COMPETENCY STANDARDS

DIGITAL FABRICATION MACHINE OPERATION LEVEL III

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

DIGITAL FABRICATION MACHINE OPERATION LEVEL III

COMPETENCY STANDARDS FOR
DIGITAL FABRICATION MACHINE OPERATION LEVEL III

Section 1 DIGITAL FABRICATION MACHINE OPERATION LEVEL III QUALIFICATION

The **DIGITAL FABRICATION MACHINE OPERATION LEVEL III** qualification consists of competencies that a person must achieve to create 2D/3D model for digital fabrication requirements, conduct prototyping and perform machine operation and maintenance.

The units of competency comprising this qualification include the following:

Code	BASIC COMPETENCIES
400311210	Participate in workplace communication
400311211	Work in a team environment
400311212	Solve/address general workplace problems
400311213	Develop career and life decisions
400311214	Contribute to workplace innovation
400311215	Present relevant information
400311216	Practice occupational safety and health policies and procedures
400311217	Exercise efficient and effective sustainable practices in the workplace
400311218	Practice entrepreneurial skills in the workplace
Code	**COMMON COMPETENCIES**
MEE721202	Interpret Drawings and Sketches
MEE721210	Perform Basic Workshop Measurements & Computations
MEE721211	Contribute to Quality Management System
MEE721205	Use Hand Tools
MEE721212	Prepare Materials and Consumables
Code	**CORE COMPETENCIES**
AB-MEE0730600732301	Process Designs
AB-MEE0730600732302	Perform Prototyping and Mass Production

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

- Digital Fabrication Machine Operator II

SECTION 2 COMPETENCY STANDARDS

This section provides the Technical Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for **DIGITAL FABRICATION MACHINE OPERATION LEVEL III.**

BASIC COMPETENCIES

UNIT OF COMPETENCY : **LEAD WORKPLACE COMMUNICATION**

UNIT CODE : **400311319**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to lead in the effective dissemination and discussion of ideas, information, and issues in the workplace. This includes preparation of written communication materials.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Communicate information about workplace processes	1.1 Relevant ***communication method*** is selected based on workplace procedures 1.2 Multiple operations involving several topics/areas are communicated following enterprise requirements 1.3 Questioning is applied to gain extra information 1.4 Relevant sources of information are identified in accordance with workplace/ client requirements 1.5 Information is selected and organized following enterprise procedures 1.6 Verbal and written reporting is undertaken when required 1.7 Communication and negotiation skills are applied and maintained in all relevant situations	1.1 Organization requirements for written and electronic communication methods 1.2 Effective verbal communication methods 1.3 Business writing 1.4 Workplace etiquette	1.1 Organizing information 1.2 Conveying intended meaning 1.3 Participating in a variety of workplace discussions 1.4 Complying with organization requirements for the use of written and electronic communication methods 1.5 Effective business Writing 1.6 Effective clarifying and probing skills 1.7 Effective questioning techniques (clarifying and probing)

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Lead workplace discussions	2.1 Response to workplace issues are sought following enterprise procedures 2.2 Response to workplace issues are provided immediately 2.3 Constructive contributions are made to ***workplace discussions*** on such issues as production, quality and safety 2.4 Goals/ objectives and action plans undertaken in the workplace are communicated promptly	2.1 Organization requirements for written and electronic communication methods 2.2 Effective verbal communication methods 2.3 Workplace etiquette	2.1 Organizing Information 2.2 Conveying intended meaning 2.3 Participating in variety of workplace discussions 2.4 Complying with organization requirements for the use of written and electronic communication methods 2.5 Effective clarifying and probing skills
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise 3.2 Information regarding problems and issues are organized coherently to ensure clear and effective communication 3.3 Dialogue is initiated with appropriate personnel 3.4 Communication problems and issues are raised as they arise 3.5 Identify barriers in communication to be addressed appropriately	3.1 Organization requirements for written and electronic communication methods 3.2 Effective verbal communication methods 3.3 Workplace Etiquette 3.4 Communication problems and issues 3.5 Barriers in communication	3.1 Organizing information 3.2 Conveying intended meaning 3.3 Participating in a variety of workplace discussions 3.4 Complying with organization requirements for the use of written and electronic communication methods 3.5 Effective clarifying and probing skills 3.6 Identifying issues 3.7 Negotiation and Communication skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Methods of communication	May include: 1.1. Non-verbal gestures 1.2. Verbal 1.3. Face-to-face 1.4. Two-way radio 1.5. Speaking to groups 1.6. Using telephone 1.7. Written 1.8. Internet
2. Workplace discussions	May include: 2.1. Coordination meetings 2.2. Toolbox discussion 2.3. Peer-to-peer discussion

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Dealt with a range of communication/information at one time 1.2 Demonstrated leadership skills in workplace communication 1.3 Made constructive contributions in workplace issues 1.4 Sought workplace issues effectively 1.5 Responded to workplace issues promptly 1.6 Presented information clearly and effectively written form 1.7 Used appropriate sources of information 1.8 Asked appropriate questions 1.9 Provided accurate information
2. Resource Implications	The following resources should be provided: 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace
3. Methods of Assessment	Competency in this unit may be assessed through: Case problem 3.1. Third-party report 3.2. Portfolio 3.3. Interview 3.4. Demonstration/Role-playing
4. Context for Assessment	4.1. Competency may be assessed in the workplace or in a simulated workplace environment

UNIT OF COMPETENCY : **SOLVE/ADDRESS GENERAL WORKPLACE PROBLEMS**

UNIT CODE : **400311212**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to apply problem-solving techniques to determine the origin of problems and plan for their resolution. It also includes addressing procedural problems through documentation, and referral.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify routine problems	1.1 Routine ***problems or procedural problem*** areas are identified 1.2 Problems to be investigated are defined and determined 1.3 Current conditions of the problem are identified and documented	1.1 Current industry hardware and software products and services 1.2 Industry maintenance, service and helpdesk practices, processes and procedures 1.3 Industry standard diagnostic tools 1.4 Malfunctions and resolutions	1.1 Identifying current industry hardware and software products and services 1.2 Identifying current industry maintenance, services and helpdesk practices, processes and procedures. 1.3 Identifying current industry standard diagnostic tools 1.4 Describing common malfunctions and resolutions. 1.5 Determining the root cause of a routine malfunction

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Look for solutions to routine problems	2.1 Potential solutions to problem are identified 2.2 Recommendations about possible solutions are developed, **documented**, ranked and presented to ***appropriate person*** for decision.	2.1 Current industry hardware and software products and services 2.2 Industry service and helpdesk practices, processes and procedures 2.3 Operating systems 2.4 Industry standard diagnostic tools 2.5 Malfunctions and resolutions. 2.6 Root cause analysis	2.1 Identifying current industry hardware and software products and services 2.2 Identifying services and helpdesk practices, processes and procedures. 2.3 Identifying operating system 2.4 Identifying current industry standard diagnostic tools 2.5 Describing common malfunctions and resolutions. 2.6 Determining the root cause of a routine malfunction
3. Recommend solutions to problems	3.1.Implementation of solutions are planned 3.2 Evaluation of implemented solutions are planned 3.3 Recommended solutions are documented and submit to appropriate person for confirmation	3.1 Standard procedures 3.2 Documentation produce	3.1 Producing documentation that recommends solutions to problems 3.2 Following established procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. Problems/Procedural Problem	May include: 1.1 Routine/non – routine processes and quality problems 1.2 Equipment selection, availability and failure 1.3 Teamwork and work allocation problem 1.4 Safety and emergency situations and incidents 1.5 Work-related problems outside of own work area
2. Appropriate person	May include: 2.1 Supervisor or manager 2.2 Peers/work colleagues 2.3 Other members of the organization
3. Document	May include: 3.1 Electronic mail 3.2 Briefing notes 3.3 Written report 3.4 Evaluation report
4. Plan	May include: 4.1 Priority requirements 4.2 Co-ordination and feedback requirements 4.3 Safety requirements 4.4 Risk assessment 4.5 Environmental requirements

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Determined the root cause of a routine problem 1.2 Identified solutions to procedural problems. 1.3 Produced documentation that recommends solutions to problems. 1.4 Followed established procedures. 1.5 Referred unresolved problems to support persons.
2. Resource Implications	The following resources should be provided: 2.1. Assessment will require access to a workplace over an extended period, or a suitable method of gathering evidence of operating ability over a range of situations.
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Case Formulation 3.2 Life Narrative Inquiry 3.3 Standardized test The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.
4. Context for Assessment	4.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions.

UNIT OF COMPETENCY : **DEVELOP CAREER AND LIFE DECISIONS**

UNIT CODE : **400311213**

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes in managing one's emotions, developing reflective practice, and boosting self-confidence and developing self-regulation.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Manage one's emotion	1.1 **Self-management strategies** are identified 1.2 Skills to work independently and to show initiative, to be conscientious, and persevering in the face of setbacks and frustrations are developed. 1.3 Techniques for effectively handling negative emotions and **unpleasant situation** in the workplace are examined.	1.1 Self-management strategies that assist in regulating behavior and achieving personal and learning goals (e.g. Nine self-management strategies according to Robert Kelley) 1.2 Enablers and barriers in achieving personal and career goals. 1.3 Techniques in handling negative emotions and unpleasant situation in the workplace such as frustration, anger, worry, anxiety, etc.	1.1 Managing properly, one's emotions and recognizing situations that cannot be changed and accept them and remain professional 1.2 Developing self-discipline, working independently and showing initiative to achieve personal and career goals 1.3 Showing confidence, and resilience in the face of setbacks and frustrations and other negative emotions and unpleasant situations in the workplace

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Develop reflective practice	2.1 Personal strengths and achievements, based on self-assessment strategies and teacher feedback are contemplated. 2.2 Progress when seeking and responding to feedback from teachers to assist them in consolidating strengths, addressing weaknesses and fulfilling their potential are monitored. 2.3lllOutcomes of personal and academic challenges by reflecting on previous problem solving and decision making strategies and feedback from peers and teachers are predicted	2.1 Basic SWOT analysis 2.2 Strategies to improve one's attitude in the workplace 2.3 Gibbs' Reflective Cycle/Model (Description, Feelings, Evaluation, Analysis, Conclusion, and Action plan)	2.1 Using the basic SWOT analysis as self-assessment strategy 2.2 Developing reflective practice through realization of limitations, likes/dislikes; through showing of self-confidence 2.3 Demonstrating self-acceptance and being able to accept challenges
3. Boost self-confidence and develop self-regulation	3.1kEfforts for continuous self-improvement are demonstrated 3.2 Counter-productive tendencies at work are eliminated 3.3 Positive outlook in life are maintained.	3.1 Four components of self-regulation based on Self-Regulation Theory (SRT) 3.2 Personality development concepts 3.3 Self-help concepts (e. g., 7 Habits by Stephen Covey, Transactional analysis, psycho-spiritual concepts)	3.1 Performing effective communication skills – reading, writing, conversing skills 3.2 Showing affective skills – flexibility, adaptability, etc. 3.3 Self-assessment for determining one's strengths and weaknesses

RANGE OF VARIABLES

VARIABLE	RANGE
1. Self-management strategies	May include: 1.1 Seeking assistance in the form of job coaching or mentoring 1.2 Continuing dialogue to tackle workplace grievances 1.3 Collective negotiation/bargaining for better working conditions 1.4 Share your goals to improve with a trusted co-worker or supervisor 1.5 Make a negativity log of every instance when you catch yourself complaining to others 1.6 Make lists and schedules for necessary activities
2. Unpleasant situation	May include: 2.1 Job burn-out 2.2 Drug dependence 2.3 Sulking

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Express emotions appropriately 1.2 Work independently and show initiative 1.3 Consistently demonstrate self-confidence and self-discipline
2. Resource Implications	**The following resources should be provided:** 2.1. Access to workplace and resource s 2.2. Case studies
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1. Demonstration or simulation with oral questioning 3.2. Case problems involving work improvement and sustainability issues 3.3. Third-party report
4. Context for Assessment	4.1 Competency assessment may occur in workplace or any appropriately simulated environment.

UNIT OF COMPETENCY : **CONTRIBUTE TO WORKPLACE INNOVATION**

UNIT CODE : **400311214**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to make a pro-active and positive contribution to workplace innovation.

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify opportunities to do things better	1.1 ***Opportunities for improvement*** are identified proactively in own area of work. 1.2 ***Information*** are gathered and reviewed which may be relevant to ideas and which might assist in gaining support for idea.	1.1 Roles of individuals in suggesting and making improvements. 1.2 Positive impacts and challenges in innovation. 1.3 Types of changes and responsibility. 1.4 Seven habits of highly effective people.	1.1 Identifying opportunities to improve and to do things better involvement. 1.2 Identifying the positive impacts and the challenges of change and innovation. 1.3 Identifying examples of the types of changes that are within and outside own scope of responsibility.
2. Discuss and develop ideas with others	2.1 ***People who could provide input*** to ideas for improvements are identified. 2.2vWays of approaching people to begin sharing ideas are selected. 2.3 Meeting is set with relevant people. 2.4 Ideas for follow up are review and selected based on feedback. 2.5b***Critical inquiry method*** is used to discuss and develop ideas with others.	2.1 Roles of individuals in suggesting and making improvements. 2.2 Positive impacts and challenges in innovation. 2.3 Types of changes and responsibility. 2.4 Seven habits of highly effective people.	2.1 Identifying opportunities to improve and to do things better involvement. 2.2oIdentifying the positive impacts and the challenges of change and innovation. 2.3 Providing examples of the types of changes that are within and outside own scope of responsibility 2.4kCommunicating ideas for change through small group discussions and meetings.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Integrate ideas for change in the workplace	3.1 Critical inquiry method is used to integrate different ideas for change of key people. 3.2 Summarizing, analyzing and generalizing skills are used to extract salient points in the pool of ideas. 3.3 ***Reporting skills*** are likewise used to communicate results. 3.4 ***Current Issues and concerns*** on the systems, processes and procedures, as well as the need for simple innovative practices are identified.	3.1 Roles of individuals in suggesting and making improvements. 3.2bPositive impacts and challenges in innovation. 3.3 Types of changes and responsibility. 3.4hSeven habits of highly effective people. 3.5hBasic research skills.	3.1 Identifying opportunities to improve and to do things better. Involvement. 3.2 Identifying the positive impacts and the challenges of change and innovation. 3.3 Providing examples of the types of changes that are within and outside own scope of responsibility. 3.4 Communicating ideas for change through small group discussions and meetings. 3.5 Demonstrating skills in analysis and interpretation of data.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Innovative practices	May include: 1.1 Self-directed support 1.2 Community based services 1.3 Working within a collaborative arrangement 1.4 Making scope of work more efficient
2. Innovation	May include: 2.1 New ideas 2.2 Original ideas 2.3 Different ideas 2.4 Methods or tools

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Identified need for innovation in the area of work 1.2 Recognized innovative and creative ideas 1.3 Pursed agreement for flexible and innovative ways of working 1.4 Supported individuals and people to access flexible and innovative ways of working
2. Resource Implications	**Specific resources for assessment** 2.1. Evidence of competent performance should be obtained by observing an individual in an information management role within the workplace or operational or simulated environment.
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1. Written Test 3.2. Interview The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.
4. Context for Assessment	4.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions

UNIT OF COMPETENCY : **PRESENT RELEVANT INFORMATION**

UNIT CODE : **400311215**

UNIT DESCRIPTOR : This unit of covers the knowledge, skills and attitudes required to present data/information appropriately.

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Gather data/ information	1.1 Evidence, facts and information are collected 1.2 Evaluation, terms of reference and conditions are reviewed to determine whether data/information falls within project scope.	1.1 Organisational protocols 1.2 Confidentiality 1.3 Accuracy 1.4dBusiness mathematics and statistics 1.5 Data analysis techniques/ procedures 1.6hReporting requirements to a range of audiences 1.7 Legislation, policy and procedures relating to the conduct of evaluations 1.8kOrganisational values, ethics and codes of conduct	1.1 Describing organisational protocols relating to client liaison 1.2 Protecting confidentiality 1.3 Describing accuracy 1.4 Computing business mathematics and statistics 1.5 Describing data analysis techniques/ procedures 1.6 Reporting requirements to a range of audiences 1.7 Stating legislation, policy and procedures relating to the conduct of evaluations 1.8 Stating organisational values, ethics and codes of conduct

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Assess gathered data/ information	2.1 Validity of data/ information is assessed 2.2 Analysis techniques are applied to assess data/ information. 2.3 Trends and anomalies are identified 2.4 ***Data analysis techniques*** and procedures are documented 2.5 Recommendations are made on areas of possible improvement	2.1 Business mathematics and statistics 2.2 Data analysis techniques/ procedures 2.3 Reporting requirements to a range of audiences 2.4 Legislation, policy and procedures relating to the conduct of evaluations 2.5 Organisational values, ethics and codes of conduct	2.1 Computing business mathematics and statistics 2.2 Describing data analysis techniques/ procedures 2.3 Reporting requirements to a range of audiences 2.4 Stating legislation, policy and procedures relating to the conduct of evaluations 2.5 Stating organisational values, ethics and codes of conduct
3. Record and present information	3.1 Studied data/information are recorded. 3.2 Recommendations are analysed for action to ensure they are compatible with the project's scope and terms of reference. 3.3 Interim and final reports are analysed and outcomes are compared to the criteria established at the outset. 3.4 Findings are presented to stakeholders.	3.1 Data analysis techniques/ procedures 3.2 Reporting requirements to a range of audiences 3.3 Legislation, policy and procedures relating to the conduct of evaluations 3.4 Organisational values, ethics and codes of conduct	3.1 Describing data analysis techniques/ procedures 3.2 Reporting requirements to a range of audiences 3.3 Stating legislation, policy and procedures relating to the conduct of evaluations 3.4 Stating organisational values, ethics and codes of conduct practices

RANGE OF VARIABLES

VARIABLE	RANGE
1. Data analysis techniques	May include: 1.1. Domain analysis 1.2. Content analysis 1.3. Comparison technique

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Determine data / information 1.2 Studied and applied gathered data/information 1.3 Recorded and studied studies data/information These aspects may be best assessed using a range of scenarios what ifs as a stimulus with a walk-through forming part of the response. These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.
2. Resource Implications	**Specific resources for assessment** 2.1. Evidence of competent performance should be obtained by observing an individual in an information management role within the workplace or operational or simulated environment.
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1. Written Test 3.2. Interview The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.
4. Context for Assessment	4.1 In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.

UNIT OF COMPETENCY : **PRACTICE OCCUPATIONAL SAFETY AND HEALTH POLICIES AND PROCEDURES**

UNIT CODE : **400311216**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to identify OSH compliance requirements, prepare OSH requirements for compliance, perform tasks in accordance with relevant OSH policies and procedures.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify OSH compliance requirements	1.1 Relevant ***OSH requirements, regulations, policies and procedures*** are identified in accordance with workplace policies and procedures. 1.2jOSH activity nonconformities are conveyed to ***appropriate personnel***. 1.3 ***OSH preventive and control requirements*** are identified in accordance with OSH work policies and procedures	1.1 OSH preventive and control requirements 1.2 Hierarchy of Controls 1.3 Hazard Prevention and Control 1.4 General OSH principles 1.5 Work standards and procedures 1.6 Safe handling procedures of tools, equipment and materials 1.7 Standard emergency plan and procedures in the workplace	1.1 Communication skills 1.2 Interpersonal skills 1.3 Critical thinking skills 1.4 Observation skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Prepare OSH requirements for compliance	2.1 OSH work activity material, tools and equipment requirements are identified in accordance with workplace policies and procedures. 2.2lfRequired OSH materials, tools and equipment are acquired in accordance with workplace policies and procedures. 2.3kRequired OSH materials, tools and equipment are arranged/ placed in accordance with OSH work standards.	2.1 Resources necessary to execute hierarchy of controls 2.2 General OSH principles 2.3 Work standards and procedures 2.4 Safe handling procedures of tools, equipment and materials 2.5 Different OSH control measures	2.1 Communication skills 2.2 Estimation skills 2.3 Interpersonal skills 2.4 Critical thinking skills 2.5 Observation skills 2.6 Material, tool and equipment identification skills
3. Perform tasks in accordance with relevant OSH policies and procedures	3.1 Relevant OSH work procedures are identified in accordance with workplace policies and procedures. 3.2 Work Activities are executed in accordance with OSH work standards. 3.3 ***Non-compliance work activities*** are reported to appropriate personnel.	3.1 OSH work standards 3.2 Industry related work activities 3.3 General OSH principles 3.4 OSH Violations Non-compliance work activities	3.1 Communication skills 3.3 Interpersonal skills 3.4 Troubleshooting skills 3.5 Critical thinking skills 3.6 Observation skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. OSH Requirements, Regulations, Policies and Procedures	May include: 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 Permit to Operate 1.6 Philippine Occupational Safety and Health Standards 1.7 Department Order No. 13 (Construction Safety and Health) 1.8 ECC regulations
2. Appropriate Personnel	May include: 2.1 Manager 2.2 Safety Officer 2.3 EHS Offices 2.4 Supervisors 2.5 Team Leaders 2.6 Administrators 2.7 Stakeholders 2.8 Government Official 2.9 Key Personnel 2.10 Specialists 2.11 Himself
3. OSH Preventive and Control Requirements	May include: 3.1 Resources needed for removing hazard effectively 3.2 Resources needed for substitution or replacement 3.3 Resources needed to establishing engineering controls 3.4 Resources needed for enforcing administrative controls 3.5 Personal Protective equipment
4. Non OSH-Compliance Work Activities	May include non-compliance or observance of the following safety measures: 4.1 Violations that may lead to serious physical harm or death 4.2 Fall Protection 4.3 Hazard Communication 4.4 Respiratory Protection 4.5 Power Industrial Trucks 4.6 Lockout/Tag-out 4.7 Working at heights (use of ladder, scaffolding) 4.8 Electrical Wiring Methods 4.9 Machine Guarding 4.10 Electrical General Requirements 4.11 Asbestos work requirements 4.12 Excavations work requirements

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Convey OSH work non-conformities to appropriate personnel 1.2. Identify OSH preventive and control requirements in accordance with OSH work policies and procedures 1.3. Identify OSH work activity material, tools and equipment requirements in accordance with workplace policies and procedures 1.4. Arrange/Place required OSH materials, tools and equipment in accordance with OSH work standards 1.5. Execute work activities in accordance with OSH work standards 1.6. Report OSH activity non-compliance work activities to appropriate personnel
2. Resource Implications	**The following resources should be provided:** 2.1 Facilities, materials tools and equipment necessary for the activity
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Observation/Demonstration with oral questioning 3.2 Third party report
4. Context for Assessment	4.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : **EXERCISE EFFICIENT AND EFFECTIVE SUSTAINABLE PRACTICES IN THE WORKPLACE**

UNIT CODE : **400311217**

UNIT DESCRIPTOR : This unit covers knowledge, skills and attitude to identify the efficiency and effectiveness of resource utilization, determine causes of inefficiency and/or ineffectiveness of resource utilization and Convey inefficient and ineffective environmental practices.

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify the efficiency and effectiveness of resource utilization	1.1 Required resource utilization in the workplace is measured using appropriate techniques 1.2 Data are recorded in accordance with workplace protocol 1.3 Recorded data are compared to determine the efficiency and effectiveness of resource utilization according to established environmental work procedures.	1.1 Importance of Environmental Literacy 1.2 Environmental Work Procedures 1.3 Waste Minimization 1.4 Efficient Energy Consumptions	1.1 Recording Skills 1.2 Writing Skills 1.3 Innovation Skills
2. Determine causes of inefficiency and/or ineffectiveness of resource utilization	2.1 Potential causes of inefficiency and/or ineffectiveness are listed 2.2 Causes of inefficiency and/or ineffectiveness are identified through deductive reasoning 2.3 Identified causes of inefficiency and/or ineffectiveness are validated thru established environmental procedures.	2.1 Causes of environmental inefficiencies and ineffectiveness	2.1 Deductive Reasoning Skills 2.2 Critical thinking 2.3 Problem Solving 2.4 Observation Skills

ELEMENT	**PERFORMANCE CRITERIA** ***Italicized terms*** are elaborated in the Range of Variables	**REQUIRED KNOWLEDGE**	**REQUIRED SKILLS**
3. Convey inefficient and ineffective environmental practices	3.1 Efficiency and effectiveness of resource utilization are reported to appropriate personnel 3.2 Concerns related resource utilization are discussed with appropriate personnel 3.3 Feedback on information/ concerns raised are clarified with appropriate personnel.	3.1 Appropriate Personnel to address the environmental hazards 3.2 Environmental corrective actions	3.1 Written and Oral Communication Skills 3.2 Critical thinking 3.3 Problem Solving 3.4 Observation Skills 3.5 Practice Environmental Awareness

RANGE OF VARIABLES

VARIABLE	RANGE
1. Environmental Work Procedures	May include: 1.1 Utilization of Energy, Water, Fuel Procedures 1.2 Waster Segregation Procedures 1.3 Waste Disposal and Reuse Procedures 1.4 Waste Collection Procedures 1.5 Usage of Hazardous Materials Procedures 1.6 Chemical Application Procedures 1.7 Labeling Procedures
2. Appropriate Personnel	May include: 2.1 Manager 2.2 Safety Officer 2.3 EHS Offices 2.4 Supervisors 2.5 Team Leaders 2.6 Administrators 2.7 Stakeholders 2.8 Government Official 2.9 Key Personnel 2.10 Specialists 2.11 Himself

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Measured required resource utilization in the workplace using appropriate techniques 1.2. Recorded data in accordance with workplace protocol 1.3. Identified causes of inefficiency and/or ineffectiveness through deductive reasoning 1.4. Validate the identified causes of inefficiency and/or ineffectiveness thru established environmental procedures 1.5. Report efficiency and effectives of resource utilization to appropriate personnel 1.6. Clarify feedback on information/concerns raised with appropriate personnel
2. Resource Implications	**The following resources should be provided:** 2.1 Workplace 2.2 Tools, materials and equipment relevant to the tasks 2.3 PPE 2.4 Manuals and references
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Demonstration 3.2 Oral questioning 3.3 Written examination
4. Context for Assessment	4.1 Competency assessment may occur in workplace or any appropriately simulated environment 4.2 Assessment shall be observed while task are being undertaken whether individually or in-group

UNIT OF COMPETENCY : **PRACTICE ENTREPRENEURIAL SKILLS IN THE WORKPLACE**

UNIT CODE : **400311218**

UNIT DESCRIPTOR : This unit covers the outcomes required to apply entrepreneurial workplace best practices and implement cost-effective operations.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Apply entrepreneurial workplace best practices	1.1 ***Good practices*** relating to workplace operations are observed and selected following workplace policy. 1.2 Quality procedures and practices are complied with according to workplace requirements. 1.3 Cost-conscious habits in ***resource utilization*** are applied based on industry standards.	1.1 Workplace best practices, policies and criteria 1.2 Resource utilization 1.3 Ways in fostering entrepreneurial attitudes: • Patience • Honesty • Quality-consciousness • Safety-consciousness • Resourcefulness	1.1 Communication skills 1.2 Complying with quality procedures
2. Communicate entrepreneurial workplace best practices	2.1 Observed Good practices relating to workplace operations are communicated to ***appropriate person***. 2.2 Observed quality procedures and practices are communicated to appropriate person. 2.3 Cost-conscious habits in ***resource utilization*** are communicated based on industry standards.	2.1 Workplace best practices, policies and criteria 2.2 Resource utilization 2.3 Ways in fostering Entrepreneurial attitudes: • Patience • Honesty • Quality-consciousness • Safety-consciousness • Resourcefulness	2.1 Communication skills 2.2 Complying with quality procedures 2.3 Following workplace communication protocol

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Implement cost-effective operations	3.1 Preservation and optimization of workplace resources is implemented in accordance with enterprise policy. 3.2 Judicious use of workplace tools, equipment and materials are observed according to manual and work requirements. 3.3 Constructive contributions to office operations are made according to enterprise requirements. 3.4 Ability to work within one's allotted time and finances is sustained.	3.1 Optimization of workplace resources 3.2 5S procedures and concepts 3.3 Criteria for cost effectiveness 3.4 Workplace productivity 3.5 Impact of entrepreneurial mindset to workplace productivity 3.6 Ways in fostering entrepreneurial attitudes: • Quality-consciousness • Safety-consciousness	3.1 Implementing preservation and optimizing workplace resources 3.2 Observing judicious use of workplace tools, equipment and materials 3.3 Making constructive contributions to office operations 3.4 Sustaining ability to work within allotted time and finances

RANGE OF VARIABLES

VARIABLE	RANGE
1. Good practices	May include: 1.1 Economy in use of resources 1.2 Documentation of quality practices
2.Resources utilization	May include: 2.1 Consumption/ use of consumables 2.2 Use/Maintenance of assigned equipment and furniture 2.3 Optimum use of allotted /available time

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Demonstrated ability to identify and sustain cost-effective activities in the workplace 1.2 Demonstrated ability to practice entrepreneurial knowledge, skills and attitudes in the workplace.
2. Resource Implications	**The following resources should be provided:** 2.1 Simulated or actual workplace 2.2 Tools, materials and supplies needed to demonstrate the required tasks 2.3 References and manuals 2.3.1 Enterprise procedures manuals 2.3.2 Company quality policy
3. Methods of Assessment	**Competency in this unit should be assessed through:** 3.1 Interview 3.2 Third-party report
4. Context for Assessment	4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group

COMMON COMPETENCIES

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.

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret technical drawing	1.1 Dimensions identified as appropriate. 1.2 Instructions identified and followed as required. 1.3 Material requirements identified as required. 1.4 Symbols recognized as appropriate in the drawing/ sketch. 1.5 Tolerance, limits and fits identified in the drawing.	1.1 Alphabet of lines 1.2 Projections 1.3 Drawing symbols 1.4 Dimensioning techniques 1.5 Tolerance, limits and fits 1.6 Engineering materials 1.7 Drawing tools and supplies 1.8 AWF-CWCS/ ISO 9606-1 / AWS D1.1 / ASME IX.	1.1 Identifying dimension 1.2 Identifying instruction 1.3 Identifying material 1.4 Recognizing symbols in the drawing 1.5 Identifying tolerance, limits and fits
2. Interpret details from freehand sketch	2.1 Dimensions identified as appropriate. 2.2 Instructions identified and followed as required. 2.3 Material requirements identified as required. 2.4 Symbols recognized as appropriate in the drawing.	2.1 Alphabet of lines 2.2 Projections 2.3 Drawing symbols 2.4 Dimensioning techniques 2.5 Tolerance, limits and fits 2.6 Engineering materials 2.7 Drawing tools and supplies 2.8 AWF-CWCS/ ISO 9606-1 / AWS D1.1 / ASME IX.	2.1 Identifying dimensions 2.2 Identifying instruction 2.3 Identifying material requirements 2.4 Recognizing symbols

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing/sketch	May include: 1.1 Perspective 1.2 Joint design 1.3 Welding symbols
2.Tolerance	May include: 2.1 General tolerance 2.2 Groove Angle 2.3 Root Face 2.4 Root Opening

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate interpreted:** 1.1 Drawings 1.2 Sketches.
2. Resource Implications	**The following resources should be provided:** 2.1 Drawings or plans 2.2 Sketches 2.3 Measuring tools
3. Methods of Assessment	**Competency in this unit should be assessed through:** 3.1 Direct observation 3.2 Written or oral short answer questions 3.3 Demonstration
4. Context for Assessment	4.1 Competency may be assessed in the workplace or in simulated workplace environment or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : **PERFORM BASIC WORKSHOP MEASUREMENTS & COMPUTATIONS**

UNIT CODE : **MEE721210**

UNIT DESCRIPTOR : This unit covers the competencies required to perform proper measurement and simple calculations using the four fundamental operations.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select and use measuring tools	1.1 ***Measuring tools*** are selected according to the requirement. 1.2 Measuring tools are used according to the requirement 1.3 Measuring technique used is correct and appropriate to the device used.	1.1 Types, purposes and accuracy of measuring instruments 1.2 Capability of measuring instruments 1.3 Part dimensions and tolerances 1.4 Techniques for measuring dimensions	1.1 Selecting measuring tools 1.2 Obtaining accurate measurements 1.3 Determining measuring technique
2. Clean and store measuring tools	2.1 Cleaning of devices undertaken according to standard operating procedures. 2.2 Care of devices undertaken according to manufacturer's specifications. 2.3 Storage of devices undertaken according to standard operating procedures.	2.1 Types, purposes and accuracy of measuring instruments 2.2 Capability of measuring instruments 2.3 Part dimensions and tolerances 2.4 Techniques for measuring dimensions 2.5 Care and storage procedure of measuring tools	2.1 Determining proper care and storage of measuring tools.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Perform four fundamental operations.	3.1 Simple calculations are performed using four fundamental operations. 3.2 Correct formula are applied to isolate the variable required. 3.3 Simple transposition of variables in the formulae is carried out. 3.4 Unknown variables are solved correctly.	3.1 Linear measurement 3.2 Geometrical measurement 3.3 Ratio and proportion 3.4 Area	3.1 Performing Calculation
4. Perform conversion of units	4.1 Familiarity to English system of measurement is required 4.2 Understanding to the metric system is necessary. 4.3 ***Units*** are converted to the required figure using the given formulae	4.1 English Systems of Measurement 4.2 Metric System of Measurement 4.3 Conversion of units from English to metric and/or vice versa	4.1 Performing Calculation

UNIT OF COMPETENCY : **CONTRIBUTE TO QUALITY MANAGEMENT SYSTEM (QMS)**

UNIT CODE : **MEE721211**

UNIT DESCRIPTOR : This unit involves competence required to contribute to quality management system towards work.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Apply quality management system (QMS)	1.1 Appropriate ***quality systems and procedures*** are applied throughout the production/fabrication process. 1.2 Documented information are properly controlled 1.3 QMS are properly implemented and maintained	1.1 Awareness on applicable quality management system / standards	1.1 Conforming to QMS

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Apply quality standards to work	2.1 Inspections are conducted throughout the production processes to ensure quality standards are maintained. 2.2 Appropriate quality standards are applied throughout the production/fabrication processes. 2.3 All activities are coordinated throughout the workplace to ensure efficient quality work outcomes. 2.4 Records of work quality are maintained according to the company requirements.	2.1 Awareness on applicable quality management system / standards	2.1 Conforming to QMS
3. Protect company property and customer interests	3.1 Possible damage to company property is avoided by adherence to company quality procedures. 3.2 Quality of work is reviewed to ensure customer requirements and company standards 3.3 Customer feedback system is established.	3.1 Awareness on applicable quality management system / standards	3.1 Conforming to QMS

RANGE OF VARIABLES

VARIABLE	RANGE
1. Quality system and Procedures	Quality system and procedures may be contained in: 1.1 Work instructions 1.2 Procedures manual 1.3 Safe work procedures 1.4 Equipment maintenance schedules 1.5 Product technical procedures adopted or specifically prepared standards 1.6 Company/industry rules
2. Company property	Company property 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 Contributed to QMS towards work 1.2 Applied quality standards to work 1.3 Protected company property and customer interests
2. Resource Implications	**The following resources should be provided** 2.1 Quality manuals / procedures 2.2 Applicable Codes, Standards and Specifications 2.3 Company / Industry rules
3. Methods of Assessment	**Competency should be assessed through:** 3.1 Demonstration 3.2 Written or oral short answer questions
4. Context for Assessment	4.1 Competency may be assessed in the workplace or in simulated workplace environment or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : **USE HAND TOOLS**

UNIT CODE : **MEE721205**

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

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify and use of Personal Protective Equipment (PPE)	1.1 Personal protective equipment (PPE) is used in accordance with Rule 1080 of Occupational Safety and Health Standards 1.2 Proper Care and Maintenance of PPEs are performed in accordance with OSHS 1.3 Storage and Disposal of PPE are followed according to OSHS	1.1 OSH rule 1080 work standard 1.2 Company/ workplace policies/ guidelines 1.3 Standards and safety requirements of work process and procedures	1.1 Applying safety procedures 1.2 Communication skill 1.3 Observation skills
2. Select and use of tools and equipment	2.1 Hand tools selected are appropriate to the requirements of the task. 2.2 Tools and equipment are inspected according to manufacturer's recommendation 2.3 Tools and equipment are used as per operation manual instructions.	2.1 Tools and equipment Instruction manual 2.2 Adherence to work requirements	2.1 Communication skills 2.2 Handling of tools and equipment

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Perform simple maintenance of tools and equipment	3.1 Tools and equipment are cleaned and lubricated (routine maintenance) according to manufacturer's recommendation. 3.2 Unsafe or defective tools are identified and marked for repair/ decommission according to procedure. 3.3 Minor tools and equipment repair are performed according to manufacturer's instruction or worksite procedure.	3.1 Proper cleaning and oiling. 3.2 Equipment inspection and maintenance. 3.3 Simple repairs of hand tools	3.1 Cleaning and lubricating. 3.2 Conducting simple check –up and remedies 3.3 Performing minor repairs

RANGE OF VARIABLES

VARIABLE	RANGE
1. Personal protective Equipment (PPE)	May include: 1.1 Welding Mask 1.2 Welding apron/jacket 1.3 Welding gloves (long) 1.4 Safety goggles 1.5 Respirator (as per NIOSH) 1.6 Safety shoes 1.7 Oxy-acetylene Goggles
2. Hand tools	May include: 2.1 Chipping Hammer 2.2 Steel brush 2.3 Pliers/ tongs 2.4 Files-bastard cut 2.5 Portable disc grinder 2.6 Try square 2.7 Steel rule 2.8 Files-half round 2.9 Welding gauges 2.10 Adjustable wrench 2.11 C- Clamps
3. Task	May include: 3.1 Testing / Inspection 3.2 Adjusting 3.3 Dismantling 3.4 Assembling
4. Routine maintenance	May include: 4.1 Cleaning 4.2 Lubricating 4.3 Adjusting 4.4 Simple tool repair

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. Resource Implications	**The following resources should be provided** 2.1 Tools, equipment and facilities appropriate to the process or activity 2.2 Materials relevant to the proposed activity
3. Methods of Assessment	**Competency should be assessed through:** 3.1 Demonstration 3.2 Written or oral short answer questions 3.3 Practical exercises
4. Context for Assessment	4.1 Competency may be assessed in the workplace or in simulated workplace environment or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : **PREPARE MATERIALS AND CONSUMABLES**

UNIT CODE : **MEE721212**

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

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify and use of Personal Protective Equipment (PPE)	1.1 Personal protective equipment (PPE) is used in accordance with Rule 1080 of Occupational Safety and Health Standards 1.2 Proper Care and Maintenance of PPEs are performed in accordance with OSHS 1.3 Storage and Disposal of PPE are followed according to OSHS	1.1 OSH rule 1080 work standard 1.2 Company/ workplace policies/ guidelines 1.3 Standards and safety requirements of work process and procedures	1.1 Applying safety procedures 1.2 Communication skill 1.3 Observation skills
2. Set up cutting equipment and materials	2.1 ***Cutting equipment*** should be operational and conformed to acceptable standards 2.2 Setting-up of equipment and ***materials*** are performed according to standard operating procedure 2.3 Task performed in accordance with company or industry requirements and ***safety practices.***	2.1 ANSI Z49.1 or equivalent safety standards 2.2 Work instructions (written and verbal). 2.3 Noise Pollution 2.4 Air pollution	2.1 Identifying Material requirements 2.2 Conducting equipment and material set-ups 2.3 Applying safety procedures

ELEMENT	**PERFORMANCE CRITERIA** ***Italicized terms*** are elaborated in the Range of Variables	**REQUIRED KNOWLEDGE**	**REQUIRED SKILLS**
3. Cut and prepare edge of materials	3.1 Materials are cut to specified dimension/ specifications. 3.2 Edges are prepared in accordance to specified shapes and configurations. 3.3 Task performed in accordance with company or industry requirements and safety procedure.	3.1 ANSI Z49.1 or equivalent safety standards 3.2 Work instructions (written and verbal). 3.3 Noise Pollution 3.4 Air pollution 3.5 5S and Proper Housekeeping 3.6 Waste Segregation/ 3R 3.7 AWF-CWCS/ ISO 9606-1 / AWS D1.1 / ASME IX.	3.1 Obtaining accurate measurement 3.2 Applying safety procedures 3.3 Communication skill 3.4 Observation skills
4. Clean surfaces and edges	4.1 Cleaning methods of the surfaces are required as per specifications. 4.2 Surfaces and edges are properly cleaned and free from contaminants. 4.3 Task performed in accordance with company or industry requirements and safety practices.	4.1 Cutting Methods 4.2 OSH Standards 4.3 Work instructions (written and verbal). 4.4Types / purposes and accuracy of edge preparation 4.5 5S and Proper Housekeeping 4.6 Waste Segregation/ 3R 4.7 AWF-CWCS/ ISO 9606-1 / AWS D1.1 / ASME IX.	4.1 Determining proper care and cleanliness of the material. 4.2 Applying safety procedures 4.3 Communication skill 4.4 Observation skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
5. Prepare welding consumables	5.1 Consumables are prepared in accordance with required specifications 5.2 Recommended manufacturer's instructions are observe 5.3 Task performed in accordance with company or industry requirements and safety practices	5.1 Selection of proper welding consumables 5.2 Work instructions (written and verbal). 5.3 OSH rule 1080-Personal Protective equipment and device. 5.4 OSH rule no. 1150-Materials Handling Storage. 5.5 RA 6969-Toxic substances and hazardous and nuclear wastes control act of 1990. 5.6 Material Safety Data Sheet (MSDS)/ Safety Data Sheet (SDS) 5.7 5S and Proper Housekeeping 5.8 Waste Segregation/ 3R 5.9 AWF-CWCS/ISO 9606-1/AWS D1.1/ASME IX	5.1 Selecting of appropriate welding consumables 5.2 Applying safety procedures 5.3 Communication skill 5.4 Observation skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Cutting Equipment	May include: 1.1 Oxy-fuel gas cutting equipment (manual and /or automatic) 1.2 Plasma cutting equipment 1.3 Shearing machine 1.4 Cut-off Wheel
2. Materials	May include: 2.1 Mild steel / Carbon Steel Plates 2.2 Run on/run off tabs
3. Safety practices:	May be include: 3.1 Wearing of required PPE 3.2 Handling and storage of materials and equipment 3.3 Safety Data Sheet (SDS) 3.4 Safety standards and procedures 3.5 Checking electrical equipment and devices 3.6 House keeping
4. Cleaning Methods	Surfaces and edges may be cleaned by 4.1 Grinding 4.2 Filing 4.3 Steel Brushing
5. Consumables	May include: 5.1 Cutting gases 5.2 Welding Electrodes 5.3 Grinding/cutting discs

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. Resource Implications	The following resources MUST be provided: 2.1 Relevant documentation such as WPS and working drawing 2.2 Materials and consumables 2.3 Cutting equipment and accessories 2.4 Cleaning tools and equipment 2.5 Measuring tools 2.6 PPE 2.7 Firefighting equipment
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation/evaluation 3.2 Oral questioning 3.3 Practical exercises
4. Context for Assessment	4.1 Competency to be assessed while a task is being undertaken in the workplace or in a simulated workplace setting or at the designated TESDA Accredited Assessment Center.

CORE COMPETENCIES

UNIT OF COMPETENCY : **PROCESS DESIGNS**

UNIT CODE : **AB-MEE0730600732301**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to process 2D and 3D model design files to machine-specific software compatible format ready for machine printing. This does not include fabrication using 3D printer for metals.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare design files for digital fabrication	1.1 Design files are secured using ***relevant communication method.*** 1.2 ***Storage measures*** are followed based on industry practice. 1.3 ***Documents*** are secured based on workplace procedures. 1.4 ***Basic editing*** are applied based on industry practice. 1.5 Feedback is reported following the workplace procedure.	**Technology** 1.1 Types of File Formats 1.2 Storage of design files 1.3 Editing techniques 1.4 Editing software **Communication** 1.5 Different forms 1.6 Proper use and filling-up of forms **Environment Related Laws and Ordinances** 1.7 Awareness on Intellectual Property Code of the Philippines (RA 8293) 1.8 Awareness on Data Privacy Law (RA10173)	1.1 Securing design files 1.2 Following storage measures 1.3 Communication skills 1.4 Handling of storage medium 1.5 Documentation skills 1.6 Basic editing skills
2. Import design files	2.1 ***Tools and equipment*** are used based on job requirements. 2.2. Readability of imported ***design files*** are ensured based on the ***design parameters***. 2.3. Compatibility of design files are ensured based on	**Technology** 2.1 Types of editing tools 2.2 File format 2.3 Utility softwares 2.4 Techniques and methods on digital design 2.5 Design Parameters 2.6 Storage database **Environment Related Laws and Ordinances**	2.1 Using tools and equipment 2.2. Analytical skills in using computer 2.3 Performing 2D and 3D Modeling and Simulation 2.4 Utilizing storage database 2.5. Parameter setting skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	machine requirements.	2.7 Awareness on Intellectual property Code of the Philippines (RA 8293) 2.8 Awareness on Data Privacy Law (RA10173)	
3. Configure parameters for digital fabrication	3.1 Materials are selected based on design requirements. 3.2 ***Material parameters*** are set based on design requirements. 3.3 ***Machine parameters*** are set according to manufacturer's manual.	**Science** 3.1 Material properties 3.2 Geometric principles and techniques **Technology** 3.3 File format and standards 3.4 Production techniques 3.5 Machine parameters 3.6 Materials parameters 3.7 Utility softwares **Environment Related Laws and Ordinances** 3.8 Awareness on Intellectual Property Code of the Philippines (RA 8293) 3.9 Awareness on Data Privacy Law (RA10173)	3.1 Selecting materials 3.2 Setting material parameters 3.3. Spatial Skills 3.4 Computer operation skills 3.5 Using measuring tools 3.6. Using utility softwares

RANGE OF VARIABLES

VARIABLE	RANGE
1. Relevant communication method	Relevant communication method may include: 1.1 E-mail 1.2 File-sharing platforms 1.3 USB Drive 1.4 Collaboration Platforms e.g. Slack 1.5 Cloudbase 1.5.1 Gdrive 1.5.2 Icloud 1.5.3 Onedrive
2. Storage measures	Storage measures may include: 2.1. Utilizing trusted cloud storage 2.2. Regular data backups 2.3. Utilizing version control systems 2.4. Strict access controls 2.5 Watermarking and digital rights management
3. Documents	Documents may include: 3.1. Blueprint (Orthographic Drawings) 3.2. Vector Files (2D Designs) 3.3. Mesh Model (3D Designs)
4. Design files	Design files may include: 4.1. 2D digital fabrication designs (Vector File) 4.2. 3D digital fabrication designs (Mesh Model)
5. Basic editing	Basic editing may include: 5.1 Minor design modification 5.2 Data Correction 5.3 Measurement Corrections
6. Tools and equipment	Tools and equipment may include: Tools: 6.1 CAD/CAM Software 6.1.1 Adobe Illustrator 6.1.2 CorelDraw 6.1.3 AutoCAD 6.1.4 Fusion360 6.1.5 Rhinoceros 3D 6.1.6 Blender 6.1.7 Slicing Software for 3D Printing 6.1.8 Measuring Tools Equipment: 6.2 Laptop 6.3 Router with internet connection 6.4 Digital Fabrication Machineries 6.4.1 3D printers and 3D Scanners 6.4.2 Laser cutter and engraver 6.4.3 CNC Machines 6.4.4 Print and cut machine 6.4.5 Digital Embroidery Machine

7. Design parameters	Design parameters may include: 7.1 Additive Manufacturing: 7.1.1 Scaling 7.1.2 Setting Print parameters 7.1.3 Slicing the model 7.1.4 Sliced model 7.2 Subtractive Manufacturing 7.2.1 Set unit and scale 7.2.2 Define cut and engrave lines 7.2.3 Identify printing area
8. Material parameters	Material parameters may include: 8.1 Additive Manufacturing 8.1.1 Material Selection 8.1.2 Setting Material Properties 8.1.3 Printing Parameters (Infill Density, Print Speed, 8.1.4 Temperature -Bed and Extrusion) 8.2 Subtractive Manufacturing 8.2.1 Material Selection 8.2.2 Setting Material Properties 8.2.3 Printing Parameters (Cutting Speed, Depth of Cut)
9. Machine parameters	Machine parameters may include: 9.1 Additive Manufacturing: 9.1.1 Machine Selection 9.1.2 Print Bed configuration 9.1.3 Printing Parameters (Layer height, Retraction, Fan Speed, etc.) 9.2 Subtractive Manufacturing: 9.2.1 Material Setup 9.2.2 Calibration / Tool Setup 9.2.3 Power and Speed Settings 9.2.4 Workpiece Alignment

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Prepared design files for digital fabrication. 1.1.1 Secured design files. 1.1.2 Followed storage measure. 1.1.3 Applied basic editing. 1.1.4 Used tools and equipment. 1.2 Imported design files. 1.2.1 Ensured readability of imported design files. 1.2.2 Ensured compatibility of design files. 1.3 Configured parameters for digital fabrication. 1.3.1 Selected materials. 1.3.2 Set material and machine parameters.
2. Resource Implications	The following resources **MUST** be provided: 2.1 Tool, Equipment, and Materials 2.2 Simulated and workplace environment
3. Methods of Assessment	Competency in this unit must be assessed through 3.1 Written Examination 3.2 Demonstration with oral questioning 3.3 Portfolio 3.4 Direct observation 3.5 Third party report
4. Context for Assessment	4.1 Competency may be assessed in the actual workplace or simulation environment in TESDA accredited institutions.

UNIT OF COMPETENCY : **PERFORM PROTOTYPING AND MASS PRODUCTION**

UNIT CODE : **AB-MEE0730600732302**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to prepare for operation, process design files to machine-specific software compatible format.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare for operation	1.1 PPEs are identified according to Job Requirement 1.2 Availability of First Aid Kit are checked according to OHS Procedure 1.3 Hazard and Risks are Identified based on Occupational Health and Safety Standard. 1.4 Machineries Operating Environment is ensured based on Manufacturer's Manual. 1.5 ***Tools and accessories*** are identified and prepared according to Job Requirements. 1.6 ***Equipment*** are calibrated according to job Requirement 1.7 Materials are prepared according to machine requirement	**Technology** 1.1 Type of PPE's 1.2 Machine Operation 1.3 Manufacturers Manual 1.4 Tools and Accessories for Digital Fabrication machines 1.5 Procedure in Machine Calibration 1.6 Materials for Digital Fabrication 1.7 Technical drawing **Environment Related Laws and Ordinances** 1.8 Occupational Health and Safety 1.9 Hazard and Risks	1.1 Communication skills 1.2 Interpreting 2D Modeling 1.3 Interpreting 3D Modeling 1.4 Interpreting technical drawing 1.5 System thinking skills 1.6 Ethical thinking skills
2. Produce prototype through additive process	2.1 Design File is Imported according to machine requirement 2.2 ***Materials*** are Loaded according to machine requirement	**Technology** 2.1 Materials Specification 2.2 Types of file formats 2.3 Manufacturer's manual 2.4 Types of machines and its functions 2.4.1 3D Printer 2.4.2 3D Scanner 2.5 Concept models 2.6 Operating procedures	2.1. Collaboration skills 2.2. Utilizing machineries for additive process 2.3. System Thinking Skills 2.4. Problem Solving Skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.3 Design files are printed according to Job Requirement. 2.4 ***Operation is*** monitored following industry practices. 2.5 ***Post Processes*** are Conducted following industry practices. 2.6 Adjustment are applied based on recommendation. 2.7 Output are submitted for evaluation following industry practices. 2.8 Safety practices are applied following OHS.	**Mathematics** 2.7 Technical drawings **Environment Related Laws and Ordinances** 2.8 OHS standards 2.9 5S principles 2.10 3Rs - Reduce, re-use, and recycle/recover 2.11 3Rs environmental policies 2.12 Awareness of RA 9003 Ecological Solid Waste Management Act of 2000 2.13 Awareness of RA 6969 Toxic Substances, Hazardous and Nuclear Waste Control Act of 1990 2.14 Awareness of RA 8749 Philippine Clean Air Act of 1999 2.15 Awareness of Presidential Decree 1586 Environmental Impact Statement (EIS) of 1978	2.5. Ethical Thinking Skills 2.6. Troubleshooting machines 2.7. Applying safety practices
3. Produce prototype through subtractive process	3.1 Design File is Imported according to machine requirement 3.2 ***Materials*** are Loaded according to machine requirement 3.3 ***Machine*** setting are aligned based on design requirements. 3.4 Design files are printed according to Job Requirement. 3.5 ***Operation*** is monitored	**Technology** 3.1 Materials Specification 3.2 Types of file formats 3.3 Manufacturer's manual 3.4 Types of machines and its functions 3.4.1 Laser Printing and Engraving 3.4.2 CNC Milling 3.4.3 Print and Cut Machine Operation 3.4.4 Digital Embroidery Machine 3.5 Concept models 3.6 Operating procedures **Mathematics** 3.7 Technical drawings	3.1 Collaboration skills 3.2 Utilizing machineries for subtractive process 3.3 Problem Solving Skills 3.4 System Thinking Skills 3.5 Ethical Thinking Skills 3.6 Troubleshooting machines 3.7 Applying safety practices

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	following industry practices. 3.6 ***Post Processes*** are Conducted following industry practices. 3.7 Adjustment are applied based on recommendation 3.8 Output are submitted for evaluation following industry practices. 3.9 Safety practices are applied following OHS.	**Environment Related Laws and Ordinances** 3.8 OHS standards 3.9 5S principles 3.10 3Rs - Reduce, re-use, and recycle/recover 3.11 3Rs environmental policies 3.12 Awareness of RA 9003 Ecological Solid Waste Management Act of 2000 3.13 Awareness of RA 6969 Toxic Substances, Hazardous and Nuclear Waste Control Act of 1990 3.14 Awareness of RA 8749 Philippine Clean Air Act of 1999 3.15 Awareness of Presidential Decree 1586 Environmental Impact Statement (EIS) of 1978	
4. Conduct mass production	4.1 Approved Prototype is received for Production following industry practice. 4.2 Quantity of Product is validated based on Job requirement. 4.3 ***Machines*** are operated based on approved prototype. 4.4 ***Operation*** is monitored following industry practices. 4.5 Safety practices are applied following Occupational Health and Safety. 4.6 ***Corrective actions*** are applied based	**Technology** 4.1 Types of machines and its functions 4.2 Manufacturer's manual 4.3 Operating procedures 4.3.1 Issues 4.3.2 Corrective Actions **Mathematics** 4.4 Estimation **Environment Related Laws and Other Ordinances** 4.5 OHS standards 4.6 5S principles 4.7 3Rs - Reduce, re-use, and recycle/recover 4.8 3Rs environmental policies 4.9 Awareness of RA 9003 Ecological Solid	4.1 Utilizing machineries for digital fabrication 4.2 System Thinking Skills 4.3 Ethical Thinking Skills 4.4 Troubleshooting machines 4.5 Applying safety practices

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	on ***operation issues.*** 4.7 Safety practices are applied following OHS.	Waste Management Act of 2000 4.10 Awareness of RA 6969 Toxic Substances, Hazardous and Nuclear Waste Control Act of 1990 4.11 Awareness of RA 8749 Philippine Clean Air Act of 1999 4.12 Awareness of Presidential Decree 1586 Environmental Impact Statement (EIS) of 1978	
5. Perform post operation process	5.1 ***Parameters*** are recorded for reference based on industry practices 5.2 ***Tools, accessories and materials*** are unloaded following industry practices 5.3 ***Routinary maintenance*** are performed based on industry Practices. 5.4 Safety practices are applied following OHS.	**Technology** 5.1 Types of Tools, accessories, and materials 5.2 Types of machines 5.3 Manufacturers Manual **Environment Related Laws and Other Ordinances** 5.4 OHS standards 5.5 5S principles 5.6 3Rs - Reduce, re-use, and recycle/recover 5.7 3Rs environmental policies 5.8 Awareness of RA 9003 Ecological Solid Waste Management Act of 2000 5.9 Awareness of RA 6969 Toxic Substances, Hazardous and Nuclear Waste Control Act of 1990 5.10 Awareness of RA 8749 Philippine Clean Air Act of 1999 5.11 Awareness of Presidential Decree 1586 Environmental Impact Statement (EIS) Statement of 1978	5.1. Applying waste Segregation 5.2. System Thinking Skills 5.3. Ethical Thinking Skills 5.4. Applying safety practices

RANGE OF VARIABLES

VARIABLE	RANGE
1. Tools	Tools may include: 1.1. Screwdrivers 1.2. Calibration Sheet 1.3. Working jigs 1.4. Measurement Tools: 1.4.1. Calipers, rulers, and gauges for precise measurements. 1.5. Safety Gear: 1.5.1. Gloves, goggles, and ear protection for safety.
2. Accessories	Accessories may include: 2.1. 3D printer and Scanner 2.1.1. Wash and Cure 2.1.2. Glass plate 2.2. Laser cutter/engraver 2.2.1. Rotary Attachment 2.2.2. Honeycomb 2.3. CNC machine (Lathe and Milling) 2.3.1. Drill Bit 2.3.2. Board (Sacrificial) 2.4. Print and Cut Machine 2.4.1. Cutter Blade 2.4.2. Wiper 2.5. Digital Embroidery Machine 2.5.1. Frames 2.5.2. Needles
3. Equipment	Equipment may include: 3.1. Computer 3.2. 3D printer and Scanner 3.3. Laser cutter/engraver 3.4. CNC machine (Lathe and Milling) 3.5. Print and Cut Machine 3.6. Digital Embroidery Machine
4. Materials	Materials may include: 4.1. 3D printer and Scanner 4.1.1. Filaments/Fillets 4.2. Laser cutter/engraver 4.3. CNC machine (Lathe and Milling) 4.4. Print and Cut Machine 4.5. Digital Embroidery Machine
5. Post processes	Post processes may include: 5.1. Post process 5.2. Support Removal 5.3. Grinding 5.4. Paint 5.5. Treat with Chemicals

6. Machine	Machine may include: 6.1. 3D printer and Scanner 6.2. Laser cutter/engraver 6.3. CNC machine (Lathe and Milling) 6.4. Print and Cut Machine 6.5. Digital Embroidery Machine
7. Monitoring of operation	Monitoring of operation may include: 7.1 Machine Performance 7.2 Material Mechanical Properties
8. Corrective actions	Corrective actions may include: 8.1. Machine reset 8.2. Replace Materials
9. Operation issues	Operation issues may Include: 9.1. Machine Breakdown 9.2. Material Errors
10. Parameters	Parameters may include: 10.1. Material Mechanical Properties 10.2. Machine Parameters 10.3. Design Parameters
11. Routinary maintenance	Routinary maintenance may include: 11.1. Material Waste Disposal 11.2. Storage of tools and materials 11.3. Lubrication of machines 11.4. Cleaning of machines

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Prepared for operation. 1.1.1. Identified PPEs. 1.1.2. Ensured machineries operating environment. 1.1.3. Identified and prepared tools and accessories. 1.1.4. Calibrated equipment. 1.1.5. Prepared materials. 1.2. Produced prototype through additive process. 1.2.1. Imported design file. 1.2.2. Loaded materials. 1.2.3. Printed design files. 1.2.4. Conducted post processes. 1.2.5. Applied adjustment. 1.2.6. Monitored operation. 1.2.7. Applied safety practices. 1.3. Produced prototype through subtractive process. 1.3.1. Imported design file. 1.3.2. Loaded materials. 1.3.3. Aligned machine setting. 1.3.4. Printed design files. 1.3.5. Conducted post processes. 1.3.6. Applied adjustment. 1.3.7. Monitored operation. 1.3.8. Applied safety practices. 1.4. Conducted mass production. 1.4.1. Received approved prototype. 1.4.2. Validated quantity of product. 1.4.3. Operated machines. 1.4.4. Monitored operation. 1.4.5. Applied safety practices. 1.4.6. Applied corrective actions. 1.4.7. Applied safety practices. 1.5. Performed post operation process. 1.5.1. Unloaded tools, accessories and materials 1.5.2. Performed routinary maintenance
2. Resource Implications	The following resources MUST be provided: 2.1 Tool, equipment, and materials 2.2 Simulated and workplace environment
3. Methods of Assessment	Competency in this unit must be assessed through 3.1. Written examination 3.2. Demonstration with oral questioning 3.3. Portfolio 3.4. Direct observation 3.5. Third party report
4. Context for Assessment	4.1. Competency may be assessed in the actual workplace or simulation environment in TESDA accredited institutions.

GLOSSARY OF TERMS

1. Additive Fabrication	Additive manufacturing, often referred to as 3D printing, is a process of creating objects by adding material layer by layer. It contrasts with traditional manufacturing methods, which often involve removing material (subtractive manufacturing) or molding it into shape.
2. Design Files	Design files refer to digital documents that contain detailed specifications for creating a product. These files are used across various manufacturing processes to guide the creation of parts or assemblies. Design files typically include: CAD Files: Computer-Aided Design (CAD) files contain precise 2D or 3D models of objects. Common formats include. STL, STEP, IGES, and .DWG. Drawings: Technical drawings provide detailed views, dimensions, and annotations for manufacturing. Specifications: Additional information such as material types, tolerances, and surface finishes.
3. Subtractive Fabrication	Subtractive manufacturing involves removing material from a solid block (workpiece) to create the desired shape. This is typically done using various cutting, milling, and drilling tools.

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