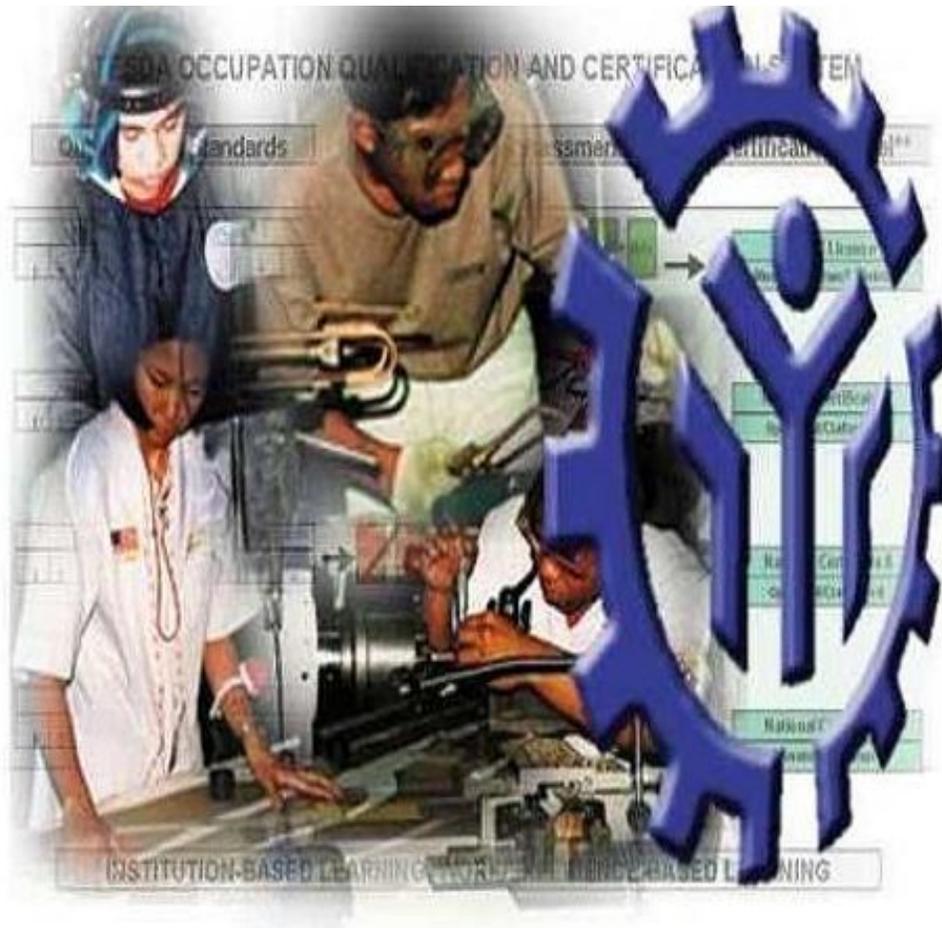


TRAINING REGULATIONS



FOUNDRY MELTING/CASTING NC II

AUTOMOTIVE MANUFACTURING SECTOR

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

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FOUNDRY MELTING/CASTING NC II

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TRAINING REGULATIONS FOR FOUNDRY MELTING/CASTING NC II

SECTION 1 FOUNDRY MELTING/ CASTING NC II QUALIFICATION

The FOUNDRY MELTING/CASTING NC II Qualification consists of competencies that a person must achieve to be able to melt different kinds of metals, cast it and clean. This will not be limited to ferrous metals and only one type of furnace.

Melting of different type of metals may use different kinds of furnaces. The melting operations may use different furnaces, each type of which may use different heating systems and fuel. When the metal is molten, the composition is checked and adjusted. Then this is tapped from the furnace and cast into molds. The resulting castings are fettled and cleaned.

The furnaces are subjected to intense heat and temperature. Furnaces are lined with refractory linings which are eroded in every melting. The refractory linings will need periodic maintenance and replacement. This unit covers all operations of melting and casting including the maintenance of furnaces.

Tasks undertaken include utilizing knowledge in estimating metal charges, controlling temperature and chemical composition and designated procedures, use of correct and appropriate tools and equipment in cleaning castings and maintaining furnaces.

He should also be able to inspect, measure and interpret drawings and repair procedures; sets up and operates variety of specialized furnaces and uses precision measuring instrument in operating and maintaining the melting equipment.

This Qualification is packaged from the competency map of the Automotive Industry (Manufacturing sub-sector) as shown in Annex A.

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
ALT742201	Read & Interpret Engineering Drawings
ALT311202	Perform Mensuration and Calculation
ALT723203	Read, Interpret and Apply Specifications and Manuals
ALT723205	Perform Shop Maintenance

CODE NO.	CORE COMPETENCIES
ALT812307	Operate Melting Furnaces (Non Electric)
ALT812308	Operate Cupola Melting Furnaces
ALT812309	Operate Electric Induction Melting Furnaces
ALT812310	Fettle and Trim Metal Castings/Forgings
ALT812311	Perform Refractory Installation and Repair
ALT821303	Use and Maintain Measuring Instrument

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

- Foundry Melter**

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in **FOUNDRY MELTING/CASTING 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 <i>Italicized</i> 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 matters 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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 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
<p>2. Underpinning knowledge and attitudes</p>	<ol style="list-style-type: none"> 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
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> 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
<p>4. Resource implications</p>	<ol style="list-style-type: none"> 4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
<p>5. Method of assessment</p>	<ol style="list-style-type: none"> 5.1. Direct Observation 5.2. Oral interview and written test
<p>6. Context of assessment</p>	<ol style="list-style-type: none"> 6.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY: WORK IN 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 <i>Italicized</i> 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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Underpinning knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1. Communicate appropriately, consistent with the culture of the workplace
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 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
<p>5. Method of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 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
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 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 <i>Italicized</i> 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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> 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
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 Case studies/scenarios
<p>5. Method of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 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
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 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 <i>Italicized</i> 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
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 <ul style="list-style-type: none"> • Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles • Physiological factors – monotony, personal relationship, work out cycle
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

<p>5. Emergency-related drills and training</p>	<p>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</p>
<p>6. OHS personal records</p>	<p>6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed</p>

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 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
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
<p>4. Resource implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 OHS personal records 4.3 PPE 4.4 Health records
<p>5. Method of assessment</p>	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 6.1 Competency may be assessed in the work place or in a simulated work place setting

COMMON COMPETENCIES
AUTOMOTIVE MANUFACTURING

UNIT TITLE: READ, INTERPRET AND APPLY ENGINEERING DRAWINGS.

UNIT CODE: ALT742201

UNIT DESCRIPTOR: This unit deals with identifying, interpreting and applying specification from Engineering blue prints or drawings that provides the measurements of the product and pattern that is to be produced.

ELEMENT	PERFORMANCE CRITERIA
	<i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify and access engineering drawings/ specification	1.1 Appropriate Engineering drawings are identified and accessed as per job requirements. 1.2 Version and date of drawing is checked to ensure correct specification and procedure are identified.
2. Interpret drawings	2.1 Relevant dimensions and sections of the drawings/ specifications are located in relation to the work to be conducted 2.2 Information in the manual are interpreted in accordance to industry practices
3 Apply information in the drawings & specifications	3.1 Engineering drawing is interpreted according to job requirements 3.2 Work steps are correctly identified in accordance with the specifications in the drawings. 3.3 Dimensional data and shape are applied according to the given task
4. Store drawings	4.1 The drawings and specification are stored properly to ensure prevention of damage, ready access and updating of information when required in accordance with company requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engineering drawings	Kinds of drawings: 1.1 Casting drawing 1.2 Machining drawing 1.3 Project plan 1.4 Technical drawing
2. Data	Data includes but not limited to 2.1 Material specifications 2.2 Process specifications 2.3 Special instructions 2.4 Machining locating points 2.5 Clamping points 2.6 Amount of draft 2.7 Surface finish

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Identified and accessed drawings/specification 1.2 Interpreted drawings 1.3 Applied information in drawings 1.4 Stored drawings
2. Underpinning knowledge and attitudes	<ul style="list-style-type: none"> 2.1 Types of drawings used in automotive manufacturing industry 2.2 Identification of symbols used in the drawings 2.3 Identification of units of measurements 2.4 Unit conversion 2.5 Attention to details, Perseverance, Honesty
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Reading and comprehension skills required to identify and interpret engineering drawings and specifications 3.2 Accessing information and data
4. Resource implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 All drawings/engineering specifications relative to automotive manufacturing 4.2 Job order, requisitions 4.3 Product sample
5. Method of assessment	<p>Competency MUST be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with questioning 5.2 Interview
6. Context of assessment	<ul style="list-style-type: none"> 6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment may be conducted in the workplace or a simulated environment.

UNIT OF COMPETENCY: PERFORM MENSURATION AND CALCULATION

UNIT CODE: ALT311202

UNIT DESCRIPTOR: This unit includes identifying, caring for, handling, using and maintaining measuring instruments.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Select measuring instruments	1.1 Object or component to be measured is identified 1.2 Correct specifications are obtained from relevant source 1.3 Appropriate <i>measuring instrument</i> is selected according to job requirements
2. Carry out measurements and calculation	2.1 Measuring tools are selected in line with job requirements 2.2 Accurate measurements are obtained to job 2.3 <i>Calculation</i> needed to complete work tasks are performed using the four basic process of addition (+), subtraction (-), multiplication (x) and division (/). 2.4 Calculations involving fractions, percentages and mixed numbers are used to complete workplace tasks. 2.5 Numerical computation is self-checked and corrected for accuracy 2.6 Instruments are read to the limit of accuracy of the tool.
3. Maintain measuring instruments	3.1 Measuring instruments are kept free from corrosion 3.2 Measuring instruments are not dropped to avoid damage 3.3 Measuring instruments are cleaned before and after using.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring instruments	Measuring instruments includes: 1.1 Multitester 1.2 Micrometer (In-out, depth) 1.3 Vernier caliper (Out, inside) 1.4 Dial Gauge with Mag. Std. 1.5 Straight Edge 1.6 Thickness gauge 1.7 Try square 1.8 Protractor 1.9 Height gauge 1.10 Steel rule Shrink rule
2. Calculation	Kinds of part mensuration include: 2.1 Volume 2.2 Area 2.3 Displacement 2.4 Inside diameter 2.5 Circumference 2.6 Length 2.7 Thickness 2.8 Outside diameter 2.9 Taper 2. 10 Out of roundness 2.11 Shrinkage allowance

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Selected measuring instruments 1.2 Carried-out measurements and calculations. 1.3 Maintained measuring instruments
2. Underpinning knowledge and attitudes	2.1 Types of Measuring instruments and its uses 2.2 Safe handling procedures in using measuring instruments 2.3 Four fundamental operation of mathematics 2.4 Formula for Volume, Area, Perimeter and other geometric figures
3. Underpinning Skills	3.1 Caring and Handling measuring instruments 3.2 Calibrating and using measuring instruments 3.3 Performing calculation by Addition, Subtraction, Multiplication and Division 3.4 Visualizing objects and shapes 3.5 Interpreting formula for volume, area, perimeter and other geometric figures
4. Resource Implications	The following resources MUST be provided: 4.1 Workplace location 4.2 Measuring instrument appropriate to servicing processes 4.3 Instructional materials relevant to the propose activity
5. Method of assessment	Competency MUST be assessed through: 5.1 Observation with questioning 5.2 Written or oral examination 5.3 Interview 5.4 Demonstration with questioning
6. Context of assessment	6.1 Competency elements must be assessed in a safe working environment 6.2 Assessment may be conducted in a workplace or simulated environment

UNIT TITLE: READ, INTERPRET AND APPLY SPECIFICATION AND MANUALS.

UNIT CODE: ALT723203

UNIT DESCRIPTOR: This unit deals with identifying, interpreting and applying service specification manuals, maintenance procedure manuals and periodic maintenance manual.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify and access manual/ specification	1.1 Appropriate manuals are identified and accessed as per job requirements. 1.2 Version and date of manual is checked to ensure correct specification and procedure are identified.
2. Interpret manuals	2.1 Relevant sections, chapters of manuals/specifications are located in relations to the work to be conducted 2.2 Information and procedure in the manual are interpreted in accordance to industry practices
3 Apply information in manual	3.1 Manual is interpreted according to job requirements 3.2 Work steps are correctly identified in accordance with manufacturer specification 3.3 Manual data is applied according to the given task 3.4 All correct sequencing and adjustments are interpreted in accordance with information contained on the manual or specifications
4. Store manuals	4.1 Manual or specification are stored appropriately to ensure prevention of damage, ready access and updating of information when required in accordance with company requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Manuals	Kinds of manuals: 1.1 Manufacturer's specification manual 1.2 Repair manual 1.3 Maintenance Procedure Manual 1.4 Periodic Maintenance Manual

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Identified and accessed manual/specification 1.2 Interpreted manuals 1.3 Applied information in manuals 1.4 Stored manuals
2. Underpinning knowledge	2.1 Types of manuals used in automotive industry 2.2 Identification of symbols used in the manuals 2.3 Identification of units of measurements 2.4 Unit conversion
3. Underpinning skills	3.1. Reading and comprehension skills required to identify and interpret automotive manuals and specifications 3.2. Accessing information and data
4 Resource Implications	The following resources MUST be provided: 4.1 All manuals/catalogues relative to Automotive 4.2 Job order, requisitions 4.3 Actual vehicle or simulator
5 Method of assessment	Competency MUST be assessed through: 5.1 Observation with questioning 5.2 Interview
6 Context of assessment	6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment may be conducted in the workplace or a simulated environment.

UNIT OF COMPETENCY : **PERFORM SHOP MAINTENANCE**

UNIT CODE : **ALT723205**

UNIT DESCRIPTOR : This unit deals with inspecting and cleaning of work area including tools, equipment and facilities. Storage and checking of tools/ equipment and disposal of used supplies/materials are also incorporated in this competency.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Inspect/clean tools and work area	1.1 Cleaning solvent used as per workshop/tools <i>cleaning requirement</i> 1.2 <i>Work area</i> is checked and cleaned 1.3 Wet surface/spot in work area is wiped and dried
2. Store/arrange tools and shop equipment	2.1 Tools/equipment are checked and stored in their respective shelves/location 2.2 Corresponding labels are posted and visible 2.3 Tools are safely secured and logged in the records
3. Dispose wastes/used lubricants	3.1 Containers for used lubricants are visibly labeled 3.2 Wastes/used lubricants are disposed as per workshop SOP
4. Report damaged tools/equipment	4.1 Complete inventory of tools/equipment is maintained 4.2 Damaged tools/equipment/facilities are identified and repair recommendation is given 4.3 Reports prepared has no error/discrepancy

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work area	Work areas include: 1.1 Workshop areas for servicing/repairing light and/or heavy vehicle and/or plant transmissions and/or outdoor power equipment 1.2 Open workshop/garage and enclosed, ventilated office area 1.3 Other variables may include workshop with: <ul style="list-style-type: none"> • Mess hall • Wash room • Comfort room
2. Cleaning requirement	2.1 Cleaning solvent 2.2 Inventory of supplies, tools, equipment, facilities 2.3 List of mechanics/technicians 2.4 Rags 2.5 Broom 2.6 Mop 2.7 Pail 2.8 Used oil container 2.9 Oiler 2.10 Dust/waste bin
3. Manuals	3.1 Vehicle/plant manufacturer specifications 3.2 Company operating procedures 3.3 Industry/Workplace Codes of Practice 3.4 Product manufacturer specifications 3.5 Customer requirements 3.6 Industry Occupational Health and Safety
4. Company standard operating procedure	Wearing of Personal protective equipment include: 4.1 Gloves 4.2 Apron 4.3 Goggles 4.4 Safety shoes

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Cleaned workshop tools/facilities 1.2 Maintained equipment, tools and facilities 1.3 Disposed wastes and used lubricants/fluid as per required procedure
2. Underpinning knowledge and attitudes	2.1 5 S or TQM 2.2 Service procedures 2.3 Relevant technical information 2.4 Safe handling of equipment and tools 2.5 Vehicle safety requirements 2.6 Workshop policies 2.7 Personal safety procedures 2.8 Fire extinguishers and prevention 2.9 Storage/disposal of hazardous/flammable materials 2.10 Positive Work Values (Perseverance, Honesty, Patience, Attention to Details)
3. Underpinning skills	3.1 Handling/Storing of tools/equipment/supplies and material 3.2 Cleaning grease/lubricants 3.3 Disposing of wastes and fluid 3.4 Preparing inventory of s/m and tools and equipment 3.5 Monitoring of s/m and tools/equipment
4. Resource implications	The following resources MUST be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
5. Method of assessment	Competency MUST be assessed through: 5.1 Written/Oral Questioning 5.2 Demonstration
6. Context of assessment	6.1 Competency must be assessed on the job or in a simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

CORE COMPETENCIES

UNIT OF COMPETENCY: OPERATE MELTING FURNACES (NON-ELECTRIC)

UNIT CODE: ALT812307

UNIT DESCRIPTOR: This unit covers operating a non electric metal melting furnace.

ELEMENT	PERFORMANCE CRITERIA
1. Select materials	<p>1.1 Requisitions for materials are completed as required according to standard operating procedures.</p> <p>1.2 Charge analysis is undertaken in accordance with standard operating procedures.</p> <p>1.3 The charge analysis is converted to furnace charge weight using standard operating procedures.</p> <p>1.4 Charge is weighed according to standard operating procedures.</p>
2. Start up furnace	<p>2.1 Furnace is inspected for any defects or damage.</p> <p>2.2 Routine operational maintenance of furnace is undertaken to standard operating procedures.</p> <p>2.3 Furnace is started-up to standard operating procedures.</p> <p>2.4 Faults are reported according to standard operating procedures.</p>
3. Charge furnace	<p>3.1 Emergency/safety procedures are identified and followed as necessary.</p> <p>3.2 Materials are pre-heated if required according to standard operating procedures.</p> <p>3.3 Materials are charged into furnace using standard operating procedures.</p> <p>3.4 Suitable areas for emergency unloading of molten metal are identified and kept available.</p>

4. Monitor furnace	<p>4.1 Furnace is maintained at optimum operating condition to standard operating procedures.</p> <p>4.2 Sample for chemical analysis is taken and remedial action is applied as required to correct composition using standard operating procedures.</p> <p>4.3 Dross or slag is removed from furnace per standard operating procedures.</p> <p>4.4 If necessary, metal in the furnace is de-gassed to standard operating procedures.</p> <p>4.5 Temperature of metal is checked and adjustment made if necessary.</p>
5. Tap or unload the furnace	<p>5.1 Quantity of the required metal is identified.</p> <p>5.2 Tap rate is carried out to standard operating procedures.</p> <p>5.3 Tapping or unloading is undertaken and completed safely according to standard operating procedures.</p>
6. Shut down furnace	<p>6.1 Shut-down of furnace is completed to standard operating procedures.</p> <p>6.2 Routine operational maintenance of furnace is undertaken to standard operating procedures.</p>

RANGE OF VARIABLE

VARIABLE	RANGE
1. Materials	Type of alloy to be melted. 1.1 Aluminum 1.2 Bronze 1.3 Brases 1.4 Magnesium Alloy
2. Furnace	2.1 Singular 2.2 Multi-fuel 2.3 Oil fired 2.4 Gas fired
3. Routine Operational maintenance	3.1 Routine lubrication 3.2 Cleaning 3.3 Routine repair 3.4 Repairing of refractory lining
4. Faults	4.1 Leaks in crucible 4.2 Clogged burner 4.3 Damage crucible
5. Emergency/safety procedures	5.1 Tapped out 5.2 Cleaning of burner 5.3 Repair

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Selected materials 1.2 Started up furnace 1.3 Charged furnace 1.4 Monitored furnace 1.5 Tapped or unloaded the furnace 1.6 Shut down furnace
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Types of manuals used in the automotive foundry industry 2.2 Identification of symbols used in the manuals forms and standard operating procedures 2.3. Identification of units of measurements and unit of conversion 2.4 Sampling procedures for chemical analysis, carbon equivalent and chill wedge tests 2.5 Procedures for de-gassing as necessary using tablets or lance and other methods. 2.6 Procedures and principles of de-slagging or dross removal 2.7 Tapping temperature and procedure of the molten metal 2.8 Weighing procedures using different scale types 2.9 Correct order of loading of different charge materials 2.10 Thermocouple condition monitoring and adjustment mechanism for furnace, 2.11 Furnace close-down procedures 2.12 Applicable industry safety standards, national standards, OSHA guides, Philippine codes of practice/standards, use and application of personal protective equipment safe work practices and procedures
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Reading and interpreting routine information on written job instructions, specifications, standard operating procedures relevant test data sheets and other standard workplace forms. May include drawings for furnace operation 3.2 Following oral instruction and entering routine and familiar information onto proformas and standard workplace forms. 3.3 Identifying faults and areas for routine repair of the furnace and performing routine maintenance as necessary. 3.4 Following procedures for starting and closing down the furnace 3.5 Deciding on charge materials, weighing them and feeding the charge materials into the furnace. 3.6 Measuring metal temperature and correcting as necessary 3.7 Sampling for chemical analysis, carbon equivalent and chill wedge tests 3.8 Degassing as necessary using tablets or lance and other methods. 3.9 Deslagging or dross removal 3.10 Tapping temperature and procedure of the molten metal 3.11 Weighing procedures using different scale types 3.12 Correct order of loading of different charge materials

4. Resource implications	<p>The following resources MUST be provided:</p> <p>4.1 All manuals/catalogues relative to Melting/Casting</p> <p>4.2 Job order, requisitions slip for materials</p> <p>4.3 Materials, tools and equipment relevant to the activity</p> <p>4.4 Actual furnace</p>
5. Method of assessment	<p>Competency MUST be assessed through:</p> <p>5.1 Observation with questioning</p> <p>5.2 Demonstration with questioning</p> <p>5.3 Interview</p> <p>5.4 Portfolio</p>
6. Context of assessment	<p>6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</p> <p>6.2 Assessment may be conducted in the workplace or a simulated environment.</p>

UNIT OF COMPETENCY: OPERATE CUPOLA MELTING FURNACES

UNIT CODE: ALT812308

UNIT DESCRIPTOR: This unit covers operating a cupola metal melting furnace for cast iron.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Select materials	1.1 Charges are computed for the required metal composition needed as per standard operating procedures. 1.2 The charge computation is converted to furnace charge weight using standard operating procedures. 1.3 Charge is weighed according to standard operating procedures.
2. Start up furnace	2.1 Furnace is inspected for any defects or damage. 2.2 Routine operational maintenance of furnace is undertaken to standard operating procedures. 2.3 Fuel (coke) is charge into the cupola furnace and fired up with a fire starter according to standard operating procedures. 2.4 Additional fuel is added to the initial volume according to standard operating procedures and until the right level is reached.
3. Charge furnace	3.1 Safety/emergency procedures are identified and followed as necessary. 3.2 Materials are prepared. Scrap metal are cut to required size, cleaned and dried. 3.3 Materials are charged into furnace using standard operating procedures. Charges are arranged in layers, in sequence of coke, limestone and metal scrap.
4. Monitor furnace	4.1 Furnace is operated at optimum condition according to standard operating procedures. 4.2 Sample for chemical analysis is taken and remedial action is applied as required according to standard operating procedures. 4.4 Temperature of metal is checked and adjustment made according to standard operating procedures if necessary.
5. Tap the furnace	5.1 Quantity of the required metal is computed and determined. 5.2 Tapping is carried out according to standard operating procedures. 5.3 Tapping is undertaken and completed safely according to standard operating procedures.
6. Shut down furnace	6.1 Shut-down of furnace is completed according to standard operating procedures and when all the metal have been tapped, 6.2 Routine operational maintenance of furnace is undertaken to standard operating procedures.
7. Cool down furnace	7.1 Bottom of furnace is opened and all loads are dropped. 7.2 Air blast is introduced to cool down the furnace 7.3 Cupola hearth is inspected once the furnace is cooled and repair of lining is undertaken.

RANGE OF VARIABLE

VARIABLE	RANGE
1. Routine operational maintenance	1.1 Routine lubrication 1.2 Blower maintenance 1.3 Cleaning 1.4 Routine repair 1.5 Replacement of refractory
2. Materials	2.1 Fire brick 2.2 Mortar clay 2.3 Fire clay 2.4 Silica sand 2.5 Coko 2.6 Return scrap 2.7 Purchase scrap 2.8 Ferrous Alloy 2.9 Lime stone

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate</p> <ul style="list-style-type: none"> 1.1 Selected materials 1.2 Started up furnace 1.3 Charged furnace 1.4 Monitored furnace 1.5 Tapped the furnace 1.6 Shut down furnace 1.7 Cooled down furnace
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Types of manuals used in the automotive foundry industry 2.2 Identification of symbols used in the manuals forms and standard operating procedures 2.3. Identification of units of measurements and unit of conversion 2.4 Sampling procedures for chemical analysis, carbon equivalent and chill wedge tests 2.5 Procedures for de-gassing as necessary using tablets or lance and other methods. 2.6 Procedures and principles of de-slugging or dross removal 2.7 Tapping temperature and procedure of the molten metal 2.8 Weighing procedures using different scale types 2.9 Correct order of loading of different charge materials 2.10 Thermocouple condition monitoring and adjustment mechanism for furnace, 2.11 Furnace close-down procedures 2.12 Applicable industry safety standards, national standards, OSHA guides, Philippine codes of practice/standards, use and application of personal protective equipment safe work practices and procedures 2.13 Hazards and control measures associated with operating melting furnaces
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Identified and accessed manual/specification 3.2 Interpreted manuals 3.3 Applied information in manuals 3.4 Stored manuals 3.5 Reading and interpreting routine information on written job instructions, specifications, standard operating procedures relevant test data sheets and other standard workplace forms and drawings for furnace operation 3.6 Entering routine and familiar information onto 3.7 Proformas and standard workplace forms. 3.8 Identifying faults and areas for routine repair of the furnace and performing routine maintenance as necessary. 3.9 Following procedures for starting and closing down the furnace. 3.10 Deciding on charge materials weighing charge materials feeding materials into furnace 3.11 Measuring metal temperature and correcting as necessary

4. Resource implications	<p>The following resources MUST be provided:</p> <p>4.1 All manuals/catalogues relative to Melting/Casting</p> <p>4.2 Job order, requisitions slip for materials</p> <p>4.3 Materials, tools and equipment relevant to the activity</p> <p>4.4 Actual furnace</p>
5. Method of assessment	<p>Competency MUST be assessed through:</p> <p>5.1 Observation with questioning</p> <p>5.2 Demonstration with questioning</p> <p>5.3 Interview</p> <p>5.4 Portfolio</p>
6. Context of assessment	<p>6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</p> <p>6.2 Assessment may be conducted in the workplace or a simulated environment.</p>

UNIT OF COMPETENCY: OPERATE AN ELECTRIC INDUCTION MELTING FURNACES

UNIT CODE: ALT812309

DESCRIPTOR : This unit covers operating an electric furnace for melting of ferrous metals.

ELEMENT	PERFORMANCE CRITERIA
1. Select materials	1.1 Material requisitions are prepared according to standard operating procedures / Job instructions. 1.2 Charge analysis is undertaken in accordance with standard operating procedures. 1.3 The charge analysis is converted to furnace charge weight using standard operating procedures. 1.4 Charge is weighed according to standard operating procedures.
2. Start up furnace	2.1 Furnace is inspected for any defects or damage. 2.2 Routine operational maintenance of furnace is undertaken to standard operating procedures. 2.3 Furnace is started up to standard operating procedures. 2.4 Faults are reported according to standard operating procedures.
3. Charge furnace	3.1 Emergency/safety procedures are identified and observed / followed as necessary. 3.2 Materials are pre-heated (if required) according to standard operating procedures. 3.3 Materials are charged into furnace using standard operating procedures. 3.4 Suitable areas for emergency unloading of molten metal are identified and kept available.
4. Monitor furnace	4.1 Furnace is maintained at optimum operating condition to standard operating procedures. 4.2 Sample for chemical analysis is taken and remedial action is applied as required to standard operating procedures. 4.3 Furnace is drossed and/or de-slagged to standard operating procedures. 4.4 Temperature of metal is checked and adjustment made if necessary.
5. Tap or unload the furnace	5.1 Pouring ladles repaired / pre-heated. 5.2 Quantity of the required metal is identified. 5.3 Tap rate is carried out to standard operating procedures. 5.4 Tapping or unloading is undertaken and completed safely according to standard operating procedures.
6. Shut down furnace	6.1 Shut-down of furnace is completed to standard operating procedures. 6.2 Routine operational maintenance of furnace is undertaken to standard operating procedures.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials	Type of alloy to be melted. 1.1 Gray cast iron and its alloys 1.2 Low / Medium carbon steel 1.3 High alloy carbon steel 1.4 Stainless steel 1.5 Aluminum and its Alloy 1.6 Copper Alloy
2. Furnace	2.1 High Frequency 2.2 Low Frequency 2.3 Medium Frequency 2.4 Type of lining refractory
3. Routine Operational Maintenance	3.1 Routine repair 3.2 Patching of refractory 3.3 Routine cleaning 3.4 Lubrication 3.5 Make-up water adjustment

EVIDENCE GUIDE

<p>1. Critical aspect of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Selected materials 1.2 Started up furnace 1.3 Charged furnace 1.4 Monitored furnace 1.5 Tapped or unloaded the furnace 1.6 Shut down furnace
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Types of manuals used in the automotive foundry. industry 2.2 Identification of symbols used in the manuals forms and standard operating procedures 2.3. Identification of units of measurements and unit of conversion 2.2 Sampling procedures for chemical analysis, carbon equivalent and chill wedge tests 2.5 Procedures for de-gassing as necessary using tablets or lance and other methods. 2.6 Procedures and principles of slag or dross removal 2.7 Tapping temperature and procedure of the molten metal Weighing procedures using different scale types 2.8 Correct order of loading of different charge materials 2.9 Thermocouple condition monitoring and adjustment mechanism for furnace, 2.10 Furnace close-down procedures 2.11 Applicable industry safety standards, national standards, OSHA guides, Philippine codes of practice/standards, use and application of personal protective equipment safe work practices and procedures

<p>3. Underpinning skills</p>	<p>3.1 Reading and interpreting routine information on written job instructions, specifications, standard operating procedures relevant test data sheets and other standard workplace forms or drawings for furnace operation</p> <p>3.2 Following oral instruction and entering routine and familiar information onto proformas and standard workplace forms.</p> <p>3.3 Identifying faults and areas for routine repair of the furnace and performing routine maintenance as necessary.</p> <p>3.4 Following procedures for starting and closing down the furnace</p> <p>3.5 Deciding on charge materials, weighing them and feeding the charge materials into the furnace.</p> <p>3.6 Measuring metal temperature and correcting as necessary</p> <p>3.7 Sampling for chemical analysis, carbon equivalent and chill wedge tests</p> <p>3.8 Degassing as necessary using tablets or lance and other methods.</p> <p>3.9 Deslagging or dross removal</p> <p>3.10 Tapping temperature and procedure of the molten metal</p> <p>3.11 Correct order of loading of different charge materials</p> <p>3.12 Thermocouple condition monitoring and adjustment mechanism for furnace</p> <p>3.13 Operating temperature measurement instruments</p> <p>3.14 Repair / lining of furnace lining refractory</p> <p>3.15 Operating re-lining tools</p> <p>3.16 Reading of measuring tools, i.e. steel rule, plumb bulb, outside caliper, etc.</p> <p>3.17 Operating over-head crone</p> <p>3.18 Operating fork-lifts</p> <p>3.19 Operating cooling curve analysis</p> <p>3.20 Operating weigh scales</p>
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <p>4.1 All manuals/catalogues relative to coreless induction furnace.</p> <p>4.2 Job order, requisitions</p> <p>4.3 Actual furnace and operations</p>
<p>5. Method of assessment</p>	<p>Competency MUST be assessed through:</p> <p>5.1 Observation with questioning</p> <p>5.2 Demonstration with questioning</p> <p>5.3 Interview</p> <p>5.4 Portfolio</p>
<p>6. Context of assessment</p>	<p>6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</p> <p>6.2 Assessment may be conducted in the workplace or a simulated environment.</p>

UNIT OF COMPETENCY: FETTLE AND TRIM METAL CASTINGS

UNIT CODE: ALT812310

UNIT DESCRIPTOR: This unit covers fettling and trimming metal castings and assessing the quality of the casting.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Determine job requirements	1.1 Job requirements are correctly determined from instructions and specifications. 1.2 Correct moldings and/or castings are located and arranged for efficient processing.
2. Observe safety requirements	2.1 Personal protective equipment is selected and used correctly. 2.2 Castings are handled using manual or mechanical handling methods appropriate to the task. 2.3 Castings/forgings are stored or positioned in a safe manner.
3. Identify excess material for removal	3.1 Casting is removed from mold and/or sand media is removed from casting as required. 3.2 Castings are visually checked as suitable for further processing, and excess metal is correctly identified according to standard operating procedures.
4. Select correct tools and equipment	4.1 Cleaning method is selected appropriate to casting and job requirements. 4.2 Rumbling/shot blast/sand blast equipment is set to specification and used in accordance with standard operating procedures as required. 4.3 Appropriate hand tools are selected and used for the given task. 4.4 Appropriate power tools and accessories are selected and used for the given task.
5. Remove excess material	5.1 Excess metal (e.g. runners, risers and flashing) is removed using methods and equipment appropriate to the task and to standard operating procedures. 5.2 Excess metal suitable for recycling is identified according to standard operating procedures. 5.3 Excess metallic materials are identified from specifications and isolated as required according to standard operating procedures.
6. Quality assess castings/forgings	6.1 Castings are visually checked for conformance with specifications to standard operating procedures. 6.2 Non-conforming castings are rejected or set aside and identified for further consideration or remedial action according to standard operating procedures. 6.3 Faults are reported/recorded as required according to standard operating procedures.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Personal protective equipment	1.1 Safety goggles 1.2 Apron 1.3 Gloves 1.4 Safety shoes
2. Hand tools	2.1 Files 2.2 Chisels 2.3 Hammers, etc.
3. Power tools and Equipment	3.1 Saws 3.2 Croppers 3.3 Grinding disks/belts (including grades) 3.4 Swing grinder 3.5 Pedestal grinders etc. 3.6 Hanger type blast machine 3.7 Shot thumblast machine 3.8 Table type shot blasting machine

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Performed fettling and trimming metal castings.</p> <p>1.2 Operated grinding machines and cutting equipment.</p> <p>1.3 Operated shot blasting machines.</p>
<p>2. Underpinning knowledge and attitudes</p>	<p>2.1 Characteristic of quality fettling standards for metal casting/forging</p> <p>2.2 Fettling requirements</p> <p>2.3 Different fettling tools and their usage</p> <p>2.4 Handling procedure and storage requirements of materials tools and equipment</p> <p>2.5 Use and application of personal protective equipment</p> <p>2.6 Safe work practices and procedures</p> <p>2.7 Hazards and control measures associated with fettling and trimming metal castings</p>
<p>3 Underpinning skills</p>	<p>3.1 Interpreting written instruction sketches and drawings</p> <p>3.2 Identifying castings</p> <p>3.3 Visually inspecting castings</p> <p>3.4 Fettling and trimming metal castings</p> <p>3.5 Conducting a final inspection</p> <p>3.6 Recording and reporting associated with fettling and trimming metal castings</p> <p>3.7 Handling materials, tools and equipment</p>
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <p>4.1 All manuals/catalogues relative to coreless induction furnace.</p> <p>4.2 Job order, requisitions</p> <p>4.3 Actual furnace and operations</p>
<p>5. Method of assessment</p>	<p>Competency MUST be assessed through:</p> <p>5.1 Observation with questioning</p> <p>5.2 Demonstration with questioning</p> <p>5.3 Interview</p> <p>5.4 Portfolio</p>
<p>6. Context of assessment</p>	<p>6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</p> <p>6.2 Assessment may be conducted in the workplace or a simulated environment.</p>

**UNIT OF COMPETENCY: PERFORM REFRACTORY INSTALLATION
AND REPAIR**

UNIT CODE : **ALT812311**

UNIT DESCRIPTOR: This unit covers repairing and installing/replacing refractory.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Inspect refractory	1.1 Specification is interpreted and understood. 1.2 <i>Specific areas of the refractory</i> are identified for repair or replacement.
2. Knock out refractory	2.1 Sequence of operations to remove refractory is determined to meet the job specification. 2.2 Appropriate <i>tools and equipment</i> are selected to safely remove damaged refractory. 2.3 Damaged refractory is removed and disposed of safely.
3. Prepare refractory materials	3.1 Appropriate refractory materials are selected to meet specifications. 3.2 Refractory media is mixed to specification.
4. Install refractory	4.1 Sequence of operations to install refractory is determined to meet the job specification. 4.2 <i>Installation of refractory</i> is performed in accordance to standard operating procedures and techniques to meet the job specification. using appropriate tools and equipment
5. Cure refractory	5.1 Refractory is cured to specifications using appropriate techniques and equipment to meet the job specification.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Specific area of refractory	1.1 Heat insulating materials used inside molten metal vessels and includes material which can be machine rammed, hand rammed, forked or vibrated 1.2 Refractory bricks 1.3 Fiberboard
2. Tools and equipment	Tools 2.1 Paint brush 2.2 Brooms 2.3 Chisel Equipment 2.4 Mixer 2.5 Scissors 2.6 Steel tape
3. Installation of refractory	3.1 Hand ramming 3.2 Machine ramming 3.3 Internal vibration 3.4 External vibration

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Repaired and installed/replaced all types of refractory.
2. Underpinning knowledge and attitudes	2.1 Requirements repair or replacement Inspection techniques 2.2 Mixing, installing and curing techniques and equipment 2.3 OH&S legislation and EPA regulations applying to working with refractory 2.4 Use and application of personal protective equipment 2.5 Safe work practices and procedures 2.6 Hazards and control measures associated with refractory installation and repair
3 Underpinning skills	3.1 Interpreting job specifications and other applicable reference documents 3.2 Planning and sequencing operations 3.3 Inspecting and identifying faults 3.4 Removing damaged refractory safely 3.5 Mixing refractory correctly 3.6 Installing refractory correctly 3.7 Curing refractory correctly 3.8 Following oral instructions 3.9 Handling materials 3.10 Recording and reporting associated with to repair and install/replace of all types of refractory
4 Resource implications	The following resources MUST be provided 4.1 All tools, equipment, materials required. 4.2 All relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials 4.3 Refractory facility
5. Method of assessment	Competency MUST be assessed through: 5.1 Observation with questioning 5.2 Demonstration with questioning 5.3 Interview 5.4 Portfolio
6. Context of assessment	6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment may be conducted in the workplace or a simulated environment.

UNIT OF COMPETENCY: USE AND MAINTAIN MEASURING INSTRUMENT

UNIT CODE: ALT821303

UNIT DESCRIPTOR: This unit identifies the competence required to measure components or sections using non-specialist instrument and maintain the measuring instrument.

ELEMENT	PERFORMANCE CRITERIA
1. Measure dimensions or variables using appropriate instrument	<p><i>Italicized</i> terms are elaborated in the Range of Variables</p> <p>1.1 Measurement of dimensions and variables are completed without causing damage to any instrument or components</p> <p>1.2 Appropriate measuring instrument is selected</p> <p>1.3 Relevant measuring techniques are used and results appropriately recorded</p> <p>1.4 All measuring activities are carried out according to industry regulations/guidelines OHS & requirements and enterprise/procedures policies</p>
2. Maintain measuring instrument	<p>2.1 Maintenance of measuring instrument is achieved without causing damage to any instrument or component</p> <p>2.2 Routine care and storage of measuring instrument is undertaken according to manufacture specifications</p> <p>2.3 Checking and calibrating of measuring devices is done prior to use.</p> <p>2.4 All maintenance activities of measuring instruments are carried out according to industry regulations/guidelines OHS legislation, and enterprise procedures policies</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Dimension and variables measurement	1.1 Measuring Tape <ul style="list-style-type: none"> • Diameter of Furnace components • External Dimensions 1.2 Steel Rule <ul style="list-style-type: none"> • Straightness • Alignment 1.3 Leveling Gauge <ul style="list-style-type: none"> • Warpage • Level and angle 1.4 Pyrometer
2. Measuring instrument and tools	2.1 Handtools 2.2 Depth gage 2.3 Vernier Caliper 2.4 Straight edge 2.5 Feeler gage 2.6 Inside Caliper 2.7 T-squares 2.8 Flat edges 2.9 Dividers 2.10 Protractors
3. Measuring technique	3.1 Correct usage of the above mentioned measuring instrument and tools. 3.2 Out of round or ovality 3.3 Cylindricity or taper conicity
4. OHS Requirements	4.1 Wearing of personal protective instrument such as apron, goggles, gloves, safety shoes 4.2 Disposal of wastes materials 4.3 Workshop housekeeping
5. Routine care and storage of measuring instrument	5.1 Periodic check up of pyrometer with standard bars 5.2 Storage in box separated from hand tools 5.3 Proper handling 5.4 Not to exposed to liquid such as water.

EVIDENCE GUIDE

1. Critical aspects competency	Assessment requires evidence that the candidate: 1.1 Measured components or section using correct instrument. 1.2 Maintained measuring instrument.
2. Underpinning knowledge and attitudes	2.1 Personal and instrument safety requirements 2.2 Measuring instrument types and their application 2.3 Measuring procedures 2.4 Measuring instrument graduation 2.5 Measuring instrument maintenance procedures 2.6 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Accessing, interpreting and applying technical information 3.2 Using tools and instrument correctly and safely 3.3 Maintain measuring instrument 2.1 Using measuring instrument
3 Resource implications	The following resources must be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & instrument 4.3 Materials relevant to the activity
4 Method of assessment	Competency must be assessed through 5.1 Demonstration of skills in measurement of length, squareness, flatness, angles, roundness, depth, clearance or any measurements that can be taken from analogue or digital devices. 5.2 Written examination
5 Context of assessment	6.1 The assessment of practical skills must only take place after a period of supervised practice and repetitive experience in a safe working environment. If workplace conditions are not available, assessment in simulated workplace conditions is acceptable.

SECTION 3 TRAINING STANDARDS

These guidelines are set to provide the Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for Foundry Melting/Casting NC II

3.1 CURRICULUM DESIGN

Course Title: **Foundry-Melting/Casting**

NC Level: **NC II**

Nominal Training Duration: **18 Hours** (Basic Competencies)
 20 Hours (Common Competencies)
 90 Hours (Core Competencies)

Course Description:

This course is designed to equip individual the competencies that a person must achieve to be able to melt different kinds of metals, cast it using different operations and different furnaces or heating systems and fuel. It also includes fettling and cleaning; ability to inspect, measure and interpret drawings; set up and operate variety of specialized furnaces; use appropriate measuring instrument in operating and maintaining the melting equipment and perform repair.

This course is also designed to provide basic and common skills to equip individual with operational skills in foundry-melting/casting.

To obtain this, all units prescribed for this qualification must be achieved.

BASIC COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
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.	<ul style="list-style-type: none"> • Group discussion • Interaction 	<ul style="list-style-type: none"> • Written test • Practical/performance test • Interview
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.	<ul style="list-style-type: none"> • Discussion • Interaction 	<ul style="list-style-type: none"> • Observation • Simulation • Role playing
3. Practice career professionalism	3.1 Integrate personal objectives with organizational goals. 3.2 Set and meet work priorities. 3.3 Maintain professional growth and development.	<ul style="list-style-type: none"> • Group Discussion • Interaction 	<ul style="list-style-type: none"> • Demonstration • Observation • Interviews/questioning

4. Practice occupational health and safety	4.1 Identify hazardous risks 4.2 Evaluate hazard and risks 4.3 Control hazards and risks 4.4 Maintain occupational health and safety awareness	<ul style="list-style-type: none"> • Discussion • Plant tour • Symposium 	<ul style="list-style-type: none"> • Observation • Interview
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COMMON COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Read, Interpret and Apply Engineering Drawings	1.1 Identify and access engineering drawings/specification 1.2. Interpret drawings 1.3. Apply information in the drawings & specifications 1.4 Store drawings	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Direct observation • Interview
2. Perform Mensuration and Calculation	2.1. Select measuring instrument and 2.2 Carry out measurement and calculations. 2.3. Maintain measuring instruments	<ul style="list-style-type: none"> • Lecture/ Demonstration • Simulation • Exercises 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation
3. Read, Interpret and Apply Specifications and Manual	4.1. Identify/accessed manuals and interpret data and specification 4.2 Apply information accessed in manual 4.3 Store manual	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Distance Learning 	<ul style="list-style-type: none"> • Written test • Direct observation • Project method • Interview
5. Perform Shop Maintenance	5.1 Inspect/clean tools and work area 5.2 Store/arrange tools and shop equipment 5.3 Dispose wastes/used lubricants 5.4 Report damaged tools/equipment	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Simulation 	<ul style="list-style-type: none"> • Written test • Direct observation • Demonstration • Interview

CORE COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Operate Melting Furnaces (Non Electric)	1.1 Select materials 2.2 Start up non- electric furnace 3.3 Charge non-electric furnace 4.4 Monitor non-electric furnace 5.5 Tap or unload the furnace 6.6 Shut down furnace	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio
2. Operate Cupola Melting Furnaces	2.1 Select materials 2.2 Start up Cupola furnace 2.3 Charge Cupola furnace' 2.4 Monitor cupola furnace 2.5 Tap the furnace 2.6 Shut down cupola furnace 2.7 Cool down cupola furnace	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio
3. Operate an Electric Induction Melting Furnace	3.1 Furnace Select materials 3.2 Start up Electric Induction Melting 3.3 Charge Electric Induction Furnace 3.4 Monitor furnace 3.5 Tap and unload furnace 3.6 Shot down furnace	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio
4. Fettle and Trim Metal Casting / Forgings	4.1 Determine job requirements to fettle and trim metal casting/forging 4.2 Observe safety requirements 4.3 Identify excess material for removal 4.4 Select correct tools and equipment 4.5 Remove excess material 4.6 Quality assess castings/forgings	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio

<p>5. Perform Refractory Installation and Repair</p>	<p>5.1 Inspect refractory 5.2. Knock out refractory 5.3. Prepare refractory materials 5.4. Install refractor 5.5. Cure refractory</p>	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio
<p>6. Use and Maintain Measuring Instruments</p>	<p>6.1 Measure dimensions or variables using appropriate instruments 6.2 Maintain measuring instruments</p>	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training 	<ul style="list-style-type: none"> • Observation with Questioning • Demonstration of practical skills • Interview • Portfolio

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 learner-centered and should accommodate individualized and self-paced learning strategies;
- 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 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 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, or audio, video or computer technologies.
- Project-Based Instruction is an authentic instructional model or strategy in which students plan, implement and evaluate projects that have real world applications.

3.3 TRAINEE ENTRY REQUIREMENTS

This section specifies the qualifications of trainees and educational experience. Other requirements like health and physical requirements are also stated. Passing entry written examinations may also be indicated if necessary.

- With experience in basic machining
- With good moral character;
- Ability to communicate both oral and written; and
- Physically and mentally fit

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS FOUNDRY MELTING/CASTING NC II

Recommended list of tools, equipment and materials for the training of 12 trainees for Foundry Melting/Casting NC II

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
2 sets	Box wrench	1 unit	Melting furnace (non-electric)	2 tons	Aluminum Alloy
2 sets	Open end wrench	1 unit	Cupola melting furnace	500Kgs	Copper Alloy
2 sets	Socket wrench	1 unit	Induction melting furnace	200Kgs	Magnesium Alloy
2 pcs	Adjustable wrench	1 unit	Shot hanger blast machine	50Kgs	Zinc
2 sets	Screwdriver (+)	1 unit	Table blast machine	50Kgs	Tin
2 sets	Screwdriver (-)	1 unit	Thumb blast machine	50Kgs	Lead
2 pcs	Plier (side cutting)	1 unit	Pedestal grinder (double head)	2 tons	Pig Iron
2 pcs	Plier (long nose)	1 unit	Shake out machine	2 tons	Return scrap
2 pcs	Mechanical plier	1 unit	Swing grinder	2 tons	Steel scrap
2 pcs	Ballpein hammer	1 set	Refractory ramming tools	100Kgs	Carburizer
4 pcs	Wood mallet	1 unit	Immersion type Thermo-couple (1300 C° min.)	30Kgs	Ferro silicone
4 pcs	Claw hammer	5 sets	Transfer ladle	30Kgs	Ferro manganese
1 set	Feeler gauge	1 unit each	Weighing scale (10, 50, 100, 500, 1000 Kgs capacity)	50Kgs	Ferro chrome
2 pcs	Hammer (plastic)	1 unit	Charging hoist (1	20 Kgs	Slag coagelants

	faced)		ton capacity)		
1 set	Number punch	2 units	Charging box (200Kgs capacity)	500Kgs	Acid lining
1 set	Alphabet punch	1 unit	Optical Pyro-meter (for ferrous metals)	500Kgs	Neutral lining
1 set	Straight drill	1 unit	Cooling curve analyzer (with sample pedestal)	2 sheets	Mica 4"x8"
2 pcs	Ballpein hammer (5lbs)	1 unit	Forehearth (1 ton capacity)	2 sheets	Asbestos board 4"x8"
12 pcs	Goggles	1 unit	Chill mold (wedge)	200Kgs	Mortar clay
12 pcs	Helmet	1 unit	Chill mold (ASTN 2C)	200Kgs	Fire clay
12 pcs	Safety Shoes	1 unit	Angle grinder (6 inches)	10 tablets	De-gasser
1 pc	Straight edge (1000 mm long)	2 units	Portable grinder (pencil type)	10 tablets	Silicone modifier
1 pc	Tri-square (300mm long)	1 set	A-crane (500Kgs capacity)	10 Kgs	Titanium boron grain refiner
1 pc	Adjustable protractor	2 sets	MS plate (2.3mm thick)	2 Kgs	Melt cover
2 sets	Colored goggles	2 lengths	BI pipe (1 1/2 " dia)	500Kgs	Foundry coke
1 pc	Sledge hammer	2 lengths	CRS shafting 16 dia	50Kgs	Limestone
		20 meters	Wire rope (1/2 dia)	10 Kgs	Inoculant
2 pcs	File (coarse) half round			20Kgs	Ferro silicon magnesium
2 pcs	File (fine) half round			50pcs	Cooling curve analyzer mold
1 set	Vernier caliper (300)			10 ton	Steel shots (SB-1417)
1 set	Vernier height gage (1000mm)			2pcs	Grinding wheel 50x50x300
				5pcs	Wheel grinder 180x20x6 dia
1 set	Vernier height gage (500mm)			10 pcs	Mounted wheel 6x25x40
1 pc	Divider (300mm)			3 cans	Color check
2 pcs	Trammel point			1	Hexagonal bar 25x3

				length	meters long
1 pc	Divider (200mm)			1 length	Steel wire 5mm dia x 3 meters long
1 pc	Straight edge (510mm)			2 cans	Layout-blue
4 pcs	Chisel 1 ½" wide			24 sets	Cotton gloves
4 pcs	Chisel 1" wide			24 sets	Maong gloves
4 pcs	Chisel 1/2 " wide				
4 pcs	Chisel ¼" wide				
1 set	Tong				

3.5 TRAINING FACILITIES

FOUNDRY METAL/CASTING NC II

Based on a class size of 12 students/trainees

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
Building (permanent)	26.00 x 28.00	728.00	728.00
Trainee Working Space	3.50 x 3.50 per student / trainee	10.25 per student	123
Lecture room	9.00 x 10.00	90.00	90.00
Learning resource center	5.00 x 8.00	40.00	40.00
Facilities / Equipment / Circulation area	-	-	291.75

3.7 TRAINER'S QUALIFICATIONS FOR AUTOMOTIVE MANUFACTURING SUB SECTOR

FOUNDRY MELTING/CASTING NC II

TRAINER QUALIFICATION (TQ II)

- Must be a holder of Foundry Melting/Casting NC II
- Must have undergone training on Training Methodology II (TM II)
- Must be computer literate
- 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 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 FOUNDRY MELTING/CASTING NC II, the candidate must demonstrate competence in all the units listed in Section 1. Successful candidates shall be awarded a National Certificate signed by the TESDA Director General.

4.2 The qualification of Foundry-Melting/Casting NC II may be attained through.

4.2.1 Accumulation of Certificates of Competency (COCs) in all the following areas:

Perform Melting/Casting Using Non-electric Melting Furnace

- Operate Melting Furnaces (Non Electric)
- Fettle and Trim Metal Castings
- Perform Refractory Installation and Repair
- Use and Maintain Measuring Instrument

Perform Melting/Casting Using Cupola Melting Furnace

- Operate Cupola Melting Furnaces
- Fettle and Trim Metal Castings
- Perform Refractory Installation and Repair
- Use and Maintain Measuring Instrument

Perform Melting/Casting Using Electric Induction Melting Furnace

- Operate Electric Induction Melting Furnaces
- Fettle and Trim Metal Castings
- Perform Refractory Installation and Repair
- Use and Maintain Measuring Instrument

4.3 Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.

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

1.1.1 Graduates of formal, non-formal and informal including enterprise-based training programs.

1.1.2 Experienced workers (wage employed or self-employed)

4.5 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 (PTQCS).

**COMPETENCY MAP- AUTOMOTIVE SECTOR
MANUFACTURING SUB-SECTOR**

ANNEX A

FOUNDRY-MELTING/CASTING NC II

CORE COMPETENCIES	Develop and manufacture wood pattern	Develop and manufacture polymer pattern	Develop and manufacture assembled plated pattern	Develop and manufacture production pattern	Perform general woodworking machine operations	Use and maintain measuring instrument		
	Prepare & mix sand for metal molding	Produce molds by hand	Produce cores by hand	Operate molding machine	Operate core-making machine	Pour molten metal to molds	Use and maintain measuring instrument	
	Operate melting furnaces (non-electric)	Operate cupola melting furnace	Operate electric induction melting furnace	Fettle & trim metal castings/forgings	Perform refractory installation & repair	Use & maintain measuring instrument		
COMMON COMPETENCIES	Read & Interpret Engineering Drawings	Perform Mensuration and Calculation	Read, Interpret and Apply Specifications and Manuals	Perform Shop Maintenance				
BASIC COMPETENCIES	Receive and respond workplace communication	Work with Other	Demonstrate work values	Practice basic housekeeping procedures	Lead in workplace communication	Develop and practice negotiation skills	Use relevant technologies	Solve workplace problems related to work activities
	Participate in workplace communication	Work in team environment	Practice career professionalism	Practice occupational health and safety procedures	Lead small Team	Use mathematical concepts and techniques	Develop team and individual	Apply problem solving techniques in the workplace
	Plan and organize work	Utilize specialist communication skills						

Legend:
FOUNDRY-MELTING/CASTING NC II

DEFINITION OF TERMS (FOUNDRY)

1. **Alloy** An **alloy** is a homogeneous blend of two or more elements at least one of which is a metal, and where the resulting material has metallic properties.
2. **CarbonDioxide Process** **Carbon Dioxide Process** consist of mixing a clean dry silica sand with a silicate binder, compacting the mixture to shape and hardening it by passing carbon dioxide gas.
3. **Casting** **Casting** is the term used to describe both the process and the product when molten metal is poured and solidified in a mold.
4. **Chemical Analysis** **Analytical chemistry** is the science that seeks ever improved means of measuring the chemical composition of natural and artificial materials.
5. **Cope** In a two-part mold, the **cope** is the name given to the top half of the pattern, flask, mold, or core.
6. **Core** The **core** is a sand shape that is inserted into the mold to produce the internal features of a casting, such as, holes or passages for water-cooling.
7. **Core Box** A **core box** is the mold or die used to produce casting cores.
8. **Core Print** The **core print** is the region added to the pattern, core, or mold that is used to locate and support the core within the mold.
9. **Draft** **Draft** is the taper on a pattern or casting that permits it to be withdrawn from the mold.
10. **Drag** The **drag** is the bottom part of the two-part mold.
11. **Dross** **Dross** is a mass of solid impurities floating on a molten metal bath. It appears usually on the melting of low melting point metals or alloys such as aluminum, copper, magnesium or each alloys.
12. **Fettle / Finishing** The process of cleaning the casting, removal of excess metal, grinding and inspection operation which may be required for some casting process.

- 13. Flask** The **flask** is the box that contains the molding aggregate.
- 14. Foundry** A **Foundry** is a factory which produces metal castings from either ferrous or non-ferrous alloys.
- 15. Furnace** **Furnaces** are refractory lined vessels that contain the material to be melted and provide the energy to melt it.
- 16. Gate** **Gate** is controlled entrances to the mold cavity.
- 17. Gating System** **Gating system** is the network of channels used to deliver the molten metal to the mold cavity.
- 18. Green Sand** The term **Green Sand** refers to that molded sand mixture which is allowed to remain moist and is used in casting ferrous and non-ferrous metals.
- 19. Melting** The process includes melting the charge, refining the melt, adjusting the melt chemistry and tapping into a transport vessel. Refining is done to remove deleterious gasses and elements from the molten metal. Material is added during the melting process to bring the final chemistry within a specific range specified by industry and/or internal standards. During the tap, final chemistry adjustments are made.
- 20. Molding** Is the process of making the mold cavity with a necessary allowances such as shrinkage, machining, taper, and surface finish. Usually it is done with green sand as the molding medium.
- 21. Mold Cavity** The **mold cavity** is the shaped hole into which the molten metal is poured and solidified to produce the desired casting.
- 22. Parting Line** **Parting Line** or Parting Surface is the interface that separates the cope and drag halves of a mold, flask, or pattern. The same part can also be found in some core making processes.
- 23. Pattern** The **pattern** is the approximate copy of the final casting. The molding material (sand for sand molds) is then packed around the pattern and the pattern is removed to produce the mold cavity.

24. Pattern Shrinkage Allowance	Dimensions added to the pattern to compensate for the solid shrinkage or contraction occurs in the solidified casting as it cools to room / ambient temperature.
25. Pouring Cup	A Pouring Cup or Pouring Basin is the portion of the gating system that initially receives the molten metal from the pouring vessel and controls its delivery to rest of the mold.
26. Refractories	Refers to materials that are used to make crucibles, linings for furnaces, kilns, ovens and incinerators. A practical requirement is the ability of the material to withstand temperatures above 1100°C without softening.
27. Riser	A riser is an extra void created in the mold that will also fill with molten metal. It provides a reservoir of molten metal that flow into the mold cavity to compensate for any shrinkage during solidification.
28. Runners	Runners are the horizontal part of the gating system that is connected to the gate.
29. Slag	Are by-product of melting metals. They are composed of metal oxides and sulfides. They assist in melt temperature control and minimize oxidation of the liquid metal before casting.
30. Sprue	From the pouring cup, the molten metal travels down the sprue the vertical part of the gating system that connects with the runners.
31. Vents	Vents are additional channels providing an escape for the gasses that are generated within the mold.
32. Wedge Chill Test	Indicates the chilling tendencies of cast iron melt which is related to melting conditions, chemical composition and casting section thickness.

ACKNOWLEDGEMENT

The Technical Education and Skills Development Authority (TESDA) wishes to extend thanks and appreciation to the many representatives of business, industry, academe and government agencies who rendered their time and expertise to the development and validation of this Training Regulation.

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