



**education**

Department:  
Education  
REPUBLIC OF SOUTH AFRICA

# **NATIONAL CERTIFICATES (VOCATIONAL)**

## **ASSESSMENT GUIDELINES**

### **WELDING NQF Level 4**

October 2007



# CONTENTS

## **SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES**

## **SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)**

- 1 Assessment in the National Certificates (Vocational)**
- 2 Assessment framework for vocational qualifications**
  - 2.1 Internal continuous assessment (ICASS)
  - 2.2 External summative assessment (ESASS)
- 3 Moderation of assessment**
  - 3.1 Internal moderation
  - 3.2 External moderation
- 4 Period of validity of internal continuous assessment (ICASS)**
- 5 Assessor requirements**
- 6 Types of assessment**
  - 6.1 Baseline assessment
  - 6.2 Diagnostic assessment
  - 6.3 Formative assessment
  - 6.4 Summative assessment
- 7 Planning assessment**
  - 7.1 Collecting evidence
  - 7.2 Recording
  - 7.3 Reporting
- 8 Methods of assessment**
- 9 Instruments and tools for collecting evidence**
- 10 Tools for assessing student performance**
- 11 Selecting and/or designing recording and reporting systems**
- 12 Competence descriptions**
- 13 Strategies for collecting evidence**
  - 13.1 Record sheets
  - 13.2 Checklists

## **SECTION C: ASSESSMENT IN WELDING**

- 1 Schedule of assessment**
- 2 Recording and reporting**
- 3 Internal assessment of Subject Outcomes in Welding - Level 4**
- 4 Specifications for the external assessment in Welding – Level 4**
  - 4.1 Integrated summative assessment task (ISAT)
  - 4.2 National examination

## SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Welding in the National Certificates (Vocational). It must be read with the *National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF)*. This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the *Subject Guidelines: Welding* prepare for and deliver Welding Level 4 Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

## SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

### 1 ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

- Create an integrated national framework for learning achievements.
- Facilitate access to and progression within education, training and career paths.
- Enhance the quality of education and training.
- Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
- Contribute to the holistic development of the student by addressing:
  - social adjustment and responsibility;
  - moral accountability and ethical work orientation;
  - economic participation; and
  - nation-building.

The principles that drive these objectives are:

- **Integration**

To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

- **Relevance**

To be dynamic and responsive to national development needs.

- **Credibility**

To demonstrate national and international value and recognition of qualification and acquired competencies and skills.

- **Coherence**

To work within a consistent framework of principles and certification.

- **Flexibility**

To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

- **Participation**

To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

- **Access**

To address barriers to learning at each level to facilitate students' progress.

- **Progression**

To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

- **Portability**

To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

- **Articulation**

To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

- **Recognition of Prior Learning**

To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

- **Validity of assessments**

To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:

- clearly stating the outcome to be assessed;
- selecting the appropriate or suitable evidence;
- matching the evidence with a compatible or appropriate method of assessment; and
- selecting and constructing an instrument(s) of assessment.

- **Reliability**

To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the interpretation of evidence; therefore, careful monitoring of assessment is vital.

- **Fairness and transparency**

To verify that no assessment process or method(s) hinders or unfairly advantages any student. The following could constitute unfairness in assessment:

- Inequality of opportunities, resources or teaching and learning approaches
- Bias based on ethnicity, race, gender, age, disability or social class
- Lack of clarity regarding Learning Outcome being assessed
- Comparison of students' work with other students, based on learning styles and language

- **Practicability and cost-effectiveness**

To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

## **2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS**

The assessment structure for the National Certificates (Vocational) qualification is as follows:

### **2.1 Internal continuous assessment (ICASS)**

Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. The internal continuous assessment (ICASS) practical component is undertaken in a real workplace, a workshop or a "Structured Environment". This component is moderated internally and externally quality assured by Umalusi. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes.

### **2.2 External summative assessment (ESASS)**

The external summative assessment is either a single or a set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.

A compulsory component of external summative assessment (ESASS) is the **integrated summative assessment task (ISAT)**. This assessment task draws on the students' cumulative learning throughout the year. The task requires **integrated application of competence** and is executed under strict assessment conditions. The task should take place in a simulated or "Structured Environment". The integrated summative assessment task (ISAT) is the most significant test of students' ability to apply acquired knowledge.

The integrated assessment approach allows students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

### 3 MODERATION OF ASSESSMENT

#### 3.1 Internal moderation

Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) college. Internal college moderation is a continuous process. The moderator's involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

#### 3.2 External moderation

External moderation is conducted by the Department of Education, Umalusi and, where relevant, an Education and Training Quality Assurance (ETQA) body according to South African Qualifications Authority (SAQA) and Umalusi standards and requirements.

The external moderator:

- monitors and evaluates the standard of all summative assessments;
- maintains standards by exercising appropriate influence and control over assessors;
- ensures proper procedures are followed;
- ensures summative integrated assessments are correctly administered;
- observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
- gives written feedback to the relevant quality assessor; and
- moderates in case of a dispute between an assessor and a student.

Policy on inclusive education requires that assessment procedures be customised for students who experience barriers to learning and supported to enable these students to achieve their maximum potential.

### 4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the *National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational)*.

The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

### 5 ASSESSOR REQUIREMENTS

Assessors must be subject specialists and should ideally be declared competent against the standards set by the ETDP SETA. If the lecturer conducting the assessments has not been declared a competent assessor, an assessor who has been declared competent may be appointed to oversee the assessment process to ensure the quality and integrity of assessments.

### 6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.

### 6.1 Baseline assessment

At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

### 6.2 Diagnostic assessment

This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

### 6.3 Formative assessment

This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

### 6.4 Summative assessment

This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

## 7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

### 7.1 Collecting evidence

The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

### 7.2 Recording

Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

### 7.3 Reporting

All the evidence is put together in a report to deliver a decision for the subject.

## 8 METHODS OF ASSESSMENT

Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.

<b>LECTURER ASSESSMENT</b>	The lecturer assesses students' performance against given criteria in different contexts, such as individual work, group work, etc.
<b>SELF-ASSESSMENT</b>	Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.
<b>PEER ASSESSMENT</b>	Students assess another student's or group of students' performance against given criteria in different contexts, such as individual work, group work, etc.
<b>GROUP ASSESSMENT</b>	Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

## 9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for assessment purposes is kept or recorded in the student's PoE.

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate that the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

	METHODS FOR COLLECTING EVIDENCE		
	Observation-based (Less structured)	Task-based (Structured)	Test-based (More structured)
<b>Assessment instruments</b>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Class questions</li> <li>• Lecturer, student, parent discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments or tasks</li> <li>• Projects</li> <li>• Investigations or research</li> <li>• Case studies</li> <li>• Practical exercises</li> <li>• Demonstrations</li> <li>• Role-play</li> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Examinations</li> <li>• Class tests</li> <li>• Practical examinations</li> <li>• Oral tests</li> <li>• Open-book tests</li> </ul>
<b>Assessment tools</b>	<ul style="list-style-type: none"> <li>• Observation sheets</li> <li>• Lecturer's notes</li> <li>• Comments</li> </ul>	<ul style="list-style-type: none"> <li>• Checklists</li> <li>• Rating scales</li> <li>• Rubrics</li> </ul>	<ul style="list-style-type: none"> <li>• Marks (e.g. %)</li> <li>• Rating scales (1-7)</li> </ul>
<b>Evidence</b>	<ul style="list-style-type: none"> <li>• Focus on individual students</li> <li>• Subjective evidence based on lecturer observations and impressions</li> </ul>	<p><b>Open middle:</b> Students produce the same evidence but in different ways.</p> <p><b>Open end:</b> Students use same process to achieve different results.</p>	Students answer the same questions in the same way, within the same time.

## 10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

**Rating scales** are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

**Task lists** and **checklists** show the student what needs to be done. These consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

**Rubrics** are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. Using rubrics is a different way of assessing and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly two types of rubrics, namely holistic and analytical, are used.

## 11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used.

Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

## 12 COMPETENCE DESCRIPTIONS

All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against rubrics and not be simply a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) that a student must demonstrate to achieve each level of the rating scale.

When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.

## 13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

### 13.1 Record sheets

The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students' interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

### 13.2 Checklists

Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.

## SECTION C: ASSESSMENT IN WELDING

### 1 SCHEDULE OF ASSESSMENT

At NQF levels 2, 3 and 4, lecturers will conduct assessments as well as develop a schedule of formal assessments that will be undertaken in the year. All three levels also have an external examination that accounts for 50 percent of the total mark. The marks allocated to assessment tasks completed during the year, kept or recorded in a PoE account for the other 50 percent.

The PoE and the external assessment include practical and written components. The practical assessment in Welding must, where necessary, be subjected to external moderation by Umalusi or an appropriate Education and Training Quality Assurance (ETQA) body, appointed by the Umalusi Council in terms of Section 28(2) of the *General and Further Education and Training Quality Assurance Act, 2001 (Act No. 58 of 2001)*.

### 2 RECORDING AND REPORTING

Welding, as is the case for all the other Vocational subjects, is assessed according to five levels of competence. The level descriptions are explained in the following table.

#### **Scale of Achievement for the Vocational component**

RATING CODE	RATING	MARKS %
5	Outstanding	80-100
4	Highly Competent	70-79
3	Competent	50-69
2	Not yet competent	40-49
1	Not achieved	0-39

The programme of assessment should be recorded in the Lecturer's Portfolio of Assessment for each subject. The following at least should be included in the Lecturer's Assessment Portfolio:

- A contents page
- The formal schedule of assessment
- The requirements for each assessment task
- The tools used for each assessment task
- Recording instrument(s) for each assessment task
- A mark sheet and report for each assessment task

The college must standardise these documents.

The student's PoE must include at least:

- A contents page
- The assessment tasks according to the assessment schedule
- The assessment tools or instruments for the task
- A record of the marks (and comments) achieved for each task

Where a task cannot be contained as evidence in the PoE, its exact location must be recorded and it must be readily available for moderation purposes.

The following units guide internal assessment in Welding Level 4:

<b>NUMBER OF UNITS</b>	<b>ASSESSMENT</b>	<b>COVERAGE</b>
2	Formal written tests	One or more completed topics
1	Internal written exam	All completed topics
3	Practical assessments	Must cover the related Subject Outcomes EXAMPLES: <ul style="list-style-type: none"><li>• A research project on subject-related current issues from different sources, e.g. the Internet, magazines and newspapers</li><li>• Welding of components in the engineering fabrication industry</li></ul>

**ASSESSMENT OF WELDING**  
**LEVEL 4**

### 3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN WELDING - LEVEL 4

#### Topic 1: Principles of arc welding (pipe)

SUBJECT OUTCOME	
<b>1.1 Identify, discuss and describe welded joints in pipes.</b>	
ASSESSMENT STANDARDS	LEARNING OUTCOMES
<ul style="list-style-type: none"> <li>The types of pipe weld connections are identified and discussed <i>Range: butt welds in pipes; in line and at an angle; the importance of gas backing.</i></li> <li>The method of performing tube to plate welding is described.</li> <li>Branch connections (set-on, set-in and set through) are described.</li> <li>The adaptation of joint preparation methods of pipes are explained and discussed.</li> </ul>	<ul style="list-style-type: none"> <li>Identify joint preparations</li> <li>Identify and draw tube to plate welds and branch connections</li> <li>Describe the methods of joint preparation of pipes</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Theory test or questionnaire</li> <li>Project assignment</li> <li>Research portfolio</li> <li>Or combination of the above</li> </ul>	

SUBJECT OUTCOME	
<b>1.2 Explain welding problems associated with alloyed steels.</b>	
ASSESSMENT STANDARDS	LEARNING OUTCOMES
<ul style="list-style-type: none"> <li>The basics of stainless steel, aluminium and other alloys, their welding processes and health aspects are explained and discussed.</li> <li>Weld-ability, welded joints and distortion related to the alloys are explained.</li> <li>Various welding consumables and their backing gases are identified and listed.</li> <li>Corrosion and post weld treatment of alloys is explained.</li> <li>Typical welding problems associated with stainless steels and other alloys are discussed <i>Range:</i> <ul style="list-style-type: none"> <li><i>Stainless steels</i></li> <li><i>Aluminium alloys</i></li> <li><i>Copper alloys</i></li> <li><i>Nickel alloys</i></li> <li><i>Titanium and other special materials</i></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Describe the processes when making steel</li> <li>Explain the influence of welding on steel.</li> <li>Discuss the differences between non-alloy, stainless steels and other alloy steels.</li> <li>Briefly explain the influence of alloying elements on the properties of steel.</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Theory test or questionnaire</li> <li>Project Assignment</li> <li>Research portfolio</li> <li>Or combination of the above</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>1.3 Explain the consequences of weld failures.</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The safety requirements relating to welded products are explained.</li> <li>• Product failures due to bad performance of welding are discussed</li> <li>• The implications of failure and product liability are explained.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain examples of failures and their consequences</li> <li>• Explain the role of the welder in avoiding failures</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Theory test or questionnaire</li> <li>• Project Assignment</li> <li>• Research portfolio</li> <li>• Or combination of the above</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>1.4 Explain the harmonized system of international standards</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The role and operation of CEN and ISO and its relationship with National Standards Organizations are explained and discussed.</li> <li>• Standards for welding equipment and welding consumables are described and explained.</li> <li>• The standards for welding practice and product standards that contain welding requirements are discussed.</li> <li>• Standards for quality and co-ordination in welding are discussed.</li> </ul>	<ul style="list-style-type: none"> <li>• Name the important international and national standards for welding</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Theory test or questionnaire</li> <li>• Project Assignment</li> <li>• Research portfolio</li> <li>• Or combination of the above</li> </ul>	

**Topic 2: Shielded metal arc welding (pipes)**

<b>SUBJECT OUTCOME</b>	
<b>2.1 Describe the shielded metal arc welding (SMAW) process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Basic and major components of shielded metal arc welding (SMAW) equipment and their functions are identified and explained.</li> <li>• The importance of the correct setting of the power source and choice of electrode and the consequences of incorrect selection is explained</li> <li>• The thickness of materials in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process are explained.</li> <li>• Welding consumables include misuse; mishandling; baking procedures are identified and described.</li> <li>• Welding characteristics of low carbon steel are identified and the implications for un-safe conditions are described.</li> <li>• Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the terminologies associated with shielded metal arc welding (SMAW) procedures.</li> <li>• Explain the actual chemical and mechanical processes that take place during welding.</li> <li>• Explain the shielded metal arc welding (SMAW) method for welding pipes.</li> <li>• Identify the various welding parameters, in relation to the thickness of materials (steel) being welded.</li> <li>• Demonstrate setting up procedures</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Questionnaire-based activities related to:</p> <ul style="list-style-type: none"> <li>• The shielded metal arc welding process and related equipment.</li> <li>• The shielded metal arc welding equipment used</li> <li>• The shielded metal arc welding method and the application of specifications (parent material, current setting, electrode angle, electrode-type, and other consumables used).</li> <li>• Implementation of safety precautions during shielded metal arc welding.</li> <li>• Explaining the heat characteristics of common metals during the shielded metal arc welding process</li> <li>• Correct use of terminology is assessed.</li> </ul> <p>For the practical assessment:</p> <p><i>Range: Parts include: Suitable power source, earth clamp, electrode holder and welding cable.</i></p> <ul style="list-style-type: none"> <li>• Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down</li> <li>• Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>2.2 Plan and prepare for the welding process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The steel making processes are described.</li> <li>• Continuous casting and hot-working processes are explained.</li> <li>• Nature of non-alloy steels is described.</li> <li>• The basis of ISO (TR) 15608 is explained and discussed.</li> <li>• Materials are identified according to ISO (TR) 15608.</li> <li>• The effects of welding on steel are explained.</li> <li>• The addition of elements to create alloys is explained.</li> <li>• Types of welding (butt and fillet) are identified and explained.</li> <li>• Types of joints (butt; "T"; lap and corner – EN 12345, ISO [(DIS) 17659]) are identified and discussed.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the safety aspects of shielded metal arc welding (SMAW) in the fabrication workshop.</li> <li>• Prepare the shielded metal arc welding (SMAW) equipment</li> <li>• Prepare the pipe/s for welding</li> <li>• Prepare the welding environment.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Students are given a welding task according to the range in Subject Outcome 3.</p> <ul style="list-style-type: none"> <li>• Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task</li> <li>• Before any welding can take place all students must be found competent in this activity</li> <li>• The shielded metal arc equipment is to be well insulated to avoid electric shock.</li> <li>• Work-piece tack welded in position as per drawing specifications.</li> <li>• Safety precautions adhered to.</li> <li>• Inspection work-piece prior to welding.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Parts include: Suitable power source, earth clamp, electrode holder and welding cable.</i></li> <li>• <i>Material type to be used: Size of pipes to be welded should be: Nominal bore (NB) - 10mm (minimum )</i></li> <li>• <i>Minimum wall thickness of pipe -1mm</i></li> <li>• <i>Select from range of Carbon Steels (Material Group 1, 2, 3 or 11, according to CR/ISO TR 15608)</i></li> <li>• <i>Despite the minimum material thickness as specified,, students have to display sufficient competency to prepare the groove prior to welding.</i></li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>2.3 Weld pipe material</b>	
<i>Range: Groove-welding positions only: Flat rotational; Flat/ Horizontal; Vertical (fixed position); Inclined at 45° Weld</i>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements.</li> <li>Safety precautions applicable to the shielded metal arc welding (SMAW) process are adhered to in accordance with OHS Act.</li> <li>Quality checks on welded materials are applied.</li> <li>The end product is inspected to conform to specifications as reflected on drawing or job requirement.</li> <li>Welding defects are identified and corrective action is taken.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>Defects include excessive slag, spatter and irregular weld finish (bead)</li> <li>Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.</li> </ul>	<ul style="list-style-type: none"> <li>Adhere to all safety precautions according to workshop requirements and OHS Act</li> <li>Demonstrate the shielded metal arc welding (SMAW) process, using knowledge and skills attained.</li> <li>Inspect welded work-piece for defects and apply quality checks on process.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Practical project or task</p> <ul style="list-style-type: none"> <li>Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures</li> <li>Students to use skills, knowledge and safety during cutting</li> <li>Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn.</li> <li>All welding must take place in a controlled environment and lecturers to ensure quality of cuts.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>Size of pipes to be welded should be: Nominal bore (NB) - 10mm (minimum )</li> <li>Minimum wall thickness of pipe -1mm</li> <li>Select from range of Carbon Steels (Material Group 1, 2, 3 or 11, according to CR/ISO TR 15608)</li> <li>Resources include: Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.</li> <li>Welding positions: Groove-welding positions only: <ul style="list-style-type: none"> <li>Flat rotational;</li> <li>Flat/ Horizontal;</li> <li>Vertical (fixed position);</li> <li>Inclined at 45° Weld</li> </ul> </li> <li>Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>2.4 Care and storage of welding equipment</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>The proper care and storage of tools and equipment is explained in accordance with worksite practices.</li> <li>Shielded metal arc welding equipment is dismantled according to workshop procedures</li> <li>The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures</li> </ul>	<ul style="list-style-type: none"> <li>Explain the care and storage procedures for tools and equipment in accordance with worksite practices and specifications.</li> <li>Dismantle and store welding equipment in accordance with manufacturer's specifications and requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Students are given a welding task according to the range in Subject Outcome 3.</li> <li>Care and storage of welding equipment is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within the practical project (welding task).</li> <li>Tools and equipment are stored to conform to worksite practices</li> <li>Defective equipment is reported.</li> </ul>	

**Topic 3: Gas metal arc welding (stainless steel)**

<b>SUBJECT OUTCOME</b>	
<b>3.1 Describe the gas metal arc welding (GMAW) process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Basic and major components of gas metal arc welding GMAW equipment and their functions are identified and explained.</li> <li>• The importance of the correct setting of the power source and choice of electrode and the consequences of incorrect selection is explained.</li> <li>• The thickness of materials, in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process are explained.</li> <li>• <b>The consequences of misuse and/or mishandling of welding consumables are explained.</b></li> <li>• Welding characteristics of low carbon steel are identified and the implications for un-safe conditions are described.</li> <li>• Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the terminologies associated with gas metal arc welding procedures.</li> <li>• Explain the actual chemical and mechanical processes that take place during welding.</li> <li>• <b>Explain the gas metal arc welding (GMAW) method for stainless steel.</b></li> <li>• Identify the various welding parameters, in relation to the thickness of materials (stainless steel) being welded.</li> <li>• Demonstrate setting up procedures</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Questionnaire-based activities related to:</p> <ul style="list-style-type: none"> <li>• The gas metal arc welding process and related equipment.</li> <li>• The gas metal arc welding equipment used</li> <li>• The gas metal arc welding method and the application of specifications (parent material, current setting, electrode angle, electrode-wire, shielding gas, pressure settings and other consumables used).</li> <li>• Application of safety precautions during gas metal arc welding.</li> <li>• Explaining the heat characteristics of common metals during the gas metal arc welding process</li> <li>• Correct use of terminology is assessed.</li> </ul> <p>For the practical assessment: <i>Range: Parts include: Suitable power source, earth clamp, wire-feeder, shielding gas, electrode holder and welding cable.</i></p> <ul style="list-style-type: none"> <li>• Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down</li> <li>• Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>3.2 Plan and prepare for the welding process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Welding hazards are identified and eliminated in accordance with standard working practices.</li> <li>• The selection of gas metal arc welding equipment as specified in the welding procedure is verified.</li> <li>• Work-piece/s is prepared prior to welding as specified on drawing and working practices.</li> <li>• Task dimensions and work-piece alignment are checked as specified on drawing</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the safety aspects of gas metal arc welding GMAW in the fabrication workshop.</li> <li>• Prepare the gas metal arc welding (GMAW) equipment</li> <li>• Prepare the work-piece for welding</li> <li>• Prepare the welding environment.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Students are given a welding task according to the range in Subject Outcome 3.</li> <li>• Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task               <ul style="list-style-type: none"> <li>▪ Before any welding can take place all students must be found competent in this activity</li> <li>▪ The gas metal arc welding equipment is to be well insulated to avoid electric shock.</li> <li>▪ Work-piece tack welded in position as per drawing specifications.</li> <li>▪ Safety precautions adhered to.</li> <li>▪ Inspection work-piece prior to welding.</li> </ul> </li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Parts include: Suitable power source, earth clamp, shielding gas, wire-feeder, electrode-wire, and welding cable.</i></li> <li>• <i>Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608].</i></li> <li>• <i>Material thickness: minimum –1,6mm</i></li> <li>• <i>Despite the minimum material thickness as specified, students must display sufficient competency to prepare the groove prior to welding.</i></li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>3.3 Weld the work-piece</b>	
<i>Range: Weld positions to include: Fillet welding: Flat/Horizontal Groove welding: Flat/Horizontal</i>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements.</li> <li>• Safety precautions applicable to the gas metal arc welding (GMAW) process are applied and adhered to in accordance with OHS Act.</li> <li>• Quality checks on welded materials are applied.</li> <li>• The end product is inspected to conform to specifications as reflected on drawing or job requirement.</li> <li>• Welding defects are identified and corrective action is taken.</li> </ul> <p><i>Range: Defects include excessive slag, spatter and irregular weld finish (bead).</i></p> <ul style="list-style-type: none"> <li>• <i>Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Adhere to all safety precautions according to workshop requirements and OHS Act</li> <li>• Demonstrate the gas metal arc welding gas metal arc welding (GMAW) process, using knowledge and skills attained.</li> <li>• Inspect welded work-piece for defects and apply quality checks on process.</li> </ul>

<b>ASSESSMENT TASKS OR ACTIVITIES</b>
<ul style="list-style-type: none"> <li>• Practical project or task</li> <li>• Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures</li> <li>• Students to use skills, knowledge and safety during cutting</li> <li>• Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn.</li> <li>• All welding must take place in a controlled environment and lecturers to ensure quality of cuts.</li> <li>• Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Material to be used:</i></li> <li>• <i>Range of materials: stainless steel and stainless steel alloys.</i></li> <li>• <i>Materials group – To be selected from groups 8 or 10 [ISO (TR) 15608] for the purpose of assessment</i></li> <li>• <i>Minimum plate thickness – 1,6mm</i></li> <li>• <i>Resources include:</i></li> <li>• <i>Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.</i></li> <li>• <i>Weld positions to include:</i> <ul style="list-style-type: none"> <li>▪ <i>Fillet welding: Flat/Horizontal</i></li> <li>▪ <i>Groove welding: Flat/Horizontal</i></li> </ul> </li> </ul>

<b>SUBJECT OUTCOME</b>	
<b>3.4 Care and storage of welding equipment</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The proper care and storage of tools and equipment is explained in accordance with worksite practices.</li> <li>• Gas metal arc welding equipment is dismantled according to workshop procedures</li> <li>• The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the care and storage procedures for tools and equipment in accordance with work site practices and specifications.</li> <li>• Dismantle and store welding equipment in accordance with manufacturer's specifications and requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Theory test or questionnaire</li> <li>• Project assignment</li> <li>• Research portfolio</li> <li>• Or combination of the above</li> </ul>	

**Topic 4: Gas metal arc welding (aluminium)**

<b>SUBJECT OUTCOME</b>	
<b>4.1 Describe the gas metal arc welding (GMAW) process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Basic and major components of gas metal arc welding (GMAW) equipment and their functions are identified and explained.</li> <li>• The importance of the correct setting of the power source and choice of electrode and the consequences of incorrect selection is explained</li> <li>• The thickness of materials, in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process is explained.</li> <li>• The consequences of misuse and/or mishandling of welding consumables are explained.</li> <li>• Welding characteristics of low carbon steel are identified and the implications for un-safe conditions are described.</li> <li>• Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the terminologies associated with gas metal arc welding procedures.</li> <li>• Explain the actual chemical and mechanical processes that take place during welding.</li> <li>• Explain the down-hand – gas metal arc welding (GMAW) method.</li> <li>• Identify the various welding parameters, in relation to the thickness of materials (steel) being welded.</li> <li>• Demonstrate setting up procedures</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Questionnaire-based activities related to:</p> <ul style="list-style-type: none"> <li>• The gas metal arc welding process and related equipment.</li> <li>• The gas metal arc welding equipment used</li> <li>• The gas metal arc welding method and the application of specifications (parent material, current setting, electrode angle, electrode-wire, shielding gas, pressure settings and other consumables used).</li> <li>• Application of safety precautions during gas metal arc welding.</li> <li>• Explaining the heat characteristics of common metals during the gas metal arc welding process</li> <li>• Correct use of terminology is assessed.</li> </ul> <p>For the practical assessment: <i>Range: Parts include: Suitable welding power source, wire-feeder, shielding gas, regulator, flow-meter, materials as specified on drawings and weld filler material.</i></p> <ul style="list-style-type: none"> <li>• Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down</li> <li>• Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>4.2 Plan and prepare for the welding process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Welding hazards are identified and eliminated in accordance with standard working practices.</li> <li>• The selection of gas metal arc welding equipment as specified in the welding procedure is verified.</li> <li>• Work-piece/s prepared prior to welding as specified on drawing and in working practices.</li> <li>• Task dimensions and work-piece alignment are checked as specified on drawing</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the safety aspects of gas metal arc welding (GMAW) in the fabrication workshop.</li> <li>• Prepare the equipment</li> <li>• Prepare the work-piece for welding</li> <li>• Prepare the welding environment.</li> </ul>

<b>ASSESSMENT TASKS OR ACTIVITIES</b>
<ul style="list-style-type: none"> <li>• Students are given a welding task according to the range in Subject Outcome 3.</li> <li>• Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task               <ul style="list-style-type: none"> <li>▪ Before any welding can take place all students must be found competent in this activity</li> <li>▪ The gas metal arc welding equipment is to be well insulated to avoid electric shock.</li> <li>▪ Work-piece tack welded in position as per drawing specifications.</li> <li>▪ Safety precautions adhered to.</li> <li>▪ Inspection work-piece prior to welding.</li> <li>▪ Despite the minimum material thickness as specified, students must display sufficient competency to prepare the groove prior to welding</li> </ul> </li> </ul>

<b>SUBJECT OUTCOME</b>
<p><b>4.3 Weld the work-piece</b>  <i>Range: Weld positions to include:</i>  <i>Fillet welding: Flat/Horizontal</i>  <i>Groove welding: Flat/Horizontal</i></p>

<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements.</li> <li>• Safety precautions are applied and adhered to in accordance with OHS Act (applicable to the gas metal arc welding (GMAW) process).</li> <li>• Quality checks on welded materials are applied.</li> <li>• The end product is inspected to conform to specifications as reflected on drawing or job requirement.</li> <li>• Welding defects are identified and corrective action is taken.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Defects include excessive slag, spatter and irregular weld finish (bead).</i></li> <li>• <i>Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Adhere to all safety precautions according to workshop requirements and OHS Act</li> <li>• Demonstrate the gas metal arc welding (GMAW) process, using knowledge and skills attained.</li> <li>• Inspect welded work-piece for defects and apply quality checks on process.</li> </ul>

<b>ASSESSMENT TASKS OR ACTIVITIES</b>
<p>Practical project or task</p> <ul style="list-style-type: none"> <li>• Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures</li> <li>• Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn.</li> <li>• Students to use skills, knowledge and safety during cutting</li> <li>• All welding must take place in a controlled environment and lecturers to ensure quality of cuts.</li> <li>• Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Parts include: Suitable welding power source, wire-feeder, shielding gas, regulator, flow-meter, materials as specified on drawings and weld filler material.</i></li> <li>• <i>Range of materials: aluminium and aluminium alloys. Materials group – To be selected from groups 21, 22, 24 or sub-group 23.1 [ISO (TR) 15608; Table 2] for the purpose of assessment</i></li> <li>• <i>Minimum plate thickness – 1,6mm</i></li> <li>• <i>Resources include: Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.</i></li> <li>• <i>Weld positions to include:</i> <ul style="list-style-type: none"> <li>▪ <i>Fillet welding: Flat/Horizontal</i></li> <li>▪ <i>Groove welding: Flat/Horizontal</i></li> </ul> </li> </ul>

<b>SUBJECT OUTCOME</b>	
<b>4.4 Care and storage of welding equipment</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• The proper care and storage of tools and equipment is explained in accordance with worksite practices.</li> <li>• Gas metal arc welding equipment is dismantled according to workshop procedures</li> <li>• The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the care and storage procedures for tools, equipment in accordance with worksite practices and specifications.</li> <li>• Dismantle and store welding equipment in accordance with manufacturer's specifications and requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Students are given a welding task according to the range in Subject Outcome 3.</li> <li>• Care and storage of welding equipment is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within the practical project (welding task). <ul style="list-style-type: none"> <li>▪ Tools and equipment are stored to conform to worksite practices</li> <li>▪ Defective equipment is reported.</li> </ul> </li> </ul>	

### Topic 5: Gas tungsten arc welding (downhand position)

<b>SUBJECT OUTCOME</b>	
<b>5.1 Describe the gas tungsten arc welding (GTAW) process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Basic and major components of GTAW equipment and their functions are identified and explained.</li> <li>• The importance of the correct setting of the power source and choice of electrode and the consequences of incorrect selection is explained</li> <li>• The thickness of materials, in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process.</li> <li>• Welding consumables include misuse; mishandling; baking procedures.</li> <li>• Welding characteristics of low carbon steel are identified and the implications for unsafe conditions are described.</li> <li>• Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain and use the terminologies associated with gas tungsten arc welding procedures.</li> <li>• Briefly explain the actual chemical and mechanical processes that take place during welding.</li> <li>• Explain the gas tungsten arc welding (GTAW) method (down hand position)</li> <li>• Identify the various welding parameters, in relation to the thickness of materials (steel) being welded.</li> <li>• Demonstrate setting up procedures</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<p>Questionnaire-based activities related to:</p> <ul style="list-style-type: none"> <li>• The gas tungsten arc welding process and related equipment.</li> <li>• The gas tungsten arc welding equipment used</li> <li>• The gas tungsten arc welding method and the application of specifications (parent material, current setting, electrode angle, electrode-type, and other consumables used).</li> <li>• Application of safety precautions during gas tungsten arc welding.</li> <li>• Explaining the heat characteristics of common metals during the gas tungsten arc welding process</li> <li>• Correct use of terminology is assessed.</li> </ul> <p>For the practical assessment:</p> <ul style="list-style-type: none"> <li>• Parts include: Suitable welding power source, torch, electrode, shielding gas, regulator, flow-meter, materials as specified on drawings and weld filler material.</li> <li>• Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down</li> <li>• Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>5.2 Plan and prepare for the GTAW process</b>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>• Welding hazards are identified and eliminated in accordance with standard working practices.</li> <li>• The selection of gas tungsten arc welding equipment as specified in the welding procedure is verified.</li> <li>• Work-piece/s is prepared prior to welding as specified on drawing and working practices.</li> <li>• Task dimensions and work-piece alignment are checked as specified on drawing</li> </ul>	<ul style="list-style-type: none"> <li>• Explain and implement the safety aspects of GTAW in the fabrication workshop.</li> <li>• Prepare the GTAW equipment</li> <li>• Prepare the work-piece/s for gas tungsten arc welding.</li> <li>• Prepare the welding environment.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Students are given a welding task according to the scope of coverage in Subject Outcome 3.</li> <li>• Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task</li> <li>• Before any welding can take place all students must be found competent in this activity</li> <li>• The gas tungsten arc welding equipment is to be well insulated to avoid electric shock.</li> <li>• Work-piece tack welded in position as per drawing specifications.</li> <li>• Safety precautions adhered to.</li> <li>• Inspection work-piece prior to welding.</li> <li>• Resources include: Suitable welding power source, torch, electrode, shielding gas, regulator, flow-meter, materials as specified on drawings and weld filler material.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li>• <i>Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608].</i></li> <li>• <i>Minimum wall thickness of plate -1.6mm</i></li> <li>• Despite the minimum material thickness as specified, students have to display sufficient competency to prepare the groove prior to welding.</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<p><b>5.3 Weld materials</b>  <i>Range: Weld positions to include:</i>  <i>Fillet welding: Flat/Horizontal, Flat rotational</i>  <i>Groove welding: Flat/Horizontal, Flat rotational</i></p>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements.</li> <li>Safety precautions are applied and adhered to in accordance with OHS Act (applicable to the GTAW process).</li> <li>Quality checks on welded materials are applied.</li> <li>The end product is inspected to conform to specifications as reflected on drawing or job requirement.</li> <li>Welding defects are identified and corrective action is taken</li> </ul> <p><i>Range: Defects include excessive slag, spatter and irregular weld finish (bead).</i></p> <ul style="list-style-type: none"> <li><i>Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.</i></li> </ul>	<ul style="list-style-type: none"> <li>Adhere to all safety precautions according to workshop requirements and OHS Act</li> <li>Demonstrate the GTAW process, using knowledge and skills attained.</li> <li>Inspect welded work-piece for defects and apply quality checks on process.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Practical project or task</li> <li>Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures</li> <li>Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn.</li> <li>Students to use skills, knowledge and safety during cutting</li> <li>All welding must take place in a controlled environment and lecturers to ensure quality of cuts.</li> </ul> <p><i>Range:</i></p> <ul style="list-style-type: none"> <li><i>Welding positions: Fillet and Groove-welding positions: Flat rotational; Flat/ Horizontal;</i></li> <li><i>Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.</i></li> </ul>	

<b>SUBJECT OUTCOME</b>	
<p><b>5.4 Care and storage of welding equipment</b></p>	
<b>ASSESSMENT STANDARDS</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"> <li>The proper care and storage of tools and equipment is explained in accordance with worksite practices.</li> <li>Gas tungsten arc welding equipment is dismantled according to workshop procedures</li> <li>The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures</li> </ul>	<ul style="list-style-type: none"> <li>Explain the care and storage procedures for tools and equipment in accordance with worksite practices and specifications.</li> <li>Dismantle and store gas tungsten arc welding equipment in accordance with manufacturer's specifications and requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Students are given a welding task according to the range in Subject Outcome 3.</li> <li>Care and storage of welding equipment is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within the practical project (welding task).</li> <li>For the purpose of assessment:</li> <li>Tools and equipment are stored to conform to worksite practices</li> <li>Defective equipment is reported.</li> </ul>	

#### 4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN WELDING - LEVEL 4

##### 4.1 Integrated summative assessment task (ISAT)

A compulsory component of the external assessment (ESASS) is the **Internal Summative Assessment Task (ISAT)**. The ISAT draws on the students' cumulative learning achieved throughout the year. The task requires **integrated application of competence** and is executed and recorded in compliance with assessment conditions.

Two approaches to the ISAT may be as follows:

- The students are assigned a task at the beginning of the year which they will have to complete in phases during the year to obtain an assessment mark. A final assessment is made at the end of the year when the task is completed.

**OR**

- Students achieve the competencies during the year but the competencies are assessed cumulatively in a single assessment or examination session at the end of the year.

The ISAT is set by an externally appointed examiner and is conveyed to colleges in the first quarter of the year.

The integrated assessment approach enables students to be assessed in more than one subject with the same ISAT.

##### 4.1 National Examination

A national examination is conducted annually in October or November by means of a paper(s) set and moderated externally. The following distribution of cognitive application is suggested:

<b>LEVEL 4</b>	<b>KNOWLEDGE AND COMPREHENSION</b>	<b>APPLICATION</b>	<b>ANALYSIS, SYNTHESIS AND EVALUATION</b>
	30%	50%	20%