

TRAINING REGULATIONS



FOUNDRY MOLDING NC II

AUTOMOTIVE MANUFACTURING SECTOR

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

TABLE OF CONTENTS
AUTOMOTIVE/LAND TRANSPORT SECTOR
FOUNDRY MOLDING NC II

	Page No.
SECTION 1 FOUNDRY MOLDING NC II QUALIFICATION	1-2
SECTION 2 COMPETENCY STANDARDS	
• Basic Competencies	3-14
• Common Competencies	15-26
• Core Competencies	27-50
- FOUNDRY MOLDING NC II	
SECTION 3 TRAINING STANDARDS	
3.1 Curriculum Design	51-54
3.2 Training Delivery	55
3.3 Trainee Entry Requirements	56
3.4 List of Tools, Equipment and Materials	56-57
3.5 Training Facilities	58
3.6 Trainers' Qualifications	58
3.7 Institutional Assessment	58
SECTION 4 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS	59
ANNEX A: COMPETENCY MAP	60
DEFINITION OF TERMS	61-63
ACKNOWLEDGEMENTS	64

TRAINING REGULATIONS FOR FOUNDRY MOLDING NC II

SECTION 1 FOUNDRY MOLDING NC II QUALIFICATION

The FOUNDRY MOLDING NC II Qualification consists of competencies that a person must achieve to be able to produce all types of molds and cores using different kinds of binders and sand. He may produce the molds or cores manually or he may use molding machines and core making machines.

Molds may be produced by a mix of molding sand with a binding agent (such as bentonite clay or chemical resins) formed in metal or wooden flasks using patterns attached to molding machines. These may also be formed manually specially if these are large molds, using sand rammers to compact the molding sand.

Cores are produced using sand mixed with core binders compacted into core boxes and cured with heat or catalyst to harden into the required shape. The cores formed using different binders are finished and painted with coatings of graphite or refractory. Cores are set in the molds before it is closed and prepared for pouring. In most cases the molders pour metal into the molds they produced.

This unit covers all specifications interpreted from drawings, technical sketches and/or customer requirements. Tasks undertaken include utilizing appropriate sand binding agents, patterns, core boxes and proper machineries using principles and techniques, designated procedures, correct and appropriate tools and equipment.

The molder should also be able to inspect, measure and interpret drawings and repair procedures; sets up and operates variety of specialized molding and core making machines and uses precision measuring instrument in operating and maintaining patterns and molding 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
ALT723204	Perform Shop Maintenance

CODE NO.	CORE COMPETENCIES
ALT812301	Prepare & Mix Sand for Metal Molding and Coremaking
ALT812302	Produce Molds by Hand (Jobbing)
ALT812303	Produce Cores by Hand (Jobbing)
ALT812304	Operate Sand Molding Machines
ALT812305	Operate Sand Core Making Machines
ALT812306	Pour Molten Metal to Molds
ALT821303	Use and Maintain Measuring Instrument

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

- **Foundry Molder**

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in FOUNDRY MOLDING 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 <i>role and objective of the team</i> is identified from available <i>sources of information</i> 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 <i>workplace context</i> 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> <ol 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>	<ol 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>	<ol 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> <ol 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> <ol 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>	<ol 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

1. Critical aspects of competency	<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
2. Underpinning knowledge	<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
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
4. Resource implications	<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
5. Method of assessment	<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
6. Context of assessment	<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
5. Emergency-related drills and training	5.1 Fire drill 5.2 Earthquake drill 5.3 Basic life support/CPR 5.4 First aid 5.5 Spillage control 5.6 Decontamination of chemical and toxic 5.7 Disaster preparedness/management
6. OHS personal records	6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed

EVIDENCE GUIDE

<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>	<p>6.1 Competency may be assessed in the work place or in a simulated work place setting</p>

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	Assessment requires evidence that the candidate: 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	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
1. Underpinning skills	1.1 Reading and comprehension skills required to identify and interpret engineering drawings and specifications 1.2 Accessing information and data
4. Resource implications	The following resources MUST be provided: 4.1 All drawings/engineering specifications relative to automotive manufacturing 4.2 Job order, requisitions 4.3 Product sample
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 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 Thickness gauge 1.6 Try square 1.7 Protractor 1.8 Height gauge 1.9 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 aspect 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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Identified and accessed manual/specification 1.2 Interpreted manuals 1.3 Applied information in manuals 1.4 Stored manuals
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 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
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1. Reading and comprehension skills required to identify and interpret automotive manuals and specifications 3.2. Accessing information and data
<p>4 Resource Implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 4.1 All manuals/catalogues relative to Automotive 4.2 Job order, requisitions 4.3 Actual vehicle or simulator
<p>5 Method of assessment</p>	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with questioning 5.2 Interview
<p>6 Context of assessment</p>	<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 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 cleaning requirement 1.2 Work area 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: PREPARE AND MIX SAND FOR MOLDING AND COREMAKING

UNIT CODE: ALT812301

UNIT DESCRIPTOR: This unit covers loading up a mixer, mixing the sand, taking test samples and interpreting the results, discharging the sand and cleaning the mixer.

ELEMENT	PERFORMANCE CRITERIA
	<i>Italicized</i> terms are elaborated in the Range of Variables
1. Load mixer (mill/muller)	1.1 All pre start-up checks are performed safely and according to standard operating procedures. 1.2 Formula for sand mix is determined according to standard operating procedures. 1.3 Materials are measured and loaded according to formula specification.
2. Mix sand	2.1 Sand is mixed for correct time to specifications. 2.2 The performance of mixer and the condition of the sand is monitored. 2.3 Material supply is maintained. 2.4 Faults are reported.
3. Take and test samples	3.1 Sample is correctly extracted. 3.2 Test is applied in accordance with standard operating procedures. 3.3 Test results are compared against specifications. 3.4 Adjustments to formula/mix are made as required in accordance with standard operating procedures.
4. Discharge mixture	4.1 Load is charged correctly according to standard operating procedures. 4.2 Unwanted treated sand is disposed of according to standard operating procedures.
5. Clean mixer	5.1 Mixer is shut down to standard safety and operating procedures. 5.2 Mixer is cleaned according to standard operating procedures.

RANGE OF VARIABLE

VARIABLE	RANGE
1. Materials	1.1. Sand 1.2. Silica 1.3. Zircon 1.4. Chromite 1.5. Mixtures 1.6. Water
2. Faults	2.1. Chemical ratios 2.2. Acid 2.3. Binder 2.4. Water
3. Mixer	3.1. Batch 3.2. Continuous mixers

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 Loaded the mixer 1.2 Mixed sand 1.3 Took and tested the samples 1.4 Discharged the mixture 1.5 Cleaned the mixer
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Characteristics, safe handling procedure and mixture applications of sand and binding agent 2.2 Moulding requirements 2.3 Mixers, applications, loading, operating and unloading procedures 2.4 Volumes, quantities, ratios and percentages 2.5 Sampling, testing and acceptance criteria for mixed sand 2.6 Procedures for cleaning and shutting down mixer 2.7 Environmental requirements for the disposal of unwanted sand 2.8 Use and application of personal protective equipment 2.9 Safe work practices and procedures 2.10 Hazards and control measures related to preparing and mixing sand for metal moulding
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Reading and following written instructions and standard operating procedures 3.2 Setting parameters for mixing 3.3 Loading mixers 3.4 Mixing sand and monitoring the process 3.5 Sampling and testing mixed sand 3.6 Discharging sand 3.7 Closing down and cleaning 3.8 Using measurement skills for preparing and mixing sand within the scope of this unit.
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, and reference materials.
<p>5. Method of assessment</p>	<p>Competency MUST be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with Questioning 5.2 Demonstration with Questioning 5.3 Portfolio 5.4 Third party report
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 6.1 This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2 Where assessment occurs off-the-job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

UNIT OF COMPETENCY: PRODUCE MOLDS BY HAND (JOBGING)

UNIT CODE: ALT812302

UNIT DESCRIPTOR: This unit covers hand making of sand molds and cores for metal casting.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify job requirements	1.1 Job requirements are correctly identified from drawings, instructions and specifications. 1.2 Material is selected appropriate to job requirements.
2. Determine sequence of operation	2.1 Sequence of operation including job set-up is determined for maximum efficiency and to meet job specifications.
3. Select inspect and prepare pattern equipment	3.1 Pattern equipment is correctly identified from specifications to standard operating procedures. 3.2 Pattern equipment is inspected to specifications, and damaged patterns are identified for repair or replacement to standard operating procedures. Pattern is assembled to specification. 3.3 Pattern equipment is set up to specification according to standard operating procedures.
4. Make mould	4.1 Appropriate mold -making equipment is selected and positioned according to standard operating procedures. 4.2 Appropriate molding media is selected to produce mold to specification. 4.3 Molding media is used to produce mold according to standard operating procedures. 4.4 Molds are rammed up with joints and drawbacks as required to standard operating procedures. 4.5 Parting and stripping systems are utilized in accordance with standard operating procedures. 4.6 Loose pieces, vents, risers and runners are positioned and secured as required to standard operating procedures. 4.7 Pattern and loose pieces are removed from mold and core box in a safe manner least likely to cause damage to the pattern and in accordance with standard operating procedures. 4.8 Core is positioned in prints utilizing chaplets and chills as required and vented to specification according to standard operating procedures. 4.9 Mold is closed and checked for compliance to component specification in accordance with standard operating procedures. 4.10 Mold is inspected and repaired as required.

	<p>4.11 Mold and core is cleaned and painted according to specification using standard operating procedures.</p> <p>4.12 Mold is secured according to standard operating procedures.</p> <p>4.13 Pouring basin is selected or manufactured to specification and positioned in accordance with standard operating procedures.</p>
<p>5. Clean and restore work area</p>	<p>5.1 All materials/debris is cleared and work site cleaned and left in a safe state.</p> <p>5.2 Unwanted treated sand is disposed of according to standard operating procedures and legislative and statutory requirements.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials	1.1 Binders 1.2 Hardeners 1.3 Sand additives 1.4 Mold coatings
2 Patterns	2.1 Flatback 2.2 Uneven 2.3 Plated patterns 2.4 Multi-joint 2.5 Consumable 2.6 Split patterns 2.7 Loose piece patterns 2.8 Patterns requiring odd sides 2.9 Cored moulds 2.10 Drag and cope mould etc.
3 Molds	3.1 Flatback 3.2 Uneven jointed 3.3 Multi-part molds
4 Molding media	4.1 Green sand 4.2 Shell sand 4.3 Chemically bonded media etc.
5 Parting and stripping systems	5.1 Dry 5.2 Wet
6 Runners	6.1 Hand-formed 6.2 Pattern-formed
7. Secured	6.1 Weights 6.2 Clamps 6.3 Bolting
8. Core	8.1 Full 8.2 Half 8.3 Segment cores
9. Pouring basin	9.1 Hand-formed 9.2 Pattern-formed

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Identified job requirements. 1.2 Determined sequence of operation. 1.3 Selected, inspected and prepared pattern equipment. 1.4 Made mould. 1.5 Cleaned and restored work area.
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Metal casting process 2.2 Variety of pattern types and their application 2.3 Pattern assembly techniques 2.4 Selection of moulding box 2.5 How to select ancillary components 2.6 Sand types and their bonding systems 2.7 Compaction processes 2.8 Parting and stripping systems 2.9 Mould requirements 2.10 Finishing and closing techniques 2.11 Core placement 2.12 Pouring requirements 2.13 Securing systems 2.14 Pattern care and storage 2.15 Environmental requirements 2.16 Use and application of personal protective equipment 2.17 Safe work practices and procedures 2.18 Hazards and control measures associated with producing moulds and cores by hand (jobbing)
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Interpreting written instruction sketches and drawings 3.2 Assembling and positioning pattern in the moulding box 3.3 Positioning ancillary methoding components 3.4 Preparing moulding media 3.5 Filling and compacting the mould assembly 3.6 Stripping the pattern 3.7 Inspecting the mould 3.8 Finishing the mould 3.9 Positioning cores in prints 3.10 Closing moulds 3.11 Placing pouring basin 3.12 Securing mould 3.13 Following oral instruction 3.14 Entering routine and familiar information onto proforma and standard workplace forms.
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation required. 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

5. Method of assessment	Competency MUST be assessed through: 5.1 Observation with Questioning 5.2 Demonstration with Questioning 5.3 Portfolio 5.4 Third party report
6 Context of assessment	6.1 This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2 Where assessment occurs off-the-job, appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with producing jobbing moulds and cores by hand or other units requiring the exercise of the skills and knowledge covered by this unit. 6.4 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team

UNIT OF COMPETENCY: PRODUCE CORES BY HAND (JOBGING)

UNIT CODE: ALT812303

UNIT DESCRIPTOR: This unit covers hand making of sand cores for metal casting.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify job requirements	1.1 Job requirements are correctly identified from drawings, instructions and specifications. 1.2 Material is selected appropriate to job requirements.
2. Determine sequence of operation	2.1 Sequence of operation including job set-up is determined for maximum efficiency and to meet job specifications.
3. Select inspect and prepare core box equipment	3.1 Core box is correctly identified from specifications to standard operating procedures. 3.2 The core box is inspected to specifications, and damaged patterns are identified for repair or replacement to standard operating procedures. Core box is assembled to specification. 3.4 Core box is set up to specification according to standard operating procedures.
4 Make sand core	4.1 Core box is positioned and wires and gagers are inserted as required. Then cavity is filled with mixed core sand according to standard operating procedures. 4.2 Core box is closed and checked for compliance to component specification in accordance with standard operating procedures. 4.3 Appropriate core making equipment is selected and positioned according to standard operating procedures. 4.4 Appropriate core curing media is selected to produce core to specification. 4.5 Core is secured according to standard operating procedures. 4.6 Core curing media is used to produce core according to standard operating procedures. 4.7 Core is allowed to harden or cure 4.8 Parting and stripping systems are utilized in accordance with standard operating procedures. 4.9 Core is finished by removing fins and protrusions, and then coated with refractory core wash. 4.10 Core is secured and stored according to standard

	<p>operating procedures.</p> <p>4.11 Core box is inspected and repaired as required.</p> <p>4.13 Core box is cleaned and painted according to specification using standard operating procedures.</p>
<p>5. Clean and restore work area</p>	<p>5.1 All materials/debris is cleared and work site cleaned and left in a safe state.</p> <p>5.2 Unwanted treated sand is disposed of according to standard operating procedures and legislative and statutory requirements.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials	1.1 Binders 1.2 Catalyst 1.3 Sand additives 1.4 Break down agents 1.5 Mould coatings
2. Core-box	2.1 Full 2.2 Half 2.3 Segment core-box
3. Secured	3.1 Weights 3.2 Clamps 3.3 Bolting
4. Core curing media	4.1 Silica sand 4.2 Chromite sand 4.3 Shell sand 4.4 Sodium silicate 4.5 Breakdown agents 4.6 Chemically bonded media etc.
5. Parting and stripping systems	5.1 Dry 5.2 Wet

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Demonstrated the competency to produce jobbing molds and cores by hand.
2. Underpinning knowledge and attitudes	<ul style="list-style-type: none"> 2.1 Metal casting process 2.2 Core box types, assembly techniques and their application 2.3 Selection of core box and ancillary components 2.4 Sand types and their bonding systems 2.5 Compaction processes 2.6 Parting and stripping systems 2.7 Mold requirements 2.8 Finishing and closing techniques 2.9 Core placement 2.10 Pouring requirements 2.11 Securing systems 2.12 Core box care and storage 2.13 Environmental requirements 2.14 Use and application of personal protective equipment 2.15 Safe work practices and procedures 2.16 Hazards and control measures associated with producing cores by hand (jobbing)
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Interpreting written instruction sketches and drawings 3.2 Assembling and positioning core box 3.3 Positioning ancillary methoding components 3.4 Preparing core making media 3.5 Filling and compacting the core box assembly 3.6 Stripping, inspecting, finishing the core box 3.7 Following oral instruction 3.8 Entering routine and familiar information onto proforma and standard workplace forms
4. Resource implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation required 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and references
5. Method of assessment	<p>Competency MUST be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with questioning 5.2 Demonstration with questioning 5.3 Portfolio 5.4 Third party report
6. Context of assessment	<ul style="list-style-type: none"> 6.1 This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2 Where assessment occurs off the job, an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.

UNIT OF COMPETENCY: OPERATE SAND MOLDING MACHINES

UNIT CODE: ALT812304

UNIT DESCRIPTOR: This unit covers operating automatic and semi-automatic sand molding and core making machines

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Determine job requirements	1.1 Instructions and specifications are interpreted correctly.
2. Conduct pre-operational checks	2.1 Pattern is selected and inspected to specifications and cleaned as required. Damaged patterns/core boxes are identified for repair or replacement to standard operating procedures. 2.2 Pattern is set up in bolster and core box according to standard operating procedures.
3. Operate machine to produce mould/cores	3.1 Appropriate molding media is selected to produce mould and core to specification. 3.2 Moulds are filled to specification according to standard operating procedures. 3.3 Machine is operated in accordance with standard operating procedures. 3.4 Machine is unloaded safely to standard operating procedures. 3.5 Moulds are stripped, inspected and painted as required according to standard operating procedures.
4. Assemble moulds/cores	4.1 Molds are dried and vented as required to specification and closed in accordance with standard operating procedures. 4.2 Runner bush is set to specification as required.
5. Clean and restore work	5.1 All material/debris is cleared and work site is cleaned and left in a safe state.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Molding media	Molding media may include the following or as appropriate for the particular machine: 1.1 Shell 1.2 Chemically bonded 1.3 Green sand
2. Machine	2.1 Automatic molding machine 2.2 Semi-automatic molding machine

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. Determined job requirements 1.2. Conducted pre- operational checks 1.3. Operated machine to produce mold/cores 1.4. Assembled molds/cores 1.5. Cleaned and restored work
<p>2. Underpinning knowledge and attitudes</p>	<ol style="list-style-type: none"> 2.1 Characteristics and applications of sand and binding agents 2.2 Machine operation, fault identification, analysis and rectification procedures 2.3 Core selection and loading procedures 2.4 Use and application of personal protective equipment 2.5 Safe work practices and procedures 2.6 Hazards and control measures associated with operating sand moulding machines.
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> 3.1 Interpreting written instructions and specifications 3.2 Preparing and installing pattern 3.3 Programming operating parameters 3.4 Operating and monitoring moulding machines 3.5 Assembling molds 3.6 Inserting cores (in moulding machines) 3.7 Inserting runner bushes 3.8 Maintaining integrity of mold 3.9 Maintaining integration of interrelated metal melting, core making and sand mixing processes 3.10 Maintaining operational capability of molding machines 3.11 Entering routine and familiar information onto proformas and standard workplace forms
<p>4. Resource implications</p>	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation required 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
<p>5. Method of assessment</p>	<p>Competency MUST be assessed through:</p> <ol style="list-style-type: none"> 5.1. Observation with questioning 5.2. Demonstration with questioning 5.3. Portfolio 5.4. Third party report
<p>6. Context of assessment</p>	<ol style="list-style-type: none"> 6.1. This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.

UNIT OF COMPETENCY: OPERATE SAND CORE MAKING MACHINES

UNIT CODE: ALT812305

UNIT DESCRIPTOR: This unit covers operating automatic and semi-automatic sand moulding and core making machines

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Determine job requirements	1.1 Instructions and specifications are interpreted correctly.
2. Conduct pre-operational checks	2.1 Core box is selected and inspected to specifications and cleaned as required. Damaged core boxes are identified for repair or replacement to standard operating procedures. 2.2 Core box is set up in bolster according to standard operating procedures.
3. Operate machine to produce cores	3.1 Appropriate core making media is selected to produce core to specification. 3.2 Cores are filled to specification according to standard operating procedures. 3.3 Machine is operated in accordance with standard operating procedures. 3.4 Machine is unloaded safely to standard operating procedures. 3.5 Cores are stripped, inspected and painted as required according to standard operating procedures.
4. Assemble cores	4.1 Cores are dried, glued and vented as required to specification and closed in accordance with standard operating procedures.
5. Clean and restore work	5.1 All material/debris is cleared and work site is cleaned and left in a safe state.

RANGE OF VARIABLES

VARIABLE	RANGE
1 Core Making Media	1.1 Shell 1.2 Chemically bonded sand as appropriate for the particular machine
2 Machine	2.1 Automatic core making or core blowing machine 2.2 Semi-automatic core making or core blowing machine

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Determined job requirements. 1.2 Conducted pre- operational checks. 1.3 Operated machine to produce cores. 1.4 Assembled cores. 1.5 Cleaned and restored work.
<p>2. Underpinning knowledge and attitudes</p>	<ul style="list-style-type: none"> 2.1 Characteristics and applications of sand and binding agents 2.2 Machine operation, fault identification, analysis and rectification procedures 2.3 Core selection and loading procedures 2.4 Use and application of personal protective equipment 2.5 Safe work practices and procedures 2.6 Hazards and control measures associated with operating and moulding and core making machines
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Interpreting written instructions and specifications 3.2 Preparing and installing core box 3.3 Programming operating parameters 3.4 Operating and monitoring core making machines 3.5 Assembling cores 3.6 Maintaining integrity of core 3.7 Maintaining integration of interrelated metal melting, 3.8 Core making and sand mixing processes 3.9 Maintaining operational capability of moulding and core making machines 3.10 Entering routine and familiar information onto proformas and standard workplace forms
<p>4. Resource implications</p>	<p>The following resources MUST be provided</p> <ul style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation required 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
<p>5. Method of assessment</p>	<p>Competency MUST be assessment through:</p> <ul style="list-style-type: none"> 5.1 Observation with Questioning 5.2 Demonstration with Questioning 5.3 Portfolio 5.4 Third party report
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 6.1 This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2 Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.

UNIT OF COMPETENCY: POUR MOLTEN METAL TO MOLDS

UNIT CODE: ALT812306

UNIT DESCRIPTOR: This unit covers the competency in manually pouring molten metal. to molds

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Prepare for pouring molten metal	1.1 The condition of the mould is checked according to standard operating procedures. 1.2 The condition of the ladle is checked according to standard operating procedures. 1.3 The temperature of molten metal is checked for conformance to specification, and pouring method is sequenced to standard operating procedures. 1.4 The capacity of the required pour is identified against specification according to standard operating procedures.
2. Preheat or prepare ladle	2.1 The ladle is preheated/ prepared to receive molten metal.
3. Transfer ladle to pouring area	3.1 Safety clips are checked according to standard operating procedures. 3.2 The ladle is filled and transferred to the pouring area in accordance with standard operating procedures. 3.3 Additives are determined from specification and added to molten metal as required.
4. Maintain quality of metal as required	4.1 Slag/dross is removed where necessary. 4.2 The temperature is monitored as required. 4.3 Chemical analysis is undertaken and remedial action is applied as required to standard operating procedures.
5. Pour molten metal	5.1 Personnel in the immediate area of the metal pour are informed that pour is to take place and appropriate safety clothing and equipment is used as specified in standard operating procedures. 5.2 Metal is poured safely to specification and in accordance with standard operating procedures. 5.3 Metal is poured at an appropriate and continuous rate. 5.4 A test bar is poured in accordance with standard operating procedures as required. The ladle is emptied of excess metal and cleaned and maintained according to standard operating procedures. Ladle is returned to appropriate location.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Ladle	1.1 Lip pour 1.2 Tea pot 1.3 Bottom pour 1.4 Barrel 1.5 Bull ladles of varying capacity
2. Additives	2.1 Alloys 2.2 Inoculants 2.3 Spheroidisers 2.4 Coagulants

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Prepared for pouring molten metal 1.2 Preheated or prepared ladle 1.3 Transferred ladle to furnace 1.4 Poured molten metal and maintained quality of metal as required
2. Underpinning knowledge and attitudes	<ul style="list-style-type: none"> 2.1 Types and pouring characteristics of metals 2.2 Types and characteristics of ladles 2.3 Procedures for maintaining condition and integrity of ladle 2.4 Procedure on safe handling and transfer of molten metal 2.5 Metal treatments procedures for making additions to molten metal 2.6 Slag and dross removing procedures 2.7 Techniques for sampling/testing molten metal pouring 2.8 Metal identification and tagging procedures 2.9 Use and application of personal protective equipment 2.10 Safe work practices and procedures 2.11 Hazards and control measures on pouring molten metal
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Reading and following written instructions, standard operating procedures, specifications and standard test data sheets 3.2 Selecting and checking ladle 3.3 Preparing ladle for pouring 3.4 Transferring metal to ladle 3.5 Treating metal 3.6 Removing slag and dross 3.7 Sampling and testing molten metal 3.8 Pouring molten metal into moulds and pigs 3.9 Tagging pig metal
4. Resource implications	<p>The following resources MUST be provided</p> <ul style="list-style-type: none"> 4.1 Workplace area: Simulated or actual 4.2 Access to all tools, equipment, materials and documentation required 4.3 Relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
5. Method of assessment	<p>Competency MUST be assessment through:</p> <ul style="list-style-type: none"> 5.1 Observation with Questioning 5.2 Demonstration with Questioning 5.3 Portfolio 5.4 Third party report
6 Context of assessment	<ul style="list-style-type: none"> 6.1 This unit may be assessed on-the-job, off-the-job or a combination of both on-and off-the-job. 6.2 Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. 6.3 The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.

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> <ul style="list-style-type: none">1.1 <i>Measurement of dimensions and variables</i> are completed without causing damage to any instrument or components1.2 Appropriate <i>measuring instrument</i> is selected1.3 Relevant <i>measuring techniques</i> are used and results appropriately recorded1.4 All measuring activities are carried out according to industry regulations/guidelines <i>OHS & requirements</i> and enterprise/procedures policies
2. Maintain measuring instrument	<ul style="list-style-type: none">2.1 Maintenance of measuring instrument is achieved without causing damage to any instrument or component2.2 <i>Routine care and storage of measuring instrument</i> is undertaken according to manufacture specifications2.3 Checking and calibrating of measuring devices is done prior to use.2.4 All maintenance activities of measuring instruments are carried out according to industry regulations/guidelines OHS legislation, and enterprise procedures policies

RANGE OF VARIABLES

VARIABLE	RANGE
1. Dimension and Variables Measurement	1.1 Length 1.2 Width 1.3 Diameter 1.4 Tapes 1.5 Machinery Allowance 1.6 Angles
2. Measuring instrument and tools	2.1 Handtools 2.2 Vernier Caliper 2.3 Straight edge 2.4 Inside Caliper 2.5 T-squares, 2.6 Flat edges, 2.7 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 micrometer 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 3.4 Using measuring instrument
4 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
5 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
6 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 MOLDING NC II.

3.1 CURRICULUM DESIGN

Course Title: **FOUNDRY MOULDING**

NC Level: **NC II**

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

Course Description:

This course is designed to equip individual with competency to produce all types of molds and cores using different kinds of binders and sand manually or with the use molding machines and core making machines.

It also includes competencies on interpreting specifications, drawings, technical sketches and/or customer requirements. Tasks undertaken would also include utilizing appropriate sand binding agents, patterns, core boxes and proper machineries using principles and techniques; designated procedures, correct and appropriate tools and equipment; inspection, measure and repair procedures; sets up and operates variety of specialized molding and core making machines and uses precision measuring instrument in operating and maintaining patterns and molding equipment.

This course is also designed to provide basic and common skills to equip individual with operational skills in foundry molding.

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

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
4. Perform Shop Maintenance	4.1 Inspect/clean tools and work area 4.2 Store/arrange tools and shop equipment 4.3 Dispose wastes/used lubricants 4.4 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. Prepare and Mix Sand for Molding and Coremaking	1.1 Load mixer (mill/muller) 1.2 Mix sand 1.3 Take and test samples 1.4 Discharge mixture 1.5 Clean mixer	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report
2. Produce Molds by Hand (Jobbing)	2.1 Identify job requirements 2.2 Determine sequence of operation 2.3 Select inspect and prepare pattern equipment 2.4 Make mould 2.5 Clean and restore work area	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report
3. Produce Core by hand (Jobbing)	3.1 Identify job requirements 3.2 Determine sequence of operation 3.3 Select inspect and prepare core box equipment 3.4 Make sand core 3.5 Clean and restore work area	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report
4. Operate Sand Molding Machine	4.1 Determine job requirements 4.2 Conduct pre- operational checks 4.3 Operate machine to produce mould/cores 4.4 Assemble moulds/cores 4.5 Clean and restore work	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report
5. Operate Sand Core Making Machine	5.1 Determine job requirements 5.2. Conduct pre- operational checks 5.3 Operate machine to produce cores 5.4 Assemble cores 5.5 Clean and restore work	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report

6. Pour Molten Metal	6.1 Prepare for pouring molten metal 6.2 Preheat or prepare ladle 6.3 Transfer ladle to furnace 6.4 Pour molten metal	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report
7. Use and Maintain Measuring Instrument	7.1 Measure dimensions or variables using appropriate instrument 7.2 Maintain measuring instrument	<ul style="list-style-type: none"> • Lecture/ Demonstration • Discussion • Dual training 	<ul style="list-style-type: none"> • Observation w/ questioning • Demonstration of practical skills • Portfolio • Third party report

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 background 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 MOLDING NC II

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

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
2 sets	Box wrench	1 set	Sand muller (250Kgs capacity)	5 tons	Silica sand (minimum 96% silica)
2 sets	Open wrench	1 set	Sand mixer (250Kgs capacity)	5 tons	Chromite sand
2 sets	Socket wrench	1 set	1-AS or 3-DS shell core	2 tons	Resin bonded shell core sand
2 pcs	Adjustable wrench (300mm)	1 set	Air compressor (50hp)	500Kgs	Bentonite (Volclay)
2 pcs	Screwdriver (Minus 200mm)	1 set	CO ₂ gas regulator	400Kgs	Sodium silicate (ratio 2.5 - 3)
2 pcs	Screwdriver (Philips 200mm)	1 set	LPG burner	50Kgs	Sea coal
2 pcs	Electrical pliers	1 set	Weighing scale 50Kgs capacity	100Kgs	Molasses
2 sets	Stopwatch with lap time	2 sets	Working bench (1m x 2m x 1m)	5Kgs	Parting compound (Dry)
3 pcs	Shovel	1 set	Weighing scale 100Kgs capacity	10Kgs	Graphite coating
2 sets	Spray gun	2 sets	Weighing scale 15Kgs capacity	10Kgs	Magnesia based coating
4 pcs	Wood mallet	4 sets	Molding box (16"x20"x6")	5 cylinder	LPG 50Kgs capacity
10 pcs	Paint brush (1")	1 set	Spirit based leveling device	2Kgs	Grease
10 pcs	Paint brush (2")	1 set	A-crane (1 ton capacity)	50m	Wire rope (1/2" dia, 6 strand)

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
4 sets	Blow gun	1 set	Hoist (1 ton capacity)	50m	Air hose (1/4 dia)
12 pcs	Calulator (regular)	1 set	F-D2 molding machine	10sqm	Wire screen (mesh #2 / #4)
2 pcs	Water container (60 liters capacity)	2 pcs	Tooth box with wheel	4 sets	Molding tools
5m	Shafting (5mm dia)	1 sets	Oil dispenser	20 Liters	Methanol
5m	Shafting (20mm dia)	1 set	Pattern (Cope and drag)	2m	Copper tube (10mm OD)
6 pcs	Eye bolt (12mm dia)	2 sets	Molding corebox	36pairs	Cotton gloves
2 sets	Box wrench	1 set	Sand muller (250Kgs capacity)	5 tons	Silica sand (minimum 96% silica)
2 sets	Open wrench	1 set	Sand mixer (250Kgs capacity)	5 tons	Chromite sand
2 sets	Socket wrench	1 set	1-AS or 3-DS shell core	2 tons	Resin bonded shell core sand
4 pcs	Claw hammer	2 pcs	White board (1m x 2m each)	24 pcs	Broom (ting-ting)
4 pcs	Ballpein hammer	2 sets	Storage cabinet	20 pcs	Broom (tambo)
2 pcs	Long nose pliers	2 pcs	Open shelf	4 pcs	Push broom
2 sets	Steel rule (1m long)	1 set	Shell corebox for 1-AS or 3-DS with ejector plate, burner plate, ejector pin	50Kgs	Cleaning rags
2 sets	Hack saw with blade	1 set	Loose piece pattern	24 sets	Goggles
2 sets	Vernier caliper (300mm)		Oxyacetylene regulator with hose and cutter / welding tip	12 sets	Hard hat
6 pcs	Steel brush	4 cylinder	Oxygen gas	12 sets	Safety shoes
1 set	Oil dispenser	2 cylinder	Acetylene gas	24 sets	T-shirt
1 set	Grease gun	1 set	Welding machine (200-300amperes)	200Liters	Ecolotic Resin binder
	Training materials			2 pcs	Angular bar (2"x2"x36")
	Reference book				
	Machine manuals				
	Foundry supplies catalogues / brochures				
	CD / Video tapes				
	Notebook				
	Ballpen				
	Pencil				
	Pentel pen				

3.5 TRAINING FACILITIES FOUNDRY MOLDING 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	12.25 per student	147
• 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

3.6 TRAINER'S QUALIFICATIONS FOR AUTOMOTIVE SECTOR MANUFACTURING SUB-SECTOR

FOUNDRY MOLDING NC II

TRAINER QUALIFICATION (TQ II)

- Must be a holder of Foundry Molding 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 Demonstration of competence through project-type assessment covering all required units of competency of the qualification.
- 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 MOLDING 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 MOLDING 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. **Carbon Dioxide Process** **Carbon Dioxide Process** consists 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.

THE TECHNICAL AND INDUSTRY EXPERT PANEL FOUNDRY-MOLDING

Antonio A. Gimenez

Philippine Automotive
Federation, Inc. (PAFI)

Cesar R. Leal

Philippine Automotive
Federation, Inc. (PAFI)

Elmo N. Serbito

PAFI (Samahan ng mga
Manggagawang Supercast)

Carina J. Bondad

(Administrative Staff)

The PARTICIPANTS in the National Validation of this Training Regulation

- (Supercast Foundry & Machinery Corp. SFMC)
- Philippine Aluminum Wheels Inc. (PAWI)
- Toyota Auto Parts Phils. Inc.
- Philippine Resin Sand (PRS)
- ASPEC Corp.
- Philippine Phosphate (PHILPHOS)

Members of the TESDA Board

The MANAGEMENT and STAFF of the TESDA Secretariat
TESDA EXCOM

Qualification and Standards Office

Florante P. Inoturan

Agnes P. Panem

Abel B. Elpedes