TRAINING REGULATIONS

SHIELDED METAL ARC WELDING (SMAW) I

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) I

SECTION 1 SHIELDED METAL ARC WELDING (SMAW) I

The Welding NC I (SMAW) Qualification consists of competencies that a person must achieve to weld carbon steel plates 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 01	Receive and respond to workplace communication
5 00 311 1 02	Work with others
5 00 311 1 03	Demonstrate work values
5 00 311 1 04	Practice basic housekeeping procedures

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
MEE721301	Weld Carbon Steel Plates Using SMAW

A person who has achieved this Qualification is competent to be:
- Plate Welder (SMAW)

SECTION 2 COMPETENCY STANDARDS

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

BASIC COMPETENCIES

UNIT OF COMPETENCY : RECEIVE AND RESPOND TO WORKPLACE COMMUNICATION

UNIT CODE : 500311101

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to receive, respond and act on verbal and written communication.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Follow routine spoken messages	1.1 Required information is gathered by listening attentively and correctly interpreting or understanding information/instructions 1.2 Instructions/information are properly recorded 1.3 Instructions are acted upon immediately in accordance with information received 1.4 Clarification is sought from workplace supervisor on all occasions when any instruction/information is not clear
2. Perform workplace duties following written notices	2.1 *Written notices and instructions* are read and interpreted correctly in accordance with organizational guidelines 2.2 Routine written instruction are followed in sequence 2.3 Feedback is given to workplace supervisor based on the instructions/information received

RANGE OF VARIABLES

VARIABLE	RANGE
1. Written notices and instructions	It refers to : 1.1. Handwritten and printed material 1.2. Internal memos 1.3. External communications 1.4. Electronic mail 1.5. Briefing notes 1.6. General correspondence 1.7. Marketing materials 1.8. Journal articles
2. Organizational guidelines	It may include: 2.1. Information documentation procedures 2.2. Company policies and procedures 2.3. Organization manuals 2.4. Service manual

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1. Demonstrated knowledge of organizational procedures for handling verbal and written communications 1.2. Received and acted on verbal messages and instructions 1.3. Demonstrated competency in recording instructions/information
2. Underpinning knowledge and attitudes	2.1. Knowledge of organizational policies/guidelines in regard to processing internal/external information 2.2. Ethical work practices in handling communications 2.3. Communication process
3. Underpinning skills	3.1. Conciseness in receiving and clarifying messages/information/communication 3.2. Accuracy in recording messages/information
4. Resource implications	The following resources **MUST** be provided: 4.1. Pens 4.2. Note pads
5. Methods of assessment	Competency may be assessed through: 5.1. Direct Observation 5.2. Oral interview 5.3. Written Evaluation 5.4. Third Party Report
6. Context of assessment	6.1. Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions

UNIT OF COMPETENCY : WORK WITH OTHERS

UNIT CODE : 500311102

UNIT DESCRIPTOR : This unit cover the skills, knowledge and attitudes required to develop workplace relationship and contribute in workplace activities.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Develop effective workplace relationship	1.1 ***Duties and responsibilities*** are done in a positive manner to promote cooperation and good relationship 1.2 Assistance is sought from ***workgroup*** when difficulties arise and addressed through discussions 1.3 ***Feedback*** provided by others in the team is encouraged, acknowledged and acted upon 1.4 Differences in personal values and beliefs are respected and acknowledged in the development
2. Contribute to work group activities	2.1 ***Support is provided to team members*** to ensure workgroup goals are met 2.2 Constructive contributions to workgroup goals and tasks are made according to ***organizational requirements*** 2.3 Information relevant to work is shared with team members to ensure designated goals are met

RANGE OF VARIABLES

VARIABLE	RANGE
1. Duties and responsibilities	1.1 Job description and employment arrangements 1.2 Organization's policy relevant to work role 1.3 Organizational structures 1.4 Supervision and accountability requirements including OHS 1.5 Code of conduct
2. Work group	2.1 Supervisor or manager 2.2 Peers/work colleagues 2.3 Other members of the organization
3. Feedback on performance	3.1 Formal/Informal performance appraisal 3.2 Obtaining feedback from supervisors and colleagues and clients 3.3 Personal, reflective behavior strategies 3.4 Routine organizational methods for monitoring service delivery
4. Providing support to team members	4.1 Explaining/clarifying 4.2 Helping colleagues 4.3 Providing encouragement 4.4 Providing feedback to another team member 4.5 Undertaking extra tasks if necessary
5. Organizational requirements	5.1 Goals, objectives, plans, system and processes 5.2 Legal and organization policy/guidelines 5.3 OHS policies, procedures and programs 5.4 Ethical standards 5.5 Defined resources parameters 5.6 Quality and continuous improvement processes and standards

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1. Provided support to team members to ensure goals are met 1.2. Acted on feedback from clients and colleagues 1.3. Accessed learning opportunities to extend own personal work competencies to enhance team goals and outcomes
2. Underpinning knowledge	2.1. The relevant legislation that affects operations, especially with regards to safety 2.2. Reasons why cooperation and good relationships are important 2.3. Knowledge of the organization's policies, plans and procedures 2.4. Understanding how to elicit and interpret feedback 2.5. Knowledge of workgroup member's responsibilities and duties 2.6. Importance of demonstrating respect and empathy in dealings with colleagues 2.7. Understanding of how to identify and prioritize personal development opportunities and options
3. Underpinning skills	3.1. Ability to read and understand the organization's policies and work procedures 3.2. Write simple instructions for particular routine tasks 3.3. Interpret information gained from correspondence 3.4. Communication skills to request advice, receive feedback and work with a team 3.5. Planning skills to organized work priorities and arrangement 3.6. Technology skills including the ability to select and use technology appropriate to a task 3.7. Ability to relate to people from a range of social, cultural and ethnic backgrounds.

4. Resource implications	The following resources **MUST** be provided: 4.1. Access to relevant workplace or appropriately simulated environment where assessment can take place 4.2. Materials relevant to the proposed activity or task
5. Methods of assessment	Competency may be assessed through: 5.1. Direct observations of work activities of the individual member in relation to the work activities of the group 5.2. Observation of simulation and/or role play involving the participation of individual member to the attainment of organizational goal 5.3. Case studies and scenarios as a basis for discussion of issues and strategies
6. Context for assessment	6.1. Competency assessment may occur in workplace or any appropriately simulated environment 6.2. Assessment shall be observed while task are being undertaken whether individually or in group

UNIT OF COMPETENCY: : DEMONSTRATE WORK VALUES

UNIT CODE : 500311103

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitude in demonstrating proper work values.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Define the purpose of work	1.1 One's unique sense of purpose for working and the why's of work are identified, reflected on and clearly defined for one's development as a person and as a member of society. 1.2 Personal mission is in harmony with company's values
2. Apply work values/ethics	2.1 ***Work values/ethics/concepts*** are classified and reaffirmed in accordance with the transparent company ethical standards, policies and guidelines. 2.2 ***Work practices*** are undertaken in compliance with industry work ethical standards, organizational policy and guidelines 2.3 Personal behavior and relationships with co-workers and/or clients are conducted in accordance with ethical standards, policy and guidelines. 2.4 ***Company resources*** are used in accordance with transparent company ethical standard, policies and guidelines.
3. Deal with ethical problems	3.1 Company ethical standards, organizational policy and guidelines on the prevention and reporting of unethical conduct are accessed and applied in accordance with transparent company ethical standard, policies and guidelines. 3.2 ***Work incidents/situations*** are reported and/or resolved in accordance with company protocol/guidelines. 3.3 Resolution and/or referral of ethical problems identified are used as learning opportunities.
4. Maintain integrity of conduct in the workplace	4.1 Personal work practices and values are demonstrated consistently with acceptable ethical conduct and company's core values. 4.2 ***Instructions*** to co-workers are provided based on ethical, lawful and reasonable directives. 4.3 Company values/practices are shared with co-workers using appropriate behavior and language.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work values/ethics/ concepts	May include but are not limited to: 1.1 Commitment/ Dedication 1.2 Sense of urgency 1.3 Sense of purpose 1.4 Love for work 1.5 High motivation 1.6 Orderliness 1.7 Reliability 1.8 Competence 1.9 Dependability 1.10 Goal-oriented 1.11 Sense of responsibility 1.12 Being knowledgeable 1.13 Loyalty to work/company 1.14 Sensitivity to others 1.15 Compassion/Caring attitude 1.16 Balancing between family and work 1.17 Pakikisama 1.18 Bayanihan spirit/teamwork 1.19 Sense of nationalism
2. Work practices	2.1 Quality of work 2.2 Punctuality 2.3 Efficiency 2.4 Effectiveness 2.5 Productivity 2.6 Resourcefulness 2.7 Innovativeness/Creativity 2.8 Cost conciousness 2.9 5S 2.10 Attention to details
3. Incidents/situations	3.1 Violent/intensed dispute or argument 3.2 Gambling 3.3 Use of prohibited substances 3.4 Pilferages 3.5 Damage to person or property 3.6 Vandalism 3.7 Falsification 3.8 Bribery 3.9 Sexual Harassment 3.10 Blackmail

VARIABLE	RANGE
4. Company resources	4.1 Consumable materials 4.2 Equipment/Machineries 4.3 Human 4.4 Time 4.5 Financial resources
5. Instructions	5.1 Verbal 5.2 Written

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Defined one's unique sense of purpose for working 1.2 Clarified and affirmed work values/ethics/concepts consistently in the workplace 1.3 Demonstrated work practices satisfactorily and consistently in compliance with industry work ethical standards, organizational policy and guidelines 1.4 Demonstrated personal behavior and relationships with co-workers and/or clients consistent with ethical standards, policy and guidelines 1.5 Used company resources in accordance with company ethical standard, policies and guidelines. 1.6 Followed company ethical standards, organizational policy and guidelines on the prevention and reporting of unethical conduct/behavior
2. Underpinning knowledge	2.1 Occupational health and safety 2.2 Work values and ethics 2.3 Company performance and ethical standards 2.4 Company policies and guidelines 2.5 Fundamental rights at work including gender sensitivity 2.6 Work responsibilities/job functions 2.7 Corporate social responsibilities 2.8 Company code of conduct/values 2.9 Balancing work and family responsibilities
3. Underpinning skills	3.1 Interpersonal skills 3.2 Communication skills 3.3 Self awareness, understanding and acceptance 3.4 Application of good manners and right conduct
4. Resource implications	The following resources MUST be provided: 4.1 Workplace or assessment location 4.2 Case studies/Scenarios
5. Methods of assessment	Competency may be assessed through: 5.1 Portfolio Assessment 5.2 Interview 5.3 Third Party Reports
6. Context of assessment	6.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : PRACTICE HOUSEKEEPING PROCEDURES

UNIT CODE : 500311104

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to apply the basic housekeeping procedures.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Sort and remove unnecessary items	1.1 Reusable, recyclable materials are sorted in accordance with company/office procedures 1.2 ***Unnecessary items*** are removed and disposed of in accordance with company or office procedures
2. Arrange items	2.1 Items are arranged in accordance with company/office housekeeping procedures 2.2 Work area is arranged according to job requirements 2.3 Activities are prioritized based on instructions. 2.4 Items are provided with clear and visible ***identification marks*** based on procedure 2.5 Safety equipment and evacuation passages are kept clear and accessible based on instructions
3. Maintain work area, tools and equipment	3.1 Cleanliness and orderliness of work area is maintained in accordance with company/office procedures 3.2 Tools and equipment are cleaned in accordance with manufacturer's instructions/manual 3.3 ***Minor repairs*** are performed on tools and equipment in accordance with manufacturer's instruction/manual 3.4 Defective tools and equipment are reported to immediate supervisor
4. Follow standardized work process and procedures	4.1 Materials for common use are maintained in designated area based on procedures 4.2 Work is performed according to standard work procedures 4.3 Abnormal incidents are reported to immediate supervisor
5. Perform work spontaneously	5.1 Work is performed as per instruction 5.2 Company and office ***decorum*** are followed and complied with 5.3 Work is performed in accordance with occupational health and safety (OHS) requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Unnecessary items	May include but are not limited to: 1.1 Non-recyclable materials 1.2 Unserviceable tools and equipment 1.3 Pictures, posters and other materials not related to work activity 1.4 Waste materials
2. Identification marks	2.1 Labels 2.2 Tags 2.3 Color coding
3. Decorum	3.1 Company/ office rules and regulations 3.2 Company/ office uniform 3.3 Behavior
4. Minor repair	Minor repair include but not limited to: 4.1 Replacement of parts 4.2 Application of lubricants 4.3 Sharpening of tools 4.4 Tightening of nuts, bolts and screws

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Practiced the basic procedures of 5S
2. Underpinning knowledge and attitudes	2.1 Principles of 5S 2.2 Work process and procedures 2.3 Safety signs and symbols 2.4 General OHS principles and legislation 2.5 Environmental requirements relative to work safety 2.6 Accident/Hazard reporting procedures
3. Underpinning skills	3.1 Basic communication skills 3.2 Interpersonal skills 3.3 Reading skills required to interpret instructions 3.4 Reporting/recording accidents and potential hazards
4. Resource implications	The following resources **MUST** be provided: 4.1 Facilities, materials tools and equipment necessary for the activity
6. Methods of assessment	Competency must be assessed through: 5.1 Third party report 5.2 Interview 5.3 Demonstration with questioning
6. Context for assessment	6.1 Competency may be assessed in the work place or in a simulated work place setting

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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Identify hazardous area	1.1 *Hazards* 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 *protective clothing and devices* 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 *injuries* are carried out according to recommended procedures
5. Use fire extinguisher	5.1 Fire extinguisher selected and operated correctly according to the *type of fire*.

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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 identified hazardous area 1.2 used protective clothing and devices 1.3 handled tools, equipment and materials properly 1.4 performed first aid 1.5 used fire extinguisher
2. Underpinning knowledge and attitude	2.1 Shop safety signs, symbols and alarms 2.2 Safety precautionary measures 2.3 Housekeeping 2.4 Machine tools 2.5 First aid 2.6 Engineering materials 2.7 Fire extinguishers
3. Underpinning skills	3.1 Operating machine tools 3.2 Handling tools and materials 3.3 Communicating with superiors and co-workers 3.4 Interpreting instructions
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 : INTERPRET DRAWINGS AND SKETCHES

UNIT CODE : MEE721202

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

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Identify standard alphabet of lines	1.1 Alphabet of lines are identified 1.2 Uses of the alphabet of lines are explained
2. Identify orthographic/ isometric views	2.1 Orthographic and isometric *drawing* are identified 2.2 Orthographic and isometric views are explained
3. Interpret standard drawing symbols, dimensional tolerances and notations	3.1 Drawing symbols are interpreted according to drawing standards 3.2 Dimensional *tolerances*, 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	• Competency may be assessed in the workplace or in simulated workplace environment.

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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** 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 *four fundamental operations.*
2. Perform conversion of units	2.1 *Units* are converted to the required figure using the given formulae 2.2 *English measurements are converted to metric measurements according to procedure.*
3. Perform calculations on algebraic expressions	3.1 Simple calculations are performed on algebraic expressions using four fundamental operations. 3.2 Simple transposition of formulae are carried out to isolate the variable required, involving the four fundamental operations. 3.3 Where appropriate, formulae are constructed to enable problems to be solved. 3.4 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

VARIABLE	RANGE
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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Inspect work done	1.1 Appropriate inspections are conducted to ensure company ***quality systems and procedures*** 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 2.4 outcomes. Records of work quality are maintained according to the company requirements.
3 Protect company property and customer interests	3.1 Possible damage to ***company property*** is avoided by adherence to company quality 3.2 procedures. 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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Select hand tools	1.1 ***Hand tools*** selected are appropriate to the requirements of the ***task***. 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 ***Routine maintenance*** 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	Routine maintenance may include: 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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** 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 *Materials* are *cut* to specified dimension/*specifications*. 2.2 Task performed in accordance with company or industry requirements and safety procedure.
3. Clean surfaces and edges	3.1 Surfaces are *cleaned* to required specifications. 3.2 Task performed in accordance with company or industry requirements and *safety procedure*
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

VARIABLE	RANGE
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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Perform edge preparation in accordance with WPS and safety procedures 1.2 Use edge preparation equipment and tools in accordance with the requirements or manufacturer's instructions
2. Underpinning knowledge	2.1 Interpretation of plans and drawings 2.2 Selection of appropriate method of edge preparation 2.3 Selection of appropriate cutting equipment, accessories and supplies 2.4 Operation of cutting equipment such as mechanical, gas and plasma 2.5 Operation of grinding equipment 2.6 Safety procedures for cutting and grinding
3. Underpinning skills	3.1 Measuring and communication skills 3.2 Set up of cutting equipment such as mechanical, gas and plasma 3.3 Cutting techniques 3.4 Grinding techniques 3.5 Observance of safety procedures
4. Resource implications	The following resources must be provided: 4.1 Relevant documentation such as WPS and working drawing 4.2 Supplies and materials 4.3 Cutting equipment and facilities 4.4 Grinding equipment and facilities 4.5 Measuring tools 4.6 PPE 4.7 Stand-by fire fighting equipment
5. Method of assessment	Competency must be assessed through: 5.1 Observation/evaluation 5.2 Oral questioning 5.3 Inspection of prepared edges
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 : SET UP WELDING EQUIPMENT

UNIT CODE : MEE721207

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

ELEMENTS	PERFORMANCE CRITERIA ***Italicized terms*** 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 *Welding machine* 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 *polarity* 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 *accessories* 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

VARIABLE	RANGE
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

1. Critical aspects of competency	Assessment requires evidence that the candidate 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&S rules and accessible and convenient location. 1.2 Applied housekeeping and 5S practices
2. Underpinning knowledge	2.1 Types and uses of welding equipment and accessories 2.2 Power requirement and capacity of welding machine and its accessories 2.3 Operating capacity of welding machine and accessories 2.4 Basic electricity 2.5 Shop safety, housekeeping and 5S procedures
3. Underpinning skills	3.1 Setting and operating welding machine and accessories 3.2 Communication skills 3.3 Recognizing operational abnormalities and faults in welding machine and accessories 3.4 Fine tuning of welding machine and accessories for optimum operation 3.5 Minor repairs/maintenance of welding machine and accessories 3.6 Use of PPE
4. Resource implications	The following resources must be provided: 4.1 Appropriately ventilated work area/shop with welding facilities, machines and accessories 4.2 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 : FIT UP WELD MATERIALS

UNIT CODE : MEE721208

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

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Perform tack welding	1.1 *Tack welding* performed in accordance with the requirements of WPS and client's specifications. 1.2 Tack weld *visually and dimensionally acceptable*. 1.3 Tack on root for pipe or as required. 1.4 *Backing* 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 *Root gap* is performed in accordance with the requirements of WPS. 2.2 *Alignment* 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

VARIABLE	RANGE
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.

ELEMENTS	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Mark/locate weld defects	1.1 Identified *weld defects* marked/located according to recommended practice
3. Prepare tools and equipment	2.1 *Tools and equipment* 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 *removed/excavated* 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

VARIABLE	RANGE
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 Carbon Steel Plates Using SMAW**

UNIT CODE : **MEE721301**

DESCRIPTOR : This unit covers the skills, knowledge and attitudes in welding carbon steel plates using SMAW process.

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

RANGE OF VARIABLE

VARIABLE	RANGE
1. WPS	WPS Requirements 1.1 Welding positions 1.1.1 1F, 2F, 3F,4F 1.1.2 1G, 2G, 3G 1.2 Material thickness 1.2.1 1.6mm – unlimited (plate) 1.3 Type of material 1.3.1 Carbon or mild steel 1.4 Type and size of mild steel electrode 1.5 Travel speed 1.6 Current setting (polarity, amperage, voltage) 1.7 Preheating/post weld heating treatment (PWHT) 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 carbon steel plates in 2G and 3G positions to acceptable standard following the approved WPS.
2. Underpinning knowledge	2.1 Drawing/Plan/WPS interpretation 2.2 Materials and consumables (Electrodes, Base Metal) 2.3 Welding Equipment and Tools 2.4 Basic Mathematics (Multiplication, Division, Addition and Subtraction) 2.5 Welding Codes 2.6 Identification of weld defects
3. Underpinning skills	3.1 Measuring skills 3.2 Communication skills 3.3 Rectifying weld defects 3.4 Applying weld techniques 3.5 Handling welding tools and equipment 3.6 Handling welding materials and consumables
4. Resource implications	The following resources must be provided: 4.1 Appropriately ventilated work area/shop with welding facilities and equipment 4.2 Supplies and materials 4.3 PPE 4.4 Relevant documentation such as WPS and working drawing
5. Method of assessment	Competency must be assessed through: 5.1 Observation and interview 5.2 Demonstration and interview 5.3 Written test 5.4 Portfolio
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 I**

Suggested Nominal Training Hours: 28 hrs. (Basic Competencies)
56 hrs. (Common Competencies)
184 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, Welding Carbon Steel Plates Using SMAW and Repairing Welds.

BASIC COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Receive and respond to workplace communication	1.1 Follow routine spoken message 1.2 Perform work duties following written notices.	• Group discussion • Interaction	• Interviews/ questioning • Observation
2. Work with others	2.1 Develop effective workplace relationship. 2.2 Contribute to work group activities.	• Group discussion • Interaction	• Interviews/ questioning • Demonstration • Observation

3. Demonstrate work values	3.1 Define the purpose of work 3.2 Apply work values/ethics 3.3 Deal with ethical problems 3.4 Maintain integrity of conduct in the workplace	• Group discussion • Interaction	• Demonstration • Observation • Interviews/ Questioning
4. Practice housekeeping procedures	4.1 Sort and remove unnecessary items 4.2 Arrange items 4.3 Maintain work areas, tools and equipment 4.4 Follow standardize work process and procedures 4.5 Perform work spontaneously	• Group discussion • Interaction	• Demonstration • Observation • Interviews/ questioning

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	• Lecturette • Practical application	• Oral questioning • Written • Demonstration
2. Interpret working 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	• Lecturette • Practical application	• Oral questioning • Written
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	• Lecturette • Practical application	• Oral questioning • Written test
4. Contribute to quality system	4.1 Inspect work done 4.2 Apply quality standards to work 4.3 Protect company property and customer interest	• Lecturette • Practical application	• Oral questioning • Written • Demonstration

5. Use hand tools	5.1 Select hand tools 5.2 Use hand tools 5.3 Maintain hand tools	• Lecturette • Practical application	• Oral questioning • Written • Demonstration
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	• Lecturette • Practical application	• Observation • Demonstration and oral questioning • Written test
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	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test
8. Fit up Weld Materials	8.1 Perform tack welding 8.2 Check gap and alignment 8.3 Set up welding positioner	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test
9. Repair Welds	9.1 Mark/locate weld defects 9.2 Prepare tools and equipment 9.3 Remove defects 9.4 Perform re-welding	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test

CORE COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Weld Carbon Steel Plates Using SMAW	1.1 Perform single pass fillet weld in different positions (1F-4F) 1.2 Perform multiple pass fillet weld in different positions (1F-4F) 1.3 Perform multiple pass groove weld in different positions (1G-3G)	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test

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:

- 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 I

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

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	5 kgs.	Electrodes 3.2mm E6011
75 pcs.	Steel brush	12pcs.	Welding positioners	20 kgs.	Electrodes 3.2mm E7018
12 pcs.	Plier/tongs	1 unit	Electrode oven	38 pcs.	Mild steel plate 10mm X 150mm X 200mm
20 pcs.	Files-bastard cut	12 units	Portable disc grinder	40 pcs.	Mild steel plate 6mm X 100mm X 100mm
25 pcs.	Welding Mask	1 unit	Exhaust fan	3 pcs	Dark glass
25 sets	Leather apron/jacket	2 units	Work bench w/ bench vice on 4 corners	46 pcs	Lens clear glass
50 sets	Leather gloves, long	2 sets	Oxy-acetylene/Oxy-LPG cutting outfit	38 pcs.	Cutting disc 3/32” 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	19 pcs	Grinding disc 1/4” X 5/8” X 4”
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 I

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 *(male & female)* *	2.5 X 4	10		10
Total				117
Circulation Area**				35
Total Workshop Area				**152**

** 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 I

TRAINER QUALIFICATION (TQ I)

- Must be a holder of SMAW NC II
- Must have undergone training on Training Methodology I (TM I)
- 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 I (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 carbon steel plates using SMAW. The basic and common units shall be integrated or assessed concurrently with the core units.

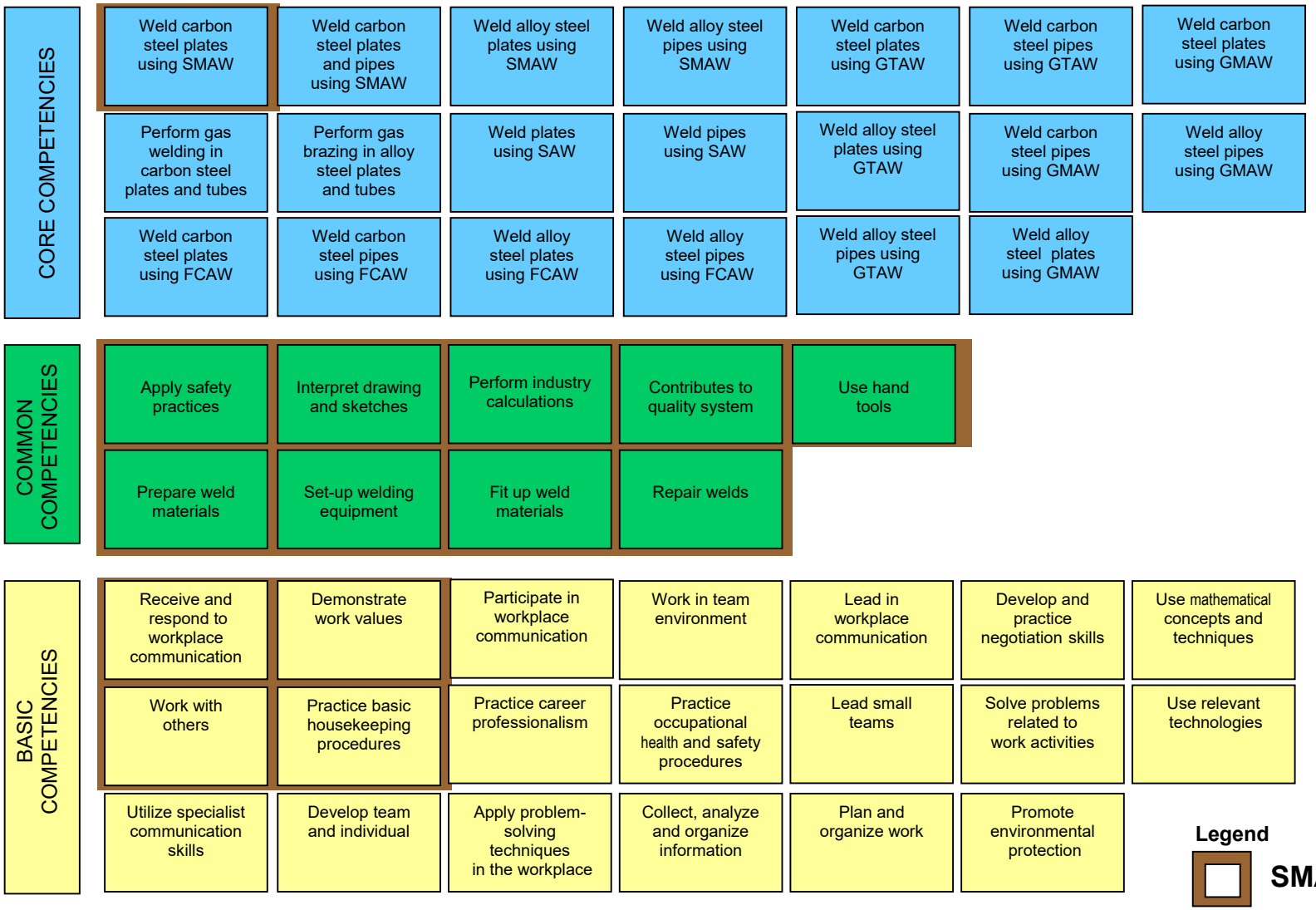
4.3 The following are qualified to apply for assessment and certification:

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)



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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THE INDUSTRY EXPERTS

MR. ANTONIO M. REYES
Pilipinas Shell Foundation, Inc.
San Isidro, Batangas City

MR. ARIEL S. MANALO
Bobcock Hitachi Phil., Inc.
San Roque, Bauan, Batangas

MR. ROLANDO S. PEREZ
EEI Corp.
Sta. Maria, Bauan, Batangas

MR. ROLANDO TORRES
AG & P
San Roque, Bauan, Batangas

MR. MOISES C. LACORTE
TESDA IV RTC
Batangas City

MR. SAMUEL M. CUNANAN
Norwegian Training Center
TESDA Complex, Taguig, Metro Manila

The **PARTICIPANTS** in the Validation of this Training Regulation

MR. EFREN B. IBAÑEZ
Tribol Trading and Fabrication
47E Morning Star
Quezon City

MR. JACOB L. BACANI
Philippine Welding Society
TESDA Complex
Tagig, Metro Manila

MR. ROSAULIO R. GUIRNALDA
Bureau Veritas Phils
Magsaysay Center
1680 Roxas Blvd.

MR. JIMMY LIBO-ON RUZGAL
MFI Staff Union
Meralco Foundation Inc.
Ortigas Ave., Pasig

MR. VIRGILIO D. MALANA
EEI Corporation
12 Manggahan St.,
Bagumbayan, Quezon City

MS. SHELLA S. DEL MUNDO
Philippine Welding Society
TESDA Complex
Taguig, Metro Manila

The Members of the TESDA Board

The TESDA Executive Committee

The MANAGEMENT and STAFF of the TESDA Secretariat

SSCO **NITVET**
OFTVET