

# TRAINING REGULATIONS



## SHIELDED METAL ARC WELDING (SMAW) IV

**METALS AND ENGINEERING SECTOR**

**TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY**  
East Service Road, South Superhighway, Taguig City, Metro Manila

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## METALS AND ENGINEERING SECTOR

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## TRAINING REGULATIONS FOR SHIELDED METAL ARC WELDING (SMAW) IV

### SECTION 1 SHIELDED METAL ARC WELDING SMAW IV

The Welding NC IV (SMAW) Qualification consists of competencies that a person must achieve to weld alloy steel pipes components as specified by layout, blueprints, diagrams, work order, welding procedure or oral instructions using SMAW welding equipment.

This Qualification conforms with AWS D 1.1 Structural Welding Code; ASME IX Boiler and Pressure Vessel Code; API 1104 Code for Gas and Oil Pipeline Facilities; and ISO 9606-1 Qualification of Welders for Steel.

The Units of Competency comprising this qualification include the following:

Code No.	BASIC COMPETENCIES
5 00 311 1 15	Utilize specialized communication skills
5 00 311 1 16	Develop teams and individuals
5 00 311 1 17	Apply problem solving techniques in the workplace
5 00 311 1 18	Collect, analyze and organize information
5 00 311 1 19	Plan and organize work
5 00 311 1 20	Promote environmental protection

Code No.	COMMON COMPETENCIES
MEE721201	Apply Safety Practices
MEE721202	Interpret Drawings and Sketches
MEE721203	Perform Industry Calculations
MEE721204	Contribute to Quality System
MEE721205	Use Hand Tools
MEE721206	Prepare Weld Materials
MEE721207	Setup Welding Equipment
MEE721208	Fit up Weld Materials
MEE721209	Repair Welds

Code No.	CORE COMPETENCY
MEE721317	Weld Alloy Steel Pipes Using SMAW

A person who has achieved this Qualification is competent to be:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>- Plate Welder (SMAW)</li> <li>- Pipe Welder (SMAW)</li> </ul> | <ul style="list-style-type: none"> <li>- Plate Welder (SMAW-Alloy Steel)</li> <li>- Pipe Welder (SMAW-Alloy Steel)</li> </ul> |
|---|---|

## SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the core units of competency required in SMAW IV.

### BASIC COMPETENCIES

**UNIT OF COMPETENCY :** UTILIZE SPECIALIZED COMMUNICATION SKILLS

**UNIT CODE :** 500311115

**UNIT DESCRIPTOR :** This unit covers the knowledge, skills and attitudes required to use specialized communication skills to meet specific needs of internal and internal clients, conduct interviews, facilitate group of discussions, and contribute to the development of communication strategies.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Meet common and specific communication needs of clients and colleagues	1.1 Specific communication needs of clients and colleagues are identified and met 1.2 Different approaches are used to meet communication needs of clients and colleagues 1.3 Conflict is addressed promptly and in a timely way and in a manner which does not compromise the standing of the organization
2. Contribute to the development of communication strategies	2.1 <b>Strategies</b> for internal and external dissemination of information are developed, promoted, implemented and reviewed as required 2.2 Channels of communication are established and reviewed regularly 2.3 Coaching in effective communication is provided 2.4 Work related network and relationship are maintained as necessary 2.5 Negotiation and conflict resolution strategies are used where required 2.6 Communication with clients and colleagues is appropriate to individual needs and organizational objectives

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
3. Represent the organization	3.1 When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization 3.2 Presentation is clear and sequential and delivered within a predetermined time 3.3 Utilize appropriate media to enhance presentation 3.4 Differences in views are respected 3.5 Written communication is consistent with organizational standards 3.6 Inquiries are responded in a manner consistent with organizational standard
4. Facilitate group discussion	4.1 Mechanisms which enhance effective group interaction is defined and implemented 4.2 Strategies which encourage all group members to participate are used routinely 4.3 Objectives and agenda for meetings and discussions are routinely set and followed 4.4 Relevant information is provided to group to facilitate outcomes 4.5 Evaluation of group communication strategies is undertaken to promote participation of all parties 4.6 Specific communication needs of individuals are identified and addressed
5. Conduct interview	5.1 A range of appropriate communication strategies are employed in <i>interview situations</i> 5.2 Records of interviews are made and maintained in accordance with organizational procedures 5.3 Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Strategies	1.1 Recognizing own limitations 1.2 Referral to specialists 1.3 Utilizing techniques and aids 1.4 Providing written drafts 1.5 Verbal and non verbal communication
2. Effective group interaction	2.1 Identifying and evaluating what is occurring within an interaction in a non judgmental way 2.2 Using active listening 2.3 Making decision about appropriate words, behavior 2.4 Putting together response which is culturally appropriate 2.5 Expressing an individual perspective 2.6 Expressing own philosophy, ideology and background and exploring impact with relevance to communication
3. Types of Interview	3.1 Related to staff issues 3.2 Routine 3.3 Confidential 3.4 Evidential 3.5 Non disclosure 3.6 Disclosure
4. Interview situations	4.1 Establish rapport 4.2 Elicit facts and information 4.3 Facilitate resolution of issues 4.4 Develop action plans 4.5 Diffuse potentially difficult situation

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Demonstrated effective communication skills with clients accessing service and work colleagues</p> <p>1.2 Adopted relevant communication techniques and strategies to meet client particular needs and difficulties</p>
2. Underpinning knowledge and values	<p>2.1 Communication process</p> <p>2.2 Dynamics of groups and different styles of group leadership</p> <p>2.3 Communication skills relevant to client groups</p>
3. Underpinning skills	<p>3.1 Full range of communication techniques including:</p> <ul style="list-style-type: none"> <li>3.1.1 Full range of communication</li> <li>3.1.2 Active listening</li> <li>3.1.3 Feedback</li> <li>3.1.4 Interpretation</li> <li>3.1.5 Role boundaries setting</li> <li>3.1.6 Negotiation</li> <li>3.1.7 Establishing empathy</li> </ul> <p>3.2 Communication skills required to fulfill job roles as specified by the organization</p>
4. Resource implications	4.1 Access to appropriate workplace where assessment can take place
5. Methods of assessment	<p>Competency may be assessed through</p> <p>5.1 Direct observation</p> <p>5.2 Oral Interview</p>
6. Context for assessment	6.1 This unit should be assessed on the job through simulation

**UNIT OF COMPETENCY : DEVELOP TEAMS AND INDIVIDUALS**

**UNIT CODE : 500311116**

**UNIT DESCRIPTOR :** This unit covers the skills, knowledge and attitudes required to determine individual and team development needs and facilitate the development of the workgroup.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Provide team leadership	1.1. <b>Learning and development needs</b> are systematically identified and implemented in line with <b>organizational requirements</b> 1.2. Learning plan to meet individual and group training and developmental needs is collaboratively developed and implemented 1.3. Individuals are encouraged to self evaluate performance and identify areas for improvement 1.4. <b>Feedback on performance</b> of team members is collected from relevant sources and compared with established team learning process
2. Foster individual and organizational growth	2.1. Learning and development program goals and objectives are identified to match the specific knowledge and skills requirements of competency standards 2.2. <b>Learning delivery methods</b> are appropriate to the learning goals, the learning style of participants and availability of equipment and resources 2.3. Workplace learning opportunities and coaching/mentoring assistance are provided to facilitate individual and team achievement of competencies 2.4. Resources and timelines required for learning activities are identified and approved in accordance with organizational requirements
3. Monitor and evaluate workplace learning	3.1. Feedback from individuals or teams is used to identify and implement improvements in future learning arrangements 3.2. Outcomes and performance of individuals/teams are assessed and recorded to determine the effectiveness of development programs and the extent of additional support 3.3. Modifications to learning plans are negotiated to improve the efficiency and effectiveness of learning 3.4. Records and reports of competency are maintained within organizational requirement

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
4. Develop team commitment and cooperation	4.1. Open communication processes to obtain and share information is used by team 4.2. Decisions are reached by the team in accordance with its agreed roles and responsibilities 4.3. Mutual concern and camaraderie are developed in the team
5. Facilitate accomplishment of organizational goals	5.1. Team members actively participated in team activities and communication processes 5.2. Teams members developed individual and joint responsibility for their actions 5.3. Collaborative efforts are sustained to attain organizational goals

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Learning and development needs	1.1 Coaching, mentoring and/or supervision 1.2 Formal/informal learning program 1.3 Internal/external training provision 1.4 Work experience/exchange/opportunities 1.5 Personal study 1.6 Career planning/development 1.7 Performance appraisals 1.8 Workplace skills assessment 1.9 Recognition of prior learning
2. Organizational requirements	2.1 Quality assurance and/or procedures manuals 2.2 Goals, objectives, plans, systems and processes 2.3 Legal and organizational policy/guidelines and requirements 2.4 Safety policies, procedures and programs 2.5 Confidentiality and security requirements 2.6 Business and performance plans 2.7 Ethical standards 2.8 Quality and continuous improvement processes and standards
3. Feedback on performance	3.1 Formal/informal performance appraisals 3.2 Obtaining feedback from supervisors and colleagues 3.3 Obtaining feedback from clients 3.4 Personal and reflective behavior strategies 3.5 Routine and organizational methods for monitoring service delivery
4. Learning delivery methods	4.1 On the job coaching or mentoring 4.2 Problem solving 4.3 Presentation/demonstration 4.4 Formal course participation 4.5 Work experience 4.6 Involvement in professional networks 4.7 Conference and seminar attendance 4.8 Induction

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1. Identified and implemented learning opportunities for others</li> <li>1.2. Gave and received feedback constructively</li> <li>1.3. Facilitated participation of individuals in the work of the team</li> <li>1.4. Negotiated learning plans to improve the effectiveness of learning</li> <li>1.5. Prepared learning plans to match skill needs</li> <li>1.6. Accessed and designated learning opportunities</li> </ol>
<p>2. Underpinning knowledge and attitude</p>	<ol style="list-style-type: none"> <li>2.1. Coaching and mentoring principles</li> <li>2.2. Understanding how to work effectively with team members who have diverse work styles, aspirations, cultures and perspective</li> <li>2.3. Understanding how to facilitate team development and improvement</li> <li>2.4. Understanding methods and techniques for eliciting and interpreting feedback</li> <li>2.5. Understanding methods for identifying and prioritizing personal development opportunities and options</li> <li>2.6. Knowledge of career paths and competency standards in the industry</li> </ol>
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> <li>3.1. Ability to read and understand a variety of texts, prepare general information and documents according to target audience; spell with accuracy; use grammar and punctuation effective relationships and conflict management</li> <li>3.2. Communication skills including receiving feedback and reporting, maintaining effective relationships and conflict management</li> <li>3.3. Planning skills to organize required resources and equipment to meet learning needs</li> <li>3.4. Coaching and mentoring skills to provide support to colleagues</li> <li>3.5. Reporting skills to organize information; assess information for relevance and accuracy; identify and elaborate on learning outcomes</li> <li>3.6. Facilitation skills to conduct small group training sessions</li> <li>3.7. Ability to relate to people from a range of social, cultural, physical and mental backgrounds</li> </ol>
<p>4. Resource implications</p>	<p>The following resources <b>MUST</b> be provided:</p> <ol style="list-style-type: none"> <li>4.1. Access to relevant workplace or appropriately simulated environment where assessment can take place</li> <li>4.2. Materials relevant to the proposed activity or tasks</li> </ol>

<p>5. Methods of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1. Observation of work activities of the individual member in relation to the work activities of the group</li> <li>5.2. Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal</li> <li>5.3. Case studies and scenarios as a basis for discussion of issues and strategies in teamwork</li> </ul>
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> <li>6.1. Competency may be assessed in workplace or in a simulated workplace setting</li> <li>6.2. Assessment shall be observed while task are being undertaken whether individually or in-group</li> </ul>

**UNIT OF COMPETENCY : APPLY PROBLEM SOLVING TECHNIQUES IN THE WORKPLACE**

**UNIT CODE : 50011117**

**UNIT DESCRIPTOR :** This competency covers the knowledge, skills and attitudes required to apply the process of problem solving and other problems beyond those associated directly with the process unit. It includes the application of structured processes and improvement tools. This competency is typically performed by an experienced technician, team leader or supervisor.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Analyze the problem	1.1. Issues/concerns are evaluated based on data gathered  1.2. Possible causes of problem are identified within the <b>area of responsibility</b> as based on experience and the use of problem solving tools/analytical techniques  1.3 Possible cause statements are developed based on findings
2. Identify possible solutions	2.1 All possible options are considered for resolution of the problem in accordance with <b>safety</b> and operating procedures  2.2 Strengths and weaknesses of possible options are considered  2.3 Corrective action is determined to resolve the problem and its possible future causes
3. Recommend solution to higher management	3.1 Report/ <b>communication</b> or <b>documentation</b> are prepared  3.2 Recommendations are presented to appropriate personnel  3.3 Recommendations are followed-up, if required

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
4. Implement solution	4.1 Measurable objectives are identified 4.2 Resource needs are identified 4.3 Timelines are identified in accordance with plan
5. Evaluate/Monitor results and outcome	5.1. Processes and improvements are identified based on evaluative assessment of problem 5.2. Recommendations are prepared and submitted to superiors.

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Area of responsibility	Variables may include but are limited to: 1.1. Work environment 1.2. Problem solution processes 1.3. Preventative maintenance and diagnostic policy 1.4. Roles and technical responsibilities
2. Occupational Health and Safety	2.1. As per company, statutory and vendor requirements. Ergonomic and environmental factors must be considered during the demonstration of this competency.
3. Communication	3.1. Variables may include but are not limited to: 3.2. Written communication can involve both hand written and printed material, internal memos, electronic mail, briefing notes and bulletin boards.
4. Documentation	4.1. Audit trails 4.2. Naming standards 4.3. Version control

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1. Analyzed the problem</li> <li>1.2. Identified possible solutions</li> <li>1.3. Implemented solutions</li> <li>1.4. Recommended solutions to higher management</li> <li>1.5. Outcome evaluated/monitored</li> </ol> <p>Evidence of satisfactory performance in this unit can be obtained by observation of performance and questioning to indicate knowledge and understanding of the elements of the competency and performance criteria.</p>
<p>2. Underpinning knowledge</p>	<ol style="list-style-type: none"> <li>2.1. Broad understanding of systems, organizational systems and functions</li> <li>2.2. Broad knowledge of help desk and maintenance practices</li> <li>2.3. Current industry accepted hardware and software products with broad and detailed knowledge of its general features and capabilities</li> <li>2.4. Broad knowledge of the operating system</li> <li>2.5. Broad knowledge of the client business domain</li> <li>2.6. Broad knowledge based incorporating current industry practices related to escalation procedures</li> <li>2.7. Broad knowledge based of diagnostic tools</li> <li>2.8. General principles of OHS</li> <li>2.9. Divisional/unit responsibilities</li> </ol>
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> <li>3.1. Decision making within a limited range of options.</li> <li>3.2. Communication is clear, precise and varies according to the type of audience</li> <li>3.3. Teamwork in reference to personal responsibility</li> <li>3.4. Time management as applied to self-management.</li> <li>3.5. Analytical skills in relation to routine malfunctions.</li> <li>3.6. General customer service skills displayed.</li> <li>3.7. Questioning and active listening is employed to clarify general information</li> </ol>

<p>4. Resource implications</p>	<p>4.1. Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios/case studies/what ifs will be required as well as bank of questions which will be used to probe the reasoning behind the observable actions.</p>
<p>5. Methods of assessment</p>	<p>Competency may be assessed through:</p> <p>5.1. Through direct observation of application to tasks and questions related to underpinning knowledge</p> <p>Under general guidance, checking various stages of operation and at the completion of the activity against performance criteria and specifications</p>
<p>6. Context for assessment</p>	<p>6.1. Competency may be assessed in the work place or in a simulated work place setting</p> <p>6.2. Assessment shall be carried out through TESDA's Accredited Assessment Centers/Venues while tasks are undertaken either individually or as part of a team under limited supervision</p>

**UNIT OF COMPETENCY : COLLECT, ANALYZE AND ORGANIZE INFORMATION**

**UNIT CODE : 50011118**

**UNIT DESCRIPTOR :** This unit covers the outcomes required to process, analyze, interpret and organize workplace information and other relevant data.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Study information requirements	1.1 Needs are identified using established <b>research procedures</b> 1.2 Relevant <b>forms</b> and recording systems are used to gather the information. 1.3 Respondents are selected to implement survey / research based on established procedures.
2. Process data	2.1 <b>Data</b> are collected and collated based on the prescribed method. 2.2 Relevant data are used as references in accordance with the objectives of the program. 2.3 <b>Information</b> is compiled according to the required form.
3. Analyze, interpret and organize information gathered	3.1 Data are analyzed using relevant <b>methodologies</b> 3.2 Where applicable, <b>statistical analysis/methods</b> are employed according to the objectives of the program 3.3 Graphs and other visual presentations are prepared to facilitate analysis / interpretation of information
4. Present findings/ recommendations	4.1 Findings/recommendations summarized and presented/packaged in user-friendly manner 4.2 Relevant inputs gathered to finalize report 4.3 Draft report prepared based on standard format. 4.4 Technical reports are submitted and disseminated to concerned offices.

**RANGE OF VARIABLES**

<b>VARIABLE</b>	<b>RANGE</b>
1. Research procedures	May include but are not limited to: 1.1 TNA 1.2 Front-end analysis 1.3 Surveys 1.4 Interviews 1.5 Functional analysis 1.6 DACUM research
2. Forms	May include but are not limited to: 2.1 Survey forms/Questionnaires 2.2 Personal information/Profile 2.3 Accident report form 2.4 Requisition slip 2.5 Job orders 2.6 Purchase request form 2.7 Incident report form
3. Methodologies	3.1 Qualitative methods 3.2 Quantitative methods
4. Statistical analysis/methods	4.1. Averages (Mean, Median, Mode) 4.2. Percentage 4.3. Ranks 4.4. Frequency Distribution 4.5 Statistical test
5. Data	5.1. Raw Data
6. Information	6.1. Processed and packaged data

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate</p> <ul style="list-style-type: none"> <li>1.1 Determined information requirements based on organizational goals and objectives.</li> <li>1.2 Used relevant forms and recording systems to gather data</li> <li>1.3 Processed data based on the objectives of the program</li> <li>1.4 Utilized relevant research methods based on the objective of the program</li> <li>1.5 Analyzed and organized information gathered</li> <li>1.6 Submitted/Disseminated technical reports to concerned offices</li> </ul>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1 Data processing, Information analysis and interpretation</li> <li>2.2 Research methods <ul style="list-style-type: none"> <li>2.2.1 Qualitative</li> <li>2.2.2 Quantitative</li> <li>2.2.3 Statistical</li> </ul> </li> <li>2.3 Report writing</li> <li>2.4 Use of relevant software <ul style="list-style-type: none"> <li>2.4.1 Spreadsheets</li> <li>2.4.2 Presentation graphics</li> <li>2.4.3 Work processor</li> <li>2.4.4 Statistical package</li> </ul> </li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Communicating effectively</li> <li>3.2 Performing research and analysis</li> <li>3.3 Reading / interpreting data and information</li> <li>3.4 Problem solving</li> </ul>
<p>4. Resource implications</p>	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace or assessment location</li> <li>4.2 Access to office equipment and facilities relevant to the unit</li> <li>4.3 Case studies/scenarios</li> </ul>
<p>5. Methods of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Written/ Oral Examination</li> <li>5.2 Interviews</li> <li>5.3 Portfolio</li> </ul>
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> <li>6.1 Competency may be assessed in actual workplace or TESDA Accredited Assessment Center</li> </ul>

**UNIT OF COMPETENCY :** PLAN AND ORGANIZE WORK

**UNIT CODE :** 500311119

**UNIT DESCRIPTOR :** This unit covers the outcomes required in planning and organizing work. It may be applied to a small independent operation or to a section of a large organization.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Set objectives	1.1 <b>Objectives</b> are consistent with and linked to work activities in accordance with organizational aims 1.2 Objectives are stated as measurable targets with clear time frames 1.3 Support and commitment of team members are reflected in the objectives 1.4 Realistic and attainable objectives are identified
2. Plan and schedule work activities	2.1 Tasks/work activities to be completed are identified and prioritized as directed 2.2 Tasks/work activities are broken down into steps in accordance with set time frames achievable components in accordance with set time frames 2.3 <b>Resources</b> are allocated as per requirements of the activity 2.4 <b>Schedule of work activities</b> is coordinated with personnel concerned
3. Implement work plans	3.1 <b>Work methods and practices</b> are identified in consultation with personnel concerned 3.2 <b>Work plans</b> are implemented in accordance with set time frames, resources and <b>standards</b>
4. Monitor work activities	4.1 Work activities are monitored and compared with set objectives 4.2 Work performance is monitored 4.3 Deviations from work activities are reported and recommendations are coordinated with appropriate personnel and in accordance with set standards 4.4 Reporting requirements are complied with in accordance with recommended format 4.5 Observe timeliness of report 4.6 Files are established and maintained in accordance with standard operating procedures

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
5. Review and evaluate work plans and activities	5.1 Work plans, strategies and implementation are reviewed based on accurate, relevant and current information 5.2 Review is based on comprehensive consultation with appropriate personnel on outcomes of work plans and reliable feedback 5.3 Results of review are provided to concerned parties and formed as the basis for adjustments/simplifications to be made to policies, processes and activities 5.4 Performance appraisal is conducted in accordance with organization rules and regulations 5.5 Performance appraisal report is prepared and documented regularly as per organization requirements. 5.6 Recommendations are prepared and presented to <b><i>appropriate personnel/authorities</i></b> 5.7 <b><i>Feedback mechanisms</i></b> are implemented in line with organization policies

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Objectives	1.1. Specific 1.2. General
2. Resources	2.1. Personnel 2.2. Equipment and technology 2.3. Services 2.4. Supplies and materials 2.5. Sources for accessing specialist advice 2.6. Budget
3. Schedule of work activities	3.1. Daily 3.2. Work-based 3.3. Contractual 3.4. Regular 3.5. Confidential 3.6. Disclosure 3.7. Non-disclosure
4. Work methods and practices	4.1. Work methods and practices may include but not limited to: 4.2. Legislated regulations and codes of practice 4.3. Industry regulations and codes of practice 4.4. Occupational health and safety practices
5. Work plans	5.1. Daily work plans 5.2. Project plans 5.3. Program plans 5.4. Organization strategic and restructuring plans 5.5. Resource plans 5.6. Skills development plans 5.7. Management strategies and objectives

VARIABLE	RANGE
6. Standards	6.1. Performance targets 6.2. Performance management and appraisal systems 6.3. National competency standards 6.4. Employment contracts 6.5. Client contracts 6.6. Discipline procedures 6.7. Workplace assessment guidelines 6.8. Internal quality assurance 6.9. Internal and external accountability and auditing requirements 6.10. Training Regulation Standards 6.11. Safety Standards
7. Appropriate personnel/authorities	7.1. Appropriate personnel include: 7.2. Management 7.3. Line Staff
8. Feedback mechanisms	8.1. Feedback mechanisms include: 8.2. Verbal feedback 8.3. Informal feedback 8.4. Formal feedback 8.5. Questionnaire 8.6. Survey 8.7. Group discussion

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1. Set objectives</li> <li>1.2. Planned and scheduled work activities</li> <li>1.3. Implemented work plans</li> <li>1.4. Monitored work activities</li> <li>1.5. Reviewed and evaluated work plans and activities</li> </ul>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1. Organization's strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities</li> <li>2.2. Organizations policies, strategic plans, guidelines related to the role of the work unit</li> <li>2.3. Team work and consultation strategies</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1. Planning</li> <li>3.2. Leading</li> <li>3.3. Organizing</li> <li>3.4. Coordinating</li> <li>3.5. Communication Skills</li> <li>3.6. Inter-and intra-person/motivation skills</li> <li>3.7. Presentation skills</li> </ul>
<p>4. Resource implications</p>	<p>The following resources MUST be provided</p> <ul style="list-style-type: none"> <li>4.1. Tools, equipment and facilities appropriate to the proposed activities</li> <li>4.2. Materials relevant to the proposed activities</li> <li>4.3. Work plan schedules</li> <li>4.4. Drawings, sketches or blueprint</li> </ul>
<p>5. Methods of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1. Direct observation/questioning</li> <li>5.2. Practical exercises on Planning and Scheduling Work Activities</li> <li>5.3. Third Party Report (collection of competency evidence)</li> </ul>
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> <li>6.1. Competency may be assessed in the workplace or in simulated work</li> </ul>

**UNIT OF COMPETENCY : PROMOTE ENVIRONMENTAL PROTECTION**

**UNIT CODE : 500311120**

**UNIT DESCRIPTOR :** This unit covers the knowledge, skills and attitudes required in adhering to environmental protection principles, strategies and-guidelines.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Study guidelines for environmental concerns.	1.1 Environmental <b>legislations/conventions</b> and local ordinances are identified according to the different <b>environmental aspects/impact</b> . 1.2 <b>Industrial standard/environmental practices</b> are described according to the different environmental concerns.
2. Implement specific environmental programs.	2.1 <b>Programs/Activities</b> are identified according to organizations policies and guidelines. 2.2 Individual roles/responsibilities are determined and performed based on the activities identified. 2.3 Problems/ constraints encountered are resolved in accordance with organizations' policies and guidelines 2.4 Stakeholders are consulted based on company guidelines.
3. Monitor activities on environmental protection /programs	3.1 Activities are <b>periodically</b> monitored and evaluated according to the objectives of the environmental program 3.2 Feedback from stakeholders are gathered and considered in proposing enhancements to the program based on consultations 3.3 Data gathered are analyzed based on evaluation requirements 3.4 Recommendations are submitted based on the findings. 3.5 Management support systems are set/established to sustain and enhance the program 3.6 Environmental incidents are monitored and reported to concerned/proper authorities.

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Legislations/Conventions	May include but are not limited to: 1.1 Clean Air act 1.2 Clean Water Act 1.3 Solid Waste Management 1.4 Montreal Protocol 1.5 Kyoto Protocol
2. Environmental aspects/impacts	2.1 Air pollution 2.2 Water pollution 2.3 Noise pollution 2.4 Solid waste 2.5 Flood control 2.6 Deforestation/Denudation 2.7 Radiation/Nuclear /Radio Frequency/ Microwaves 2.8 Situation 2.9 Soil erosion (e.g. Quarrying, Mining, etc.) 2.10Coral reef/marine life protection
3. Industrial standards/ Environmental practices	3.1 ECC standards 3.2 ISO standards 3.3 company environmental management systems (EMS)
4. Periodic	4.1 hourly 4.2 daily 4.3 weekly 4.4 monthly 4.5 quarterly 4.6 yearly
5. Programs/Activities	5.1 Waste disposal (on-site and off-site) 5.2 Repair and maintenance of equipment 5.3 Treatment and disposal operations 5.4 Clean-up activities 5.5 Laboratory and analytical test 5.6 Monitoring and evaluation 5.7 Environmental advocacy programs

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues/concerns.</li> <li>1.2 Described industrial standard environmental practices according to the different environmental issues/concerns.</li> <li>1.3 Resolved problems/ constraints encountered based on management standard procedures</li> <li>1.4 Implemented and monitored environmental practices on a periodic basis as per company guidelines</li> <li>1.5 Recommended solutions for the improvement of the program</li> <li>1.6 Monitored and reported to proper authorities any environmental incidents</li> </ul>
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> <li>2.1 Features of an environmental management strategy</li> <li>2.2 Environmental issues/concerns</li> <li>2.3 International Environmental Protocols (Montreal, Kyoto)</li> <li>2.4 Waste minimization hierarchy</li> <li>2.5 Environmental planning/management</li> <li>2.6 Community needs and expectations</li> <li>2.7 Resource availability</li> <li>2.8 Environment-friendly/environmental advocates</li> <li>2.9 5S of Good Housekeeping</li> <li>2.10 3Rs – Reduce, Reuse &amp; Recycle</li> <li>2.11 Sanitary Code</li> <li>2.12 Environmental Code of practice</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Communicating effectively</li> <li>3.2 Performing research and analysis</li> <li>3.3 Reading / interpreting data and information</li> <li>3.4 Problem solving</li> </ul>
<p>4. Resource Implications</p>	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace/Assessment location</li> <li>4.2 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection</li> <li>4.3 Case studies/scenarios relating to environmental protection</li> </ul>
<p>5. Methods of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Written/ Oral Examination</li> <li>5.2 Interview/Third Party Reports</li> <li>5.3 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)</li> <li>5.4 Simulations and role-plays</li> </ul>
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> <li>6.1 Competency may be assessed in actual workplace or at the designated TESDA center.</li> </ul>

## COMMON COMPETENCIES

**UNIT OF COMPETENCY : APPLY SAFETY PRACTICES**

**UNIT CODE : MEE721201**

**UNIT DESCRIPTOR :** This unit covers the competencies required to apply safety practices in the workplace.

<b>ELEMENTS</b>		<b>PERFORMANCE CRITERIA</b>	
		<i>Italicized</i> terms are elaborated in the Range of Variables	
1.	Identify hazardous area	1.1	<i>Hazards</i> are identified correctly in accordance with OHS principles.
		1.2	Safety signs and symbols are identified and adhered to.
2.	Use protective clothing and devices	2.1	Appropriate <i>protective clothing and devices</i> correctly selected and used in accordance with OHS requirements or industry/company policy
3.	Perform safe handling of tools, equipment and materials	3.1	Safety procedures for pre-use check and operation of tools and equipment followed in accordance with industry/ company policies.
		3.2	Tools, equipment and materials handled safely in accordance with OHS requirements and industry/ company policies.
4.	Perform first aid	4.1	First aid treatment of <i>injuries</i> are carried out according to recommended procedures
5.	Use fire extinguisher	5.1	Fire extinguisher selected and operated correctly according to the <i>type of fire</i> .

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Hazards	1.1 Cluttered tools and materials 1.2 Slippery floors (caused by oil, grease or any liquid) 1.3 Exposed electrical wires 1.4 Sharp edges 1.5 Machine without guards or with exposed moving parts
2. Protective clothing and devices	Protective clothing and devices may include but is not limited to: 2.1 safety glasses/goggles 2.2 safety shoes 2.3 overalls 2.4 cap 2.5 gloves
3. Injuries	Injuries may include: 3.1 burns/scalds 3.2 fractures 3.3 cuts and abrasions 3.4 poisoning 3.5 foreign bodies in the eye 3.6 concussion 3.7 shock
4. Type of fires	Fires involving or caused by: 4.1 common combustibles (wood, cloth, paper, rubber and plastic) 4.2 flammable liquids (gasoline, oil, solvents, paints, etc.) 4.3 energized electrical equipment (wiring, fuse boxes, circuit breakers, appliances, etc.) 4.4 combustible metals (magnesium, sodium, etc.)

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 identified hazardous area</li> <li>1.2 used protective clothing and devices</li> <li>1.3 handled tools, equipment and materials properly</li> <li>1.4 performed first aid</li> <li>1.5 used fire extinguisher</li> </ul>
<p>2. Underpinning knowledge and attitude</p>	<ul style="list-style-type: none"> <li>2.1 Shop safety signs, symbols and alarms</li> <li>2.2 Safety precautionary measures</li> <li>2.3 Housekeeping</li> <li>2.4 Machine tools</li> <li>2.5 First aid</li> <li>2.6 Engineering materials</li> <li>2.7 Fire extinguishers</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Operating machine tools</li> <li>3.2 Handling tools and materials</li> <li>3.3 Communicating with superiors and co-workers</li> <li>3.4 Interpreting instructions</li> </ul>
<p>4. Resource implications</p>	<p>The following resources must be provided</p> <ul style="list-style-type: none"> <li>4.1 Tools, equipment and facilities appropriate to processes or activity</li> <li>4.2 Materials relevant to the proposed activity</li> </ul>
<p>5. Method of assessment</p>	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Demonstration</li> <li>5.2 Written or oral short answer questions</li> <li>5.3 Practical exercises</li> </ul>
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> <li>• Competency may be assessed in the workplace or in simulated workplace environment.</li> </ul>

**UNIT OF COMPETENCY : INTERPRET DRAWINGS AND SKETCHES**

**UNIT CODE : MEE721202**

**UNIT DESCRIPTOR : This unit covers the competencies required to read and interpret drawings and sketches.**

<b>ELEMENTS</b>		<b>PERFORMANCE CRITERIA</b>	
		<i>Italicized</i> terms are elaborated in the Range of Variables	
1.	Identify standard alphabet of lines	1.1 1.2	Alphabet of lines are identified Uses of the alphabet of lines are explained
2.	Identify orthographic/ isometric views	2.1 2.2	Orthographic and isometric <i>drawing</i> are identified Orthographic and isometric views are explained
3.	Interpret standard drawing symbols, dimensional tolerances and notations	3.1 3.2	Drawing symbols are interpreted according to drawing standards Dimensional <i>tolerances</i> , notations are interpreted according to specifications

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing	Drawing technique include 1.1 Perspective 1.2 Exploded view 1.3 Hidden view technique  Projections 1.4 First angle projections 1.5 Third angle projections
2. Tolerance	2.1 General tolerance 2.2 Angular tolerance 2.3 Geometric tolerance

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate interpreted technical drawings and sketches.
2. Underpinning knowledge	2.1 Alphabet of lines 2.2 Projections 2.3 Drawing symbols 2.4 Dimensioning techniques 2.5 Tolerances
3. Underpinning skills	3.1 Communication skills (reading and comprehension) 3.2 Computation skills
4. Resource implications	The following resources must be provided 4.1 Working drawing or plans or sketches 4.2 Measuring tools 4.3 Drawings, sketches or blueprint 4.4 Specimen parts/components
5. Method of assessment	Competency must be assessed through: 5.1 direct observation 5.2 written or oral short answer questions 5.3 demonstration 5.4 project/work sample 5.5 portfolio
6. Context for assessment	<ul style="list-style-type: none"><li>• Competency may be assessed in the workplace or in simulated workplace environment.</li></ul>

**UNIT OF COMPETENCY : PERFORM INDUSTRY CALCULATIONS****UNIT CODE : MEE721203****UNIT DESCRIPTOR :** This unit covers the competencies required to perform basic calculations using the four fundamental operation.

<b>ELEMENTS</b>		<b>PERFORMANCE CRITERIA</b>	
		<i>Italicized</i> terms are elaborated in the Range of Variables	
1.	Perform four fundamental operations.	1.1	Simple calculations involving whole numbers, mixed numbers, fraction and decimal are performed using <i>four fundamental operations</i> .
2.	Perform conversion of units	2.1 2.2	<i>Units</i> are converted to the required figure using the given formulae <i>English measurements are converted to metric measurements according to procedure.</i>
3.	Perform calculations on algebraic expressions	3.1 3.2 3.3 3.4	Simple calculations are performed on algebraic expressions using four fundamental operations. Simple transposition of formulae are carried out to isolate the variable required, involving the four fundamental operations. Where appropriate, formulae are constructed to enable problems to be solved. Equations involving on unknown solved correctly.
4.	Compute percentage and ratio	4.1	Percentages are computed using appropriate formula. Ratio and proportion are computed using appropriate formula.

**RANGE OF VARIABLES**

<b>VARIABLE</b>	<b>RANGE</b>
1. Four fundamental operations	1.1 Addition 1.2 Subtraction 1.3 Multiplication 1.4 Division
2. Units	2.1 Fractions 2.2 Mixed numbers 2.3 decimal

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate performed calculations: 1.1 using four fundamental operations 1.2 involving fractions and mixed numbers 1.3 involving fractions and decimals 1.4 on algebraic expressions 1.5 involving ratio and proportion
2. Underpinning knowledge and attitude	2.1 English and metric system of measurements 2.2 Four fundamental operations 2.3 Method of transposing formulae 2.4 Equation formulation
3. Underpinning skills	3.1 Performing calculations using pen and paper or with the use of calculator
4. Resource implications	The following resources must be provided 4.1 Tools and facilities appropriate to processes or activity 4.2 Materials relevant to the proposed activity
5. Method of assessment	Competency must be assessed through: 5.1 written or oral short answer questions 5.2 practical exercises
6. Context for assessment	Competency may be assessed in the workplace or in simulated workplace environment.

**UNIT OF COMPETENCY : CONTRIBUTE TO QUALITY SYSTEM**

**UNIT CODE : MEE721204**

**UNIT DESCRIPTOR :** This unit involves competence required to inspect work against specification and standards and apply quality standards to work.

<b>ELEMENTS</b>		<b>PERFORMANCE CRITERIA</b>	
		<i>Italicized</i> terms are elaborated in the Range of Variables	
1.	Inspect work done	1.1	Appropriate inspections are conducted to ensure company <b>quality systems and procedures</b> are maintained/ followed.
		1.2	Job specifications/work order and quality standards are identified.
		1.3	Faults/Defects are identified and rectified according to company procedures.
2.	Apply quality standards to work	2.1	Inspections are conducted throughout the manufacturing processes to ensure quality standards are maintained.
		2.2	Appropriate quality standards are applied throughout the production/fabrication process.
		2.3	All activities are coordinated throughout the workplace to ensure efficient quality work outcomes.
		2.4	Records of work quality are maintained according to the company requirements.
3	Protect company property and customer interests	3.1	Possible damage to <b>company property</b> is avoided by adherence to company quality procedures.
		3.2	Quality of work is reviewed to ensure customer requirements and company standards are met.

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Quality system and procedures	Quality system and procedures may be contained in: 1.1 work instructions 1.2 safe work procedures 1.3 product specifications 1.4 equipment maintenance schedules 1.5 technical procedures adopted or specifically prepared standards 1.6 company/industry rules
2. Company property	Company properties includes : 2.1 production and/or fabrication equipment 2.2 hand and power tools 2.3 OH&S paraphernalia 2.4 facilities

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 inspected work done against specification 1.2 applied quality standards to work 1.3 protected company property and customer interests
2. Underpinning knowledge and attitude	2.1 Communication/feedback methods-written and verbal 2.2 Company systems, processes and work quality requirements 2.3 Work inspection techniques 2.4 Quality assurance principles 2.5 Safety precautionary measures 2.6 Handling materials, tools and equipment
3. Underpinning skills	3.1 Problem solving skills 3.2 Communicating with superiors and co-workers 3.3 Interpreting job specification and work order
4. Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to processes or activity 4.2 Materials relevant to the proposed activity
5. Method of assessment	Competency must be assessed through: 5.1 Demonstration 5.2 Written or oral short answer questions 5.3 Practical exercises
6. Context for assessment	Competency may be assessed in the workplace or in simulated workplace environment.

**UNIT OF COMPETENCY : USE HAND TOOLS**

**UNIT CODE : MEE721205**

**UNIT DESCRIPTOR** : This unit covers the competencies required to use hand tools.

<b>ELEMENTS</b>		<b>PERFORMANCE CRITERIA</b>	
		<i>Italicized</i> terms are elaborated in the Range of Variables	
1.	Select hand tools	1.1	<b>Hand tools</b> selected are appropriate to the requirements of the <b>task</b> .
		1.2	Unsafe or defective tools are identified and marked for repair according to procedure.
2.	Use hand tools	2.1	Hand tools are used to produce the desired outcomes to job specifications.
		2.2	Task performed in accordance with company or industry safety procedure.
3.	Maintain hand tools	3.1	<b>Routine maintenance</b> of hand tools is undertaken according to standard operating procedures, principles and techniques.
		3.2	Hand tools are stored in designated location in accordance with manufacturer's instruction/standard operating procedure.

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Hand tools	Hand tools includes but not limited to: 1.1 Hacksaws 1.2 Hammers (ball peen, chipping) 1.3 Punches 1.4 Screwdrivers 1.5 Wrenches 1.6 Scrapers 1.7 Chisels 1.8 Gouges 1.9 Files 1.10 Clamps
2. Task	Tasks may include: 2.1 Adjusting 2.2 Dismantling 2.3 Assembling 2.4 Finishing of item or components
3. Routine maintenance	<b><i>Routine maintenance may include:</i></b> 3.1 Cleaning 3.2 Lubricating 3.3 Tightening 3.4 Simple tool repair 3.5 Hand sharpening

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Selected and used hand tools appropriate to the job 1.2 Performed routine maintenance and storage of hand tools
2. Underpinning knowledge and attitude	2.1 Types and uses of hand tools 2.2 Hand tool defects 2.3 Procedure, principles and techniques in maintenance of hand tools
3. Underpinning skills	3.1 Handling tools and materials 3.2 Communicating with superiors and co-workers 3.3 Interpreting instructions
4. Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to the process or activity 4.2 Materials relevant to the proposed activity
5. Method of assessment	Competency must be assessed through: 5.1 Demonstration 5.2 Written or oral short answer questions 5.3 Practical exercises
6. Context for assessment	Competency may be assessed in the workplace or in simulated workplace environment.

**UNIT TITLE** : **PREPARE WELD MATERIALS**

**UNIT CODE** : **MEE721206**

**DESCRIPTOR** : This unit covers the skills, knowledge and attitudes in preparing welding materials.

<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the range of Variables
1. Set up cutting equipment	1.1 Cutting equipment should be operational and should conform to acceptable OH&S standards 1.2 Appropriate for operation intended
2. Cut and prepare edge of materials	2.1 <i>Materials</i> are <i>cut</i> to specified dimension/ <i>specifications</i> . 2.2 Task performed in accordance with company or industry requirements and safety procedure.
3. Clean surfaces and edges	3.1 Surfaces are <i>cleaned</i> to required specifications. 3.2 Task performed in accordance with company or industry requirements and <i>safety procedure</i>
4. Prepare welding consumables	4.1 Consumables are prepared in accordance with required specifications 4.2 Recommended manufacturer's instructions are observed
5. Prepare welding safety and protective equipment	5.1 PPE should conform to acceptable OH&S requirement and standards

**RANGE OF VARIABLE**

<b>VARIABLE</b>	<b>RANGE</b>
1. Materials and consumables	1.1 Mild steel 1.2 Carbon steel 1.3 Alloy steel (level III & IV) 1.4 Cutting gases 1.5 Gouging electrodes 1.6 Grinding/cutting discs 1.7 Run on/run off, backing plates/ring 1.8 Cutting accessories
2. Cut	Cut material using 2.1 Oxy-acetylene gas cutting equipment (manual and /or automatic) 2.2 Plasma cutting equipment 2.3 Shearing machine 2.4 Disc cutter
3. Specification	Specifications based on 3.1 Welding codes 3.2 Reference Industry standards 3.3 Client specification
4. Cleaned	Surfaces and edges are cleaned by 4.1 Grinding or sanding 4.2 Filing 4.3 Chemical washing (Degreaser)
5. Safety procedures	5.1 Wearing of required PPE 5.2 Securing oxy-acetylene tanks before, during and after use 5.3 Checking oxy-acetylene hose for gas leaks 5.4 Switch off equipment after use 5.5 Checking electrical equipment and devices

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Perform edge preparation in accordance with WPS and safety procedures</li> <li>1.2 Use edge preparation equipment and tools in accordance with the requirements or manufacturer's instructions</li> </ul>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1 Interpretation of plans and drawings</li> <li>2.2 Selection of appropriate method of edge preparation</li> <li>2.3 Selection of appropriate cutting equipment, accessories and supplies</li> <li>2.4 Operation of cutting equipment such as mechanical, gas and plasma</li> <li>2.5 Operation of grinding equipment</li> <li>2.6 Safety procedures for cutting and grinding</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Measuring and communication skills</li> <li>3.2 Set up of cutting equipment such as mechanical, gas and plasma</li> <li>3.3 Cutting techniques</li> <li>3.4 Grinding techniques</li> <li>3.5 Observance of safety procedures</li> </ul>
<p>4. Resource implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>4.1 Relevant documentation such as WPS and working drawing</li> <li>4.2 Supplies and materials</li> <li>4.3 Cutting equipment and facilities</li> <li>4.4 Grinding equipment and facilities</li> <li>4.5 Measuring tools</li> <li>4.6 PPE</li> <li>4.7 Stand-by fire fighting equipment</li> </ul>
<p>5. Method of assessment</p>	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Observation/evaluation</li> <li>5.2 Oral questioning</li> <li>5.3 Inspection of prepared edges</li> </ul>
<p>6. Context of assessment</p>	<p>Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting.</p>

**UNIT TITLE** : **SET UP WELDING EQUIPMENT**

**UNIT CODE** : **MEE721207**

**DESCRIPTOR** : This unit covers the skills, knowledge and attitudes in preparing equipment for welding.

<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1.1 Set up welding machine	1.1 Requirements for welding is determined from job requirements, welding procedures and specifications and/or technical drawings. 1.2 <i>Welding machine</i> is set up in accordance with job requirements, welding procedures and specifications, technical drawings and manufacturer's instructions. 1.3 Welding machine should be connected to an independent power supply and wired up or set to the <i>polarity</i> indicated in the welding procedures /specifications or as recommended by the manufacturer. 1.4 Current and voltage fine-tuned or adjusted consistent with job requirements to produce acceptable weld. 1.5 Task is completed without causing damage to the tools, equipment and materials and injury to self and others.
2. Set up welding accessories	2.1 Welding machine <i>accessories</i> and consumables are identified from job requirements, welding procedures and specifications. 2.2 Welding machine accessories and consumables are set up in accordance with job requirements, welding procedures and specifications and/or manufacturer's instructions.
3. Set up welding positioners, jigs and fixtures	3.1 Braces, stiffeners, rails and other jigs are provided and in conformity with job requirements. 3.2 Work items/materials are protected from strong winds, drafts and rainfall
4. Set up pre-heating tools/equipment as required	4.1 Pre-heating equipment appropriate to the job requirement and specifications 4.2 Equipment operated in conformance with the manufacturer's instructions.

**RANGE OF VARIABLE**

<b>VARIABLE</b>	<b>RANGE</b>
1. Welding machine	Types, kind and uses of SMAW welding machines 1.1 Alternating current (AC) 1.2 Direct current (DC) 1.3 Constant current 1.4 Constant voltage
2. Polarity	Application and uses 2.1 Direct current – electrode positive (reverse polarity) 2.2 Direct current – electrode negative (straight polarity) 2.3 Alternating current
3. Accessories	3.1 welding cables 3.2 electrode holders

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate</p> <p>1.1 Set up and install welding machine, accessories, welding positioners, jigs and fixtures and pre-heating equipment within allotted time and in accordance with OH&amp;S rules and accessible and convenient location.</p> <p>1.2 Applied housekeeping and 5S practices</p>
<p>2. Underpinning knowledge</p>	<p>2.1 Types and uses of welding equipment and accessories</p> <p>2.2 Power requirement and capacity of welding machine and its accessories</p> <p>2.3 Operating capacity of welding machine and accessories</p> <p>2.4 Basic electricity</p> <p>2.5 Shop safety, housekeeping and 5S procedures</p>
<p>3. Underpinning skills</p>	<p>3.1 Setting and operating welding machine and accessories</p> <p>3.2 Communication skills</p> <p>3.3 Recognizing operational abnormalities and faults in welding machine and accessories</p> <p>3.4 Fine tuning of welding machine and accessories for optimum operation</p> <p>3.5 Minor repairs/maintenance of welding machine and accessories</p> <p>3.6 Use of PPE</p>
<p>4. Resource implications</p>	<p>The following resources must be provided:</p> <p>4.1 Appropriately ventilated work area/shop with welding facilities, machines and accessories</p> <p>4.2 PPE</p>
<p>5. Method of assessment</p>	<p>Competency must be assessed through:</p> <p>5.1 Observation/evaluation</p> <p>5.2 Oral questioning</p>
<p>6. Context of assessment</p>	<p>Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting.</p>

**UNIT TITLE** : **FIT UP WELD MATERIALS**

**UNIT CODE** : **MEE721208**

**DESCRIPTOR** : This unit covers the skills, knowledge and attitudes in fitting up welding materials.

<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Perform tack welding	1.1 <i>Tack welding</i> performed in accordance with the requirements of WPS and client's specifications. 1.2 Tack weld <i>visually and dimensionally acceptable</i> . 1.3 Tack on root for pipe or as required. 1.4 <i>Backing</i> plate, stiffener, running plate installed as required. 1.5 Joints are free from rust, paints, grease and other foreign materials prior to fit up or tacking.
2. Check gap and alignment	2.1 <i>Root gap</i> is performed in accordance with the requirements of WPS. 2.2 <i>Alignment</i> within the range of acceptability of code and standard. 2.3 Fitted materials visually free from stresses
3. Set up welding positioner	3.1 Weld specimen positioned and secured according to the requirements.

**RANGE OF VARIABLE**

<b>VARIABLE</b>	<b>RANGE</b>
1. Tack welding	Kinds of tacking 1.1 Bridge tacking 1.2 Permanent tacking 1.3 Temporary tacking
2. Visually and dimensionally acceptable	2.1 Acceptable tack welds 2.2 Fully fused to the base metal 2.3 Free from defects and discontinuities 2.4 Evenly distributed
3. Root gap	3.1 WPS requirements 3.2 Client requirements
4. Backing materials	4.1 Stiffeners 4.2 Backing plate 4.3 Strong back
5. Alignment	5.1 Codes and specifications 5.2 Client requirements

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate 1.1 performed tack welding 1.2 checked gap and alignment 1.3 set up welding positioners
2. Underpinning knowledge	2.1 Fit up tolerances 2.2 Mensuration 2.3 WPS 2.4 Welding materials and consumables 2.5 Drawing and plan interpretation 2.6 Welding codes (symbols) 2.7 Identification of weld defects 2.8 Fit up
3. Underpinning skills	3.1 Applying weld techniques 3.2 Handling welding materials and consumables 3.3 Rectifying weld defects 3.4 Measuring skills 3.5 Communication skills 3.6 Pre-heating technique 3.7 Observance of safety procedures
4. Resource implications	The following resources must be provided: 4.1 Drawing and plans 4.2 Appropriately ventilated work area/shop with welding facilities, machines and accessories 4.3 PPE
5. Method of assessment	Competency must be assessed through: 5.1 Observation/evaluation 5.2 Oral questioning
6. Context of assessment	Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting.

**UNIT TITLE** : **REPAIR WELDS**

**UNIT CODE** : **MEE721209**

**DESCRIPTOR** : This unit covers the skills, knowledge and attitudes in repairing welds.

<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Mark/locate weld defects	1.1 Identified <i>weld defects</i> marked/located according to recommended practice
3. Prepare tools and equipment	2.1 <i>Tools and equipment</i> prepared are appropriate to the job requirements including the provision of wind barriers. 2.2 Task performed in accordance with company or industry requirements and safety procedure
3. Remove defects	3.1 Weld defects <i>removed/excavated</i> in accordance with approved industry procedures or client requirements. 3.2 Removal of non-defective welds is minimized and cleaned. 3.3 Visual and dye-penetrant test performed to verify the extent of removal of defects, where applicable 3.4 Welding inspector informed to verify the extent of defect removal. 3.5 Task performed in accordance with company or industry requirement and safety procedure
4. Perform re-welding	4.1 Re-welding performed in accordance with approved repair procedure. 4.2 Task performed in accordance with company or industry requirement and safety procedure 4.3 No new weld defects or damages occurred during re-welding. 4.4 Weld visually checked after re-welding for acceptability

**RANGE OF VARIABLE**

<b>VARIABLE</b>	<b>RANGE</b>
1. Weld defects	1.1 Porosity 1.2 Root undercut 1.3 and solid material inclusion 1.4 Concavity/convexity 1.5 Degree of reinforcement 1.6 Burn Through 1.7 Crater cracks 1.8 Cracks 1.9 Lack of Fusion (tie-in) 1.10 Pinholes/Blowholes 1.11 Under Fill 1.12 Excess/incomplete penetration 1.13 Slag/tungsten inclusion 1.14 Overlap 1.15 Misalignment 1.16 Distortion
2. Tools and equipment	2.1 Welding machine and accessories 2.2 Gouging outfit and accessories 2.3 Portable grinder 2.4 Chipping hammer 2.5 Files 2.6 Extension cord and lightings 2.7 Barriers 2.8 Dye-penetrant kit 2.9 Portable oven
3. Removed/excavated	Defects removed by 3.1 Grinding 3.2 Arc/air Gouging 3.3 Cutting (mechanical, gas) 3.4 Plasma gouging

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate repaired weld defects within the approved weld repair procedures
2. Underpinning knowledge	2.1 Interpretation of weld repair procedures and WPS 2.2 Causes and identification of weld defects 2.3 Materials and consumables 2.4 Welding Equipment and Tools 2.5 Welding Codes (symbols) 2.6 Repair techniques 2.7 Selection and use of PPE
3. Underpinning skills	3.1 Operating weld defect removal tools and equipment 3.2 Applying correct weld techniques 3.3 Measuring skills 3.4 Communication skills 3.5 Rectifying weld defects 3.6 Handling welding tools and equipment 3.7 Handling materials and consumables 3.8 Identifying weld defects
4. Resource implications	The following resources must be provided: 4.1 Weld defect removal and repair facilities and equipment 4.2 Supplies and materials 4.3 PPE 4.4 Relevant documentation such as WPS and approved repair procedure
5. Method of assessment	Competency must be assessed through: 5.1 Observation and interview 5.2 Performance record
6. Context of assessment	Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting.

## CORE COMPETENCIES

**UNIT OF COMPETENCY :** Weld alloy steel pipes using SMAW

**UNIT CODE :** MEE721317

**DESCRIPTOR :** This unit covers the skills, knowledge and attitudes in welding alloy steel pipes using SMAW process.

ELEMENTS	PERFORMANCE CRITERIA
	<i>Italicized terms</i> are elaborated in the Range of Variables
1. Perform root pass	1.1 Root pass performed in accordance with <i>WPS</i> and/or client specifications. 1.2 Task performed in accordance with company or industry requirement and safety procedure. 1.3 Weld visually checked for <i>defects</i> and repaired, as required 1.4 Weld visually acceptable in accordance with applicable codes and standards
2. Clean root pass	2.1 Root pass cleaned is free from defects and discontinuities 2.2 Task performed in accordance with approved <i>WPS</i>
3. Weld subsequent/ filling passes	3.1 Subsequent/ filling passes performed in accordance with approved <i>WPS</i> 3.2 Weld visually checked for defects and repaired, as required 3.3 Weld visually acceptable in accordance with applicable codes and standards
4. Perform capping	4.1 Capping performed in accordance with <i>WPS</i> and/or client specifications 4.2 Weld visually checked for defects and repaired, as required 4.3 Weld visually acceptable in accordance with applicable codes and industry/company standards

**RANGE OF VARIABLE**

<b>VARIABLE</b>	<b>RANGE</b>
1. WPS	WPS Requirements 1.1 Welding positions 1.1.1 2G and 5G and/or 6G 1.2 Wall thickness 1.2.1 1.6mm and above 1.3 Type of material 1.3.1 Alloy steel 1.4 Type and size of alloy electrode 1.5 Travel speed 1.6 Current setting (polarity, amperage, voltage) 1.7 Preheating requirement 1.8 Joint preparation
2. Defects	2.1 Porosity 2.2 Undercut 2.3 Arc Strike 2.4 Spatters 2.5 Slag inclusion 2.6 Concavity/convexity 2.7 Degree of reinforcement 2.8 Burn Through 2.9 Crater cracks 2.10 Cracks 2.11 Lack of Fusion 2.12 Pinholes/Blowholes 2.13 Under Fill 2.14 Overlap 2.15 Misalignment 2.16 Distortion

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate welded alloy steel pipes in all positions and to acceptable standard following the approved WPS.
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Drawing/Plan/WPS interpretation</li> <li>2.2 Materials and consumables (Electrodes, Base Metal) Welding Equipment and Tools</li> <li>2.3 Basic Mathematics (MDAS)</li> <li>2.4 Welding Codes</li> <li>2.5 identification of weld defects</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Measuring skills</li> <li>3.2 Communication skills</li> <li>3.3 Rectifying weld defects</li> <li>3.4 Applying weld techniques</li> <li>3.5 Handling welding tools and equipment</li> <li>3.6 Handling welding materials and consumables</li> </ul>
4. Resource implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>4.1 Welding facilities and equipment</li> <li>4.2 Supplies and materials</li> <li>4.3 PPE</li> <li>4.4 Relevant documentation such as WPS and working drawing</li> </ul>
5. Method of assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Observation and interview</li> <li>5.2 Demonstration and interview</li> <li>5.3 Written test</li> <li>5.4 Portfolio</li> </ul>
6. Context of assessment	Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting.

## SECTION 3 TRAINING STANDARDS

These guidelines are set to provide the Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for SHIELDED METAL ARC WELDING (SMAW).

This includes information on curriculum design; training delivery; trainee entry requirements; tools and equipment; training facilities; and trainers qualification, among others.

### 3.1 CURRICULUM DESIGN

Course Title: **SHIELDED METAL ARC WELDING**

**NC Level IV**

Suggested Nominal Training Hours: 56 hrs. ( Basic Competencies)  
56 hrs. ( Common Competencies)  
56 hrs. ( Core Competencies)

Course Description:

This course is designed to enhance the knowledge, skills and attitudes in Shielded Metal Arc Welding in accordance with industry standards. It covers core competencies such as Setting-up Welding Equipment, Preparing Weld Materials, Fitting up Weld Materials, Weld alloy steel pipes using SMAW and Repairing Welds.

#### BASIC COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Utilize specialized communication skills	1.1 Meet common and specific communication needs of clients and colleagues 1.2 Contribute to the development of communication strategies 1.3 Represent the organization 1.4 Facilitate group discussion 1.5 Conduct interview	<ul style="list-style-type: none"><li>• Group discussion</li><li>• Role Play</li><li>• Brainstorming</li></ul>	<ul style="list-style-type: none"><li>• Observation</li><li>• Interviews</li></ul>

2. Develop teams and individuals	2.1 Provide team leadership 2.2 Foster individual and organizational growth 2.3 Monitor and evaluate workplace learning 2.4 Develop team commitment and cooperation 2.5 Facilitate accomplishment of organizational goals	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Demonstration</li> <li>• Self-paced (modular)</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Case studies</li> </ul>
3. Apply problem solving techniques in the workplace	3.1 Analyze the problem 3.2 Identify possible solutions 3.3 Recommend solution to higher management 3.4 Implement solution 3.5 Evaluate/Monitor results and outcome	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>
4. Collect, analyze and organize information	4.1 Study information requirements 4.2 Process data 4.3 Analyze, interpret and organize information gathered 4.4 Present findings/ Recommendations	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>
5. Plan and organize work	5.1 Set objectives 5.2 Plan and schedule work activities 5.3 Implement work plans 5.4 Monitor work activities 5.5 Review and evaluate work plans and activities	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>
6. Promote environmental protection	6.1 Study guidelines for environmental concerns 6.2 Implement specific environmental programs 6.3 Monitor activities on environmental protection /programs	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>

## COMMON COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Apply safety practices	1.1 Identify hazardous areas 1.2 Use protective clothing and devices 1.3 Perform safe handling of tools, equipment and materials 1.4 Perform first aid 1.5 Use fire extinguisher	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written</li> <li>• Demonstration</li> </ul>
2. Interpret drawings and sketches	2.1 Identify standard alphabet of lines 2.2 Identify orthographic/ isometric views 2.3 Interpret standard drawing symbols, dimensional tolerances and notations	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written test</li> </ul>
3. Perform industry calculations	3.1 Perform four fundamental operations 3.2 Perform conversion of units 3.3 Perform calculations on algebraic expressions 3.4 Compute percentage and ratio	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written test</li> </ul>
4. Contribute to quality system	4.1 Inspect work done 4.2 Apply quality standards to work 4.3 Protect company property and customer interests	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written</li> <li>• Demonstration</li> </ul>
5. Use hand tools	5.1 Select hand tools 5.2 Use hand tools 5.3 Maintain hand tools	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Oral questioning</li> <li>• Written</li> <li>• Demonstration</li> </ul>
6. Prepare Weld Materials	6.1 Set up cutting equipment 6.2 Cut and prepare edge of materials 6.3 Clean surfaces and edges 6.4 Prepare welding consumables 6.5 Prepare welding safety and protective equipment	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Practical application</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Demonstration and oral questioning</li> <li>• Written test</li> </ul>
7. Set-up Welding Equipment	7.1 Set up welding machine 7.2 Set up welding accessories 7.3 Set up welding positioners, jigs and fixtures 7.4 Set up pre-heating tools/equipment as required	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Observation and oral questioning</li> <li>• Demonstration and oral questioning</li> <li>• Written test</li> </ul>

8. Fit up Weld Materials	8.1 Perform tack welding 8.2 Check gap and alignment 8.3 Set up welding positioner	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Observation and oral questioning</li> <li>• Demonstration and oral questioning</li> <li>• Written test</li> </ul>
9. Repair Welds	9.1 Mark/locate weld defects 9.2 Prepare tools and equipment 9.3 Remove defects 9.4 Perform re-welding	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Observation and oral questioning</li> <li>• Demonstration and oral questioning</li> <li>• Written test</li> </ul>

### CORE COMPETENCIES

<b>Unit of Competency</b>	<b>Learning Outcomes</b>	<b>Methodology</b>	<b>Assessment Approach</b>
1. Weld Alloy Steel Pipes Using SMAW	1.1 Perform groove weld on pipe in different positions <ul style="list-style-type: none"> <li>• 2G</li> <li>• 5G</li> <li>• 6G</li> </ul>	<ul style="list-style-type: none"> <li>• Lecturette</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Observation and oral questioning</li> <li>• Demonstration and oral questioning</li> <li>• Written test</li> </ul>

## 3.2 TRAINING DELIVERY

***The delivery of training should adhere to the design of the curriculum. Delivery should be guided by the 10 basic principles of competency-based TVET.***

- The training is based on curriculum developed from the competency standards;
- Learning is modular in its structure;
- Training delivery is individualized and self-paced;
- Training is based on work that must be performed;
- Training materials are directly related to the competency standards and the curriculum modules;
- Assessment is based in the collection of evidence of the performance of work to the industry required standard;
- Training is based both on and off-the-job components;
- Allows for recognition of prior learning (RPL) or current competencies;
- Training allows for multiple entry and exit; and
- Approved training programs are Nationally Accredited

***The competency-based TVET system recognizes various types of delivery modes, both on and off-the-job as long as the learning is driven by the competency standards specified by the industry. The following training modalities may be adopted when designing training programs:***

- The dualized mode of training delivery is preferred and recommended. Thus programs would contain both in-school and in-industry training or fieldwork components. Details can be referred to the Dual Training System (DTS) Implementing Rules and Regulations.
- Modular/self-paced learning is a competency-based training modality wherein the trainee is allowed to progress at his own pace. The trainer just facilitates the training delivery.
- Peer teaching/mentoring is a training modality wherein fast learners are given the opportunity to assist the slow learners.
- Supervised industry training or on-the-job training is an approach in training designed to enhance the knowledge and skills of the trainee through actual experience in the workplace to acquire specific competencies prescribed in the training regulations.
- Distance learning is a formal education process in which majority of the instruction occurs when the students and instructor are not in the same place. Distance learning may employ correspondence study, audio, video or computer technologies.

### 3.3 TRAINEE ENTRY REQUIREMENTS

Trainees or students wishing to gain entry into this course should possess the following requirements:

- Must have completed training in SMAW NC III or a holder of SMAW NC III
- can communicate either oral and written
- physically and mentally fit
- with good moral character
- can perform basic mathematical computation

### 3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS SHIELDED METAL ARC WELDING – NC IV

Recommended list of tools and materials per trainee for **SHIELDED METAL ARC WELDING (SMAW) IV**

TOOLS (for 25 trainees)		EQUIPMENT (for 25 trainees)		MATERIAL (per trainee)	
Qty.	Description	Qty.	Description	Qty.	Description
25 pcs.	Chipping Hammer	12 units	Arc Welding machine AC/DC and accessories	4 kgs.	Electrodes 2.4mm / E309 or E308
50 pcs.	Steel brush	12pcs.	Welding positioners	18 kgs.	Electrodes 3.2mm / E309 or E308
12 pcs.	Plier/tongs	1 unit	Electrode oven	21 prs (or equiv jts)	6" dia. Sch. 80 A-53 Gr. B
20 pcs.	Files-bastard cut	12 units	Portable disc grinder	1 pcs	Dark glass
25 pcs.	Welding Mask	1 unit	Exhaust fan	14 pcs	Lens clear glass
25 sets	Leather apron/jacket	2 units	Work bench w/ bench vice on 4 corners	12 pcs.	Cutting disc 3/32" X 5/8" X 4"
25 sets	Leather gloves, long	2 sets	Oxy-acetylene/Oxy-LPG cutting outfit	20 pcs	Grinding disc 1/4" X 5/8" X 4"
5 pcs.	Safety goggles, wide vision, clear	1 unit	Pedestal /bench grinding machine	1 tube	Metal marker
5 pcs.	Oxy-acetylene Goggles	1 unit	Industrial fan		
12 pcs.	Try square 300 mm. Long				
12 pcs.	Steel square 300 mm. long				

12 pcs.	Files-half round				
5 pcs.	Fillet gauge				

### 3.5 TRAINING FACILITIES

#### SHIELDED METAL ARC WELDING - NC IV

The welding workshop must be of concrete structure. Based on class size of 25 students/trainees the space requirements for the teaching/learning and circulation areas are as follows:

TEACHING/LEARNING AREAS	SIZE IN METERS	AREA IN SQ. METERS	QTY	TOTAL AREA IN SQ. METERS
Welding Booth	2 X 1.5	3	8	24
Grinding Booth	2 X 1.5	3	2	6
Materials/Preparation Area*	2 X 2	4		4
Bench work Area	1.5 X 2.5	4	2	8
Tool Room & S/M Storage Area	4 X 5	20		20
Learning Resource Area*	5 X 9	45		45
Wash Area /Comfort Room ( <i>male &amp; female</i> ) *	2.5 X 4	10		10
Total				117
Circulation Area**				35
<b>Total Workshop Area</b>				<b>152</b>

\* This area can also be used by other welding courses.

\*\* Area requirement is equivalent to 30% of the total teaching/learning areas

### **3.6 TRAINERS QUALIFICATIONS FOR SMAW WELDER**

#### **SHIELDED METAL ARC WELDING - NC IV**

##### TRAINER QUALIFICATION (TQ IV)

- Must be a holder of SMAW NC IV
- Must have undergone training on Training Methodology IV (TM IV)
- Must be physically and mentally fit
- \*Must have at least 2 years job/industry experience
- Must be a civil service eligible (for government position or appropriate professional license issued by the Professional Regulatory Commission)

\* Optional. Only when required by the hiring institution

Reference: TESDA Board Resolution No. 2004 03

### **3.7 INSTITUTIONAL ASSESSMENT**

Institutional Assessment is to be undertaken by trainees to determine the achievement of units of competency. A certificate of achievement is issued for each unit of competency.

## **SECTION 4 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS**

- 4.1 To attain the National Qualification of Welding NC IV (SMAW), the candidate must demonstrate competence in all the units of competency listed in Section 1. Successful candidates shall be awarded a National Certificate signed by the TESDA Director General.
- 4.2 Assessment shall focus on the core unit of competency, weld alloy steel pipes using SMAW. The basic and common units shall be integrated or assessed concurrently with the core units.
- 4.3 The following are qualified to apply for assessment and certification:
  - 4.3.1 Graduates of formal, non-formal and informal including enterprise-based training programs.
  - 4.3.2 Experienced workers (wage employed or self employed)
- 4.4 The guidelines on assessment and certification are discussed in detail in the "Procedures Manual on Assessment and Certification" and "Guidelines on the Implementation of the Philippine TVET Qualification and Certification System (PTOQS)".

## Competency Map Metals and Engineering Sector (WELDING)

<b>CORE COMPETENCIES</b>	Weld carbon steel plates using SMAW	Weld carbon steel plates and pipes using SMAW	Weld alloy steel plates using SMAW	Weld alloy steel pipes using SMAW	Weld carbon steel plates using GTAW	Weld carbon steel pipes using GTAW	Weld carbon steel plates using GMAW
	Perform gas welding in carbon steel plates and tubes	Perform gas brazing in alloy steel plates and tubes	Weld plates using SAW	Weld pipes using SAW	Weld alloy steel plates using GTAW	Weld carbon steel pipes using GMAW	Weld alloy steel pipes using GMAW
	Weld carbon steel plates using FCAW	Weld carbon steel pipes using FCAW	Weld alloy steel plates using FCAW	Weld alloy steel pipes using FCAW	Weld alloy steel pipes using GTAW	Weld alloy steel plates using GMAW	
<b>COMMON COMPETENCIES</b>	Apply safety practices	Interpret drawing and sketches	Perform industry calculations	Contributes to quality system			
	Prepare weld materials	Set-up welding equipment	Fit up weld materials	Repair welds			
<b>BASIC COMPETENCIES</b>	Receive and respond to workplace communication	Demonstrate work values	Participate in workplace communication	Work in team environment	Lead in workplace communication	Develop and practice negotiation skills	Use mathematical concepts and techniques
	Work with others	Practice basic housekeeping procedures	Practice career professionalism	Practice occupational health and safety procedures	Lead small teams	Solve problems related to work activities	Use relevant technologies
	Utilize specialist communication skills	Develop team and individual	Apply problem-solving techniques in the workplace	Collect, analyze and organize information	Plan and organize work	Promote environmental protection	

**Legend**  
**SMAW IV**

## DEFINITION OF TERMS

- 1) **base metal** – the metal that is to be worked or welded
- 2) **weld bead** – a deposit of filler metal from a single welding pass
- 3) **weld defect**– an irregularity that spoils the weld appearance or impairs the effectiveness of the weld or weldment by causing weakness or failure
- 4) **weld line** – the junction of weld metal and the base metal, or the junction of base metal parts when filler metal is not used
- 5) **weldment** – an assembly or structure whose component parts are joined by welding
- 6) **welding** – joining two metals by applying heat to melt and fuse them, with or without filler metal
- 7) **welding electrode** – the current-carrying rod used to strike an arc between rod and metal
- 8) **welding rod** – filler metal in the form of a rod or heavy wire
- 9) **welding torch** – a gas mixing and burning tool for the welding of metal

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