TRAINING REGULATIONS

SHIELDED METAL ARC WELDING (SMAW) NC II

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) NC II

SECTION 1 SHIELDED METAL ARC WELDING (SMAW) NC II QUALIFICATION

The Shielded Metal Arc Welding (SMAW) NC II Qualification consists of competencies that a person must achieve to weld carbon steel plate and pipe components as specified by layout, blueprints, diagrams, work order, welding procedure or oral instructions using shielded metal arc welding equipment.

This Qualification conforms with American Welding Society (AWS) D 1.1 Structural Welding Code; American Society of Mechanical Engineers (ASME) IX Boiler and Pressure Vessel Code; American Petroleum Institute (API) 1104 Code for Gas and Oil Pipeline Facilities; and International Standards Organization (ISO) 9606-1 Qualification of Welders for Steel.

The Units of Competency comprising this qualification include the following:

Code No.	BASIC COMPETENCIES
500311105	Participate in Workplace Communication
500311106	Work in Team Environment
500311107	Practice career professionalism
500311108	Practice occupational health and safety procedures

Code No.	COMMON COMPETENCIES
MEE722201	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 COMPETENCIES
MEE721306	Weld Carbon Steel Plates and Pipes Using SMAW

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

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in SHIELDED METAL ARC WELDING (SMAW) NC II.

BASIC COMPETENCIES

UNIT OF COMPETENCY : PARTICIPATE IN WORKPLACE COMMUNICATION

UNIT CODE : 500311105

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Obtain and convey workplace information	1.1 Specific and relevant information is accessed from ***appropriate sources*** 1.2 Effective questioning , active listening and speaking skills are used to gather and convey information 1.3 Appropriate ***medium*** is used to transfer information and ideas 1.4 Appropriate non- verbal communication is used 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed 1.6 Defined workplace procedures for the location and ***storage*** of information are used 1.7 Personal interaction is carried out clearly and concisely
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time 2.2 Own opinions are clearly expressed and those of others are listened to without interruption 2.3 Meeting inputs are consistent with the meeting purpose and established ***protocols*** 2.4 ***Workplace interactions*** are conducted in a courteous manner 2.5 Questions about simple routine workplace procedures and maters concerning working conditions of employment are asked and responded to 2.6 Meetings outcomes are interpreted and implemented
3. Complete relevant work related documents	3.1 Range of ***forms*** relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines

RANGE OF VARIABLES

VARIABLE	RANGE
1. Appropriate sources	1.1. Team members 1.2. Suppliers 1.3. Trade personnel 1.4. Local government 1.5. Industry bodies
2. Medium	2.1. Memorandum 2.2. Circular 2.3. Notice 2.4. Information discussion 2.5. Follow-up or verbal instructions 2.6. Face to face communication
3. Storage	3.1. Manual filing system 3.2. Computer-based filing system
4. Forms	4.1. Personnel forms, telephone message forms, safety reports
5. Workplace interactions	5.1. Face to face 5.2. Telephone 5.3. Electronic and two way radio 5.4. Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
6. Protocols	6.1. Observing meeting 6.2. Compliance with meeting decisions 6.3. Obeying meeting instructions

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1. Prepared written communication following standard format of the organization 1.2. Accessed information using communication equipment 1.3. Made use of relevant terms as an aid to transfer information effectively 1.4. Conveyed information effectively adopting the formal or informal communication
2. Underpinning Knowledge and Attitudes	2.1. Effective communication 2.2. Different modes of communication 2.3. Written communication 2.4. Organizational policies 2.5. Communication procedures and systems 2.6. Technology relevant to the enterprise and the individual's work responsibilities
3. Underpinning Skills	3.1. Follow simple spoken language 3.2. Perform routine workplace duties following simple written notices 3.3. Participate in workplace meetings and discussions 3.4. Complete work related documents 3.5. Estimate, calculate and record routine workplace measures 3.6. Basic mathematical processes of addition, subtraction, division and multiplication 3.7. Ability to relate to people of social range in the workplace 3.8. Gather and provide information in response to workplace Requirements
4. Resource Implications	4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
5. Methods of Assessment	5.1. Direct Observation 5.2. Oral interview and written test
6. Context of Assessment	6.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY: WORK IN A TEAM ENVIRONMENT

UNIT CODE : 500311106

UNIT DESCRIPTOR : This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Describe team role and scope	1.1. The ***role and objective of the team*** is identified from available ***sources of information*** 1.2. Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources
2. Identify own role and responsibility within team	2.1. Individual role and responsibilities within the team environment are identified 2.2. Roles and responsibility of other team members are identified and recognized 2.3. Reporting relationships within team and external to team are identified
3. Work as a team member	3.1. Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives 3.2. Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and ***workplace context*** 3.3. Observed protocols in reporting using standard operating procedures 3.4. Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Role and objective of team	1.1. Work activities in a team environment with enterprise or specific sector 1.2. Limited discretion, initiative and judgement maybe demonstrated on the job, either individually or in a team environment
2. Sources of information	2.1. Standard operating and/or other workplace procedures 2.2. Job procedures 2.3. Machine/equipment manufacturer's specifications and instructions 2.4. Organizational or external personnel 2.5. Client/supplier instructions 2.6. Quality standards 2.7. OHS and environmental standards
3. Workplace context	3.1. Work procedures and practices 3.2. Conditions of work environments 3.3. Legislation and industrial agreements 3.4. Standard work practice including the storage, safe handling and disposal of chemicals 3.5. Safety, environmental, housekeeping and quality guidelines

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1. Operated in a team to complete workplace activity 1.2. Worked effectively with others 1.3. Conveyed information in written or oral form 1.4. Selected and used appropriate workplace language 1.5. Followed designated work plan for the job 1.6. Reported outcomes
2. Underpinning Knowledge and Attitude	2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
3. Underpinning Skills	3.1. Communicate appropriately, consistent with the culture of the workplace
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 tasks
5. Methods of Assessment	Competency may be assessed through: 5.1. Observation 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 in teamwork
6. Context for Assessment	6.1. Competency may be assessed in workplace or in a simulated workplace setting 6.2. Assessment shall be observed while task are being undertaken whether individually or in group

UNIT OF COMPETENCY: PRACTICE CAREER PROFESSIONALISM

UNIT CODE : 500311107

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes in promoting career growth and advancement.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Integrate personal objectives with organizational goals	1.1 Personal growth and work plans are pursued towards improving the qualifications set for the profession 1.2 Intra- and interpersonal relationships ~~is~~ are maintained in the course of managing oneself based on performance ***evaluation*** 1.3 Commitment to the organization and its goal is demonstrated in the performance of duties
2. Set and meet work priorities	2.1 Competing demands are prioritized to achieve personal, team and organizational goals and objectives. 2.2 ***Resources*** are utilized efficiently and effectively to manage work priorities and commitments 2.3 Practices along economic use and maintenance of equipment and facilities are followed as per established procedures
3. Maintain professional growth and development	3.1 ***Trainings and career opportunities*** are identified and availed of based on job requirements 3.2 ***Recognitions*** are sought/received and demonstrated as proof of career advancement 3.3 ***Licenses and/or certifications*** relevant to job and career are obtained and renewed

RANGE OF VARIABLES

VARIABLE	RANGE
1. Evaluation	1.1 Performance Appraisal 1.2 Psychological Profile 1.3 Aptitude Tests
2. Resources	2.1 Human 2.2 Financial 2.3 Technology 2.3.1 Hardware 2.3.2 Software
3. Trainings and career opportunities	3.1 Participation in training programs 3.1.1 Technical 3.1.2 Supervisory 3.1.3 Managerial 3.1.4 Continuing Education 3.2 Serving as Resource Persons in conferences and workshops
4. Recognitions	4.1 Recommendations 4.2 Citations 4.3 Certificate of Appreciations 4.4 Commendations 4.5 Awards 4.6 Tangible and Intangible Rewards
5. Licenses and/or certifications	5.1 National Certificates 5.2 Certificate of Competency 5.3 Support Level Licenses 5.4 Professional Licenses

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Attained job targets within key result areas (KRAs) 1.2 Maintained intra - and interpersonal relationship in the course of managing oneself based on performance evaluation 1.3 Completed trainings and career opportunities which are based on the requirements of the industries 1.4 Acquired and maintained licenses and/or certifications according to the requirement of the qualification
2. Underpinning Knowledge	2.1 Work values and ethics (Code of Conduct, Code of Ethics, etc.) 2.2 Company policies 2.3 Company-operations, procedures and standards 2.4 Fundamental rights at work including gender sensitivity 2.5 Personal hygiene practices
3. Underpinning Skills	3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
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 Simulation/Role-plays 5.4 Observation 5.5 Third Party Reports 5.6 Exams and Tests
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 OCCUPATIONAL HEALTH AND SAFETY PROCEDURES**

UNIT CODE : **500311108**

UNIT DESCRIPTOR : This unit covers the outcomes required to comply with regulatory and organizational requirements for occupational health and safety.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Identify hazards and risks	1.1 ***Safety regulations*** and workplace safety and hazard control practices and procedures are clarified and explained based on organization procedures 1.2 ***Hazards/risks*** in the workplace and their corresponding indicators are identified to minimize or eliminate risk to co-workers, workplace and environment in accordance with organization procedures 1.3 ***Contingency measures*** during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures
2. Evaluate hazards and risks	2.1 Terms of maximum tolerable limits which when exceeded will result in harm or damage are identified based on threshold limit values (TLV) 2.2 Effects of the hazards are determined 2.3 OHS issues and/or concerns and identified safety hazards are reported to designated personnel in accordance with workplace requirements and relevant workplace OHS legislation

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
3. Control hazards and risks	3.1 Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed 3.2 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies 3.3 ***Personal protective equipment (PPE)*** is correctly used in accordance with organization OHS procedures and practices 3.4 Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol
4. Maintain OHS awareness	4.1 ***Emergency-related drills and trainings*** are participated in as per established organization guidelines and procedures 4.2 ***OHS personal records*** are completed and updated in accordance with workplace requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Safety regulations	May include but are not limited to: 1.1 Clean Air Act 1.2 Building code 1.3 National Electrical and Fire Safety Codes 1.4 Waste management statutes and rules 1.5 Philippine Occupational Safety and Health Standards 1.6 DOLE regulations on safety legal requirements 1.7 ECC regulations
2. Hazards/Risks	May include but are not limited to: 2.1 Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation 2.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects 2.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors 2.4 Ergonomics • Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles • Physiological factors – monotony, personal relationship, work out cycle
VARIABLE	**RANGE**
3. Contingency measures	May include but are not limited to: 3.1 Evacuation 3.2 Isolation 3.3 Decontamination 3.4 (Calling designed) emergency personnel

4. PPE	May include but are not limited to: 4.1 Mask 4.2 Gloves 4.3 Goggles 4.4 Hair Net/cap/bonnet 4.5 Face mask/shield 4.6 Ear muffs 4.7 Apron/Gown/coverall/jump suit 4.8 Anti-static suits
5. Emergency-related drills and training	5.1 Fire drill 5.2 Earthquake drill 5.3 Basic life support/CPR 5.4 First aid 5.5 Spillage control 5.6 Decontamination of chemical and toxic 5.7 Disaster preparedness/management
6. OHS personal records	6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Explained clearly established workplace safety and hazard control practices and procedures 1.2 Identified hazards/risks in the workplace and its corresponding indicators in accordance with company procedures 1.3 Recognized contingency measures during workplace accidents, fire and other emergencies 1.4 Identified terms of maximum tolerable limits based on threshold limit value- TLV. 1.5 Followed Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace 1.6 Used Personal Protective Equipment (PPE) in accordance with company OHS procedures and practices 1.7 Completed and updated OHS personal records in accordance with workplace requirements
2. Underpinning Knowledge and Attitude	2.1 OHS procedures and practices and regulations 2.2 PPE types and uses 2.3 Personal hygiene practices 2.4 Hazards/risks identification and control 2.5 Threshold Limit Value -TLV 2.6 OHS indicators 2.7 Organization safety and health protocol 2.8 Safety consciousness 2.9 Health consciousness
3. Underpinning Skills	3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
4. Resource Implications	The following resources must be provided: 4.1 Workplace or assessment location 4.2 OHS personal records 4.3 PPE 4.4 Health records
5. Methods of Assessment	Competency may be assessed through: 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
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 evidence	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 evidence	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 4.1 Measuring tools 4.2 Drawings, sketches or blueprint 4.3 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 the 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 one unknown solved correctly.
4. Compute percentage and ratio	4.1 Percentages are computed using appropriate formula. 4.2 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 evidence	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 2.2 standards are maintained. Appropriate quality standards are applied 2.3 throughout the production/fabrication process. All activities are coordinated throughout the 2.4 workplace to ensure efficient quality work 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 evidence	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 evidence	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 Set up equipment is appropriate for operation intended
2. Cut and prepare edge of materials	2.1 *Materials* are *cut* based on specified dimension/*specifications*. 2.2 Task is 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 is 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 and codes 4.2 Welding consumables are prepared in accordance with manufacturer's instructions
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 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 automatic) 2.2 Plasma cutting equipment 2.3 Shearing machine 2.4 Disc cutter 2.5 Cutting electrode
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 *Welding machine* is positioned in proximity to work, does not pose as obstruction and is protected from damage due to dust, falling objects or rainfall. 1.2 Current, voltage, and wire feed settings is fine tuned or adjusted consistent with job requirements to produce acceptable weld. 1.3 Welding machine is wired up or set to the *polarity* indicated in the welding procedures/specifications or as recommended by the filler wire manufacturer 1.4 Welding machine should be connected to an independent *power supply*. 1.5 Tractor and wire feeders should be connected to welding machine where needed.
2. Set up welding accessories	2.1 Ground cable is connected directly to materials to be welded. 2.2 Welding cables, electrode holders and *accessories* installed are consistent with equipment requirements and work specifications, and shall be free from cracks, burns and cuts along the length of cable insulation. 2.3 Welding and ground cables laid out and free from tangles 2.4 Undersize or makeshift grounding is not used 2.5 Spools firmly locked to holder, rollers adjusted to correct tension 2.6 Purging hoses, damps, flowmeter, regulators, torches and guns are properly installed where needed. 2.7 Gas tanks properly secured where needed. 2.8 Flux recovery equipment installed where needed. 2.9 Electrode, flux oven/heaters installed where needed. 2.10 Tungsten electrodes properly ground for GTAW process where needed

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 1.1 SAW equipment 1.2 SMAW/GTAW equipment 1.3 GMAW/FCAW equipment 1.4 Multi-process welding equipment
2. Polarity	Application and uses 2.1 Direct current – electrode positive (reverse polarity) 2.2 Direct current – electrode negative (straight polarity)
3. Power supply	3.1 Alternating current (AC) 3.2 Direct current (DC) 3.3 Constant current 3.4 Constant voltage
4. Accessories	4.1 welding cables 4.2 electrode holders 4.3 welding torches and guns 4.4 regulators and flow meters 4.5 wire feeders and wire cutter 4.6 gas hoses and adaptors 4.7 tanks, cylinders and gas heaters 4.8 filters, gas lenses and insulators 4.9 electrode ovens and heaters 4.10 ceramic caps 4.11 collet and collet bodies 4.12 contact tips, short and long back caps 4.13 liners and diffusers 4.14 fume extractors/dust collectors 4.15 flux recovery equipment 4.16 PPE (masks, goggles, ear plug, etc.) 4.17 tractor rollers and rails
5. Gases	5.1 Pure inert gas (argon, etc.) 5.2 Mixed gases 5.3 Pure CO2 5.4 Pure nitrogen
6. Pre-heating equipment	6.1 Oxy-acetylene heating torch/burner 6.2 Electric resistance heating machine

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* is performed in accordance with the requirements of WPS and client's specifications. *1.2* Tack welding is performed *visually and dimensionally acceptable*. 1.3 *Backing* plate, stiffener, running plate installed as required. 1.4 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 1.2 Weld defects are located and marked according to procedures
2. Prepare tools and equipment	2.1 *Tools and equipment* are prepared based on job requirements and provision of wind barriers. 2.2 Task is performed in accordance with company or industry requirements and safety procedure
3. Remove defects	3.1 Weld defects are *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 is performed to verify the extent of removal of defects, where applicable 3.4 Welding inspector is informed to verify the extent of defect removal. 3.5 Task is performed in accordance with company or industry requirement and safety procedure
4. Perform re-welding	4.1 Re-welding is performed in accordance with approved repair procedure. 4.3 Task is performed in accordance with company or industry requirement and safety procedure 4.4 Re-welding is performed with no new weld defects or damages occurred 4.5 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 Wire 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 and Pipes Using SMAW**

UNIT CODE: **MEE721306**

DESCRIPTOR: **This unit covers the skills, knowledge and attitudes required in welding carbon steel plates and pipes 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 is visually 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 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 4G (plate) 1.1.2 1G, 2G, 5G and 6G (pipe) 1.2 Material thickness 1.2.1 1.6mm – unlimited (plate) 1.2.2 1.6mm and above (pipe wall thickness) 1.3 Pipe diameter 1.3.1 25.4mm (1in.) - unlimited 1.4 Type of material 1.4.1 Carbon or mild steel 1.5 Type and size of mild steel electrode 1.6 Travel speed 1.7 Current setting (polarity, amperage, voltage) 1.8 Preheating requirement 1.9 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 pipes in 2G and 5G and/or 6G 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
2 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
3 Resource Implications	The following resources must be provided: 4.1 Welding facilities and equipment 4.2 Supplies and materials 4.3 PPE 4.4 Relevant documentation such as WPS and working drawing
4 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
5 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

SHIELDED METAL ARC WELDING (SMAW)

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 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: SMAW **NC Level:** NC II

Nominal Training Duration: 18 hrs. (Basic Competencies)
56 hrs. (Common Competencies)
194 hrs. (Core Competencies)

Course Description:

This course is designed to enhance the knowledge, skills and attitudes of SMAW Welder in accordance with industry standards. It covers competencies such as Setting-up Welding Equipment, Preparing Weld Materials, Fitting up Weld Materials, Welding Carbon Steel Plates Using SMAW, Welding Carbon Steel Plates and Pipes Using SMAW and Repairing Welds.

BASIC COMPETENCIES

1. Participate in workplace communication	1.1 Obtain and convey workplace information. 1.2 Complete relevant work related documents. 1.3 Participate in workplace meeting and discussion	• Group discussion • Interaction	• Demonstration • Observation • Interviews/ questioning
2. Work in a team environment	2.1 Describe and identify team role and responsibility in a team. 2.2 Describe work as a team member.	• Discussion • Interaction	• Demonstration • Observation • Interviews/ questioning
3. Practice career professionalism	3.1Integrate personal objectives with organizational goals. 3.2 Set and meet work priorities. 3.3 Maintain professional growth and development.	• Discussion • Interaction	• Demonstration • Observation • Interviews/ questioning

4. Practice occupational health and safety	4.1 Evaluate hazard and risks 4.2 Control hazards and risks 4.3 Maintain occupational health and safety awareness	• Discussion • Plant tour • Symposium	• Observation • Interview

COMMON COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Perform work safely	1.1 Identify hazardous areas and conditions 1.2 Use protective clothing and devices 1.3 Perform safe handling of tools, equipment and materials 1.4 Explain/perform first aid procedure 1.5 Use fire extinguisher	• Lecturette • Practical application	• Oral questioning • Written • Demonstration
2. Contribute to quality system	2.1 Inspect work done 2.2 Apply quality standards to work 2.3 Protect company/ institution properties 2.4 Protect customer interest	• Lecturette • Practical application	• Oral questioning • Written • Demonstration
3. Use hand tools	3.1 Use different handtools 3.2 Maintain handtools	• Lecturette • Practical application	• Oral questioning • Written • Demonstration
4. Interpret Blueprints	4.1 Interpret technical drawing. 4.2 Interpret welding symbols	• Lecturette • Practical application	• Oral questioning • Written test
5. Perform industry calculations	5.1 Solve mathematical problems 5.2 Convert systems of measurement 5.3 Measure workpiece	• Lecturette • Practical application	• Oral questioning • Written test
6. Prepare Weld Materials	6.1 Identify the different cutting equipment and accessories 6.2 Identify types of mild steel electrodes 6.3 Identify types of joints and edge preparation 6.4 Identify protective equipment	• Lecturette • Practical application	• Observation • Demonstration and oral questioning • Written test

	6.5 Prepare welding consumables, tools and accessories 6.6 Layout on materials 6.7 Set-up cutting equipment 6.8 Cut and prepare edge of materials		
7. Set-up Welding Equipment	7.1 Explain welding principles and concepts. 7.2 Identify the parts of welding machine 7.3 Set up welding machine and accessories 7.4 Set up welding positioners, jigs and fixtures 7.5 Set up pre-heating equipment *(as required)*	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test
8. Fit up Weld Materials	8.1 Explain the importance of backing plate and stiffener. 8.2 Explain the methods of striking an arc 8.3 Perform striking an arc 8.4 Tack weld specimen, backing plate and stiffener.	• Lecturette • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test
9. Repair Welds	9.1 Identify causes and prevention of the different weld defects 9.2 Mark/locate weld defects 9.3 Prepare tools and equipment 9.4 Remove defects 9.5 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 Explain the essentials of welding 1.2 Deposit weld beads on plate 1.3 Weld plates in single pass fillet joints in all positions 1.4 Weld plates in multiple pass fillet joints in all positions 1.5 Weld plates in single pass groove joints in flat, horizontal and vertical positions 1.6 Weld plates in multiple pass groove joints in flat, horizontal and vertical positions	• Discussion • Demonstration	• Observation and oral questioning • Demonstration and oral questioning • Written test
2. Weld Carbon Steel Plates and Pipes Using SMAW	2.1 Weld plates in single pass groove joints in overhead positions 2.2 Weld plates in multiple pass groove joints in overhead positions 2.3 Weld pipe in 1G, 2G, 5G and 6G positions	• Discussion • Demonstration	• Observation and oral questioning • Demonstration and oral questioning

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:

- completed training in SMAW NC I or a holder of SMAW NC I
- can communicate both oral and written
- physically and mentally fit
- can perform basic mathematical computation

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS

Recommended list of tools, equipment and materials for the training of 25 trainees for **SMAW NC II**

TOOLS		EQUIPMENT		MATERIAL	
Qty.	Description	Qty.	Description	Qty.	Description
12 pcs.	Chipping Hammer	8 units	Arc Welding machine AC/DC and accessories	6 boxes	Electrode 3.2mm E6011
12 pcs.	Steel brush	8 pcs.	Welding table/positioners	6 boxes	Electrode 3.2mm E7018/6013
8 pcs.	Ballpeen Hammer	1 unit	Electrode oven	20 pcs.	Mild steel plate 10mm X 150mm X 6m
12 pcs.	Plier/tong	1 unit	Automatic gas cutting machine	20 pcs.	Mild steel plate 3.2mm X 150mm X 6m
10 pcs.	Files-bastard cut	5 units	Portable disc grinder	2 pcs.	Carbon steel pipe, schedule 40 dia. 150 X 3m
12 pcs.	Head shield/helmet	1 unit	Exhaust fan	20 pcs.	Filter lens
12 sets	Leather apron/jacket	1 unit	Power hacksaw	20 pcs.	Lens clear glass
12 sets	Leather glove, long	2 units	Anvil	20 pcs	Cut off disc 6mm X 15mm X 100mm
2 pcs.	Safety goggle, wide vision, clear	2 units	Work bench w/ bench vice on 4 corners	5 pcs.	Power saw blade
2 pcs.	Oxy-acetylene goggles	2 sets	Oxy-acetylene/Oxy-LPG cylinder with content	1 box	Metal chalk

12 pcs.	Try square 300 mm. long	1 unit	Pedestal /bench grinding machine		
12 pcs.	Steel square 300 mm. long	1 unit	Industrial fan		
10 pcs.	Files-half round				
2 pcs.	Fillet gauge				

3.5 TRAINING FACILITIES
SMAW NC II

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 NC II

TRAINER QUALIFICATION (TQ II)

- Must be a holder of SMAW Welder II
- Must have undergone training on Training Methodology II (TM II)
- 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 their 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 SMAW II, 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 and pipes using SMAW. The basic and common units shall be integrated or assessed concurrently with the core units.

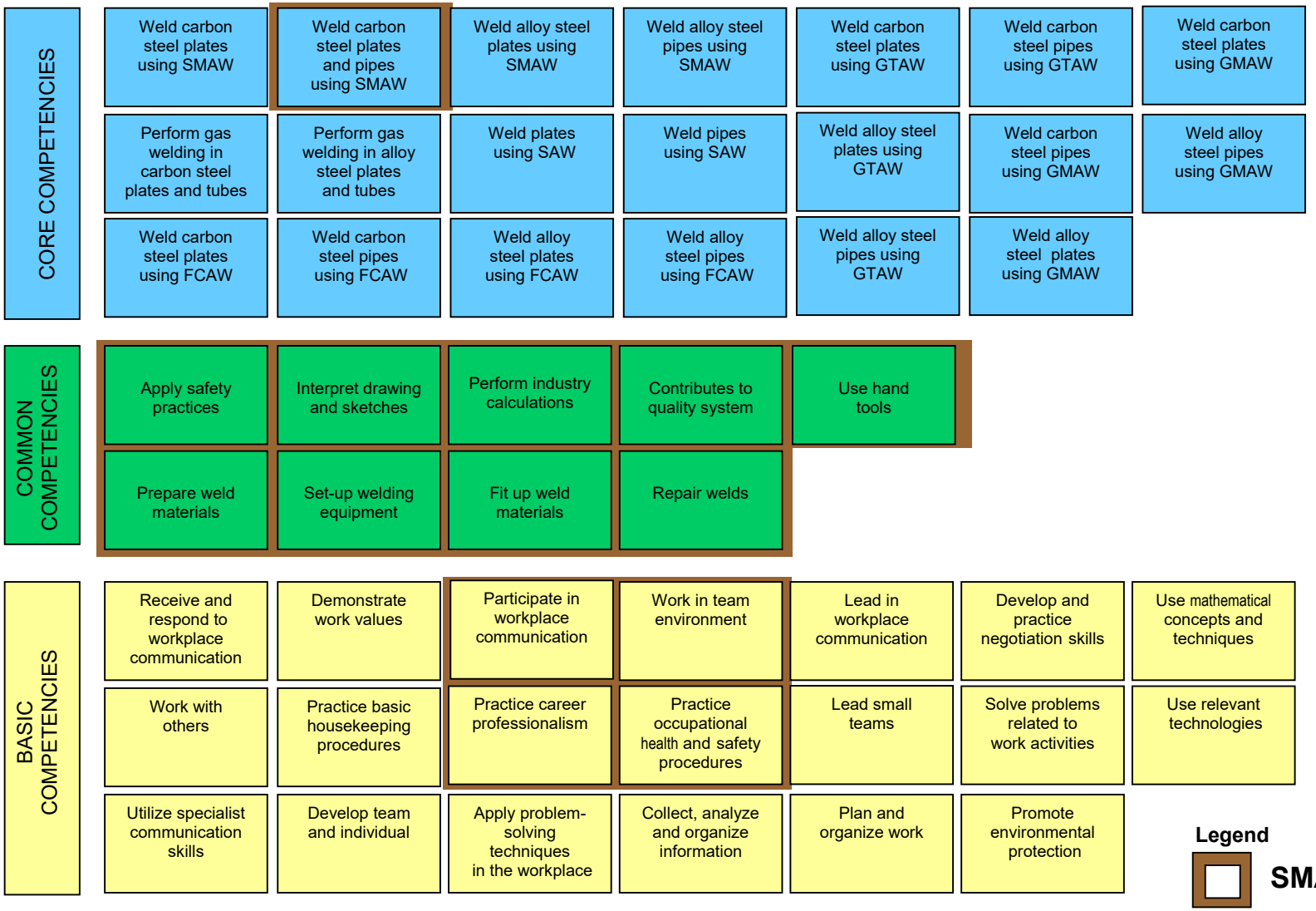
4.3 The following are qualified to apply for assessment and certification:

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)



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