is fit for purpose.

You will understand the safety precautions required when working with the tools and equipment, especially those for use in hot metal processes and the safeguards necessary for undertaking the using processes. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant instructions, assembly drawings and any other specifications
P3 ensure that the specified components are available and that they are in a usable condition
P4 use the appropriate methods and techniques to assemble the components in their correct positions
P5 secure the components using the specified connectors and securing devices
P6 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be followed when working in a fabrication environment and when carrying out joining activities using fabricated components (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the joining activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the hazards associated with the joining operations and how they can be minimised (such as handling sheet/fabricated components, using hot metal riveting techniques, handling and using sealants and cleaning agents, dangerous or badly maintained tools and equipment)
K4 how to obtain the necessary drawings and joining procedure specifications

K5 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K6 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K7 the use of manufacturers' specifications for the types of fasteners used
K8 the advantages and disadvantages of the different forms and methods of mechanical join
K9 the various joining processes that are used and the tools and equipment that is required
K10 the preparations that need to be carried out on the materials/components prior to joining them (such as, materials to be degreased, dry and clean, with hole and flanges de-burred)
K11 how to set up and align the joints prior to fixing and the tools and methods that can be used (such as clamps, rivet gripping tools, temporary fixings, jacking and supporting devices)
K12 how to produce a secure joint using blind rivets and the type of riveting tools that are available
K13 how to produce a good solid riveted joint and the use of the various riveting tools
K14 how to determine the length of the rivets required to give a properly formed rivet head
K15 the range of bolts and screwed fasteners that are to be used; why it is important to use the correct type of washer; sequence of tightening bolts on flanged joints; and the tools and equipment used to ensure they are tightened to the required torque
K16 the various types of proprietary fasteners that are used on fabricated assemblies (such as anchor nuts, clinch nuts, welded studs)
K17 the materials used and their joining characteristics, electrochemical reaction between dissimilar metals and means of reducing the effects, use of gasket material or other substances
K18 checks that need to be carried out on the tools and equipment prior to use to ensure that they are in a safe and usable condition (such as condition of plugs and leads on power tools, condition of striking faces on hammers, condition of riveting tools and rivet snaps)
K19 equipment setting, operating and care procedures; why equipment and tools need to be correctly set up and in good condition
K20 the importance of using the tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of preserving and storing tools and equipment between operations.
K21 quality control and test procedures for detection of defects in joints, visual, feel and measurement checks
K22 the problems that can occur with the joining operations and how these can be avoided
K23 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K24 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the joining process:
1.1 correctly prepare the faces of the materials to be joined
1.2 select the appropriate/specified fixings
1.3 correctly align the materials and faces to be joined
1.4 assemble the components in the correct order or manner
1.5 produce a joint that meets the requirements of the specification
2. Produce assemblies which include six of the following:
2.1 flat and flanged joints on flat or curved surfaces
2.2 joints with gasket or sealant

2.3 square/rectangular trunking
2.4 pipes
2.5 circular trunking
2.6 structural components
2.7 access flanges and cover plates
2.8 long or critical alignments
2.9 tanks and tank covers
2.10 permanent and temporary assemblies
2.11 other specific items
3. Use four of the following assembly methods and techniques:
3.1 riveting using solid rivets
3.2 assembling using bolt fittings
3.3 riveting using pop/blind rivets
3.4 using screw fittings to tapped components
3.5 self-tapping screws
3.6 nuts and (spot welded) screw studs
3.7 use of proprietary fasteners
3.8 locking methods and devices
3.9 crimping
3.10 clinching
3.11 other specific method
4. Join the components in three of the following joining positions, access and environmental conditions:
4.1 horizontal
4.2 vertical
4.3 overhead
4.4 in workshop conditions
4.5 internal and confined spaces
5. Produce joints to all of the following quality and accuracy standards as is applicable to the application:
5.1 joints are accurately assembled and aligned in accordance with the specifications
5.2 joints are secure and firm
5.3 bolted and screwed joints are tightened to the correct torque
5.4 riveted joints are free from excessive material deformation and hammer marks
5.5 pitch of holes meet the specification
5.6 completed joints are clean and free from burrs

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SEMFWE346
Producing socket and flange fillet welded joints in pipe using a manual welding process

Overview

This standard identifies the competencies you need to produce socket and flange fillet welded joints in pipe using a manual welding process such as manual metal arc (MMA), MIG, MAG, TIG, flux cored wire, plasma or oxy/fuel gas welding equipment in accordance with instructions and/or approved welding procedures. You will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. You will be expected to check the welding equipment to ensure that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage.

In preparing to weld you will need to set and adjust the welding conditions in line with the instructions or welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in line with your permitted authority in order to produce the welded joints to the required specification. You will be required to demonstrate you capability to produce the fillet welds to the required quality and this could be through tests according to BS 4872-1 or BS EN ISO 9606-1 (for aluminium).

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and provide an understanding of how the particular welding process works. You will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers from arc eye, safety in enclosed/confined spaces; fume control; accident procedure; risk assessment; statutory requirements; relevant requirements of HASAWA, COSHH, Work Equipment Regulations and other relevant legislation and regulations; safe disposal of waste materials)
K2 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K3 the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, EMF, fumes and gases, gas supply leaks, spatter, hot slag and metal, elevated working, grinding and mechanical metal/slag removal; enclosed spaces, slips, trips and falls)
K4 the manual welding process selected, and an awareness of the different types of welding equipment (basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols, scope, content and application of the welding procedure specification) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 the consumables associated with the chosen welding process (types of electrodes and or filler metal and application; types of shielding gas and their application; gas supply and control; correct storage and drying of electrodes and filler wire)
K7 the types and features of welded joints in pipe (fillet welds, single and multi-run welds, welding positions, weld quality)
K8 methods of setting up and restraining the joint to achieve correct location of components and control of distortion (edge preparation; use of jigs and fixtures; manipulators and positioners; tack welding size and spacing in relationship to material thickness and component size; use of temporary attachments; pre-setting)
K9 preparing the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, earthing arrangements; equipment calibration, setting welding parameters)

K10 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters; correct manipulation of the welding gun or electrode; safe closing down of the welding equipment)
K11 the importance of complying with job instructions and the welding procedure specification
K12 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control; effects of welding on materials and sources of weld defects; methods of prevention)
K13 the organisational quality systems used and weld standards to be achieved, weld inspection and test procedures used including visual, mechanical and non-destructive tests
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the pipe welding process, to include carrying out all of the following:
1.1. obtaining the appropriate equipment for the welding activities to be carried out
1.2. checking the condition of, and correctly connecting, welding leads, earthing arrangements and electrode holder (where appropriate)
1.3. connecting all required hoses, regulators and/or flow meters and safety devices (where appropriate)
1.4. setting and adjusting welding conditions/parameters, in accordance with welding procedure specification
1.5. preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)
1.6. ensuring that the components are correctly set up with regard to specified joint preparation and is secure
1.7. obtaining and wearing appropriate personal protective equipment
2. Set up, check, adjust and use welding and related equipment for one of the following welding processes:
2.1 manual metal arc
2.2 cored wire
2.3 MIG/MAG
2.4 plasma
2.5 TIG
2.6 oxy/fuel gas welding
3. Use consumables appropriate to the material and application to include either of the following:
3.1 two types of electrode from:
rutile
basic
cellulosic
nickel alloy
stainless
other specific type
OR
3.2 two types of filler wire from different material groups
4. Produce socket and flange fillet welded joints in one of the following:

4.1 small bore pipe (50mm outside diameter or less)
4.2 large bore pipe (above 50mm outside diameter)
5. Weld joints according to approved welding procedures in good access situations in four of the following BS EN ISO 6947 positions:
5.1 Flat (PA) rotating
5.2 Vertical upwards (PF) fixed
5.3 Horizontal vertical (PB) fixed
5.4 Vertical down (PG) fixed
5.5 Horizontal vertical (PB) rotating
5.6 Horizontal overhead (PD) fixed
6. produce welded joints that:
6.1 achieve minimum weld quality requirements applicable to fillet welds equivalent to those given in the relevant standards (such as BS EN ISO 5187 or BS EN ISO 10042) required by the application standard or specification
6.2 meet the required dimensional accuracy within specified tolerance

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SEMFWE329
Bonding engineering materials using adhesives

Overview

This standard identifies the competencies you need to undertake the joining of engineering materials using adhesive bonding processes in accordance with approved procedures. You will be required to identify and select suitable or specified bonding agents for the materials to be joined that meet the specified conditions and subsequent operating conditions to be demanded of the joint. Particular attention will be needed in the preparation of the materials and the application of the bonding agent as well as the means of securing the joint until the setting or curing process has been completed so that the finished component meets the level of accuracy required. The adhesive bonding agents used will include impact adhesives, cold curing adhesives, rubber mastic, solvent adhesives, epoxy resins and thermally cured adhesives. The joint will be of two or more materials and may include metallic and/or non-metallic materials and joints of dissimilar materials.

Your responsibilities will require you to comply with organisational policies and procedures, and/or those of the bonding agent manufacturers. You will be expected to seek out the relevant information and to report any problems with the bonding agents, materials or bonding activities

that you cannot resolve yourself, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to the adhesive bonding activities carried out. You will understand the basic characteristics of the materials to be joined, the bonding agents used and the procedures that go with them in adequate depth to provide a sound basis for carrying out the activities safely and correctly and for achieving a sound and cohesive joint fit for purpose. You will need to understand the precautions required when working with the various bonding agents and safeguards necessary for undertaking the process. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant bonding procedure specification and job instructions
P3 check that the materials to be bonded and bonding agents comply with the specification
P4 correctly prepare the parent materials and bonding agents in line with the bonding specification
P5 carry out the bonding operations using the specified processes and techniques to position and bond the materials in their correct locations
P6 ensure that any equipment used to maintain surface contact during the bonding activities is set up and used correctly
P7 achieve bonds of the required quality and within the specified dimensional accuracy
P8 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when bonding engineering materials using adhesives in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)

K2 the personal protective clothing and equipment that needs to be worn when carrying out bonding as part of the fabrication activities (such as gloves, eye protection, safety helmets, respiratory protection)
K3 the importance of good workshop practice and house keeping, ventilation and fume control equipment, first aid procedures and actions, hazardous substances and relevant sections of COSHH
K4 the correct methods of moving or lifting sheet or plate materials
K5 the hazards associated with bonding fabricated components and how they can be minimised
K6 how to obtain the necessary drawings and joining specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 the material preparations that are required and the equipment and consumables that are used
K10 the importance of working to organisational and bonding agent manufacturers' instructions whilst carrying out the bonding activities
K11 the methods and techniques used for bonding the materials (such as gluing, impact, chemical and thermal reaction techniques)
K12 the basic characteristics of the adhesives that are to be used adhesives
K13 the use and precautions to be taken when using adhesives and solvents
K14 maintenance and care of tools and equipment
K15 methods of degreasing components and producing a keying surface
K16 type and suitability of adhesives, setting or curing requirements and time, strength and appearance
K17 common causes of defects associated with the bonding processes and how to avoid them
K18 the effects of the environment on the bonding process such as temperature, humidity, cleanliness
K19 how to identify, select, use, and clean, the appropriate bonding agent holding vessels, brushes, stirrers and spatulas, scrapers, knives, clamps and weights
K20 the importance of cleaning up after use to ensure everything can be used again and minimising the need for replacement of equipment
K21 reasons for checking components are assembled in the correct sequence, are positioned dimensionally accurately and to the correct orientation in accordance with the specifications prior to bonding
K22 how to check that completed joints are firm, sound and fit for purpose
K23 procedures for cleaning off surplus adhesive and tidying up the appearance of joints
K24 the problems that can occur with the bonding operations and how these can be avoided
K25 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K26 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the adhesive bonding process:
1.1 correctly prepare the materials for bonding
1.2 select the right constituents and bonding methods

1.3 check the surfaces to be bonded mate properly to make a sound joint possible
1.4 ensure the joint is rigidly secure during the curing period
1.5 remove surplus material and clean up at the appropriate time
2. Carry out adhesive bonding activities using two of the following types of material:
2.1 metallic
2.2 non-metallic
2.3 combinations of materials
3. Use two of the following types of adhesives:
3.1 impact adhesives
3.2 rubber mastic
3.3 epoxy resins
3.4 cold curing adhesives
3.5 solvent adhesives
3.6 thermally cured adhesives
3.7 other specific adhesive
4. Produce bonded joints in three of the following types of component:
4.1 flat and flanged joints on flat surfaces
4.2 circular trunking
4.3 flat and flanged joints on curved surfaces
4.4 access flanges, panels and cover plates
4.5 vertical components
4.6 tanks and tank covers
4.7 horizontal components
4.8 pipe work
4.9 rectangular trunking
4.10 other specific component
5. Use a range of bonding equipment and devices to include four of the following:
5.1 mixing vessels
5.2 jigs
5.3 presses
5.4 spatulas, brushes, knives
5.5 formers
5.6 weights
5.7 spray equipment
5.8 clamps
5.9 temporary fixtures (clips, wiring)
6. Use a range of preparation and cleaning agents to include two of the following:
6.1 detergents
6.2 solvents
6.3 petroleum products
6.4 acids
6.5 other type of agent
7. Produce bonded joints which comply with all of the following quality and accuracy standards:
7.1 components are dimensionally accurate and of the correct orientation
7.2 joints meet the required application standard
7.3 completed joints are clean and free from surplus adhesive
7.4 the completed joint has the required appearance

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Key words: engineering; welding; fabrication; bonding; adhesives; metallic components; non-metallic to metallic; epoxy resins; impact adhesives; cold curing adhesives

SEMFWE339
Slinging, lifting and moving materials and components

Overview

This standard identifies the competencies you need to move loads by slinging and lifting in accordance with approved procedures. You will be required to use correctly specified items of lifting gear, which will include hand, and/or power operated cranes and winches, and associated lifting accessories. You must check that the lifting equipment is within current authorisation dates, is undamaged and within the permitted safe working load (SWL) or working load limit (WLL). You will be expected to correctly estimate the weight of the load to be moved and attach the appropriate slings to suitable or designated lifting points on the load in order to achieve a safe and balanced lift. You must check the area that the load will move through to ensure that it is free from obstructions and is safe for the load to be moved. You will also be expected to able to give the correct hand and verbal signals during the lifting activities.

Your responsibilities will require you to comply with organisational policy and procedures for the slinging, signalling and lifting activities undertaken and to report any problems with the slinging and lifting equipment or the lifting activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the safety and integrity of the materials or components being moved.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying slinging, signalling and lifting procedures. You will understand the slinging, signalling and lifting techniques used, and their application, and will know about the lifting equipment and accessories for lifting, in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will need to understand the safety precautions required when slinging and lifting materials or components and the safeguards that are necessary for undertaking the activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude

- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 position the moving equipment so that the weight of the load is evenly distributed
P3 attach the appropriate handling equipment securely to the load, using approved methods to eliminate slippage
P4 confirm that the load is secure before moving
P5 move the load over the selected, suitable route
P6 position and release the load safely in its intended final location

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when slinging and lifting loads and the need for ensuring load security (general workshop and site safety, appropriate personal protective equipment (PPE), protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the hazards associated with slinging and lifting of loads, and how they can be minimised
K3 an understanding of ACOP for safe use of lifting equipment and Lifting Operation and Lifting Equipment Regulations (LOLER) also BS 7121
K4 the specific requirements for the marking of lifting equipment and the specific method used in the organisation in which you are working
K5 the range of equipment that is to be used for the lifting operations (such as hand and power operated cranes, winches pulling equipment)
K6 the lifting equipment accessories that are to be used (such as slings, chains, wire ropes, eye bolts)
K7 checks that should be made on the lifting equipment prior to use, and problems that you should look for
K8 how to carry out in-service inspections of the equipment and what to do should any defective equipment be identified
K9 how to determine the approximate weight of the load to be moved
K10 factors which affect the selection of the lifting equipment and lifting accessories (such as weight, centre of gravity, type of load, operating environment)
K11 how to calculate loads on winches/lead ropes on multi-sheaved rigs
K12 how to identify the included angle when using multi-leg slings
K13 how to check that the lifting equipment is capable of lifting the load to be moved
K14 how to determine the centre of gravity of the load and determine suitable slinging and lifting points
K15 how to plan and prepare a route for moving loads and the areas that you will need to take into account
K16 the specific requirements for the organisation of lifting operations

K17 signalling techniques used to communicate with crane drivers to include both hand signals and verbal commands
K18 how lifting equipment should be stored, handled and maintained.
K19 the problems that can occur when moving loads and how these can be avoided
K20 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure that the equipment to be used is suitable for the materials or components being lifted and in a safe and usable condition by checking all of the following:
1.1 equipment is certified and is compliant, within current test dates
1.2 all lifting equipment registers are up to date
1.3 all slings are free from obvious defects
1.4 the lifting equipment selected is suitable and has a sufficient SWL/WLL for the application
1.5 the identification number and SWL/WLL are clearly marked on the equipment selected
1.6 the equipment selected is suitable for the environment of operation
2. Before slinging, lifting or moving the load, ensure that all of the following, have been established/checked:
2.1. weight of the load
2.2. centre of gravity of the load
2.3. the proposed route of the load is clear
2.4. those affected have been informed
2.5. landing/storage area is clear
2.6. agreed code of verbal/hand signals
2.7. precautions are in place in case of spillage
2.8. arrangements are made for securing/storing in the landing place
3. Use two of the following lifting and moving methods and technique:
3.1 crane
3.2 lifting appliances
3.3 hand operated lifting equipment
3.4 winch
3.5 pulling appliances
3.6 jacks, skates & trolleys
3.7 powered lifting equipment
3.8 multi sheaved block combinations
4. Use two of the following slinging methods:
4.1 single leg slings
4.2 two-leg slings
4.3 three-and-four leg slings
4.4 lifting beams
4.5 other specific method
5. Move two of the following types of loads:
5.1 sheet materials
5.2 components with evenly distributed weight
5.3 pipes, bars, joists (single and in bundles)
5.4 components with unevenly distributed weight
5.5 fragile
5.6 awkward shaped

5.7 hot/radiant
5.8 corrosive/chemical
5.9 other specific type of load
6. Calculate loads in three of the following sheave block combinations:
6.1 single
6.2 two doubles
6.3 two singles
6.4 a treble and double
6.5 a double and single
7. Find the weight of the materials or components to be moved using all of the following as applicable:
7.1 check against documentation
7.2 by estimation
7.3 calculation from drawings
7.4 by converting metric-imperial
7.5 load markings
8. Move loads safely and correctly that are re-positioned in two of the following positions:
8.1 to differing elevations
8.2 along the same elevation
8.3 as part of an assembly
8.4 turn a load
8.5 through complex rigging operations

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SEMFWE304
Welding materials by the manual metal arc process

Overview

This standard identifies the competencies you need to prepare and operate manual metal arc (MMA) welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment you will need to connect all the required leads/cables, electrode holder and workpiece earthing arrangements ready for use, and set and adjust the welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant person. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the manual metal-arc welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Non-destructive testing of your completed work is implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 make the joints as specified using the appropriate thermal joining technique
P6 produce welded joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with MMA welding equipment (general workshop and site safety; appropriate personal protective equipment

(PPE); fire prevention; protecting other workers from effects of the arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with MMA welding and how they can be minimised (live electrical components; poor earthing; the electric arc; fumes and gases; spatter; hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces)
K3 principles of MMA welding, the equipment and its operation (fusion welding principles, characteristics of the metal arc, AC and DC power sources, typical equipment and power ranges, care of equipment, terminology used in welding)
K4 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K5 types and classification of electrodes (flux coverings, correct control, storage and drying of electrodes)
K6 types and features of welded joints in plate, tube and sections (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K7 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K8 methods of setting up the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs/fixtures; manipulators and positioners, tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K9 setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters, care and maintenance of equipment)
K10 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of electrode, safe closing down of the welding equipment)
K11 the organisational quality systems used and weld standards to be achieved
K12 weld inspection and test procedures used including destructive and non-destructive methods
K13 personal approval tests and their applicability to your work
K14 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the manual metal arc welding process, to include carrying out all of the following:
1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 checking the condition of and correctly connecting welding leads, earthing arrangements and electrode holder
1.3 setting and adjusting welding conditions/parameters, in accordance with welding procedure specification

1.4 preparing the work area for the welding activities (such as sighting welding screens, positioning fume extraction equipment)
1.5 ensuring that the workpiece is correctly set up with regard to specified joint preparation and is secure
1.6 obtaining and wearing appropriate personal protective equipment
2. Set up, check, adjust and use manual metal-arc welding and related equipment to include either:
2.1 alternating current equipment (AC)
2.2 direct current equipment (DC)
3. Use two types and two sizes of electrode from the following:
3.1 rutile
3.2 basic
3.3 nickel alloy
3.4 cellulosic
3.5 stainless steel
3.6 other electrodes
4. Produce welded joints which incorporate both:
4.1 butt welds
4.2 fillet welds
5. Produce joints in two of the following forms in specified materials from different material groups:
5.1 plate
5.2 section
5.3 pipe/tube
5.4 other specific forms
6. Weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
6.1 Vertical upwards (PF) butt weld
and four other positions chosen from:
6.2 flat (PA)
6.3 horizontal (PC)
6.4 overhead (PE)
6.5 horizontal vertical (PB)
6.6 vertical downwards (PG)
6.7 inclined tube/pipe (H-LO45 or J-LO45)
7. Produce welded components which:
7.1 achieve a weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium, BS EN ISO10042 applies)
7.2 meet the required dimensional accuracy within specified tolerances

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SEMFWE305
Welding materials by the Semi-Automatic MIG/MAG and Flux Cored Arc processes

Overview

This standard identifies the competencies you need to prepare and operate semi-automatic MIG, MAG and flux cored wire arc (FCAW) welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment you will need to connect all the required leads/cables, hoses, shielding gas supply and wire feed mechanisms ready for use, and set and adjust the welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the MIG, MAG or FCAW welding process used, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of your completed work is implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 make the joints as specified using the appropriate thermal joining technique
P6 produce welded joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with MIG, MAG or FCAW welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with arc welding and how they can be minimised (live electrical components, poor earthing, the electric arc, EMF, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)
K3 the correct handling and storage of gas cylinders, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K4 principles of MIG, MAG, or FCAW welding, the equipment and its operation (fusion welding principles, characteristics of the metal arc, power sources, typical equipment and power ranges, care of equipment, control systems, filler wires, gas supply and control, terminology used in welding)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 types and classification of consumables (wires, shielding gases -inert and active; control and storage of consumables)
K7 types and features of welded joints in plate, sheet and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K8 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K9 methods of setting up the joint to achieve correct location of components and control of distortion (edge preparation; correct joint set-up; cleanliness of materials used; use of jigs/fixtures, manipulators and positioners; tack welding, size and spacing in relationship to material thickness and component size; use of temporary attachments; pre-setting)

K10 setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; wire feed mechanisms; gas supply; equipment calibration; setting welding parameters; care and maintenance of equipment)
K11 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters; correct manipulation of the welding gun; safe closing down of the welding equipment)
K12 the organisational quality systems used and weld standards to be achieved
K13 weld inspection and test procedures used including destructive and non-destructive methods
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the semi-automatic MIG/MAG or FCAW welding process, to including carrying out all of the following:
1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 checking the condition of and correctly connecting, welding leads/cables, hoses, shielding gas supply and wire-feed mechanisms
1.3 setting and adjusting welding conditions/parameters, in accordance with the welding procedure specification
1.4 preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)
1.5 ensuring that the workpiece is correctly set up with regard to specified joint preparation and is secure
1.6 obtaining and wearing appropriate personal protective equipment
2. Set up, check, adjust and use welding and related equipment for one of the following welding processes:
2.1 MIG
2.2 MAG
2.3 FCAW
3. Use consumables appropriate to the material and application to include both of the following:
3.1 two wire types and sizes from different material groups
3.2 two different shielding gases (where applicable)
4. Produce welded joints which incorporate both of the following:
4.1 butt welds
4.2 fillet welds
5. Produce joints in two of the following forms in specified materials from different material groups:
5.1 plate
5.2 section
5.3 sheet (<3mm)
5.4 pipe/tube
5.5 other specific forms

6. Weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
6.1 vertical upwards (PF) butt weld
and four other positions chosen from:
6.2 flat (PA)
6.3 horizontal (PC)
6.4 overhead (PE)
6.5 horizontal vertical (PB)
6.6 vertical downwards (PG)
6.7 inclined pipe/tube (H-LO 45 or J-LO45)
7. Produce welded components which:
7.1 achieve a weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium BS EN ISO 10042 applies)
7.2 meet the required dimensional accuracy within specified tolerances

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SEMFWE306
Welding materials by the manual TIG and Plasma Arc welding process

Overview
This standard identifies the competencies you need to prepare and operate manual TIG or Plasma Arc welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment you will need to connect all the required leads/cables, hoses and torch ready for use, and set and adjust the welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the TIG or Plasma Arc welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of your completed work is implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with TIG or Plasma-arc welding equipment (general workshop and site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)

K2 the hazards associated with arc welding and how they can be minimised (live electrical components, poor earthing, the electric arc, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)
K3 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K4 principles of TIG or Plasma-arc welding, the equipment and its operation (fusion welding principles, characteristics of the arc, power sources, typical equipment and power ranges, care of equipment, control systems, filler wires, gas supply and control, terminology used in welding)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 types and classification of consumables (wires, shielding gasses, electrodes; control and storage of consumables)
K7 types and features of welded joints in plate and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K8 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K9 methods of setting up the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs/fixtures; manipulators and positioners, tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K10 setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; gas supply, equipment calibration, setting welding parameters, care and maintenance of equipment)
K11 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of torch, safe closing down of the welding equipment)
K12 the organisational quality systems used and weld standards to be achieved
K13 weld inspection and test procedures used including destructive and non-destructive methods
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the manual TIG or plasma arc welding process, to include carrying out all of the following:
1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 checking the condition of, and correctly connecting, welding leads/cables, hoses, shielding gas supply and wire-feed mechanisms
1.3 setting and adjusting welding conditions/parameters, in accordance with welding procedure specification
1.4 preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)

1.5 ensuring that the workpiece is correctly set up with regard to specified joint preparation, and is secure
1.6 obtaining and wearing appropriate personal protective equipment
2. Set up, check, adjust and use welding and related equipment for one of the following manual welding processes:
2.1 TIG
2.2 Plasma-arc
3. Use consumables appropriate to the material, application and electrodes to include both of the following:
3.1 two different sizes of electrode
3.2 two types of filler wire from different material groups
4. Produce welded joints which incorporate the following:
4.1 butt welds
i. and either
4.2 fillet welds OR
4.3 welds made autogenously (without filler wire)
5. Produce joints in two of the following forms in specified materials from different material groups:
5.1 plate
5.2 section
5.3 sheet
5.4 pipe/tube
5.5 other specific forms
6. Weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
6.1 Vertical upwards (PF) butt weld
6.2 and four other positions chosen from:
6.3 flat (PA)
6.4 horizontal (PC)
6.5 overhead (PE)
6.6 horizontal vertical (PB)
6.7 vertical downwards (PG)
6.8 inclined pipe/tube (H-LO45 or J-LO45)
7. Produce welded components which:
7.1 achieve a weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium BS EN ISO 10042 applies)
7.2 meet the required dimensional accuracy within specified tolerances

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SEMFWE307
Welding materials by the Manual Oxy/Fuel gas welding process

Overview

This standard identifies the competencies you need to prepare and operate manual oxy/fuel gas welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated work holding and manipulating devices required. In setting up the equipment you will need to connect all the required regulators/gauges, flashback arrestors, hoses and welding torch ready for use, and set and adjust the gas pressures/welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the gas welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Non-destructive testing of your completed work is implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with gas welding equipment (general workshop and site safety; cylinder handling and storage; appropriate personal protective equipment (PPE); fire and explosion prevention; protecting other workers; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with gas welding and how they can be minimised (high pressure cylinders and gas supply systems; naked flames; fumes and gases; explosive gas mixtures; oxygen enrichment; spatter; hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)
K3 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K4 principles of oxy/fuel gas welding, the equipment and its operation (gas welding principles, supply of compressed gases, characteristics of welding flames, typical equipment, care of equipment, terminology used in gas welding)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 types and classification of filler rods and fluxes; control and storage of consumables
K7 types and features of welded joints in sheet, plate and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K8 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K9 methods of setting up the joint to achieve correct location of components and control of distortion (correct joint set-up; cleanliness of materials used; edge preparation; use of jigs/fixtures, manipulators and positioners; tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K10 setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (connection of hoses, torch, flash-back arrestors, hose check valves and regulators; checking connections for leaks; setting welding parameters)

K11 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (selection of nozzle, application of flux, manipulation of torch and filler rods, safe closing down of the welding equipment)
K12 the organisational quality systems used and weld standards to be achieved
K13 weld inspection and test procedures used including destructive and non-destructive methods
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria
You must be able to:

1 Prepare for the manual oxy/fuel gas welding activities, to include carrying out all of the following:
1.1. obtaining the appropriate equipment for the welding activities to be carried out
1.2. correctly handling and storing gas cylinders
1.3. checking the condition of, and correctly connecting, regulators, hoses and valves
1.4. connecting the welding torch and selecting and fitting the correct size nozzle
1.5. fitting a flashback arrestor
1.6. setting appropriate gas pressures
1.7. using the correct procedure for lighting, adjusting and extinguishing the welding flame
1.8. preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)
1.9. ensuring that the workpiece is correctly set up with regard to specified joint preparation and is secure
1.10. obtaining and wearing appropriate personal protective equipment
2 Use a range of filler wire to include:
2.1. two different sizes
2.2. two different filler wire properties/composition
3 Produce welded joints which incorporates the following:
3.1. butt welds
and either
3.2. fillet welds OR
3.3. welds made autogenously (without filler wire)
4 Produce joints in two of the following forms in specified materials from different groups:
4.1. plate
4.2. section
4.3. sheet (<3mm)
4.4. pipe/tube
4.5. other specific forms
5 Weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
5.1. vertical upwards (PF) butt weld
and four other positions chosen from:
5.2. flat (PA)
5.3. horizontal (PC)
5.4. overhead (PE)
5.5. horizontal vertical (PB)
5.6. vertical downwards (PG)
5.7. inclined pipe/tube (H-LO45 or J-LO45)

6 Produce welded components which:
6.1. Achieve a minimum weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium BS EN ISO 10042 applies)
6.2. Meet the required dimensional accuracy within specified tolerances

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SEMFWE308
Welding pipe/tube using multiple manual arc welding processes

Overview

This standard identifies the competencies you need to produce full penetration butt welds in pipe or tube using manual welding processes such as manual metal arc (MMA), MIG, MAG, TIG, Plasma arc or cored wire welding equipment in accordance with instructions and/or approved welding procedures. It covers the use of multiple welding processes such as root TIG and fill with MMA or MMA root and flux core fill. You will be required to check that all the work holding equipment and manipulating devices required are available and in a usable condition. You will be expected to set up the welding equipment ensuring that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld you will need to set and adjust the welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the welding process used and its application, and will know about the equipment, materials and consumables used in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of your completed work is

implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K3 the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, EMF, fumes and gases, gas supply leaks, spatter, hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls)

K4 the manual welding process selected and an awareness of the different types of welding equipment (basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols, scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 the consumables associated with the chosen welding process (types of electrodes and or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
K7 the types and features of welded joints in pipe/tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K8 methods of setting up and restraining the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K9 preparing the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters)
K10 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)
K11 the importance of complying with job instructions and the welding procedure specification
K12 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K13 the organisational quality systems used and weld standards to be achieved
K14 weld inspection and test procedures used including visual and non-destructive tests
K15 personal approval tests and their applicability to your work
K16 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the pipe/tube welding process, to include carrying out all of the following:
1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 checking the condition of and correctly connecting welding leads, earthing arrangements and electrode holder
1.3 connecting all required hoses, regulators and/or flow meters and safety devices
1.4 setting and adjusting welding conditions/parameters, in accordance with welding procedure specification
1.5 preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)
1.6 ensuring that the components are correctly set up with regard to specified joint preparation and secure
1.7 obtaining and wearing appropriate personal protective equipment

2. Set up, check, adjust and use welding and related equipment for two of the following welding processes:
2.1 Manual Metal Arc
2.2 MIG/MAG
2.3 TIG
2.4 Plasma arc
2.5 Cored wire
3. Use consumables specified in the welding procedure specification for the following:
3.1 the root run(s)
3.2 the fill and capping runs
4. Produce full penetration butt joints in both of the following:
4.1 small bore pipe / tube (50mm diameter or less)
4.2 large bore pipe / tube (above 50mm diameter)
5. Weld butt joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
5.1 Inclined (H-LO 45 or J-LO 45)
and three other positions chosen from:
5.2 flat (PA) rotating
5.3 horizontal (PC)
5.4 vertical Upwards (PF)
5.5 vertical Downwards (PG)
6. produce welded components which:
6.1 achieve a minimum weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium BS EN ISO10042 applies)
6.2 meet the required dimensional accuracy within specified tolerance

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SEMFWE309
Welding Plate using Multiple Manual Arc Welding Processes

Overview

This standard identifies the competencies you need to produce full penetration butt welds in plate or section materials using multiple manual welding processes such as manual metal arc (MMA), MIG, MAG, TIG, Plasma arc or cored wire welding equipment in accordance with instructions and/or approved welding procedures. You will be expected to produce welds using two or more welding processes such as root TIG and fill with MMA or MMA root and flux core fill.

You will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. You will be expected to set up the welding equipment ensuring that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld you will need to set and adjust the welding conditions in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying multiple welding procedures and instructions. You will understand the welding processes used and their application, and will know about the equipment, materials and consumables used in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of your completed work is implied. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and job instructions
P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures

P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K3 the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, EMF, fumes and gases, gas supply leaks, spatter, hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls)
K4 the manual welding process selected and an awareness of the different types of welding equipment (basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols, scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 the consumables associated with the chosen welding process (types of electrodes and or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
K7 the types and features of welded joints in plate, fillet and butt welds (single and multi-run welds, welding positions, weld quality)
K8 methods of setting up and restraining the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K9 preparing the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters)
K10 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)
K11 the importance of complying with job instructions and the welding procedure specification
K12 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K13 the organisational quality systems used and weld standards to be achieved
K14 weld inspection and test procedures used including visual and non-destructive tests
K15 personal approval tests and their applicability to your work
K16 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the plate welding process, to include carrying out all of the following:
1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 checking the condition of and correctly connecting welding leads, earthing arrangements and electrode holder
1.3 connecting all required hoses, regulators and/or flow meters and safety devices
1.4 setting and adjusting welding conditions/parameters, in accordance with welding procedure specification
1.5 preparing the work area for the welding activities (such as placing welding screens, positioning fume extraction equipment)
1.6 ensuring that the components are correctly set up with regard to specified joint preparation, and are secure
1.7 obtaining and wearing appropriate personal protective equipment
2. Set up, check, adjust and use welding and related equipment for two of the following welding processes:
2.1 Manual Metal Arc
2.2 MIG/MAG
2.3 TIG
2.4 Plasma Arc
2.5 Cored wire
3. Use consumables specified in the welding procedure specification for the following:
3.1 the root run(s)
3.2 the fill and capping runs
4. Produce full penetration butt joints in one the following types of material:
4.1 carbon range of steel plate
4.2 stainless plate
4.3 non-ferrous plate
5. Weld butt joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
5.1 vertical upwards (PF)
and four other positions chosen from:
5.2 flat (PA)
5.3 horizontal (PC)
5.4 horizontal Vertical (PB)
5.5 vertical Downwards (PG)
5.6 overhead (PE or PD)
6. Produce welded components which:
6.1 achieve a minimum weld quality acceptable to quality level B of BS EN ISO 5817 except for excessive weld metal, excessive convexity, excessive throat thickness and excessive penetration for which quality level C shall apply (for aluminium BS EN ISO10042 applies)
6.2 meet the required dimensional accuracy within specified tolerance

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SEMFWE310
Preparing mechanised arc welding equipment for production

Overview

This standard identifies the competencies needed to prepare a mechanised MIG/MAG, cored wire, Submerged Arc, TIG or Plasma Arc welding installation for production in accordance with approved procedures. You will be required to set up and check both the welding installation and all associated mechanical and electrical apparatus forming part of the mechanised or automated installation. This will include setting up of handling and loading equipment, workholding arrangements, traversing mechanisms, transfer mechanisms and safety equipment as is applicable to the machine type. In setting up the welding conditions you will be expected to set the electrical conditions, wire feed rate, welding speed, shielding gas supply system and, where applicable, flux dispensing and recovery mechanisms. You must produce trial welds and prove the machine is working satisfactorily before declaring the installation ready for production. Making adjustments to settings to achieve specification and solving machine related problems during production will also form part of your role.

Your responsibilities will require you to comply with organisational policy and procedures for setting up the welding equipment and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying mechanised welding procedures. You will understand the welding process carried out, and its application, and will know about the equipment, relevant materials and consumables in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the machine and its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability

- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure specification and job instructions for the work to be produced
P3 check that the equipment is as specified and in usable condition
P4 obtain the required components and check that the joint preparation complies with the specification
P5 set up the handling, work-holding and associated equipment to achieve correct joint positioning
P6 select and prepare the appropriate consumables in line with the joining procedure specification
P7 set and adjust the machine operating conditions to achieve joints of the required quality and within specified dimensional accuracy
P8 check that all safety mechanisms are in place and that the equipment is operating satisfactorily
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when setting and operating arc welding installations (working with machinery; the use of appropriate personal protective equipment (PPE); machine guards; ventilation and fume extraction; protecting other workers from the effects of the welding arc; machine safety devices; stopping the machine in an emergency; closing the machine down on completion of activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with mechanised arc welding machines and how they can be minimised (dangers from the electric arc; EMF; live electrical components; fumes and gases; hot slag and metal; grinding and mechanical metal/slag removal; moving parts of machinery)
K3 the basic principles of the relevant mechanised arc welding process (using heat to join metals by fusion; forming a weld; use of filler metal; principal features of a welded joint; process principles, parameters, heat input; how variation in the parameters influences the weld features, quality and output; terminology used in welding)
K4 the key components and features of the equipment (power source; power range; electrical parameters such as arc voltage, current, and duty cycle; wire dispensing and feed mechanisms; flux dispensing and recovery and shielding gas supply; calibration of equipment)
K5 mechanised and automated welding basics (types of installations; machine functions: loading, handling, clamping and transfer of components; traversing components or welding head)

K6 extracting necessary information from the component drawings and welding procedure specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K7 non-consumable electrodes, types, sizes, profiles, selection and maintenance
K8 types and application of electrodes; the selection, control, handling and storage of filler wires, fluxes and shielding gases
K9 types of joints applicable and the edge preparation required
K10 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, welding characteristics of parent metals and sources of weld defects; methods of prevention)
K11 methods of setting up the joint to achieve correct location of components and control of distortion (work holding methods such as use of jigs/fixtures; component alignment; joint setting to give correct penetration)
K12 setting up the welding equipment to the welding procedure specification (setting electrical conditions and filler wire feed rate; flux dispensing rate; gas flow; welding speed)
K13 checking the machine functions to the required specification (running pre-production trials to prove that the installation is working satisfactorily)
K14 organisational quality systems (standards to be achieved; production records to be kept, quality control)
K15 personal approval tests and their applicability to your work
K16 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure the arc welding equipment is suitable for production by carrying out all of the following checks:
1.1 the equipment is correctly maintained and in a safe and usable condition
1.2 the equipment is correctly calibrated
1.3 all electrical and mechanical systems function smoothly
1.4 equipment shut down systems function correctly
2. Prepare and set-up one of the following arc welding installations for two different joint configurations in the specified materials, forms and positions, according to work instructions and the welding procedure specification:
2.1 MIG/MAG
2.2 Submerged Arc
2.3 Cored wire
2.4 Plasma Arc
2.5 TIG
3. Set up the welding equipment and parameters in accordance with the welding procedure specification to include setting all of the following as is applicable to the machine type:
3.1 electrical parameters
3.2 welding speed
3.3 shielding gas supply system
3.4 wire feed rate
3.5 consumables
3.6 flux dispensing and recovery mechanisms
3.7 safety devices

4. Set up the work piece to achieve correct joint fit-up and alignment to include setting and checking all of the following as is applicable to the machine type:
4.1 handling and loading equipment
4.2 preparation of materials and joint faces is to specification
4.3 workholding arrangements
4.4 traversing mechanisms
4.5 transfer mechanisms
4.6 safety mechanisms
5. Prove the installation is operating correctly and is ready for production by producing specified trial welds and checking all of the following:
5.1 visual appearance of weld
5.2 quality of weld
5.3 dimensional accuracy
5.4 machine settings are as specified
6. Solve problems in production relating to two of the following:
6.1 machine performance
6.2 joint set-up
6.3 condition of materials being joined
6.4 consumables

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SEMFWE311
Preparing resistance spot, seam and projection welding machines for production

Overview

This standard identifies the competencies you need to prepare a resistance spot, seam or projection welding installation for production in accordance with approved procedures. You will be required to set up and check both the welding equipment and all associated mechanical and electrical apparatus forming part of the mechanised or automated installation. This will include setting up of handling and loading equipment, workholding arrangements, traversing mechanisms, transfer mechanisms and safety equipment as is applicable to the machine type. In setting up the welding conditions you will be expected to set the welding current, welding and squeeze times, electrode pressure cycle, and welding speed for seam or spot pitch. You must produce trial welds and prove the machine is working satisfactorily before declaring the

equipment ready for production. Making adjustments to settings to achieve specification and solving machine related problems during production will also form part of your role.

Your responsibilities will require you to comply with organisational policy and procedures for setting up the welding installation and to report any problems with the welding equipment or the welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying resistance-welding procedures. You will understand the welding process carried out, and its application, and will know about the equipment, relevant materials and consumables in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the machine and its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure specification and job instructions for the work to be produced
P3 check that the equipment is as specified and in usable condition
P4 obtain the required components and check that the joint preparation complies with the specification
P5 set up the handling, work-holding and associated equipment to achieve correct joint positioning
P6 select and prepare the appropriate consumables in line with the joining procedure specification
P7 set and adjust the machine operating conditions to achieve joints of the required quality and within specified dimensional accuracy
P8 check that all safety mechanisms are in place and that the equipment is operating satisfactorily
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when setting and operating resistance welding installations (working with machinery; the use of appropriate personal protective equipment (PPE); machine guards; operation of machine safety devices; stopping the machine in an emergency; closing down the machine on completion of the welding activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with resistance welding machines and how they can be minimised (dangers from live internal electrical components, fumes, hot metal, expulsion of hot particles, moving parts of machines)
K3 the basic principles of resistance welding (heat and pressure to join metals; heating effect of welding current; principle features of the welded joint; heat input; welding and pressure cycles; how variations in the parameters influences the weld features; terminology used in welding)
K4 the key components and features of the resistance welding equipment used (power source; welding head; power range; electrical parameters such as voltage, current, electrode pressure and welding time; systems for parameter control)
K5 mechanised and automated resistance welding basics (types of installation; machine functions; control systems; safety features; loading, handling, clamping and transfer of components)
K6 extracting information from drawing and welding procedure specifications to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K7 types of electrodes used in resistance welding, contact profiles and maintenance requirements of the electrodes
K8 types of joints applicable to resistance welding and the surface preparation required
K9 methods of setting up the joints to achieve correct location of components (work holding arrangements; component location and contact)
K10 setting up the welding equipment to the welding procedure specification (setting welding conditions, time and pressure cycles; welding speed)
K11 checking that the equipment functions to the required specification (running pre-production trials to prove that the installation is working satisfactorily)
K12 problems that can occur with the welding activities and how these can be overcome (welding characteristics of relevant materials and sources of weld defects; methods of prevention)
K13 organisational quality systems (standards to be achieved; production records to be kept, quality control)
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure the resistance welding equipment is suitable for production by carrying out all of the following checks:
1.1 the equipment is correctly maintained and in a safe and usable condition
1.2 the equipment is correctly calibrated
1.3 all electrical and mechanical systems function smoothly

1.4 equipment shut down systems function correctly
2. Set up, check, adjust and use one of the following types of resistance welding installations:
2.1 spot welding
2.2 seam welding
2.3 projection welding
3. Set up the welding installation and parameters in accordance with the welding procedure specification to include setting up all of the following as is applicable to the type of installation:
3.1 welding current
3.2 welding speed (seam)
3.3 welding and squeeze times
3.4 weld pitch (spot)
3.5 electrode pressure cycle
4. Set up the work piece to achieve correct joint fit-up and alignment to include setting and checking all of the following as is applicable to the type of installation:
4.1 handling and loading equipment
4.2 preparation of materials and joint faces is to specification
4.3 traversing mechanisms
4.4 work holding arrangements
4.5 safety mechanisms
4.6 transfer mechanisms
5. Set up the equipment to produce welded components in the specified materials and forms that cover both of the following:
5.1 two different material thicknesses
5.2 two different joint configurations
6. Prove the installation is operating correctly and is ready for production by producing specified trial welds and checking all of the following as is applicable to the application:
6.1 visual appearance of weld area
6.2 weld quality
6.3 dimensional accuracy
6.4 machine settings are as specified
7. Solve problems in production relating to two of the following:
7.1 machine performance
7.2 joint set-up
7.3 condition of electrode
7.4 condition of materials being joined

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SEMFWE316
Welding materials with mechanised arc welding equipment

Overview

This standard identifies the competencies you need to operate one type of mechanised MIG/MAG, cored wire, Submerged Arc, TIG, or Plasma Arc welding installation, which has already been prepared for production in accordance with approved instructions, or welding procedures. You will be expected to check that the equipment has been approved for production and that sufficient supplies of all the required materials and consumables are present and correct, and ready for production operations to be performed.

You must operate the installation safely and correctly in accordance with instructions and approved procedures and achieve a weld quality and tolerances that meet the product specification. The production output may be inspected by visual and non-destructive testing methods to check that the specified quality is being achieved. You must continuously monitor the operation of the installation, and make any necessary adjustments to equipment settings in line with your permitted authority in order to produce the welded joints to the required specification. Meeting production requirements will be an important issue and your production records must show consistent and satisfactory performance.

Your responsibilities will require you to comply with organisational policy and procedures for operating the welding installation and to report any problems or adjustments to the installation that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a sound basis for your work, enabling you to adopt an informed approach to applying welding procedures and instructions. You will have an understanding of how the welding process works and is applied in mechanised form, and will know about the equipment, materials and consumables in adequate depth to provide a sound background to the process operation and for carrying out the welding activities to the required specification. You will understand the safety precautions required when working with the machine and its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and work instructions
P3 confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out
P4 check that the parent material, components, consumables and joint preparation comply with specifications
P5 carry out and monitor the machine operations in accordance with specifications and job instructions
P6 achieve joints of the required quality and specified dimensional accuracy
P7 make sure that the rate of output is as specified
P8 deal promptly and effectively with problems within your control and report those that you cannot solve
P9 shut down the equipment to a safe condition on conclusion of the joining activities

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when operating mechanised arc welding installations (working with machinery; the use of personal protective equipment (PPE); protecting others from the effects of the electric arc; appropriate machine guards; operation of machine safety devices; stopping the machine in an emergency; closing the machine down on completion of activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with arc welding machines and how they can be minimised (dangers from the electric arc; live electrical components; fumes and gases; hot metal; grinding and mechanical metal/slag removal; moving parts of machinery)
K3 the principles of mechanised and automated welding (types of installations; machine functions; control systems; safety features)
K4 the key components and features of the equipment used (power source; electrical parameters such as arc voltage, current, wire dispensing and feed mechanisms; flux dispensing and recovery; shielding gas supply; control and storage of consumables; how variations in the parameters influence weld features, quality and output)
K5 extracting the necessary information from drawings and welding procedure specifications, welding symbols and abbreviations used (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K6 operation of the machine controls and their function; care of equipment
K7 setting up and aligning the workpiece, and the equipment to be used
K8 monitoring the installation during the welding process; recognition of problems and action to be taken
K9 problems that can occur with the welding activities (distortion, material and weld defects)
K10 weld inspection and test procedures used including destructive and non-destructive methods
K11 organisational quality systems (standards to be achieved; production records to be kept)
K12 personal approval tests and their applicability to your work
K13 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information

Scope/range related to performance criteria
You must be able to:

1. Confirm that the installation is ready for production operations to include checking all of the following:
1.1 the installation has been approved for production
1.2 supplies of components and consumables are adequate and correctly prepared
1.3 machine settings comply with instructions and the welding procedure specification
1.4 all machine functions operate correctly
1.5 all safety equipment is in place and functioning correctly
2. Operate one of the following mechanised arc welding processes in the specified materials, forms and positions:
2.1 MIG/MAG
2.2 Submerged Arc
2.3 Cored Wire
2.4 Plasma Arc
2.5 TIG
3. Produce welded components covering both of the following:
3.1 two different joint configurations
3.2 two different material groups
4. Monitor the process operation and machine functions, and make adjustments as required to parameters and mechanisms within your permitted authority and tolerances to include adjusting all of the following:
4.1 electrical parameters
4.2 welding speed
4.3 flux dispensing and recovery mechanisms
4.4 safety devices
4.5 wire feed rate
4.6 gas shielding system
4.7 mechanical functions (handling, loading, workholding, transfer)
5. Produce welded components which:
5.1 achieve a weld quality equivalent to the relevant level of BS EN ISO 5817 as required by the application standard (for aluminium, BS EN ISO 10042 applies)
5.2 meet the required dimensional accuracy within specified tolerances

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SEMFWE317
Welding materials using resistance spot, seam and projection welding machines

Overview

This standard identifies the competencies you need to operate resistance spot, seam or projection welding installations, which have already been prepared for production in accordance with approved instructions, or welding procedures. You will be expected to check that the installation has been approved for production and that sufficient supplies of all required materials and consumables are present and correct, and ready for production operations to be performed.

You must operate the installation safely and correctly in accordance with instructions and approved procedures and achieve a weld quality and tolerances that meet the product specification. The production output may be inspected by visual and non-destructive testing methods to check that the specified quality is being achieved. You must continuously monitor the operation of the installation and make any necessary adjustments to equipment settings in line with your permitted authority in order to produce the welded joints to the required specification. Meeting production requirements will be an important issue and your production records must show consistent and satisfactory performance.

Your responsibilities will require you to comply with organisational policy and procedures for operating the welding installation and to report any problems or adjustments to the installation that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a sound basis of your work, enabling you to adopt an informed approach to applying welding procedures and instructions. You will have an understanding of how the resistance welding process works and is applied in mechanised form, and will know about the equipment, materials and consumables in adequate depth to provide a sound background to the process operation and for carrying out the activities to the required specification. You will understand the safety precautions required when working with the machine and its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and work instructions
P3 confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out
P4 check that the parent material, components, consumables and joint preparation comply with specifications
P5 carry out and monitor the machine operations in accordance with specifications and job instructions
P6 achieve joints of the required quality and specified dimensional accuracy
P7 make sure that the rate of output is as specified
P8 deal promptly and effectively with problems within your control and report those that you cannot solve
P9 shut down the equipment to a safe condition on conclusion of the joining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when operating resistance welding installations (working with machinery; the use of appropriate personal protective equipment (PPE); machine guards; operation of machine safety devices; stopping the machine in an emergency; closing down the machine on completion of the welding activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with resistance welding machines and how they can be minimised (dangers from live internal electrical components, fumes, hot metal, expulsion of hot particles, moving parts of machines)
K3 the basic principles of resistance welding; terminology used in welding
K4 mechanised and automated welding basics (types of installation; machine functions; control systems; safety features)
K5 the key components and features of the equipment used (power source; electrical parameters such as arc voltage, current, electrode pressure and welding time; systems for parameter control; how variation in the parameters influence weld features, quality and output)
K6 extracting information required from drawings and welding procedure specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K7 operation of the machine controls and their function; clamping and transfer of components, equipment care procedures
K8 setting up and aligning the workpiece
K9 monitoring the installation during the welding process; recognition of problems and action to be taken
K10 problems that can occur with the welding activities, materials and weld defects
K11 weld inspection and test procedures used including destructive and non-destructive methods
K12 organisational quality systems (standards to be achieved; production records to be kept)
K13 personal approval tests and their applicability to your work
K14 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information

Scope/range related to performance criteria
You must be able to:

1. Confirm that the installation is ready for operation to include checking all of the following:
1.1 the installation has been approved for production
1.2 supplies of components and consumables are adequate and correctly prepared
1.3 machine settings comply with instructions and the welding procedure specification
1.4 all machine functions operate correctly
1.5 all safety equipment is in place and functioning correctly
2. Operate one of the following resistance welding installations:
2.1 spot welding
2.2 seam welding
2.3 projection welding
3. Produce welded components in the specified materials and forms that cover both of the following:
3.1 two different material thicknesses
3.2 two different joint configurations
4. Monitor the process operation, electrode condition and machine function and make adjustments to required parameters and mechanisms to include all of the following as is appropriate to machine type:
4.1 welding current
4.2 welding and squeeze times
4.3 electrode pressure cycle
4.4 welding speed (seam)
4.5 weld pitch (spot)
4.6 mechanical functions
5. Produce welded components which:
5.1 achieve a weld quality as specified in the application standard
5.2 spot and projection welds are correctly located
5.3 seam welds are of the correct dimensions
5.4 meet the required dimensional accuracy within specified tolerance

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SEMFWE332
Cutting plate and sections using shearing machines

Overview

This standard identifies the competencies you need for cutting and shaping metal plate and sections (3 mm thickness and above) for fabrications using guillotines and section cropping machines, in accordance with approved procedures. You will be required to select the appropriate equipment and machine settings to use for the material and thickness and the accuracy required to be achieved. Materials to be cut and shaped may include ferrous and non-ferrous and will include parallel cuts, square cuts, and cuts that are at an angle. These cuts will be achieved by working to marking out and by setting the machines back stop when multiple cutting is required. This will call for care in selecting the right tools so as to avoid damage to the materials and tools, and danger to oneself.

Your responsibilities will require you to comply with organisational policy and procedures, seeking out relevant information for the activities undertaken and to report any problems with the equipment, materials or cutting activities that you cannot personally resolve or are outside your permitted authority to the relevant people. You will be expected to work with minimum supervision taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying metal shearing procedures. You will understand the shearing processes, the equipment and its application, and will know about the process in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with shearing machines and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the machine is set up and ready for the machining activities to be carried out
P3 manipulate the machine tool controls safely and correctly in line with operational procedures
P4 produce cut components to the required quality and within the specified dimensional accuracy
P5 carry out quality sampling checks at suitable intervals

P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when working with shearing machines (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 safe working practices and procedures for operating machine tools
K4 the correct methods of moving or lifting heavy plate and the equipment to be used
K5 the hazards associated with fabrication work and shearing operations and how they can be minimised (such as using dangerous or badly maintained tools and equipment; lifting and handling plate; operating machinery)
K6 how to obtain the necessary drawings and specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions (such as cutting lines, centre lines)
K10 the various shearing machine cutting methods and techniques (such as cutting to marking out; using machine back-stops; setting plate at an angle to the machine slides)
K11 material handling and preparation methods (such as degreasing, de-burring, straightening)
K12 the material cutting characteristics and process considerations that need to be taken into account when shearing plate material
K13 the method of setting and adjusting guillotine blades for the material thickness
K14 tool and equipment care and control procedures and how to recognise when the cutting blades require changing
K15 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K16 the safety mechanisms and devices that are on the machine and why they must always be used (machine guards, interlocks, safety operating devices
K17 the problems that can occur when shearing materials and how these can be avoided
K18 inspection techniques that can be applied to check shape and dimensional accuracy are to specification and within acceptable limits
K19 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K20 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe and fit for purpose by carrying out all of the following checks:
1.1 the appropriate equipment/machine is selected for the operation being performed
1.2 the machine guards and safety devices are in position and function correctly
1.3 cutting blades are in a serviceable condition (sharp, free from damage or chips)
1.4 machine settings are suitable for the material thickness and operations to be performed
2. Cut metal plate using both of the following types of shearing machine:
2.1 guillotines
2.2 section cropping machine
3. Cut materials using both of the following techniques:
3.1 to markings
3.2 using machine back-stop for multiple cutting
4. Perform operations that produce straight and accurate cuts which includes all of the following:
4.1 parallel cuts
4.2 square cuts
4.3 angular cuts
5. Cut plate, sections or bars for one appropriate material and for two different thicknesses:
5.1 mild steel
5.2 brass or copper
5.3 stainless steel
5.4 tin plate
5.5 aluminium
5.6 other specific materials
6. Produce cut components which meet all of the following quality and accuracy standards:
6.1 dimensional accuracy is within the tolerances specified on the drawing/specification
6.2 cut components are free from excessive distortion
6.3 cut edges are neat and free from false tool cuts and shearing slivers
6.4 angled cuts are within specification requirements

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SEMFWE366
Operating CNC Fabrication Equipment

Overview
This standard identifies the competences you need to operate computer numerically controlled (CNC) fabrication machines, such as shearing machines, gas, laser, plasma or water jet cutting,

punching, bending and forming machines, in accordance with approved procedures. You will be expected to take charge of the prepared machine and to check that it is ready for the machining operations to be performed. This will involve checking that all the required materials and consumables are present, and that the machine has been approved for production. In operating the machine, you will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages, and executing the program activities safely and correctly.

You will be required to monitor the cutting or forming operations continuously, making any necessary adjustments to machine parameters in line with your permitted authority. Meeting production targets will be an important issue, and your production records must show consistent and satisfactory performance.

Your responsibilities will require you to comply with organisational policy and procedures for the CNC activities undertaken, and to report any problems with the equipment, tooling, program, materials or activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will be sufficient to provide a good understanding of your work, and will enable you to adopt an informed approach to applying CNC fabrication procedures. You will have an understanding of the CNC machining process used, and its application, and will know about the machine, tooling, materials, machining activities and consumables, in adequate depth to provide a sound background to machine operation and for carrying out the activities to the required specification.

You will understand the safety precautions required when working with the machine, and with its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the equipment is set up and ready for operation

P3 follow the defined procedures for starting and running the operating system
P4 deal promptly and effectively with error messages or equipment faults that are within your control and report those that cannot be solved
P5 operate the CNC fabrication equipment
P6 monitor the computer process and ensure that the production output is to the required specification
P7 shut down the equipment to a safe condition on conclusion of the activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when operating CNC fabrication machines and equipment
K2 the safety mechanisms on the machine, and the procedures for checking that they are operating correctly
K3 the hazards associated with working on CNC cutting and forming machines (such as moving machinery, automatic machine operation, handling of tooling/cutting media, lifting and handling workholding devices, handling materials) and how they can be minimised
K4 how to start and stop the machine in both normal and emergency situations
K5 the importance of wearing the appropriate protective clothing and equipment (PPE), and of keeping the work area clean and tidy
K6 the application of the CNC machine, and the range of operations it can perform
K7 where to obtain component drawings, specifications and/or job instructions required for the components being machined
K8 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K9 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K10 how to interpret the visual display and the various messages displayed
K11 the function of error messages, and what to do when an error message is displayed
K12 how to find the correct restart point in the program when the machine has been stopped before completion of the program
K13 the operation of the various hand and automatic modes of machine control (such as program operating and control buttons)
K14 how to operate the machine using manual operation, single block run, full program run and feed/speed override controls
K15 how to make adjustments to the program operating parameters
K16 how to set and secure the workpiece to the machine; the effects of clamping the workpiece; and how material shaping/removal can cause warping/distortion of the finished workpiece
K17 the problems that can occur with the cutting/forming activities, and how to prevent them
K18 the quality control procedures used, inspection checks that need to be carried out and the equipment to be used
K19 the extent of your own responsibility and whom you should report to if you have problems you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure that the machine is ready for operation, by carrying out all of the following:
1.1 checking that the correct operating program is loaded and is at the correct start point
1.2 ensuring that machine guards are in place, correctly adjusted and functions
1.3 positioning and securing material/components without damage and distortion
1.4 checking that cutting tools/tooling are in a suitable condition
1.5 setting plate/section datum's and positioning the machine
1.6 update the program tool data, as applicable
1.7 ensuring that start-up procedures are observed
1.8 adjusting machine settings as required to maintain accuracy
2. Operate one of the following CNC fabrication machines:
2.1 shearing machine
2.2 punching machine
2.3 forming machine
2.4 bending machine
2.5 plasma cutting
2.6 laser cutting
2.7 gas cutting
2.8 water jet cutting
3. Position and secure the workpiece, using two of the following holding methods/device:
3.1 jigs and fixtures
3.2 clamps and stops
3.3 pneumatic clamps
3.4 other workholding devices
4. Produce components which combine several different operations, which cover five of the following:
4.1 straight cuts
4.2 square/rectangular profiles
4.3 curved profiles
4.4 internal profiles
4.5 angular profiles
4.6 holes linearly pitched
4.7 holes radially pitched
4.8 louvers
4.9 swages
4.10 bends at 90 degrees
4.11 bends of various angles
4.12 multi-bend platework
4.13 curved plates
4.14 slots and apertures
4.15 circles/ellipses
4.16 other specific features
5. Produce components using one of the following types of material:
5.1 ferrous
5.2 non-ferrous
5.3 stainless steel
5.4 special alloys
5.5 other appropriate material
6. Carry out the necessary checks during production for accuracy of four of the following:
6.1 linear dimensions
6.2 vertical dimensions
6.3 position of features

6.4 accuracy of hole/slot dimensions
6.5 accuracy of profiles
6.6 flatness/freedom from excessive distortion
6.7 accuracy of louvers and swages
7. Produce components which meet all of the following standards:
7.1 dimensional accuracy is within the tolerances
7.2 components conforms to the required shape/geometry or profile
7.3 components are free from deformity, burrs and sharp edges

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SEMFWE335
Bending and forming plate using press brakes or bending machines

Overview

This standard identifies the competencies you need for bending and forming plate (of 3mm and above) for fabrications using power operated equipment such as press brakes, bending machines and power presses in accordance with approved procedures. You will be required to select the appropriate bending and forming equipment and set it up for the operations being performed. This will involve setting up appropriate backstops or plate positioning devices, fitting of appropriate bending tools/formers taking account of material thickness and the accuracy required to be achieved. You will also need to ensure that all the required safety devices are operating correctly and that the machine guards are in place and correctly adjusted.

Materials to be bent and formed may include ferrous and non-ferrous, and tasks will include producing bends of various angles, producing box and tray sections, setting plate ends for rolling operations, and producing curved sections. This will call for care in selecting the right tools so as to avoid damage to the tools and danger to oneself.

Your responsibilities will require you to comply with organisational policy and procedures, seeking out relevant information for the activities undertaken and to report any problems with the equipment, materials, tooling or bending activities that you cannot personally resolve, or are outside your personal authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying the power pressing procedures required. You will understand the processes, and will know about the equipment and its application, the tooling and materials, in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will need to understand the safety precautions required when working with power operated presses and the safeguards necessary for undertaking the activities safely and correctly. You will be required to demonstrate safe working practices and procedures throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the equipment is set up correctly and is ready for use
P3 manipulate the machine controls safely and correctly in line with operational procedures
P4 produce formed components to the required specification
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with power operated bending and forming equipment such as press brakes or/and bending machines in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the correct protective clothing, and handling precautions to be taken, when working with heavy platework
K3 the correct methods of moving or lifting sheet or plate materials
K4 the hazards associated with power operated bending and forming processes, and how they can be minimised (such as handling heavy sheet materials and components; operating moving equipment; using faulty or badly maintained tools and equipment)
K5 the safe working practices and procedures required for operating power operated bending machines

K6 how to obtain the necessary drawings and bending specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 marking out conventions applicable to the bending process (such as centre lines, bending lines)
K10 the various types of power operated bending machines that are used and typical applications
K11 how to prepare and set-up the machine for a range of different bends (such as angled bends; box sections; plate edge setting; curved sections)
K12 the types of bending tools that are used for the various operations and how they are secured and set to the machines tool holding device
K13 ways of limiting distortion, marking and creases in the finished workpiece
K14 the preparations that need to be carried out on the materials prior to bending them
K15 the basic characteristics of the materials with regard to the bending operations undertaken
K16 why some materials may require a heating process before bending begins
K17 the need to take care of the bending tools and equipment; how to recognise faulty or damaged forming tools; how bending and forming tools should be stored
K18 the sort of problems that can occur with the bending and forming activities, and how they can be avoided
K19 the organisational quality control procedures that are used, and how to recognise defects in the bends that you produce
K20 how to make dimensional and forming inspection checks, and the tools and equipment that can be used
K21 accuracy and limitations of processes
K22 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe to use and fit for purpose by carrying out all of the following checks:
1.1 the appropriate machine is selected for the operation being performed
1.2 the machine guards and safety devices are in position and function correctly
1.3 forming tools are appropriate and in a serviceable condition (including security, correct shape, free from damage)
1.4 machine settings are suitable for the material thickness and operations to be performed
2. Operate one of the following types of power operated bending equipment:
2.1 press brakes
2.2 powered bending machine
2.3 power press
3. Perform operations that produce all of the following :
3.1 bends at 90°
3.2 bends of various angles using various bend radii
3.3 set plate ends
3.4 box square and rectangular sections

3.5 curved plates
4. Bend and form metal plate of 3mm or more thickness for one appropriate material and two thicknesses:
4.1 mild-steel
4.2 stainless steel
4.3 aluminium
4.4 special metals
5. Produce components that conform to all of the following quality and accuracy standards:
5.1 bend position and dimensional accuracy is within the specification tolerances
5.2 the form or sharpness of the bend conforms to best practice and or specification without deformation or cracking
5.3 the bend conforms to the required shape/geometry (to the template profile)

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SEMFWE336
Forming platework using power rolling machines

Overview

This standard identifies the competencies you need to bend and form plate for fabrications in accordance with approved procedures using power operated pinch or pyramid rolls which may be hand adjusted or console controlled. You will be required to select the most appropriate type and size of power rolling machine based on the operations to be performed and the thickness and size of the material to be rolled. Setting up the rolls will involve setting and adjusting the gap between feed and forming rolls to suit plate thickness, positioning side roller and adjusting to suit required radius, checking and setting parallelism of rollers and applying suitable pressure to rollers throughout the forming operation.

You will be expected to carry out or direct the rolling operations for their effective use to form the material to the required profile without flats or deformities. You will also need to ensure that all the required safety devices are operating correctly and that the machine guards are in place and correctly adjusted. Materials to be rolled may include ferrous and non-ferrous and will include operations such as rolling cylinders and cones, producing curved sections, counter curved sections, pipe sections and straightening plate. This will call for care in selecting the right machines so as to avoid damage to the tools and danger to oneself.

Your responsibilities will require you to comply with organisational policy and procedures, seeking out relevant information for the activities undertaken and to report any problems with the

equipment, materials, or rolling activities that you cannot personally resolve, or are outside your personal authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying the power rolling procedures required. You will understand the process and its application, and will know about the equipment and materials in adequate depth to provide a sound basis for setting up the equipment, correcting faults and carrying out the activities to the required specification. You will need to understand the safety precautions required when working with power rolls and the safeguards necessary for undertaking the activities safely and correctly. You will be required to demonstrate safe working practices and procedures throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the equipment is set up correctly and is ready for use
P3 manipulate the machine controls safely and correctly in line with operational procedures
P4 produce formed components to the required specification
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with rolling machines in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 checks that need to be carried out to ensure that the power rolls are safe and in a fit condition to use

K3 the personal protective clothing and equipment that needs to be worn when working with heavy platework (such as gloves, eye/ear protection, safety helmets)
K4 the handling precautions and correct methods of moving or lifting sheet or plate materials
K5 the hazards associated with fabrication work and how they can be minimised, such as handling sheet/fabricated components, using hot metal techniques, using dangerous or badly maintained tools and equipment, moving parts of power rolling machines
K6 how to obtain the necessary drawings, specifications and job instructions
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 marking out conventions used in platework and how to recognise the bending, forming and cutting lines
K10 the basic principle of operation of the power rolling machine used and the type of work it can perform
K11 how to select an appropriate machine for the operations to be performed (including roll size; power of machine)
K12 how to set up the machine to produce the required form (such as cylinders, cones, curved sections, straightening plates)
K13 techniques of rolling (including pre-setting plate edges, adjusting pressure throughout the rolling operations, checking component for parallelism or form throughout the operations)
K14 how to release the rolls and remove the workpiece when rolling cylindrical and conical sections
K15 ways of limiting distortion, marking, creases and flats in curved sections
K16 how the materials need to be prepared prior to rolling, and the effects of raw material scale or burrs on the finished article
K17 material characteristics with regard to forming using rolling machines
K18 the care and maintenance procedures that need to be observed to ensure the machines are in a serviceable condition
K19 the problems that can occur with the rolling activities, and how they can be avoided
K20 the organisational quality control procedures and how to recognise rolling defects
K21 the inspection checks that need to be carried out and the tools and equipment that are used
K22 the accuracy that can be achieved by rolling and limitations of the rolling processes
K23 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe to use and fit for purpose by carrying out all of the following checks:
1.1 the rolls are appropriate for the material used and operations being performed
1.2 the machine guards and safety devices are in position and operating correctly
1.3 rolls are appropriate for the operation and in a serviceable condition (including suitable diameter; free from damage)
1.4 roll settings are suitable for the material thickness and operations to be performed
1.5 equipment for supporting the plate at the start of the rolling operations is in place
2. Use one of the following types of power rolling machine:

2.1 powered rolls hand adjusted
2.2 powered rolls console adjusted
2.3 different roll sizes (diameter) and power
3. Perform rolling operations that produce five of the following:
3.1 cylinders
3.2 cones
3.3 segments of a cylindrical tank
3.4 curved section or sector of an otherwise flat plate
3.5 counter curved sections
3.6 pipe sections
3.7 flattening or straightening plate
3.8 other specific form
4. Carry out rolling operations on one type of material from the following:
4.1 carbon steel
4.2 stainless steel
4.3 aluminium
4.4 special metals
5. Produce rolled components that conform to all of the following quality and accuracy standards:
5.1 dimensional accuracy is within the specification tolerances
5.2 the rolled section conforms to best practice and or specification without deformation or cracking
5.3 the component conforms to the required shape/geometry (to the template profile)

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SEMFWE338
Producing platework assemblies

Overview

This standard identifies the competencies you need to produce heavy platework (3mm thick plate and above) assemblies in accordance with approved procedures. You will be required to correctly interpret specifications and drawings, bring together and assemble and join, in the right order, plate work components and sections in order to construct completed fabricated assemblies or sub-assemblies such as square and rectangular plate structures, covers and side plates, tanks, pressure vessels, cylindrical sections, conical sections, reduction pieces, simple and complex boiler seatings. You will be required lay out and secure the various component parts of the structure using mechanical fastenings, temporary tack welding, flanged and mechanically fastened or

adhesive bonding techniques in the correct order and ensuring they are assembled in a manner that is fit for purpose.

Your responsibilities will require you to comply with organisational policy and procedures for the platework fabrication activities to be undertaken and to report any problems with the activities, tools and equipment or materials that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying platework fabrication techniques and their assembly and fixing procedures. You will understand the techniques used and the requirements of the manufacturing and assembling procedures, and their application. You will know about the methods of assembling the components of the required strength, that are fit for purpose, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with heavy platework components and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant instructions, assembly drawings and any other specifications
P3 ensure that the specified components are available and that they are in a usable condition
P4 use the appropriate methods and techniques to assemble the components in their correct positions
P5 secure the components using the specified connectors and securing devices
P6 produce finished platework assemblies
P7 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
P8 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when producing platework assemblies (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye protection, safety helmets, ear protection)
K3 safe working practices and procedures needed for producing platework assemblies
K4 the correct methods of moving or lifting bulky and heavy fabrications
K5 the hazards associated with platework fabrication and assembly work and how they can be minimised (such using dangerous or badly maintained tools and equipment; lifting and handling long and heavy components; cuts, slips trips and falls)
K6 how to obtain the necessary drawings and joining specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions (such as cutting lines, centre lines)
K10 the preparations that need to be carried out on the components prior to assembling them
K11 the various methods of securing the assembled components (including nuts and bolts; tack welding methods and techniques; hot and cold riveting; adhesive bonding of components)
K12 how to set up and align the various components and the tools and equipment that is used
K13 methods of temporarily holding the joints together to aid the assembly activities (including clamps, rivet clamps, jacks and wedges)
K14 the use and care of tools and equipment, and control procedures
K15 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K16 the problems that can occur when producing platework assemblies, and how these can be avoided
K17 inspection techniques that can be applied to check shape (including straightness) and dimensional accuracy is to specification and within acceptable limits
K18 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K19 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the platework assembly operations:
1.1 correctly prepare and set-up the components and faces to be joined
1.2 use the correct datum faces
1.3 use the specified or appropriate fixing method
1.4 correctly align the components and faces to be joined
1.5 assemble/fabricate the platework components in the correct order or manner
1.6 produce an assembly which meets the required specification
2. Produce five of the following platework assemblies:
2.1 frames

2.2 reduction pieces
2.3 tanks
2.4 transformers
2.5 covers and side plates
2.6 segmented bends
2.7 square, rectangular and box sections
2.8 steel and composite material assemblies
2.9 cylindrical
2.10 conical
2.11 simple or complicated seatings (tank or boiler seats)
2.12 other specific assembly
3. Use four of the following types of components in the assemblies produced:
3.1 plates or covers
3.2 flanges
3.3 pre-fabricated square/rectangular components
3.4 pipes
3.5 pre-fabricated cylindrical/conical components
3.6 rolled section components (angle, channel or tee section)
3.7 brackets
3.8 other specific components
4. Assemble platework components using two of the following methods:
4.1 temporary tack welding
4.2 riveting (hot or cold)
4.3 flanged and mechanically fastened (such as threaded devices)
4.4 adhesive bonding
4.5 other specific method
5. Produce platework assemblies which meet all of the following quality and accuracy standards:
5.1 all components are correctly assembled and aligned in accordance with the specification
5.2 overall dimensions are within specification tolerances
5.3 assemblies meet appropriate geometric tolerances (square, straight, angles free from twists)
5.4 where appropriate, pitch of erection holes meet specification requirements
5.5 completed assemblies have secure and firm joints, and are clean and free from burrs or flash

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SEMFWE331
Producing fillet welded joints using a manual welding process

Overview

This standard identifies the competencies you need to produce fillet welds in plate, sheet or sections and/or fillet welded joints in pipe/tube using a manual welding process such as manual metal arc, MIG, MAG, TIG, flux cored wire, inert shield or oxy/fuel gas welding equipment in accordance with instructions and/or approved welding procedures. You will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. You will be expected to check the welding equipment to ensure that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage.

In preparing to weld you will need to set and adjust the welding conditions in line with the instructions or welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in line with your permitted authority in order to produce the welded joints to the required specification. You will be required to demonstrate your capability to produce the fillet welds of the required quality and this could be through tests according to BS 4872-1 or BS EN ISO 9696 Part 1 (for aluminium).

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a sound basis for your work, and will provide an understanding of how the particular welding process works. You will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 follow the relevant joining procedure and job instructions

P3 check that the joint preparation complies with the specification
P4 check that joining and related equipment and consumables are as specified and fit for purpose
P5 produce joints as specified using the appropriate thermal joining technique
P6 produce joints of the required quality and of specified dimensional accuracy
P7 shut down the equipment to a safe condition on completion of joining activities
P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers from arc eye, safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
K3 the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, EMF, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces, slips, trips and falls)
K4 the manual welding process selected and an awareness of the different types of welding equipment (including basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
K5 how to extract information required from drawings and welding procedure specifications (such as interpretation of welding symbols, scope, content and application of the welding procedure specification) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken
K6 the consumables associated with the chosen welding process (such as types of electrodes and or filler metal and their application, types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
K7 the types and features of welded joints (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
K8 methods of setting up and restraining the joint to achieve correct location of components and control of distortion (such as edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
K9 preparing the welding equipment and checks that need to be made to ensure that it is safe and ready to use (such as electrical connections, power return and earthing arrangements; equipment calibration before use, setting welding parameters, care and maintenance of the equipment)
K10 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (including fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)

K11 the importance of complying with job instructions and the welding procedure specification
K12 problems that can occur with the welding activities and how these can be overcome (including causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
K13 the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual, mechanical and non-destructive tests)
K14 personal approval tests and their applicability to your work
K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Prepare for the manual welding process, to include carrying out all of the following:
1.1 obtain the appropriate equipment for the welding activities to be carried out (type, current capacity)
1.2 check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder (where applicable)
1.3 connect all required hoses, regulators and/or flow meters and safety devices (where applicable)
1.4 prepare the work area for the welding activities (such as sighting welding screens, positioning fume extraction equipment)
1.5 ensure that the workpiece/component is correctly set up with regard to specified joint preparation, and is secure
1.6 obtain and wear appropriate personal protective equipment
2. Set up, check, adjust and use welding and related equipment for one of the following welding processes:
2.1 Manual Metal Arc (MMA)
2.2 TIG
2.3 Flux cored wire
2.4 MIG/MAG
2.5 Plasma Arc
2.6 Oxy/fuel Gas welding
3. Use consumables as specified in the welding procedure specification covering either:
3.1 two types of electrode from:
rutile
basic
cellulosic
nickel alloy
stainless steel
other electrode type
OR
3.2 two types of filler wire from different material groups
4. Produce fillet welded joints in two of the following forms of material:
4.1 plate
4.2 sheet
4.3 sections
4.4 pipe/tube
4.5 other specific form

5. Weld joints according to approved welding procedures in good access situations in two of the following BS EN ISO 6947 positions:
5.1 Flat (PA)
5.2 Horizontal (PC)
5.3 Horizontal Vertical (PB)
5.4 Vertical Upwards (PF)
5.5 Vertical Downwards (PG)
5.6 Overhead (PE or PD)
6. Produce fillet welded joints which:
6.1 achieve a minimum weld quality requirements applicable to fillet welds equivalent to those given in the relevant European/International Standards (such as BS EN ISO 5187 and BS EN ISO 10042) as required by the application standard or specification
6.2 meet the required dimensional accuracy within specified tolerance

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SEMFWE323
Cutting sheetmetal to shape using hand and machine tools

Overview

This standard identifies the competencies you need to cut and shape sheetmetal (up to and including 3 mm) in order to fabricate clips, brackets, covers, trunking and similar components (including templates) in accordance with approved procedures. You will be required to select the appropriate equipment to use for the material and thickness and the accuracy required to be achieved and will use hand tools, hand power tools and machinery as is applicable. The cutting and shaping will involve producing straight cuts, external curved contours, cut-ins, notches and round and square holes.

Materials to be cut and shaped may include ferrous and non-ferrous. This will call for care in selecting the right tools so as to avoid damage or contamination to the tools and danger to oneself.

Your responsibilities will require you to comply with organisational policy and procedures, seeking out relevant information and to report any problems with the cutting equipment, materials or cutting activities that you cannot personal resolve, or are outside your permitted authority, to the relevant person. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying sheetmetal cutting and shaping procedures. You will understand the processes, the equipment and their application, and will know about the materials in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with fabrication tools and machinery. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow relevant specifications for the component to be produced
P3 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition
P4 cut and finish the materials to shape using appropriate methods and techniques
P5 check that all the required shaping operations have been completed to the required specification
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 complete the relevant paperwork in accordance with organisational procedures

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with sheetmetal equipment and materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting sheetmetal
K4 safe working practices and procedures that need to be observed when using manual and power operated tools
K5 the hazards associated with fabrication work and how they can be minimised, such as using dangerous or badly maintained tools and equipment, operating guillotines and when using hand and bench shears

K6 the procedures for obtaining the necessary drawings and specifications and how to check that they are the latest issue
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret the marking out conventions on the materials to be cut and shaped (such as cutting lines, centre lines)
K10 the tools and techniques available for cutting and shaping sheetmetal (such as tin snips, bench shears, guillotines, portable power tools, bench drills, saws)
K11 what preparations you may have to carry out on the material prior to cutting it
K12 the material characteristics and process considerations that need to be taken into account when cutting and shaping sheetmetal
K13 the use and care of tools and equipment including checks that need to be made to ensure that the tools are fit for purpose (sharp, undamaged, plugs and cables secure and free from damage, machine guards or safety devices operating correctly)
K14 tool cutting characteristics
K15 setting and adjusting tools and equipment, including the use of back stops on guillotines
K16 the importance of using tools or equipment only for the purpose intended, the care that is required when using the tools or equipment, the proper way of preserving tools or equipment between operations
K17 the problems that can occur with cutting and shaping sheetmetal and how these can be avoided
K18 the importance of using the machine guards and safety protection equipment at all times
K19 inspection techniques that can be applied to check shape and dimensional accuracy are to specification and within acceptable limits
K20 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K21 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Cut and finish material to the marked out shape using six of the following tools:
1.1 tin snips
1.2 pillar drill
1.3 bench shears
1.4 files
1.5 guillotine
1.6 punch/cropping machine
1.7 hacksaw
1.8 trepanning
1.9 band saw
1.10 nibbling machine
1.11 hand power tools (drill, nibbling)
1.12 thermal devices
1.13 other specific tool
2. Perform operations to produce all of the following shapes:
2.1 straight cuts

2.2 cut-ins (straight and curved)
2.3 notches
2.4 external and internal curved contours
2.5 round holes
2.6 square holes
3. Use sheetmetal of various thickness up to and including 3 mm for two appropriate materials and two thicknesses from the following:
3.1 hot rolled mild-steel
3.2 brass
3.3 cold rolled mild steel
3.4 copper
3.5 coated mild steel (such as primer, tinned, galvanised)
3.6 lead
3.7 stainless steel
3.8 titanium
3.9 aluminium
4. Produce cut and shaped components which meet all the following quality and accuracy standards:
4.1 company/customer standards requirements
4.2 dimensionally accurate (to drawing or specifications)
4.3 free from distortion
4.4 free from sharp edges, slivers or burrs
5. Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:
5.1 build records
5.2 log cards
5.3 job cards
5.4 quality documentation
5.5 other specific recording methods

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SEMFWE324
Forming sheetmetal using hand and machine tools

Overview
This standard identifies the competencies you need to form sheetmetal (up to and including 3mm) using hand tools and machine tools in accordance with approved procedures. You will be

required to select the appropriate equipment to use based on the operations required, material to be formed and accuracy to be achieved and this will include such things as hammers and stakes, formers, bending machines, rolling machines, wiring and swaging machines. The components/shapes to be produced will include bends/upstands, folds, box sections, wired edges, cylinders and curved sections, square to round trunking, lobsterback trunking, and stretching and shrinking of materials to form cowlings and rounded covers, curved panels with balled corners, concertina ducting or trunking.

Your responsibilities will require you to comply with organisational policy and procedures for the forming activities undertaken and to report any problems with the tools and equipment, materials or activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying sheet metalwork forming procedures. You will understand the forming processes, the equipment used and its application, and will know about the materials and forming techniques in adequate depth to provide a sound basis for carrying out the activities, correcting faults and producing the components to the required specification. You will understand the safety precautions required when working with the forming machines and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the correct component drawing and any other related specifications for the component to be produced
P3 determine what has to be done and how this will be achieved
P4 use the appropriate tools and equipment for the pressure shaping operations and check that they are in a safe and usable condition
P5 shape the materials to the required specification using appropriate methods and techniques
P6 check that all the required shaping operations have been completed to the required standard

P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with sheetmetal equipment and materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather apron and gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting sheet or plate materials
K4 the hazards associated with sheetmetal work and how they can be minimised, such as handling sheet/fabricated components, using machinery, using dangerous or badly maintained tools and equipment
K5 how to obtain the necessary drawings, specifications and work instructions
K6 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K7 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K8 marking out conventions used in sheetmetal work and how to recognise cutting detail and bending and folding lines
K9 hand tools used in sheetmetal forming activities and typical operations that they are used for (hammers, stakes, formers, sand bags)
K10 the various machine tool forming equipment that can be used to produce a range of shapes (such as bends, box sections, cylinders and curved sections, wired edges and swages)
K11 methods of stretching and shrinking materials and the tools, equipment and techniques used
K12 how to set up the various machine to produce the required forms (setting up of rolls; setting fingers on bending machines; setting forming tools for swaging)
K13 ways of limiting distortion, marking, creases, flats (in curved sections)
K14 how the materials are to be prepared for the forming operations and why some materials may require a heating process prior to forming
K15 the characteristics of the various materials used with regard to the bending and forming process
K16 tool and equipment care and maintenance procedures
K17 the problems that can occur with forming sheetmetal and how these can be avoided
K18 organisational quality control procedures and recognition of pressure forming defects
K19 dimensional and forming inspection checks that need to be carried out and the tools and equipment to be used
K20 limitations of the various forming processes and accuracy that may realistically be achieved
K21 ways of avoiding and correcting inaccuracies in forming activities
K22 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria

You must be able to:

1. Ensure that the tools and equipment to be used are appropriate to the application and in a safe and usable condition by carrying out all of the following checks:
1.1 hand tools are in a usable condition (hammer shafts secure; stakes, formers and striking faces free from defects and damage)
1.2 the appropriate machine is selected for the operation being performed
1.3 the machine guards and safety devices are in position and function correctly
1.4 forming tools are appropriate and in a serviceable condition (secure, correct shape, free from damage)
1.5 machine settings are suitable for the material thickness and operations to be performed
2. Use three of the following types of forming equipment/techniques:
2.1 hammers/panel beating equipment
2.2 wheeling machine
2.3 stakes and formers
2.4 jenny/wiring machine
2.5 bending machine (hand or powered)
2.6 swaging machine
2.7 rolling machine (hand or powered)
2.8 spot heating techniques
3. Perform forming operations which produces seven of the following shapes:
3.1 bends/upstands
3.2 cowlings and rounded covers
3.3 folds
3.4 square to round trunking
3.5 box sections
3.6 lobsterback trunking
3.7 wired edges
3.8 domed corners
3.9 swages
3.10 concertina ducting or trunking
3.11 curved panels
3.12 ribbed components
3.13 cylindrical sections
3.14 boxed edges
3.15 concentric cones
3.16 offset cones
3.17 other specific shape
4. Produce components made from two different materials from the following:
4.1 mild-steel
4.2 aluminium
4.3 tinned steel
4.4 brass
4.5 galvanised plate
4.6 copper
4.7 stainless steel
4.8 lead
4.9 titanium/special steels
5. Produce components which meet all of the following quality and accuracy standards:
5.1 dimensional accuracy is within specification tolerances
5.2 finished components meet the required shape/geometry (to the template profile)

5.3 completed components are free from excessive tooling marks, deformation or cracking
6. Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:
6.1 build records
6.2 log cards
6.3 job cards
6.4 quality documentation
6.5 other specific recording methods

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SEMFWE325
Producing sheetmetal assemblies

Overview

This standard identifies the competencies you need to produce sheetmetal (up to and including 3mm) assemblies in accordance with approved procedures. You will be required to correctly interpret specifications and drawings, bring together and assemble and join, in the right order, sheetmetal components and/or light sections in order to construct completed fabricated assemblies or sub-assemblies such as ducting, tanks, cylindrical sections, conical sections, reduction pieces. You will be required to lay out and secure the various component parts of the structure using mechanical fastenings, resistance welding or self securing methods in the correct order and ensure they are assembled in a manner that is fit for purpose.

Your responsibilities will require you to comply with organisational policy and procedures for the sheetmetal fabrication activities to be undertaken and to report any problems with the activities, tools and equipment or materials that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying sheetmetal fabrication techniques and their assembly and fixing procedures. You will understand the techniques used and the requirements of the manufacturing and assembling procedures and their application. You will know about the methods of assembling the components of the required strength, that are fit for purpose in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when

working with sheetmetal components and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant instructions, assembly drawings and any other specifications
P3 ensure that the specified components are available and that they are in a usable condition
P4 use the appropriate methods and techniques to assemble the components in their correct positions
P5 secure the components using the specified connectors and securing devices
P6 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when producing sheetmetal assemblies (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye protection, safety helmets, ear protection)
K3 safe working practices and procedures needed for producing sheetmetal assemblies
K4 the correct methods of moving or lifting bulky fabrications
K5 the hazards associated with sheetmetal fabrication and assembly work and how they can be minimised (such using dangerous or badly maintained tools and equipment, lifting and handling long and heavy components, cuts, slips trips and falls)
K6 how to obtain the necessary drawings and joining specifications
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)

K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to interpret marking out conventions(such ascutting lines, centre lines)
K10 the preparations that need to be carried out on the components prior to assembling them
K11 the various methods of securing the assembled components the range of mechanical fastening devices that are used (such as nuts and bolts, screws, special fasteners, resistance and tack welding methods and techniques, adhesive bonding of components and self secured joints such as knocked up, paned down, swaged and joggled)
K12 how to set up and align the various components and the tools and equipment that is used
K13 methods of temporarily holding the joints together to aid the assembly activities (clamps, rivet clamps)
K14 the use and care of tools and equipment, and control procedures
K15 the importance of using tools or equipment only for the purpose intended, the care that is required when using the tools or equipment, the proper way of preserving tools or equipment between operations
K16 the problems that can occur when producing sheetmetal assemblies, and how these can be avoided
K17 inspection techniques that can be applied to check shape (including straightness) and dimensional accuracy are to specification and within acceptable limits
K18 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K19 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the sheetmetal assembly operations:
1.1 correctly prepare and set-up the components and faces to be joined
1.2 use the correct datum faces
1.3 use the specified or appropriate fixing method
1.4 correctly align the components and faces to be joined
1.5 assemble/fabricate the sheetmetal components in the correct order or manner
1.6 produce an assembly which meets the required specification
2. Produce five of the following sheetmetal assemblies:
2.1 frames
2.2 panels
2.3 reduction pieces
2.4 tanks
2.5 sectional trunking
2.6 transformers
2.7 ducting
2.8 square, rectangular and box sections
2.9 segmented bends
2.10 guards
2.11 cylindrical sections
2.12 conical sections
2.13 hoods
2.14 steel and composite material assemblies
2.15 other specific assembly
3. Use four of the following types of components in the assemblies produced:

3.1 sheetmetal covers
3.2 flanges
3.3 pre-fabricated square/rectangular components
3.4 pipes
3.5 pre-fabricated cylindrical/conical components
3.6 light rolled section (angle, channel or tee section) stiffeners and frame components
3.7 brackets
3.8 other specific component
4. Assemble sheetmetal components using two of the following methods:
4.1 temporary tack welding
4.2 adhesive bonding
4.3 soldering or brazing
4.4 flanged and mechanically fastened (bolts, screws)
4.5 resistance spot welding
4.6 self securing joints (knocked up, paned down, swaged, joggled)
4.7 riveting (hollow or solid)
4.8 other specific method
5. Produce sheetmetal assemblies which meet all of the following quality and accuracy standards:
5.1 all components are correctly assembled and aligned in accordance with the specification
5.2 overall dimensions are within specification tolerances
5.3 assemblies meet appropriate geometric tolerances (square, straight, angles free from twists)
5.4 where appropriate pitch of erection holes meet specification requirements
5.5 completed assemblies have secure and firm joints, are clean and free from burrs or flash
6. Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:
6.1 build records
6.2 log cards
6.3 job cards
6.4 quality documentation
6.5 other specific recording methods

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SEMFWE326
Heat treating materials for fabrication activities

Overview

This standard identifies the competencies you need to heat treat ferrous and non-ferrous materials in order to assist with the fabrication activities in accordance with approved procedures. You will be required to identify and use the appropriate materials, apply the appropriate processes and use tools and equipment based on the information presented to you to achieve the required condition. The heat treatment processes will include hardening, tempering, annealing, normalising and stress relieving and can be applied to the fabricator's tools such as punches, chisels and scribers or the component/materials to be worked on.

Your responsibilities will require you to comply with organisational policy and procedures for the heat treatment activities undertaken and to report any problems with the heat treatment equipment, materials used or heat treatment activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide a sound approach to applying the heat treatment procedures. You will understand the principles of heat treatment, and their application, and will know about the effects on the structure of the materials and their characteristics in sufficient depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the process is carried out to the required specification. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 ensure the materials to be processed are suitably prepared for the processing operations to be carried out

P3 check and monitor that the processing equipment is set up and maintained at satisfactory operating conditions throughout the processing operations

P4 carry out the process in accordance with operating procedures and the workpiece specification requirements

P5 ensure that the processed workpiece achieves the required characteristics and meets the processing specification

P6 deal promptly and effectively with problems within your control and report those that you cannot solve
P7 dispose of waste and excess materials in line with agreed organisational procedures
P8 shut down the processing equipment to a safe condition on completion of the processing activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken and safe working practices to be employed when carrying out the heat treatment of materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when working on heat treatment processes (such as gloves, eye/ear protection)
K3 the handling precautions and correct methods of moving materials, particularly when hot
K4 the hazards associated with heat treatment processes and fabrication and how they can be minimised (such as handling sheet/fabricated components, handling hot materials, overheating quenching oils)
K5 reasons for heat treating materials
K6 the various heat treatment processes, methods and procedures that may be applied
K7 the type of equipment that can be used to carry out the various heat treatment processes (such as furnaces, blacksmiths hearth, gas torches)
K8 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K9 handling techniques for hot metal components
K10 how the materials need to be prepared in readiness for the heat treatment operations
K11 the type of materials that can be heat treated and the processes that may be applied
K12 materials and their characteristics and how their structure can be modified
K13 the various cooling and quenching techniques that are applied to the processes and why it is important to use the correct process (such as water, oil, sand, air)
K14 the use of quenching oils and the need to maintain the oil temperature below the oil flash point
K15 information sources on heat treatment temperatures, tempering colours, soak times required and quenching/cooling mediums to be used
K16 the various testing techniques that can be used to check the correct condition has been achieved (such as simple file tests to check hardening or annealing has been achieved, the use of hardness testing equipment)
K17 ways of limiting distortion during the heat treatment process
K18 quality control procedures and recognition of defects
K19 limitations of the various heat treatment processes
K20 the problems that can occur when heat treating materials, and how these can be avoided
K21 organisational procedures for disposing of and recycling of waste
K22 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all the following during the heat treatment activities:
1.1 use the correct heat treatment procedure and quality documentation
1.2 follow relevant COSHH and risk assessment procedures
1.3 apply the required heat treatment processes safely and correctly
1.4 ensure the safety of self and others while carrying out the processes
1.5 leave the work area in a safe condition on completion of the activities
2. Carry out two of the following heat treatment processes/techniques:
2.1 hardening
2.2 tempering
2.3 annealing
2.4 pre/post heating
2.5 normalising/stress relieving
2.6 carburising
2.7 case hardening
3. Carry out heat treatment processes using two of the following types of equipment
3.1 furnace
3.2 induction heating
3.3 blacksmiths hearth
3.4 gas torch
3.5 electrical resistance heating
3.6 other specific heat process
4. Carry out the heat treatment process using two of the following cooling/quenching techniques:
4.1 water
4.2 oil
4.3 sand
4.4 air
4.5 brine
4.6 other specific technique
5. Apply the appropriate heat treatment process to two of the following::
5.1 ferrous components/sections
5.2 ferrous high carbon tools (punches, chisels, scribes)
5.3 hot steel rivets
5.4 non-ferrous sheet or plate
5.5 titanium
6. Carry out heat treatment processes to all the following quality and accuracy standards:
6.1 tools are of the correct hardness for the application and where appropriate suitably tempered
6.2 hardened materials are free from cracks
6.3 materials/components are suitably treated to permit working
6.4 stresses are relieved and distortion is limited and controlled

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SEMFWE330
Joining materials by resistance spot welding

Overview

This standard identifies the competencies you need to set up and use portable, and simple fixed spot welding machines in accordance with approved instructions, or welding procedures. You will be expected to check that the equipment is fit for purpose, the electrodes are correctly profiled, and that the component parts are in the correct condition for spot welding. In preparing the equipment you will need to set the welding current, welding and squeeze times and electrode pressure. You must operate the equipment safely and correctly and make any necessary adjustments to the equipment settings and parameters within permitted tolerances in order to achieve weld quality and tolerances that meet the specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems or adjustments to the equipment that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a sound basis of your work, enabling you to adopt an informed approach to applying spot welding procedures and instructions. You will have an understanding of how the resistance spot welding process works, and will know about the equipment, materials and consumables in adequate depth to provide a sound background to the process operation and for carrying out the activities to the required specification. You will understand the safety precautions required when working with the welding equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant joining procedure and work instructions
P3 confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out
P4 check that the parent material, components, consumables and joint preparation comply with specifications
P5 carry out and monitor the machine operations in accordance with specifications and job instructions
P6 achieve joints of the required quality and specified dimensional accuracy
P7 make sure that the rate of output is as specified
P8 deal promptly and effectively with problems within your control and report those that you cannot solve
P9 shut down the equipment to a safe condition on conclusion of the joining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when operating resistance welding equipment (working with machinery, the use of appropriate personal protective equipment (PPE); the use of safety screens; operation of equipment safety devices; closing down the equipment on completion of the welding activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
K2 the hazards associated with resistance welding equipment and how they can be minimised (dangers from live internal electrical components, fumes, hot metal, expulsion of hot particles, moving parts of machines)
K3 the basic principles of resistance welding (heat and pressure to form a weld heating effect of welding current; principal features of the welded joint; heat input; welding and pressure cycles; terminology used in welding)
K4 the key components and features of the equipment used (power source; welding head; power range; electrical parameters such as arc voltage, current, electrode pressure and welding time; systems for parameter control; how variation in the parameters influence weld features, quality and output)
K5 extracting information required from drawings and procedure specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K6 operation of the equipment controls and their function; equipment care procedures
K7 monitoring the equipment during the welding process; fine tuning parameters to maintain quality; recognition of problems and action to be taken
K8 problems that can occur with the welding activities, materials and weld defects
K9 self inspection of completed work
K10 organisational quality systems (standards to be achieved; production records to be kept)
K11 personal approval tests and their applicability to your work
K12 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure the resistance spot welding equipment is fit for purpose by carrying out all of the following checks:
1.1 equipment range is suitable for the operations to be performed
1.2 portable equipment power leads are undamaged and securely connected
1.3 electrodes are of the correct type, size and profile
1.4 all equipment mechanical and electrical systems operate correctly
1.5 supplies of components are adequate and suitably prepared
1.6 appropriate safety screens are available
2. Set up, check, adjust and operate one of the following resistance spot welding machines:
2.1 portable spot welding machines
2.2 fixed simple spot welding machines
3. Set up the equipment parameters in accordance with instructions and the welding procedure specification to include setting all of the following:
3.1 electrode tip diameter/profile
3.2 welding current
3.3 welding and squeeze times
3.4 electrode pressure
3.5 water cooling flow rate (as applicable)
4. Monitor the process operation and make adjustments to parameters in order to produce welded components covering both of the following:
4.1 two different components
4.2 two different material thicknesses
5. Produce welded components which meet all the following requirements:
5.1 achieve a weld quality as specified in the application standard
5.2 spot welds are correctly pitched out
5.3 welded components meet the required dimensional accuracy within specified tolerances

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Originating organisation: SEMTA
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Suite: Fabrication and Welding Engineering Suite 3
Key words engineering; welding; fabrication; joining; spot weld; spot welder; freestanding spot welder; parameters; monitor weld condition; set electrode tips

SEMFWE340
Forming structural sections using machines

Overview
This standard identifies the competencies you need to bend and form rolled sectional structural materials using presses, bending machines and power rolls in accordance with approved procedures. You will be required to select the most appropriate type and size of machine, based on the operations to be performed and the type and section of material being used. In producing the components you will be required to operate the equipment safely and correctly, or direct

operations for its effective use to form the material to the required profile without flats or deformities. The operations to be performed will include bending beams, curved beams, circular sections, counter curved sections, twisted beams and straightening of beams.

Your responsibilities will require you to comply with organisational policy and procedures for the use of the machines and the process activities undertaken and to report any problems with the forming equipment, materials or forming activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to forming structural section material using power machine procedures. You will understand the equipment being used, the forming principles, and their application, and will know about the processes involved and their limitations in sufficient depth to provide a sound basis for carrying out the activities, correcting any faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the forming machines and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 confirm that the equipment is set up correctly and is ready for use
P3 manipulate the machine controls safely and correctly in line with operational procedures
P4 produce formed components to the required specification
P5 carry out quality sampling checks at suitable intervals
P6 deal promptly and effectively with problems within your control and report those that cannot be solved
P7 shut down the equipment to a safe condition on conclusion of the machining activities

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working with power operated bending and forming equipment such as presses, bending machines and rolling machines in a fabrication environment
K2 the general workshop and site safety requirements, statutory regulations; risk assessment procedures and COSHH regulations
K3 the correct personal protective equipment (PPE) and handling precautions to be taken when working with structural section materials (such as gloves, eye protection, safety helmets, ear protection)
K4 the handling precautions and correct methods of moving or lifting heavy structural section (such as rolled steel joists (RSJ's))
K5 the hazards associated with power operated bending processes and how they can be minimised (such as handling heavy structural materials and components; operating moving equipment; using faulty or badly maintained tools and equipment)
K6 the safe working practices and procedures required for operating power operated bending and forming machines
K7 how to obtain the necessary structural drawings and bending procedure specifications
K8 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K9 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K10 marking out conventions applicable to the bending process (such as centre lines, bending lines)
K11 the various types of power operated bending machines that are used for structural section materials, and typical applications
K12 how to prepare and set up the machine for a range of different bends (including angled bends, curved sections, twisted sections and straightening of sections)
K13 the types of bending tools that are used for the various operations and how they are secured and set to the machine's tool holding device
K14 ways of limiting distortion, marking and creases in the finished workpiece
K15 the preparations that need to be carried out on the materials prior to bending them
K16 the basic characteristics of the materials with regard to the bending operations undertaken
K17 why some materials may require a heating process before bending begins
K18 the need to take care of the bending tools and equipment; how to recognise faulty or damaged forming tools; how bending and forming tools should be stored
K19 the problems that can occur with the bending and forming activities, and how they can be avoided
K20 the organisational quality control procedures that are used, and how to recognise defects in the bends that you produce
K21 how to make dimensional and forming inspection checks, and the tools and equipment that can be used
K22 accuracy and limitations of the processes
K23 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Confirm that the equipment is safe to use and fit for purpose by carrying out all of the following checks:
1.1 the appropriate machine is selected for the operation being performed
1.2 the machine guards and safety devices are in position and function correctly
1.3 forming tools are appropriate and in a serviceable condition (including security, correct shape, free from damage)
1.4 machine settings are suitable for the material thickness and operations to be performed
2. Use one of the following types of machines:
2.1 power press
2.2 hammer machines
2.3 section bending machine
2.4 powered rolls
2.5 special purpose machines
3. Produce formed structural sections which contain four of the following features:
3.1 right angled bends
3.2 angular bends
3.3 curved beams
3.4 circular sections
3.5 counter curved sections
3.6 twisted section
3.7 straightening
4. Bend and form structural components made from three of the following forms of material:
4.1 rolled steel joists (RSJ)
4.2 structural tubes/pipes
4.3 angle section
4.4 extrusions
4.5 channel section
4.6 other specific components
5. Produce structural components which meet all of the following quality and accuracy standards:
5.1 bend position and dimensional accuracy is within the specification tolerances
5.2 the form or sharpness of the bend conforms to best practice and/or specification without deformation or cracking
5.3 the bend conforms to the required shape/geometry (to the template profile)

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Suite: Fabrication and Welding Engineering Suite 3
Key words: engineering; welding; fabrication; machining; forming; structural section; power press; hammer machine; bending; rolling

SEMFWE341
Producing structural steel ancillary components

Overview

This standard identifies the competencies you need to cut and shape plate and section materials to produce structural steel ancillary components such as fish plates, gussets, brackets, support pads and bed plates in accordance with approved procedures. You will be required to interpret drawings, mark out simple shapes and hole positions, cut out and shape plate and sections, drill and prepare structural ancillary components ready for the assembly of major structural components.

Your responsibilities will require you to comply with organisational policy and procedures for the marking out, shaping and preparation activities undertaken and to report any problems with the interpretation, equipment used, materials or manufacturing activities that you cannot personal resolve, or are outside your permitted authority, to the relevant person. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying structural steel shaping and fabrication procedures. You will understand the fabrication processes, the equipment and its application, and will know about the materials and how to produce structural component parts in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with fabrication tools and machinery. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow relevant specifications for the component to be produced
P3 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition
P4 shape the materials using appropriate methods and techniques
P5 produce finished ancillary components
P6 check that all the required shaping operations have been completed to the required specification

P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when cutting plate or rolled sections to shape (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
K3 the correct methods of moving or lifting plate and rolled section materials
K4 safe working practices and procedures that need to be observed when using manual and power operated tools
K5 the hazards associated with fabrication work and how they can be minimised (such as using dangerous or badly maintained tools and equipment; operating shearing machines; handling plate and fabricated components; using hot metal techniques)
K6 the procedures for obtaining the necessary drawings and specifications and how to check that they are the latest issue
K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K9 how to produce a three dimensional shape from the two dimensional material
K10 the preparations that need to be carried out on the material prior to marking out to enhance clarity, accuracy and safety
K11 principles of marking out and the tools and equipment that are used
K12 use of marking out conventions (such as datums, cutting detail, centre lines)
K13 how to calculate and mark out true lengths, bend allowances and circumferences
K14 ways of laying out the shapes/patterns to maximise the use of plate or sheet materials
K15 marking out and transferring information from templates and how to transfer information to the underside of the plate
K16 the tools and techniques available for cutting and shaping plate and section materials (such as shearing machines, saws, burning equipment, drills, presses and rolling machines)
K17 the material characteristics and process considerations that need to be taken into account when cutting and shaping plate and section materials
K18 the use and care of tools and equipment including checks that need to be made to ensure that the tools are fit for purpose (cutting tools are sharp and undamaged; plugs and cables secure and free from damage; machine guards or safety devices operating correctly)
K19 how to produce weld preparations and the type of preparations required for different joints and material thicknesses
K20 setting and adjusting tools and equipment including the use of back stops on guillotines
K21 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K22 safety and control procedures for shaping plate and rolled steel sections
K23 the problems that can occur with cutting and shaping plate and section materials, and how these can be avoided
K24 the use of machine guards and safety protection equipment

K25 inspection techniques that can be applied to check shape and dimensional accuracy is to specification and within acceptable limits
K26 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K27 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Ensure that you carry out all of the following during the manufacturing activities:
1.1 use the tools and equipment safely and correctly and only for its intended purpose
1.2 mark out the components accurately using recognised conventions
1.3 set up and hold the components firmly during the shaping operations
1.4 produce the components to the correct size and shape
1.5 ensure all holes are of the correct size and are at the correct centres for fixings
2. Cut and shape material to the marked out shape using four of the following methods:
2.1 shearing/cropping
2.2 sawing
2.3 burning
2.4 drilling
2.5 bending
2.6 other specific method
3. Produce structural steel components to include three of the following:
3.1 fish tails
3.2 flanges
3.3 gussets
3.4 bed plates
3.5 brackets
3.6 tie bars
3.7 support pads
3.8 stiffening plates
3.9 other specific component
4. Produce structural steel components from both of the following:
4.1 steel plate (3mm or more thickness)
4.2 rolled steel section
5. Produce cut and shaped structural steel components which meet all the following quality and accuracy standards:
5.1 company/customer standards requirements
5.2 dimensionally accurate (to drawing or specifications)
5.3 free from distortion
5.4 free from sharp edges, slivers or burrs

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Original URN: SEMFWE3-41

Relevant occupations: Engineering and manufacturing technologies; engineering; Metal Forming, Welding and Related Trades
Suite: Fabrication and Welding Engineering Suite 3
Key words: engineering; welding; fabrication; manufacture; ancillary components; structures; sheering; cropping; brackets; stiffening plates; bending

SEMFWE342
Producing major structural components/sub-assemblies

Overview

This standard identifies the competencies you need to produce major structural components/sub-assemblies such as beams, columns, portals, roof trusses, lattice braced framework, castellated beams using sections and fabricated components to specification and in accordance with approved procedures. You will be required lay out and secure parts of the structure for welding or fixing using mechanical fastenings in the correct order, and ensuring they are assembled in a manner that is fit for purpose.

Your responsibilities will require you to comply with organisational policy and procedures for the manufacture and assembly of the fabricated structures and the associated activities to be undertaken and to report any problems with the activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to producing structural components, their assembly and fixing procedures. You will understand the techniques used and the requirements of the manufacturing and assembling procedures and their application. You will know about the methods of producing structural components of the required strength, that are fit for purpose, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with structural components and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:
You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria
You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 follow the relevant instructions, assembly drawings and any other specifications
P3 ensure that the specified components are available and that they are in a usable condition
P4 use the appropriate methods and techniques to assemble the components in their correct positions
P5 produce the structural components/sub-assemblies using the specified connectors and securing devices
P6 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
P7 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding
You need to know and understand:

K1 the specific safety precautions to be taken when working in a fabrication environment and when producing structural components (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye protection, safety helmets, ear protection)
K3 safe working practices and procedures needed for producing structural components
K4 the workforce guards and safety protection equipment needed
K5 the correct methods of moving or lifting heavy fabrications or rolled steel sections
K6 the hazards associated with fabrication work and structural component operations and how they can be minimised (such using dangerous or badly maintained tools and equipment, lifting and handling log and heavy components, slips trips and falls)
K7 how to obtain the necessary drawings and joining specifications
K8 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
K9 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
K10 how to interpret marking out conventions (such as cutting lines, centre lines)
K11 the preparations that need to be carried out on the components prior to assembling them
K12 the various methods of securing the assembled components (the range of threaded fasteners used including close tolerance location bolts; tack welding methods and techniques; adhesive bonding of components)
K13 how to set up and align the various components and the tools and equipment that is used
K14 the material cutting characteristics and process considerations that need to be taken into account when producing structural components
K15 the use and care of tools and equipment, and control procedures
K16 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K17 the problems that can occur when producing structural components/assemblies, and how these can be avoided

K18 inspection techniques that can be applied to check shape (including straightness) and dimensional accuracy are to specification and within acceptable limits
K19 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
K20 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the structural assembly operations:
1.1 correctly prepare and set up the components and faces to be joined
1.2 use the correct datum faces
1.3 use the specified or appropriate fixing method
1.4 correctly align the components and faces to be joined
1.5 assemble/fabricate the structural components in the correct order or manner
1.6 produce an assembly which meets the required specification
2. Produce three of the following structural assemblies:
2.1 beams
2.2 flanged components
2.3 columns
2.4 bulk heads
2.5 portals
2.6 staircases
2.7 roof trusses
2.8 safety cages
2.9 lattice braced frameworks
2.10 hand rails
2.11 castellated beams
2.12 seatings
2.13 other specific assembly
3. Use four of the following types of components in the assemblies produced:
3.1 structural sections
3.2 support plates
3.3 fabricated beams
3.4 bed plates
3.5 fish plates
3.6 guards, hand rails
3.7 brackets
3.8 platforms and ladders
3.9 other specific components
4. Assemble the components using two of the following methods:
4.1 bolted
4.2 temporary tack welded
4.3 riveted
4.4 adhesive bonding
4.5 other specific method
5. Produce assemblies which meet all of the following quality and accuracy standards:
5.1 all components are correctly assembled and aligned in accordance with the specification
5.2 overall dimensions are within specification tolerances

5.3 assemblies meet appropriate geometric tolerances (square, straight, angles free from twists)
5.4 pitch of erection holes meets specification requirements, where appropriate
5.5 completed assemblies are secure, clean and free from burrs or flash

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Suite: Fabrication and Welding Engineering Suite 3
Key words: engineering; welding; fabrication; manufacture; structures; beams; columns; portals; roof trusses; frameworks

SEMFWE343
Erecting structural steelwork

Overview

This standard identifies the competencies you need to erect and assemble pre-fabricated structural steelwork such as support structures, building frames and roofs, mezzanine platforms, rigs, access staging and platforms to specification and in accordance with approved procedures. You will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.

Your responsibilities will require you to comply with organisational policy and procedures for the safe erection of the structure and the associated assembly activities to be undertaken and to report any problems with the component parts, equipment or construction activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying structural assembly and erection procedures. You will understand the principles and processes associated with the erection and assembly of the structures, and their application. You will know about the ways of handling structural steelwork, the means of fixing them in position as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the finished structure is produced to the required specification. You will understand the safety precautions required when working at height and with structural components and their associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 determine what has to be done and how this will be achieved

P3 select the appropriate construction steelwork and check that they are in a usable condition

P4 position and secure the construction steelwork in line with the specification

P5 securely fix any necessary temporary support facilities

P6 erect structural steelwork for specified structures

P7 produce constructions that meet specified quality and accuracy requirements

P8 take appropriate measures to protect the finished construction

P9 deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

K1 the specific safety precautions to be taken when working in a steel construction/erection environment and when erecting structural components (general site safety, appropriate personal protective equipment (PPE), accident procedure; working at height and statutory regulations relating to it, risk assessment procedures and COSHH regulations)

K2 the personal protective clothing and equipment that needs to be worn when carrying out the erection activities (such as leather gloves, eye protection, safety helmets, ear protection, safety harness)

K3 safe working practices and procedures needed for erecting structural components

K4 the correct methods of moving or lifting heavy structural sections

K5 the hazards associated with erecting structural components and how they can be minimised (such as using dangerous or badly maintained tools and equipment, lifting and handling long and heavy components, working at height, slips trips and falls)

K6 how to obtain the necessary construction and site drawings and joining specifications

K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)

K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing

K9 the preparations that need to be carried out on the components prior to erecting and assembling them

K10 equipment and temporary installations that may be required to support the structure during the erection activities
K11 the various methods of securing the assembled components (the range of threaded fasteners used including close tolerance location bolts; temporary tack welding methods and techniques)
K12 how to set-up and align the various components and the tools and equipment that is used
K13 the use and care of tools and equipment, and tool control procedures
K14 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
K15 the problems that can occur when erecting structural components/assemblies, and how these can be avoided
K16 inspection techniques that can be applied to check the construction is to specification and within acceptable limits
K17 the extent of your own responsibility and whom you should report to if you have problems that you cannot solve
K18 reporting lines and procedures, line supervision and technical experts

Additional Information
Scope/range related to performance criteria
You must be able to:

1. Carry out all of the following during the structural erecting operations:
1.1 comply with health and safety and site regulations at all times
1.2 use the correct construction drawings and interpret them correctly
1.3 correctly prepare the components and faces to be erected and assembled
1.4 use the correct datum faces
1.5 erect and assemble the structural components in the correct order or manner
1.6 correctly align the components and faces to be joined
1.7 use the specified or appropriate fixing method and ensure all bolts are tightened to the required torque
1.8 produce an assembly which meets the required specification
2. Erect structural steelwork for one of the following:
2.1 building frames and roofs
2.2 mezzanine platforms
2.3 access staging and platforms
2.4 support structures
2.5 rigs
3. Use four of the following types of components in the assemblies produced:
3.1 columns
3.2 bed plates
3.3 fish plates
3.4 beams
3.5 staircases
3.6 brackets
3.7 roof trusses
3.8 bulkheads
3.9 support plates
3.10 frames
3.11 roof sheeting/cladding
3.12 guards and hand rails

3.13 safety cages
3.14 platforms and ladders
3.15 other specific component
4. Use all of the following during the erection and assembly activities:
4.1 hand tools and equipment (podger, crow bar, spanners, torque wrenches)
4.2 assembly and alignment techniques and procedures (levels, plumb lines, laser equipment)
4.3 mechanical fastening techniques and procedures (bolted, riveted)
4.4 slinging and lifting techniques (ropes, chains, cranes)
4.5 temporary staging or mobile platforms
5. Erect structural steelwork on either of the following sites:
5.1 new construction site
5.2 existing construction
6. Produce constructions which meet all of the following quality and accuracy standards:
6.1 all components are correctly assembled and aligned in accordance with the specification
6.2 overall dimensions are within specification tolerances
6.3 assemblies meet appropriate geometric tolerances (square, straight, angles, free from twists)
6.4 completed assemblies meet specification

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Suite: Fabrication and Welding Engineering Suite 3
Key words: engineering; welding; fabrication; erecting; structures; building frames; roofs; support structures; mezzanine platforms; rigs

APPENDIX 3 - ASSESSMENT TEMPLATE DOCUMENTS

3A: Sample Form
Assessment plan and review

Candidate name:	
Employer/location:	Date:
Qualification: Unit(s): Elements:	
Assessor:	
Period of Review: (should not normally exceed 12 weeks)	Proposed Date for next review:

Part 1 – **<u>Activities / Tasks / Learning / Training</u>** undertaken since last review:
Part 2a – '**<u>Progress to date'</u>** specifying units/elements/modules achieved to date (the progress recorded **must** tie in with the associated '**Summary of Achievement Record'**):

Part 2b – Identified **barriers** to progress (please detail here any issues relating to the programme delivery, which have impacted negatively on progress e.g. attendance times, learning difficulties, suitability of training/learning materials, physical barriers to participation, health issues, attitude etc):

*

Part 2c – Solutions proposed to address the above barriers:

-

Part 3 – Agreed '**assessment planning'** & action required for the next review (proposed methods of evidence collection must be recorded & proposed assessment methods must be selected): ***N.B.*** *Methods of evidence collection may include: either hard copy records or electronic records such as audio recordings, scanned documents, photographs etc.*	Element: Proposed Assessment Methods/Sources of Evidence:							
	CrossRef	RPL	OBS	Questioning	PS	WR	D	WT

Key: Assessment Methods/Sources of Evidence

CrossRef = Cross Referencing **RPL**= Recognition of Prior Learning

OBS = Observation **PS** = Personal Statement

WR = Work Record **D** = Discussion

WT= Witness Testimony

Part 4 – Additional comments / issues (e.g. health & safety issues):
Part 5 – Candidate comments/feedback/evaluation:
Part 6 – Employer comments on progression and achievement noted in **Part 2a**:
Part 7 – Assessor Feedback/Assessment Judgements/Decisions/Outcome

Candidate Signature: ..... Date: .....

Assessor Signature: ..... Date: .....

Employer Signature (where present): ..... Date: .....

Employer Name and position: .....

3B: Sample Form
Assessor report

Qualification:	
Candidate:	
Assessor:	
Date:	
Unit/ element:	
Location/ circumstance:	
Details of observation/ question/ answers/ discussion	**Ref**
Details of observation/ question/ answers/ discussion	**Ref**
Details of observation/ question/ answers/ discussion	**Ref**
Assessors comments (state whether candidate is competent)	
Assessor signature	
Candidate signature	

3C: Sample Form
Witness testimony

Qualification: ……

Unit: ……

Element(s): ……

Candidate Name: ……

Witness Name: ……

Witness Contact Details: ……

……

Describe your construction and any assessment qualifications/ experience:

……

……

……

Describe your relationship with the candidate:

……

……

Date of evidence: ……

Testimony and comment on candidate's performance

……

……

……

……

……

……

……

Witness Signature & Date: ……

Candidate Signature & Date: ……

Assessor Signature & Date: ……

3D: Sample Form
Candidate personal statement

Qualification:		
Candidate name:		
Element(s)	**Date**	**Statement / evidence**
Candidate's signature:		
Assessor's signature: Date:		

APPENDIX 4 - ASSESSOR TEMPLATE DOCUMENTS

4A: Sample Form
Element achievement record

Candidate name:													
Qualification:													
Unit title: **Element(s):**													
Assessor:													
Evidence ref:	**Evidence description ***	**Location ****	**Performance criteria**					**Knowledge and understanding**					

***Key: Assessment Methods/Sources of Evidence**

CrossRef = Cross Referencing **RPL**= Recognition of Prior Learning **OBS**= Observation
Q&A= Questioning **PS**= Personal Statement **WR** = Work Record **D**= Discussion
WT= Witness Testimony

***Should refer to whether the evidence can be found in the portfolio ('PF') or elsewhere, if so state location of evidence*

4B: Sample Form
Unit progress record

Qualification:		
Unit title:		
I confirm that the candidate has been assessed as competent for this unit		
Assessor name	Assessor signature	Date
I confirm that I have been assessed as competent and that the evidence produced is from work that is all mine		
Candidate name	Candidate signature	Date
I confirm that I have internally verified this unit and confirm that the candidate is competent (this section must be completed where the assessor is unqualified)		
IV name	IV signature	Date

APPENDIX 5 - INTERNAL VERIFIER TEMPLATE DOCUMENTS

5A: Sample Internal verification Strategy

This document indicates what may be covered as part of an internal verifier's strategy. An effective internal verification strategy ensures:

- A forum for discussion of borderline cases
- Assessor networking and sharing of good practice
- Valid, reliable and consistent training and/or assessment
- Recorded assessment decisions which are appropriate, consistent, fair, transparent and equitable
- Clarity for candidates about assessment requirements
- Effective preparation and presentation for external verification
- Reduction in level of direct external verification scrutiny

To underpin the IV/ verification process a plan of internal activity should be developed indicating

- what will happen
- when it will happen
- who will be involved

New instructors/assessors must:

a) be supplied with assessment and materials
b) clearly understand assessment requirements and procedures

All assessors must:

a) know the name of the person who will manage the IV process and the name of the IV
b) know how IV/ verification will happen, when it will happen and who will be involved
c) be informed about issues raised through previous internal and external quality assurance

On Course Monitoring

The IV should:

a) Sample assessments to ensure that:
   - feedback to candidates is clear and constructive
   - teaching and assessment activities are standard and appropriate
   - assessment decisions are fair and consistent
   - teaching and assessment records are clear
b) Undertake standardisation activities
c) Ensure candidates understand assessment requirements

d) Provide advice and support for Assessors and share good practice
e) Identify good assessment practice
f) Record internal verification activities and findings, list action points and report to instructors/assessors and the EV
g) Liaise with the EV as necessary

End of Course Checking

The IV should:

a) monitor progress against previous action points
b) ensure assessment records are complete and accurate
c) ensure evidence of achievement is appropriate and standardised
d) record internal verification activities and findings, list action points, and report these to assessors and the EV

Guidance on Sampling and Record Keeping

What do IVs/IVs sample and why?

IVs are responsible for monitoring the quality of assessment, hence the need for them to sample assessment practices and decisions. It is not usually possible or necessary to verify every aspect of assessment at each internal verification. A properly selected representative sample should identify any issues with assessment practices and decisions.

Selecting a sample

To select a representative sample, IVs must take account of factors which may impact on the quality of assessment. These factors are used to define a sampling strategy that determines the size of the sample and enables judgements to be made.

Key factors to consider are:

- Sites of delivery
- Number and experience of Assessors
- Number of courses/assessments
- Previous IV actions/recommendations
- Assessment methods
- Special arrangements
- EV recommendations
- Borderline cases
- Anything else that you think might impact on assessment decisions

The sample should include an element of random selection by the IV. It is not necessary to sample across every aspect of the programme at each event but the plan should seek to cover everything over a period of time, e.g. 3 years.

Which records should be kept?

Records of internal quality assurance/ verification must be kept and made available to the EV during monitoring visits. These should demonstrate that the internal verification procedures have been carried out. IVs should record two sets of information:

1. The sample taken by the IV
2. The comments and feedback to the Assessor following the sampling exercise, showing any recommendations or action required and how this was resolved.

There is a sample form shown below that you may use or adapt to suit your own requirement.

5B: Sample Form
Internal verification - sampling assessment decisions

Unit/qualification:

Location:
Assessor name:

Candidate Name	Sampling element[1]	Was the assessment method appropriate?	Is there sufficient evidence that outcomes have been met?	Is the evidence appropriate for the level?	Comments
Comments					

Signed: **(IV)** **Date:**

Signed: **(Assessor)** **Date:**

[1] *Was this a learning outcome across candidates, or a whole unit or one method of assessment?*

5C: Sample Form
Internal verification – observation of assessors

Internal Verifier's Name: ……

Assessor's Name: ……

Candidate's Name: ……

Qualification Title: ……

Unit Assessed: ……

Element Assessed: ……

Date of Observation: ……

Location of Assessment: ……

Prior to the assessment had the Assessor:	**Yes**	**No**	**Comments:**
Developed a written Assessment Plan for the candidate			
Checked that the facilities, resources and information required for the assessment were available and ready for use			
Briefed the candidate on how the assessment would take place and what would be assessed			

During the assessment did the Assessor:	Yes	No	Comments:
Conduct the assessment unobtrusively without interfering with the candidate's performance			
Encourage the candidate to satisfy the specified Assessment Criteria			
Ask questions clearly in an encouraging tone and manner without leading the candidate			
Ensure that sufficient questions were asked and that they were justifiable and relevant to the Unit assessed			

During the assessment did the Assessor (continued):	Yes	No	Comments:
Ensure that the atmosphere created during the assessment was pleasant and conducive			
Clarify and resolve any concerns that the candidate had during the assessment			
Clearly inform the candidate of the assessment decision i.e. 'achieved' or 'requires further practice'			
After the assessment did the Assessor:	**Yes**	**No**	**Comments:**

Provide feedback that was clear, constructive, met the candidate's needs and was appropriate to his/her level of confidence			
Encourage the candidate to comment on the assessment decision and how he/she was assessed			
Complete the Unit assessment documentation and ensure it was fully signed and dated			

Overall feedback to Assessor:

Assessor's comments on the IV's feedback:

Assessor's Signature: ……

Date:……

Internal Verifier's Signature: ……

Date:……