International Labour Organization

REGIONAL MODEL COMPETENCY STANDARD: MANUFACTURING INDUSTRY

SKILLS-AP

Regional Skills and Employability Programme in Asia and the Pacific (SKILLS-AP)

Regional Skills and Employability Programme in Asia and the Pacific
(SKILLS-AP)

Regional Model Competency Standard: Manufacturing Industry

International Labour Office

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Preface

The issue of skills recognition, and the development of national skills standards, has recently been of increasing importance in Asia and the Pacific. The need to improve the quality and effectiveness of training systems and the increasing mobility of skilled workers have been the main driving forces behind the need to develop new approaches to skills recognition together with new skills standards. There are very few tools available to help countries make these challenging reforms.

While many countries in the region have developed their national skills standards systems using the earlier Asia and the Pacific Skills Development Programme (APSDEP) Model Occupational Skills Standards, when a review of selected national systems took place in the mid-90s, it was clear that there was a move away from occupational standards towards industry-based competency standards. In this context, the ILO member States called on the ILO to develop a new model, which they chose to call Regional Model Competency Standards (RMCS). While work on the new RMCS started at that time, the increasing pressure on countries to be competitive and improve productivity, along with greater mobility of skilled workers, has given new impetus to this work. In the first Technical Meeting of the Regional Skills Network Partner Organizations, held in Korea in November 2005, the ILO constituents identified skills recognition and the development of regional standards as high priority issues. This was reinforced at the Second Planning Meeting of the Network, which along with other regional meetings, called on the ILO to update the guidance materials and assess the currency of existing standards.

These revised Regional Model Competency Standards for the Manufacturing Sector were prepared by Andre Lewis for the ILO Regional Skills and Employability Programme in Asia and the Pacific (SKILLS-AP). I would like to take this opportunity to thank Mr Lewis for his excellent work on this subject, together with the ILO, for many years. I would also like to express my sincere appreciation to the Government of the Republic of Korea for their continuing support to the ILO's work on skills development in the region and, specifically, to the development and publication of this document. I am sure that this Manufacturing RMCS will be greatly appreciated by countries in the region both in assisting the development of their national standards in this sector, and as a basis for discussion on the recognition of skills across countries, in the context of the mobility of skilled workers.

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Introduction

These Manufacturing RMCS describe the competencies used in a range of occupations and job roles that apply across the manufacturing and engineering industry. Competency is in essence extremely simple, involving being clear about what people in, or entering work need to be able to do.

When competency is described in these RMCS it is an essential tool for:

- basing training and assessment, at the least, on those identified outcomes; and
- certifying that people can actually do what was specified as the outcome and credentialing them accordingly.

Thus the Manufacturing RMCS enables the industry to accurately define its workplace requirements. As well as underpinning training and vocational education outcomes these standards provide the benchmark for recognition of competencies gained informally.

The fundamental concept of competency in the Manufacturing RMCS is that it focuses on what is expected of an employee in the workplace rather than on a learning process or time spent in training or education.

In other words, it describes exactly what someone in the manufacturing industry should be able to do and not any particular training they should undertake. It also embodies the ability to transfer and apply broad manufacturing skills and knowledge to new situations and environments. This is a comprehensive definition of competency in that all aspects of work performance, not only narrow task skills, are included. It encompasses:

- the requirement to efficiently perform individual tasks *[task skills]*
- the requirement to manage a number of different tasks within a job *[task management skills]*
- the requirement to effectively respond to irregularities and breakdowns in routine *[contingency management skills]*
- the requirement to deal with the responsibilities and expectations of the work environment *[job / role environment skills]*, including working with others and in teams.

The Manufacturing RMCS also incorporate appropriate underlying skills and knowledge as this relates to competence in a variety of workplaces, and deals with attitudes and values in a way that focuses on the outcomes to be achieved rather than the views of individuals. These Manufacturing RMCS are free of bias and discrimination.

The Manufacturing RMCS can be used to underpin training and assessment that meets the real workplace needs of industry. However, they can also be used to form the basis for a complete and integrated human resource system. Such as:

- compiling job descriptions and organising work structures
- recruitment
- determining training needs
- developing training and training resources/materials
- conducting appraisals and skills assessments
- establishing linkages between skills and remuneration.

The Manufacturing RMCS Structure

The standards have the following three primary components:

1. **Industry Descriptor and Coverage**

   details what industry, sector or occupational cluster the standard deals with and its main work coverage.

2. **Primary Functions**

   describe the major types of work involved - administrative, technical and so on with a range of contexts for its application.

3. **Units**

   are statements about what particular work is done and the performance measures and underpinning knowledge that apply to a competent worker.

The third component – **Units –** is structured with four sub-components:

- **Performance Criteria**

  Each unit has a number of Performance Criteria describing in detail the skills a worker applies when undertaking the work defined in the Unit. They set out fully what is done, how well the work should be performed and allow for a measurable outcome.

- **Evidence requirements**

  This component covers guidance on the sort of evidence that would support assessment to determine if an individual held the competencies described. It relates to the broad activities that should be observed to reliably attest to a person being able to apply a competency in a realistic workplace environment, and is expressed in:

- **Critical Skills and Essential Knowledge**

  That is information on the skills and theoretical knowledge needed to perform effectively and to source alternative options / strategies to achieve workplace outcomes, and a

- **Range Statement**

  Which sets the parameters for application of the competency and captures the types of work, resources, services and so on that could apply when the competency was being used.

In summary

These standards are statements about what people need to be able to do in manufacturing workplaces - they are not designed to cover all the details of training that may be needed for people to acquire the skills or the educational instruments to assess them.

The standards are written to be general enough to apply to the full range of situations in the manufacturing industry. The standards thus provide a broad guide that can be

tailored to meet the needs of specific sectors and business enterprises. This can be through adding more specific detail of local operations where appropriate.

The standards allow for flexible tailoring and targeting of training and assessment.

When using the standards, take advantage of all the information provided. The evidence and range statement provide useful information in this regard.

While individual Units define the skills and knowledge in a particular area of work, it is the combination of a number of these which creates a meaningful outcome in the workplace. This also captures the need to manage different task simultaneously and within a whole job/role environment.

Manufacturing RMCS

Industry Descriptor and Coverage:

Regional Model Competency Standards cover the Manufacturing sector and include competencies for -

Basic manufacturing processes

Casting and moulding

Machining operation and component assembly

Fabrication and finishing

Equipment servicing and maintenance

The structure includes some basic machine operation and maintenance skills but does not cover trade specialist or advanced manufacturing processes in the areas of vehicle, manufacture, plastics and electronics although some included competencies would be common across these areas. In future development of the Manufacturing RMCS specific skills in these areas could be added as Functional Areas or encompassed in separate RMCS.

The scope of the standards is entry level to basic production work and encompasses common sector skills in the areas of materials handling, measurement and marking out, production techniques and quality assurance plus communication and health & safety in the workplace.

The following concepts underpin all Regional Model Competency Standards:

- The standards define the essential skills and knowledge required to work in the Manufacturing Industry in the region. The standards provide a flexible framework that can be used by all manufacturing enterprises, regardless of location or business size. They do not cover every possible skill that could be required in some countries but can be added to with specific and specialist competencies as required.

- The standards are regional models and therefore do not have all the detail needed to fully underpin training programs and assessment.

- The standards are grouped functionally and not as jobs or occupations so need to be combined to meet a country's particular need for recognition and training.

- The standards reflect the need to balance the commercial viability of manufacturing operations with culturally and environmentally appropriate practices to sustain the viability of the industry in the region.

The Manufacturing industry RMCS are organised as follows:

MANUFACTURING FUNCTIONAL AREAS

Functional Area A - Manufacturing core units

Unit A1 Communicate effectively in the workplace

Unit A2 Follow workplace health and safety requirements

Unit A3 Apply quality procedures

Unit A4 Plan for work tasks

Other Functional Areas - Selected according to needs of a particular job or occupation from the following groupings

B **Basic manufacturing processes**	**C** **Casting and moulding**	**D** **Machine operation and component assembly**	**E** **Fabrication and finishing**	**F** **Equipment servicing and maintenance**
23 Units	**14 Units**	**12 Units**	**27 Units**	**8 Units**

(The units comprising these competencies have a prefix letter – **B** to **F** – designating which functional group they come from)

Functional Area A – Manufacturing core

Unit A1 Communicate effectively in the workplace

Unit A2 Follow workplace health and safety requirements

Unit A3 Apply quality procedures

Unit A4 Plan for work tasks

Unit A1 Communicate effectively in the workplace

Performance criteria

a. Communicate information about tasks, processes, events or skills
- An appropriate choice of communication techniques, eg: telephone, face to face, written report, sketches etc. are used
- Multiple operations involving several topics/areas are communicated.
- Listening is undertaken without continuous interruptions of the speaker.
- Questions are used to gain extra information.

b. Correct sources of information are identified
- Information is selected and sequenced appropriately.
- Verbal and written reporting undertaken where required

c. Communication is demonstrated in both familiar and unfamiliar situations and to take part in group discussion to achieve appropriate work outcomes
- Responses sought and provided to others in the group
- Constructive contributions are made in terms of the production process involved.
- Goals and aims are communicated.
- Represent views of group to others
- Views, opinions of others are understood and reflected accurately.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that comfirms skils in:

- Appropriate communication techniques are chosen as required by: - the information to be conveyed - the receiver of the communication - the context in which the communication takes place.

Required knowledge
Look for evidence that confirms knowledge of:

- Advantages and disadvantages of different ways of communicating - why a particular communication technique was chosen for a particular situation.
- How communication covering a variety of topics and content areas works so that the information is clearly understood by the receiver/s of the message.

Range Statement

Situations - where employees must collectively undertake a task eg: three or four assemblers co-operating to assemble a product, a tradesman who has to attend a service call, or a group of process workers who undertake a similar task in close proximity to each other.

Communication - includes sketches, drawings, production schedules; written machine or job instructions; client instructions. It is assumed that the application of this unit in most workplaces would require a basic level of ability in speaking, reading and writing as well as basic numeracy.

Unit A2 Follow workplace health and safety requirements

Performance criteria

a. Follow safe work practices

- Tasks are performed in a safe manner and in accordance with legislative requirements, enterprise policies and procedures.
- Organisation of duties, tools, equipment and materials are performed in accordance with enterprise procedures.
- Personal protective equipment and clothing is worn, used and stored according to enterprise procedures.
- Plant and equipment guards are used in accordance with manufacturers specifications and regulations, where applicable.
- Safety signs and symbols are identified and followed.

b. Assess risks

- Hazards in the work area are identified, assessed and reported to designated personnel.
- OH&S issues and risks in the work area are identified, assessed and reported to designated personnel.
- Safe workplace procedures and safe work instructions are followed for controlling risks.
- OH&S, hazard, accident or incident reports are contributed to according to workplace procedures and relevant legislation.

c. Follow emergency procedures

- Appropriate personnel are identified in the event of an emergency.
- Safe workplace procedures for dealing with accidents, fires and emergencies are followed within scope of responsibilities.
- Emergency and evacuation procedures are practiced and carried out when required.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms knowledge of:

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with workplace safety plan, OH&S regulations and legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Communication and working effectively and safely with others
- Selection and use of fire fighting equipment to extinguish a simulated mechanical fire
- Evacuation of a site through simulated response to an emergency complying with workplace procedures

Required knowledge

Look for evidence that confirms knowledge of:

- Site and equipment safety requirements
- Personal protective equipment an clothing
- Signage
- Basic fire fighting equipment
- Fires
- Basic first aid procedures
- Accidents and injuries
- Company procedures
- Regulations
- OH&S policies and procedures
- Induction procedures
- Emergency response and evacuation procedures
- Materials Safety Data Sheets and materials handling methods
- Project quality requirements
- Communication devices
- General manufacturing terminology
- Safe work method statements

Range Statement

Safe working practices – include day to day observation of OH&S policies and procedures, risk assessment, emergency procedures and use of basic fire fighting equipment

Personal protective equipment - includes overalls, steel capped boots, high visibility vest, jacket, gloves, safety glasses/goggles, hard hat, cap, dust mask/respirator, ear muffs/plugs

Appropriate personnel - to be contacted in case of an emergency, accident, fire or to report a risk are designated safety officers, determined by the enterprise, who have undertaken specific safety response training, supervisors, managers or other senior personnel

Signs - include but are not limited to hazard identification, facility or location signs, site safety, directional, traffic and warning signs and symbols

Hazards - include but are not limited to chemical spills, gases, liquids under pressure, moving machinery and equipment, hazardous materials, work at heights, work in confined spaces, high temperatures, noise, dust, vapours, fires, protrusions, sharp equipment, overhanging beams and traffic

Emergency procedures - include emergency response and evacuation procedures

Types of fire - includes but is not limited to electrical, chemical, gas, mechanical, paper, wood or natural fire

Fire equipment - includes fire truck, fire reel, fire hydrant and hoses, fire extinguishers and manual fire fighting instruments

Safety (OH&S) - requirements are to be in accordance with legislation and regulations, organisational safety policies and procedures, and project safety plan. This may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, organisational first aid, hazard control and hazardous materials and substances

Environmental Requirements - include but are not limited to waste management, noise, dust, vibration and clean-up management

Quality Requirements - include but is not limited to relevant regulations including internal company quality policy and standards, workplace operations and procedures and manufacturers specifications

Equipment - includes but is not limited to a first aid kit, fire fighting equipment and personal protective equipment and may include ladders and work platforms

Information – includes but is not limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, memos, material safety data sheets (MSDS), diagrams or sketches; safe work procedures or equivalent; regulatory/legislative requirements; manufacturers' specifications and instructions; organization work specifications and requirements; instructions issued by authorised organizational or external personnel.

Unit A3 Apply quality procedures

Performance criteria

a. Assess own work

- Continuously check completed work against workplace standards relevant to the operation being undertaken
- Demonstrate an understanding of how the work activities and completed work relate to the next production process or processes and to the final products concerned
- Identify and isolate faulty pieces/components or final products/batches
- Record and/or report the faults and any identified causes to the supervisor concerned where required in accordance with workplace procedures.

b. Assess quality of received component parts/materials

- Continuously check received materials, component parts or final products against workplace standards and specifications for conformance
- Demonstrate an understanding of how the received materials or component parts relate to the current operation and how they contribute to the final quality of the product
- Identify and isolate faulty material or component parts related to the operator's work
- Record and/or report the faults and any identified causes to the supervisor concerned where required, in accordance with workplace procedures
- Identify causes of any identified faults and take corrective action specified in the workplace procedures

c. Measure parts/materials

- Measure materials, component parts or products, as required, using the appropriate measuring instruments in accordance with workplace procedures.

d. Record information on production indicator

- Record basic information on the quality and other indicators of production performance in accordance with workplace procedures.

e. Investigate causes of quality deviations

- Investigate and report causes of deviations from specified quality standards for materials, component parts or final products, as required, using the appropriate measuring techniques in accordance with workplace procedures

- Recommend suitable preventative action based on workplace quality standards and the identified causes of deviations from specified quality standards of materials, component parts or final products.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Specific evidence requirements

- interpret, relevant work instructions, standards and specifications appropriate to the assessee's work
- check and measure the relevant quality parameters
- interpret the results of quality checks in terms of specifications, patterns and work standards
- take required action where standards of materials, component parts, final product or work processes are found to be unacceptable
- maintain accurate records

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- quality procedures

- hazard policies and procedures including codes of practice relevant to their job within defined procedures
- job procedures and work instructions
- waste, pollution and recycling management processes within defined procedures
- action taken promptly, accidents and incidents reported in accordance with statutory requirements and enterprise procedures
- recognises and adapts appropriately to cultural differences in the workplace, including modes of behaviour and interactions among staff and others in accordance with workplace procedures
- work completed systematically with attention to detail without damage to goods, equipment or personnel.
- interpret work instructions, specifications, standards and patterns appropriate to the assessee's work
- carry out relevant visual inspections of materials, component parts and final products
- carry out relevant physical/chemical measurements or tests
- maintain accurate work records in accordance with procedures
- carry out work in accordance with OHS policies and procedures
- meet work specifications
- communicate effectively within defined workplace procedures
- interpret and apply defined procedures

Required knowledge
Look for evidence that confirms knowledge of:

- relevant quality standards, policies and procedures
- relevant production processes, materials and products
- basic characteristics of materials used in the relevant production processes
- safety and environmental aspects of relevant production processes
- relevant measurement techniques and quality checking procedures
- workplace procedures
- reporting procedures

Range Statement

Quality parameters - include*:*

- finish
- size
- durability
- product variations
- materials
- alignment
- colour
- damage and imperfections

Quality checks - include:

- visual inspection
- physical measurements
- chemical tests
- checks against patterns, templates and guides

Measure - includes those measurements which may be taken by the employee in the work place/at their work station.

Procedures - include all work instructions, standard operating procedures, formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the operation of the plant. They may be written, verbal, computer based or in some other form.

Indicators of production performance - include things like number of items/production rate, delays and causes of delays (where known) and other information as specified in the procedures.

Data entry/recording - include*:*

- keyboard
- written (including ticks or signs)
- verbal

Sources of information/documents - include:

- quality standards and procedures
- work instructions, patterns, designs and recipes
- organisation work procedures
- manufacturer's instructions for materials and equipment
- organisational or external personnel
- customer/s requirements

Investigate and report - is used to mean following set procedures defined for such investigations.

Workplace context - Work organisation procedures and practices relating to the manufacture and quality outcomes for products; conditions of service, legislation and industrial agreements including such as workplace agreements, government legislation, and standard work practice.

Reporting/communication

- Reporting/communication may include verbal and written communication in accordance with organisational policies and procedures.
- Communication may be oral, written or visual and can include simple data.
- Being responsible for the maintenance of own work quality.
- Being responsible for the maintenance of own work quality may include being required to contribute to the quality improvement of team or section output, where necessary, in accordance with workplace procedures.
- Safety, environmental, housekeeping and quality are as specified by materials/machine/equipment manufacturers, regulatory authorities and the enterprise.

Unit A4 Plan work tasks

Performance criteria

a. Plan and prepare

- Work instructions and operational details are obtained, confirmed and applied.
- Safety requirements are followed in accordance with safety plans and policies.
- Signage requirements are identified and implemented.
- Tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported prior to commencement.
- Material quantity requirements are calculated in accordance with plans and/or specifications.
- Materials appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use.
- Environmental protection requirements are identified for the project in accordance with environmental plans and regulatory obligations and applied.

b. Sequence work safely

- Work plan is determined, modified and performed in a logical and efficient sequence.
- Tasks are completed to meet work instructions.

c. Clean up

- Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan.
- Tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Specific evidence requirements

- interpret, relevant work instructions, standards and specifications appropriate to the assessee's work
- check and measure the relevant quality parameters
- interpret the results of quality checks in terms of specifications, patterns and work standards
- take required action where standards of materials, component parts, final product or work processes are found to be unacceptable
- maintain accurate records

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- Location, interpretation and application of relevant information
- Compliance with site safety plan, OH&S regulations and legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Communication and working effectively and safely with others
- Selection of the necessary tools, materials, personal protective equipment and work sequence for separate tasks

Required knowledge

Look for evince that confirms knowledge of:

- Workplace and equipment safety requirements
- Operational and maintenance procedures
- Processes for the calculation of material requirements
- Materials Safety Data Sheets and materials handling methods
- Project quality requirements
- General manufacturing terminology
- Safe work method statements

Range Statement

Pre work planning - includes but is not limited to correctly selecting the tools and equipment for the task, the materials for the task, the personal protective equipment for the task and plan the logical sequence for the task.

Planning and preparation - includes but is not limited to worksite inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements.

Work sequencing - includes but is not limited to receiving instructions, organising for task, carry out task and clean up after completing task.

Work instructions - include the direct criteria for the allotted tasks, written or verbal.

Functional Area B – Basic manufacturing processes

Unit B1	Plan to undertake a routine task
Unit B2	Plan a complete activity
Unit B3	Handle/move bulk fluids/gases
Unit B4	Operate mobile load shifting equipment
Unit B5	Undertake manual handling
Unit B6	Order materials
Unit B7	Undertake warehouse receival process
Unit B8	Undertake warehouse dispatch process
Unit B9	Perform production packaging
Unit B10	Package materials
Unit B11	Use mechanical hand tools
Unit B12	Use power tools for hand held operations
Unit B13	Undertake tool store procedures
Unit B14	Purchase materials
Unit B15	Undertake basic process planning
Unit B16	Undertake basic production scheduling
Unit B17	Mark off/out (general engineering)
Unit B18	Use tools for precision work
Unit B19	Terminate and connect electrical wiring
Unit B20	Use comparison and basic measuring devices
Unit B21	Prepare basic engineering drawing
Unit B22	Perform basic engineering detail drafting
Unit B23	Create 2D drawings using computer aided design system

Unit B1 Plan to undertake a routine task

Performance criteria

a. Identify task requirements
   - Instructions and procedures are obtained, understood and where necessary clarified.
   - Relevant *specifications* for task outcomes are obtained, understood and where necessary clarified.
   - Task outcomes are identified.
   - Task *requirements* such as completion time and quality measures are identified.

b. Plan steps required to complete task
   - Based on instructions and specifications provided, the individual steps or activities required to undertake the task are understood and where necessary clarified.
   - Sequence of activities is identified.
   - Plan is checked to ensure it complies with specifications and task requirements.

c. Review plan
   - Effectiveness of plan is reviewed against specifications and task requirements.
   - If necessary, plan is revised to better meet specifications and task requirements.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining instructions for tasks from correct source of information (job card, supervisor, work colleagues and others)
- clarifying tasks and required outcomes with appropriate personnel where necessary
- identifying relevant specifications from documentation, job cards, or other information source
- preparing plans for tasks
- sequencing activities
- comparing planned steps against specifications and task requirements
- communicating and interpreting information appropriate to the scope of this unit

Required knowledge
Look for evidence that confirms knowledge of:

- correct sources of information for a particular task
- procedures for obtaining instructions and clarification
- specifications for the task
- hazards and established control measures associated with the routine task, including housekeeping
- safe work practices and procedures.

Range statement

Specifications - specific product or process information, such as:

- outcome and performance requirements
- quality requirements and checks
- quantity.

Specifications are conveyed verbally or on familiar standard forms, such as on job sheets

Requirements - general requirements necessary to carry out routine tasks, such as:

- dedicated tools and equipment
- materials and parts
- work procedures
- completion time
- safety measures and equipment.

Requirements and instructions are supplied verbally or on familiar standard forms, such as on job sheets. Instructions are carried out under supervision and in accordance with established procedures.

Unit B2 Plan a complete activity

Performance criteria

a. Identify activity requirements
   - Activity outcomes and objectives are identified and clarified with appropriate persons.
   - Activity *requirements*, including resources, overall timeframe, quality requirements and criteria for acceptable completion are identified and clarified.
   - Relevant *specifications* and procedures are obtained and clarified.

b. Plan process to complete activity
   - The individual components of the activity are identified and prioritised.
   - *Planning tools and techniques* are selected and used according to the needs of the activity.
   - The plan is checked for accuracy and conformance to instructions and requirements.

c. Modify plan
   - The plan is referred to and modified as necessary to overcome unforeseen difficulties or developments that occur as work progresses.
   - The results of the activity are reviewed against the plan, and possible future improvements to plan are identified.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining, reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawing and other applicable reference documents
- preparing a plan including sequential steps that will enable the activity to be completed
- modifying the plan where appropriate, to take account of difficulties or developments that occur while following the prepared plan
- planning and sequencing activities
- checking and clarifying task-related information
- checking for conformance to specifications
- using numerical operations, geometry and calculations/formulae within the scope of this unit
- using planning techniques such as scheduling, time management, brainstorming, setting of goals and defined outcomes, prioritising, review and evaluation strategies

Required knowledge
Look for evidence that confirms knowledge of:

- tasks to be performed
- person/s who can clarify the objectives, requirements and specifications
- specifications relevant to the tasks to be performed
- outcomes to be achieved
- timeframe for activity completion
- quality requirements of the product or service
- priority of each step in the plan
- reasons for the relative priority of each step
- modifications to the plan to overcome a range of unforeseen situations
- hazards and control measures associated with planning the complete activity, including housekeeping
- safe work practices and procedures

Range statement

Requirements - formal or informal information about the task required, such as:

- timeframe
- quality requirements
- outcome and performance requirements
- job history
- checks and tests
- special reporting requirements
- tools and equipment
- materials and parts
- reference documents.

Requirements and instructions are supplied verbally or in written form such as on job sheets. Instructions are carried out in accordance with established procedures

Specifications - technical task related information conveyed verbally or as found in:

- task lists
- instructions
- manufacturer manuals
- diagrams and schematics
- technical drawings and sketches
- parts lists
- computer records

Planning techniques and tools - scheduling, time management, brainstorming, setting goals and defined outcomes, prioritising, review and evaluation strategies

Unit B3 Handle/move bulk fluids/gases

Performance criteria

a. Determine handling methods
   - Type of material is determined from labels, colour codes, signage.
   - *Material properties* are understood.
   - All relevant material properties are identified or clarified with appropriately qualified and authorised authority.
   - All relevant *safety and emergency procedures* are understood and implemented as required.
   - All relevant legislation, regulations and codes of practice are understood and observed.
   - Correct and appropriate handling methods are undertaken.

b. Store bulk fluids/gases
   - Correct *storage conditions* are determined from instructions/ manufacturers' specifications/directions.
   - Containers are checked for safe and clean use.
   - Containers are filled/emptied in accordance with standard operating procedures, regulations/legislative requirements.
   - Containers are handled and moved in accordance with site procedures regulations/legislative requirements.
   - Containers are correctly labelled and stored to standard operational procedures, regulations/legislative requirements.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following handling and storage instructions, labels, colour codes, signage and terminology
- calculating quantities
- communicating with users of the materials and appropriately qualified and authorised authority
- orally reporting routine information
- checking and clarifying task-related information
- applying appropriate Materials Safety Data Sheet
- selecting personal protective clothing and equipment
- filling/emptying applicable containers
- storing and handling bulk fluids/gases
- entering routine and familiar information onto labels, proformas and standard workplace forms

Required knowledge
Look for evidence that confirms knowledge of:

- OH&S and dangerous goods acts and regulations, transport of dangerous goods code, and industry codes of practice and standards relevant legislative requirements
- organisation's emergency response plan
- procedures for filling and emptying storage containers
- packaging requirements for dangerous goods
- personal protective clothing and equipment for various substances
- cleaning requirements for storage containers
- relevant hazards and control measures related to the competency

Range statement

Material properties - gas, solid, liquid. Material properties are determined from material safety data sheet, dangerous goods code, manifest or register

Safety and emergency procedures - emergency procedures are determined by organisational emergency response plan, and advice may be sought from appropriately qualified and/or authorised personnel

Legislation, regulations and codes of practice - relevant jurisdictions OH&S and dangerous goods acts and regulations, transport of dangerous goods code, and industry codes of practice and standards

Storage conditions - separation and segregation to legislative requirement and dangerous goods code

Unit B4 Operate mobile load shifting equipment

Performance criteria

a. Prepare to shift loads
   - Work area is inspected to identify hazards, and appropriate prevention/control measures are implemented to avoid hazards.
   - Routine *pre-operational checks* are undertaken in accordance with manufacturers' specifications and regulatory safety requirements.
   - Attachments and/or equipment are inspected.

b. Check controls and equipment
   - Pre-operational and *post start-up* equipment checks are carried out in accordance with manufacturers' specifications and/or operating manual
   - Defects and damage are reported according to site procedures.

c. Shift loads
   - The most appropriate *load shifting* device is selected to suit load and shifting requirements.
   - Load shifting device is operated within design specifications and *safe working load* in accordance with *standard operating procedures.*
   - Load is lifted, ensuring balance, vision of operation and protection of load.
   - The safe and efficient path of movement is selected and used.
   - Path of movement is checked and monitored for *obstacles and hazards* and safely are maintained.

d. Place loads
   - Loads are placed ensuring safety, stability, protection of material and avoidance of hazards on site.

e. Shut down equipment and secure site
   - Machinery is parked avoiding equipment hazards.
   - *Shut-down* is conducted in accordance with manufacturers' specification to isolate vehicles.
   - Post-operational check is completed in accordance with operational procedures.
   - Machinery is parked in accordance with standard operating procedures, avoiding site hazards.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- interpreting and following routine information on standard operating procedures. May include simple drawings, tables and figures, written documents
- performing routine safety, basic service and maintenance procedures
- calculating load masses and safe working loads
- selecting appropriate load shifting device
- following oral instructions
- safely operating load shifting devices and shifting loads
- working with others
- interpreting communication signals and instructions
- determining load masses and equipment requirements
- determining mass of irregular shaped loads
- demonstrating emergency operating procedures
- communicating faults, malfunctions and workplace
- hazards, reports and maintenance of operational records

Required knowledge

Look for evidence that confirms knowledge of:

- pre-operational checks
- design specifications of load shifting device
- load chart
- licensing requirements
- load protection
- safe load placement
- operational environment
- appropriate permits
- hazards and control measures associated with load shifting and equipment
- use and application of personal protective equipment
- safe work practices and procedures
- workplace communication procedures
- manufacturers' specifications

Range statement

Pre-operational checks - battery, water, fuel, hazards warning lights, fluid or gas leaks, braking, movement of booms, visual checks of tyres, emergency devise/alarms, log books, operating motions, evidence of damage, excessive wear and tear, as determined by manufacturers' specifications and standard operating procedures

Attachments and/or equipment - hooks, electromagnetic hook, buckets, slings, tag lines, buckets, trench, excavating, rock breakers, shackles, lifting lugs, fork arms

Post start-up - hazards warning systems, attachments, movements and control functions are smooth Operating and emergency controls and safety devices are located, identified and tested.

- Communication signals are confirmed.
- Defects and damage are reported.

Load shifting device - front end loaders/back hoes, ride on forklifts and pallet trucks, bobcats, vehicle loading crane

Safe working load - weight of load is assessed to ensure compliance with equipment load plate specifications.

Standard operating procedures - industry standards, production schedules, material safety data sheets, work notes and plans, product labels, manufacturers' specifications, operator manuals, enterprise policies and procedures, supervisors' oral and written instructions, occupational health and safety legislation, standards and codes of practice

Obstacles and hazards - overhead cables, personnel, obstacles (fixed and moveable), trenches, pits, uneven terrain, trees, underground services Exposure to chemicals, dangerous or hazardous substances Movements of equipment, goods, materials and vehicular traffic

Shut-down - post-operational equipment checks, motion locks and brakes are applied

- Lifting equipment is checked.
- Defective equipment is identified, segregated and reported to supervisor.
- Equipment is correctly stowed.

Unit B5 Undertake manual handling

Performance criteria

a. Lift materials manually
   - *Material weight* is determined correctly utilising most appropriate technique, and risks associated with lifting are assessed.
   - *Lifting techniques* are undertaken to occupational health and safety and standard operating procedures. Types of movement, methods, storage, height and position are considered.

b. Move/shift materials manually
   - *Appropriate equipment* is selected where required.
   - Material is placed safely and securely on moving equipment.
   - Material is relocated ensuring safety of personnel and security of material.
   - Material is unloaded from moving equipment and placed in a safe and secure manner.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace. procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- identifying relevant standards and lifting techniques
- assessing weight of material
- selecting lifting equipment
- working and communicating in teams
- assessing risks
- planning
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- following oral instructions

Required knowledge
Look for evidence that confirms knowledge of:

- manual handling techniques
- hazards of incorrect procedures
- safety standards for manual handling
- safe work practices and procedures

Range statement

Material weight - material weight is determined using scales or interpreting signage.

Lifting techniques - individual or team lifting, use of appropriate lifting equipment

Appropriate equipment - hand trolleys, wheelbarrows, motorised/hand pallet trucks (not sit on), scissor lifts, boom lifts, hand carts, dedicated production or process lifting equipment such as baskets, spreader bars, cradles or the like attached to lifting equipment

Unit B6 Order materials

Performance criteria

a. Prepare purchase order/list
   - Purchase order/list is prepared to standard operating procedures.
   - *Material specifications*, price limitations, quantities and delivery requirements are determined from instructions, requisitions etc.

b. Purchase order
   - *Supplier/vendor* is informed of requirements and specifications according to standard operating procedures.
   - Supplier/vendor is followed up to achieve delivery as required.
   - Where appropriate, goods are directly received and checked for damage
   - Records/files are completed accurately according to standard operating procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following information on instructions, specifications, standard operating procedures, requisitions, lists, records, files and other applicable reference documents
- preparing an order/list
- checking and clarifying order information
- entering information onto manual and electronic proformas and standard workplace forms
- accessing manual and electronic order information
- communicating with suppliers, manufacturers and other personnel
- checking for conformance to specifications
- following verbal instructions
- orally reporting routine information
- record keeping

Required knowledge
Look for evidence that confirms knowledge of:

- ordering policy (delegations, preferred suppliers etc.)
- ordering procedures
- safe work practices and procedures
- hazards and control measures associated with ordering materials

Range statement

Material specifications - material specifications can be gained from manufacturers' catalogues, from the item, from a drawing

Supplier/vendor – local, national, international, preferred supplier

Unit B7 Undertake warehouse receival process

Performance criteria

a. Check supplier documentation
   - Supplier *documentation* is checked against order according to standard operating procedures.

b. Confirm the quality and quantity of received goods
   - The quality and quantity of goods are checked against order and supplier documentation.
   - Incorrect and damaged goods are identified and appropriate action is taken to standard operating procedures.

c. Arrange unloading of goods
   - Goods requiring *special unloading procedures* are identified.
   - Goods are unloaded using manual handling or appropriate *lifting equipment.*
   - Carrier or supplier documentation is signed or processed according to standard operating procedures.

d. Prepare, locate and store received goods
   - Goods are prepared for storage according to standard operating procedures.
   - Signs, *codes* or labels are applied according to standard operating procedures.
   - Inventory records documentation is completed.
   - Storage location is identified.
   - Goods are stored in correct location using appropriate materials handling techniques.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- interpreting information on job instructions, orders, supplier documents, signs, codes, labels and other applicable reference documents
- checking orders, quantities, descriptions and supplier documentation
- maintaining goods inwards documentation
- manual handling within the scope of this unit
- selecting and using appropriate lifting equipment
- operating lifting equipment for goods inwards
- selecting storage procedures and processes, including labelling
- entering information onto manual and electronic workplace documents

Required knowledge
Look for evidence that confirms knowledge of:

- relevant legislation, regulations and codes
- checking and recording processes and procedures
- handling of hazardous goods
- storage procedures and processes, including labelling
- safe work practices and procedures
- hazards and control measures associated with undertaking warehouse receival processes

Range statement

Documentation - invoice, carrier or supplier documentation, purchase specifications

Special unloading procedures - special unloading procedures may be required in respect of hazardous goods, chemicals/poisons and goods where size, shape, fragility require special procedures

Lifting equipment - hand trolleys, wheelbarrows, motorised/hand pallet trucks (not sit on), hand carts, and dedicated production or process lifting equipment such as baskets, spreader bars, cradles or the like attached to lifting equipment

Codes - dangerous goods acts and regulations, storage of chemicals/poisons, industry codes of practice, environmental codes etc.

Unit B8 Undertake warehouse dispatch process

Performance criteria

a. Arrange and consolidate orders
   - Packed orders are consolidated into customer or carrier batches according to standard operating procedures.
   - Consolidated goods are placed into correct dispatch area.

b. Prepare for dispatch of goods
   - Goods are *packed*, shrink-wrapped and/or palletised.
   - Goods are *labelled* and appropriate *documentation* is attached according to standard operating procedures.
   - Goods are placed in dispatch area ready for *loading* according to pick-up schedule and carrier requirements.

c. Dispatch goods
   - Carrier and customer documentation is checked.
   - Loading and transportation requirements are accurately communicated to driver and received from the driver.
   - Goods are loaded onto vehicle using appropriate *materials handling techniques and devices.*
   - Inventory records/documentation is completed according to requirements.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- interpreting information on job instructions, orders, supplier documents, signs, codes, labels and other applicable reference documents
- checking orders, quantities, descriptions and supplier documentation
- packing, shrink-wrapping and/or palletising goods for dispatch
- maintaining dispatch documentation
- manual handling
- selecting and using lifting equipment appropriate to the load
- selecting dispatch procedures and processes, including labelling
- entering information onto manual and electronic workplace documents

Required knowledge
Look for evidence that confirms knowledge of:

- relevant legislation, regulations and codes
- checking and recording processes and procedures
- handling of hazardous goods, storage procedures and processes, including labelling
- safe work practices and procedures
- hazards and control measures associated with undertaking warehouse dispatch processes

Range statement

Packed - wrapping, shrink wrapping, wrapping in bubble wrap, polystyrene packing, pallets, crates/boxes and others. Sealing such as packing tape, banding, boxes, pallet racking

Labelled - labelling meets requirements of dangerous goods legislation acts and regulations, storage of chemicals/poisons, industry codes of practice, environmental codes etc.

Documentation - invoice, carrier or supplier documentation

Loading - special loading procedures may be required with respect to hazardous goods, chemicals/poisons, etc. and for goods where size, shape, fragility require special procedures

Materials handling techniques and devices - hand trolleys, wheelbarrows, motorised/hand pallet trucks (not sit on), hand carts, dedicated production or process lifting equipment such as baskets, spreader bars, cradles or the like attached to lifting equipment etc.

Unit B9 Perform production packaging

Performance criteria

a. Undertake packaging
   - Packaging requirements are identified from instructions or determined by safety, storage conditions, site and legislative requirements.
   - Packaging is undertaken to standard operating procedures.

b. Label packaged items
   - Identification labels, tags and stickers are checked for correctness and appropriately placed/attached.
   - Packaged items are stored in a safe, orderly and retrievable manner and the location in the warehouse/store is recorded.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- reading and interpreting routine information on written job instructions and standard operating procedures. May include simple drawings

- determining packaging requirements from safety, storage conditions, site and legislative requirements
- labelling packaged items
- handling and storing products
- using scanning devices, if required
- following oral instruction
- entering routine and familiar information onto proforma and standard workplace forms
- orally reporting routine information

Required knowledge
Look for evidence that confirms knowledge of:

- labelling procedures and standards
- storage and recording procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with production packaging

Range statement

Packaging requirements - packaging methods include manual processes, semi automatic and fully automated packaging equipment. Procedures undertaken include standards, codes, legislative, company and customer requirements. Packaging material is generally determined from instructions, written or verbal

Storage conditions, site and legislative requirements - as per legislative requirements e.g. dangerous goods and storage of poisons acts and regulations

Unit B10 Package materials

Performance criteria

a. Determine packaging requirements
   - Safety or special packaging requirements are determined.
   - *Storage requirements* to meet safety, storage conditions, *site and legislative requirements* are determined.
   - Transport and store requirements are determined.

b. Undertake packaging
   - The most appropriate *packaging method* to suit the product is selected and used.
   - Correct seal, compression and *packaging materials* are used.

c. Label packaged items
   - Labels and identification stickers are correctly applied and accurately describe content of package.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- selecting packaging methods and materials to suit given products
- effectively communicating with the production and dispatch personnel
- undertaking numerical operations and calculations within the scope of this unit
- managing time
- following procedures for labelling packaged products
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge
Look for evidence that confirms knowledge of:

- packaging methods, materials and legislation
- weights, measures and capacities
- types of transport
- knowledge of organisational receival and dispatch functions
- applicable material safety data sheets (MSDS)
- labelling procedures and standards
- storage and recording procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with packaging materials

Range statement

Storage requirements - as per legislative requirements e.g. dangerous goods and storage of poisons acts and regulations

Site and legislative requirements - site requirements: standard operating procedures, organisational policy. Legislative requirements e.g. dangerous goods, storage of poisons, environmental protection acts and regulations

Transport and store requirements - racks, boxes, bins, etc. Road, rail, courier transport Dangerous goods code for transport of goods

Packaging methods and materials - wrapping, shrink wrapping, wrapping in bubble wrap, polystyrene packing, pallets, crates/boxes and other methods Sealing, such as packing tape, banding, boxes, pallet racking

Unit B11 Use mechanical hand tools

Performance criteria

a. Use hand tools
- Hand tools are selected appropriate to the task requirements.
- Hand tools are used to produce desired outcomes to *job specifications* which may include finish, tension, size or shape.
- All safety requirements are adhered to before, during and after use.
- Unsafe or faulty tools are identified and marked for repair according to designated procedures before, during and after use.
- *Routine maintenance* of tools, including hand sharpening is undertaken according to standard operational procedures, principles and techniques.
- Hand tools are stored safely in appropriate location according to standard operational procedures and manufacturers' recommendations.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- reading and following information on standard operating procedures
- following verbal instructions

- selecting hand tools appropriate to the task
- using hand tools safely
- identifying hand tool defects and marking for repair
- maintaining/sharpening hand tools using appropriate techniques
- storing hand tools in accordance with manufacturers'/standard operating procedures

Required knowledge
Look for evidence that confirms knowledge of:

- applications of different hand tools in a general engineering context
- common faults and/or defects in hand tools
- procedures for marking unsafe or faulty tools for repair
- routine maintenance requirements for a range of hand tools
- storage location and procedures for a range of hand tools
- hazards and control measures associated with using hand tools
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Hand tools - hacksaws, hammers, punches, screwdrivers, sockets, wrenches, scrapers, chisels, gouges, wood planes and files of all cross-sectional shapes and types

Job specifications - finish, tension, size or shape etc.

Routine maintenance - cleaning, lubricating, tightening, simple tool repairs, hand sharpening and adjustments using engineering principles, tools, equipment and procedures

Unit B12 Use power tools for hand held operations

Performance criteria

a. Use power tools
- *Power tools* are selected appropriate to the task requirements.
- Power tools are used for a determined sequence of operations – which may include *clamping*, alignment and adjustment to produce desired outcomes – to *job specifications* which may include finish, size or shape.
- All safety requirements are adhered to before, during and after use.
- Unsafe or faulty tools are identified and marked for repair before, during and after use according to designated procedures.
- *Operational maintenance* of tools, including hand sharpening, is undertaken according to standard workplace procedures, principles and techniques.
- Power tools are stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading and following information on standard operating procedures
- following verbal instructions
- selecting power tools appropriate to the task
- using power tools safely
- using clamping/securing devices
- identifying power tool defects
- maintaining power tools using appropriate techniques
- sharpening tools/tool bits within the scope of this unit
- storing power tools according to manufacturers'/standard operating procedures

Required knowledge
Look for evidence that confirms knowledge of:

- application of different power tools
- clamping/securing methods
- adjustments/alignments to a range of power tools
- common faults and/or defects in power tools
- procedures for marking unsafe or faulty power tools for repair
- routine maintenance requirements of a range of power tools
- tool sharpening techniques for a range of power tools
- storage location and procedures of a range of power tools
- hazards/control measures associated with power tools
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Power tools - electric or pneumatic/hydraulic drills, grinders, jigsaws, nibblers, cutting saws, sanders, planers, routers, pedestal drills and pedestal grinders

Clamping - multigrips, vices, jigs and fixtures, clamps etc.

Job specifications - finish, size or shape etc.

Operational maintenance - hand sharpening, cleaning, lubricating, tightening. Simple tool repairs and adjustments using engineering principles, tools, equipment and procedures to statutory and regulatory requirements

Unit B13 Undertake tool store procedures

Performance criteria

a. Order tools/tooling
   - *Tools/tooling* requirements are identified and consolidated from order documentation, drawings, and liaison with trade and production personnel according to standard operating procedures.
   - Appropriate tools/tooling are identified from supplier catalogues and manuals, including correct size, hardness, quality etc.
   - Order is placed according to standard operating procedures.

b. Receive tool/tooling orders
   - Orders are received from main receival warehouse or direct from supplier according to standard operating procedures.
   - Orders are unpacked and stock placed in correct location.
   - Items are checked and confirmed against order.
   - Incorrect items are processed to standard procedures.

c. Maintain tooling
   - Tools/tooling are cleaned and protected as necessary.
   - Supplies are monitored to ensure maintenance of contingency stock.

d. Distribute tools/tooling
   - Tools/tooling are issued to users according to standard operating procedures.
   - Enterprise documentation procedures are followed.
   - Procedures against unauthorised use of tools/tooling are established and followed.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- maintaining documentation
- undertaking stock control
- performing manual handling
- packaging and storing engineering specialist tools and tooling
- cleaning and maintaining engineering tools/tooling
- interpreting specifications, data sheets, drawings, supplier catalogues and manuals for relevant tools/tooling information
- checking and clarifying information

Required knowledge

Look for evidence that confirms knowledge of:

- types and applications of engineering tooling and specialist engineering tools
- methods of storing and protecting tools/tooling
- ordering procedures
- inventory systems
- procedures for protecting store against unauthorised entry and use of tools/tooling
- safe work practices and procedures
- hazards and control measures associated with tool store activities
- use and application of personal protective equipment

Range statement

Tools/tooling - hand tools, cutting tips for lathes, mills and other machines for metal removal, grinding wheels, special steel etc. Specialist tools include engineering power tools, specialised hand tools, mechanical and electro-mechanical devices (e.g. for lifting, clamping), measuring and marking equipment, templates, jigs etc.

Unit B14 Purchase materials

Performance criteria

a. Determine purchasing requirements
   - Client, customer, user is consulted as necessary to determine *purchasing* requirements.
   - Material specifications are determined from orders, instructions and/or technical drawings.
   - Quantities, price limitations and delivery requirements are determined from orders, instructions.

b. Prepare purchase order/list
   - Purchase order/list is developed to standard operational procedure.

c. Purchase material
   - Standard operating procedures are followed.
   - Supplier/vendor is informed of requirements and specifications.
   - *Purchasing schedules* are adjusted where required to standard operating procedures.
   - Appropriate *paperwork/contracts* are exchanged to standard operating procedures.
   - Records/files are maintained accurately using standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following information on orders, instructions and/or technical drawings, standard operating procedures, purchasing schedules, orders, records, files and other applicable reference documents
- planning and sequencing tasks
- checking and clarifying information
- entering and maintaining information on manual and electronic workplace documents
- checking for conformance to specifications
- communicating with client, customer, user, supplier/vendor
- identifying purchasing specifications
- calculating quantity, price and delivery requirements
- selecting suppliers
- maintaining purchase documentation

Required knowledge
Look for evidence that confirms knowledge of:

- suppliers and available products
- purchasing procedures
- contract initiation and exchange procedures
- safe work practices and procedures
- hazards and control measures associated with purchasing materials

Range statement

Purchasing - can cover one-off or multiple quantities of raw materials, components, equipment etc.

Purchasing schedules - purchasing specifications – determined from standard engineering drawings and data sheets, instructions written or verbal. Purchasing schedules – developed to site procedures and for pre-contracted suppliers/vendors

Paperwork/contracts - generated manually or electronically utilising on-site system

Unit B15 Undertake basic process planning

Performance criteria

a. Review process specifications
   - Supporting engineering and production data is examined, where required.
   - The *production processes* to be used are determined.
   - Specifications are obtained and examined.

b. Determine production sequence
   - *Steps* required for the process are identified and flow charts are produced where required in accordance with standard operating procedures.
   - Material and parts lists are prepared in accordance with standard operating procedures.
   - Tooling and/or equipment requirements are documented in accordance with standard operating procedures.
   - Quality assurance steps and specifications are identified and incorporated into process steps.
   - Process steps are documented and clearly represented in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining, reading and interpreting engineering and production data
- preparing flow charts
- communicating
- planning
- assessing
- reading and interpreting engineering specifications
- organising information
- prioritising

Required knowledge
Look for evidence that confirms knowledge of:

- production processes found within the organisation
- tooling and/or equipment requirements for workplace processes
- quality assurance requirements
- safe workplace practices and procedures

Range statement

Production processes - work planned over a specified timeframe, taking into account required and available resources

Steps - steps and milestones against which progress can be checked

Unit B16 Undertake basic production scheduling

Performance criteria

a. Identify production requirements and capacities
   - Engineering production data is identified and obtained in accordance with workplace procedures.
   - Inventory capacities and requirements are identified and obtained in accordance with workplace procedures.
   - Procurement and supply requirements and constraints are identified and obtained in accordance with workplace procedures.
   - Production capacity and constraints are identified and obtained in accordance with workplace procedures.
   - Standard times are identified and obtained in accordance with workplace procedures.

b. Prepare schedule for production of a component/part
   - Production of component is scheduled in accordance with production, inventory, procurements, time constraints, supply capacities and requirements.
   - Schedule is documented in accordance with accepted organisation procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining, reading and interpreting production process data and procedure
- prioritising
- communicating
- time management
- organising
- documenting
- using project management tools such as Gantt Charts
- analysing
- performing arithmetic calculations

Required knowledge
Look for evidence that confirms knowledge of:

- scheduling techniques
- production methods
- quality assurance requirements
- inventory policies
- procurement, supply requirements and constraints
- general staffing levels, capabilities and application of standard times
- machine set-up, capability and application of standard times
- enterprise safety requirements and directives

Range statement
N/A

Unit B17 Mark off/out (general engineering)

Performance criteria

a. Determine job requirements
   - Drawings, job instructions and specifications are interpreted and understood.
   - Appropriate methods and sequencing are selected consistent with proposed manufacturing process using standard operating procedures.

b. Transfer dimension
   - All *marking off/out* is carried out to specifications using appropriate *tools and equipment.*
   - Datum points are correctly established.
   - Dimensions are transferred and correct and appropriate calculations are used where required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- determining job requirements

- transferring dimensions
- applying method and sequence of marking out
- making templates as required
- establishing datum points
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- performing calculations using formulae
- locating, reading and interpreting information on written job instructions, specifications, drawings, charts, lists and other reference documentation
- checking and clarifying strategies

Required knowledge
Look for evidence that confirms knowledge of:

- drawings, job instructions and specifications
- procedures for marking off/out
- tools, equipment and techniques related to the task
- purpose of establishing datum points
- method of determining/calculating dimensions
- use and application of personal protective equipment
- safe work practices and procedures
- relevant hazards and control measures related to the competency

Range statement

Marking off/out - engineering components, jigs and fixtures, castings, templates, dies and tooling etc.

Tools and equipment - marking out tables, surface tables, rotary tables, dividing heads etc., vee blocks, cylinder squares, sine bars and the like, vernier height gauges, protractors, straight edge and set squares, hammers, scribers, centre punch, marking medium etc.

Unit B18 Use tools for precision work

Performance criteria

a. Determine job requirements
   - Task requirements and specifications are determined and clarified with appropriate persons.
   - *Processes*/techniques are selected appropriate to task, specifications and material.

b. Prepare tools and tooling to produce *precision outcome*
   - *Tools*, accessories and consumables are selected appropriate to task, specifications and material.
   - Where applicable, cutting *tool modifications* required to produce outcome are determined using engineering principles.
   - Tools/tooling are prepared and modified as required.

c. Use tools to produce work to precise specifications
   - The work area is prepared and made safe.
   - The work piece is prepared and secured using appropriate method for selected operation/s.
   - Tools are used according to acceptable engineering principles, methods, applications and procedures to produce specified outcome to the required accuracy.
   - Tools and equipment are inspected for safe and proper working order before, during and after use.
   - Unserviceable tools/equipment are identified, repaired where appropriate, or marked for repair and/or disposal, according to prescribed procedure.
   - Tools are stored and maintained to ensure serviceability.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- obtaining and interpreting relevant drawings, specifications, instructions etc
- preparing and making safe the work area(s) prior to the work being carried out
- using appropriate tools to produce the specified outcomes
- checking tools and equipment for safe and proper working order before, during and after use
- where appropriate, marking unsafe or faulty tools and equipment for repair
- where appropriate, repairing/maintaining unsafe or faulty tools
- checking condition of all tools and equipment for conformance to specifications and safe and proper operation prior to storage
- safely storing all tools and equipment in the appropriate location

Required knowledge

Look for evidence that confirms knowledge of:

- work to be undertaken
- specifications to be achieved
- appropriate tools, processes and equipment required to carry out the work to the required specifications
- reasons for selecting the chosen tools, processes and equipment
- hazards and control measures associated with using the selected tools, processes and equipment, including housekeeping
- safety procedures to be followed to ensure the safety of the individual and other personnel
- procedures for using the selected tools
- engineering principles to be applied during the use of the tools
- manufacturers' specifications of the tools and equipment selected
- safe and proper function of tools and equipment selected
- procedures for checking tools and equipment for correct and safe operation
- common faults and/or defects in tools and equipment used/selected
- procedures for marking unsafe or faulty tools and equipment for repair
- repairs/operational maintenance that can be made to the tools and equipment used/selected
- procedures for repairing/maintaining the tools and equipment used/selected
- procedures for checking tools and equipment prior to storage
- storage location of the tools and equipment used/selected
- procedures for storing tools and equipment used/selected

Range statement

Processes - hand tools and hand held power tools are used to fashion or shape work to high levels of precision for dimension and or finish to specifications. Engineering techniques, methods and procedures may include cutting out, drilling, fitting, filing, reaming, lapping, broaching, burnishing, scraping, polishing, hand held grinding, chiselling.

Precision outcomes - specified tolerances, allowances, fits, finishes, alignments

Tools - any tools or equipment required to achieve precision outcomes

Tool modifications - tool shape, rake angle and clearance angles

Unit B19 Terminate and connect electrical wiring

Performance criteria

a. Prepare for *electrical wiring* termination and connection
   - All work is undertaken safely and to workplace procedures and *local regulations and legislative requirements.*
   - Materials are checked for correct specifications.
   - Preparation of work is undertaken or checked/inspected.
   - for *correct location and specifications*

b. Connect *electrical wiring*
   - *Terminations/connections* are made to specifications, manufacturers' requirements and to safety and local regulations and legislative requirements.
   - All brackets, clamps, holders etc. are adjusted and fixed to specifications.
   - All cables, wires, conductors and connections etc. are marked/tagged and labelled to specification.
   - All completed wiring and connections are tested for compliance with specifications.
   - All reports and documentation are completed correctly to required specifications.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- checking materials for conformance to specifications
- checking existing and new installation site for correct location and specification
- making terminations/connections to specification, manufacturer and regulatory requirements
- adjusting and fixing wiring supports
- marking, tagging and labelling cables, wires, conductors and connections to specification
- undertaking testing of wiring and connections for conformance to specification
- using language and literacy skills to complete short reports and required documentation
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- using measurements for checking connections and components

Required knowledge
Look for evidence that confirms knowledge of:

- safety hazards associated with the termination and connection of electrical wiring
- statutory and regulatory requirements associated with the termination and connection of electrical wiring
- wiring support and/or protection requirements and specifications
- relevant manufacturer requirements
- specifications and methods for terminating different materials
- wiring support techniques and alternatives
- marking, tagging and labelling requirements for cables, wires, conductors and connections
- tests for wiring and connections
- data to be recorded/reported and the frequency of
- recording/reporting
- requirements for approval to work
- use and application of personal protective equipment for terminating and connecting electrical wiring

Range statement

Local regulations and legislative requirements - applicable acts, regulations, wiring codes and codes of practice (electrical), international standards

Correct location and specifications - cable trays, brackets, trenches

Electrical wiring - wiring associated with power, lighting, control wiring, machinery, switchboards and other electrical apparatus

Terminations/connections - utilisation of a range of methods including clamping, crimping, pin connection, soldered joints, plugs, sockets etc., clamping of cables and wires, sealing entry points where required

Unit B20 Use comparison and basic measuring devices

Performance criteria

a. Use comparison and/or *basic measuring devices*
   - Measuring devices are identified and used to undertake required *comparisons* or measurements using standard operating procedures.
   - Checking or sorting of items is undertaken using *comparison* and/or basic *measuring device* according to standard operating procedures.

b. Maintain comparison and/or basic measuring devices
   - Basic care and storage is maintained to manufacturers' standards or standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- using device in accordance with standard operating procedures
- storing and maintaining devices
- using basic numeracy skills for undertaking comparison measurements
- following oral instructions and written standard operating procedures.

Required knowledge
Look for evidence that confirms knowledge of:

- use and application of various comparison or measurement devices
- procedures for the correct use of devices
- procedures for maintaining and storing devices
- hazards and control measures associated with conducting measurements, including housekeeping
- safe work practices and procedures.

Range statement

Basic measuring devices - linear measuring devices measuring to within 1mm graduation – may include rules, tapes and retractable tapes

Comparisons - comparison of length, angle, size, temperature, pressure, weight, voltage, resistance and amperage

Comparison measuring devices - go/no-go devices, thread angle and taper gauges, temperature gauges, pressure gauges, measuring gauges and overlay indicators, templates, digital devices and pre-set verniers and micrometers

Unit B21 Prepare basic engineering drawing

Performance criteria

a. Identify drawing requirements
   - Requirements and purpose of drawing are determined from customer and/or work specification and associated documents.
   - All data necessary to produce the drawing is identified and collected.
   - Drawing requirements are confirmed with *relevant personnel* and timeframes for completion are established.

b. Prepare or make changes to engineering drawing
   - *Drafting equipment* is selected appropriate to the drawing method chosen.
   - *Drafting principles* are applied to produce a drawing that is consistent with standard operating procedures within the enterprise.
   - All work is undertaken safely and to prescribed procedure.
   - Completed drawing is approved in accordance with standard operating procedures.

c. Prepare engineering parts list
   - Components parts are identified and organised by component type and/or in accordance with organisation/customer requirements.

d. Issue drawing
   - Drawings and or parts lists *records* are completed in accordance with standard operating procedures.
   - Approved drawings and or parts lists are copied and *issued* to relevant personnel in accordance with standard operating procedures.
   - Approved drawings and or parts lists are stored and catalogued in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- obtaining all relevant job requirements, data/information and specifications necessary to produce the drawing in accordance with workplace procedures
- using drafting equipment appropriate to the drawing method chosen
- producing/changing the drawing to conform with the relevant standard
- undertaking all work safely and in accordance with workplace procedures
- checking the completed drawing in accordance with standard operating procedures
- producing the component parts list with part name, description of part, material specification or part number, quantities and all other details specified by the customer and/or organisational procedures
- recording completed drawings and or parts lists in accordance with standard operating procedures
- where appropriate, copying and issuing approved drawings and or parts lists in accordance with standard operating procedures
- handling and storing the approved drawings and or parts lists in accordance with standard operating procedures
- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task related information
- undertaking numerical operations, geometry and calculations/formulae within the scope of this unit

Required knowledge

Look for evidence that confirms knowledge of:

- requirements and purpose of the drawing to be produced
- requirements and purpose of the engineering parts list
- sources of relevant data/ information
- timeframe for completion of the drawing(s)
- person(s) who can confirm drawing requirements
- method of drawing preparation
- the reasons for selecting the chosen drawing method
- procedures for producing an initial drawing
- procedures for changing an existing drawing
- drafting principles to be applied to the production/changing of a drawing
- standards to which the drawing is to be produced
- procedures for checking drawings
- the persons responsible for checking and approving drawings
- consequences of inappropriate/incomplete components parts lists

- procedures and reasons for recording completed drawings and or parts lists
- procedures for copying approved drawings and or parts lists
- procedures for issuing approved drawings and or parts lists
- the personnel to whom copies of approved drawings and or parts lists can be issued
- procedures for filing approved drawings and or parts lists
- procedures for safe handling and storage of drawings and or parts lists
- consequences of inappropriate handling and storage of approved drawings and or parts lists
- safe work practices and procedures

Range statement

Relevant personnel - technical personnel, supervisors, manufacturers, suppliers, contractors, customers

Drafting equipment - drafting and drawing equipment includes the use of Computer Aided Drafting systems.

Drafting principles - drawings are prepared in accordance with local or international standards as required.

Records - drawing records may include cataloguing, issuing security classifications, filing, preparing distribution lists.

Issued - in hard copy, photographic, slide or transparency form including presentation as a single drawing and/or with other drawings, support documentation as a package

Unit B22 Perform basic engineering detail drafting

Performance criteria

a. Prepare assembly, layout and detail drafting
   - Drawings are prepared in plane orthogonal, isometric projection or equivalent including auxiliary views and sections to local or international standards.
   - Layout, assembly and component drawings are prepared from specification.
   - Drawings are dimensioned and labelled using supplied tolerances in accordance with relevant local or international standards.
   - Drawings are produced to specification in accordance with standard operating procedures.
   - Standard symbols to local or international standards or equivalent are used to specify requirements.

b. Determine component and/or material requirement
   - Components and/or materials are selected from supplier/manufacturers' catalogues using design specifications.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- preparing drawings using appropriate projections and views in accordance with local or international standards or equivalent
- producing layout, assembly and component drawings in conformance with specification
- inserting all relevant dimensions, tolerances and instructions in the drawing
- producing drawings to specification
- appropriately using standard symbols in accordance with
- local or international standards or equivalent in the drawings produced
- obtaining component specifications in accordance with work place procedures
- reading, interpreting and following information written
- job instructions, specifications, standard operating
- procedures, charts, lists, drawings and other applicable
- reference documents
- planning and sequencing operations
- checking and clarifying task related information
- checking for conformance to specifications
- undertaking numerical operations, geometry and calculations/formulae within the scope of this unit

Required knowledge
Look for evidence that confirms knowledge of:

- appropriate projection for the drawing purpose
- reasons for selecting the chosen projection
- reasons for including auxiliary views in drawings
- requirements of local or international standards or equivalent with respect to dimensions, tolerances and labels
- procedures for producing component, layout and/or assembly drawings
- drawing specifications
- common symbols used in drawings to local or international standards or equivalent
- design specifications of the component
- appropriate components and materials from supplier/manufacturers' catalogues
- reasons for selecting the chosen components and/or materials
- safe work practices and procedures

Range statement
N/a

Unit B23 Create 2D drawings using computer aided design system

Performance criteria

a. Prepare CAD environment
   - System variables are customised to suit standard operating procedures.
   - Menus are customised to suit standard operating procedures.
   - Drawing defaults are customised to standard operating procedures.
   - Macros are developed to standard operating procedures.

b. Create 2D drawings
   - *Drawings* are created using the full capability of the available software system.
   - Drawing *entities* are linked to database *attributes* to suit job requirements.
   - Detailed views are created using various scales to meet job requirements.

c. Produce output
   - Files are saved in various formats to standard operating procedures.
   - Linked entities are listed in a bill of materials format to meet job requirements.
   - Supplementary data is extracted from drawing to meet job requirements and may include area, lengths, angles and perimeters.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining all relevant manuals, instructions and operation procedures for the CAD software and hardware being used where appropriate, customising the relevant system variables to suit the applicable drafting standards/procedures
- where appropriate, customising menus to suit the applicable drafting standards/procedures
- where appropriate, customising the system defaults to suit the applicable drafting standards/procedures
- where appropriate, developing macros
- creating drawings using the appropriate drawing features of the software system
- where appropriate, linking drawing entities to database attributes
- producing detailed views of the object being drawn
- printing drawing files at the appropriate scale
- saving drawing files in the appropriate format
- producing bills of material from the drawing files/database
- extracting supplementary data from the drawing file to meet job requirements
- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task related information
- checking for conformance to specifications
- undertaking numerical operations, geometry and calculations/formulae within the scope of this unit

Required knowledge
Look for evidence that confirms knowledge of:

- CAD software system
- system variables that can be customised
- procedures for customising identified system variables
- reasons for customising the system variables
- applicable drafting standards/procedures
- procedures for customising menus
- reasons for customising menus
- procedures for customising system defaults
- reasons for customising system defaults
- procedures for developing macros
- reasons for developing macros
- drawing features of the CAD software system
- reasons for using specialised software features
- procedures for linking drawing entities to database attributes
- appropriate drawing scales
- procedures for printing drawing files
- procedures for creating additional views of the object being drawn
- procedures for saving drawing files
- various formats in which drawing files can be saved
- reasons for using different formats when saving drawing files
- procedures to produce bills of material

- procedures to extract data with respect to drawn shapes/features
- properties of shapes/sections/ features that can be extracted from the drawing file
- hazards and control measures associated with using computer aided design system, including housekeeping
- safe work practices and procedures

Range statement

Drawing - include plans, diagrams, charts, electrical/electronic circuits

Entities - mean any single item created on the screen and includes for example lines, arcs, circles, text, hatch and dimensions

Attributes - mean properties associated with an entity and includes for example layer or level, line type, line width, colour and text

Functional Area C – Casting and moulding

Unit C1	Operate melting furnaces
Unit C2	Perform gravity die casting
Unit C3	Operate pressure die casting machine
Unit C4	Prepare and mix sand for metal moulding
Unit C5	Produce moulds and cores by hand (jobbing)
Unit C6	Operate sand moulding and core making machines
Unit C7	Pour molten metal
Unit C8	Fettle and trim metal castings/forgings
Unit C9	Assemble plated patterns
Unit C10	Carry out heat treatment
Unit C11	Perform drop and upset forging
Unit C12	Perform basic incidental heat/quenching, tempering and annealing
Unit C13	Hammer forge complex shapes
Unit C14	Hand forge complex shapes

Unit C1 Operate melting furnace

Performance criteria

a. Select materials
   - Requisitions are completed as required according to standard operating procedures.
   - Charge analysis is undertaken in accordance with standard operating procedures.
   - The charge analysis is converted to furnace charge weight using standard operating procedures.
   - Charge is weighed according to standard operating procedures.

b. Start up furnace
   - *Furnace* is inspected for any defects or damage.
   - Routine *operational maintenance* of furnace is undertaken to standard operating procedures.
   - Furnace is started up to standard operating procedures.
   - Faults are reported according to standard operating procedures.

c. Charge furnace
- Emergency/safety procedures are identified and followed as necessary.
- Materials are pre-heated if required according to standard operating procedures.
- Materials are charged into furnace using standard operating procedures.
- Suitable areas for emergency unloading of molten metal are identified and kept available.

d. Monitor furnace
- Furnace is maintained at optimum operating condition to standard operating procedures.
- Sample for chemical analysis is taken and remedial action is applied as required to standard operating procedures.
- Furnace is drossed and/or degassed to standard operating procedures.
- Temperature of metal is checked and adjustment made if necessary.

e. Tap or unload the furnace
- Quantity of the required metal is identified.
- Tap rate is carried out to standard operating procedures.
- Tapping or unloading is undertaken and completed safely according to standard operating procedures.

f. Shut down furnace
- Shut-down of furnace is completed to standard operating procedures.
- Routine operational maintenance of furnace is undertaken to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading and interpreting routine information on written job instructions, specifications, standard operating procedures relevant test data sheets and other standard workplace forms. May include drawings for furnace operation
- following oral instruction
- entering routine and familiar information onto proformas and standard workplace forms
- identifying faults and areas for routine repair of the furnace and performing routine maintenance as necessary
- following procedures for starting and closing down the furnace
- deciding on charge materials
- weighing charge materials
- feeding materials into furnace
- measuring metal temperature and correcting as necessary
- sampling for chemical, carbon equivalent and wedge tests
- degassing as necessary
- deslagging/drossing
- tapping the metal

Required knowledge
Look for evidence that confirms knowledge of:

- refractory conditions, faults, and routine repair
- condition of cooling water supply
- starting procedures for different types of furnaces
- metallic charge materials and alloying elements
- weighing procedures and scale types
- correct order of loading of different charge materials
- thermocouple condition monitoring and adjustment mechanism for furnace
- interpretation of carbon equivalent and wedge test results
- degassing procedures including tablet, lance and other procedures
- coagulant agents, application procedures and slag removal procedures
- close-down procedures
- applicable industry and national/international standards, codes of practice
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with operating melting furnaces

Range statement

Furnaces: Singular or multi, coke, oil, gas fired or electric induction, arc and resistance furnaces

Operational maintenance: Routine lubrication, cleaning, routine repair/repointing of refractory brickwork

Unit C2 Perform gravity die casting

Performance criteria

a. Prepare equipment
- Die coat is mixed in *correct proportion.*
- *Die temperatures* are lifted to, or maintained, at the correct level.
- Appropriate safety clothing and apparatus is used.
- Die coat is applied in correct sequence and in a safe manner according to standard operating procedures.
- Die is correctly located and closed.
- Die is correctly placed on machine, toggle clamps are attached and done up to required torque.
- Air cooling is attached to the die as specified if required.

b. Carry out manual pouring
- Pour is made in manner to reduce porosity and lamination.
- Conditions are identified that contribute to inferior castings or rejects.
- Allowance is made for adequate cooling time.
- Pour is made at a continuous and appropriate rate during filling.
- Monitoring of die coating condition is carried out and respraying occurs as required.

c. Remove materials
- Parts are removed and stored in a manner that minimises damage. Any flash is removed from the die surface.

d. Clean die
- Shot blaster is operated in a safe manner and according to standard operating procedures.
- Chemical analysis of melt is taken and remedial action is applied as required to standard operating procedures.
- Furnace is drossed and/or degassed to standard operating procedures.
- Work area is cleaned of coating and shot residue to appropriate standard.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings relating to gravity die casting
- mixing of die coats in the correct proportions in accordance with standard operating procedures
- maintaining of die at correct temperatures
- pouring of molten metal
- assessing correct curing times
- applying die coats
- removing of casting from die
- operating shot blaster
- using measurement skills needed to meet the requirements of this unit
- entering routine and familiar information onto proforma and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- relevant written instructions
- die coat function(s) in gravity die casting
- correct proportions and consistency of die coats
- correct identification of die coat materials
- procedures for raising the temperature of the die to the correct level and maintaining the required temperature
- procedures to be followed when pouring molten metal to produce sound castings
- causes of defects in castings
- curing times for castings of various volumes and materials
- timing of die coat application and quantity of die coat to be used for different applications
- correct procedures for removing castings from the die and storing of castings
- die condition and need for shot blasting
- shot blaster operating procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with gravity die casting, including housekeeping

Range statement

Correct proportions - *w*ill be determined by manufacturer specifications

Die temperatures - *wi*ll vary according to standard operating procedures and/or organisation's procedures

Appropriate safety clothing and apparatus glasses, aluminised suits, masks, gloves, gauntlet, etc.

Unit C3 Operate pressure die casting machine

Performance criteria

a. Conduct pre-operational checks
   - The start-up procedure is conducted according to standard operating procedures.
   - If necessary, the shot size is adjusted.
   - If applicable, nitrogen and/or vacuum systems are checked.
   - If applicable, a functional check is made of the picking robot, and the component gripper is adjusted if necessary.
   - Die spray nozzles are adjusted as necessary.
   - Planning is carried out which ensures efficient flow of finished product i.e. breaking of runners, stacking baskets, bins, conveyors.

b. Operate all functions on machine control panel
   - Appropriate knowledge of die casting process is applied to the operation, adjustment and monitoring of machine functions.

c. Operate machine to produce castings
   - The die casting machine is operated to standard operating procedures, including maintenance of liquid metal and die operating conditions.
   - Runners are broken off correctly.
   - Castings are visually inspected for porosity, cracks, tears, splits, sinks, cold shuts, tinning and die surface crazing according to standard operating procedures.
   - Castings are handled in a manner that minimises risk of damage to the casting and injury to personnel.
   - First-off castings are produced, visually inspected and submitted for checking against specifications.

d. Monitor furnace
   - The furnace is maintained at optimum operating condition to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and following information on written job procedures and specifications
- performing pre-start checks
- adjusting the shot size
- checking nitrogen and/or vacuum systems for correct operation
- checking and adjusting the picking robot and component gripper
- adjusting die spray nozzles
- sequencing of operations
- starting, operating and shutting down a die casting machine
- visually checking for conformance to specifications
- handling castings

Required knowledge

Look for evidence that confirms knowledge of:

- procedures for pre-start checks
- procedures for starting up the die casting machine
- adjustments that can be made to ensure correct operation of the machine
- procedures for adjusting the shot size
- the effects of incorrect shot size on the quality of the die casting
- the function of nitrogen and vacuum systems in the die casting process
- the procedures for checking/ adjusting nitrogen and/or vacuum systems
- the function of a picking robot and the component gripper
- procedures for adjusting the picking robot
- the effects of adjustments on robot performance
- the reasons for spraying the die
- procedures for adjusting the die spray nozzles
- operations to be performed subsequent to the die casting of the product
- tools and equipment
- methods of transporting/conveying the die cast product
- the die casting process
- the effect of adjusting each machine control on the quality of the die casting produced
- procedures to adjust the operation of the die casting machine
- die casting machine operation
- maintenance of liquid levels
- operating parameters
- procedures to remove runners from the die casting
- procedures to inspect die castings
- common faults in die castings and probable causes

- damage that can be caused to castings through inappropriate handling and storage
- procedures for checking first-off castings for conformance to specification
- specifications of the die cast product
- shut-down procedures
- hazards and control measures associated with operating a die casting machine, including housekeeping
- safe work practices and procedures
- use and application of personal protective equipment

Range statement
N/a

Unit C4 Prepare and mix sand for metal moulding

Performance criteria

a. Load mixer (mill/muller)
   - All pre start-up checks are performed safely and according to standard operating procedures.
   - Formula for sand mix is determined according to standard operating procedures.
   - *Materials* are measured and loaded according to formula specification.

b. Mix sand
   - Sand is mixed for correct time to specifications.
   - The performance of *mixer* and the condition of the sand is monitored.
   - Material supply is maintained.
   - *Faults* are reported.

c. Take and test samples
   - Sample is correctly extracted.
   - Test is applied in accordance with standard operating procedures.
   - Test results are compared against specifications.
   - Adjustments to formula/mix are made as required in accordance with standard operating procedures.

d. Discharge mixture
   - Load is charged correctly according to standard operating procedures.
   - Unwanted treated sand is disposed of according to standard operating procedures.

e. Clean mixer
   - *Mixer* is shut down to standard safety and operating procedures.
   - Mixer is cleaned according to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading and following written instructions and standard operating procedures
- setting parameters for mixing
- loading mixers
- mixing sand and monitoring the process
- sampling and testing mixed sand
- discharging sand
- closing down and cleaning
- using measurement skills for preparing and mixing sand within the scope of this unit

Required knowledge
Look for evidence that confirms knowledge of:

- characteristics, safe handling procedure and mixture applications of sand and binding agent
- moulding requirements
- mixers, applications, loading, operating and unloading procedures
- volumes, quantities, ratios and percentages
- sampling, testing and acceptance criteria for mixed sand
- procedures for cleaning and shutting down mixer
- environmental requirements for the disposal of unwanted sand
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures related to preparing and mixing sand for metal moulding

Range statement

Materials Sand, silica, zircon, chromite, mixtures, water

Faults Chemical ratios – acid, binder, water

Mixer Batch and continuous mixers

Unit C5 Produce moulds and cores by hand (jobbing)

Performance criteria

a. Identify job requirements
   - Job requirements are correctly identified from drawings, instructions and specifications.
   - *Material* is selected appropriate to job requirements.

b. Determine sequence of operation
   - Sequence of operation including job set-up is determined for maximum efficiency and to meet job specifications.

c. Select inspect and prepare pattern equipment
   - *Pattern* equipment is correctly identified from specifications to standard operating procedures.
   - Pattern equipment is inspected to specifications, and damaged patterns are identified for repair or replacement to standard operating procedures.
   - Pattern is assembled to specification.
   - Pattern equipment is set up to specification according to standard operating procedures.

d. Make *mould* and core
   - *Core* is positioned in prints utilising chaplets and chills as required and vented to specification according to standard operating procedures.
   - Mould is closed and checked for compliance to component specification in accordance with standard operating procedures.
   - Appropriate moulding/core making equipment is selected and positioned according to standard operating procedures.
   - Appropriate moulding media is selected to produce mould and core to specification.
   - Mould is *secured* according to standard operating procedures.
   - *Moulding media* is used to produce mould and core according to standard operating procedures.
   - *Pouring basin* is selected or manufactured to specification and positioned in accordance with standard operating procedures.
   - Mould and cores are rammed up with joints and drawbacks as required to standard operating procedures.
   - *Parting and stripping systems* are utilised in accordance with standard operating procedures.
   - Loose pieces, vents, risers and *runners* are positioned and secured as required to standard operating procedures.
   - Pattern and loose pieces are removed from mould and core box in a safe manner least likely to cause damage to the pattern and in accordance with standard operating procedures.
   - Mould is inspected and repaired as required.
   - Mould and core is cleaned and painted according to specification using standard operating procedures.

e. Clean and restore work area
   - All materials/debris is cleared and work site cleaned and left in a safe state.

- Unwanted treated sand is disposed of according to standard operating procedures and legislative and statutory requirements.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- interpreting written instruction sketches and drawings
- assembling and positioning pattern in the moulding box
- positioning ancillary methoding components
- preparing moulding media
- filling and compacting the mould assembly
- stripping the pattern
- inspecting the mould
- finishing the mould
- positioning cores in prints
- closing moulds
- placing pouring basin
- securing mould
- following oral instruction
- entering routine and familiar information onto proforma and standard workplace forms

Required knowledge
Look for evidence that confirms knowledge of:

- metal casting process
- variety of pattern types and their application
- pattern assembly techniques
- selection of moulding box
- how to select ancillary components
- sand types and their bonding systems
- compaction processes
- parting and stripping systems
- mould requirements
- finishing and closing techniques
- core placement
- pouring requirements
- securing systems
- pattern care and storage
- environmental requirements
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with producing moulds and cores by hand (jobbing)

Range statement

Materials Binders, hardeners, sand additives, mould coatings

Patterns Flatback, uneven, plated patterns, multi-joint, consumable, split patterns, loose piece patterns, patterns requiring odd sides, cored moulds, drag and cope mould etc.

Moulds Flatback, uneven jointed, multi-part moulds

Core Full, half and segment cores

Secured Weights, clamps, bolting

Moulding media Green sand, shell sand, chemically bonded media etc. may be used

Pouring basin Hand and pattern formed

Parting and stripping systems Dry and wet

Runners Hand and pattern formed

Unit C6 Operate sand moulding and core making machines

Performance criteria

a. Determine job requirements
   - Instructions and specifications are interpreted correctly.

b. Conduct pre-operational checks
   - Pattern/core box is selected and inspected to specifications and cleaned as required. Damaged patterns/core boxes are identified for repair or replacement to standard operating procedures.
   - Pattern/core box is set up in bolster and core box according to standard operating procedures.

c. Operate machine to produce mould/cores
   - Appropriate *moulding media* is selected to produce mould and core to specification.
   - Moulds/cores are filled to specification according to standard operating procedures.
   - *Machine* is operated in accordance with standard operating procedures.
   - Machine is unloaded safely to standard operating procedures.
   - Moulds/cores are stripped, inspected and painted as required according to standard operating procedures.

d. Assemble moulds/cores
   - Moulds/cores are dried, glued and vented as required to specification and closed in accordance with standard operating procedures.
   - Runner bush is set to specification as required.

e. Clean and restore work
   - All material/debris is cleared and work site is cleaned and left in a safe state.
   - Unwanted treated sand is disposed of according to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- interpreting written instructions and specifications
- preparing and installing pattern or core box
- programming operating parameters
- operating and monitoring moulding and core making machines
- assembling moulds and cores
- inserting cores (in moulding machines)
- inserting runner bushes
- maintaining integrity of mould or core
- maintaining integration of interrelated metal melting, core making and sand mixing processes
- maintaining operational capability of moulding and core making machines
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge
Look for evidence that confirms knowledge of:

- characteristics and applications of sand and binding agents
- machine operation, fault identification, analysis and rectification procedures
- core selection and loading procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with operating sand moulding and core making machines

Range statement

Moulding media Shell, chemically bonded or green sand as appropriate for the particular machine

Machine Automatic, semi-automatic, moulding and core making

Unit C7 Pour molten metal

Performance criteria

a. Prepare for pouring molten metal
   - The condition of the mould is checked according to standard operating procedures.
   - The condition of the ladle is checked according to standard operating procedures.
   - The temperature of molten metal is checked for conformance to specification, and pouring method is sequenced to standard operating procedures.
   - The capacity of the required pour is identified against specification according to standard operating procedures.

b. Preheat or prepare ladle
   - The *ladle* is preheated/prepared to receive molten metal.

c. Transfer ladle to furnace
   - Safety clips are checked according to standard operating procedures.
   - The ladle is filled and transferred to the pouring area in accordance with standard operating procedures.
   - *Additives* are determined from specification and added to molten metal as required.

d. Maintain quality of metal as required
   - Slag/dross is removed where necessary.
   - The temperature is monitored as required.
   - Chemical analysis is undertaken and remedial action is applied as required to standard operating procedures.

e. Pour molten metal
   - Personnel in the immediate area of the metal pour are informed that pour is to take place and appropriate safety clothing and equipment is used as specified in standard operating procedures.
   - Metal is poured safely to specification and in accordance with standard operating procedures.
   - Metal is poured at an appropriate and continuous rate.
   - A test bar is poured in accordance with standard operating procedures as required.

f. Empty excess metal from ladle
   - Pigs are poured and tagged.

g. Return ladle
   - The ladle is emptied, cleaned and maintained according to standard operating procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and following written instructions, standard operating procedures, specifications and standard test data sheets
- selecting and checking ladle
- preparing ladle for pouring
- transferring metal to ladle
- treating metal
- removing slag and dross
- sampling and testing molten metal
- pouring molten metal into moulds and pigs
- tagging pig metal
- using communication skills to effectively transfer skills and knowledge to employees

Required knowledge

Look for evidence that confirms knowledge of:

- types and pouring characteristics of metals
- types and characteristics of ladles
- procedures for maintaining condition and integrity of ladle
- procedures for safe handling and transference of molten metal
- metal treatments, applications and procedures for making additions to molten metal

- slag and dross removing procedures
- techniques for sampling and testing molten metal
- pouring procedures
- metal identification and tagging procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with pouring molten metal

Range statement

Ladle lip pour, tea pot, bottom pour, barrel, and bull ladles of varying capacity

Additives Alloys, inoculants, spheroidisers, coagulants

Unit C8 Fettle and trim metal castings/forgings

Performance criteria

a. Determine job requirements
   - Job requirements are correctly determined from instructions and specifications.
   - Correct mouldings and/or castings/forgings are located and arranged for efficient processing.

b. Observe safety requirements
   - Personal protective equipment is selected and used correctly.
   - Castings/forgings are handled using manual or mechanical handling methods appropriate to the task.
   - Castings/forgings are stored or positioned in a safe manner.

c. Identify excess material for removal
   - Casting is removed from mould and/or sand media is removed from casting as required.
   - Castings/forgings are visually checked as suitable for further processing, and excess metal is correctly identified according to standard operating procedures.

d. Select correct tools and equipment
   - Cleaning method is selected appropriate to casting and job requirements.
   - Rumbling/shot blast/sand blast equipment is set to specification and used in accordance with standard operating procedures as required.
   - Appropriate *hand tools* are selected and used for the given task.
   - Appropriate *power tools* and accessories are selected and used for the given task.

e. Remove excess material
   - Excess metal (e.g. runners, risers and flashing) is removed using methods and equipment appropriate to the task and to standard operating procedures.
   - Excess metal suitable for recycling is identified according to standard operating procedures.
   - Excess metallic materials are identified from specifications and isolated as required according to standard operating procedures.

f. Quality assess castings/forgings
   - Castings/forgings are visually checked for conformance with specifications to standard operating procedures.
   - Non-conforming castings/forgings are rejected or set aside and identified for further consideration or remedial action according to standard operating procedures.
   - Faults are reported/recorded as required according to standard operating procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- interpreting written instruction sketches and drawings
- identifying castings
- visually inspecting castings
- fettling and trimming metal castings/forgings
- conducting a final inspection

Required knowledge

Look for evidence that confirms knowledge of:

- accept/reject/rework criteria
- fettling requirements
- fettling tools
- fettling standards
- handling and storage requirements
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with fettling and trimming metal castings/forgings
- excess metals suitable for recycling

Range statement

Hand tools Dedicated tools for fettling and trimming:files, chisels, hammers etc.

Power tools Saws, croppers, grinding disks/belts (including grades), swing and pedestal grinders etc.

Unit C9 Assemble plated patterns

Performance criteria

a. Determine job requirements
   - Job instructions and specifications are correctly interpreted and followed.

b. Inspect and layout patterns
   - Pattern(s) are inspected to ensure dimensions and surface finish conform to specifications.
   - Pattern and runner system is laid out to specifications from drawings, sketches or verbal instructions.
   - Pattern(s) are correctly aligned.

c. Mount pattern on plates
   - Cope and drag patterns/double sided match plate patterns are attached to pattern plate/s according to specification.
   - Cope and drag patterns/double sided match plate patterns are inspected for security and alignment.

d. Mount runner system
   - Volume of runner system conforms to specification.
   - Runner components are attached to pattern plates using appropriate fixing and joining techniques to specification.

e. Inspect plated pattern assembly
   - Surface and mouldability of plated pattern assembly are inspected for compliance with specifications.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- determining job requirements from written instructions, specifications, sketches and drawings
- planning and sequencing tasks
- checking and clarifying task-related information
- performing relevant calculations
- following verbal instructions
- applying surface finishes for the moulding process
- laying out patterns and runner systems
- attaching pattern and runner components
- locating and aligning patterns
- checking patterns for compliance

Required knowledge
Look for evidence that confirms knowledge of:

- units of measurement, numerical operations and calculations associated with assembling plated patterns
- fixing and drilling techniques
- the reason for using particular layout and runner system
- types of pattern plates
- the techniques for avoiding cross jointing or mismatch of the pattern and their relationship to the pin-centre
- methoding systems
- mouldability i.e. surface finish, face taper, convex or concave perspectives, undercuts, etc.
- moulding and casting techniques
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with assembling plated patterns

Range statement

Aligned Measurement and or dowels

Calculations The determination of contraction rates as well as applicable general engineering calculations

Unit C10 Carry out heat treatment

Performance criteria

a. Determine requirements of job
   - Job requirements are determined from engineering drawings, job sheet, or verbal instructions from metallurgist or supervisor.

b. Select heat treatment equipment
   - Appropriate *equipment* is selected for the required heat treatment.

c. Set up equipment
   - Equipment is set up according to standard operating procedures and manufacturers' instructions.

d. Work safely with hot metals
   - Safety clothing and personal protective equipment is used correctly according to standard operating procedures.
   - Emergency procedures are demonstrated according to approved safety instructions.
   - Safety signs and symbols are identified and understood.
   - Equipment is used according to specifications and standard operating procedures.

e. Heat treat material
   - *Material* is treated to achieve required result and may include *preparation processes.*
   - Material is piece or batch loaded and unloaded using equipment appropriate to the situation, according to standard operating procedures.
   - Correct temperature is maintained according to standard operating procedures.

f. Identify hazardous conditions
   - Hazards are identified and hazard control measures are implemented to maintain a safe work environment.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- setting up and operating heat treatment equipment
- applying heat treatment
- safely loading furnace(s)

Required knowledge
Look for evidence that confirms knowledge of:

- work specifications
- material characteristics
- heat treatment applications, equipment and processes
- emergency procedures
- material preparation, quenching, preheating requirements
- material condition during heat treating process
- batch and/or piece loading of furnaces
- safe loading of furnaces
- hazards and control measures associated with heat treatment, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Equipment Gas, electric, oil fired furnaces, vacuum furnace, induction heating, kilns, heated baths, salt baths, specialised tongs/tools and lifting equipment

Material Plain carbon steels, alloy steels, non-ferrous

Preparation processes Coatings and packings; preheating; soaking; quenching; tempering; annealing; normalising; carburizing; sintering

Unit C11 Perform drop and upset forging

Performance criteria

a. Identify and select drop and upset forging equipment and tools for specific operation
   - Appropriate *equipment* is selected which accounts for size of material and procedures.
   - Dies and punches are correctly selected for specific operations and equipment.
   - Die replacement is correctly determined with regard to relief allowances, cracking, dimensions, etc.

b. Set up and operate drop and upset forging equipment
   - Equipment is correctly and safely set up, adjusted and operated.
   - Correct die setting techniques are applied in setting correct die and punch alignment.
   - Correct die preheating procedures are applied.

c. Prepare material
   - *Materials* are correctly prepared and heated in accordance with job requirements and/or specifications.

d. Drop and upset forge material
   - Material is drop forged using the correct procedures and techniques
   - Correct *lubricant* is applied for die wear and forging release.
   - Correct grain flow is determined.
   - Galls, folds and cracks are identified and corrected.
   - *Correct removal* of flash or fin is carried out.
   - Material amounts are calculated with allowance for heat wastage and flash or fin.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- inspecting dies and preparing dies and materials
- aligning dies and punches
- replacing dies
- operating drop/upset forging equipment
- die preparation
- material preparation
- detecting and correcting defects
- removing flash or fins
- calculating material volume, weight, allowances, heat wastage, flash, fin

Required knowledge
Look for evidence that confirms knowledge of:

- drop or upset forging techniques
- characteristics of forging equipment
- safety work practices and procedures
- hazards and control measures associated with drop and upset forging, including housekeeping
- incorrect/correct alignment of dies, punches
- dies (preheating, preparation, lubrication, defects, conformance, replacement)
- materials pre-heating
- relevant tools, techniques and equipment
- setting, adjusting, operating forging equipment
- features of defects in drop/upset forged articles such as, galls, folds, cracks
- ways of correcting defects
- ways of removing flash, fins from drop/upset forged articles
- calculations for material volume, weight, allowances, heat wastage, flash/fin

Range statement

Equipment May include: drop forging hammer/press, open die forging hammer using closed loose die or horizontal upsetting machine (heading machine)

Materials May include: ferrous materials (steel) or non-ferrous material (copper, aluminium bronze)

Lubricants Graphite bearing oils/greases or cellulose granules, waxes

Correct removal Ejector pins, drafts in die (angle)

Unit C12 Perform basic incidental heat/quenching, tempering and annealing

Performance criteria

a. Determine job requirements
   - Job requirements are determined from engineering drawing, job sheet or verbal instructions.

b. Set up equipment for heat/quenching, tempering and annealing
   - Appropriate *heating process* and/or procedure is selected for the given job.
   - Equipment is set up according to standard operating procedures and manufacturers' instructions.

c. Operate heating equipment
   - All safety procedures are observed.
   - Appropriate *heating equipment* operating procedures are followed.
   - Appropriate equipment adjustments are made.
   - *Material* is treated to achieve required result.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, manufacturer instructions, charts, lists, drawings and other applicable reference documents
- checking and clarifying task-related information
- following verbal instructions
- orally reporting routine information
- selecting appropriate processes for heating/quenching, tempering, annealing
- setting up, adjusting and operating equipment

Required knowledge
Look for evidence that confirms knowledge of:

- characteristics and applications of heating/quenching, tempering, annealing processes
- specifications for heating, quenching, tempering, and annealing
- process for heating/quenching, tempering, annealing, different materials
- operating/adjusting heating equipment
- hazards and control measures associated with heating/quenching, tempering, annealing, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Heating process Heating/quenching, tempering and annealing

Heating equipment Oxy acetylene, LPG gas equipment, forge etc.

Material Ferrous and non-ferrous metals of various types and thicknesses

Unit C13 Hammer forge complex shapes

Performance criteria

a. Set up and operate forging machine
   - The forging machine is set up and operated in accordance with standard operating procedures and specifications.
   - Complex open die tooling is selected and used according to workplace procedures.
   - Safe operating procedures are followed.

b. *Forge* complex shapes and heavy parts
   - The material to be forged is safely and correctly positioned in the forming equipment in accordance with standard operating procedures.
   - Hot forgings are marked and measured as required.
   - Allowance is made for material shrinkage and oxidisation.
   - Hammer tools and fixtures attached to power hammer are used correctly.
   - Forging is checked to ensure conformance to tolerances and specifications.
   - Forgings are handled safely and correctly according to workplace procedures.

c. Heat complex forgings
   - Heating plant and equipment is selected appropriate to work undertaken.
   - Techniques used to heat heavy and complex forgings are applied correctly.
   - Post-forging heating is performed correctly and safely.
   - Hot forgings are handled safely and according to workplace procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- selecting and using measuring guides
- calculating allowance for material shrinkage and oxidisation
- setting up and operating forging machine
- selecting forming tools and equipment
- positioning material
- handling materials
- selecting and setting up heating equipment
- performing heat treatment process(es) for forging

Required knowledge
Look for evidence that confirms knowledge of:

- hammer tools and formers and their applications
- hammer forging techniques
- numerical operations and calculations/formulae for data analysis within the scope of this unit
- tools, formers and techniques to produce a range of hammer forged articles
- procedures for measuring forged articles
- effects of material shrinkage and oxidisation on the dimensions of the forged article
- methods of overcoming/allowing for the effects of shrinkage and oxidisation when hammer forging articles
- hammer punching techniques
- procedures for handling material to be hammer forged
- heating equipment and applications
- heat treatment processes for forging
- heat treatment requirements for given materials

Range statement

Forge Forging on and against cold mandrels Hammer punching and opening of large diameter holes

Unit C14 Hand forge complex shapes

Performance criteria

a. Forge complex shapes using hand tools on an anvil
   - Task requirements for *complex hand forging* are identified and clarified as required.
   - Material volume is correctly calculated.
   - Allowances for bending, material shrinkage and oxidisation are made as required.
   - Hand tools and formers are selected and used correctly in accordance with standard operating procedures.
   - Safe hand forging procedures are followed.
   - Techniques and principles for producing complex shapes are applied correctly.
   - Forging is checked to ensure conformance to tolerances and specifications.

b. Perform splitting and bundling on anvil
   - Tools and equipment are selected and used correctly.
   - *Hand forging techniques* and procedures are applied to forging and opening bundled and split sections.
   - Allowance is made for material shrinkage, distortion and oxidisation.
   - Heat is applied and controlled in specified areas of the material to be forged in accordance with standard operating procedures.
   - Forgings are handled safely and correctly according to workplace procedures.
   - Forgings are checked to ensure conformance to tolerances and specifications.

c. Produce jigs and tools for complex shapes
   - Tools and equipment required to taper and bend materials are selected appropriate to task requirements.
   - Techniques for producing jigs and tools are applied correctly.
   - Jigs and patterns are bent and shaped to specifications.
   - Hand held tools are forged to cut pattern, in accordance with specifications.
   - Final shaping, heat treatment and sharpening is performed to specifications.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- selecting and using measuring guides
- calculating allowance for material volume, bending, shrinkage and oxidisation
- selecting tools and equipment
- forging and splitting sections
- forging bundled sections and opening bundled sections
- positioning material
- handling materials
- selecting and setting up heating equipment
- performing heat treatment process(es) for forging
- applying and controlling heat

Required knowledge

Look for evidence that confirms knowledge of:

- hand tools and their applications
- techniques and procedures for hand forging complex shapes
- numerical operations and calculations/formulae within the scope of this unit
- procedures for measuring forged articles
- forging temperatures and heat specifications for multiple pieces
- tools, techniques and equipment required to taper and bend materials
- effects of material shrinkage and oxidisation on the dimensions of the forged article
- methods of overcoming/allowing for the effects of shrinkage and oxidisation when hand forging articles
- procedures for handling forgings
- heating equipment and applications
- heat treatment processes for forging
- heat treatment requirements for given materials

Range statement

Complex hand forging Shaping, reverse tapering, jump up section for bends

Hand forging techniques Spreading, surface chasing, hot splitting

Functional Area D – Machining operation and component assembly

Unit D1	Perform operational maintenance of machines/equipment
Unit D2	Perform machine setting (routine)
Unit D3	Perform general machining
Unit D4	Perform lathe operations
Unit D5	Perform milling operations
Unit D6	Perform grinding operations
Unit D7	Perform tool and cutter grinding operations
Unit D8	Perform machining operations using horizontal and/or vertical boring machines
Unit D9	Operate and monitor machine/process
Unit D10	Operate computer controlled machine/processes
Unit D11	Perform routine sharpening/maintenance of production tools and cutters
Unit D12	Perform metal spinning lathe operations (basic)

Unit D1 Perform operational maintenance of machines/equipment

Performance criteria

a. Undertake programmed safety and maintenance checks
   - *Checks* are undertaken safely and to prescribed procedure.
   - Status/report is recorded on proforma or reported orally.

b. Undertake programmed maintenance
   - Removal/replacement of *consumable components* is undertaken to prescribed procedure and instructions are followed.
   - Fluids and lubricants are replaced and/or topped up to prescribed schedule.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the

range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- undertaking programmed safety and maintenance checks
- undertaking programmed operational maintenance
- entering routine and familiar information onto proformas and standard workplace forms
- following routine information on written procedures
- following oral instructions
- orally reporting routine information

Required knowledge

Look for evidence that confirms knowledge of:

- programmed maintenance and safety check procedures for the specified machine/equipment
- recording/reporting requirements
- safe work practices and procedures
- hazards and control measures associated with operational maintenance of machines/equipment

Range statement

Machines/equipment - manual, semi-automatic and automatic machines of a standalone continuous production or process nature

Checks - programmed safety and maintenance checks

Adjustments of a limited nature - including safety guards, stops, wear pads and tool holders, nipping up glands and adjustment of scrapers and aprons

Consumable components - air filters, oil wipers, grease containers, tool tips, indicator globes, fluids and lubricants, guides and limit switch actuators

Unit D2 Perform machine setting

Performance criteria

a. Determine job requirements
   - Job sheets or *equivalent instructions* are interpreted correctly and understood.

b. Set machine
   - Safe working practices are understood and implemented.
   - Machine is set in accordance with defined procedures.
   - Machine is adjusted to meet specifications and operational requirements.
   - First-off samples are measured for compliance with specifications.

c. Instruct machine operator
   - Machine operator is instructed, if necessary, on sequencing settings and any required safety procedures.

d. Replace worn/damaged tooling
   - Worn or damaged tooling is identified and changed as required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- interpreting and following job/operation sheets, standard operating procedures, specifications, safe working procedures and other applicable reference documents
- verbally conveying routine and familiar instructions
- identifying worn tools
- using hand tools for machine setting
- measuring to specified tolerances
- following oral instructions

Required knowledge
Look for evidence that confirms knowledge of:

- sequences of machine setting operations
- techniques, tools and equipment to measure samples
- characteristics of machines/processes
- safe work practices and procedures
- tools and equipment for machine setting
- applicable machine tooling and accessories
- symptoms of tool wear
- use and application of personal protective equipment
- hazards and control measures associated with machine setting (routine)
- strategies for conveying routine instructions

Range statement

*Equivalent instructions - s*tandard operating procedures, safe working procedures, operation sheets

Unit D3 Perform general machining

Performance criteria

a. Determine job requirements
   - Drawings, instructions and specifications are interpreted and understood.

b. Determine sequence of operations
   - Sequence of *operations* including job set-up is determined for maximum efficiency and to meet job specifications.
   - Appropriate *material* is selected and datum established as required.

c. Select and mount tools
   - Appropriate *tools* for job are selected, sharpened and shaped as required.
   - Tools are mounted and positioned correctly.

d. Perform machining operations
   - Basic *marking out techniques* are used where required.
   - *Machining parameters* are set for job requirements and maximum tool life.
   - Work is held or correctly clamped without damage to product, and all safety requirements are met..
   - Machining is performed in a safe manner utilising all guards, safety procedures and personal protective clothing and equipment.

e. Measure components
   - Components are checked with instruments or gauges appropriate to measurement requirements to ensure compliance with specifications.

f. Adjust and maintain machine
   - Routine *maintenance and adjustments* are carried out as required which may include slide and collar adjustment, cleaning and lubrication and the like.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- following oral instruction
- planning and sequencing operations
- preparing operational work plan
- sharpening and shaping cutting tools
- identifying worn or damaged cutting tools
- correct mounting and positioning of cutting tools
- basic marking out of materials
- setting machining parameters to achieve the job requirements and maximise tool life
- using appropriate and sufficient clamping/mounting of the work piece
- using coolant/lubricant correctly
- checking for conformance to specifications
- measuring to specified tolerances and dimensions

Required knowledge

Look for evidence that confirms knowledge of:

- reasons for selecting the chosen sequence of operations
- methods of work holding
- basic marking out techniques including datum points/lines etc.
- geometry of cutting tools for a range of materials and applications
- benefits of using correctly sharpened cutting tools
- machine operation
- selection of feeds and speeds to suit a range of materials and operations within the scope of this unit
- correct methods of mounting a variety of cutting tools
- safety issues with regard to correct clamping, guards, shields etc.
- tolerances, limits of size
- situations indicating the need for machine adjustment, lubrication and cleaning
- techniques, tools and equipment to measure materials and machined components
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with general machining

Range statement

Operations - parallel cutting, slotting, planing, drilling, knurling, cutting flats, non-precision surface grinding operations etc.

Material - *f*errous and non ferrous

Tools - *c*utting tools and accessories, measuring devices

Marking out techniques - *b*asic marking out techniques using calipers, steel rules, dividers, scribers etc.

Machining parameters Speeds, feeds, stops, coolant and cutting lubricants etc.

Machines - include lathes, mills, planers, shapers, radial arm drills, slotters, surface grinder etc.

Maintenance and adjustments - *s*lide and collar adjustment, cleaning and lubrication

Unit D4 Perform lathe operations

Performance criteria

a. Observe safety precautions
   - Correct safety procedures are observed and protective clothing and safety glasses worn.

b. Determine job requirements
   - *Drawings* are interpreted, sequence of operation is determined and *tooling* is selected to produce component to specification.

c. Mount job
   - Job is set up using *instruments* such as dial test indicators, and digital read-out equipment.

d. Perform turning operations
   - *Speeds and feeds* are calculated using appropriate mathematical techniques and reference material.
   - The full range of *accessories* on a centre lathe are used including three and four jaw chucks, centres, face plate, steadies, cross slide and tailstock.
   - *Turning operations* are performed to specification.

e. Check components for conformance with specifications
   - Components are checked for conformance to specification using appropriate techniques, tools and equipment.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- interpreting technical drawings/specifications in relation to turning
- setting up jobs using appropriate equipment
- calculating and setting cutting feeds and speeds appropriate to the job
- checking that job is concentric, running true etc.
- safely operating lathes
- performing turning operations

Required knowledge
Look for evidence that confirms knowledge of:

- sequence of operations to achieve the job requirements
- tool type and geometry to achieve the required specifications and for work pieces of different materials
- numerical operations, geometry and calculations/formulae within the scope of this unit
- the consequences of varying speeds and feeds from the optimum rates calculated
- characteristics of different materials and their effects on cutting speeds and feeds
- application of lathe accessories
- techniques, tools and equipment to measure materials and machined components
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with lathe operations

Range statement

Drawings - engineering drawings

Tooling - cutting tools, boring bars, drills, reamers, thread chasers, tapping heads, taps etc.

Instruments - manual and digital micrometers, vernier calipers, dial indicators, scribing blocks

Speeds and feeds - setting up machine, changing gears and speeds, use of lead screw, calculations

Accessories - three and four jaw chucks, centres, face plate, steadies, cross slide, tailstock

Turning operations - manual parallel and taper turning, internal and external turning including boring drilling, reaming, single start thread cutting, parting off

Unit D5 Perform milling operations

Performance criteria

a. Observe safety precautions
   - Correct safety procedures are observed, and protective clothing and safety glasses are worn.

b. Determine job requirements
   - *Drawings* are interpreted, the sequence of operations is determined and *tooling* is selected to produce component to specification.
   - *Cutting parameters* are determined.

c. Perform milling operations
   - Milling operations are carried out to produce components to specification.
   - Operations are undertaken using conventional and/or climb milling techniques and a variety of cutters including slab, gang, end, shell, slot, form, slitting.
   - The full range of standard *accessories* is used including dividing heads and rotary tables as required.

d. Check components for conformance to specification
   - Component is checked for conformance to specification using appropriate techniques, tools and equipment.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- setting up jobs using appropriate equipment
- calculating and setting cutting feeds and speeds appropriate to the job
- interpreting drawings and job instructions/specifications
- milling components to specification
- visually and dimensionally checking components for conformance to specification

Required knowledge
Look for evidence that confirms knowledge of:

- safety hazards associated with milling machines
- sequence of operations to achieve the job requirements
- cutter types and tooling geometry
- consequences of varying speeds and feeds from the optimum rates calculated
- effects of different materials on cutting speeds and feeds
- conventional and climb milling techniques and their applications
- the application of each of the following: slab, gang, shell, slot, form, and slitting
- applications requiring the use of dividing heads and rotary tables when milling components
- the procedures for using dividing heads and rotary tables on milling machines
- appropriate techniques, tools and equipment to measure milled components
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Drawings - engineering drawings

Tooling - slab, gang, end, shell, slot, form, slitting cutters

Cutting parameters - setting up machine, feed and speed calculations

Accessories - dividing heads and rotary tables

Unit D6 Perform grinding operations

Performance criteria

a. Determine job requirements
   - Job requirements are determined from *specifications*, and sequence of operations is determined.
   - Correct and appropriate *holding devices* are selected and applied.

b. Observe safety precautions
   - Machine guards, coolant and dust extraction devices are checked.
   - Correct safety procedures are observed and protective clothing and safety glasses are worn.

c. Select grinding wheels and accessories
   - *Wheels* are selected, *balanced* and dressed based on knowledge of grinding wheel structure and application.
   - Accessories are selected to facilitate production to job specifications.

d. Perform grinding operations
   - *Grinding machine* is set up and adjusted in accordance with defined procedures.
   - Work piece is held or clamped appropriately to avoid damage.
   - Grinding operations are performed safely, utilising all guards, safety procedures and personal protective clothing and equipment.

e. Check components for conformance with specifications
   - Components are checked for conformance to specification using appropriate techniques, tools and equipment.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and interpreting information on written job instructions, procedures, specifications, charts, lists, drawings and other applicable reference documents
- checking and clarifying task related information
- preparing an operational work plan
- planning and sequencing operations
- using precision measurement equipment within the scope of this unit
- setting up work using tools, techniques and equipment
- using coolant and dust extraction devices
- selecting and preparing grinding wheels and accessories appropriate to the grinding task(s)
- performing and monitoring internal/external cylindrical grinding process
- clamping/mounting work pieces
- checking for conformance to specifications
- performing numerical operations and calculations within the scope of this unit

Required knowledge

Look for evidence that confirms knowledge of:

- reasons for selecting the chosen sequence of operations
- the application of a range of holding devices/accessories
- reasons for selecting specific work holding devices, tools, techniques and equipment
- coolant selection/function
- standard grinding wheel shapes
- the range of abrasive materials used in grinding wheels
- factors impacting grinding wheel selection including grain size of abrasive particles; grade or strength of bond; and bond material
- grinding wheel dressing tools and their application
- internal/external cylindrical grinding process
- principles of effective clamping
- grinding operations/procedures
- the function of any grinding accessories
- tools, techniques and equipment for checking components for conformance to specifications
- hazards and control measures associated with grinding operations, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Specifications - dimensions and tolerances, geometry and tolerances, surface finish

Holding devices - vices, clamps, magnetic chucks, face plates, collets, 3 jaw chuck, etc.

Wheels - shape, grit/bond composition

Balanced - static and dynamic balancing

Grinding machine - surface, cylindrical and centreless machines

Unit D7 Perform tool and cutter grinding operations

Performance criteria

a. Observe safety precautions
   - Machine guards, coolant and dust extraction devices are checked.
   - Correct safety procedures are observed, and protective clothing and safety glasses are worn.

b. Determine job requirements
   - Drawings are interpreted and sequence of operations is determined.

c. Select appropriate tool and cutter grinding wheels and accessories
   - *Tool and cutter grinding wheels* are selected, based on knowledge of grinding wheel structure, and are balanced and dressed. Accessories are selected to facilitate production to specification.

d. Perform tool and cutter grinding
   - Universal tool and cutter grinding machines are operated to sharpen and shape the full range of tools and cutters including side and face cutters, end mill, form relieved milling cutters, flat, vee and circular form tools and hobs, slitting saws, and drills.
   - Parallel internal and/or external grinding is carried out.
   - Internal and/or external taper grinding is carried out to drawing specifications.

e. Check components for conformance to specification
   - Components are checked for conformance to specification using appropriate techniques, tools and equipment.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading, interpreting and following information on written job instructions, specifications, charts, lists, drawings and other applicable reference documents
- checking and clarifying task related information
- preparing operational work plan
- planning and sequencing operations
- performing numerical operations and calculations within the scope of this unit
- performing safety checks of equipment
- selecting tool and cutter grinding accessories
- balancing/dressing grinding wheels
- sharpening/shaping tools and cutters
- checking components for conformance with specifications
- using precision measurement equipment within the scope of this unit

Required knowledge

Look for evidence that confirms knowledge of:

- reasons for selecting the chosen sequence of operations
- function of coolant and dust extraction devices
- criteria for grinding wheel selection:
- grain size of abrasive particles
- grade or strength of bond
- bond material
- grinding wheel dressing procedures and wheel dressing tools
- source(s) of data on tool geometry for the full range of tools and cutters, including the terminology used to describe the tool geometry
- procedures to be followed when parallel grinding on a tool and cutter grinder
- procedures to be followed when grinding tapers on a tool and cutter grinder
- tools, techniques and equipment used to check ground components for conformance with the following specifications:
- dimensions and tolerances
- geometry and tolerances
- surface finish
- hazards and control measures associated with tool and cutter grinding, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Tool and cutter grinding wheels - wheel selection criteria includes shape and grit/bond composition

Unit D8 Perform machining operations using horizontal and/or vertical boring machines

Performance criteria

a. Observe safety precautions
   - Correct safety procedures are observed and protective clothing and safety glasses are worn.

b. Determine job requirements
   - Drawings are interpreted, sequence of operations is determined and tools are selected to produce component to specification using International Standard Organisation or standard operating procedures.
   - Cutting parameters are determined.

c. Perform boring operations
   - *Horizontal* and *vertical* boring operations are carried out including parallel line and taper boring, facing, turning, drilling and reaming to drawing specifications.

d. Check component for conformance to specification
   - Components are checked for conformance to specification using appropriate techniques, tools and equipment.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following information on written job instructions, specifications, quality and standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task-related information
- preparing an operational work plan
- selecting, mounting and positioning cutting tools
- calculating and selecting cutting parameters, including speeds and feeds
- performing horizontal and/or vertical boring operations

Required knowledge
Look for evidence that confirms knowledge of:

- reasons for selecting the chosen sequence of operations
- geometry for cutting tools for a range of materials
- calculations for determining cutting parameters and checking tolerances within the scope of this unit
- consequences of varying the speeds and feeds from the optimum rates
- procedures and techniques for carrying out horizontal and vertical boring operations
- appropriate techniques, tools and equipment to measure components
- hazards and control measures associated with horizontal and/or vertical boring, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Horizontal boring machines - table type, floor type

Vertical boring machines - double column, single column

Unit D9 Operate and monitor machine/process

Performance criteria

a. Obtain job instructions
   - Job sheets or equivalent instructions are interpreted correctly.

b. Conduct pre-start checks
   - *Pre-start checks* are undertaken to standard operating procedure
   - Safety procedures are observed and all safety equipment is checked for correct operation.

c. Operate machine/process
   - *Machine/process* is started up safely and correctly in accordance with standard operating procedures.
   - Machine/process is operated in accordance with job instructions or standard operating procedures.
   - Components/feed stock are loaded and maintained consistent with production requirements.
   - Machine/process output is unloaded safely to standard operating procedures, as required.
   - Machine/process output is handled and stored in a manner not likely to cause damage, as required.
   - *Production data* is recorded to standard operating procedures.

d. Monitor machine/process
   - Machine/process is monitored for safe and correct operation, deviations and faults are identified and reported in accordance with standard operating procedures.
   - Emergency procedures are understood and followed in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- following job sheets, standard operating procedures and other applicable workplace forms
- manual handling
- following oral instructions
- entering routine and familiar information onto proformas and standard workplace forms
- orally reporting routine information
- identifying deviations and faults in machine operation/process

Required knowledge
Look for evidence that confirms knowledge of:

- pre-start checks
- machine/process start-up and unloading procedures
- component/feed stock levels to ensure continuous process
- production recording and reporting requirements
- types of product fault/deviations
- consequences of improper handling and storing of finished work
- procedures to be followed in emergency situations
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with operating and monitoring machine/process

Range statement

Pre-start checks - condition of machine before operation

Machine/process - machines and processes used in pressing, punching, plastic moulding, extruding, bending, joining, rolling, forming, drawing, metal removal, pickling, cylinder filling, printing, painting etc.

Production data - production schedules, job sheets, checklists

Unit D10 Operate computer controlled machine/processes

Performance criteria

a. Obtain job instructions
   - Job sheets or equivalent instructions are understood and correctly followed.

b. Conduct pre-start checks
   - Pre-start checks are undertaken to standard operating procedures.
   - Correct safety procedures are observed and all safety equipment is checked for correct operation.

c. Operate computer controlled machine/process
   - Installed computer controlled program is selected and verified in accordance with job instructions.
   - Computer controlled machine is operated safely to product specifications using standard operating procedures.
   - Machine malfunctions are identified and reported.
   - Production samples are checked for compliance to specification using standard operating procedures.

d. Monitor machine/process
   - Tool wear is monitored and, where appropriate, preset tools are replaced, tool offsets are identified in computer controlled program and adjusted, or other corrective action is taken using standard operating procedures.
   - Product deviation from specification is reported in accordance with standard operating procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task related information
- making pre-start checks
- checking safety equipment and guards for correct operation
- following safety procedures
- selecting and verifying the correct computer controlled program
- operating the computer controlled machine
- identifying and reporting machine malfunctions
- checking parts/products for conformance to specification
- monitoring the machine or process for signs of tool wear
- taking corrective action
- reporting part or product deviations from specification

Required knowledge

Look for evidence that confirms knowledge of:

- pre-start checks
- safety equipment and features associated with the machine/process
- safety procedures associated with the machine/process
- procedures for accessing computer controlled programs installed in the machine controller
- procedures for verifying the correct computer controlled program
- computer controlled machine operating procedures
- typical machine malfunctions
- procedures for reporting machine malfunctions
- measuring instruments/techniques
- examples of tool wear and the effect on product or part specifications
- procedures to be followed once tool wear has been detected
- replacing preset tools
- adjustments to tool offsets
- the effect of adjustments on part or product specifications
- procedures for reporting product or part deviations
- hazards and control measures associated with operating computer controlled machines/processes, including housekeeping
- safe workplace practices and procedures

Range statement

N/a

Unit D11 Perform routine sharpening/maintenance of production tools and cutters

Performance criteria

a. Obtain job instructions
   - Job sheets or equivalent instructions are interpreted correctly and understood.

b. Observe safety precautions
   - Machine guards, coolant and dust extraction devices are checked for proper operation in accordance with standard operating procedures.
   - Correct safety procedures are observed, and protective clothing and safety glasses are worn.

c. Disassemble production tooling in preparation for sharpening
   - *Production tooling* is disassembled as required to facilitate sharpening in accordance with standard operating procedures.

d. Set up machine
   - Tool and cutter *grinding wheels* are selected, balanced and dressed in accordance with job instructions.
   - *Fixtures* for locating tools/cutters to be sharpened are mounted in accordance with job instructions.

e. Perform tool and cutter grinding
   - Tools and cutters to be sharpened are mounted in predetermined fixtures.
   - Tools and cutters are sharpened in accordance with defined procedures.

f. Check tools/cutters for conformance to specification
   - Tools/cutters are visually inspected and checked, and measured for conformance to specification in accordance with job instructions.

g. Assemble/reassemble production tooling
   - Production tooling is reassembled, and inserts are installed in accordance with job instructions.
   - Assembled tooling is visually inspected and checked, and measured for conformance to specification in accordance with job instructions.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and interpreting drawings and instructions
- planning a sequence of operations
- selecting and using appropriate tools
- entering routine and familiar information onto proforma and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- sequence of operations to be performed
- function of coolant and dust extraction devices
- hazards associated with tool and cutter grinding operations
- the standard grinding wheel shapes
- range of abrasive materials used in grinding wheels
- the effect of the following grinding wheel features on wheel selection and application:
- grain size of abrasive particles
- grade or strength of bond material
- structure of grain spacing and dressing processes
- function and application of the full range of tool and cutter grinding accessories
- preparation requirements for tool maintenance
- requirements for checking:
- dimensions and tolerances
- geometry and tolerances
- surface finish
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Production tooling - hserted boring bars, face cutters, gear cutters, grinding machines and accessories etc.

Grinding wheels - cup, dish, diamond

Grain size of abrasive particles

Grade or strength of bond

Structure of grain spacing

Grain size of abrasive particles

Fixtures/equipment - Dedicated holding devices e.g. clamps, vices, magnetic chucks, indicator pawls

Unit D12 Perform metal spinning lathe operations (basic)

Performance criteria

a. Observe safety precautions
   - Correct safety procedures are observed and protective clothing and safety glasses are worn.

b. Determine job requirements
   - Drawings are interpreted and sequence of operation is determined.
   - *Tools* are selected to produce components to specifications.
   - Disc size is determined in accordance with appropriate procedures.

c. Perform spinning operations
   - Spinning speeds are calculated for various *metals* and metal thicknesses using appropriate mathematical techniques and *reference materials.*
   - Correct back centre and form chucks are selected and mounted in accordance with procedures and specifications.
   - Prepared disc is mounted for forming.
   - A full range of spinning accessories is used including: back centre, various chucks, trimming accessories, blank centre equipment and tee-rest.
   - *Spinning operations* are performed to specifications.

d. Check components for conformance to specifications
   - Components are checked for conformance to specifications using appropriate techniques, tools and equipment.

e. Remove and store components
   - Components are removed from the spinning lathe without marking or any deformation.
   - Components are correctly stored and packaged to avoid oxidation and damage.

f. Adjust and maintain spinning lathe
   - Routine *maintenance and adjustments* are carried out as required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of

ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- following oral instruction
- entering routine and familiar information onto proformas and standard workplace forms
- using all basic metal spinning tools
- minimising damage and defects
- calculating disc size and lathe speed
- undertaking manual handling related to spinning products
- using appropriate techniques, tools and equipment to measure materials and spinnings

Required knowledge

Look for evidence that confirms knowledge of:

- sequence of spinning operation
- types of spinning tools, their functions and requirements for maintaining tools
- types of damage and defects e.g. tool marks, cracking, stress marks, thinning and incorrect finish
- spinning lathe operation
- why and how lathe speed is calculated
- reasons for types of form chuck mounting
- function and operation of accessories for basic spinning
- methods used for each process
- methods for stacking and protecting finished product
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with metal spinning lathe operations (basic)

Range statement

Tools - spinning tools, planishing tools, backstick, trimming, beading tools etc.

Metals - steel, aluminium, copper, brass, zinc, pewter, silver, gold, tin, etc. of varying thicknesses

Reference materials - workplace reference materials

Spinning operations - spinning, beading, trimming, finishing, annealing and/or pickling

Maintenance and adjustments - cleaning, lubrication etc.

Functional Area E - Fabrication and finishing

Unit E1	Perform manual production assembly
Unit E2	Perform sheet and plate assembly
Unit E3	Perform electronic/electrical assembly (production)
Unit E4	Set assembly stations
Unit E5	Perform soft soldering
Unit E6	Perform routine oxy acetylene welding
Unit E7	Carry out mechanical cutting
Unit E8	Perform brazing and/or silver soldering
Unit E9	Perform manual thermal cutting, gouging and shaping
Unit E10	Perform automated thermal cutting
Unit E11	Select welding processes
Unit E12	Apply safe welding practices
Unit E13	Perform manual production welding
Unit E14	Monitor quality of production welding/fabrications
Unit E15	Weld using gas metal arc welding process
Unit E16	Weld using gas tungsten arc welding process
Unit E17	Apply fabrication, forming and shaping techniques
Unit E18	Assemble fabricated components
Unit E19	Repair/replace/modify fabrications
Unit E20	Manually finish/polish materials
Unit E21	Prepare surfaces using solvents and/or mechanical means
Unit E22	Prepare surfaces by abrasive blasting
Unit E23	Pre-treat work for subsequent surface coating
Unit E24	Finish work using wet, dry and vapour deposition methods
Unit E25	Produce clear and/or coloured and/or sealed anodised films on aluminium

Unit E26 Apply protective coatings

Unit E27 Electroplate protective finishes

Unit E1 Perform manual production assembly

Performance criteria

a. Read and understand job sheets
   - Job sheets and instructions are understood and followed correctly.

b. Select assembly equipment and components
   - Assembly equipment is selected according to instructions or job sheets and used to standard operating procedures.
   - *Components/sub-assemblies* are obtained and arranged for assembly.
   - Equipment/tools are used in a safe manner.

c. Assemble components
   - Assembly is produced following correct sequence of operations, using selected equipment to standard operating procedures.
   - Production data is *recorded/input* to standard operating procedures.

d. Perform tests
   - Assembly is *tested/checked* for compliance to job sheet requirements, following standard operating procedures as required.

e. Protect assembly from damage
   - Components and/or assemblies are handled and stored safely, in a manner least likely to cause damage.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- following job instructions and standard operating procedures
- selecting and using assembly tools, components and sub-assemblies
- entering routine and familiar information onto proformas and other standard workplace forms
- following oral instruction

Required knowledge
Look for evidence that confirms knowledge of:

- application and use of assembly tools and equipment
- sequence in which the assemblies are to be performed
- storage location of the component/sub-assemblies
- required tests and checks
- required action for non-conformance
- potential damage through the use of inappropriate handling and/or unsafe storage procedures
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with manual production assembly

Range statement

Components/sub-assemblies - Parts that make up the sub-assembly and components

Recorded/input - By means of production schedules, job sheets, checklists

Tested/checked - Carried out according to specification of assembled product

Unit E2 Perform sheet and plate assembly

Performance criteria

a. Read and understand job sheets
   - Job sheets/instruction are correctly interpreted and followed.

b. Select and use sheet and plate assembly equipment
   - *Assembly equipment* is selected in accordance with instructions on job sheet.
   - Equipment is used in a safe manner according to standard operating procedures.

c. Assemble fabrications
   - Products to be assembled are verified against specifications.
   - Assembly is produced following correct sequence of operations.
   - Assemblies/fabrications are joined to specification using specified *joining techniques.*
   - Assembly is tested/checked for compliance with job requirements using standard operating procedures.

d. Protect assembly from damage
   - Assemblies/fabrications are handled and stored according to standard operating procedures and in a safe manner least likely to cause damage.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following written job sheets, instructions, standard operating procedures and other applicable reference documents
- checking and clarifying routine familiar information
- selecting and using specified assembly equipment and tools
- following sequence of operations
- joining the components/fabrications correctly and safely using appropriate techniques
- testing and checking assembled products for compliance with specifications
- handling and storing components, fabrications and/or assemblies
- checking for conformance to specifications
- following oral instructions

Required knowledge
Look for evidence that confirms knowledge of:

- the importance of following the sequence of operations
- application and function of assembly equipment
- safety precautions and operating characteristics of assembly equipment and tools
- application and limitations of different joining techniques
- surface preparation and joining techniques
- assembly tests/checks
- safe handling and storage procedures applicable to components, fabrications and/or assemblies
- effects of inappropriate handling and storage procedures
- hazards and control measures associated with sheet and plate assembly
- use and application of personal protective equipment
- safe work practices and procedures for sheet and plate assembly

Range statement

Assembly equipment - Jigs, fixtures and other appropriate tools

Joining techniques - Seaming, bonding, riveting, welding etc.

Unit E3 Perform electronic/electrical assembly (production)

Performance criteria

a. Read and understand job sheets.
   - Job sheets and instructions are understood and followed correctly.

b. Select assembly equipment
   - Assembly equipment is selected and used in accordance with instructions or job sheets to standard operating procedures.
   - Equipment is used in a safe manner.

c. Identify electronic/electrical components
   - Common name, appearance, colour of electronic and electrical components are identified.
   - Polarity indicators are identified on components.

d. Assemble components
   - Correct components are selected by code/colour or other identification methods.
   - Components/devices are prepared for soldering or other termination methods.
   - Cables are connected to a variety of plug and socket combinations as required.
   - Components are safely handled and stored using appropriate anti-static handling procedures and techniques in accordance with standard operating procedures.
   - Assembly is produced following correct sequence of operations.

e. Perform tests.
   - Assembly is tested/checked for compliance with job sheet requirements using standard operating procedures.
   - Production data is recorded/input as required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading, interpreting and following assembly job sheets, instructions and standard operating procedures
- selecting appropriate tools and equipment
- using tools and equipment
- selecting electronic and electrical components by name, colour and appearance
- preparing components/devices for soldering and termination
- connecting cables to plugs/sockets
- handling and storing components safely
- applying anti-static handling procedures and techniques
- checking work for conformance to specification
- completing production records and reports
- following oral instructions
- using hand and power tools dedicated to the assembly process
- identifying components by name, appearance and colour
- entering routine and familiar information onto proforma and
- standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- assembly equipment and its application
- hazards associated with the misuse of tools and equipment
- polarity indicators on common electronic and electrical components
- consequences of connecting electronic and electrical components with incorrect polarity
- termination methods
- preparation requirements for components/devices to be soldered
- preparation requirements for components/devices to be terminated using non-soldering techniques
- connection requirements of a variety of plugs and sockets
- anti-static procedures and techniques
- safe handling and storage requirements of electrical and electronic components
- consequences of not following the correct sequence of operations
- specifications against which the assembly is to be checked/tested

- test/check procedures
- data recording requirements

Range statement

All

Unit E4 Set assembly stations

Performance criteria

a. Identify job requirements
   - Setting requirements are correctly identified from *job sheets/instructions*.

b. Select and use a range of hand tools and equipment
   - Hand tools and equipment for setting assembly stations are used in a safe manner, according to instructions, standard operating procedures and any legislative requirements.

c. Set assembly stations
   - *Assembly stations* are *set up* for a range of *processes and operations* according to defined procedures.
   - Safe work practices are observed and implemented.
   - Assembly stations are adjusted to specifications and operational requirements.
   - Assembly stations are tested for correct operation.

d. Maintain equipment
   - Routine maintenance is carried out to standard operating procedures.
   - Worn or damaged components are identified and changed.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings for setting assembly stations
- following oral instructions
- testing and checking assembly station and outputs
- identifying worn and/or damaged components

Required knowledge
Look for evidence that confirms knowledge of:

- procedures to be followed in setting up assembly stations
- safety hazards associated with the assembly station and/or its setting up
- specifications applicable to the assembly station
- effect of various adjustments that can be made to the assembly station
- routine maintenance requirements
- effect of worn or damaged components on the operational requirements and specifications of the assembly station
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Job sheets/instructions - Verbal and written job instructions, specifications, standard operating procedures and assembly drawings within the scope of this unit

Assembly station - May be used for operations such as riveting, pressing, screwing, tensioning etc. and processes such as testing, gluing, identification, numbering or simple hot stamping etc.

Set up - Ensuring that appropriate jigs, fixtures, die sets, stores and tooling etc. are in place as required to meet the production order or schedules

Processes and operations - Riveting, pressing, screwing, tensioning, testing, gluing, identification, numbering or simple hot stamping of components and assemblies

Unit E5 Perform soft soldering

Performance criteria

a. Identify job requirements
   - Soldering requirements are identified and correctly understood from job sheets or instructions.

b. Undertake soft soldering
   - *Tools*, equipment and consumables appropriate to the task are assembled and prepared for use as required.
   - *Materials* to be soldered are prepared, arranged and checked as required, to ensure solder joint meets specifications.
   - Correct techniques are used to apply soft solder to standard operating procedures.
   - Solder joint is cleaned and checked for conformance to specifications using standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- using soldering irons
- using direct flame and other heating devices
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instruction

Required knowledge
Look for evidence that confirms knowledge of:

- the effect of material to be soft soldered on the selection of consumables
- the reasons for preparing surfaces prior to soldering
- the procedures for rectifying defects in soldered joints
- use and application of personal protective equipment for soft soldering
- safe work practices and procedures

Range statement

Tools - Soldering irons (all types) and direct flame or other heating devices

Materials - Ferrous and non-ferrous

Unit E6 Perform routine oxy acetylene welding

Performance criteria

a. Identify weld requirements
   - Weld requirements are identified from job instructions.
   - Location of welds is identified in accordance with standard operating procedures and job specifications.

b. Prepare materials for welding
   - *Materials* are cleaned and *prepared* ready for welding.

c. Prepare equipment for welding
   - Welding *equipment* is set up correctly.
   - Settings and *consumables* are selected.

d. Perform routine welding using *oxy acetylene*
   - Safe welding practices are applied.
   - Materials are welded to job requirements.
   - Welds are *cleaned* in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- preparing materials
- setting up welding equipment
- welding with oxy acetylene fuel gas
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instructions
- using measurement skills for joint preparation and routine oxy acetylene welding

Required knowledge
Look for evidence that confirms knowledge of:

- preparatory requirements
- materials and consumables properties and characteristics
- equipment and equipment settings
- fuel gas properties and applications
- post welding treatments
- weld characteristics
- any applicable industry standards, workplace safety guides, local regulatory codes of practice/standards
- safe work practices and procedures
- safe welding practices
- use and application of personal protective equipment for routine oxy acetylene welding

Range statement

Materials - Mild and low carbon steel and cast iron

Prepared - Preheating, setting up jigs, fixtures, clamps, joint preparation

Equipment - Hoses, blowpipes, regulators

Consumables - Filler rods, fluxes

Oxy acetylene - The term ‘oxy-acetylene’ is used here to describe a range of fuel gases, including acetylene, LPG, hydrogen etc.

Cleaned - Fluxes

Unit E7 Carry out mechanical cutting

Performance criteria

a. Determine job requirements
   - Job requirements and specifications are determined from job sheets and/or instructions.
   - Appropriate method/machine is selected to meet specifications.
   - *Machine* is loaded and adjusted for operation consistent with standard operating procedures.

b. Select/set up machine tooling
   - *Tooling* is selected to match job requirements.
   - Tooling is correctly installed using standard operating procedures
   - Machine is set up and adjusted using standard operating procedures.

c. Operate mechanical cutting machine
   - Appropriate *stops and guards* are set and adjusted as required.
   - *Material* is secured and correctly positioned using measuring equipment as necessary.
   - Machine is started and stopped safely to standard operating procedures.
   - Machine is operated to cut/hole material to specifications using standard operating procedures.

d. Check material for conformance to specification
   - Material is checked against specification. Machine and/or tooling is adjusted as required and in process adjustments carried out as necessary.
   - Material is cut and/or holed to within workplace tolerances.
   - Material is used in most economical way.
   - Codes and standards are observed.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- loading and adjusting cutting machines
- selecting machines and tooling
- installing cutting tool
- setting up and adjusting cutting machine
- securing and correctly positioning materials
- cutting and holing materials
- applying relevant codes and standards
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instruction
- measuring materials to specified workplace tolerances and within the machine range
- clarifying routine task-related information

Required knowledge
Look for evidence that confirms knowledge of:

- the characteristics of cutting methods and machines
- effect of materials on the machine tooling, tooling defects and adjustments
- effect of adjustments on the dimensions of the cut material
- applicable tolerances
- methods of marking out materials to ensure minimum wastage
- any applicable industry standards, national standards, workplace safety guides, local regulatory codes of practice/standard
- use and application of personal protective equipment for mechanical cutting
- safe work practices and procedures

Range statement

Machine - Guillotines, croppers, cold saws, band saws, automatic saws etc.

Tooling - Tooling to suit guillotines, croppers, cold saws, band saws, automatic saws etc.

Stops and guards - All safety equipment/stops/guards on guillotines, croppers, cold saws, band saws, automatic saws etc.

Material - Ferrous and non-ferrous metals and non-metallic products

Codes and standards - Legislative and regulatory requirements, industry and enterprise codes and standards

Unit E8 Perform brazing and/or silver soldering

Performance criteria

a. Prepare materials and equipment
   - Job requirements are determined from specifications and/ or instructions.
   - Materials are correctly prepared using appropriate tools and techniques.
   - *Materials* are correctly assembled/aligned to meet specifications as required.
   - Distortion prevention measures are identified and appropriate action is taken as required.
   - *Heating* equipment is assembled and set up safely and correctly in accordance with standard operating procedures.
   - Correct and appropriate *consumables* are selected and prepared.
   - Test run is undertaken and verified as required.

b. Braze and/or silver solder
   - The correct process is selected to meet specifications.
   - Materials are preheated as required.
   - Consumables are applied using correct techniques.
   - Jointing material is applied correctly and in appropriate quantities to meet job/specifications.
   - Material temperature is normalised using correct and appropriate techniques.

c. Inspect joints
   - Excess jointing materials are removed using correct and appropriate techniques.
   - Inspection of joints is undertaken to standard operating procedures.
   - Inspection results are reported/recorded using standard operating procedures as required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- preparing materials
- performing brazing/silver soldering
- undertaking visual inspection
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instructions

Required knowledge
Look for evidence that confirms knowledge of:

- the reasons for selecting specific methods of assembly/alignment
- the procedures for minimising distortion of the materials being brazed/silver soldered
- the procedures for assembling and setting up specific heating equipment
- the reasons for selecting specific heating equipment
- the reasons for selecting specific consumables and conducting test runs
- typical applications of brazing and silver soldering processes
- the procedures and precautions for preheating the materials to be joined
- the effects of the use of inappropriate techniques on the performance of the jointed materials
- the effect of inappropriate quantities of jointing material on the performance of the jointed materials
- the procedures for normalising the temperature of jointed materials
- the consequences of using inappropriate techniques to
- normalise the temperature of the joint
- the procedures for removing excess jointing material
- the procedures for inspecting brazed/silver soldered joints
- use of protective equipment for silver soldering and brazing
- safe work practices and procedures

Range statement

Materials - Ferrous and non-ferrous

Heating - Oxy acetylene and fuel gas, cylinders, connections, hoses, tips and nozzles

Consumables - Fluxes (resin or powder), all types of silver solder and brazing grades, etc.

Unit E9 Perform manual thermal cutting, gouging and shaping

Performance criteria

a. Assemble/disassemble plant, equipment for manual thermal cutting gouging and shaping
   - Appropriate cutting process and procedure for material being worked are selected.
   - Accessories and equipment are correctly selected and assembled.

b. Select equipment settings and consumables
   - Correct equipment settings and consumables are selected from standard operating procedures.

c. Operate hand held thermal cutting and shaping equipment
   - All safety procedures are observed.
   - Equipment start-up procedures are followed correctly to standard operating procedures.
   - Material is cut to specification with shape/profile/surface finish to accepted workplace standards.
   - Cutting defects are identified and corrective action is taken to standard operating procedures.
   - Material is removed with minimum loss of sound metal.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining, interpreting and following relevant job sheets, drawings, instructions and procedures
- selecting and assembling equipment and accessories
- following safety procedures
- safely checking, starting and operating equipment
- cutting material to specifications
- identifying and correcting cutting defects
- economising material and minimising waste

Required knowledge
Look for evidence that confirms knowledge of:

- cutting processes and procedures appropriate to various material
- heating and cutting specifications
- procedures for heating and cutting
- specifications for cutting and surface finish
- use and applications of tools, equipment and techniques for heating and cutting
- assembling procedures for equipment and accessories
- equipment settings
- application of various consumables
- sources of information on equipment settings and consumables
- hazards and control measures associated with manual heating and thermal cutting
- use and application of personal protective clothing and equipment
- equipment pre-checks and operation
- procedures for adjusting heating and cutting equipment
- cutting allowances and reasons for applying them
- procedures for minimising waste material
- reasons for minimising waste material
- cutting defects and their causes
- procedures for correcting cutting defects
- tools, equipment and techniques required to correct cutting defects
- use and application of personal protective equipment
- safe work practices and procedures

Range statement
N/a

Unit E10 Perform automated thermal cutting

Performance criteria

a. Set up *material*
   - Material is set up, including correct procedures for stack cutting and nesting to minimise waste.

b. Set up and use automated cutting *machine*
   - Appropriate *cutting medium* is selected and set to specification.
   - Process requirements are determined from specifications or instructions.
   - Machine is set up safely to specifications using standard operating procedures.
   - *Correct program* is selected and loaded to standard operating procedure.
   - Machine datum are established to specifications.

c. Use automated thermal cutting machine
   - Where required, cutting medium is ignited following standard operating procedures.
   - Machine is started using correct sequence and procedure.
   - Powder marking and other *tracing devices* are used as required to standard operating procedures.
   - Correct shut-down procedure is observed in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- setting up materials and machines
- using thermal cutting machines
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instruction

Required knowledge
Look for evidence that confirms knowledge of:

- material set-up procedures
- advantages of stack cutting and nesting
- procedures for establishing machine datum
- hazards associated with igniting cutting media
- safety precautions to be taken when starting and shutting down the machine
- procedures for using powder marking and other tracing devices
- use and application of personal protective equipment for automated thermal cutting
- safe work practices and procedures

Range statement

Material - Ferrous and non-ferrous

Cutting medium - Includes fuel gases, oxy acetylene, plasma arc, laser etc.

Machine - Single or multi-headed machines including NC driven equipment etc.

Correct program - Programs on numerically controlled (NC) machines are selected and loaded according to predetermined instructions

Tracing devices - Powder marking and magnetic, photoelectric tracing devices

Unit E11 Select welding processes

Performance criteria

a. Identify properties of *commonly used metals*
   - Materials to be welded are identified.
   - *Characteristics* and *properties* of commonly used materials are identified.
   - Uses and purposes of commonly used materials are identified.
   - Basic metallurgical characteristics are considered.

b. Identify and provide for welding contingencies
   - *Information* relevant to welding processes is sourced as required.
   - Potential contingencies are identified and solutions are considered.

c. Identify appropriate welding processes
   - *Welding processes* are identified and selected to achieve specified outcomes with selected metals.
   - *Effects* of welding processes on materials are identified.
   - Distortion prevention measures are identified.
   - Alternative joining methods for job are identified and assessed for relevancy.

d. Identify cleaning and preparation requirements
   - Processes for cleaning and preparing metals are identified.
   - Role of contaminants in welding flaws is explained.
   - *Safety requirements* for chemicals and other materials are identified and utilised in accordance with manufacturers' specifications and legislative requirements.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in**:**

- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task-related information

Required knowledge
Look for evidence that confirms knowledge of:

- hazards and control measures associated with welding practices, including housekeeping
- safe work practices and procedures
- properties and characteristics of commonly used metals and materials
- basic metallurgy principles
- information resources
- chemical content of fumes emitted by welding processes
- uses and purposes of various metals
- distortion prevention measures for various metals

Range statement

Commonly used metals - Stainless steel, aluminium, galvanised metals, carbon steel, copper, manganese, zinc

Characteristics - Tensile strength, grade, heat resistance, density

Properties - Physical properties, flammable limits, melting point

Basic metallurgical characteristics - Alloys and grades of metals and different types of electrodes

Information - Steel supplier's handbooks, welding company materials, standard operating procedures, safety documentation

Welding processes – Fusion; electric arc welding; gas (oxy-fuel) welding; thermit welding

Pressure welding processes - resistance welding; fire or forge welding; friction welding; explosive welding

Low temperature processes - soldering; brazing;

Other - ultrasonic welding; electron beam welding

Effects - Thermal expansion, heat affected zones, fume emissions, altered density, distortion

Distortion prevention measures - Heat treatments, consolidations

Processes for cleaning and weld preparation - Etching, grinding, arc gouging, thermal cutting, chemical additives, anti-corrosion treatments

Safety requirements - Dry and ventilated areas; Location away from heat risks; Location away from incompatible substances; Requirements for hazardous substances; Adequate signage and labelling; Appropriate sealing; Routine inspections; Emergency procedures

Unit E12 Apply safe welding practices

Performance criteria

a. Access and interpret safety information
   - *OH&S information* is obtained and interpreted.
   - Relevant OH&S legislation is identified.
   - *Work related safety information* is obtained and interpreted.

b. Identify risks associated with welding
   - *Pollutants* formed by welding processes are identified.
   - *Occupational diseases and injuries* which may be associated with welding are identified.
   - *Factors* associated with increased risk are identified.
   - *Exposure levels* for pollutants are identified.
   - Risks and potential health effects associated with *specific metals* are identified.
   - Risks and potential health effects associated with *gases* in welding are identified.
   - *Other hazards* of welding are identified.

c. Reduce risks associated with welding
   - Manual handling techniques are used.
   - Personal protective equipment is used correctly.
   - Procedures to control hazards are implemented.
   - Workplace safety procedures are implemented.
   - Workplace safety non-compliances are reported in accordance with workplace procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.

- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- sourcing and interpreting safety-related information and Material Safety Data Sheets (MSDS)
- planning and sequencing operations
- identifying workplace risks and non-conformances
- reporting workplace risks and non-conformances
- checking and clarifying task-related information

Required knowledge
Look for evidence that confirms knowledge of:

- characteristics and properties of common metals and welding materials
- effect of gas and electrical welding operations on metals
- hazards and control measures associated with gas and electrical welding, including housekeeping
- welding safety practices and procedures
- effect of various treatments on a range of commonly used metals
- use and application of personal protective equipment

Range statement

OH&S information - Organisational OH&S practices and procedures manuals; Company risk management policy; Codes of practice; Occupational Health and Safety reporting requirements; Weld procedures

Work related safety information - Standard operating procedures; Material safety data sheets (MSDS); Job sheets; Emergency procedures; Safety standards and procedures

Pollutants - Nitrogen oxides; Ozone; Metal fumes etc.; Lead oxide; Silicon oxide; Calcium fluoride; Calcium oxide; Magnesium oxide; Sodium oxide; Potassium oxides; Carbon dioxide; Organics; Iron; Manganese; Calcium carbonate; Zirconium oxide; Titanium oxide; Hexavalent chromium

Occupational diseases and Injuries - Eye injuries; Skin damage; Respiratory irritations; Chronic effects; Allergies

Factors - Gas leakage from cylinders; Type of consumable and metals used; Type of welding processes; Type of electrodes; Welding current; Voltage and amperage; Ventilation; Contamination; Interaction of chemicals; Exposure levels; Flammability

Exposure levels - Time Weighted Average; Short Term Exposure Limit (STEL); Maximum Allowable Concentration (MAC) or Threshold; Limit Value – Ceiling (TLV-C); Skin Notation

Specific metals - Aluminium; Antimony; Arsenic; Beryllium; Boron; Cadmium; Chromium; Copper; Cobalt; Iron; Lead; Lithium; Magnesium; Manganese; Mercury; Molybdenum; Nickel; Platinum; Selenium; Silver; Thorium; Tin; Titanium; Tungsten; Vanadium; Zinc; Zirconium;

Gases - Acetylene; Argon; Carbon dioxide ;Carbon monoxide; Helium; Nitrogen oxides; Ozone; Phosgene; Phosphine; Stibine

Other hazards - Fluxes; Electro-magnetic radiation; Electric shock; Sparks; Spatter; Contaminated and coated metals; Gas cylinder and electrical hazards; Confined spaces; Noise; Chemical exposure; Solvents; Musculoskeletal, back and overuse injuries; Vibration; Dusts ;Heat stress ;Ultraviolet radiation; Airborne pollutants; Flammable gases; Infrared radiation; Thermal damage

Manual handling techniques - Housekeeping practices; Lifting weight limits; Appropriate storage; Use of lifting devices; Appropriate training; Hazardous materials storage standards and procedures

Personal protective equipment - Respirators; Ear muffs; Protective clothing; Gloves; Boots; Helmets; Eye protection; Face shields

Procedures to control hazards - Substituting hazardous materials with safer materials; Changing workplace design to eliminate hazards; Modifying work practices to reduce exposure; Using personal protective equipment; Using adequate and appropriate ventilation

Workplace safety measures - Shielding requirements; Ventilation; General and diluted; Local exhaustion; Use of personal protective equipment; Checking equipment condition; Equipment maintenance ; Correct operation of equipment; Correct voltage and electrical connections; Good posture; Fire safety, plant and equipment isolation; Communications with appropriate personnel

Unit E13 Perform manual production welding

Performance criteria

a. Tack and/or weld material using appropriate welding process
   - *Material* is prepared for the process to be used following standard operating procedures.
   - Material is aligned (if required) using dedicated jigs and fixtures.
   - *Welding* is carried out to accepted workplace standards.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- aligning to jigs and fixtures
- welding within the scope of this unit
- following standard operating procedures

Required knowledge
Look for evidence that confirms knowledge of:
- function and use of jigs and fixtures in production welding
- hazards associated with the welding process used

- function, application and operation of welding equipment within the scope of this unit
- material preparation
- acceptable workplace standards

Range statement

Material - Metallic and non-metallic materials, including low carbon steels

Welding - Spot, resistance, hot air, ultrasonic

Unit E14 Monitor quality of production welding/fabrications

Performance criteria

a. Monitor quality of welded products
   - Weld requirements are identified from specifications and/or drawings.
   - *Inspection procedures* are carried out to standard operating procedures.
   - Nonconforming welds are reported and corrective action is initiated according to standard operating procedures.
   - Pre-set gauges are used to monitor quality of product.

b. Initiate testing when required
   - Test requirements are implemented according to standard operating procedures and any legislative or regulatory requirements.

c. Undertake procedures reporting
   - Data is collected to standard operating procedures.
   - Reports are prepared as required.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- recognising nonconforming welds
- reading, interpreting and following information on specifications, standard operating procedures, drawings and other applicable reference documents
- using pre-set gauges
- collecting weld test data
- entering routine and familiar information onto proformas and standard workplace forms/reports

Required knowledge
Look for evidence that confirms knowledge of:

- the function of pre-set gauges
- test requirements appropriate to the welded product
- legislative and/or regulatory requirements of the welded product
- reporting and corrective action procedures

Range statement

Inspection procedures - Visual/gauges inspections

Unit E15 Weld using gas metal arc welding process

Performance criteria

a. Prepare materials for gas metal arc welding (GMAW)
   - *Weld* requirements are identified from specifications and/or drawings.
   - Material is correctly *prepared.*
   - Materials are assembled/aligned to specification where required.

b. Select welding components
   - Welding machine settings accessories and consumables are identified.

c. Assemble and set up welding equipment
   - Welding *equipment* is assembled and set up.

d. Minimise and rectify distortion
   - *Distortion prevention measures* are selected appropriate to material and process.
   - Distortion is *rectified*.

e. Weld to job specification
   - Weld deposit is to specifications using GMAW 5.2 Joints are cleaned to specifications.

f. Ensure weld conformance
   - Weld joints are visually inspected for conformance to specifications.
   - *Defects* are removed with minimum loss of sound metal using correct and appropriate techniques and tools.

g. Maintain weld records as required
   - Weld records are completed correctly.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- identifying and interpreting appropriate standard e.g. American Bureau of Shipping (ABS) or equivalent
- selecting and using appropriate tools and equipment
- using a variety of welding machines and electrodes
- identifying and rectifying weld defects
- applying techniques for distortion prevention and rectification
- cleaning welds
- reading and interpreting information on written job instructions, specifications, standard operating procedures and drawings
- recording routine information related to GMAW onto proformas and standard workplace forms
- following oral instructions
- measurement skills relating to joint preparation and GMAW

Required knowledge
Look for evidence that confirms knowledge of:

- types of gases and their uses
- the relationships between amperage/wire feed, voltage, gas flow, electrode and material
- the application of weld metal transfer (short arc, spray etc.)
- correct welding machine, leads, hand pieces and electrodes
- material preparation
- joint preparations
- electrode classification
- causes of distortion for materials within the scope of this unit
- safe welding practices
- use and application of personal protective equipment for GMAW

Range statement

Weld - Fillet and butt in all positions, vertical, horizontal, overhead

Prepared - Preparation of materials including preheating, setting up of jigs, fixtures, clamps, etc., joint preparation e.g. bevelling

Equipment - AC or DC welding machines

Distortion prevention measures - Distortion prevention including preheating, setting up of jigs, fixtures, clamps, etc.

Rectified - Oxyacetylene, air arc equipment and grinding devices

Defects - Porosity, slag inclusions, discontinuities, lack of penetration, undercut

Unit E16 Weld using gas tungsten arc welding process

Performance criteria

a. Prepare materials for gas tungsten arc welding (GTAW)
   - Weld requirements are identified from specifications and/or drawings.
   - Material is correctly *prepared.*
   - *Materials* are assembled/aligned to specification, where required.

b. Select welding machine components
   - Welding machine settings, accessories and consumables are identified.

c. Assemble and set up welding equipment
   - *Welding equipment* is assembled and set up.

d. Minimise and rectify distortion
   - Appropriate *distortion prevention measures* are selected for weld and material type.
   - Distortion is *rectified*.

e. Weld to job specification
   - Weld deposit is to specifications. using GTAW 5.2 Joints are cleaned to specifications.

f. Ensure weld conformance
   - *Defects* are removed with minimum loss of sound metal using techniques and tools appropriate to the defect, material and process.
   - Weld joints are visually inspected for conformance to specifications.

g. Maintain weld records as required
   - Weld records are completed correctly.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- identifying and interpreting appropriate standards e.g. American Bureau of Shipping (ABS) or equivalent
- selecting and using appropriate tools and equipment
- using a variety of welding machines and electrodes
- identifying and rectifying weld defects
- applying techniques for distortion prevention and rectification
- cleaning welds
- reading and interpreting information on written job instructions, specifications, standard operating procedures and drawings
- recording routine information related to GTAW onto proformas and standard workplace forms
- following oral instructions
- measurement skills relating to joint preparation and GTAW

Required knowledge
Look for evidence that confirms knowledge of:

- correct welding machine, leads, hand pieces and electrodes
- material preparation
- joint preparations
- electrode classification
- causes of distortion for materials within the scope of this unit
- causes of defects and methods of rectification
- the relationships between amperage, electrode and material
- types of gases and their uses
- types of electrodes, current settings, high frequency voltage
- filler materials and consumables
- safe welding practices
- use and application of personal protective equipment for GTAW

Range statement

Prepared - Preheating, setting up of jigs, fixtures, clamps, etc., joint preparation e.g. bevelling

Materials - Carbon steel or stainless steel, aluminium

Welding equipment - AC or DC welding machines

Distortion prevention measures - Preheating, setting up of jigs, fixtures, clamps, etc.
Rectified Oxy acetylene and air arc equipment, grinding devices

Defects - Porosity, slag inclusions, discontinuities, lack of penetration, undercut

Unit E17 Apply fabrication, forming and shaping techniques

Performance criteria

a. Select and set up forming/shaping equipment for a specific operation
   - Most appropriate *tools and equipment* are selected.
   - Equipment is correctly set up and adjusted for operation to standard operating procedures.
   - Allowances for shrinkage, thickness and inside/outside measurements are correctly made.

b. Operate forming/shaping equipment
   - Machine is safely started up and shut down to standard operating procedures.
   - *Material* and safety guards are correctly positioned.
   - Equipment is correctly operated and adjusted.

c. Form and shape *material*
   - Material is levelled, straightened, rolled, pressed or bent to specifications/ drawings using *fabrication techniques.*
   - Correct hot or cold forming procedures are followed.
   - *Final form/shape* is checked for compliance to specification and adjusted as necessary to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- selecting tools and equipment
- setting up and adjusting equipment
- calculating allowances
- taking measurements
- starting up and shutting down the machine
- positioning material
- positioning safety guards
- obtaining drawings and/or specifications
- selecting the most appropriate forming/shaping process to achieve the required size and specification
- forming/shaping material to size and specification
- checking the final form/shape of the object for conformance with specifications
- reworking the object to ensure conformance with specifications
- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking task-related information

Required knowledge
Look for evidence that confirms knowledge of:

- a variety of hot and cold forming/shaping processes
- the machines, tools and/or equipment required to perform forming/shaping processes
- the reasons for selecting chosen tools, equipment and process(es)
- adjustments that can be made to the equipment and the effect of adjustments on the object being formed/shaped
- allowances when forming/shaping materials
- sources of data relating to allowances
- start-up and shut-down procedures
- the material positioning/feeding requirements
- the location and function of all safety guards
- procedures for the forming/shaping process
- defects in formed/shaped materials
- defects that can be rectified by further work/adjustment
- hazards and control measures associated with undertaking fabrication, forming and shaping, including housekeeping
- safe work practices and procedures

Range statement

Tools and equipment - Presses, shapers, benders, rollers, drop hammers etc.

Material - Ferrous and no-ferrous and non-metallic substances

Fabrication techniques - Includes measurements and calculations associated with allowances for shrinkage, thickness and inside/outside measurements

Final form/shape - Pipework, chamfers, cylinders, cones, angles, hoppers, ductwork, ‘square to round’, ‘transitions’, ‘lobster backs’ and all forms of tubular shapes, including hand rails, reticulation pipework, mufflers etc.

Unit E18 Assemble fabricated components

Performance criteria

a. Identify assembly method and construct jigs if required
   - Method is identified and jigs are constructed from engineering drawings or according to workshop practice.
   - *Distortion prevention/control techniques* are correctly applied.

b. Ensure all components for assembly are available
   - All *components* are checked against drawings and material list.

c. Select tools and fixtures for fabrication assembly
   - Most appropriate equipment is selected.

d. Assemble fabricated components
   - Material and/or fabricated components are correctly positioned
   - Jigs, fixtures, tools and measuring equipment are correctly adjusted and applied.
   - Datum line is correctly determined if necessary.
   - Assembled components are checked for position including squareness, level and *alignment* to specification.
   - *Fixing/joining techniques* are applied as necessary according to standard operating procedures.
   - Assembly is checked for compliance with drawing.
   - *Codes/standards* are interpreted and applied.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- constructing jigs where appropriate
- applying distortion prevention/control techniques
- positioning components in accordance with drawing/specifications
- using jigs, fixtures, tools and equipment
- correctly marking the datum line
- checking the position of all assembled components visually and dimensionally
- using appropriate fixing/joining techniques

Required knowledge
Look for evidence that confirms knowledge of:

- methods for assembly of fabricated components
- jigs construction
- effects of distortion of fabricated components
- distortion prevention techniques
- drawing and material list
- characteristics of relevant tools and equipment squareness, level, alignment
- function of datum lines
- variety of fixing/joining techniques
- defects associated with the assembly of fabricated components
- methods of rectification of defects by rework or adjustment
- requirements of relevant codes/standards

Range statement

Distortion prevention/control techniques - Jigs, fixtures, heat, clamps, etc.

Components - General fabricated components in either plate, pipe and section or sheet

Alignment - Typical structural alignment and levelling using planes and line straight edges, spirit levels, line levels, squares, etc.

Fixing/joining techniques - Welding, adhesives, fasteners, rivets, etc.

Codes/standards - All work carried out in accordance with legislative and regulatory requirements

Unit E19 Repair/replace/modify fabrications

Performance criteria

a. Assess and process repair, replacement, modification requirement
   - Work requirements are determined from job sheet, instruction or visual inspection.
   - Specifications and drawings are obtained and interpreted where required.
   - *Fabrication is inspected* and suitability for repair/replacement/modification determined.

b. Assess and process material requirements
   - Material requirements are assessed in accordance with relevant codes, manufacturers' specifications and standard operating procedures.
   - Materials are obtained/requisitioned according to standard operating procedures.
   - Tool and equipment requirements are assessed and obtained, where required, according to standard operating procedures.

c. Prepare materials
   - Fabrication for repair/replacement and/or modification is prepared to specification using acceptable workplace practices, tools and equipment.
   - Materials are *marked out* and prepared to specifications with minimum wastage using correct principles, tools, equipment and procedures.
   - Materials are cut, bent, rolled, shaped or formed to specifications using appropriate fabrication techniques/procedures, tools and equipment.
   - Where required, items are *marked for identification.*

d. Repair, replace or modify fabrication
   - Using suitable *clamping methods*, equipment, jigs and fixtures, materials are positioned/clamped for welding.
   - Pre-tack checks are undertaken and compliance with specifications is determined prior to tack welding in position.
   - *Welding equipment* is prepared and settings are adjusted according to requirements.
   - Immediate work site environment is checked to ensure compliance with safety requirements and procedures.
   - Material or item is tack welded using appropriate distortion minimisation techniques and procedures.
   - Material or item is checked against specifications prior to welding.
   - Material or item is welded to specifications using techniques and procedures appropriate to job requirements.

e. Finish and inspect repair, replacements and/or modification
   - Repair, replacement and/or modification is cleaned and finished to specifications using appropriate workplace practices.
   - Welds are visually inspected to assess weld quality against predetermined specifications.
   - Completed repair, replacement and/or modification is assessed against specifications.
   - Maintenance report is prepared and lodged according to standard operating procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- visually inspecting fabrication for defects, faults, and compliance
- marking out
- minimising wastage of materials
- cutting, bending, rolling, shaping or forming materials
- positioning and clamping materials for welding
- undertaking pre-welding/tacking checks
- setting up and adjusting welding equipment
- tack welding
- welding according to all relevant codes, and specifications
- cleaning and finishing materials/fabrication
- reading and interpreting job sheets, specifications, drawings, standard operating procedures, manufacturer
- documentation and other literature to the level required by this unit
- assessing material and equipment requirements
- using measuring skills for preparing and marking out materials and for checking modification against specifications
- completing short reports using relevant terminology and format

Required knowledge
Look for evidence that confirms knowledge of:

- applicable industry standards, national standards, workplace safety guidelines, local regulatory codes of practice/standards
- characteristics of faults, defects and or non-compliance
- means of rectifying faults, defects and/or non-compliance by rework or additional work, or by replacement of components/materials
- effects of proposed modifications on the fabrication
- reasons for selection of specific materials, tools, equipment and consumables
- marking out principles, techniques
- material preparation processes
- clamping method(s) for the welds undertaken
- location of all materials to be welded
- weld specifications
- equipment, consumables and settings required to achieve the weld specification
- distortion minimisation procedures and methods for rectifying any distortion of materials
- material cleaning and finishing processes for the repair/replacement/modification
- reporting requirements
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and hazard control measures associated with repairing, replacing or modifying fabrications

Range statement

Fabrication inspected - Determine defects/faults, non-compliance with specifications, repair/replacement/modification

Marked out - Marking out principles, techniques

Marked for identification - To undergo repair, replacement and/or modification, to be cut, bent, rolled, shaped or formed to specifications

Clamping methods - Automatic, semi-automatic, manual methods

Welding equipment - MMAW, GMAW, GTAW

Unit E20 Manually finish/polish materials

Performance criteria

a. Select appropriate finishing/polishing procedure
   - Surface *finish* specifications are understood and appropriate finishing/polishing method/technique is selected for the work requirements.
   - Appropriate *finishing/polishing equipment/media* is selected for the work *material* and work requirements.

b. Install and set up grinding and polishing devices
   - Endless belt finishers are fitted according to standard operating procedures.
   - Grinding wheels and mops are fitted and dressed according to standard operating procedures.
   - Polishing mops are installed and set up according to standard operating procedures.

c. Identify job materials
   - Common metals, alloys and non-metals are identified.

d. Identify job surface condition
   - Common surface imperfections are identified.

e. Assess processing hazards associated with work piece size and shape
   - *Hazards* are correctly identified.
   - Correct safe working procedures are followed.

f. Grind, finish, brush and/or polish job
   - Job surface is *finished* to specification according to standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- reading and following information on standard operating procedures
- checking and clarifying task-related information
- selecting appropriate polishing/finishing method to suit work requirements
- fitting and adjusting endless belts on finishing machines
- fitting and dressing grinding wheels and mops on pedestal grinders
- installing and setting up polishing mops in polishing machines
- producing surface finishes to specification
- identifying surface imperfections
- assessing processing hazards

Required knowledge

Look for evidence that confirms knowledge of:

- typical surface finish specifications within the scope of this unit
- procedures, tools and techniques for fitting and adjusting endless belts on finishing machines
- procedures, tools and techniques required to fit and dress grinding wheels and mops
- procedures tools and techniques for installing and setting up polishing mops
- characteristics of common metals, alloys and non-metals
- appropriate polishing media to be used in finishing/polishing for different types of materials
- effect of different types and grades of polishing media on the surface finish
- finishing and polishing methods/techniques
- reasons for selecting a specific method/technique
- common surface imperfections/defects
- surface imperfections/defects that can be removed/repaired by manual finishing/polishing procedures
- procedures for handling components with surface imperfections/defects that cannot be removed/repaired
- methods and techniques to check for conformance to specifications
- hazards associated with the manual finishing/polishing process
- personal protective clothing and equipment
- safe work practices and procedures

Range statement

The range statement provides information about the context in which the unit of competency is carried out.

Finish - Brightness, texture, roughness comparison

Finishing/polishing equipment - Endless belt grinders; table finishers; pedestal grinders and polishers; felt wheels, fabric mops and brushes with underhand and overhand techniques; flexible drive appliances; buffing compounds; cutting compounds and abrasive belts

Finishing/polishing media - Solid and liquid compositions containing alumina, silicon carbide, diamond dust, tripoli, calcium oxide and iron oxides

Material - Cast iron, steel, zinc and its alloys, copper, aluminium and its alloys, bronzes, sterling silver, gold and plastics

Common surface imperfections - Pitted surface, machining lines, scale, rust

Hazards - Airborne dust inhalation, unsecured components

Unit E21 Prepare surfaces using solvents and/or mechanical means

Performance criteria

a. Determine job requirements
   - *Surface preparation* requirements are determined from job sheet, instructions or other predetermined specifications in accordance with standard operating procedures.
   - Where required, appropriate *solvent* and *solvent application* are selected to meet job specification.
   - Where required, appropriate *mechanical equipment* is selected to meet job specification.
   - Work site is prepared for surface cleaning activities.

b. Set up equipment
   - Appropriate equipment and any required *consumables* are assembled, set up and prepared correctly and safely in accordance with manufactures' specifications and standard operating procedures.

c. Prepare surfaces using solvents as required
   - Safe working environment for solvent use is established according to regulatory requirements and standard operating procedures.
   - Solvents are applied correctly.
   - Treated surface is neutralised and made safe to handle.

d. Prepare surfaces using mechanical means as required
   - Safe working environment for mechanical surface preparation is established according to regulatory requirements and standard operating procedures.
   - Surfaces are prepared using mechanical means.
   - Mechanical equipment is cleaned and checked for damage and operational faults, in accordance with standard operating procedures.
   - Equipment faults are recorded and reported in accordance with standard operating procedures.

e. Inspect prepared surface
   - Surface preparation is checked for cleanliness and conformance to specifications.
   - Faults or defects are rectified where required and recorded/reported in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- planning and sequencing operations
- preparing surfaces using solvents as required
- preparing surfaces using mechanical means
- setting up equipment and consumables
- meeting all safety requirements
- using solvents correctly
- neutralising solvents
- using mechanical equipment to prepare surface
- maintaining mechanical equipment
- recording and reporting of faults
- inspecting prepared surface
- rectifying work performed
- checking for conformance to specifications
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instructions
- applying measurement skills needed to meet the requirements of this unit
- entering routine and familiar information onto proformas and standard workplace forms

Required knowledge

Look for evidence that confirms knowledge of:

- common surface contaminates, conditions
- reasons for selecting solvents
- mechanical equipment required
- procedure for setting up equipment
- specifications applying to the surface to be prepared
- methods for neutralising solvents
- tools, equipment, abrasives and other materials

- procedures for maintaining/storing mechanical equipment
- procedures for recording/reporting faulty equipment
- procedures checking prepared surfaces
- rectification techniques
- use and application of personal protective equipment
- safe work practices and procedures
- relevant hazards and control measures related to the competency

Range statement

Surface preparation - New surfaces and restoration work

Solvents - A range of cleaning chemicals including acids, chlorinated solvents and hydrocarbons

Solvent application methods - Spraying, wiping, brushing, vapour degreasing etc.

Mechanical equipment - Finishers, grinders, polishers, sanders, blast device, enclosures, air grinders etc.

Consumables - Emery cloth/belts, grinding/sanding disks, grinding accessories etc.

Unit E22 Prepare surfaces by abrasive blasting

Performance criteria

a. Determine job requirements
   - Work requirements are determined from job sheet, instructions or other predetermined specifications in accordance with standard operating procedures.
   - Appropriate abrasive *blasting process*, equipment and *blasting media* are identified to meet job specification.
   - Work site is prepared for surface cleaning activities.

b. Set up equipment
   - Appropriate equipment and any required consumables are assembled, set up and prepared correctly and safely in accordance with manufactures' specifications and standard operating procedures.
   - Correct *rust inhibitor* for use in wet abrasive blast methods is selected where required.
   - Pre-operational checks are carried out on equipment and faults and are rectified or reported for further action.

c. Prepare surfaces using abrasive blasting
   - *Blasting equipment* is operated in accordance with standard operating procedures.
   - Emergency shut-down procedures can be undertaken.
   - Work procedures are undertaken to appropriate environmental requirements.
   - Abrasive media disposal is carried out in accordance with standard operating procedures.
   - Blasting equipment is cleaned and disassembled and inspected in accordance with manufacturers' specifications and standard operating procedures.
   - Equipment faults are recorded and reported in accordance with standard operating procedures.

d. Inspect prepared surface
   - Surface preparation is assessed for cleanliness and conformance with specifications.
   - Faults or defects are rectified where required and inspection results are recorded and reported in accordance with standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- planning and sequencing operations
- undertaking numerical operations within the scope of this unit
- selecting blasting equipment and media
- setting up equipment and consumables
- selecting rust inhibitor
- conducting pre-operational checks
- preparing surfaces using abrasive blasting
- disposing of abrasive media
- maintaining blasting equipment
- identifying, recording and reporting of faults
- inspecting prepared surface
- performing rectification work
- checking for conformance to specifications

Required knowledge

Look for evidence that confirms knowledge of:

- reason for selecting the chosen sequence of operations
- blasting equipment and media required
- equipment, consumables for various methods
- importance of using an appropriate rust inhibitor
- process for undertaking pre-operational checks
- procedures or using abrasive blasting equipment
- procedures for abrasive media disposal
- procedures for maintaining and storing blasting equipment
- recording/reporting procedures; faulty equipment
- checking prepared surfaces
- rectification techniques
- safe work practices and procedures
- hazards and control measures related to abrasive blasting

Range statement

Blasting processes - Surface preparation using propelled abrasives including water, air steam, grits and blasting mediums

Blasting media - Abrasives, shot, glass beads, sand, steel shot, garnet, and other mediums accepted by industry and all regulatory bodies

Rust inhibitor - A substance which, when added to a corrosive liquid in small amounts, reduces the rate of corrosion

Blasting equipment - Electric and diesel compressors, blast pots, blast rooms, centrifugal blast machines, water pressure washers to 35,000 kpa, air hoses and nozzles, and specified hand and power tools, etc.

Unit E23 Pre-treat work for surface coating

Performance criteria

a. Identify job material
   - *Common metals*, alloys and non-metals can be identified.

b. Identify job surface condition
   - Common *surface soils and conditions* can be identified.

c. Perform pre-treatment processes in correct sequence
   - *Pre-treatment processes* are carried out to standard operating procedures.
   - Pre-treatment *process parameters* are monitored to ensure they remain within specified limits.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- reading and following routine and familiar information on standard operating procedures

- recognising common surface soils and conditions from given samples
- carrying out appropriate pre-treatment processes
- monitoring and maintaining the pre-treatment process parameters within specified limits
- following verbal instructions
- orally reporting routine information

Required knowledge
Look for evidence that confirms knowledge of:

- characteristics of common metals, alloys and non-metals and procedures and techniques for identifying them
- common surface soils and conditions
- procedures for identifying the type(s) of soil on surfaces to be finished
- simple tests that can be used to assist in identifying surface soils and conditions
- pre-treatment processes applicable to a range of materials, surface soils and conditions
- procedures for carrying out pre-treatment processes
- parameters and procedures for monitoring pre-treatment processes
- hazards and control measures associated with pre-treatment
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Common metals - Steel, copper, brass, zinc, cast iron, stainless steel

Surface soils and conditions - Oils, greases, drawing compounds, cutting lubricants, buffing lubricants, rust and scale

Pre-treatment processes - Solvent degreasing, alkaline cleaning, pickling, acid dipping

Process parameters - Temperature, time, currents, solution concentrate

Unit E24 Finish work using wet, dry and vapour deposition methods

Performance criteria

a. Assess and prepare components for required *coating* process
   - Coating specifications are identified from operation sheets/work procedures.
   - Suitability of pre-treated components for finishing process is checked according to enterprise procedures.
   - Components are *prepared* as required for finishing application.
   - Components are positioned/located for finishing according to enterprise procedures.

b. Perform simple mixing and estimating operations
   - Mixing ratios are calculated and a range of wet coatings are mixed and thinned as required to standard operating procedures.
   - Required coating quantities are estimated using simple surface area calculations.

c. Perform *coating operation*
   - Equipment is set up to specification using standard operating procedures.
   - Coating and applied curing technique are monitored to standard operating procedures.
   - Coating application, thickness and colour are checked and maintained for compliance with specifications.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- obtaining all relevant drawings, specifications and/or instructions in accordance with work place procedures
- racking the components to be coated correctly in accordance with standard operating procedures
- calculating the correct mixing ratios for given wet coatings accurately
- where appropriate, mixing and thinning the given wet coatings
- calculating the surface area to be coated correctly
- where appropriate, estimating the quantities of wet coating materials correctly
- setting up the appropriate coating equipment
- applying the coating correctly using the appropriate technique
- curing the coating correctly using the appropriate technique
- maintaining the coating thickness and colour in accordance with specifications throughout the coating operation
- checking the coating thickness and colour
- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations
- checking and clarifying task-related information
- checking for conformance to specifications
- performing numerical operations, geometry and calculations/formulae within the scope of this unit

Required knowledge

Look for evidence that confirms knowledge of:

- work to be undertaken
- coating process to be used
- coating specifications
- appropriate type of racking for the coating process
- reasons for selecting the chosen rack type
- procedures for racking components to be coated
- source of data on mixing ratios for wet coatings
- mixing ratio for the given task(s)
- function of thinners as applied to the application of wet coatings
- procedures to be followed when mixing wet coatings
- surface area to be coated
- coverage rate of the coating material to be applied
- procedures for estimating quantities of coating materials
- types of equipment used for a variety of coating processes
- appropriate coating equipment for the given task(s)
- reasons for selecting the chosen equipment
- operating procedures applicable to the selected coating equipment

- a range of coating techniques
- a range of curing techniques
- appropriate coating and curing technique for the given task(s)
- reasons for selecting the chosen coating and curing techniques
- monitoring procedures to be followed
- examples of coating defects
- the causes of coating defects
- where appropriate, procedures for rectifying coating defects
- where appropriate, procedures for reporting coating defects
- coating thickness and colour to be achieved
- the means of checking coating thickness and colour
- frequency at which checks are undertaken
- hazards and control measures associated with finishing work using wet, dry and vapour deposition methods, including housekeeping
- safe work practices and procedures
- use of personal protective equipment

Range statement

Coating - Electrostatic powder coating, electrophoretic coating, industrial spray coating and lacquering, electroless (auto catalytic) nickel or copper plating, phosphating, chromating, galvanising, hot tinning, sputter deposition, vacuum evaporation, ion plating, paints, stains and other liquid finishes

Prepared - Visual inspection for contamination, masking out, racking, identification of correct materials to be used, ensuring cleanliness of work area and equipment, operational testing of equipment

Coating operation - Spray application, dip coating

Unit E25 Produce clear and/or coloured and/or sealed anodised films on aluminium

Performance criteria

a. Perform a series of *anodising steps*
   - All steps are carried out in the correct sequence to standard operating procedures.
   - *Masking techniques* are correctly applied, where required.
   - Contact marks and shielding are minimised.

b. Assess preparation of work for correct jigging/loading
   - Work is correctly connected for the required current flow and minimum contact marks and shielding.
   - All incorrectly loaded work is rejected.

c. Anodise work by a series of treatment steps
   - All steps are carried out in the correct sequence to standard operating procedures.

d. Seal or dye and seal anodised work
   - All steps on work are carried out in the correct sequence to standard operating procedures.

e. Monitor and control operating parameters
   - *Process parameters* are maintained within specified limits.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading and following routine and familiar information on standard operating procedures
- following all steps in the anodising process
- applying the correct masking materials and techniques
- minimising contact marks and shielding
- correctly connecting the work to the required electrical current
- identifying incorrectly loaded work
- maintaining process parameters within specified limits
- following verbal instructions
- orally reporting routine information

Required knowledge
Look for evidence that confirms knowledge of:

- process for anodising aluminium
- materials, techniques and procedures for masking materials during anodising
- causes of contact marks and shielding during the anodising process
- procedures for minimising contact marks and shielding
- procedures for connecting the work to the required electrical current
- the electrical current required for the anodising process
- methods for correctly loading work
- examples of incorrectly loaded work
- reasons for rejecting incorrectly loaded work
- steps to be carried out in the seal/dye and seal process
- procedures and reasons for monitoring and maintaining the process parameters within the specified limits
- hazards and control measures associated with anodising operations, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Anodising steps - Pre treatment, anodising, dyeing, sealing

Masking techniques - Taping, waxing

Process parameters - Temperature, current density, time

Unit E26 Apply protective coatings

Performance criteria

a. Determine job requirements
   - Work requirements are determined from job sheet, instructions, drawings or visual inspection.
   - Required protective coating materials are identified according to job specification.
   - Required protective coating application equipment is identified according to job requirements.
   - Work site is prepared for application of protective coating.

b. Work piece prepared for application of protective coating
   - Surface condition is inspected for readiness for application of protective coating according to specification.
   - Unsuitable work pieces/surfaces and fabrication defects are identified and appropriate remedial action or reporting is undertaken in accordance with standard operating procedures.
   - Components are masked where protective coating application is not specified.
   - Conditions for overspray are identified.

c. Equipment prepared for application of surface coating materials
   - Required plant and equipment basic operations are understood.
   - Routine maintenance is undertaken on plant and equipment in accordance with standard operating procedures.
   - Status/reports are recorded by proforma or orally in accordance with standard operating procedures.
   - Conventional coating application equipment is assembled in accordance with equipment requirements and standard operating procedures.

d. Apply single pack coatings
   - Coating product type, solvent, uses, mixing procedure, clean-up and safety requirements are identified as appropriate.
   - Correct method of determining wet film thickness in accordance with specified dry film is demonstrated.
   - Coating material is thinned to suit the application method and to achieve required film thickness.
   - Coating is applied using specified application method and standard operating procedures.
   - Coating schedules can be outlined for metal and non-metal materials.
   - Coating application and curing technique are monitored according to standard operating procedures.

e. Clean and store equipment
   - Conventional coating application equipment is cleaned, disassembled and inspected for damage.
   - Faulty equipment is recorded and reported to appropriate personnel in accordance with standard operating procedures.
   - Coating application equipment is stored in accordance with standard operating procedures.

f. Inspect finish surface
   - Surface finish is assessed for profile size differences and uses.
   - Coating thickness is determined using appropriate instruments and results are compared with job specifications.
   - Total surface is inspected for conformance to specification in accordance with standard operating procedures.
   - Inspection results are recorded and reported in accordance with standard operating procedures.

g. Select and maintain personal protective equipment
   - Appropriate *personal protective equipment* for coating application is selected according to job requirements and standard operating procedures.
   - Personal protective equipment is used appropriately in accordance with manufacturers' specifications and standard operating procedures.
   - Ancillary support attachments are identified and used.
   - Personal protective equipment is maintained in accordance with manufacturers' specification and standard operating procedures.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- obtaining all relevant drawings, job sheets, specifications and instructions in accordance with workplace procedures
- considering all relevant information and job requirements
- preparing site with due regard to OH&S requirements including site safety, clear working space, other
- materials/structures/personnel in the vicinity, isolation of work site where required
- undertaking comprehensive inspection and considering specifications during inspection
- using standard workplace procedures to identify, select and apply the appropriate treatment or actions to rectify items with surface or fabrication defects
- identifying surface required as 'no paint areas' and protecting these using standard masking procedures and techniques
- undertaking precautions to prevent overspray in the workplace using standard procedures
- undertaking routine maintenance on plant and equipment in accordance with standard operating procedures
- preparing all required maintenance records/reports and details communicated
- assembling equipment in accordance with manufacturers' specifications and standard operating procedures
- identifying coating type and appropriate solvents and standard workplace procedures required for mixing processes, clean-up and safe handling
- using workplace procedures for determining the wet film thicknesses of a coating from the specified dry film thickness
- calculating required thickness in accordance with product volume solids
- applying standard operating procedures for thinning coating materials and applying the specified film thickness coating to a substrate
- applying protective coating to comply with an established standard using specified methods and standard operating procedures
- controlling coating application and curing techniques using standard operating procedures
- undertaking disassembly, cleaning and checking for functionality of spraying equipment and associated items in accordance with standard operating procedures
- using standard operating procedures to report on any damage or faulty parts and communicating with appropriate personnel
- following procedure for storage including any hazard reduction and/or protection of equipment and components
- checking surface condition of the work piece, including profile size properties and problems according to standard operating procedures and other acceptable standards
- determining thickness using mechanical, electronic or other appropriate instruments and testing results compared with job specifications, drawings etc
- undertaking comprehensive inspection as required by standard operating procedures

- preparing all required inspection records/reports and details communicated
- selecting personal protective equipment suitable for applying protective coatings
- using appropriate personal protective equipment in workplace operations in accordance with standard procedures
- selecting the appropriate supports to use with personal protective equipment in standard operational practices
- checking personal protective equipment items for serviceability in accordance with manufacturers' specifications
- recording and reporting faulty items to appropriate personnel using standard workplace procedures

Required knowledge

Look for evidence that confirms knowledge of:

- work to be undertaken and specifications applying to the work
- correct interpretation of all relevant information
- safety issues, adequate precautions, awareness of other site factors that could be affected by the work
- deviation from specified surface finish/condition
- standard workplace procedures for identifying unsuitable work items
- method of locating areas to be protected from coating process and masked
- the areas subject to overspray and requiring protection
- operation of plant and equipment using standard operating procedures
- standard operating procedures for plant and equipment maintenance
- the requirements for completion and processing of maintenance reports
- assembly specifications and procedures
- workplace procedures for identifying coating types and processing solvents, mixing and safe handling practices
- the workplace procedures for determining the wet film thickness of a coating from the specified dry film thickness
- calculations using a specified formulation
- standard operating procedure for thinning coating materials for use in applying the specified film thickness coating to a substrate
- standard operating procedures to apply protective coatings to comply with an established standard
- procedures for controlling coating application and curing techniques
- standard operating procedure for disassembly, cleaning and checking
- standard operating procedures for recording and reporting defective parts
- standard operating procedures for storage and protection of equipment
- standard operating procedures and other relevant standards for assessing the profile of the surface finish
- dry film thickness testing instruments
- standard operating procedures for surface inspection, including the extent and detail of inspection as required
- requirements for completion and processing of inspection reports
- standard procedure for identifying and selecting the required personal protective equipment
- the workplace standard procedure for the use of personal protective equipment
- the use and selection of appropriate supports to use with personal protective equipment in standard operational practices

- standard procedures and manufacturers' specifications for inspecting and maintaining personal protective equipment in the workplace
- hazard and control measures associated with applying protective coatings (basic) including housekeeping
- safe work practices and procedures

Range statement

Personal protective equipment - Includes hand protection, full body protection, respirators, air fed hoods and foot protection. Noise and heat protection may also be necessary

Unit E27 Electroplate protective finishes

Performance criteria

a. Select treatments and processes/equipment for producing protective finishes
   - *Treatment processes* are selected appropriate to the work requirements.
   - *Process parameters* are selected to achieve required finish.
   - Appropriate *equipment* is selected to achieve specified finish.

b. Monitor and control protective finish processes and operating conditions
   - *Operating/process parameters* are set to produce required protective finish/specifications.
   - Surface condition of finished components is monitored and confirmed and abnormalities are identified.
   - Corrective actions are taken to rectify nonconforming conditions.
   - Pre-treatment processes are carried out, where applicable.

c. Maintain solutions for protective finishes
   - Solution compositions are checked and confirmed to specification/ operating range.
   - *Adjustment* requirements/additions are identified.
   - Additions are made to adjust solution composition to correct operating range.
   - *Purification* procedures are carried out as necessary.
   - *Anodes* are maintained to ensure correct operation.

d. *Maintain equipment* for protective finishes
   - Performance of ancillary equipment is checked and remedial actions are taken as necessary.
   - Electrical contacts are maintained.
   - Process transfer equipment is maintained.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.

- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- monitoring and maintaining:
  conformance to thickness specifications
  anode/cathode ratio
  impurities/contamination
  performance of various ancillary equipment
  condition of electrical contacts
  condition of racks, jigs and barrels
  condition of rack coating
  cathode contacts
- assessing material condition for suitability for plating
- calculating/measuring: current and processing time concentration and pH of solutions required chemical/solution additions
- making selections of: correct treatment processes correct process parameters correct equipment
- taking corrective action
- adjusting solutions/times/reprocessing or additional processing
- carrying out appropriate mechanical/chemical pre-treatment
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings
- following oral instructions
- performing calculations using formulae

Required knowledge

Look for evidence that confirms knowledge of:

- effects of plating process on different materials
- basic principles of chemistry, electro chemistry and
- metallurgy related to the process including:
  importance of maintaining satisfactory electrical contact
  methods for detecting unsatisfactory contact
  effects of build-up on cathode contacts
  properties of different base materials
  different pre-treatment processes and their application
  process parameters and their relation to each other
  differences between chromate conversion coatings
- types of defects, their causes and related corrective actions
- mechanical/chemical pre-treatment processes
- the purpose and application of simple tests including pH and concentration

- operating parameters of solutions including temperature, agitation rate and similar parameters
- acceptable appearances for each stage of operation and common abnormalities
- application of different equipment to the type of work processed and correct operation and cleaning requirements (e.g. of cleaning filters)
- solutions, solution compositions and operating ranges for processes relative to protective finishes, including cleaning/pre-treatment , electroplating and post treatment
- procedures for testing plate thickness
- safe working procedures for handling chemicals relative to protective finishes and for safely adding to baths
- procedures for measuring out materials eg use of scales, volumetric measurement devices
- level of impurities and permissible limits, effects of impurities and purification procedures for protective finish solutions
- different anode arrangements including use of baskets and bags, conforming anodes
- correct operation of anodes and appropriate remedial action
- effect of maintenance schedules on plant performance and performance requirements and basic maintenance checks for rectifier, bus bars, agitation, heating/cooling, extraction and tank linings etc.
- use and application of personal protective equipment
- relevant hazards and control measures related to the competency

Range statement

Treatment processes - Zinc, zinc alloys and tin

Process parameters - Dwell time, current density, current temperature

Equipment Wire racks, handling equipment, barrels, jigs, shields, robbers, etc.

Operating process parameters - Calculation and setting of treatment times and currents, bath pH, temperatures and densities, solution levels and compositions, purification procedures

Maintain solutions - Typical tests for pH and concentration, calculation of adjustments to relevant solutions

Adjustment - Strength of solutions, temperature range

Anodes - Soluble, insoluble auxiliary anodes, etc.

Maintain equipment - Anode condition, electrical contacts etc.

Functional Area F – Equipment servicing and maintenance

Unit F1 Inspect pre-packed articles

Unit F2 Perform verification/certification or in-service inspection

Unit F3 Maintain and overhaul mechanical equipment

Unit F4 Perform equipment condition monitoring and recording

Unit F5 Shut down and isolate machines/equipment

Unit F6 Maintain tools and dies

Unit F7 Maintain pneumatic systems

Unit F8 Maintain hydraulic systems

Unit F1 Inspect pre-packed articles

Performance criteria

a. Explain the requirements of trade measurement legislation relating to prepacked articles
   - *Legislative requirements* that apply to pre-packed articles are explained.
   - Approved markings as they apply to all prepacked articles intended for sale are described.

b. Inspect pre-packed articles for compliance with marking requirements
   - Pre-packed articles are examined for the marking of quantity statements and unit pricing in accordance with legislative requirements.
   - Pre-packed articles are examined for the marking of packer identification.
   - Results of examination are documented for further action.

c. Measure pre-packed articles
   - Articles are selected for check measuring in accordance with marketplace intelligence, legislative requirements and organisational procedures.
   - Product handling and disposal requirements are assessed and complied with in accordance with *workplace, health and safety requirements, environmental considerations* and public sector auditor's requirements.
   - *Specialised equipment and measuring devices* are selected in accordance with organisational procedures.
   - Articles are check measured in accordance with organisation's procedures to determine compliance with legislation.
   - Results of check measurements are documented for further action.

d. Finalise inspection and take appropriate action
   - Trading practice information relevant to the inspection is communicated to the trader.
   - Approved procedures to remedy non-compliance are determined and applied.

- *Inspection documentation* is completed in accordance with organisational procedures.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- applying relevant sections of the legislation to prepacked articles
- measuring pre-packed articles
- assessing quantity and unit pricing statements, for compliance with legislation
- comparing marking of packer identification, against legislation
- recording marking non-compliance accurately for further action
- interpreting marketplace intelligence
- safely handling and disposing of products in relation to measuring pre-packed articles
- documenting check-measurement results and non-compliances in accordance with organisational guidelines
- checking the accuracy and suitability of the measuring devices
- discussing trader's enquiries and concerns
- explaining legislative requirements to traders
- completing legal documentation
- planning follow-up activities

- recording results of the inspection accurately in organisation's information files
- making clear and accurate recommendations

Required knowledge
Look for evidence that confirms knowledge of:

- definition of 'pre-packed articles'
- relevant sections of legislation across a range of pre-packed articles
- the range of packing types
- quantity statement or measurement marking form, size and position
- pre-packed articles exempted from the requirements of legislation
- all symbols for units of measurement
- application of qualifying statements
- pre-packed articles exempted from marking packer identification
- how to identify origin of packing
- marketplace intelligence, legislative requirements and organisational procedures in relation to selecting pre-packed articles
- the impact of environmental factors on pre-packed articles
- use of protective clothing and equipment
- checking of hazardous product data sheet
- the organisation's policy and procedures
- the accuracy and suitability of the measuring devices used to check pre-packed articles
- procedures for determining the measurement method of pre-packed articles
- the number of articles to check-measure in accordance with legislative requirements
- methods of determining the tare weight of packages
- responding to trader's enquiries
- advising the trader
- accurate wording of notices
- legislative requirements and obligations for the issuing of notices
- organisation's guidelines for return visits
- specific reporting procedures

Range statement

Legislation requirements and *policy guidelines* - enabling legislation, organisational policies and procedures – workplace, health and safety, environmental legislation, enforcement policies, auditor's instructions

Workplace, health & safety requirements - storage of test equipment, site/premise conditions, handling of dangerous materials, safety clothing, manual handling techniques, product disposal, transportation of test equipment

Environmental considerations - disposal of hazardous materials, weather conditions, storage methods and conditions

Specialist equipment and measuring devices - reference standards and test equipment, safety equipment, product handling equipment, measuring equipment

Inspection documentation - organisational forms, notices, field books, product handling sheets, evaluation form or report

Unit F2 Perform verification/certification or in-service inspection

Performance criteria

a. Describe the design and application of basic components in trade measuring instruments
   - The fundamental operating features for a range of measuring instruments are identified.
   - The purpose of major components within the range of measuring instruments is described.

b. Determine the type of inspection required for a range of measuring instruments
   - Instrument is assessed to determine whether a verification/certification or in-service tolerance is to be applied for inspection.
   - The processes required for both the verification/certification and in-service of a *range of measuring instruments* are explained.
   - Appropriate tolerances are identified for the determined inspection.

c. Perform inspection of measuring instruments to determine compliance
   - The operating environment of the instrument is analysed and *monitored* to determine its impact on the instrument.
   - Sources of any possible operational error in the use of measuring instruments/systems are identified.
   - *Specialised equipment* is selected and used in the prescribed manner for the inspection.
   - Inspection of measuring instrument is conducted in accordance with appropriate test procedures, *legislation and policies, and workplace, health and safety considerations.*

d. Finalise inspection and take appropriate action
   - The appropriate action to be undertaken is determined and implemented
   - Performance trends of particular models of measuring instruments are identified and reported.
   - The information is *recorded* in the organisation's information system.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor’s reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- examining instruments for existing verification/certification marks
- identifying operational errors relevant to the type of instrument being tested
- selecting and correctly using the test equipment
- testing measuring instruments
- preparing technical reports relating to verification/certification or in-service inspection
- completing files

Required knowledge
Look for evidence that confirms knowledge of:

- the major components and functions of an instrument
- the purpose of major components and functions of an instrument
- differences in the application of tolerances being applied
- process variations between verification/certification and in-service inspection
- appropriate tolerances for a range of measuring instruments
- environmental factors that may not result in an instrument rejection but other remedial actions
- specialised equipment that may be required from other organisations
- the action to be taken where a conflict occurs between uniform test procedures and those test procedures contained in certificates of approval
- removal of verification/certification marks is impractical on some instruments and the appropriate action to be taken in these circumstances
- methods to monitor performance trends

Range statement

Range of measuring instruments - length of measures and measuring instruments, area measuring instruments, measures of volume, liquor measuring instruments, liquid measuring instruments, weighing instruments, milk tanks, vehicle tanks, liquefied gas flow meters, electronic metering systems, natural gas flow meters, dimensional measuring instruments, supplementary measuring instrument, auxiliary devices

Monitoring - specific test equipment, random inspections, surveillance, complaint inspection, comparison/analysis of data over time, collation of statistical information, auditing of servicing licensees

Specialised equipment - reference standards, safety equipment, product handling equipment, test equipment, specialised test equipment vehicles

Legislation and policies - enabling legislation, organisational policies and procedures, workplace, health and safety, environmental legislation, enforcement policies, conditions of licence

Workplace, health and safety considerations - storage and transportation of test equipment, site/premises conditions, specific safety equipment and clothing, manual handling techniques

Recording documentation - non-compliance notices, reflect/incorrect notices, fees, organisational reporting forms

Unit F3 Maintain and overhaul mechanical equipment

Performance criteria

a. Perform preventative maintenance tasks and adjustments
   - Preventative maintenance schedule is read and task requirements are determined.
   - Appropriate maintenance principles and techniques are used and *routine maintenance tasks* are performed on mechanical equipment, components or sub-assemblies using correct tools, equipment and procedures.
   - Mechanical equipment, components, sub-assemblies are checked visually and with *test equipment*, using prescribed procedures and safety requirements to ensure correct function or determine malfunction.
   - Adjustments are made to equipment or components to ensure specifications are met using acceptable *fitting techniques and procedures*, observing all safety requirements.

b. Diagnose and locate faults
   - Equipment component function is determined by reference to engineering drawings, technical manuals and or consultation with appropriate personnel.
   - Maintenance reports are checked, reviewed and faults are diagnosed.
   - Consultation with operators and other relevant plant personnel is carried out to assist in locating faults.
   - Where appropriate, test equipment is selected and applied in accordance with defined requirements and procedures to assist fault location.
   - Fault condition is diagnosed and localised at component level using appropriate test equipment and procedures.
   - Faulty condition is evaluated and appropriate corrective action is taken.
   - Faults are documented to standard operating procedures.

c. Repair or overhaul mechanical system
   - Machine or equipment is isolated safely or checked for isolation.
   - Faulty equipment, component or sub-assembly is removed from system using appropriate engineering principles, tools, equipment and procedures.
   - Replaceable items are selected from manufacturers' catalogues and obtained by appropriate means.
   - Correct repair procedure, tools and equipment are selected and prepared for use on serviceable items.
   - Using appropriate engineering principles, designated procedures, correct tools/equipment and safe workshop practices, serviceable items are repaired or overhauled to manufacturers' or site specifications.
   - Components are checked with precision instruments to ensure conformance to specifications where applicable.

d. Fit and adjust mechanical equipment
   - All electrical, safety and site requirements are adhered to throughout the maintenance cycle.
   - Maintenance report is completed to standard operating procedures and conveyed to designated personnel.

- Fitting requirements are determined and sequential assembly planning is carried out where applicable.
- Sound fitting principles and techniques are applied in the preparation and assembly of component parts using fastening equipment and methods which ensure conformance to specifications, operational performance, quality and safety.
- Using acceptable maintenance practices, correct gland packing, jointing and gasket materials are selected and applied correctly in conformance to specifications and operational requirements.
- Correct lubrication requirements are determined by appropriate means and attended to where applicable using mechanical or manual applications.
- Appropriate wedges and levelling devices are used to level mechanical equipment as appropriate.
- Correct alignment and balancing functions are performed where appropriate.
- Final adjustments are performed on mechanical equipment to align to operational specifications using acceptable engineering principles, fitting techniques and procedures.
- Mechanical equipment is tested for accuracy and correct operation where applicable, and returned to service to specifications using acceptable procedures.
- Appropriate work and safety clearances are obtained throughout maintenance cycle.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- planning and sequencing of multiple tasks
- sourcing resources
- using diagnostic skills to check and test mechanical systems/equipment
- using communication skills to consult with operators and other relevant plant personnel to assist in locating faults
- making systematic operational adjustments
- checking system
- using language and literacy skills to enable all reporting requirements to be met including checking maintenance reports; documenting faults etc.
- reading and interpreting engineering drawings, technical manuals equipment component function

Required knowledge
Look for evidence that confirms knowledge of:

- preventative maintenance procedures
- functions of system/equipment and their operational requirements
- causes and symptoms of faults and failures
- system and equipment hazard identification and isolation procedures
- options for sourcing replacement parts
- consequences of incorrect adjustments
- procedures for testing the mechanical systems and equipment
- procedures for returning mechanical systems and equipment to service
- use and application of personal protective equipment
- safe work practices and procedures
- hazards and control measures associated with maintaining and overhauling mechanical equipment

Range statement

Routine maintenance tasks - checks for correct operation, lubrication, adjustments; repair to leaking glands

Test equipment - engineers level, laser alignments etc., and appropriate equipment for measurement of alignment, flatness, squareness, straightness, temperature, vibration, load deflection, noise level, RPM

Fitting techniques and procedures - appropriate fitting principles and techniques are utilised in the assembly/disassembly of component parts using fastening equipment and methods, e.g. dowelling, pinning and pegging, keying, thread production and repair, etc. which ensures conformance to specifications, operational performance, quality and safety. It also includes the straightforward removal and replacement of premanufactured bearings and seals and using acceptable maintenance procedures, appropriate lubrication, gland packing, jointing/gaskets, and seals. Materials are selected and applied in conformance to application requirements and specifications as applicable. Using acceptable workshop practices new components are manufactured including by marking out, drilling, scraping, filing, reaming, tapping or threading to specifications

Unit F4 Perform equipment condition monitoring and recording

Performance criteria

a. Undertake condition monitoring
- Principles and methods of equipment condition monitoring are understood and applied.
- Appropriate condition monitoring *technique* is selected to achieve required outcomes.
- Checks are undertaken correctly, safely and to standard operating procedures.
- Results are plotted and deviations from specification are reported to appropriate authority and recorded.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:
- reading, interpreting and following information on job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- planning and sequencing operations

- checking and clarifying task-related information
- applying correct principles for monitoring
- selecting appropriate technique for the situation
- following standard operating procedures
- recording results and preparing and submitting deviation reports

Required knowledge
Look for evidence that confirms knowledge of:

- the application of principles and methods for a variety of situations
- appropriate records for a variety of situations
- hazards and control measures associated with equipment monitoring, including housekeeping
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Technique may include - built-in systems (software and site displays), vibration monitors, infra-red and ultraviolet non-destructive testing

Unit F5 Shut down and isolate machines/equipment

Performance criteria

a. *Shut down* machine/equipment
- *Machine/equipment* operational function is determined and understood.
- Shut-down sequence is undertaken safely and to standard operating procedures.
- Machine/equipment is depressurised/emptied/deenergised/ bled to standard operating procedures.
- Safe shut-down of machine/equipment is verified.
- Safety/security lock-off devices and signage are installed to standard operating procedures.
- Machine/equipment is left in clean and safe state.

b. *Isolate* machine/equipment
- Machine/equipment operational function is determined and understood.
- Isolation methods and points are recognised and identified.
- Isolation is undertaken safely and to standard operating procedures.
- Safe isolation of machine/equipment is verified.
- Safety/security lock-off devices and signage are installed to standard operating procedure.
- Machine/equipment is left in clean and safe state.

Evidence

Context of assessment:
- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:
- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:
- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria,

including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill
Look for evidence that confirms skills in:

- reading, interpreting and following information on written job instructions, specifications and other applicable reference documents
- checking and clarifying task-related information
- entering information onto proformas and standard workplace forms
- shutting down machine/equipment
- purging/de-energising equipment
- installing safety/security lock-off devices and signage

Required knowledge
Look for evidence that confirms knowledge of:

- the operational function of the machine/equipment
- the shut-down sequence
- the procedures for shutting down and isolating the machine/equipment
- safety precautions for shutting down and isolating the machine/equipment
- procedures for purging/de-energising the machine/equipment and reasons for doing so
- procedures for verifying machine/equipment shut-down and isolation and reasons for verifying
- the safety/security lock-off devices and signage to be installed
- the reasons and procedures for installing lock-off devices and signage
- the reasons for ensuring the machine/equipment is left in a clean, safe state
- hazards and control measures
- use and application of personal protective equipment
- safe work practices and procedures

Range statement

Shut down/isolate - shut down/isolation means and includes isolation of mechanical, electrical drives, pipework (pressure) rotating equipment etc. utilising electrical lock-off isolators, mechanical and power driven valves etc. in accordance with standard operating instructions. Relevant regulations, standards and legislative requirements governing isolation and shut-down must be complied with.

Machine/equipment - manual, semi automatic and automatic machines of a standalone, continuous production or process nature

Unit F6 Maintain tools and dies

Performance criteria

a. Identify and analyse defects in tooling
   - Defects are determined from any of: production components produced, production reports or tool inspections.
   - Sequence of maintenance operations is planned.

b. Disassemble and assess tooling components
   - Tooling is disassembled, and condition of components against prints, drawings, manufacturers' drawings etc. is assessed.
   - Worn/damaged parts are replaced/reconditioned.

c. Obtain and prepare replacement materials
   - Materials are obtained to meet tooling requirements.

d. Manufacture/repair tooling components
   - Appropriate hand and hand held power tools are selected and used.
   - Appropriate machining process is chosen from a range of standard tool room machines.
   - Machining parameters are set to produce components to specification.
   - Where appropriate, heat treatment is initiated according to specification.

e. Assemble tooling components
   - Using acceptable tool making techniques and procedures, tooling components are checked and assembled correctly in conformance with specifications.

f. Measure production components
   - Production components are checked with precision instruments to ensure conformance to specifications as required.

g. Identify potential production/maintenance problems
   - Conditions leading to tooling failure are identified and recorded.
   - Recurrent faults are identified and solutions are initiated.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of

ways including direct observation, supervisor's reports, project work, samples and questioning.

- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- obtaining all relevant information with respect to defective tooling
- examining the defective tooling for breakage, wear, etc
- preparing a sequential plan for the repair/maintenance of the defective tooling and documenting the plan
- disassembling the defective tooling in accordance with acceptable tool making techniques and procedures
- obtaining all relevant drawings, specifications and sample products/components
- marking worn/damaged components for repair or replacement
- testing tooling components for hardness
- obtaining the appropriate materials for manufacture of replacement tooling components
- using the appropriate hand and hand held power tools to fashion/manufacture tooling components to specification
- utilise sample components or sections to test the tooling components being manufactured
- shaping and producing the tooling components to specifications using appropriate machines and machining processes
- assembling and fitting all tooling components to specification using acceptable tool making techniques and procedures
- checking the first-off component/product using appropriate precision instruments for conformance to specification
- recording the conditions that lead to the failure of the given set of tooling
- initiating design modifications/alterations to rectify recurring faults or failure

Required knowledge

Look for evidence that confirms knowledge of:

- common tooling defects from a range of sample products/components
- the probable causes of tooling failure
- the reasons for selecting the probable causes of tooling failure
- the reasons for establishing a sequential plan for the repair/maintenance of defective tooling
- the procedures for documented plans for the repair/ maintenance of defective tooling

- the procedures for disassembling defective tooling
- the specifications of all tooling components
- the precision instruments to be used to check tooling components for conformance to specification
- the reasons for selecting the chosen precision instruments
- the procedures for identifying worn/damaged tooling
- components for repair or replacement
- the reasons for deciding to repair or replace worn/damaged components
- the appropriate materials for each component of the tooling to be replaced
- the required physical properties of the tooling to be replaced
- the reasons for selecting the chosen materials in terms of: strength, durability, component finish, heat treatment requirement, and availability
- the procedures for hardness testing materials
- the procedures for obtaining tooling materials
- the hand and hand held power tools to be used to fashion/manufacture the required tooling components
- the reasons for selecting the chosen hand and hand held power tools
- the appropriate machines and machining processes to shape/produce the required tooling components
- the reasons for selecting the chosen machines and machining processes
- the effect of machining parameters on the surface finish and tolerances achievable from machining processes
- the machining parameters appropriate to given machining tasks and specifications
- the reasons for selecting the chosen machining parameters
- the reasons for heat treating the tool steel in accordance with heat treatment procedures and specifications
- the heat treatment of tooling components initiated
- the heat treatment requirements of a range of given tool steels to achieve specified hardness
- the procedures for heat treating tool steels
- the procedures for initiating the heat treatment of tool steels
- the procedures for fitting/assembling the tooling components
- the precautions to be taken when fitting/assembling tooling components
- the appropriate precision instruments for checking the components produced
- the specifications of the finished product
- the common causes of tooling failure
- the procedures for documenting tooling failures
- the conditions leading to the failure of a given set of tooling
- the reasons for selecting the chosen mode of failure
- previous faults with the given set of tooling
- any commonalities of causes of failures or trends/events associated with tooling failure
- appropriate proposed solutions for a range of recurrent faults that may occur in tooling
- the reasons for selecting the chosen solutions
- the procedures for initiating modifications/alterations to tooling design

Range statement
N/a

Unit F7 Maintain pneumatic systems

Performance criteria

a. Undertake *preventative maintenance checks*/adjustments on pneumatic systems
   - *System* components, assemblies or sub-assemblies are identified and prepared for inspection/preventative maintenance.
   - Visual inspection and testing with appropriate *test equipment* are carried out according to fluid power principles, procedures and safety requirements.
   - Scheduled preventative maintenance tasks are performed including obvious repairs and adjustments according to manufacturers' specification using fluid power techniques/practices.

b. Undertake fault finding on pneumatic systems
   - Designated pneumatic system components are identified and a visual inspection of the system is carried out for the collection of fault finding data.
   - System operator is consulted where appropriate and additional data is collected.
   - Maintenance reports and preventative maintenance schedules are checked and reviewed for additional fault finding data.
   - Using fluid power principles, checks and tests are undertaken using appropriate test equipment and techniques.
   - Faults and malfunctions are identified and verified.
   - Faults and malfunctions are documented or reported by appropriate means to designated personnel and actioned.

c. Repair and/or overhaul pneumatic power system
   - System or sub-assembly is isolated safely and residue pressure is discharged in accordance with prescribed procedures or checked for correct isolation.
   - Isolated system or sub-assembly is tagged according to designated means.
   - Component or sub-assembly is removed from system using correct removal principles and techniques.
   - Components or sub-assemblies are dismantled examined and verified for replacement, overhaul or repair, using correct and appropriate techniques and procedures.
   - Replacement items are selected from manufacturers' catalogues to meet specifications.
   - Faulty items are repaired/replaced/overhauled, using correct and appropriate principles, techniques and procedures.
   - Component or sub-assembly items are refitted to equipment and tested for correct operation assessed against specifications.

d. Recommission pneumatic system
   - System or sub-assembly is recommissioned according to prescribed procedures and specifications.
   - Using fluid power principles and system application techniques, correct operation of the system is verified.
   - Appropriate follow-up procedures are instigated.

- Maintenance records/service reports are updated and completed by appropriate designated means.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- preparing pneumatic system components for inspection/preventative maintenance
- inspecting and testing pneumatic system and components
- performing scheduled preventative maintenance tasks
- performing repairs on the pneumatic system/components as required
- visually inspecting pneumatic system and its components for indications of correct/incorrect operation
- consulting system operator with respect to the fault being investigated
- obtaining and interpreting maintenance reports and preventative maintenance schedules
- checking/testing pneumatic system/component operation
- verifying/confirming apparent faults/malfunctions
- documenting or reporting verified faults/malfunctions
- initiating repair/overhaul of the pneumatic system
- isolating and depressurising pneumatic system
- checking pneumatic system to ensure isolation and depressurisation
- tagging isolated pneumatic system

- removing pneumatic components/sub-assembly from the system
- dismantling pneumatic components/sub-assemblies
- examining pneumatic components/sub-assemblies and their parts for conformance to specification
- selecting replacement parts selected from manufacturers' catalogues
- overhauling faulty items
- refitting pneumatic component/sub-assembly into the system
- testing pneumatic component/sub-assembly for correct operation
- recommissioning pneumatic system/sub-assembly to specification
- checking/testing pneumatic system/sub-assembly for correct operation
- initiating follow-up procedures
- updating and completing maintenance records/reports

Required knowledge
Look for evidence that confirms knowledge of:

- common pneumatic system components
- pneumatic system/component faults that can be determined by visual inspection
- the application of common pneumatic system/component test equipment
- scheduled preventative maintenance tasks
- manufacturers' specifications
- common pneumatic system and component faults
- any previous faults in the pneumatic system/components
- any previous maintenance carried out on the pneumatic system/components
- typical checks/tests that can be carried out on pneumatic systems/components and their application
- pneumatic system/component tests and testing techniques
- apparent faults/malfunctions
- documentation/reporting requirements with respect to verified faults/malfunctions
- procedures for initiating repair and/or overhaul of the pneumatic system
- hazards associated with working on pneumatic systems/components, including housekeeping
- the procedures for isolating and depressurising pneumatic systems
- the tagging requirements for isolated systems
- the structure of typical pneumatic components
- specifications of pneumatic components and their constituent parts
- reasons for deciding to repair, replace or overhaul pneumatic components
- system recommissioning procedures
- the pneumatic system operational specifications
- any appropriate follow-up maintenance or operational checks
- maintenance recording/reporting requirements
- consequences of inaccurate or incomplete recording/reporting of maintenance/service activities
- pneumatic principles
- safe work practices and procedures

Range statement

Preventative maintenance checks - preventative maintenance is undertaken on a periodic basis and appropriate documentation is maintained

Systems - for the purposes of this unit, a system is regarded as a functionally related group of elements. The unit extends to tests involving interacting, interrelated, or interdependent components

Test equipment - leak testers, escape rate gauges, hand held pressure testers and other appropriate equipment

Repair - rectify, replace components, determine for reuse

Unit F8 Maintain hydraulic systems

Performance criteria

a. Undertake *preventative maintenance* checks/adjustments on hydraulic systems
   - *System* components, assemblies or sub-assemblies are identified and prepared for inspection/preventative maintenance.
   - Visual inspection and testing with appropriate *test equipment* are carried out according to fluid power principles, procedures and safety requirements.
   - Scheduled preventive maintenance tasks are performed including obvious repairs and adjustments according to manufacturers' specifications using fluid power techniques/practices.

b. Undertake fault finding on hydraulic systems
   - Designated hydraulic system components are identified and a visual inspection of the system is carried out for the collection of fault finding data.
   - System operator is consulted where appropriate and additional data is collected.
   - Maintenance reports and preventative maintenance schedules are checked and reviewed for additional fault finding data.
   - Using fluid power principles, checks and tests are undertaken using appropriate test equipment and techniques.
   - Faults and malfunctions are identified and verified.
   - Faults and malfunctions are documented or reported by appropriate means to designated personnel and actioned.

c. Repair and/or *rectify* hydraulic system
   - System or sub-assembly is isolated safely and residue pressure is discharged in accordance with prescribed procedure and checked for correct isolation.
   - Isolated system or sub-assembly is tagged according to designated means.
   - Components or sub-assembly is removed from system using correct removal principles and techniques.
   - Components or sub-assemblies are dismantled, examined and verified for replacement, overhaul or repair, using correct and appropriate techniques and procedures.
   - Replacement items are selected from manufacturers' catalogues to meet specifications.
   - Faulty items are rectified using correct and appropriate principles, techniques and procedures.
   - Component or sub-assembly items are refitted to equipment and tested for correct operation against specifications.

d. Recommission hydraulic system
   - System or sub-assembly is recommissioned according to prescribed procedures and specifications.
   - Using fluid power principles and system applications techniques, correct operation of the system is verified.
   - Appropriate follow-up procedures are instigated.

- Maintenance records/service reports are updated and completed by appropriate designated means.

Evidence

Context of assessment:

- This unit may be assessed on the job, off the job or a combination of both on and off the job.
- Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

Method of assessment:

- Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required to complete the work.
- The candidate must have access to all tools, equipment, materials and documentation necessary.
- The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Consistency of performance:

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

Critical Skills and Essential Knowledge

Required skill

Look for evidence that confirms skills in:

- preparing hydraulic system components for inspection/preventative maintenance
- inspecting and testing the hydraulic system/components
- planning and sequencing operations
- performing scheduled preventative maintenance tasks
- where appropriate, performing obvious repairs on the hydraulic system/components
- visually inspect the hydraulic system and its components for indications of correct/incorrect operation
- where appropriate, consulting with the system operator with respect to the fault being investigated
- obtaining and interpreting maintenance reports and preventative maintenance schedules
- using appropriate test equipment and techniques to check/test hydraulic system/component operation
- verifying apparent faults/malfunctions
- documenting or reporting all verified faults/malfunctions

- initiating the repair/overhaul of the hydraulic system
- isolating and depressurising the hydraulic system
- tagging the isolated hydraulic system
- removing the hydraulic components/sub-assembly from the system
- dismantling the hydraulic components/sub-assemblies
- examining the hydraulic components/sub-assemblies and their parts for conformance to specification
- selecting replacement parts from manufacturers' catalogues in compliance with specifications
- repairing/replacing/overhauling faulty items
- refitting the hydraulic component/sub-assembly into the system
- testing the hydraulic component/sub-assembly for correct operation and compliance with specifications
- recommissioning the hydraulic system/sub-assembly to specification
- checking/testing the hydraulic system/sub-assembly for correct operation
- where appropriate, initiating follow-up procedures
- updating and completing all maintenance records/reports

Required knowledge

Look for evidence that confirms knowledge of:

- common hydraulic system components
- hydraulic system/component faults that can be determined by visual inspection
- the application of common hydraulic system/component test equipment
- schedule of preventative maintenance tasks
- the manufacturers' specifications
- common hydraulic system and component faults
- any previous faults in the hydraulic system/components
- any previous maintenance carried out on the hydraulic system/ components
- typical checks/tests that can be carried out on hydraulic systems/ components and their application
- hydraulic system/component test and testing techniques
- apparent faults/malfunctions
- the documentation/reporting requirements with respect to verified faults/malfunctions
- the procedures for initiating repair/replacement and/or overhaul of the hydraulic system
- the hazards and control measures associated with working on hydraulic systems/components, including housekeeping
- the procedures for isolating and depressurising hydraulic systems
- tagging requirements for isolated systems
- the structure of typical hydraulic components
- the specifications of hydraulic components and their constituent parts
- the appropriate repair/overhaul procedures
- system recommissioning procedures
- the hydraulic system operational specifications
- any appropriate follow-up maintenance or operational checks
- the maintenance recording/reporting requirements
- the consequences of inaccurate or incomplete recording/reporting of maintenance/service activities

Range statement

Preventative maintenance - preventative maintenance is undertaken on a periodic basis and appropriate documentation is maintained

Systems - for the purposes of this unit a system is regarded as a functionally related group of elements. The unit extends to tests involving interacting, interrelated, or interdependent components

Test equipment - leak testers, escape rate gauges, hand held pressure testers and other appropriate equipment

Rectify - replacement, repair and/or reuse of components

SKILLS–AP

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