

**THE REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**AUTOBODY TECHNICIAN LEVEL 5**

**ISCED CODE: 0716 454A**

# FOREWORD

The provision of quality education and training is fundamental to the government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training.

This policy document requires that training in TVET institutions be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery to allow for multiple entry and exit in TVET programmes. These reforms demand that industry takes a leading role in occupational standards development to ensure it addresses competence needs.

It is against this background that these Occupational Standards have been developed for a competency-based Automotive Engineering standard. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a key role towards development of competent human resource for the engineering sector’s growth and development.

# PREFACE

Kenya Vision 2030 aims to transform the country into “a newly industrializing, middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace competency-based education and training (CBET).

The Technical and Vocational Education and Training (TVET) Act No. 29 of 2013 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

Incumbent Automotive engineering industry experts in conjunction with expert subject trainers and other related stakeholders have developed these Occupational Standards for Auto body Technician Level 6. These standards will be the basis for development of competency-based curriculum for Auto body Technician Level 6.

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to everyone who participated in the development of these Occupational Standards.

# ACRONYM

CAD: Computer-Aided Design

CAE: Computer-Aided Engineering

CBET Competency Based Education and Training

CPU Central Processing Unit

ICT Information Communication Technology

ISO: International Organization of Standardization

LAN: Local Access Network

MIG: Metal Inert Gases

PLC: Programmable Logic Controller

PPE Personal Protective Equipment

TIG: Tungsten Inert Gas

TVETA Technical and Vocational Education Training Authority

OSHA Occupational Health and Safety Act

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

TVET Technical and Vocational Education and Training

RAM Random Access Memory

HDMI High-Definition multimedia interface

USB Universal Serial Bus

# KEY TO UNIT CODE



**TABLE OF CONTENTS**

[FOREWORD 2](#_Toc197093315)

[PREFACE 3](#_Toc197093316)

[ACRONYM 4](#_Toc197093317)

[KEY TO UNIT CODE 5](#_Toc197093318)

[OVERVIEW 7](#_Toc197093319)

[BASIC UNITS OF COMPETENCY 9](#_Toc197093320)

[APPLY DIGITAL LITERACY 10](#_Toc197093321)

[APPLY COMMUNICATION SKILLS 21](#_Toc197093322)

[APPLY WORK ETHICS AND PRACTICES 26](#_Toc197093323)

[APPLY ENTREPRENEURIAL SKILLS 34](#_Toc197093324)

[COMMON UNITS OF COMPETENCY 42](#_Toc197093325)

[APPLY WORKSHOP TECHNOLOGY 43](#_Toc197093326)

[APPLY MATHEMATICS 48](#_Toc197093327)

[APPLY TECHNICAL DRAWINGS 52](#_Toc197093328)

[APPLY MECHANICAL SCIENCE 59](#_Toc197093329)

[APPLY ELECTRONICS AND CONTROL PRINCIPLES 63](#_Toc197093330)

[CORE UNITS OF COMPETENCY 70](#_Toc197093331)

[WELD VEHICLE STRUCTURE I 71](#_Toc197093332)

[REPAIR VEHICLE BODY 77](#_Toc197093333)

[PERFORM VEHICLE FIBRE WORKS 82](#_Toc197093334)

[PERFORM VEHICLE BODY SURFACE PREPARATION 86](#_Toc197093335)

[PERFORM VEHICLE SPRAY PAINTING 91](#_Toc197093336)

[PERFORM VEHICLE BODY VALETING 95](#_Toc197093337)

[INSTALL VEHICLE GLASS COMPONENTS 99](#_Toc197093338)

[PERFORM GLAZING FINISHING PROCESSES 104](#_Toc197093339)

[INSTALL VEHICLE GLASS COMPONENTS 109](#_Toc197093340)

[WELD VEHICLE STRUCTURE II 114](#_Toc197093341)

[DESIGN VEHICLE BODY 121](#_Toc197093342)

[TRIM VEHICLE BODY 126](#_Toc197093343)

[FABRICATE VEHICLE STRUCTURE 131](#_Toc197093344)

[ASSEMBLE VEHICLE BODY PARTS 138](#_Toc197093345)

# OVERVIEW

Auto body Technology level 5 qualifications consist of competencies that an individual must achieve repair and maintain vehicle body. It includes designing vehicle body, fabricating automotive structure, welding vehicle body parts, restoring vehicle structure, repairing vehicle body, spray painting vehicle body, trimming vehicle body, assembling vehicle body parts and performing vehicle preventive maintenance

This course consists of the following basic, common and core units of competency as shown below:

|  |  |
| --- | --- |
| **BASIC UNITS OF COMPETENCY** | |
| 0611 441 01A | Apply Digital Literacy |
| 0031 441 02A | Apply Communication Skills |
| 0417 441 03A | Work Ethics and Practices |
| 0413 441 04A | Apply Entrepreneurial Skills |
| **COMMON UNITS OF COMPETENCY** | |
| 0715 451 05A | Apply Workshop Technology |
| 0541 441 06A | Apply Mathematics |
| 0732 451 07A | Apply Technical Drawing |
| 0715 441 09A | Apply Engineering Mechanics Principles |
| 0713 441 08A | Apply Electronics and Control Principles |
| 0732 551 10A | Perform Computer Aided Drawing |
| 0541 541 11A | Apply Engineering Mathematics |
| 0715 541 12A | Apply Engineering Mechanics Principles |
| 0715 541 13A | Apply Thermodynamics and Fluid Mechanics |
| **CORE UNITS OF COMPETENCY** | |
| 0716 251 14A | Weld Vehicle Structure I |
| 0716 251 15A | Repair Vehicle Body |
| 0716 251 16A | Perform Vehicle Fibre Works |
| 0716 351 17A | Perform Vehicle Body Surface Preparation |
| 0716 351 18A | Perform Vehicle Spray Painting |
| 0716 351 19A | Perform Vehicle Body Valeting |
| 0716 451 20A | Install Vehicle Glass Components |
| 0713 451 21A | Perform Glazing Finishing Processes |
| 0716 451 22A | Maintain Glass Components |
| 0716 551 23A | Weld Vehicle Structure II |
| 0716 551 24A | Design Vehicle Body |
| 0716 551 25A | Trim Vehicle Body |
| 0716 551 26A | Fabricate Vehicle Structure |
| 0716 551 27A | Assembly Vehicle Body |

# BASIC UNITS OF COMPETENCY

# APPLY DIGITAL LITERACY

**UNIT CODE:** 0611 451 01A

**UNIT DESCRIPTION:**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, accessing online/offline data and information, performing online communication and collaboration, applying cybersecurity skills and performing jobs online. It also involves applying job entry techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the range)*** |
| --- | --- |
| 1. Operate computer devices | * 1. C***omputer device*** usage is determined as per workplace requirements.   2. ***Computer hardware*** is identified according to job requirements.   3. ***Computer software*** is identified according to workplace requirements.   4. Computer devices are turned on or off as per the correct workplace procedure.   5. ***Mouse techniques*** are applied in solving tasks as per workplace requirements.   6. Keyboardtechniques are applied in solving tasks as per workplace requirements.   7. Computer files and folders are created and managed as per workplace requirements.   8. ***Internet connection option***s are identified and applied in connecting computer devices to the Internet.   9. ***External devices*** are identified and connected to the computer devices as per the job requirement. |
| 1. Solve tasks using Office suite | 1. ***Word processing concepts***are applied in solving workplace tasks as per job requirements. 2. Worksheet data is entered and prepared in accordance with work procedures. 3. Worksheet data is built and edited in accordance with workplace procedures. 4. ***Data manipulation*** on a worksheet is undertaken in accordance with work requirements. 5. Worksheets are saved and printed in accordance with job requirements. 6. ***Electronic presentation concepts***are applied in solving workplace tasks as per job requirements. |
| 1. Manage data and information | * 1. Office ***internet services*** are identified and applied in accordance with office procedures.   2. ***Internet access applications*** are determined in accordance with office operation procedures.   3. Internet search is performed as per job requirements.   4. Online digital content is downloaded in accordance with workplace requirements.   5. Digital content is identified and backed up in accordance with workplace procedures. |
| 1. Perform online communication and collaborations | * 1. Netiquette principles are observed as per work requirements.   2. Electronic mail communication is executed in accordance with workplace policy.   3. Digital content copyright and licenses are identified and applied according to workplace policies and regulatory requirements.   4. ***Online*** ***collaboration tools*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Apply cybersecurity skills | * 1. ***Data protection*** and ***privacy*** is classified in accordance with workplace policies and regulatory requirements.   2. ***Internet security threats*** are identified as per workplace policies and regulatory requirements.   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   4. ***Cybersecurity control measures*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Perform online jobs | * 1. ***Online job platforms*** are identified as per the job requirements.   2. Online accounts and profiles are created in accordance with the work requirements.   3. Online jobs are identified according to the bidder’s skillset.   4. Online digital identity is managed according to industry best practices.   5. Online job bidding is done as per the specific job requirements.   6. Online tasks are executed according to the job requirements.   7. Personal online payment account is managed in accordance with financial regulations. |
| 1. Apply job entry techniques | * 1. ***Job opportunities*** are sought based on competencies.   2. A winning resume/CV is developed as per job advertisement.   3. An application/cover letter is developed based on the job advertisement.   4. ***certificates and testimonials*** are organized as per resume.   5. ***Interview skills*** are demonstrated as per job advertisement. |

**RANGE**

This section provides a work environment and conditions to which the performance criteria apply. It allows for a different work environment and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Computer devices may include but are not limited to: | * Desktops * Laptops * Smartphones * Tablets * Smartwatches |
| 1. Computer hardware may include but are not limited to: | * The System Unit E.g. Motherboard, CPU, casing, * Input Devices e.g. Pointing, keying, scanning, voice/speech recognition, direct data capture devices. * Output Devices e.g. hardcopy output and softcopy output * Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives * Computer Ports e.g. HDMI, DVI, VGA, USB type C |
| 1. Computer software may include but are not limited to: | * System software e.g. Operating System (Windows, Macintosh, Linux, Android, iOS) * Application Software e.g. Word Processors, Spreadsheets, Presentations etc. * Utility Software e.g. Antivirus programs |
| 1. External devices may include but are not limited to: | * Printers * Projectors * Smart Boards * Speakers * External storage drives * Digital/Smart TVs |
| 1. Word processing concepts may include but are not limited to: | * Creating word documents * Editing word documents * Formatting word documents * Saving word documents * Printing word documents |
| 1. Mouse techniques may include but are not limited to: | * Clicking * Double-clicking * Right-clicking * Drag and drop |
| 1. Internet connection options may include but are not limited to: | * Mobile Networks/Data Plans * Wireless Hotspots * Cabled (Ethernet/Fiber) * Dial-Up * Satellite * ISDN (Integrated Services Digital Network) |
| 1. Data manipulation may include but are not limited to: | * Use of formulae * Use of functions * Sorting * Filtering * Visual representation using charts |
| 1. Electronic presentation concepts may include but are not limited to: | * Creating slides * Editing slides * Formatting slides * Applying slide effects and transitions * Creating and playing slideshows * Saving presentations * Printing slides and handouts |
| 1. Internet services may include but are not limited to: | * Communication Services * Information Retrieval Services * File Transfer * World Wide Web Services * Web Services * Directory Services * Automatic Network Address Configuration * NewsGroup * Ecommerce |
| 1. Internet access applications/software may include but are not limited to: | * Browsers * Email Apps * eCommerce Apps |
| 1. Online collaboration tools may include but are not limited to: | * Online Storage * Online productivity applications * Online meetings, * Online learning environments, * Online calendars * Social networks |
| 1. Data protection and privacy may include but not limited to: | * Confidentiality of data/information * Integrity of data/information * Availability of data/information |
| 1. Internet security threats may include but not limited to: | * Malware attacks * Social engineering attacks * Software supply chain attacks * Advanced persistent threats (APT) * Distributed denial of service (DDoS) * Man-in-the-middle attack (MitM) * Password attacks * IoT Attacks * [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks) * [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware) |
| 1. Security threats control measures may include but not limited to: | * Counter measures against cyber terrorism * Physical Controls * Technical/Logical Controls * Operational Controls |
| 1. Online job platforms may include but are not limited to: | * Remotask * Data annotation.tech * Cloudworker * Upwork * Oneforma * Appen |
| 1. Job opportunities may include but not limited to: | * Self employment * Service provision * product development * salaried employment |
| 1. Certificates and testimonialsmay include but not limited to: | * Academic credentials * Letters of previous employments/ services rendered * Letters of commendation * Certifications of participation * Awards |
| 1. Interview skills may include but not limited to: | * Listening skills * Grooming * Language command * Articulation of issues * Body language * Time management * Honesty * Generally knowledgeable in current affairs and technical area |

**REQUIRED KNOWLEDGE AND SKILLS**

This section describes the knowledge and skills required for this unit of competency.

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Computer Hardware and Software Concepts
* Computer Security Concepts (Data security and privacy)
* Cyber security threats and control measures
* Understanding Computer Crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT in Kenya
* Digital Identity Management
* Netiquette Principles
* Fundamentals of Copyright and Licenses
* Word processing;
* Functions and concepts of word processing;
* Documents and tables creation and manipulations;
* Document editing;
* Document formatting;
* Word processing utilities
* Spreadsheets;
* Meaning, types and importance of spreadsheets;
* Components of spreadsheets;
* Functions, formulae, and charts, uses and layout;
* Data formulation, manipulation and application to cells;
* Editing & formatting spreadsheets;
* Presentation Packages;
* Types of presentation Packages.
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Internet connectivity.
* Browser and digital content management;
* Managing data, information, and digital content
* Electronic mail and World Wide Web
* Fundamentals of Online Working;
* Online Profile Management;
* e-Portfolio Management;
* Online Jobs Bidding;
* Online Payment Systems;
* Job entry techniques
* Job searching sites
* Interview preparation skills
* Interview handling

**Required skills**

The individual needs to demonstrate the following skills:

* Active listening
* Keyboard Skills
* Mouse Skills
* Analytical skills
* Creativity
* Interpretation Skills
* Communication
* Spreadsheet operations (applying fundamental operations such as addition, subtraction, division and multiplication)
* Computer Use Safety Skills
* Document Editing Skills
* Document Formatting Skills
* Document Printing Skills
* Netiquette Skills
* Internet Browsing Skills
* Problem Solving Skills
* Online Collaboration Skills
* Cybersecurity Skills
* CV writing
* grooming

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge, and skills range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   * 1. Operated computer devices as per workplace policies and regulations.   2. Solved tasks using the office suite as per workplace policies and regulations.   3. Manage data and information as per workplace policies and regulations.   4. Performed online communication and collaboration as per workplace policies and regulations.   5. Applied cybersecurity skills in accordance with workplace policies and regulations.   6. Executed online tasks according to the job requirements.   7. Searched for job opportunity based on competencies.   8. Prepared job requirement documentations based on job opportunity.   9. Demonstrated interview skills based on the job opportunity. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments where assessment can take place.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Oral assessment   2. Portfolio of evidence   3. Third party report   4. Written assessment   5. Practical assessment   6. Projects |
| 1. Context of assessment | Competency may be assessed:   * 1. On the job   2. In a simulated work environment. |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# APPLY COMMUNICATION SKILLS

**UNIT CODE:** 0031 441 02A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves applying communication channels, written, non-verbal, oral, and group communication skills.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Apply communication channels | 1. Specific communication channels are identified and applied based on workplace requirements. 2. Challenges are identified and addressed as per the operational standards of the organization. 3. Communication channels are evaluated to meet workplace needs. |
| 1. Apply written communication skills | * 1. Types of written communication are identified and applied according to the workplace requirements.   2. Written communication needs are identified and implemented according to workplace procedures.   3. Written communication guidelines are analyzed, evaluated, and revised based on workplace needs. |
| 1. Apply non-verbal communication skills | * 1. xisting non-verbal communication techniques are identified and applied based on organization policy.   2. Non-verbal communication techniques are articulated to enhance inclusivity according to workplace requirements.   3. Non-verbal communication techniques are modeled to enhance inclusivity according to workplace requirements. |
| 1. Apply oral communication skills | * 1. Types of oral communication are identified and established as per organization policy.   2. Pathways of oral communication are identified and established as per organization policy.   3. Pathways of oral communication are reviewed according to organization procedures.   4. Pathways of oral communication are maintained according to the organization standards. |
| 1. Apply group communication skills | 1. Group communication strategies are appliedbased on the workplace needs. 2. Groups are organized in accordance with workplace procedures. 3. Effective questioning, listening and non-verbal communication techniques are used as per needs. 4. Group communication challenges are identified and addressed according to the workplace needs. |

**RANGE**

This section provides the work environment and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Communication strategies may include but are not limited to: | * Language switch * Comprehension check * Repetition * Asking confirmation * Paraphrasing * Clarification request * Translation * Restructuring * Generalization |
| 1. Effective group interaction may include but not limited to: | * Identifying and evaluating what is occurring within an interaction in a non-judgmental way. * Using active listening. * Making decision about appropriate words, behavior. * Putting together response which is culturally appropriate. * Expressing an individual perspective. * Expressing own philosophy, ideology and background and exploring impact with relevance to communication |
| 1. Situations may include but are not limited to: | * Establishing rapport * Eliciting facts and information * Facilitating resolution of issues * Developing action plans |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Active listening
* Interpretation
* Negotiation
* Writing
* Oral skills
* Creative thinking
* Critical thinking
* Decision making
* Analytical
* Innovation
* Conflict skills
* Leadership
* Problem solving skills
* Management
* Organizational
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* Key elements of communications strategy
* Principles of effective communication
* Turn-taking techniques
* Conflict resolution techniques
* Work planning
* Work organization
* Company policies
* Company operations and procedure standards
* Fundamental rights at the workplace
* Personal hygiene
* Accountability
* Workplace problems and how to deal with them

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills, knowledge, and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency. | Assessment requires evidence that the candidate:   * 1. Identified and applied specific communication channels based on workplace requirements.   2. Identified and applied specific written communication correspondence according to the workplace requirements.   3. Applied and developed non-verbal strategies to communicate in all areas of the workplace requirements.   4. Established pathways of oral communication as per workplace policy.   5. Applied group communication strategies based on workplace needs. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place. 2. Appropriately simulated environment where assessment can take place. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Portfolio of evidence   2. Interviews   3. Third party report   4. Written assessment   5. Practical assessment   6. Projects |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY WORK ETHICS AND PRACTICES

**ISCED UNIT CODE:** 0417 441 03A

**UNIT DESCRIPTION**

This unit covers competencies required to effectively apply work ethics and practices. It involves the ability to: conduct self-management, promote ethical work practices and values, promote teamwork, manage workplace conflicts, maintain professional and personal development, apply problem-solving and promote customer care.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in Range*** |
| --- | --- |
| 1. Apply self-management skills | 1. Personal vision, mission and goals are formulated based on potential and concerning organization objectives and strategic plan 2. Self-esteem and a positive self-image are developed and maintained based on value 3. Emotional intelligence and stress management are demonstrated as per workplace requirements. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for one's actions are demonstrated based on workplace instructions. 6. Time management, attendance and punctuality are observed as per the organization’s policy. 7. Personal goals are managed as per the organization’s objective 8. Self-strengths and weaknesses are identified based on personal objectives 9. Motivation, initiative and proactivity are utilized as per the organization policy 10. Individual performance is evaluated and monitored according to the agreed targets. |
| 1. Promote ethical work practices and values | 1. Integrity is demonstrated as per acceptable norms 2. Codes of conduct is applied as per the workplace requirements 3. Policies and guidelines are observed as per the workplace requirements 4. Professionalism is exercised in line with organizational policies |
| 1. Promote Team work | 3.1 ***Teams*** are formed to enhance productivity based on organization’s objectives  3.2 Duties are assigned to teams under the organization policy.  3.3 Team activities are managed and coordinated as per set objectives.  3.4 Team performance is evaluated based on set targets as per workplace policy.  3.5 ***Conflicts*** are resolved between team members in line with organization policy.  3.6 Gender and diversity-related issues are identified and mainstreamed in accordance with workplace policy.  3.7 Healthy ***relationships*** are developed and maintained in line with the workplace.  3.8 Adaptability and flexibility are applied in dealing with team members as per workplace policies |
| 1. Maintain professional and personal development | 4.1 ***Personal growth and development*** needs are identified and assessed in line with the requirements of the job.  ***4.2 Training and career opportunities*** are identified and utilized based on job requirements.  4.3 ***Resources*** for training are mobilized and allocated based on organizations and individual skills needs.  4.4 Licenses and certifications relevant to the job and career are obtained and renewed as per policy.  4.5 Recognitions are sought as proof of career advancement in line with professional requirements.  4.6 Work priorities and personal commitments are balanced and managed based on the requirements of the job and personal objectives.  4.7 Dynamism and on-the-job learning are embraced in line with the organization’s goals and objectives. |
| 1. Apply Problem solving skills | 5.1 ***Creative, innovative*** and practical solutions are developed based on the problem  5.2 Independence and initiative in identifying and solving problems are demonstrated based on the requirements of the job.  5.3 Team problems are solved as per the workplace guidelines  5.4 Problem-solving strategies are applied as per the workplace guidelines  5.5 Problems are analyzed and assumptions tested as per the context of data and circumstances |
| 1. Promote Customer Care | 6.1 Customers' needs are identified based on their characteristics  6.2 Customer ***feedback*** is allowed and facilitated in line with organization policies.  6.3 Customer concerns and complaints are analyzed and resolved in line with the set organizational culture.  6.4 Proactive customer outreach programs are implemented as per organizational policies  6.5 Customer retention strategies are developed and implemented in line with the organizational policy |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Feedback may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. Conflicts include but are not limited to: | * Interpersonal Conflict. * Intrapersonal Conflict. * Intergroup Conflict. * Intragroup Conflict. |
| 1. Relationships may include but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| 1. Team may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group * Virtual teams |
| 1. Personal growth may include but not limited to: | * Growth in the job * Career mobility * Gains and exposure the job gives * Net workings * Benefits that accrue to the individual as a result of noteworthy performance |
| 1. Personal objectives may include but not limited to: | * Long term * Short term * Broad * Specific |
| 1. Trainings and career opportunities may include but not limited to | * Participation in training programs * Serving as Resource Persons in conferences and workshops * Capacity building |
| 1. Resource may include may but not limited to: | * Human * Financial * Technology |
| 1. Creative and innovative may include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| 1. Emerging issues may include but not limited to: | * Artificial Intelligence * Data confidentiality * National cohesion * Open offices |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Active listening
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Problem solving
* Decision Making
* Leadership
* Creative/innovative thinking
* Adaptability
* Conflict management
* Emotional intelligence
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies and procedures
* Company operations, procedures and standards
* Flexibility and adaptability
* Concept of time and leisure time
* Decision making
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender and diversity mainstreaming
* Drug and substance abuse
* Professional growth and development
* creativity
* Innovation
* problem solving
* customer care
* mentoring and coaching.
* Emerging issues

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment require evidence that the candidate:   * 1. Applied self-management skills as per organizational procedures.   2. Promoted ethical practices and values as per organizational procedures.   3. Promoted Teamwork as per workplace assignments.   4. Maintained professional and personal development as per organizational procedures.   5. Applied Problem-solving skills based on work requirements.   6. Identified customer needs based on their characteristics.   7. Gave back Customer feedback in line with organization policies. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Oral questioning 2. Written test 3. Portfolio of Evidence 4. Interview 5. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY ENTREPRENEURIAL SKILLS

**ISCED UNIT CODE:** 0413 441 04A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate an understanding of entrepreneurship. It involves demonstrating an understanding of financial literacy, applying entrepreneurial concepts identifying entrepreneurship opportunities, applying business legal aspects, developing business innovative strategies, and developing business plans.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in Range*** |
| --- | --- |
| 1. Apply Financial Literacy | 1. **Sources of personal and business** ***funds*** are identified as per financial procedures and standards 2. Personal finances are managed as per financial procedures and standards 3. Savings are managed as per financial procedures and standards 4. Debts are managed as per financial procedures and standards 5. Investments are undertaken as per financial procedures and standards 6. Insurance services are procured as per financial procedures and standards |
| 1. Apply entrepreneurial concept | 1. Entrepreneurs and Business persons are distinguished as per principles of entrepreneurship 2. ***Types of entrepreneurs*** are identified as per principles of entrepreneurship 3. Ways of becoming an entrepreneur are identified as per principles of Entrepreneurship 4. ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship 5. Salaried employment and self-employment are distinguished as per principles of entrepreneurship 6. ***Requirements for entry into self-employment*** are identified according to business procedures and standards 7. Roles of an Entrepreneur in an enterprise are determined according to business procedures and standards 8. **Contributions of entrepreneurship** to National development are identified as per business procedures and standards |
| 1. Identify entrepreneurial opportunities | 1. Business ideas are identified as per business procedures and standards 2. Factors to consider when evaluating business opportunity viability are explored based on business procedure and standards 3. Entrepreneurial opportunities are evaluated as per business procedures and standards 4. Business ideas and opportunities are generated as per business procedures and standards 5. Business life cycle is analysed as per business procedures and standards |
| 1. Apply business legal aspects | 1. ***Forms of business ownership*** are identified as per legal procedures and practices 2. Business Registration and Licensing processes are identified as per legal procedures and practices 3. Types of Contracts and Agreements are analysed as per legal procedures and practices 4. Employment Laws are identified as per legal procedures and practices 5. Taxation laws are identified as per legal procedures and practices |
| 1. Innovate Business strategies | 1. Business innovation strategies are determined by the organization standards 2. Creativity in business development is demonstrated in accordance with business standards 3. ***Innovative business standards***  are developed as per business principles 4. Linkages with other entrepreneurs are created as per best practice 5. ICT is incorporated in business growth and development as per best practice |
| 1. Develop Business Plan | 1. Business idea is described as per business procedures and standards 2. Business description is developed as per business plan format 3. Marketing plan is developed as per business plan format 4. Organizational/Management plan is prepared in accordance with business plan format 5. Production/operation plan is prepared in accordance with business plan format 6. Financial plan is prepared in accordance with the business plan format 7. Executive summary is prepared in accordance with business plan format 8. Business plan is presented as per best practice 9. Business ideas are incubated as per institutional policy. |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Sources of personal funds mayinclude but not limited to: | * Salary/Wages * Investments * Savings * Inheritance * Government Benefits |
| 1. Sources of business finance mayinclude but not limited to: | * Equity Financing * Debt Financing, * Personal Savings/Investment * Retained Earnings * Grants and Subsidies * Crowdfunding * supplier Credit: * Leasing and Asset Financing: |
| 1. Types of entrepreneurs may include but not limited to: | * Innovators * Imitators * Craft * Opportunistic * Speculators |
| 1. Characteristics of Entrepreneurs may include but not limited to: | * Creative * Innovative * Planner * Risk taker * Networker * Confident * Flexible * Persistent * Patient * Independent * Future oriented * Goal oriented |
| 1. Requirements for entry into self-employment may include but not limited to | * Technical skills * Management skills * Entrepreneurial skills * Resources * Infrastructure |
| 1. Forms of businesses ownership may include but not limited to: | * Sole proprietorship * Partnership * Limited companies * Cooperatives |
| 1. Innovative business standards may include but not limited to: | * New products * New methods of production * New markets * New sources of supplies * Change in industrialization |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical
* Management
* Problem-solving
* Root-cause analysis
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Decision making
* Business communication
* Change management
* Competition
* Risk
* Net working
* Time management
* Leadership
* Factors affecting entrepreneurship development
* Principles of Entrepreneurship
* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Customer care standards
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Government and regulatory processes
* Local and international market trends
* Product promotion standards
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Relevant developments in other industries
* Regional/ County business expansion standards

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Identified Sources of personal and business finance as per financial procedures and standards 2. Managed Personal finances as per financial procedures and standards 3. Made Investment decisions as per financial procedures and standards 4. GeneratedBusiness ideas and opportunities based on business procedure and standards 5. Analysed business life cycle based on business procedure and standards 6. Determined business innovative standards as per business principles 7. Developed and presented a business plan as per regulatory framework. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   1. Written tests 2. Oral questions 3. Third party report 4. Interviews 5. Portfolio |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNITS OF COMPETENCY

# APPLY WORKSHOP TECHNOLOGY

**UNIT CODE: 0715 451 05A**

**Unit Description**

This unit describes the competencies required by a technician in order to apply workshop practice in their work. It includes applying workshop safety, material science principles and workshop tools and equipment. It also includes performing material preservation and house keeping

**ELEMENTS AND PERFORMANCE CRITERIA.**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| 1. Apply workshop safety | 1. Safe work environment is maintained as per workplace requirements 2. ***Workplace hazards*** and risks are controlled as per workplace requirements 3. ***Workplace accidents*** and incidents are managed as per workplace requirements |
| 1. Apply material science principles | 1. Safety procedures and practices are observed as per workplace requirements 2. Safe handling of materials is carried out as per job requirements 3. ***Engineering materials*** are selected as per job requirement 4. Engineering materials are classified as per job requirement |
| 1. Apply Workshop tools and equipment | * 1. Safety procedures and practices are observed as per workplace requirements   2. Technical Drawing are interpreted as per job requirements   3. ***Workshop Tools, equipment*** are selected as per the task to be performed   4. Workshop tools and equipment are calibrated as per manufactures manual   5. Workshop tools are used as per work requirement   6. Tools and equipment are maintained as per the workplace procedures |
| 1. Perform material preservation | * 1. Safety procedures and practices are observed as per workplace requirements   2. Preservation method is selected as per work requirement   3. Preservation method is applied as per work requirement |
| 1. Perform house keeping | * 1. Safety procedures and practices are observed as per workplace requirements   2. ***Housekeeping equipment and materials*** are selected as per the task to be performed   3. Waste sorting and disposal is carried out as per workplace procedure |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| Workplace hazards may include but not limited to: | * Physical * Biological * Chemical * Ergonomics * safety |
| Workplace accidents may include but not limited to: | * cuts and bleeds * fracture * fainting * electric shock |
| Engineering materials may include but not limited to: | * metals * polymers * composites * ceramic |
| Workshop Tools, equipment and materials may include but not limited to: | * Measuring tools * Marking out tools * Cutting tools * Fitting tools * Forging tools * Sheet metal tools * Machining tools |
| Housekeeping equipment and materials may include but not limited to: | * Brooms * Detergents * Waste clothes |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Problem solving
* Creativity
* Innovation
* Communication skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Work place hazards
* Hazard measurement and control
* Work place accidents
* Accidents contingency measures
* Engineering materials
* Workshop tools, equipment and machines
* Material preservation methods
* Waste management
* Housekeeping procedures

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Maintained work environment as per workplace requirement   2. Controlled workplace hazards and risks per workplace requirements   3. Managed workplace accidents and incidents as per workplace requirements   4. Selected engineering materials as per job requirement   5. Classified engineering materials as per job requirement   6. Selected workshop tools and equipment as per manufactures manual   7. Calibrated workshop tools and equipment as per manufactures manual   8. Maintained tools and equipment as per the workplace procedures   9. Applied preservation method as per work requirement   10. Carried out waste sorting and disposal as per workplace procedure |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of assessment | Competency in this unit may be assessed through:   1. Practical demonstration 2. Written reports 3. Case studies 4. Written examination |
| 1. Context of assessment | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# APPLY MATHEMATICS

**UNIT CODE:** 0541 451 06A

**UNIT DESCRIPTION:**

This unit describes the competences required in order to apply algebra, trigonometric functions, coordinate geometry, statistics, vector theorem, matrices and to carry out mensuration.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| * 1. Apply algebra | * 1. Calculations involving indices are performed as per task requirement   2. Calculations involving logarithms are performed as per task requirement   3. Scientific calculator is used in solving mathematical problems as per task requirement   4. Simultaneous equations are solved as per task requirement   5. Quadratic equations are solved as per as per task requirement |
| * 1. Apply trigonometric functions | * 1. Calculations involving trigonometry are performed as per task requirement   2. Calculations involving reciprocal trigonometric functions are performed as per task requirement   3. Pythagorean trigonometric identity is applied as per task requirement |
| * 1. Carry out mensuration | 3.1 Units of measurements and their symbols are determined as per task requirement  3.2 Conversion of units of measurement are performed as per task requirement  3.3 Calculation of length, width, height, perimeter, area and angles of figures is performed as per task requirement  3.4 Measurements and estimations of quantities is performed as per task requirement |
| * 1. Apply statistics and probability | 4.1 Presentation of data is done as per task requirement  4.2 Measures of ***central tendency*** are obtained as per task requirement  4.3 Measures of ***dispersion*** are obtained as per task requirement   * 1. Probability of occurrence of events are determined |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Central tendency may include but not limited to: | * 1. Mean   2. Mode   3. Median |
| 1. Dispersion may include but not limited to: | * 1. Variance   2. Standard deviation |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying fundamental operations (addition, subtraction, division, multiplication)
* Using and applying mathematical formulas
* Logical thinking
* Problem solving
* Drawing graphs
* Using different measuring tools

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Fundamental operations (addition, subtraction, division, multiplication)
* Calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Rounding techniques
* Types of fractions
* Types of tables and graphs
* Presentation of data in tables and graphs

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Solved simultaneous equations as per task requirement   2. Solved quadratic equations as per as per task requirement   3. Performed calculations involving trigonometry as per task requirement   4. Determined normal and tangents as per task requirement   5. Performed calculation of length, width, height, perimeter, area and angles of figures as per task requirement   6. Obtained measures of central tendency as per task requirement   7. Performed resolution of vectors as per task requirement   8. Solved simultaneous equations using matrices as per task requirement |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Written tests   2. Portfolio of evidence   3. Third party report |
| 1. Context of Assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# APPLY TECHNICAL DRAWINGS

**UNIT CODE:** 0732 441 07A

**UNIT DESCRIPTION**

This unit covers the competences required to apply technical drawings. It involves using technical drawing tools, equipment and materials, producing plane geometry drawings, orthographic drawings of components, solid geometry drawings, isometric drawings and assembly drawings.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Use and maintain drawing equipment and materials | * 1. ***Drawing equipment*** are identified according to   task requirements  1.2 ***Drawing materials*** are identified according to task requirements  1.3 Drawing equipment are applied as per task requirement |
| 1. Produce plane geometry drawings | * 1. Different **types of lines** used in drawing and their meanings are identified according to standard drawing conventions   2. Different **types of angles** are constructed as per task requirement   3. Angles are bisected as per task requirement   4. Different types of angles are measured using appropriate measuring tools   5. Different types of plane geometric forms are constructed as per task requirement   6. Different scales are constructed as per task requirement |
| 1. Produce orthographic drawings of components | * 1. First and third angle orthographic sketches and drawings of components are interpreted and produced as per task requirement   2. Freehand sketching of different types of geometric forms, tools, equipment, diagrams and components is conducted as per task requirement   3. Sections of different forms of projection are constructed as per task requirement |
| 1. Produce ***solid geometry drawings*** | * 1. Sketches and drawings of patterns are produced as per task requirement   2. Solids are produced as per task requirement   3. Solids are developed and interpenetrated as per task requirement   4. Different symbols and abbreviations are applied as per task requirement   5. Auxiliary views and true shapes are produced as per task requirement |
| 1. Produce isometric drawings | 1. Isometric sketches and drawings of components are interpreted and produced as per task requirement 2. Isometric curves and circles are interpreted and produced as per task requirement 3. Oblique sketches are constructed as per task requirement |
| 1. Produce assembly drawings | 1. Parts are assembled on orthographic views as per task requirement 2. ***Sectional views*** are produced as per task requirement    1. Produced drawing is hatched as per task requirement    2. Part lists are identified as per task requirement |

**RANGE**

| **Variable** | **Range**  ***May include but is not limited to:*** |
| --- | --- |
| 1. Drawing equipment include but are not limited to: | * 1. Drawing boards   2. T-square   3. Set squares   4. Drawing set |
| 1. Drawing materials include but are not limited to: | * 1. Drawing papers   2. Pencils   3. Erasers   4. Masking tapes   5. Paper clips |
| 1. Types of lines include but are not limited to: | * 1. Boarder lines   2. Faint continuous lines   3. Broken lines   4. Chain lines   5. Centre lines   6. Cutting lines |
| 1. Types of angles include but are not limited to: | * 1. 30 degrees   2. 45 degrees   3. 60 degrees   4. 90 degrees   5. 180 degrees |
| 1. Symbols and abbreviations include but are not limited to: | * 1. First angle   2. Third angle   3. E.g. of abbreviations   4. Scale- 1:2   5. Diameter – D20   6. Radius -R20 |
| 1. Isometric sketches and drawings include but are not limited to: | * 1. Use of 30 degrees |
| 1. Orthographic drawings include but are not limited to: | * 1. Front view   2. End view   3. Plan view |
| 1. Pictorial views include but are not limited to: | * 1. Front view   2. End view   3. Plan view |
| 1. Sectional views include but are not limited to: | * 1. Cutting lines   2. Assembled view |
| 1. Geometric forms include but are not limited to: | * 1. Circles   2. Triangles   3. Rectangles   4. Parallelogram   5. Polygons   6. Pyramids   7. Conic sections   8. Prisms   9. Loci |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required skills**

The individual needs to demonstrate the following skills:

* Critical thinking
* Drawing
* Interpretation
* Drawing equipment handling
* Analysis and synthesis
* Communication
* Inter personal

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Drawing equipment and materials
* Freehand sketching
* Lettering
* Geometrical constructions
* Types of drawings
* Types of lines
* Isometric drawing conventions, features, characteristics, components
* Orthographic drawing conventions, features, characteristics, components
* Sketches and drawings of simple patterns

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied drawing equipment as per task requirement   2. Constructed different types of angles as per task requirement   3. Constructed different types of plane geometric forms as per task requirement   4. Developed patterns as per task requirement   5. Developed and interpenetrated solids as per task requirement   6. Constructed sections of different forms of projection as per task requirement   7. Developed and interpreted solids as per task requirement   8. Interpreted isometric curves and circles as per task requirement   9. Assembled parts on orthographic views as per task requirement   10. Produced sectional views as per task requirement |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Portfolio of evidence   2. Practical test   3. Third party report   4. Written tests   5. Project work |
| 1. Context of Assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# APPLY MECHANICAL SCIENCE

**UNIT CODE: 0715 441 08A**

**UNIT DESCRIPTION**

This unit describes the competences required in order to apply mechanical science. It includes resolving forces, determining effects of loads in mechanical systems, analyzing properties of materials, determining the nature of friction in mechanical systems and solving problems related to motion.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range****.* |
| --- | --- |
| 1. Resolve forces | * 1. Theorems of forces are applied according to job requirements   2. Forces are resolved as per force theorems   3. Resultant forces are applied as per job requirements |
| 1. Determine effects of loads in mechanical systems. | 1. ***Types of forces*** are applied as per job requirements 2. Equilibrium of forces and plane framework are calculated as per job requirements 3. Point loads are analyzed as per job requirements 4. Principle of moments is applied as per work requirements. |
| 1. Analyze properties of materials | * 1. ***Mechanical properties*** and stress are applied as per job requirements   2. Mechanical properties of materials are tested as per job requirements   3. Direct stresses are calculated as per job requirements   4. Materials are selected are as per job requirements |
| 1. Determine the nature of friction in mechanical systems | * 1. Friction is applied as per job requirements   2. Laws of friction are applied as per job requirements   3. Effects of friction are established as per job requirements   4.4 Tools and equipment are operated as per job requirements |
| 1. Solve problems related to motion. | * 1. Laws of motion are applied as per job requirements   2. Parameters of motion are calculated as per job requirements   3. Motion graphs are drawn as per job requirements   4. Relationship between linear and angular motion is established as per job requirements |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range**  ***May include but not limited to:*** |
| --- | --- |
| 1. Types of forces | * 1. Friction   2. Centrifugal   3. Centripetal   4. Gravitational   5. Inertia   6. Shear |
| 1. Mechanical properties | * 1. Tensile strength   2. Young modulus   3. Brittleness   4. Compressive strength   5. Shear strength   6. Plasticity   7. Modulus of rigidity Elasticity |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Use of basic mechanical machines
* Perform various unit conversions of engineering quantities
* Logical thinking
* Problem solving
* Drawing graphs

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Newton’s laws of motion
* Laws of conservation of energy
* Laws of friction
* Types of forces
* Mechanical advantage and efficiency
* Properties of materials
* SI units of physical quantities
* Power, energy, work done, torque and safety factor

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Resolved forces as per force theorems   2. Applied principle of moments as per work requirements   3. Applied mechanical properties and stress as per job requirements   4. Calculated direct stresses as per job requirements   5. Applied laws of friction as per job requirements   6. Applied laws of motion as per job requirements |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Portfolio of evidence   2. Practical test   3. Third party report   4. Written tests   5. Project work |
| 1. Context of Assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# APPLY ELECTRONICS AND CONTROL PRINCIPLES

**UNIT CODE:** 0713 541 09A

**UNIT DESCRIPTION**

This unit describes the competences required in order to apply electronics and control principles. This includes using basic electrical quantities and principles, D.C and A.C circuits in electrical installation, applying safety requirements for electricity, electronics, magnetism and electromagnetism, single and three phase power supply and applying sensors, transducers and control principles, Cells and batteries

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes, which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements, which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| * + 1. Apply basic electrical quantities and principles | 1. Basic ***SI unit***s in electrical are applied as per job requirement    1. Conductors and insulators are applied as per job requirement    2. ***Quantitie***s of charge, force, work and power are applied as per job requirement    3. Calculations involving Ohm’s law are performed as per job requirement    4. Basic electrical and electronic measurements are performed as per job requirement |
| * 1. Apply D.C and A.C circuits in electrical installation | * 1. Connections involving parallel and series circuits are performed as per job requirement   2. Measurement of voltages and current in AC and DC is carried out as per job requirement |
| * 1. Apply safety requirements for electricity | 3.1 Usage of ***personal protective equipment*** is demonstrated as per job requirement  3.2 ***Electrical hazards*** are controlled as per job requirement  3.3 Methods of electric hazard prevention are applied as per job requirement |
| * 1. Apply understanding of electronics | * 1. ***Electronic component*** is identified as per job requirement   2. Functionality of the electronic components is tested as per job requirement   3. Electronic components are applied in electrical circuits as per job requirement   4. Testing of electronic circuit components is performed as per job requirement |
| * 1. Apply magnetism and electromagnetism | * 1. Magnetic and non-magnetic materials are identified as per job requirement   2. Concepts of magnetic fields and magnetic field distribution are applied as per job requirement   3. ***Laws of electromagnetic induction*** are applied as per job requirement   4. Concepts of electromagnetism are applied as per job requirement   5. Self and mutual induction is applied as per job requirement |
| * 1. Perform single and three phase power supply | * 1. Single and three phase concept is applied in as per job requirement   2. Connections of single and three phase power supply are performed as per job requirement   3. Measurement of single and three phase power is performed as per job requirement |
| * 1. Apply sensors and transducers principles | 1. Types of ***sensors and transducer*** are identified as per job requirement 2. Sensors and transducers mode of action are determined as per job requirement 3. Sensors and transducers components are applied as per job requirement |
| * 1. Apply control principles | * 1. Modes of control are identified as per job requirement   2. Special features of PLC are applied as per job requirement   3. Operations of PLCs are applied as per job requirement |
| * 1. Apply the concept of cells and batteries | * 1. Various sources of electricity are used as per task requirement   2. Electrolysis is applied as per task requirement   3. E.M.F and internal resistance of cells is determined as per task requirement   4. Primary and secondary cells are applied as per task requirement   5. Cells and batteries are applied as per task requirement   6. Maintenance of batteries is carried out as per task requirement |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. SI units include but not limited to: | * Power – Watts (W) * Current – Amperes (A) * Resistance – Ohms(Ω) * Voltage – Volts (V) |
| 1. Quantities includes but not limited to: | * Charge * Force * Work * Power |
| 1. Electric hazard includes but not limited to: | * Shocks * Explosions * Electrocution * Burns * Fires * Electric arc |
| 1. Electrical hazard protection includes but not limited to: | * Head protection * Insulating gloves * LOTTO * Eye protection |
| 1. Electronic components includes but not limited to: | * Diodes * Capacitor * Resistors * Transistors * Fuse |
| 1. Laws of electromagnetic induction may include but not limited to: | * Coulomb’ law * Faraday’s laws * Amperes law * Lenz’ law |
| 1. Sensors and transducermay include but not limited to: | * Temperature * Level * Displacement and proximity * Viscosity * Moisture * Humidity   Pressure |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Apply basic Electrical formulas
* Use of basic Electrical instruments
* Perform various unit conversions of Electrical quantities
* Power factor correction
* Logical thinking
* Problem solving
* Applying statistics
* Drawing graphs
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Electrical power calculations
* Various laws in Electrical engineering
* Electrical formulas
* Power triangle
* SI units of various electrical parameters
* Lightening arrestor testing
* Selecting the correct type of electrical machines for various uses
* Types and purpose of measuring instruments
* Units of measurement and abbreviations

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Performed calculations involving Ohm’s law as per job requirement   2. Performed basic electrical and electronic measurements as per job requirement   3. Performed connections involving parallel and series circuits as per job requirement   4. Carried out measurement of voltages and current in AC and DC as per job requirement   5. Controlled ***electrical hazards*** as per job requirement   6. Applied electronic components in electrical circuits as per job requirement   7. Applied concepts of magnetic fields and magnetic field distribution as per job requirement   8. Applied single and three phase concepts as per job requirement   9. Applied sensors and transducers components as per job requirement   10. Applied operations of PLCs as per job requirement   11. Applied concepts of cells and batteries as per job requirement |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Project   2. Practical   3. Written tests   4. Portfolio of evidence |
| 1. Context of Assessment | Competency may be assessed in a workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM COMPUTER AIDED DRAWING

**UNIT CODE:** 0732 551 07A

**Unit Description**

This unit covers the competences required to perform computer aided drawing. It involves navigating CAD software, producing geometric, pictorial, orthographic and assembly drawings as well as designing mechanical components.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Navigate CAD software | 1. Computing equipment and software are identified according to task requirement 2. Drawing ***CAD software*** is applied as per work requirements 3. CAD Software templates are identified as per drawing requirement 4. ***CAD Files*** are imported into working space as per drawing requirements 5. Symbols, codes and standards to be applied are identified according to software functionality 6. ***Drawing elements*** are applied according to task requirement 7. ***Editing tools*** are applied according to task requirement |
| 1. Produce geometric drawings | * 1. ***Drawing lines*** are identified according to standard drawing conventions   2. ***Geometrical forms*** are constructed according to standard drawing conventions   3. ***Types of angles*** are constructed according to principles of trigonometry   4. ***Geometric drawings*** are developed in accordance with standard conventions |
| 1. Produce pictorial drawings | * 1. Drawing symbols and abbreviations are applied according to standard drawing conventions   2. ***Pictorial drawings*** are produced as per work requirements   3. Pictorial drawings are saved as per work requirements |
| 1. Produce orthographic drawings. | 1. First angle orthographic drawings are developed as per standard conventions of orthographic drawings 2. Third angle orthographic drawings are developed as per standard conventions of orthographic drawings 3. Orthographic drawings are saved as per work requirements |
| 1. Produce assembly drawings | 1. Orthographic views are exploded according to standard conventions of orthographic drawings 2. Pictorial views are exploded according to standard conventions of pictorial drawings 3. Orthographic and pictorial views are assembled as per drawing specifications 4. Sectional views are produced according to standard conventions of drawing 5. Parts list is developed according to drawing schematic |
| 1. Design mechanical components | 1. Mechanical components are designed as per work requirements 2. Computer aided engineering (CAE) is applied in simulation as per work requirements 3. Improvements to increase efficiency is determined according to design analysis results 4. Manufacturing database is created according to manufacturing process 5. Improvements on designed document is achieved according the manufacturing design |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. CAD software may include but not limited to: | * + AutoCAD   + Inventor   + SolidWorks |
| 1. CAD Files may include but not limited to | * DWG * STL * DXF * STEP |
| 1. Drawing elements may include but not limited to: | * Points * Line angles * Circles and arcs * Planes (horizontal, vertical) * Figures and solids * Shapes |
| 1. Editing tools may include but not limited to: | * Delete, undo and redo commands * Fillet and chamfer commands * Trim, extend and break commands * Zoom and pan commands * Move, copy, and paste commands * Rotate and mirror commands * Object snapping and grouping commands * Dimension and scaling commands |
| 1. types of lines may include but not limited to: | * Dimension lines * Hidden detail lines * Extension lines * Section lines * Break lines * Chain |
| 1. types of geometric forms may include but not limited to: | * Circle * Rectangle * Triangle * Polygon |
| 1. Types of angles may include but not limited to | * Acute * Obtuse * Right |
| 1. Geometrical drawings may include but not limited to | * 2-Dimensional * 3-Dimensional * Orthographic * Isometric |
| 1. Pictorial drawings may include but not limited to | * Isometric * Oblique * Cabinet * Cavalier |
| 1. Different types of geometric forms may include but not limited to: | * Circle * Rectangle * Triangle * Polygon |
| 1. Different types of angles may include but not limited to: | * Acute * Obtuse * Right |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Critical thinking
* Numerical skills
* Image interpretation
* Drawing synthesis
* Communication
* Computer skills
* Software navigation (manipulates drawing entities, modify dimension styles, create and use layers, manipulate the drawing origin, define and utilize symbol libraries, etc.)

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organizational policies and procedures relevant to creating CAD drawings
* Various CAD programs their capabilities, functions and processes
* Drawing outcomes (orthographic, isometric, perspective,2D, 3D)
* Drawing elements (points, line angles, circles, arcs, planes, solids and figures, dimensions and hatchings shapes, etc.)
* Solid modeling, developing sectioned models, etc.
* Geometric constructions
* Measurement and scaling
* Engineering calculations (clearance and tolerance)
* Engineering drawing symbols
* Awareness of copyright and intellectual property issues and legislation in relation to drawing

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Applied drawing CAD software as per work requirements. 2. ImportedCAD Filesinto working space as per drawing requirements. 3. Used editing tools to manipulate drawing according to customer specification 4. Developed geometric drawings according to standard drawing conventions 5. Produced pictorial drawings as per work requirements. 6. Saved Orthographic drawings as per work requirements Produced geometric drawings. 7. Assembled Orthographic and pictorial views as per drawing specifications. 8. Computer aided engineering (CAE) is applied in simulation as per work requirements. |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work place 3. Resources relevant to the proposed activity or task. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Practical assessments 2. Project 3. Third party report 4. Written examinations 5. Portfolio of Evidence |
| 1. Context of Assessment | Competency may be assessed in a work place or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

**APPLY ENGINEERING MATHEMATICS**

**UNIT CODE:** 0541 541 10A

**Unit Description**

This unit describes the competences required in order to apply engineering mathematics. It enables the learner to; Apply complex numbers, Perform coordinates geometry, Carry out binomial expansion, Apply calculus, Apply vector theorem and Apply matrices.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Apply complex numbers | * 1. Complex numbers are represented on Argand diagrams as per job requirement   2. ***Operations*** involving complex numbers are performed as per job requirement   3. De Moivre’s theorem is applied as per as per job requirement |
| 1. Perform coordinates geometry | * 1. Polar equations are solved as per job requirement   2. Polar equations graphs are drawn as per job requirement   3. Normal and tangents are determined as per job requirement |
| 1. Carry out binomial expansion | * 1. Binomial series is determined as per as per job requirement   2. Roots of numbers are determined as per job requirement   3. Errors of small changes are determined as per job requirement |
| 1. Apply calculus | * 1. Derivatives of functions are determined as per job requirement   2. Differentiation is applied as per job requirement   3. Integrals of functions are determined as per job requirement   4. Integration is applied as per job requirement |
| 1. Apply vector theorem | * 1. Vectors and scalar quantities are defined as per job requirement   2. ***Operations*** on vectors are performed as per job requirement   3. Position vectors are determined as per as per job requirement   4. Resolution of vectors is performed as per job requirement   5. Vector and scalar products are obtained as per job requirement |
| 1. Apply matrices | * 1. Matrices operations are performed as per job requirement   2. Inverse of matrices are obtained as per job requirement   3. Simultaneous equations are solved using matrices as per job requirement |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Operations may include but not limited to: | * 1. Addition   2. Subtraction   3. Multiplication   4. Division |
| 1. Hyperbolic functions may include but not limited to: | * 1. Sinh x   2. Cosh x   3. Cosech x   4. Tanh x   5. Sech x |
| 1. binomial expansion | * 1. Powers   2. Coefficients   3. Pascals triangle   4. Expansion   5. Binomial theorem   6. Positive powers of n   7. Negative powers of n   8. Fractional powers of n (roots) |
| 1. calculus | * 1. Power   2. Product   3. Chain   4. Quotient |
| 1. vector theorem | * 1. Dot product   2. Cross product   3. Resolution of vectors   4. Analysis   5. Graphical Methods   6. Triangle theorem   7. Parallel theorem   8. Polygon theorem |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying fundamental operations (addition, subtraction, division, multiplication)
* Using and applying mathematical formulas
* Logical thinking
* Problem solving
* Applying statistics
* Drawing graphs
* Using different measuring tools

**Required Knowledge**

The individual needs to demonstrate knowledge and understanding of:

* Basic calculus
* Geometry
* Fundamental operations (addition, subtraction, division, multiplication)
* Calculating area and volume
* Rounding techniques
* Types of fractions
* Types of tables and graphs
* Presentation of data in tables and graphs
* Vector operations
* Matrix operations

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Applied algebra as per job requirement 2. Applied trigonometry and hyperbolic functions as per job requirement 3. Applied complex numbers as per job requirement 4. Applied coordinates geometry as per job requirement 5. Applied calculus as per job requirement 6. Carried out binomial expansion as per job requirement 7. Carried out mensuration as per job requirement 8. Applied statistics as per job requirement 9. Applied vector as per job requirement 10. Applied matrices as per job requirement |
| 1. Resource implications | The following resources should be provided:  2.1 Access to relevant workplace where assessment can take place  2.2 Appropriately simulated environment where assessment can take place  2.3 Resources relevant to carrying out the tasks required |
| 1. Methods of assessment | Competency may be assessed through:   * 1. Written tests   2. Third party report   3. Portfolio of evidence |
| 1. Context of assessment | Competency may be assessed:   * 1. At the workplace   2. In a simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**APPLY ENGINEERING MECHANICS**

**UNIT CODE:** 0715 541 11A

**UNIT DESCRIPTION**

This unit of competency describes the competences required in order to apply engineering mechanics principles. This includes applying simple mechanisms, design belts, ropes and chain drives, design toothed gears and gear trains, design mechanical rotor dynamic machines, apply stress and strain concepts, apply simple bending theory and apply torsion theory in mechanical systems.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| 1. Apply simple mechanisms | * 1. Mechanisms are designed as per job requirement   2. Mechanisms are selected as per job requirement   3. Linkages are designed as per job requirement |
| 1. Design belts, ropes and chain drives | * 1. Belt drives are designed as per job requirement   2. Rope drives are designed as per job requirement   3. Chain drives are designed as job requirement |
| 1. Design toothed gears and gear trains | * 1. ***Toothed gears*** are designed as per job requirement   2. Toothed gears are selected as per job requirement   3. Gears are serviced as per job requirement |
| 1. Design mechanical rotor dynamic machines | * 1. Pumps are designed as per job requirement   2. Pumps are selected as per job requirement   3. Rotary compressors are designed as per job requirement   4. Fans and vanes are designed as per job requirement |
| 1. Apply stress and strain concepts in mechanical systems | * 1. Common engineering materials are selected as job requirement   2. ***Engineering components*** are designed as job requirement   3. Engineering components are selected as per job requirement |
| 1. Determine loading conditions in mechanical systems | * 1. Structures are designed as per job requirement   2. Structures are selected as per job requirement   3. Beams are designed as per job requirement   4. Beams are selected as per job requirement |
| 1. Apply simple bending theory in mechanical systems | * 1. Beams are designed as per job requirement   2. Beams are selected as per job requirement   3. Shafts are designed as per job requirement   4. Shafts are selected as per job requirement |
| 1. Apply torsion theory in mechanical systems | * 1. Torque of components is obtained as per job requirement   2. Shafts are designed as per job requirement   3. Shafts are designed as per job requirement   4. Angle of twist of components is obtained as per job requirement |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **VARIABLE** | **RANGE**  ***May include but not limited to:*** |
| 1. Simple machines | * 1. Pulley   2. Wedge   3. Inclined plane   4. Pulley   5. Wheel and axle   6. Screw jack |
| 1. Toothed gears | * 1. Bevel gears   2. Spur gears   3. Worm gears   4. Spiral bevel gears   5. Helical gears |
| 1. Engineering components | * 1. Beams   2. Thin cylinders   3. Thin shells |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Arithmetic skills
* Mechanical machine operation
* Critical thinking
* Analytical skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* General Physics
* Engineering Mathematics
* Measurements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Designed simple machines as per job requirement   2. Selected beams and shafts as per job requirement   3. Selected mechanisms as per job requirement   4. Designed belt drives as per laws of tension   5. Selected toothed gears as per job requirement   6. Designed pumps as per job requirement   7. Designed engineering components as per job requirement   8. Designed shafts as per job requirement   9. Obtained torque of components as per job requirement |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Project   2. Practical   3. Written tests   4. Oral Questioning   5. Portfolio of evidence |
| 1. Context of Assessment | Competency may be assessed in a workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**APPLY THERMODYNAMICS AND FLUID MECHANICS**

**UNIT CODE:** 0715 541 13A

**Unit Description**

This unit describes the competences required in order to apply thermodynamics and fluid mechanics in their work. It includes applying steady flow processes, perfect gas, steam cycles, fuel and combustion. It also includes applying heat transfers and exchangers, fluid mechanics concepts and operating of air compressors and fluid pumps.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes, which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements, which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| 1. Apply Thermodynamic Processes | 1. Apply knowledge of basic thermodynamics 2. The ***Laws of Thermodynamics*** to a Non-flow Process and Steady Flow Process are applied as per the task requirements 3. ***Thermodynamic Processes*** are applied as per the task requirements 4. ***Thermodynamics systems*** are applied as per task requirement 5. Applying heating and expansions of gases and Work done During a Non-flow Process as per the task requirements 6. General Laws for Expansion and Compression are applied as per the task requirements 7. Application of Steady Flow Energy Equation to Engineering Systems as per the task requirements |
| 1. Apply knowledge of perfect gases | 1. ***Laws of Perfect Gases*** are applied as per the task requirements 2. General Gas Equation is derived as per the task requirements 3. Characteristic Equation of Gas is applied as per the task requirements 4. Universal Gas Constant or Molar Constant is determined as per the task requirements 5. ***Specific Heat*** is determinedas per the task requirements |
| 1. Apply knowledge of steam cycle | 1. Thermodynamics ***steam cycles*** are applied as per task requirements 2. Steam systems are controlled and determined as per task requirement 3. Energy balance is carried out in steam cycles as per work requirements. 4. Thermodynamics ***steam turbines*** are applied as per task requirements |
| 1. Apply knowledge of fuel combustion | * 1. Elements and compounds of fuel are determined as per the task requirement   2. Combustion equations of fuels is applied as per the task requirement   3. ***Conversion analysis*** of fuels is determined as per the task requirement   4. Mass of carbon in flue gases and mass of flue gases per kg of fuel burnt is determined as per the task requirement   5. Excess air supplied is determined as per the task requirement   6. Flue gas analysis by ors at apparatus is determined as per the task requirement |
| 1. Apply heat transfer and heat exchangers in fluid | 1. ***Heat transfer media*** is selected as per work requirements. 2. *Heat exchangers* are applied as per task requirement 3. Heat transfer is regulated as per task requirement |
| 1. Operate air compressors | 1. Air compressors are classified as per the task requirements 2. Working of single stage reciprocating air compressor is determined as per the task requirements 3. Work-done by a single stage reciprocating air compressor without clearance volume is determined as per the task requirements 4. Power required to drive a single stage reciprocating air compressor is determined as per the task requirements 5. Work-done by reciprocating air compressor with clearance volume is determined as per the task requirements 6. Multistage compression is determined as per the task requirements 7. Power required to drive a two-stage reciprocating air compressor is determined as per the task requirements 8. Minimum work required for a two-stage reciprocating air compressor is determined as per the task requirements |
| 1. Apply knowledge of flow of fluids | * 1. **losses of energy in pipes** are determine as per the task requirements   2. The hydraulic gradient and total energy lines of the flowing fluids are determined as per the task requirements   3. Power transmission of the flowing fluid through pipes are determine as per the task’s requirements |
| 1. Apply knowledge of viscous flow of fluids | * 1. ***Flow of Viscous Fluid*** are determined as per task requirements   2. Kinetic energy correction and momentum are determined as per task requirements   3. ***power* absorbed in viscous flow** is determined as per the task requirements |
| 1. Apply dimensional and models analysis fluids | * 1. **Derived quantities** and dimensional homogeneity are determined as per task requirements   2. ***Methods of dimensional analysis*** are determined as per the task requirements   3. ***Model Analysis*** is applied as per the task requirements   ***9.4******Model Laws*** are applied as per the task requirements |
| 1. Operate fluid pumps | * 1. The parts of ***Fluid pumps*** are identified as per task requirement   2. Worked done and power by the Fluid pumps are determined as per task requirement   3. Specific speed of the centrifugal pump is determined as per the task requirements   4. Variation of Velocity and Acceleration in the Suction and Delivery Pipes Due to Acceleration of the Piston in reciprocating pump is determined as per the task requirements |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Laws of Thermodynamicsmay include but not limited to: | * First law of thermodynamics * Second law of thermodynamics * Zeroth law of thermodynamics |
| 1. Thermodynamic Processes may include but not limited to: | * Non-flow Process. * Constant Volume Process * Constant Pressure Process * Hyperbolic Process. * Constant Temperature Process * Adiabatic Process * Polytropic Process. |
| 1. Laws of Perfect Gases may include but not limited to: | * Boyle's Law * Charles' Law * Gay-Lussac Law * Joule's Law * Avogadro's Law |
| 1. Specific Heat may include but not limited to: | * Constant Volume * Constant Pressure |
| 1. Steam cycles may include but not limited to: | * Rankine * Carnot * reheat * regenerative |
| 1. Steam turbines may include but not limited to: | * Impulse Turbines * Reaction turbines |
| 1. Conversion analysis may include but not limited to: | * Mass to volume * Volume to mass |
| 1. Thermodynamics systems may include but not limited to: | * Boundary and surrounding * Closed systems * Open systems * Isolated systems * Adiabatic system * Homogeneous systems * Heterogeneous systems |
| 1. Heat transfer media may include but not limited to | * Composite wall * Slab * Thick Cylinder * Thick Sphere |
| 1. Heat exchangers may include but not limited to | * Double pipe heat exchanger * Shell and tube heat exchanger * Plate heat exchanger * Condenser and boiler heat exchanger |
| 1. Air compressor may include but not limited to | * Rotary compressors * Reciprocating compressors * Axial compressors * Centrifugal compressors |
| 1. Fluid pump may include but not limited to: | * Reciprocating pump * Centrifugal pump |
| 1. Model Analysismay include but not limited to: | * Similitude-Types of Similarities * Types of Forces Acting in Moving Fluid * Dimensionless Numbers * Reynold’s Number (Re) * Froude’s Number (Fe) * Euler’s Number (Eu) * Weber’s Number (We) * Mach’s Number (M) |
| 1. losses of energy in pipesmay include but not limited to: | * Loss of Energy (or head) Due to Friction * Loss of Head Due to Sudden Enlargement * Loss of Head Due to Sudden Contraction * Loss of Head at the Entrance of a Pipe * Loss of Head at the Exit of Pipe * Loss of Head Due to an Obstruction in a Pipe * Loss of Head Due to Bend in Pipe * Loss of Head in Various Pipe Fittings |
| 1. Flow of Viscous Fluidmay include but not limited to: | * Circular pipe * Between Two Parallel Plates |
| 1. Power absorbed in viscous flowmay include but not limited to: | * Viscous Resistance of Journal Bearings * Viscous Resistance of Foot-step Bearing * Viscous Resistance of Collar Bearing * Loss of Head Due to Friction in Viscous Flow |
| 1. Model Lawsmay include but not limited to: | * Reynold’s Model Law * Froude Model Law * Euler’s Model Law * Weber Model Law * Mach Model Law * Model Testing of Partially Sub-merged Bodies |
| 1. Methods of dimensional analysis may include but not limited to: | * Rayleigh’s method * Buckingham’s pi-theorem. |
| 1. Derived quantities may include but not limited to: | * Fundamental * Geometric * Kinematic Quantities * Dynamic Quantities |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Problem solving
* Creativity and innovation
* Use of tools and equipment
* Communication skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Thermodynamics cycles
* Thermodynamics systems
* Steady flow energy equations
* Laws of thermodynamics
* Perfect gas laws
* Compression and expansion of gases
* Power cycles
  + Rankine cycle
  + Regenerative cycle
  + Reheat cycle
  + Binary cycle
* Types of fuels
* Combustion equations
* Calorific values of fuels
* Combustion analysis
* Principles of heat transfer
* Heat transfer media
* Heat exchangers
* Types of compressors
* Types of fluid pumps
* Dimensional analysis

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Applied thermodynamics cycles and systems as per task requirement 2. Applied steady flow energy equations as per laws of thermodynamics. 3. Applied steam systems as per task requirement 4. Controlled fuel combustion as per task requirement 5. Applied heat exchangers as per task requirement 6. Applied air compressor as per work requirements 7. Applied fluid pump as per work requirements 8. Controlled fluid flow discharge losses as per as per task requirement |
| 1. Resource implications | The following resources should be provided:  2.1 Access to relevant workplace where assessment can take place  2.2 Appropriately simulated environment where assessment can take place  2.3 Resources relevant to carrying out the tasks required |
| 1. Methods of assessment | Competency may be assessed through:   1. Written tests 2. Third party report 3. Portfolio of Evidence |
| 1. Context of assessment | Competency may be assessed:  4.1 At the workplace  4.2 In a simulated work environment |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

# WELD VEHICLE STRUCTURE I

**UNIT CODE:** 0716 451 13A

**Unit Description**

This unit specifies competencies required by an Autobody technician to weld vehicle body parts. It involves arc welding vehicle cross members, MIG Welding vehicle structure, TIG Welding vehicle structure and Spot-welding vehicle structure

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Arc weld vehicle cross members | 1. ***Personal Protective Equipment (PPE)*** are adorned as per workplace procedures 2. Level vehicle structure as per job specifications 3. ***Materials, tools and equipment*** are selected as per job specifications 4. ***Joints*** are prepared as per working drawings. 5. Arc welding equipment is set up as per job specifications 6. Work pieces are welded using manual metal arc welding process as per job specifications 7. Post weld treatment is performed according to job specifications 8. Weld joint is examined as per ISO 17637 standards |
| 1. MIG Weld vehicle structure | 1. Safety is observed as per workplace procedure 2. Level vehicle structure as per job specifications 3. ***MIG welding equipment*** is set up as per job specifications 4. Work pieces are Weld using MIG process as per job specifications 5. Weld-joint quality is recorded as per welding specification record |
| 1. TIG Weld vehicle structure | 1. Safety is observed as per workplace procedures 2. Vehicle structure levelled as per job specifications 3. Materials, tools and equipment are selected as per job specifications 4. ***TIG welding equipment*** is set up as per job specifications 5. Work pieces are welded as per job specifications 6. Weld-joint quality is recorded as per welding specification record |
| 1. Spot weld vehicle structure | 1. Safety is observed as per workplace procedure 2. ***Spot welding equipment*** is set up as per job specifications 3. Surface joint are prepared as per working drawings 4. Work pieces are welded using spot process as per job specifications 5. Post weld treatment is performed according to job specifications 6. Weld-joint quality is recorded as per welding specification record |
| 1. Gas weld vehicle structure | * 1. ***Personal Protective Equipment (PPE)*** are adorned as per workplace procedures   2. Level vehicle structure as per job specifications   3. ***Materials, tools and equipment*** are selected as per job specifications   4. ***Joints*** are prepared as per working drawings.   5. ***Gas welding equipment*** is set up as per job specifications   6. Work pieces are welded using gas welding process as per job specifications   7. Post weld treatment is performed according to job specifications   8. Weld joint is examined as per ISO 17637 standards |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal Protective Equipment (PPE) may include but not limited to: | * + Welding helmet/ hand shield/ welding goggles   + Respirator   + Fire resistant clothing and apron   + Earmuffs/ ear plugs   + A pair of rubber soled safety boots   + Insulated gloves |
| 1. Materials, tools and equipment may include but not limited to: | * + Metal arc welding equipment   + Metal inert gas welding machines (MIG)   + Tungsten inert gas welding equipment (TIG)   + Resistance spot welding equipment   + Steel sheet metal   + Jigs and fixtures   + Portable grinders   + Electric hand drills   + Assorted consumables filler rods   + Chassis set-up fixture   + Bandoleers/legend set-up fixture   + Laser leveling kit   + Digital angle gauge with level   + Smart tool angle sensor   + Digital protractor   + Marking table   + Vernier height gauge |
| 1. Joints may include but not limited to: | * Butt joint * Lap joint * Edge joint * Tee joint * Corner joint |
| 1. MIG welding equipment may include but not limited to: | * + MIG welding PPE   + MIG welding machine   + MIG welding accessories |
| 1. TIG welding equipment may include but not limited to: | * + TIG welding PPE   + TIG welding machine   + TIG welding accessories |
| 1. Spot welding equipment may include but not limited to: | * + Spot welding PPE   + Spot welding machine * Spot welding accessories |
| 1. Gas welding equipment may include but not limited to: | * + Gas cylinders   + Brazing rods   + Gas regulators   + Welding torches   + Gas welding accessories |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to apply the following skills:

* Diagnose extent of vehicle body structural damage
* Removal of auto body structural and non-structural parts
* Join variety of metals such as low carbon steels, high strength steels and aluminum alloy
* Use MIG, TIG, Metal – arc, welding spot, gas welding equipment
* Prepare material estimate and cost and labor requirements
* Sketching/drawing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Legislative and organizational requirements and procedures
* Health and safety
* The environment (including waste disposal) in conformity to OSHA2007
* Appropriate personal, equipment and vehicle protective equipment
* Legal requirements relating to the vehicle and its construction including body configurations and standards e.g. (KS 372:2019 KNBS)
* Working procedures relating to:
* Job task planning and organizing
* Recording vehicle body condition, assess and recommending corrective actions
* Report delays in work completion
* Referral of problems
* The relationship between time, costs and profitability
* Both Standards in auto body welding and building
* Realignment of both structure and paneling of vehicle body and chassis
* Broad knowledge of auto body construction and repair techniques
* Different models of vehicles
* Quality requirements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Adorned ***Personal Protective Equipment (PPE)*** as per workplace procedure 2. Selected Materials, tools and equipment as per job specifications 3. Set up Arc welding equipment as per job specifications 4. Welded Work pieces using manual metal arc welding process as per job specifications 5. Set up ***MIG welding equipment*** as per job specifications 6. Welded Work pieces using MIG process as per job specifications 7. ***Set up TIG welding equipment*** as per job specifications 8. Set up ***welding equipment*** is as per job specification 9. Welded work pieces as per job specifications 10. Prepared Surface joint as per working drawings 11. Welded Work pieces using spot process as per job specifications 12. Performed Post weld treatment according to job specifications |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. POE evaluation   4. Third party reports   5. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# REPAIR VEHICLE BODY

**UNIT CODE:** 0716 451 15A

**Unit Description**

This unit covers the competencies required by an autobody technician to repair vehicle body. It involves performing vehicle damage analysis, performing vehicle panel beating, performing fibre glass parts repairs, performing plastic parts welding repair, performing vehicle chassis jigging and performing vehicle body rust repairs.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Perform vehicle damage analysis | 1. ***Diagnosis procedures*** of frame and body structure is carried out as per workplace procedure 2. ***Tools and equipment*** are identified as per work requirement. 3. ***Structural and frame damage patters*** are established as per workplace procedures. 4. Vehicle damage estimation is carried out as per workplace procedures 5. Vehicle costing and damage appraisal report is written as per workplace procedures |
| 1. Perform vehicle panel beating | 1. ***Personal protective equipment*** are donned as per work requirement. 2. Vehicle body is inspected according to industry guidelines. 3. Damaged panel is identified according to manufacturer standards. 4. Damaged panel is straightened as per work requirement. |
| 1. Perform fibre glass parts repairs | 1. Vehicle body is inspected according to workplace procedure 2. Damaged area is washed according to workshop procedure 3. Fibre glass filler material is applied according to manufacturer standards 4. Repaired surface is spray-painted as per workplace procedure |
| 1. Perform plastic parts welding repairs | 1. Vehicle body is inspected according to workplace procedure 2. Damaged panel is identified according to manufacturer standards 3. Plastic panel is welded as per the workplace procedure 4. Welded panel is fitted as per the manufacturer standards |
| 1. Perform vehicle chassis Jigging | * 1. Vehicle chassis is inspected according to workplace procedure   2. Vehicle is positioned on the vehicle chassis bench according to workplace procedure   3. Body hook puller is operated according to manufacturer’s standards |
| 1. Perform vehicle body rust repairs | 1. Rusted parts are identified according to workplace procedure 2. Antirust chemical is applied according to manufacturer’s standards 3. Vehicle body ***cleaning agents*** are applied as per working procedure. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Diagnosis procedures may include but not limited to: | Visually inspect for signs of damage:   * Pulled welds * Split sealers * Cracked paint * Buckles * Panel misalignment   Measure vehicle for:   * Length * Width * Height * Upper body misalignment * Tolerances |
| 1. Tools and equipment may include but not limited to: | * Hand tools * Panel beating tools * Power tools * Spray painting gun * Pneumatic tools * Hydraulic tools * Bending machine * Sheet metal cutting machine * Marking table * Cross cutter * Vernier calliper |
| 1. Structural and frame damage patters may include but not limited to: | Types of structural and frame damage.   * Side sway * Sag * Mash * Diamond * Twist |
| 1. Personal protective equipment may include but not limited to: | * Goggles * Ear muff * Safety mask * Helmets * Safety boots * Welding gloves * Rubber gloves * Overall * Dust coat |
| 1. Cleaning agents may include but is not limited to: | * Tack cloth * Standard thinner * Soap * Phosphate based chemical * Pressurized air |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication skills
* Problem solving
* Creativity and innovation
* Use of tools and equipment
* Body structure inspection
* Manufacturer’s standards
* Interpretation of service manuals
* House keeping
* Materials handling

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Safety
* Panel beating
* Welding
* Soldering
* Plastic welding
* Fibre repair
* Spray painting
* Jacking
* Workshop technology
* Aluminum repair procedures
* Damage estimation and costing

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency. | Assessment requires evidence that the candidate:   1. Observed occupational health and safety as per work requirement. 2. Identified dents as per workplace procedure 3. Performed panel beating as per work procedure. 4. Straightened vehicle chassis as per manufacture’s specification. 5. Documented and updated service records as per workshop procedures. |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Portfolio of evidence (POE) evaluation   4. Third party reports   Written tests |
| 1. Context of Assessment | 1. The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | 5.1 Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM VEHICLE FIBRE WORKS

**UNIT CODE: 0716 451 03A**

**Unit description:**

This unit covers competencies required to Perform Vehicle Fibre Works. It involves competencies in reinforcing vehicle fibre structure, repairing vehicle fibre structure and performing housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Reinforce vehicle fibre structure | 1. ***Personal Protective Equipment*** are used as per workplace procedures 2. Vehicle body panels are assessed as per work requirements 3. ***Materials, tools and equipment*** are selected as per job specifications 4. Vehicle Body fibres are reinforced as per work requirements |
| 1. Repair vehicle fibre structure | 1. Safety precautions are taken as per workshop requirements 2. Damaged vehicle fibre panel is identified according to work requirements. 3. ***Fibre work materials*** are selected according to work requirements. 4. ***Vehicle fibre structure*** are shaped according to manufacturer’s specification 5. ***Vehicle body filler*** is applied according to workshop procedures 6. Spot putty is applied according to workshop procedures. 7. Sanding is performed according to workshop process. |
| 1. Perform House Keeping | * 1. Waste is segregated and disposed as per workshop procedures   2. Tools and equipment are cleaned as per workshop procedures   3. Tools and equipment are stored as per workshop procedures   4. Housekeeping is carried out as per workplace requirements |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal Protective Equipment (PPE) may include but are not limited to. | * Dollies * Spoons * Fibre glass |
| 1. Materials, tools and equipment may include but are not limited to. | * Dinging hammer * Chipping hammer * Soft hammer * Lever * Welding machine |
| 1. Fibre work materials may include but are not limited to. | * Resin * Hardener * Fiberglass mat * Carbon fiber fabric * Epoxy resin * Polyester resin * Catalyst |
| 1. Vehicle fibre structure may include but are not limited to. | * Bumper * Hood * Dashboard * Trunk lid * Body panels |
| 1. Vehicle body filler material may include but are not limited to. | * Compound filler * Hardener * Chemical paste |

**REQUIRED KNOWLEDGE AND SKLLS**

**Required knowledge**

***The individual needs to demonstrate***

Kenyan legislation and workplace procedures relevant to

* Health, safety, environment and quality
* the environment (including waste oil and spent refrigeration gas disposal
* personal and vehicle protective equipment.
* Workplace procedures for:
* reporting the results of tests;
* the referral of problems;
* reporting delays to the completion of work
* Requirements relating to vehicle body building

**Use of technical information**

How to find, interpret and use sources of information applicable to units

The importance of using the correct sources of technical information.

Vehicle body fibre works principles

Design and construction of vehicle body structures.

**REQUIRED SKILLS**

***The individual needs to demonstrate the following foundation skills***:

* Communications (verbal and written);
* Decision making;
* Multitasking;
* Time management;
* Problem solving;
* Planning;
* First aid
* Vehicle fibre structure reinforcement
* Vehicle fibre structure repair
* use of vehicle body workshop tools

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency. | ***Assessment requires evidence that the candidate:***   * 1. Identified and used vehicle body fibre works tools and equipment   2. Selected fibre works materials as per work requirements   3. Reinforced vehicle Body fibres as per work requirements   4. Identified damaged vehicle fibre panel as per work requirements   5. Shaped vehicle fibre structure as per work requirements   6. Applied vehicle body filler as per work requirements   7. Performed sanding as per work requirements |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant work environments. 3. Resources relevant to the proposed activities or task. |
| 1. Methods of Assessment. | ***Competency may be assessed through:***   1. Practical 2. Projects 3. Portfolio of evidence 4. Third party report 5. Written tests |
| 1. Context of Assessment. | Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions. |
| 1. Guidance information for assessment. | This unit may be assessed on an integrated basis with others within this occupational sector. |

# PERFORM VEHICLE BODY SURFACE PREPARATION

**UNIT CODE: 0716 451 04A**

**Unit description:**

This unit specifies the competencies required to prepare vehicle body surface. It involves; applying primer, applying spot putty, perform wet sanding and perform housekeeping.

The unit specifies the knowledge and attitude to perform vehicle spray painting. It involves; troubleshooting, knowledge on primer mixing, use of vehicle body workshop tools and equipment, performing workplace housekeeping procedure, time management, decision making and vehicle body principles.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1*.* Apply Primer | 1. Safety precautions are taken as per the workshop procedure 2. ***Tools, equipment and materials*** are selected as per task requirements 3. Vehicle body masking is carried out as per task requirements 4. Vehicle body Primer is administered according to task requirements 5. Vehicle Body dry sanding is carried out according to task requirements |
| 2. Apply spot putty | 1. ***Vehicle body panel*** is inspected as per task requirement. 2. Vehicle Body spot putty is administered according task requirement 3. Vehicle Body dry Sanding is carried out according to task requirements |
| 3. Perform wet sanding | 1. Tools, equipment and material are selected as per task requirements 2. Wet sanding is carried out as per work requirement 3. Drying is performed according to task requirements |
| 4. Perform House Keeping | 1. Waste is segregated and disposed as per workshop procedure 2. Tools and equipment are cleaned as per workshop procedure 3. Tools and equipment are stored as per workshop procedure 4. Work area is cleaned as per workplace procedure |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools, equipment and material may include but not limited to; | * Body surface primer * Assorted sand papers * Sander * Masking tape * Masking paper/newspapers * Spray gun * Acrylic thinner * Air compressor * Hose pipes * Measuring cup * Spraying booth * Spot putty * Detergents * Bucket of water |
| 2.Vehicle body panel may include but not limited to; | * Bonnet * Wing * Hood * Roof * Doors * Boot * Spoiler |

**REQUIRED KNOWLEDGE AND SKILLS**

**Required knowledge**

***The individual needs to demonstrate knowledge of:***

* Kenyan legislation and workplace procedures relevant to
* Health, safety, environment and quality
* personal and vehicle protective equipment.
* Workplace procedures for:
* Applying body surface primer
* Adorning of PPEs
* the referral of problems;
* reporting delays to the completion of work

**Vehicle body works principles**

How to use vehicle body workshop tools, equipment and materials

How to` mix and match automotive color paints

Measurements

Tools and Equipment maintenance

Legal requirements concerned with the disposal of body shop wastes

**FOUNDATION SKILLS**

***The individual needs to demonstrate the following foundation skills***:

* Communication
* Decision making
* Multitasking
* Time management
* Problem solving
* Planning
* First aid
* Troubleshooting
* Primer application
* spot putty application
* wet sanding
* Workplace housekeeping procedure

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical aspects of competency. | ***Assessment requires evidence that the candidate:***   1. Identified and used tools, materials and equipment as per task requirements 2. Undertook Safety precautions as per workplace procedures 3. Carried outmasking as per task requirements 4. Administered vehicle body Primer as per task requirements 5. Carried out vehicle body dry sanding as per task requirements 6. Inspected vehicle body panel as per task requirements 7. Administered vehicle body spot putty as per task requirements 8. Carried out vehicle body dry Sanding as per task requirements 9. Carried out wet sanding is carried out as per work requirement 10. Performed drying as per task requirements 11. Cleaned work area as per workplace requirements |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task |
| 1. Methods of assessment. | ***Competency may be assessed through***   * 1. Practical’s   2. Portfolio of evidence   3. Projects   4. Written tests |
| 1. Context of assessment. | Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions. |
| 1. Guidance information for assessment. | This unit may be assessed on an integrated basis with others within this occupational sector. |

# PERFORM VEHICLE SPRAY PAINTING

**UNIT CODE: 0716 451 05A**

**Unit description:** This unit specifies the competencies required to perform vehicle spray painting. It involves; performing vehicle paint mixing, applying vehicle body paint and performing workshop housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Perform vehicle paint mixing | 1. Safety precautions are taken as per the workshop procedure 2. ***Tools, equipment and material*** are selected as per task requirements 3. Automotive paints are identified as per work requirements 4. Colour mixing is done as per manufacturer’s specification |
| 1. Apply Vehicle body paint | 1. Vehicle body is cleaned as per task requirement 2. ***Vehicle body panel*** is masked as per task requirements 3. ***Spraying tools, equipment*** ***and materials*** are prepared according to work requirement 4. Paint mixing is performed as per manufacturer’s specification 5. Spray painting is carried out according to task requirement |
| 1. Perform   Workshop House Keeping | 1. Waste is segregated and disposed as per workshop procedure 2. Tools and equipment are cleaned as per workshop procedure 3. Tools and equipment are stored as per workshop procedure 4. Work area is cleaned as per workplace procedure |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools, equipment and material may include but not limited to; | * Masking tape * Dust masks * Masking paper/newspapers * Spray gun * Acrylic thinner * Air compressor * Hose pipes * Measuring cup * Spraying booth * Automotive paints * Colour chart |
| 2.Spraying tools, equipment and materials may include but not limited to; | * Spray gun * Air compressor * Hose pipe * Automotive paints * Thinner * Paint hardener |
| 3.Vehicle body panel may include but not limited to; | * Bonnet * Wing * Hood * Roof * Doors * Boot * Spoiler |

**REQUIRED KNOWLEDGE AND SKLLS**

**Required knowledge**

***The individual needs to demonstrate***

* Kenyan legislation and workplace procedures relevant to
* Health, safety, environment and quality
* Personal and vehicle protective equipment.
* Workplace procedures for:
* Performing vehicle body spray painting
* Adorning of PPEs
* the referral of problems;
* reporting delays to the completion of work

**Vehicle body works principles**

How to use vehicle body workshop tools, equipment and materials

How to` mix and match automotive color paints

Measurements

Tools and Equipment maintenance

Legal requirements concerned with the disposal of body shop wastes

**FOUNDATION SKILLS**

***The individual needs to demonstrate the following foundation skills***:

* Communication
* Decision making
* Multitasking
* Time management
* Problem solving
* Planning
* First aid
* Troubleshooting
* How to use vehicle body workshop tools
* How to` mix and match automotive color paints
* legal requirements concerned with the disposal of body shop wastes

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical aspects of competency. | ***Assessment requires evidence that the candidate:***   1. Undertook Safety precautions as per workplace procedure 2. Selected Tools, equipment and material as per task requirements 3. Identified Automotive paints as per work requirements 4. Performed Colour mixing as per manufacturer’s specification 5. Cleaned Vehicle body as per task requirement 6. Masked Vehicle body panel as per task requirement 7. Prepared Spraying tools, equipment and materials 8. Carried out Spray painting as per task requirements 9. Cleaned work area as per workplace procedure |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   Resources relevant to the proposed activities or task |
| 1. Methods of assessment. | ***Competency may be assessed through:***   * 1. oral questions   2. practical   3. portfolio of evidence   4. projects   5. written tests |
| 1. Context of assessment. | Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions. |
| 1. Guidance information for assessment. | This unit may be assessed on an integrated basis with others within this occupational sector. |

# PERFORM VEHICLE BODY VALETING

UNIT CODE: 0716 451 06A

**Unit description:** This unit specifies the competencies required to perform vehicle body Valeting. It involves; perform vehicle body polishing, perform vehicle body buffing, and perform house keeping**.**

The unit specifies the knowledge and attitude to perform vehicle body valeting. It involves; troubleshooting, performing workplace housekeeping procedure, time management, decision-making and vehicle body principles.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Perform Vehicle body polishing | 1. Safety precautions are taken as per the workshop procedure 2. ***Tools, equipment and material*** are selected as per task requirements 3. ***Vehicle body panel*** is cleaned according to task requirements 4. Polishing is carried out as per work requirements 5. Vehicle Body waxing is carried out as per work requirements |
| 1. Perform Vehicle body buffing | 1. Safety precautions are taken as per the workshop procedure 2. Tools, equipment and material are selected as per task requirements 3. ***Buffing materials*** are applied according to work requirements 4. Vehicle Body Buffing is carried out as per work requirements |
| 1. Perform House Keeping | 1. Waste is segregated and disposed as per workshop procedure 2. Tools and equipment are cleaned as per workshop procedure 3. Tools and equipment are stored as per workshop procedures 4. Work area is cleaned as per workplace procedure |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1.Tools, equipment and material may include but not limited to; | * Polishing compound * Microfiber clothing * Polishing pads * Buffing pads * Polishing wax * Fine grit sandpaper |
| 2.Vehicle body panel may include but not limited to; | * Bonnet * Wing * Hood * Roof * Doors * Boot * spoiler |
| 3.buffing materials and equipment may include but not limited to; | * Buffing compounds * Buffing pads * Buffing machine * Buffing wax |
|  |  |

**Required knowledge**

***The individual needs to demonstrate knowledge of:***

**Required knowledge**

***The individual needs to demonstrate***

* Kenyan legislation and workplace procedures relevant to
* Health, safety, environment and quality
* personal and vehicle protective equipment.
* Workplace procedures for;
* Adorning of PPEs
* the referral of problems;
* reporting delays to the completion of work

**Vehicle body works principles**

How to use vehicle body workshop tools, equipment and materials

How to perform vehicle body buffing and valeting

Measurements

Tools and Equipment maintenance

Legal requirements concerned with the disposal of body shop wastes

**FOUNDATION SKILLS**

***The individual needs to demonstrate the following foundation skills***:

* Communications
* Decision making;
* Multitasking;
* Time management;
* Problem solving;
* Planning;
* First aid
* vehicle body workshop tools
* vehicle body buffing and valeting
* Legal requirements concerned with the disposal of body shop wastes

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical aspects of competency. | ***Assessment requires evidence that the candidate:***   1. Undertaken Safety precautions as per workplace procedure 2. Selected ***Tools, equipment and material*** as per task requirements 3. ***Cleaned Vehicle body panel*** as per task requirement 4. Carried out Polishing as per work requirement 5. Carried out Vehicle Body waxing as per work requirements 6. Applied Buffing materials are applied according to work requirements 7. Carried out Vehicle Body Buffing as per work requirements 8. Cleaned work area as per workplace procedure |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task |
| 1. Methods of assessment. | ***Competency may be assessed through:***   * 1. oral questions   2. practical’s   3. portfolio of evidence   4. projects   5. written tests |
| 1. Context of assessment. | Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions. |
| 1. Guidance information for assessment. | This unit may be assessed on an integrated basis with others within this occupational sector. |

# INSTALL VEHICLE GLASS COMPONENTS

**UNIT CODE: 0716 451 03A**

**Unit description:**

This unit covers competencies required to demonstrate skills to install vehicle glass components. It involves competencies to prepare vehicle glass component, fit vehicle glass components and perform housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Prepare vehicle glass component | * 1. Work area is organized as per task requirement.   2. ***Tools and materials*** are selected as per job requirements   3. Glass sheets are inspected as per job specifications.   4. Marking out is carried out as per task requirement   5. Glass is cut as per task requirement.   6. Edges of the cut glass are smoothed and checked as per job requirement. |
| 1. Fit vehicle glass components | 1. Work area is organized as per task requirement. 2. Tools and materials are selected as per job requirements 3. Glass components are aligned to vehicle body panels as per manufacturer specifications. 4. Seals and adhesives are selected as per job requirements. 5. Adhesives are applied as per job requirement. 6. Glass components are positioned and fitted as per task requirement. 7. Fitment is tested as per manufacturer specification. |
| 1. Perform House Keeping | 1. Waste is segregated and disposed as per workshop procedures 2. Tools and equipment are cleaned as per workshop procedures 3. Tools and equipment are stored as per workshop procedures 4. Housekeeping is carried out as per workplace requirements |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  **May include but not limited to:** |
| 1. Tools, equipment and materials | 1. **Tools**     * + Suction cups and vacuum lifters      + Adhesive guns (manual and powered)      + Measuring tape and straight edge rulers      + Cutting tools (e.g., glass cutters, utility knives)      + Rubber mallets      + Sealant applicators      + Screwdrivers and torque wrenches      + Alignment tools and clamps 2. **Materials**     * + Glass panels (e.g., windshields, mirrors, side windows, back windows)      + Reflective components (e.g., side mirrors, headlights)      + Adhesives (urethane, silicone sealants)      + Rubber gaskets and seals      + Protective films (e.g., tint layers, UV-resistant films)      + Primer and bonding agents  * **Equipmen**t * Vehicle stands or jacks * Glass handling frames * Cleaning tools (e.g., microfiber cloths, sponges) * Calibrating devices (basic ADAS calibration tools) * Personal protective equipment (PPE: gloves, goggles, masks) |
| 1. Vehicle glass component | * Glass components * Windshields * Side windows * Rear windows * Roof glass * Specialty glass eg bullet resistant glass, smart glass, double glazed glass * Reflective components * Side mirrors * Rearview mirrors * Headlight reflectors |

**REQUIRED KNOWLEDGE AND SKLLS**

**Required knowledge**

***The individual needs to demonstrate knowledge of:***

* Kenyan legislation and workplace procedures relevant to:
* Health and safety
* Environment
* Personal protective equipment
* Waste management
* Manufacturers Manual
* Workplace procedures for vehicle engine overhaul.
* Working to agreed time frame and keeping others informed of progress
* The relationship between time, costs and profitability
* Interpretation and use of technical information for engine service activities

**REQUIRED SKILLS**

***The individual needs to demonstrate the following foundation skills***:

* Communication (verbal and written)
* Time management
* Problem solving
* Decision making
* Planning
* First aid
* Vehicle glass fitting procedure
* Reflective components fitting
* House keeping

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency. | Assessment requires evidence that the learner:   1. Selected tools, materials and adhesives as per job specifications. 2. Inspected glass and reflective components as per task requirements 3. Inspected glass sheets as per job specifications. 4. Carried out marking out as per task requirements. 5. Cut glass as per task requirements. 6. Smoothed and checked edges of the cut glass as per job requirements. 7. Secured mounting hardware as per vehicle design 8. Aligned glass components to vehicle body panels as per manufacturer specifications. 9. Selected seals and adhesives as per job requirements. 10. Applied adhesives as per job requirements. 11. Positioned and fitted glass components as per task requirements. 12. Tested fitment as per manufacturer specifications. 13. Tested glass components for functionality as per task requirement 14. Carried out housekeeping as per workplace requirements |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| 1. Methods of Assessment. | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party report   3.4 Written tests |
| 1. Context of Assessment. | Competency may be assessed in a workplace or in a simulated workplace |
| 1. Guidance information for assessment. | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# PERFORM GLAZING FINISHING PROCESSES

**UNIT CODE: 0716 451 06A**

**Unit description:**

This unit covers competencies required to perform glazing finishing processes. It involves competencies in clean glass surfaces, polish glass surface, install attachments, and performing housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Assess Vehicle Glass Components | 1. Work area is organized as per task requirement 2. ***Tools and equipment*** are selected as per job requirements. 3. Glass surfaces are inspected as per task requirement. 4. ***Cleaning agents*** ***and tools*** are selected as per job requirement. 5. Glass surfaces are cleaned as per task requirement |
| 1. Polish glass surface | 1. Work area is organized as per task requirement. 2. Tools and materials are selected as per job requirements. 3. Scratches and scuffs are inspected as per job requirement. 4. Glass polishing is carried out as per job requirement. 5. Glass surface is cleaned as per job requirement. |
| 1. Install attachments | 1. Work area is organized as per task requirement. 2. Tools and materials are selected as per job requirements. 3. Glass mounting areas are cleaned as per task requirements. 4. Glass mounting areas are inspected as per task requirements 5. ***Attachments*** are inspected as per job requirements. 6. Attachments are installed as per manufacturer specifications. 7. Electrical connections are tested as per job requirements. 8. Installation checks are conducted as per task requirement |
| 1. Perform housekeeping | * 1. Tools and materials are selected as per job requirements.   2. Waste materials are disposed as per workshop procedures.   3. Tools and equipment are cleaned as per workshop procedure.   4. Tools are stored as per workshop procedure. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Cleaning agents and tools | **General Cleaning Agents**   * Glass cleaners * Neutral pH cleaning solutions * Mild detergents * Distilled water   **Specialized Cleaning Agents:**   * Adhesive removers * Degreasers * Scratch-removal polishing pastes * UV glass cleaner * Rain repellent solutions   **Tools**   * Microfiber cloths * Sponges * Soft-bristle brushes * Razor blades or scrapers   **Polishing Tools:**   * Glass polishing machines * Buffing pads and discs * Hand-held polishing blocks   **Edge Cleaning Tools:**   * Detail brushes * Cotton swabs or foam sticks * Edge polishers |
| 1. Tools and equipment | * ADAS Calibration Tool * Mirror and Reflective Component Alignment Tools * Headlight Alignment Tools * Vehicle Leveling Tools * Testing Devices |
| 1. Attachments | * Sensors * Cameras * Heating elements * Wipers, * Window mechanism |

**REQUIRED KNOWLEDGE AND SKLLS**

**Required knowledge**

***The individual needs to demonstrate knowledge of:***

* Kenyan legislation and workplace procedures relevant to:
* Health and safety
* Environment
* Personal Protective Equipment
* Waste management
* Legal requirements relating to the vehicles warranty and insurance policies
* Workplace procedures for suspension system
* Working to agreed time frame and keeping others informed of progress
* The relationship between time, costs and profitability
* Interpretation and use of technical information

**REQUIRED SKILLS**

*The individual needs to demonstrate the following skills*:

* Communication (verbal and written)
* Time management
* Problem solving
* Decision making
* Planning
* First aid
* Glass and reflective components cleaning and polishing
* Calibrating and aligning components
* House keeping

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the learner:   * 1. Prepared and organised work area is as per task requirements.   2. Selected tools, materials and adhesives as per job specifications.   3. Inspected glass surfaces as per task requirements.   4. Selected cleaning agents as per job requirements.   5. Carried out glass polishing as per job requirements.   6. Cleaned glass surface as per job requirements   7. Installed attachments as per manufacturer specifications.   8. Tested glass components as per task requirement   9. Carried out housekeeping as per workplace requirements |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Project   3. Portfolio of evidence   4. Third party report   5. Written tests |
| 1. Context of Assessment | Competency may be assessed in a workplace or in a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

**MAINTAIN GLASS COMPONENTS**

**UNIT CODE: 0716 451 16A**

**Unit description:**

This unit covers competencies required to maintain glass components. It involves competencies in inspect vehicle glass components, repair vehicle glass and performing housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Inspect Vehicle Glass Components | 1. Work area is organized as per task requirement. 2. ***Tools and materials*** are selected as per job requirements. 3. ***Glass edges inspection*** is carried out as per job requirement. 4. Surface clarity is assessed as per task requirement. 5. ***Glass mounting areas*** are inspected for damage as per job requirement. |
| 1. Repair vehicle glass | 1. Work area is organized as per task requirement 2. Tools and materials are selected as per job requirements. 3. Glass surfaces are cleaned as per task requirement. 4. Repair resin or filler is applied as per job requirement. 5. Air bubbles are removed as per task requirement. 6. Resin is cured as per task requirement. 7. Glass surface is polished as per task requirement. |
| 1. Perform House Keeping | * 1. Waste is segregated and disposed as per workshop procedures   2. Tools and equipment are cleaned as per workshop procedures   3. Tools and equipment are stored as per workshop procedures   4. Housekeeping is carried out as per workplace requirements |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  may include but are not limited to: |
| 1. Tools, equipment and materials | * Magnifying glasses * UV light * Scrapers and adhesive removers * Pry bars and trim removal tools * Heat guns/blow dryers * Safety gloves   Specialized tools   * Suction cups * Cutting wires * Adhesive removers |
| 1. Glass edges inspection | * Cracks * Chips * Wear * Scratches |
| 1. Glass mounting areas | * Windshield frame * Rear window frame * Door frames * Quarter panel areas * Sunroof or moonroof frame * Headlight or taillight housing |

**REQUIRED KNOWLEDGE AND SKLLS**

**Required knowledge**

***The individual needs to demonstrate knowledge of:***

* Kenyan legislation and workplace procedures relevant to:
* Health and safety
* Environment
* Personal and vehicle protective equipment
* Waste disposal
* Legal requirements relating to the vehicles warranty and insurance policies
* Workplace procedures for:
* Reporting the results of tests
* Reporting anticipated delays
* Working to agreed time frame and keeping others informed of progress
* The relationship between time, costs and profitability
* Interpretation and use of technical information for braking system service activities
* Importance of using the correct technical information

**REQUIRED SKILLS**

***The individual needs to demonstrate the following skills***:

* Communication (verbal and written)
* Time management
* Problem solving
* Decision making
* Planning
* First aid
* Inspecting glass edges
* Removing damaged components
* Preparing surface
* House keeping

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills range

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the learner:   * 1. Selected tools and materials as per job requirements.   2. Inspected glass edges for damages as per job requirements.   3. Assessed glass surface clarity as per task requirements.   4. Inspected glass mounting areas for damage as per job requirements.   5. Cleaned glass surfaces as per task requirements.   6. Applied repair resin or filler as per job requirements.   7. Removed air bubbles and cured resin as per task requirements.   8. Polished glass surface as per task requirements.   9. Applied resin or filler as per task requirement   10. Carried out housekeeping as per workplace requirements |
| 1. Resource implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Project   3. Portfolio of evidence   4. Third party report   5. Written tests |
| 1. Context of Assessment | Competency may be assessed in a workplace or in a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# WELD VEHICLE STRUCTURE II

**UNIT CODE:** 0716 551 13A

**Unit Description**

This unit specifies competencies required by an Autobody technician to weld vehicle body parts. It involves arc welding vehicle cross members, MIG Welding vehicle structure, TIG Welding vehicle structure and Spot-welding vehicle structure

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Arc weld vehicle cross members | 1. ***Personal Protective Equipment (PPE)*** are adorned as per workplace procedures 2. Level vehicle structure as per job specifications 3. ***Materials, tools and equipment*** are selected as per job specifications 4. ***Joints*** are prepared as per working drawings. 5. Arc welding equipment is set up as per job specifications 6. Work pieces are welded using manual metal arc welding process as per job specifications 7. Post weld treatment is performed according to job specifications 8. Weld joint is examined as per ISO 17637 standards |
| 1. MIG Weld vehicle structure | 1. Safety is observed as per workplace procedure 2. Level vehicle structure as per job specifications 3. ***MIG welding equipment*** is set up as per job specifications 4. Work pieces are Weld using MIG process as per job specifications 5. Weld-joint quality is recorded as per welding specification record |
| 1. TIG Weld vehicle structure | 1. Safety is observed as per workplace procedures 2. Vehicle structure levelled as per job specifications 3. Materials, tools and equipment are selected as per job specifications 4. ***TIG welding equipment*** is set up as per job specifications 5. Work pieces are welded as per job specifications 6. Weld-joint quality is recorded as per welding specification record |
| 1. Spot weld vehicle structure | 1. Safety is observed as per workplace procedure 2. ***Spot welding equipment*** is set up as per job specifications 3. Surface joint are prepared as per working drawings 4. Work pieces are welded using spot process as per job specifications 5. Post weld treatment is performed according to job specifications 6. Weld-joint quality is recorded as per welding specification record |
| 1. Gas weld vehicle structure | * 1. ***Personal Protective Equipment (PPE)*** are adorned as per workplace procedures   2. Level vehicle structure as per job specifications   3. ***Materials, tools and equipment*** are selected as per job specifications   4. ***Joints*** are prepared as per working drawings.   5. ***Gas welding equipment*** is set up as per job specifications   6. Work pieces are welded using gas welding process as per job specifications   7. Post weld treatment is performed according to job specifications   8. Weld joint is examined as per ISO 17637 standards |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal Protective Equipment (PPE) may include but not limited to: | * + Welding helmet/ hand shield/ welding goggles   + Respirator   + Fire resistant clothing and apron   + Earmuffs/ ear plugs   + A pair of rubber soled safety boots   + Insulated gloves |
| 1. Materials, tools and equipment may include but not limited to: | * + Metal arc welding equipment   + Metal inert gas welding machines (MIG)   + Tungsten inert gas welding equipment (TIG)   + Resistance spot welding equipment   + Steel sheet metal   + Jigs and fixtures   + Portable grinders   + Electric hand drills   + Assorted consumables filler rods   + Chassis set-up fixture   + Bandoleers/legend set-up fixture   + Laser leveling kit   + Digital angle gauge with level   + Smart tool angle sensor   + Digital protractor   + Marking table   + Vernier height gauge |
| 1. Joints may include but not limited to: | * Butt joint * Lap joint * Edge joint * Tee joint * Corner joint |
| 1. MIG welding equipment may include but not limited to: | * + MIG welding PPE   + MIG welding machine   + MIG welding accessories |
| 1. TIG welding equipment may include but not limited to: | * + TIG welding PPE   + TIG welding machine   + TIG welding accessories |
| 1. Spot welding equipment may include but not limited to: | * + Spot welding PPE   + Spot welding machine * Spot welding accessories |
| 1. Gas welding equipment may include but not limited to: | * + Gas cylinders   + Brazing rods   + Gas regulators   + Welding torches   + Gas welding accessories |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to apply the following skills:

* Diagnose extent of vehicle body structural damage
* Removal of auto body structural and non-structural parts
* Join variety of metals such as low carbon steels, high strength steels and aluminum alloy
* Use MIG, TIG, Metal – arc, welding spot, gas welding equipment
* Prepare material estimate and cost and labor requirements
* Sketching/drawing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Legislative and organizational requirements and procedures
* Health and safety
* The environment (including waste disposal) in conformity to OSHA2007
* Appropriate personal, equipment and vehicle protective equipment
* Legal requirements relating to the vehicle and its construction including body configurations and standards e.g. (KS 372:2019 KNBS)
* Working procedures relating to:
* Job task planning and organizing
* Recording vehicle body condition, assess and recommending corrective actions
* Report delays in work completion
* Referral of problems
* The relationship between time, costs and profitability
* Both Standards in auto body welding and building
* Realignment of both structure and paneling of vehicle body and chassis
* Broad knowledge of auto body construction and repair techniques
* Different models of vehicles
* Quality requirements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Adorned ***Personal Protective Equipment (PPE)*** as per workplace procedure 2. Selected Materials, tools and equipment as per job specifications 3. Set up Arc welding equipment as per job specifications 4. Welded Work pieces using manual metal arc welding process as per job specifications 5. Set up ***MIG welding equipment*** as per job specifications 6. Welded Work pieces using MIG process as per job specifications 7. ***Set up TIG welding equipment*** as per job specifications 8. Set up ***welding equipment*** is as per job specification 9. Welded work pieces as per job specifications 10. Prepared Surface joint as per working drawings 11. Welded Work pieces using spot process as per job specifications 12. Performed Post weld treatment according to job specifications |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. POE evaluation   4. Third party reports   5. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DESIGN VEHICLE BODY

**UNIT CODE:** 0716 551 11A

**Unit Description**

This unit describes the competencies required by an auto body technician to design a vehicle body. It involves preparing vehicle structural drawing, simulating vehicle design and preparing bill of materials.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Prepare vehicle structural drawing | 1. ***Vehicle structure*** designs are sketched according to Kenya standard for passenger vehicle body construction (KS-372) 2. Designs are interpreted and working drawings developed as per KS 3. Viable design is selected, redrawn and modified in ***CAD software packages*** as per ***vehicle component standards*** 4. 2D vehicle diagrams are generated using CAD software as per KS-372 standards |
| 1. Simulate vehicle design | 1. 2D drawings are used to create a 3D model, using CAD software as per workplace procedures 2. Computer renders are generated and scaled clay models produced to accurately represent final vehicle design as per working drawing 3. A full-size clay model and renders are generated for vehicle design-visualization as per workplace procedure 4. Model approval is obtained as per workplace procedure 5. Job specification sheet is prepared as per working drawing |
| 1. Prepare vehicle body bill of materials | 1. List of ***part assemblies*** is prepared based on working CAD drawings. 2. Costing for vehicle components is carried out as per vehicle structural drawing 3. Vehicle structural body ***bill of materials*** is documented as per work procedure. 4. Vehicle structural body bill of materials approval is obtained as per work procedure. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Vehicle structure may include but not limited to: | * Body-on-frame structure * Unitary body structure * Space structure * Backbone structure * Triangulated tube structure * Monocoque structure * Punt structure * Perimeter space frame structure |
| 1. CAD software packages may include but not limited to: | * Auto Cad * Solid works * Inventory |
| 1. Vehicle component standards may include but not limited to: | * KS 372, Passenger vehicle body construction * KS ISO 898, Mechanical properties of fasteners * KS 376, Specification for flexible polyurethane (polyester) foams * KS 649, Specification for automobile windscreens and glass * KS 664, Specification for seat belt assemblies for motor vehicles * KS 822, Specification for anchorages for seat belts for automobiles |
| 1. Part assemblies may include but not limited to: | * Service doors * Emergency doors * Floor deck * Gangway * Cant rails * Roof * Window planes and windscreen * Handrails and handholds * Ventilators * Passenger seats * Seatbelt anchorage * Interior lights * Passenger entry steps * Door locks, window locks and boot locks * Electrical wiring * Luggage carriers |
| 1. Bill of materials may include but are not limited to: | * Welding rods * Electrode wires * Cutting disc * Grinding disc * Work pieces |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to apply the following skills:

* Interpretation of design standards
* Computer-Aided Design drawing
* CAD design simulation
* Rendering and clay modeling
* Cost accounting

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* KS 372 Standards
* Industrial vehicle design practices
* Vehicle aerodynamics
* Different vehicle materials and their application
* Government vehicle design approval process

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Sketched ***Vehicle structure*** designs according to Kenya standard for passenger vehicle body construction (KS-372) 2. Generated 2D vehicle diagrams using CAD software as per KS-372 standards 3. used 2D drawings to create a 3D model, using CAD software as per workplace procedures 4. generated A full-size clay model and renders for vehicle design-visualization as per workplace procedure 5. Prepared Job specification sheet as per the working drawing 6. Prepared List of part assemblies based on working CAD drawings. 7. Carried out Costing for vehicle components as per vehicle structural drawing |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Third party reports   4. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# TRIM VEHICLE BODY

**UNIT CODE:** 0716 551 17A

**Unit Description**

This unit covers the competencies required by an Autobody technician to trim vehicle body. It involves observing occupational health and safety, collecting trim materials, upholstering vehicle interior, padding vehicle cushion seat, installing vehicle restraints, install airbag, replacing mouldings, emblems and pin-striping, documenting and updating protocol book.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Upholster vehicle interior | * 1. ***Personal protective equipment*** are worn as per work requirements   2. ***Upholstery Material*** are identified as per work requirement   3. Upholstery Material are prepared as per vehicle design   4. Upholstery Material are sewed as per vehicle design   5. Adhesive is applied on surface to be trimmed as per workshop procedure  1. Cured upholstery material is fitted on vehicle body according to manufacturer’s specification |
| 1. Pad vehicle cushion s | * 1. Upholstery Material, are identified as per work requirement   2. ***Upholstery*** ***tools and equipment*** are identified as per work requirement   3. Upholstery Material are prepared as per vehicle design   4. Upholstery Material are sewed as per vehicle design   5. Adhesive is applied on surface to be trimmed as per workshop procedure  1. Cured upholstery material is fitted on vehicle body according to manufacturer’s specification |
| 1. Install vehicle restraints | * 1. ***Vehicle restraints*** are identified as per specification sheet   2. Vehicle restraints are mounted on seat frame as per KS-372 standard  1. Vehicle restraints are integrated with electrical system as per manufacturer’s manual |
| 1. Fit vehicle body accessories | * 1. ***Vehicle body accessories*** are identified as per specification sheet   2. Vehicle surface is prepared as per workshop procedure  1. Vehicle body accessories are fitted as per workshop procedure |
| 1. Perform vehicle buffing services | * 1. ***Buffing materials and equipment*** are identified according to manufacturer’s specifications   2. Vehicle body is prepared for buffing according to workshop procedure   3. Vehicle body buffing is performed according to manufacturer’s specifications |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal protective equipment may include but is not limited to: | * Goggles * Ear muffs * Safety mask * Head gear * A pair of safety boots * Cotton-leather gloves * Overall |
| 1. Upholstery tools and equipment may include but is not limited to: | * Power tools * Hand tools * Trim removal tool kit * Hand scissors * Straight, curved needles and skewers * Industrial Sewing machine * Mold removal wedges * Adhesive remover * Pin-striping brushes * Beugler pin-striper |
| 1. Upholstery material may include but is not limited to: | * Trim fabrics * Faux leather * Headlining material * Cushion foam, felt and fibre board * Adhesive conta glue * Mally floor |
| 1. Vehicle body accessories may include but is not limited to | * Bike rack * Tow bars * Wind screen washer * Roof Racks and Roof Rails |
| 1. Buffing materials and equipment may include but is not limited to | * Buffing pads * Rubbing compound * Buffing machine |
| 1. Vehicle restraints may include but is not limited to | * Air bags * Safety belt |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Trim work
* Equipment operation
* Assembling
* Maintenance of equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Vehicle trim and accessories
* Car upholstery materials selection and specifications
* Material estimation and costing
* Observe OSHA
* Adhesive use according to direction for use
* Fitting seats and head rests
* Material selection
* Fitting instructions
* Safety information with seat covers with air bags
* Cleaning agents
* Mounting procedure
* Use of manufacturers manual
* Operation of air bag
* Specifications of moulds
* Emblems
* Quality standards

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. wore Personal protective equipment as per work requirements 2. Identified Upholstery tools and equipment as per work requirement 3. Mounted vehicle restraints on seat frame as per KS-372 standard 4. Integrated Vehicle restraints with electrical system as per manufacturer’s manual Replaced vehicle 5. Fitted Vehicle body accessories as per workshop procedure 6. Performed Vehicle body buffing according to manufacturer’s specifications |
| 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of assessment | Competency may be assessed through:   1. Practical 2. PROJECTS 3. POE evaluation 4. Third party reports 5. Written assessment |
| 1. Context of assessment | Competency may be assessed in a workplace or a simulated workplace. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# FABRICATE VEHICLE STRUCTURE

**UNIT CODE:** 0716 551 12A

**Unit Description**

This unit describes the competencies required by an Autobody technician to fabricate automotive structure. It involves cutting metal work pieces, bending metal work pieces, prepare fabrication jigs, join jigged work pieces, mount fabricated structure and fabricate vehicle body ancillary units.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Cut metal work pieces | 1. Health and ***Safety precautions*** are practiced as per work procedures. 2. Vehicle structural drawing is interpreted as per work procedure. 3. Vehicle body fabrication materials are collected as per work procedure. 4. Vehicle body fabrication materials are marked out as per workshop procedures. 5. Vehicle body fabrication materials are ***cut*** as per vehicle structural drawing 6. Vehicle body scrap are disposedas per work procedures |
| 1. Bend metal work pieces | 1. ***Bending machines*** are selected as per the metal sizes and sections 2. ***Metal work pieces*** are prepared as per the working drawing 3. Metal work pieces are bent according to task measurements |
| 1. Prepare fabrication jigs | 1. ***Fabrication jigs*** are designed as per working drawings 2. ***Materials, tools and equipment*** are selected for jigs as per job specifications 3. Work pieces are prepared using appropriate tools as per the working drawings 4. Work pieces are joined appropriately according to design drawing 5. Jigs are mounted in the appropriate distances according to structure design. |
| 1. Join jigged work pieces | 1. Materials, tools and equipment are selected as per job specifications 2. Welding machine settings and electrodes are selected as per workplace procedure 3. Joints are tack welded as per the working drawing 4. Tacked structure is inspected using the designed drawings |
| 1. Mount fabricated structure | 1. vehicle structure diagonals are checked as per working drawing 2. Vehicle structure is levelled appropriately as per drawing. 3. Fabricated structures are mounted to the chassis as per working specification. 4. ***Fabricated structure*** is inspected as per workplace procedures |
| 1. Fabricate vehicle body ancillary units | 1. Safety and health are observed as per workplace procedures. 2. Tools and equipment are selected as per job specifications 3. ***Ancillary materials*** are selected as per working drawing 4. Work pieces are prepared as per job specifications. 5. Welding machine settings and electrode are selected as per workplace procedure 6. Work pieces are joined according to designed drawing 7. Ancillary units are inspected as per workplace procedure |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Metal work pieces may include but are not limited to: | * Angle sections * Square * Rectangular tubes * Channel bars * Flat bars * Circular tubes * Round bars |
| 1. Structure jigs may include but are not limited to:: | * Under structure * Left side structure * Right side structure * Roof structure * Front structure * Rear structure * Cross members |
| 1. Personal protection equipment may include but are not limited to: | * Overall * Safety boots * Goggles, * Earmuffs * Gloves * Helmet * Safety mask |
| 1. Tools and equipment may include but are not limited to: | * Drilling machine * Impact gun * Tape measure * Scriber * Try square * Vernier caliper * Vernier height gauge * Ball pein hammer * Marking table * Laser Leveler * Hydro pneumatic jack * Rivet gun * Hacksaw * Angle grinder * Circular saw * Angle grinder * Laser cutting machine * Plasma cutting machine * Gas cutting equipment |
| 1. Material handling equipment may include but are not limited to: | * Hoist * Chain * Conveyor belt * Forklift |
| 1. Bending machines may include but are not limited to: | * Hydraulic bending machine * Pneumatic bending equipment * Mechanical pipe benders |
| 1. Fabrication Jigs may include but are not limited to: | * Template jig * Plate jig * Diameter jig * Channel jig * Ring jig * Box jig |
| 1. Ancillary units may include but are not limited to | * Tail lifts * Cranes * Drawbars * Sleeper pods |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to apply the following skills:

* Measurement
* Designing
* Bench work
* Data analysis
* Material processing
* Metal cutting
* Metal Bending
* Welding and fabrication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Operational standards
* Machine operations and maintenance
* Tools and equipment
* Health and safety
* Material science

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Practiced Health and ***Safety precautions*** as per work procedures. 2. ***Cut*** Vehicle body fabrication materials as per vehicle structural drawing 3. Prepared ***Metal work pieces*** as per working drawing 4. Bent Metal work pieces according to the required measurements 5. Joined Work pieces appropriately according to design drawing 6. Mounted Jigs in the appropriate distances according to structure design. 7. Selected Welding machine settings and electrodes as per workplace procedure 8. Tack Joints welded as per working drawing 9. Mounted fabricated structures to the chassis as per working specification. 10. Selected ***Ancillary materials*** as per working drawing 11. Joined Work pieces according to designed drawing |
| 1. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. POE evaluation   4. Third party reports   5. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# ASSEMBLE VEHICLE BODY PARTS

**UNIT CODE:** 0716 551 18A

**Unit Description**

This unit describes the competencies required by Autobody technician in order to assemble vehicle body parts. It involves, installing vehicle seats, performing vehicle glazing, installing vehicle electrical components, install vehicle mechanical components and installing vehicle auxiliaries

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Install vehicle seats | 1. ***Personal protective equipment*** are adorned as per work requirements. 2. ***Vehicle*** floor panel is marked as per KS-372 standards. 3. ***Floor*** panel is drilled as per specification sheet 4. ***Vehicle*** carpet and seats are fitted as per specification sheet |
| 1. Perform vehicle glazing | 1. Glass and body panels are prepared as per KS-372 standards 2. Adhesive application is carried out as per work requirement 3. Vehicle windscreen is fitted as per work requirements 4. Glass window winding mechanism is installed as per working requirement |
| 1. Install vehicle electrical components | 1. ***Electrical components*** are identified according to specification sheet. 2. ***Electrical*** components are fitted as per specification sheet 3. Electrical components are tested for fitness as per specification sheet |
| 1. Install vehicle mechanical components | 1. ***Mechanical components*** are identified according to specification sheet 2. Mechanical parts are fitted as per work procedure 3. Mechanical components are tested for fitness as per specification sheet |
| 1. Install vehicle auxiliaries | 1. ***Auxiliary units*** are identified as per the specification sheet 2. Tools and equipment are identified as per work requirement 3. Auxiliary units are fitted as per the specification sheet 4. Vehicle ***body fittings*** are installed as per work requirements 5. Components are tested for fitness as per specification sheet 6. Vehicle ***documentation*** is carried out as per workshop requirements. 7. Final ***Vehicle body inspection*** is carried our as per workshop requirement |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal protective equipment may include but not limited to: | * Goggles * Earmuffs * Safety mask * Helmets * Safety boots * leather gloves * Overall |
| 1. Auxiliary units may include but not limited to: | * Chevrons * Reflector strip * Round reflectors   + - Parcel rack |
| 1. Electrical components may include but not limited to: | * Radio * Charging sockets * Entertainment systems * Air con system |
| 1. Mechanical components may include but not limited to: | * Side mirrors * Rear view mirror * Fuel filter * Fuel tank * Exhaust system * vehicle locks * latches * window regulator |
| 1. Vehicle body fittings may include but not limited to: | * Door panels and armrests * Sound deadening * Cigarette lighter * Window planes and windscreen * Handrails and handholds * Ventilator vents * Passenger seats * Seatbelt anchorage * Interior lightings * Door lock actuators and switches |
| 1. Vehicle documentation may include but not limited to: | * Approved design documents * Approved body builder documents * Approved materials standards * In stage approval documents * Assembly park list * Marking plate affixed on the body * Internal inspection documents |
| 1. Vehicle body inspection may include but not limited to: | * Government vehicle inspectorate unit * Mechanical Engineers * KEBS * Ministry of transport |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Interpretation of vehicle specification sheet
* Metal grinding and welding
* Glass glazing and joining
* Vehicle component installation

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Kenyan government motor vehicle governing regulations
* Vehicle body material types and their application
* Occupational health and safety standards
* Workshop technology practices
* Electrical installation
* Water leak testing procedures
* Vehicle body seals
* Vehicle cooling system
* Working principles of pneumatic and hydraulic systems

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Wore ***Personal protective equipment*** as per work requirements.   2. Marked Vehicle floor panel as per KS-372 standards.   3. fitted Vehicle windscreen as per work requirements   4. Fitted electrical components according to specification sheet.   5. Fitted mechanical parts are as per work procedure   6. Fitted auxiliary units as per the specification sheet |
| 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or task |
| 1. Methods of assessment. | Competency may be assessed through:   * 1. Practical   2. Projects   3. POE evaluation   4. Third party reports   5. Written examinations |
| 1. Context of assessment. | Competency may be assessed in a workplace or a simulated workplace. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |