Technical and Vocational Education and Training (TVET) Council

Occupational Standards of Competence

Additive Manufacturing – Installation and Commissioning Level 3

Hastings House West, Balmoral Gap, Hastings, Christ Church, Barbados
Telephone: (246) 435-3096 Fax: (246) 429 2060 E-mail:office@tvetcouncil.com.bb

Published by:
The Technical and Vocational Education and Training (TVET) Council
Hastings House West
Balmoral Gap
Christ Church
BARBADOS, W.I.
Tel: (246) 435-3096
Fax: (246) 429-2060
Email: office@tvetcouncil.com.bb Website: www.tvetcouncil.com.bb

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National Skills Development Corporation, India

Technical Experts for Additive Manufacturing – Installation and Commissioning Level 3

Mr. Tom Fountain	-	Managing Director, Intech Inc.
Ms. Paula Williams	-	Instructor, Samuel Jackman Prescod Institute of Technology
Ms. Nicole Scantlebury	-	Technical Writer, TVET Council

Validation Committee for Additive Manufacturing – Installation and Commissioning Level 3

Mr. Anthony Browne	-	Instructor, Samuel Jackman Prescod Institute of Technology (SJPI)
Mr. Vickram Goberdhan	-	Ullyett's Machine Shop
Mrs. Kendra Hollingsworth-Edwards	-	Instructor (Part Time), Samuel Jackman Prescod Institute of Technology (SJPI)
Mr. John Springer	-	Tutor, Barbados Community College

Qualification Overview

NVQB

in

Additive Manufacturing –

Installation and Commissioning

Level 3

NVQB Qualification in Additive Manufacturing – Installation and Commissioning Level 3

Qualification Overview

This qualification is designed to provide training, assessment and recognised certification for persons who utilise 3D printing within the manufacturing work environment. Candidates should be able to install a 3D Printer, configure the hardware and software, calibrate and successfully operate the machine for additive manufacturing, maintain it and seek technical service support when necessary.

Who is this qualification for?

This qualification is aimed at persons who have some experience in 3D printing and who are autonomous, computer literate and possess excellent problem-solving skills. The competencies are for persons who are likely to be in roles where, for example, their duties include:

- Installing, operating and commissioning additive manufacturing/3D printing
- Researching and developing new products

Jobs within the occupational area

Relevant occupations include:

- Designers
- Innovators
- Hobbyists

This list is not exhaustive and only serves to illustrate the breadth of the qualification.

A09703 - APPROVED NATIONAL VOCATIONAL QUALIFICATION STRUCTURE ADDITIVE MANUFACTURING – INSTALLATION AND COMMISSIONING - LEVEL 3

To achieve the full qualification, candidates must complete **all TWELVE (12)** mandatory units.

MANDATORY UNITS (ALL MUST BE COMPLETED)	CODE
1. Plan, prepare and work	**U55802**
1.1 Plan to work	
1.2 Prepare to work	
1.3 Follow safe work practices	
2. Install and commission 3D print systems	**UA35003**
2.1 Inspect 3D printer hardware	
2.2 Install and configure 3D print systems	
2.3 Calibrate and test 3D printers	
3. Maintain 3D print systems and provide technical support	**UA35103**
3.1 Prepare for basic maintenance activities	
3.2 Conduct maintenance on 3D print systems	
3.3 Complete maintenance activities	
3.4 Provide post installation technical support	
3.5 Restore work areas	
4. Operate a 3D scanner	**UA35203**
4.1 Prepare objects to be scanned	
4.2 Prepare and operate scanner	
4.3 Prepare output file	
5. Optimise the additive manufacturing process	**UA35303**
5.1 Develop products for the additive manufacturing process	
5.2 Create a 3D model	
5.3 Slice a 3D model	
5.4 Print product	
5.5 Clean up	
6. Design new, innovative products	**UA35403**
6.1 Conceptualise ideas on the product being developed	
6.2 Develop a prototype of the product	

MANDATORY UNITS (ALL MUST BE COMPLETED)	CODE
7. Contribute to protection of the environment	**U68402**
7.1 Work in an environmentally conscious way	
7.2 Contribute to continuous improvements in protecting the environment	
8. Manage budgets	**UA35503**
8.1 Plan for and collect information for budgets	
8.2 Develop budgets	
8.3 Finalise budgets and allocate resources	
8.4 Monitor and control budgets	
8.5 Complete financial and statistical reports	
9. Manage stock inventory	**UA12903**
9.1 Maintain stock inventory control levels	
9.2 Organise stock take and order stock	
9.3 Receive stock inventory	
9.4 Monitor and maintain stock inventory levels	
10. Deliver reliable customer service	**U12902**
10.1 Prepare to deal with your customers	
10.2 Give consistent service to customers	
10.3 Check customer service delivery	
11. Participate in workplace communication	**U53802**
11.1 Gather and convey workplace information	
11.2 Participate in workplace meetings and discussions	
11.3 Complete work-related documents	
12. Craft personal entrepreneurial strategy	**U92702**
12.1 Demonstrate knowledge of the nature of entrepreneurship	
12.2 Identify and assess entrepreneurial characteristics	
12.3 Develop a self-assessment profile	
12.4 Craft an entrepreneurial strategy	

U55802 Plan, prepare and work

Unit Descriptor: This unit describes the knowledge, skills and attitudes required to plan, prepare and work safely in the work environment. Basic maintenance and housekeeping of the work area within the scope of the employee are also included.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Plan to work	1.1 Plan work in accordance with relevant legislation, codes of practice and organisational procedures.
	1.2 Review plans with relevant personnel.
	1.3 Carry out pre-work checks and work area assessments before starting to work.
	1.4 Review safe work methods before undertaking work activity.
	1.5 Identify **personal protective equipment** correctly for the job.
2. Prepare to work	2.1 Identify **hazards** in the work area.
	2.2 Take appropriate actions to correct **hazards** identified within the scope of responsibility.
	2.3 Report **hazards** which cannot be corrected to appropriate personnel.
	2.4 Test **protective equipment** before use.
3. Follow safe work practices	3.1 Follow work procedures and instructions for ensuring safety carefully and precisely when conducting work.
	3.2 Observe **duty of care** requirements at all times.
	3.3 Adhere to occupational safety and health plans as required.
	3.4 Use **protective equipment** correctly, as required, when working.

3.5 Adhere to **ergonomic principals** as stated.

3.6 Use tools, equipment and materials correctly at all times.

3.7 Follow organisational procedures for dealing with **emergencies** within own scope of responsibility at all times.

3.8 Report incidents, injuries and hazards which occur while working to designated personnel.

3.9 Keep work area clean and orderly during the work process.

RANGE STATEMENT

All range statements must be assessed:

1. **Protective equipment:**

    - Clothing
    - Footwear
    - Face and eye protection
    - Hand protection
    - Head protection
    - Hearing protection
    - Respiratory protection
    - Machine guards

2. **Hazards:**

    - Biological
    - Environmental
    - Chemical
    - Physical
    - Psychological
    - Ergonomic

3. **Duty of care:**

    - Legal responsibility to do everything reasonably practicable to protect others from harm
    - Own responsibility to comply with safe work practices, including activities that require licences, tickets or certificates of competency

4. **Ergonomic principals:**

    - Manual handling
    - Workstation design

5. **Emergencies:**

    - Evacuations
    - Explosions, fires, bomb threats
    - Natural disasters
    - Accidents and other serious injury events
    - Security emergencies

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to interpret relevant legislation, codes and organisational procedures when planning for work.
2. How to communicate work plans with relevant personnel.
3. How to identify hazards when making pre-work checks and work area assessments and what steps to take to control those that are within own area of responsibility.
4. What personal protective equipment is needed for your job and how to use and test them correctly.
5. What are common workplace hazards and the safety measures to deal with these hazards.
6. What is duty of care, within the scope of own responsibility.
7. What are the different ergonomic techniques and how they should be used.
8. What are the organisational and manufacturer's requirements for storing, maintaining and using tools and equipment.
9. What are the organisation's safety and emergency plans and procedures to be followed.
10. What is the importance of keeping own work area clean and how does this impact on the efficiency of own work.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35003 Install and commission 3D print systems

Unit Descriptor:

This unit deals with the knowledge skills and attitudes required to unpack a printer and inspect, set-up, configure, load material and make test runs. Mechanical adjustments and software settings should be completed to obtain the desired print output quality.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Inspect 3D printer hardware	1.1 Obtain and interpret appropriate inspection and installation checklists for the printer to be used.
	1.2 Source the required tools, accessories and consumables according to manufacturer's requirements.
	1.3 Inspect parts of the 3D printer for defects against the manufacturer's manual.
	1.4 Record any defects or deficiencies found and communicate to appropriate personnel, according to organisational procedures.
2. Install and configure 3D print systems	2.1 Read and interpret manufacturer guidelines for installing **3D print system** accurately.
	2.2 Inspect the site and verify that it meets the recommended requirements for installation according to manufacturer's specifications and industry requirements.
	2.3 Inspect the **3D print system** and components to confirm serviceability according to manufacturer's specifications.
	2.4 Install and configure the **3D print system** according to manufacturer's specifications and health and safety requirements.
	2.5 Follow occupational safety and health guidelines during the process of installation and commissioning the **3D print system**.

		2.6 Power-on the **3D print system** and verify functionality of all parts and connections according to manufacturer's guidelines.
		2.7 Record and report any errors which may occur and, where possible, carry out the necessary corrective actions according to manufacturer's guidelines and standard operating procedures.
3.	Calibrate and test 3D printers	3.1 Perform calibration procedures specific to the type of 3D printer in accordance with manufacturer's guidelines and standard operating procedures.
		3.2 Perform a test output of a three-dimensional model in accordance with manufacturer's guidelines and standard operating procedures.
		3.3 Confirm the performance of the **3D print system** according to manufacturer's specifications.
		3.4 Make any necessary adjustments to the 3D printer and repeat and evaluate the test print, according to organisational procedures and manufacturer's requirements.
		3.5 Contact relevant technical support personnel if the desired print quality is not obtained in accordance with organisational policy and procedures.
		3.6 Complete documentation relevant to installation of the **3D print system** in accordance with organisational procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **3D print system:**

    - Hardware
    - Software

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are 3D print systems.
2. How to read and interpret technical specifications, drawings, manuals, instructions.
3. How to read and interpret standards and regulatory compliance documents.
4. What are the health and safety guidelines for installing and commissioning 3D print systems.
5. What are the site requirements for installing and commissioning 3D print systems.
6. How to inspect the site to ensure it meets the requirements for installation and commissioning the 3D print system.
7. How to inspect parts of the 3D print system and how to report defects and deficiencies with the 3D print system.
8. How to report errors faults or problems associated with the 3D print system and to whom they should be reported.
9. How to install computer software, hardware and connect to the Internet.
10. What are the technologies used in 3D print systems.
11. What are the methodologies and safe working practices to be employed when setting up, testing and calibrating 3D print systems.
12. What are the types of 3D printers available for use in the market and within your organisation.
13. What are the capabilities of 3D print systems in your organisation.
14. What types of materials are used in 3D print systems specifically used by your company and how to load materials.
15. How material is fed into the printer head.
16. What are the properties of filaments and how and why are they used.
17. How to handle, store and insert filaments in 3D print systems.
18. How to care for and store filaments for optimal results and shelf life.
19. How to calibrate 3D print systems.
20. How to perform test prints.
21. How to make adjustments, calibration and performance improvement of 3D printers supported by your company.
22. How to accept a test print as successful and decide if the printer is installed correctly or needs reinstallation.
23. How to obtain technical support from the manufacturer, if required.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35103 Maintain 3D print systems and provide technical support

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to perform routine and preventative maintenance activities on 3D print systems and provide technical support when required. It covers basic lubrication and filament changes to repairs, diagnosing faults and restoring equipment back to a functional state.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Prepare for basic maintenance activities	1.1 Obtain and wear suitable **personal protective equipment** for carrying out **maintenance activities** on **3D print systems** according to legislation.
	1.2 Select the appropriate tools, equipment and materials for **maintenance activities** according to manufacturer's instructions.
	1.3 **Prepare 3D print system** equipment for the **maintenance activities** to be conducted according to safety and health protocols and standard operating procedures.
2. Conduct maintenance on 3D print systems	2.1 Follow safety and health procedures when performing **maintenance activities** on **3D print systems.**
	2.2 Dismantle **3D print system**, where necessary, according to manufacturer's instructions and organisational procedures.
	2.3 Remove debris from the build plate before conducting **maintenance activities**, according to manufacturer's instructions.
	2.4 Perform manufacturer's recommended procedures to conduct **maintenance activities** on the **3D print system** hardware.
	2.5 Identify any other **corrective maintenance** which may be needed for the **3D print system** with relevant personnel.

3.	Complete maintenance activities	3.1 Reconnect and reassemble the **3D print system**, as necessary, according to manufacturer's specifications and standard operating procedures.
		3.2 Perform software updates and upgrade as necessary according to organisational procedures.
		3.3 Perform calibrations and test prints and any troubleshooting requirements according to manufacturer's specifications and standard operating procedures.
		3.4 **Record** all **maintenance activities** conducted on the **3D print system** according to organisational procedures.
4.	Provide post installation technical support	4.1 Perform test prints of models using materials approved by your organisation.
		4.2 Identify and record any defects and deficiencies found in the test prints against expected outputs.
		4.3 Identify the problem and find possible solutions according to manufacturer's guidelines.
		4.4 Contact manufacturer's technical support if solutions are not appropriate according to organisational procedures.
5.	Restore work areas	5.1 Clean and sanitise workstations before setting up the print system after maintenance according to safety procedures.
		5.2 Store tools, materials and equipment in the designated storage area according to organisational procedures.
		5.3 Dispose of **waste** according to standard operating procedures and health and safety protocols.

RANGE STATEMENT

All range statements must be assessed:

1. **Protective equipment:**

    - Clothing
    - Footwear
    - Face and eye protection
    - Hand protection
    - Head protection
    - Hearing protection
    - Respiratory protection
    - Machine guards

2. **Maintenance activities:**

    - Lubrication
    - Cleaning
    - Tightening of screws, bolts, belts
    - Update of 3D print system firmware
    - Electrical test and inspection

3. **Prepare:**

    - System back-up
    - Power off
    - Disconnect cables

4. **Corrective maintenance:**

    - Lubrication
    - Changes to hardware
    - Electrical systems

5. **3D print system**:

    - Hardware e.g. filament feeder, axis mechanism, build plate/platform
    - Software

6. **Faults and problems:**

    - Major
    - Minor

7. **Record:**

    - Manual service logs, reports
    - Electronic service logs, reports

8. **Waste:**

    - Electrical
    - Chemical e.g. lubricants, cleaning agents
    - Plastics

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the manufacturer's specifications for the 3D print systems.
2. What are the health and safety and organisational/legislative frameworks relevant to 3D print systems.
3. What PPE is required for conducting maintenance activities on 3D print systems.
4. What tools, equipment and materials are required for conducting maintenance activities on 3D print systems.
5. What are the hazards associated with 3D print systems and the safety and health procedures and protocols to be followed when conducting maintenance on 3D print systems.
6. What are the organisational policies and procedures with respect to maintenance and technical support of print systems.
7. How to plan preventative maintenance.
8. What are maintenance schedules and logs and how to follow them.
9. How 3D print systems are set up.
10. How to read technical specifications, manuals and instructions for maintenance of 3D print systems.
11. What are the main components of the 3D printer being used in particular the type of filament, the build plate and the nozzle.
12. What are the various methodologies for maintaining 3D print systems.
13. What chemicals to use when cleaning various parts of the 3D printer such as extrusion gear, build plate printer nozzle and how to do so safely.
14. What lubricants to use when lubricating various parts of the 3D printer and how to do so safely.
15. How to lubricate axis mechanisms.
16. How to clean the filament feeder.
17. What tools to use when tightening various screws and bolts of the 3D printer and how to do so correctly and safely.
18. How to update firmware on the 3D print system.
19. What are some common faults and 3D printing problems likely to be encountered when performing maintenance activities on 3D print systems.
20. How to diagnose and rectify faults or problems associated with the 3D print system.
21. How to seek assistance in dealing with major faults or problems associated with 3D print system and which technical support to contact and how to seek assistance.
22. How to document maintenance logs and write test reports.
23. How to safely clean and store tools, materials and equipment used for 3D maintenance activities.
24. How to safely store and dispose of waste generated from maintenance activities.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35203 Operate a 3D scanner

Unit Descriptor:

This unit deals with the knowledge skills and attitudes required to operate a 3D scanner to scan a 3D object and output data to a specified data file type for the additive manufacturing process. It applies to individuals who utilise 3D models for graphical, artistic and manufacturing applications.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Prepare objects to be scanned	1.1 Determine the size and complexity of the object to be scanned according to standard operating procedures.
	1.2 Determine the output requirements of the scan from specifications and confirm with the client according to standard operating procedures.
	1.3 Select the appropriate scanner according to job requirements and standard operating procedures.
	1.4 Treat and orient the object for optimal scanning results in accordance with manufacturer's guidelines and standard operating procedures.
2. Prepare and operate scanner	2.1 Power-on the **3D scan system** and verify functionality of all parts and connections according to manufacturer's guidelines.
	2.2 Check and adjust the scanner in accordance with manufacturer's guidelines and standard operating procedures.
	2.3 Report any malfunctions of the **3D scan system** to relevant personnel in accordance with standard operating procedures.
	2.4 Set the tolerance level of the scanner to obtain the most effective scan result in accordance with manufacturer's guidelines.

		2.5 Operate the scanner correctly and efficiently in accordance with manufacturer's guidelines and standard operating procedures.
		2.6 Monitor and adjust the scanner to ensure scans have been completed accurately and in accordance with standard operating procedures.
		2.7 Repeat scans where necessary, in accordance with standard operating procedures.
		2.8 Save scans using appropriate techniques and software according to standard operating procedures.
		2.9 Shut down and reset the scanner in accordance with organisational and manufacturer's operating procedures.
3.	Prepare output file	3.1 Download scanner files to the computer according to standard operating procedures.
		3.2 Confirm that the quality of the images meets client specifications according to organisational policies and procedures.
		3.3 Convert the scanner output file into the appropriate format according to standard operating procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **3D scanning system:**

    - Hardware
    - Software

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are 3D scanning systems, technologies and their respective applications.
2. How to select a suitable 3D scanner and set up 3D scanning systems.
3. What are the health and safety considerations for setting up 3D scanning systems.
4. Why it is important to make adjustments to obtain suitable 3D scans.
5. What are the methodologies and safe working practices to be employed when setting up, testing and calibrating 3D scanning systems.
6. How to install computer software, hardware and connect to the Internet.
7. What is 3D scanning and how to apply it to additive manufacturing.
8. How to report errors, faults or problems associated with 3D scanning systems and to whom they should be reported.
9. How to calibrate 3D scanning systems.
10. What are the requirements for the installation, commissioning and testing of 3D scanning systems.
11. What are the organisational policies and procedures for use of 3D scanning systems.
12. What are the capabilities of 3D scanning systems in your organisation.
13. How to make adjustments, calibration and performance improvement of scanners supported by your company.
14. How to perform test scans.
15. How to accept a test scan as successful and to decide if the scanner is installed correctly or needs re-installation.
16. What are the various file formats e.g. standard triangle language (stl), geometry definition file format (obj), polygon file format (ply), virtual reality modelling language file format (vrml), point cloud file formats (xyz/ptx), additive manufacturing file format (amf) and how to convert these.
17. How to save and download scanned images for the additive manufacturing process.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35303 Optimise the additive manufacturing process

Unit Descriptor: This unit describes the knowledge, skills and attitudes required to develop products, create and slice 3D models and print products based on job specifications. It covers the tools, techniques and software used to create, slice and save 3D models for printing.

ELEMENT	PERFORMANCE CRITERIA

To be competent you must achieve the following:

1. Develop products for the additive manufacturing process	1.1 Confirm the type of product being developed according to the job specification sheet.
	1.2 Document user requirements and **product characteristics** in accordance with standard operating procedures.
	1.3 Communicate with **relevant personnel** to confirm the **resources** to be used for the type of product being developed in accordance with organisational policies and procedures.
	1.4 Obtain **resources** required to develop the product in accordance with organisational policies and procedures.
	1.5 Identify the **constraints** in developing the product in accordance with standard operating procedures.
	1.6 Confirm the **costings** and budget associated with producing the product to required characteristics in accordance with standard operating procedures.
2. Create a 3D model	2.1 Prepare a model of the product using appropriate techniques according to design specifications and job requirements.
	2.2 Manipulate and edit the model using appropriate computer aided design (CAD) software according to design specifications and standard operating procedures.

		2.3 Create a 3D model with the help of appropriate CAD software in accordance with the design specifications of the product and standard operating procedures.
		2.4 Optimise the 3D model using appropriate software according to standard operating procedures.
		2.5 Save the 3D model using appropriate software in an appropriate **file format** according to standard operating procedures.
		2.6 Confirm that the design brief, including relevant scans, sketches, costings and 3D model, meets the client's organisational and legislative requirements.
3.	Slice a 3D model	3.1 Retrieve the 3D model file using appropriate software and in accordance with standard operating procedures.
		3.2 Position and maneuver the 3D model on the print bed using appropriate software and in accordance with standard operating procedures.
		3.3 Specify new dimensions appropriate to the product being printed in accordance with standard operating procedures.
		3.4 Scale and (re)size the 3D model using appropriate software in accordance with design specifications and standard operating procedures.
		3.5 Apply support to specific points of the 3D model using appropriate software and according to standard operating procedures.
		3.6 Create layers by selecting and modifying settings in the appropriate software in accordance with design specifications and standard operating procedures.

		3.7	Use appropriate software to slice the 3D model to create the G-code file in accordance with design specifications and standard operating procedures.
		3.8	Edit the G-code file, where necessary, using appropriate software in accordance with standard operating procedures.
		3.9	Save the G-code production files representative of the 3D model using appropriate software in accordance with standard operating procedures.
4.	Print product	4.1	Set up a suitable **3D print system** and schedule the manufacture of the product according to standard operating procedures.
		4.2	Upload the G-code file to be printed into the 3D printer according to standard operating procedures.
		4.3	Initiate and manage the print process according to organisational policies and procedures.
		4.4	Perform **post printing processes** according to standard operating procedures.
		4.5	Compare documentation and the actual product to ensure it was manufactured in accordance with the design and prototype specifications.
		4.6	**Test** and validate the product to ensure it is market ready and meets regulatory and industry standards and job requirements.
5.	Clean up	5.1	Clean the 3D printer according to manufacturer's instructions, health and safety protocols and standard operating procedures.
		5.2	Follow shut down procedures for the **3D print system** according to recommended manufacturer instructions.

5.3 Dispose of **waste** in accordance with organisational and legislative protocols.

RANGE STATEMENT

All range statements must be assessed:

1. **Product characteristics:**

   - Size
   - Colour
   - Shape
   - Weight
   - Mechanical properties (strength, elasticity, surface finish)

2. **Relevant personnel:**

   - Designers/graphic artists
   - Managers

3. **Resources:**

   - Human
   - Financial
   - Physical

4. **Constraints:**

   - Materials
   - Labour
   - Costs

5. **Costings:**

   - Direct
   - Indirect

6. **Test:**

   - Quality
   - Safety
   - Analytical

7. **3D print system:**

   - Hardware
   - Software

8. Post printing processes:

- Painting
- Polishing
- Removing supports

9. Waste:

- Hazardous
- Non-hazardous

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What is additive manufacturing.
2. What are the various types of 3D print systems available on the market and within your organisation.
3. What are the varying technologies, software, manufacturing methodologies and best practices for additive manufacturing processes.
4. How to develop products suitable for the additive manufacturing process.
5. What are the various types of materials and their properties which can be used in additive manufacturing or 3D printing.
6. How to match product, materials and printers for optimal additive manufacturing processes.
7. What are the design guidelines and specifications for various types of materials which are used for 3D printing processes and how to follow them for optimal results.
8. How to make suitable choices of materials for printing your product.
9. What materials are supported on the printer, their characteristics and design criteria for modelling them.
10. How to load materials in 3D print systems.
11. What are the tolerances and uses of different types of materials.
12. How to match printer suitability to product developed.
13. How to prepare models using appropriate technologies, tools and techniques.
14. How to manipulate and edit models using appropriate technologies, tools and techniques.
15. How to prepare and interpret sketches and scans.
16. What are the different types of precision tools used to obtain measurements and how to use them safely.
17. How to take and record accurate measurements and calculate dimensions of images and 3D models using appropriate tools and techniques.
18. How to load and configure software.
19. How to use software for creating, slicing and printing 3D models of products.
20. How to load, view and edit 3D design on CAD software.
21. How to size your product appropriately to fit your needs and the needs of the printer.
22. What is wall thickness and what considerations are to be made when strengthening your product.
23. How and why to adjust the wall thickness of your product.

24. Why it is important to apply parameters such as wall thickness, surface orientation, intersections, clearance, strength, hollowness and water-tightness and how these parameters can affect the printed product.
25. What is a stereolithography or STL and object or OBJ file and how to convert your 3D model into these files before printing.
26. How to format stl files.
27. How to change and load filaments in a 3D printer.
28. How to check the nozzle of a 3D printer.
29. How to perform general maintenance activities on a 3D printer
30. What are the file formats for 3D printing.
31. How to import, export and convert files in different formats for 3D printing.
32. What is supporting material and why do some products require supporting material to print them.
33. How to determine the thickness of supporting material required for the product.
34. How to print products using appropriate 3D print systems.
35. How to clean a 3D printer.
36. How to assess printed objects for quality based upon product design specifications.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35403 Design new innovative products

Unit Descriptor: This unit describes the knowledge, skills and attitudes required to design products and create their prototypes using available 3D technologies within the market. It also covers product research and development from concept to market as well as improving existing products.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Conceptualise ideas on the product being developed	1.1 Compile ideas on the product to be developed according to organisational procedures.
	1.2 Use ideas to design and develop a product specification in keeping with organisational policies.
	1.3 Adhere to regulatory and industry requirements relating to the product.
	1.4 Identify the required **resources** for the product according to the design specification and process to be used.
	1.5 Confirm the choice of **materials** and manufacturing processes to be used.
	1.6 Review the **design** concept to ensure it will meet the requirements of the planned product.
	1.7 Revise the **design** concept as necessary until it is approved to move onto the prototype phase.
2. Develop a prototype of the product	2.1 Assess the credibility of the raw material supply chain for the product of interest according to organisational policy and procedures.
	2.2 Identify all steps and stages of the production process along with **resources** required to manufacture the product according to the design specifications.

2.3 Communicate with **relevant personnel** to determine concerns associated with producing the product according to organisational processes.

2.4 Evaluate the **systems** in place for compliance with organisational and regulatory protocols and the sufficiency of these in producing a safe product for market use.

2.5 Adjust the **design** of the prototype to satisfy client needs according to feedback from end users.

2.6 **Design the** product for review in accordance with regulatory requirements.

2.7 Validate the **costs** associated with developing the product for market use with relevant personnel.

RANGE STATEMENT

All range statements must be assessed:

1. **Resources:**

    - Physical e.g. materials, tools, equipment
    - Human
    - Financial

2. **Materials:**

    - Plastics
    - Metals
    - Rubber
    - Resin

3. **Design:**

    - Packaging (types and sizes)
    - Labelling
    - 3D model

4. **Relevant personnel:**

    - Supply chain
    - Client
    - Designer

5. **Systems:**

    - Quality assurance
    - Production and equipment design

6. **Costs:**

    - Raw materials
    - Production
    - Human resource
    - Testing
    - Marketing

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What is creativity and innovation and the associated concepts and methodologies in additive manufacturing (3D printing).
2. What is idea generation and how to generate ideas and concepts relevant to new products.
3. What are the methods for taking ideas to paper and how to do so.
4. How to perform market research and analysis.
5. How to develop a product prototype and brand and design it.
6. What requirements are to be considered, established and maintained relating to the new product being developed.
7. What legislation is applicable to the establishment of new products on the market and how to comply with such legislation and industry standards.
8. What materials and resources are required for the product being developed and how to procure and maintain sustainability of these over time.
9. What are the labelling requirements and relevant industry standards relevant to the labelling of the product.
10. What documentation is required for the development and production of the product for market.
11. How to maintain quality and safety of the new product.
12. What processes and controls are required for the development and manufacture of the new product.
13. How to use 3D technologies and processes to design products that are safe for the market.
14. How to set up and operate 3D print systems.
15. How to create 3D models of products.
16. How to use 3D technologies to adjust 3D model for optimal results.
17. How to manage the 3D print process from start to finish.
18. How to make product improvements.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

U68402 Contribute to the protection of the environment

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to conduct work activities in a manner that protects the environment. Candidates should take steps to minimize any negative impact on the environment by completing tasks and activities in a way which causes as little damage or disturbance as possible to the environment while following organizational procedures.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Work in an environmentally conscious way	1.1 Perform duties in accordance with **relevant policies and legislation**.
	1.2 Execute duties in a **manner which minimises environmental damage**.
	1.3 Operate and handle **equipment** and **materials** in a **manner that minimises environmental damage**.
2. Contribute to continuous improvements in protecting the environment	2.1 Identify instances of likely or actual environmental damage and take appropriate action.
	2.2 Identify improvements to procedures and practices in terms of good environmental practice and report to relevant persons.
	2.3 Dispose of **hazardous** and **non-hazardous waste** safely according to approved legislative procedures and practices.
	2.4 Contribute to sustainable development particularly in the conservation of energy, water and the use of resources and equipment to minimise environmental damage.

RANGE STATEMENT

All range statements must be assessed:

1. **Relevant policies and legislation:**

    - Organisational policies
    - Health and safety at work
    - Environmental legislation
    - Solid waste management policies
    - Recyclable policies

2. **Manner which minimises environmental damage:**

    - Using recycled/reused items and materials where appropriate
    - Disposing of polluting substances safely
    - Reducing the volume of waste
    - Using biodegradable and eco-friendly chemicals
    - Planning tasks to reduce the use of fuel and electricity

3. **Equipment and materials**

    - Hand tools
    - Power tools
    - Personal protective equipment
    - Cleaning chemicals
    - Soaps and sanitisers
    - Paper towels
    - Garbage disposal bags
    - Cloths and towels
    - Containers
    - Access equipment

4. **Hazardous waste:**

    - Oils
    - Chemicals and solutions
    - Harmful materials (asbestos, fibreglass)
    - Electronic equipment
    - Organic hazards (pest excrement, pest carcasses)

5. **Non-hazardous waste:**

    - Food
    - Plant matter
    - Paper

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the relevant policies and legislation governing environmental protection.
2. How to recognize any likely or actual environmental damage.
3. What are the appropriate actions to take in the discovery of likely or actual environmental damage.
4. What are the ways in which tools and materials should be used in order to minimise environmental damage.
5. What are the different types of pollution.
6. What are the consequences of pollution.
7. How to recognize wastage of energy, water, equipment and materials.
8. What are the methods of working that will minimise pollution and wastage of resources.
9. What are the types of damage which may occur, the impact these can have on the environment and corrective actions to be taken.
10. What are the methods of waste disposal which will minimise the risk to the environment.
11. What are the organisational requirements to prevent wastage.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on no less than three (3) occasions**. This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

(3) Context of Assessment

This unit may be assessed on the job, off the job or using a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA35503 Manage budgets

Unit Descriptor:	This unit describes the knowledge, skills and attitudes required to collect and analyse information as well as develop and manage a budget in a variety of situations.

ELEMENT	PERFORMANCE CRITERIA

To be competent you must achieve the following:

1.	Plan for and collect information for budgets	1.1	Confirm areas for which the **budget** is being prepared with relevant personnel and analyse the information required for the development of the **budget.**
		1.2	Agree upon the **budget** parameters with estimates based on research, consultation and negotiation with relevant personnel.
		1.3	Consult with relevant personnel in the **budget** planning process, as required, according to standard operating procedures.
2.	Develop budgets	2.1	Draft the **budget** based on the analysis of available information according to organisational policy.
		2.2	Identify and support income and expenditure estimates with reliable information and circulate the draft **budget** to **relevant personnel f**or review and comments.
3.	Finalise budgets and allocate resources	3.1	Provide the final **budget** for relevant personnel according to standard operating procedures.
		3.2	Inform relevant personnel affected by the **budget** of its limits and goals in their work area and clarify financial management and reporting responsibilities in accordance with standard operating procedures.
		3.3	Obtain agreement to **budget** priorities from relevant personnel and allocate **resources** according to standard operating procedures.

4.	Monitor and control budgets	4.1 Confirm actual income and expenditure against the **budget** and present **budget** reports to relevant personnel according to standard operating procedures.
		4.2 Respond to **deviations** in the **budget**, take appropriate action and advise relevant personnel on the status of the budget according to organisational procedures.
5.	Complete financial and statistical reports	5.1 Complete required financial and statistical reports accurately and within designated timelines according to standard operating procedures.
		5.2 Make appropriate recommendations about future financial planning to relevant personnel in accordance with standard operating procedures.
		5.3 Provide clear and accurate reports to appropriate personnel in accordance with organisational policies and procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **Budgets:**

    - Normal operating budget
    - Capital expenditure budget

2. **Resources:**

    - Human
    - Financial
    - Physical (materials and equipment)
    - Time
    - Quotations
    - Contracts
    - Strategic plan Key Performance Indicators (KPIs)

3. **Deviations:**

    - Major
    - Minor

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are budgets.
2. What is the role and purpose of budgets within organisations.
3. How do the goals and strategic plans of an organisation and objectives of a project influence budgets.
4. Where to obtain and evaluate information for the preparation of budgets.
5. What is the importance of consulting with others to develop the budget.
6. How to discuss, negotiate and confirm a budget with persons who control finance and what key factors should be covered.
7. What types of budgets can be developed.
8. What are the organisational policies and procedures relevant to preparing and controlling budgets.
9. How to prepare, monitor and control budgets.
10. How to use budgets for the allocation of resources within an organisational context.
11. How to use a budget to actively monitor and control performances for a budget.
12. What are the main causes of deviations from a budget.
13. What are the different types of corrective action which could be taken to address identified deviations from the budget.
14. What is the importance of agreeing on revisions to the budget.
15. What are the various types of fraudulent activity and how to identify them.
16. How to evaluate a budget performance.
17. What is the budget period used in your organisation.
18. What are the organisational guidelines and procedures for the preparation and approval of budgets and how to monitor and report performance against budgets and revised budgets.
19. What are the limits of your authority.
20. How to prepare financial reports and to whom these reports are provided.
21. Who needs information in the organisation about the performance of the budget, when they need it and in what format.
22. How to calculate deficits.
23. What are balance, surplus and deficits when constructing a budget.
24. How to calculate balance, surplus and deficits when constructing a budget.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA12903 Manage stock inventory

Unit Descriptor:	This unit deals with the knowledge, skills and attitudes required to manage all aspects of stock inventory control for the efficient running of bar operations. It covers the management functions of organising, monitoring and controlling stock inventory.

ELEMENT	PERFORMANCE CRITERIA

To be competent you must achieve the following:

1. Maintain stock inventory control levels	1.1 Confirm and inform colleagues of their roles and responsibilities in regard to the stock inventory management process.
	1.2 Monitor and maintain **stock inventory** levels and document according to established workplace standards.
	1.3 Keep stock inventory records of the movement of items and revise and adjust stock to mitigate against stock outages.
	1.4 Document stock outages according to workplace procedures.
	1.5 Comply with stock inventory control security measures in keeping with workplace procedures.
	1.6 Collaborate with relevant persons to adjust stock inventory measures and assist with resolving breaches in security measures within the limits of your own authority.
2. Organise stock take and order stock	2.1 Arrange stock take according to schedule and check that assigned roles and responsibilities of colleagues are adhered to in accordance with workplace procedures.
	2.2 Record stock take data and report within designated timelines in accordance with workplace procedures.
	2.3 Assess and identify reasons for stock losses and document according to workplace procedures.

		2.4 Analyse stock inventory losses, collaborate with others and implement corrective measures.
		2.5 Place stock orders using approved workplace **stock ordering procedures.**
		2.6 Monitor and maintain ordering and recording stock inventory systems according to best industry practices and workplace procedures.
3.	Receive stock inventory	3.1 Confirm that stock is received using established workplace **inventory receipt procedures** and document accordingly.
		3.2 Document and communicate variations in receipts against ordered stock to relevant persons.
		3.3 Store stock according to **storage specifications** in keeping with safety, health and environmental regulations and workplace procedures.
4	Monitor and maintain stock inventory levels	4.1 Confirm that stock is rotated using best industry practices and deal with incorrect stock rotation issues.
		4.2 Evaluate the quality of stock and document findings according to organisational procedures.
		4.3 Move stock inventory and document stock inventory movement whilst adhering to safety, health, hygiene and environmental standards.
		4.4 Adhere to workplace policies for storing and disposing of stock inventory that is damaged, expired and non-conforming to specifications.

RANGE STATEMENT

All range statements must be assessed:

1. **Stock inventory:**

    - Machinery and equipment
    - Tools
    - Ingredients and products
    - Glassware and other serving ware
    - General consumables

2. **Stock ordering procedures:**

    - Manual
    - Electronic

3. **Inventory receipt procedures:**

    - Handling and storing specifications i.e. product specification
    - Inspection for damage, defects, non-conformance
    - Use by specifications e.g. best by dates, use by dates
    - Updating of receipts

4. **Storage specifications:**

    - Conditions e.g. humidity, air quality
    - Temperature
    - Labelling e.g. batch identification

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. Why it is important to communicate effectively and how to do so.
2. Why it is important to inform colleagues of their assigned roles and responsibilities in the stock inventory management process.
3. What are the stock inventory levels inclusive of par levels that must be maintained and what are the workplace procedures for doing so.
4. What are the workplace recording and reporting procedures for documenting stock inventory and movement of stock inventory.
5. How to organise stock inventory takes according to schedules.
6. What are the storage specifications of stock inventory and why it is important to store stock inventory according to storage specifications.
7. How to assess stock losses/shrinkage and how to identify possible reasons for the losses.
8. What are the safety, health, hygiene and environmental standards for stock inventory controls.
9. What are the best industry practices for stock inventory rotation.
10. How to monitor stock inventory for quality issues.
11. How to document stock inventory information and data and why it is important to document accurately.
12. What are the workplace procedures for dealing with out of specification stock inventory.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

U12902 Deliver reliable customer service

Unit Descriptor:

This unit is all about how you deliver consistent reliable service to customers as part of your job. As well as being good with people, you need to work with your organization's service systems to meet and wherever possible, exceed customer expectations. In your job there will be many examples of how you combine your approach and behaviour with your organization's systems to ensure that you:

- are prepared for each transaction
- deal with different types of customers under different circumstances
- check that what you have done has been effective.

When you have completed this unit you will have shown that you can deliver excellent customer service over and over again.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Prepare to deal with your customers.	1.1 Keep your knowledge of products or services offered by your organisation up-to-date using information from your colleagues and organizational literature.
	1.2 Ensure that any equipment you use is in good and safe working order.
	1.3 Ensure that the area you work in is tidy and the space is used efficiently.
	1.4 **Prepare and arrange** everything you need to deal with your customers before your shift or period of work commences.
2. Give consistent service to customers	2.1 Make realistic commitments to your customers regarding products or services during service delivery.
	2.2 Make extra efforts to keep your commitments to your customers.

		2.3 Inform your customers when you cannot keep your commitments due to unforeseen developments.
		2.4 Recognise when your customer's needs or expectations have changed and adjust your service to meet their new requirements.
		2.5 Pass your customers on to the relevant person or organisation if you are unable to deal with their needs and expectations and keep your customers advised about what is happening.
3.	Check customer service delivery	3.1 Check that the service you have given meets your customers' needs and expectations.
		3.2 Identify where you could have given a better service to your customers and how your service could have been improved.
		3.3 Share relevant information with others to maintain your organisation's standards for service delivery.

RANGE STATEMENT

All range statements must be assessed:

1. **Prepare and arrange:**

    - Tools and equipment
    - Consumables (wrapping papers, bags, etc.)
    - Documentation

2. **Customers:**

    - With clearly stated needs
    - Who are not clear about their needs and expectations
    - Who are unhappy with the level of service being provided

3. **Service:**

    - During busy periods
    - During quiet periods
    - At times when people, systems or services have let you down
    - When working with colleagues

4. **Identify:**

    - By inviting feedback from colleagues and managers on your performance
    - By asking customers for feedback directly
    - By examining written customer feedback

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are your customers' rights.
2. What are the specific aspects of:
    a. Health and safety
    b. Data protection
    c. Equal opportunity
    d. Disability discrimination, legislation and regulations that affect the way the products and services you deal with can be delivered to your customers
3. What are the industry, organisational and professional codes of practice and ethical standards that affect the way the products or services you deal with can be delivered to your customers.
4. What are the contractual agreements, if any, that customers have with your organisation.
5. What are the products or services of your organisation relevant to your customer service role.
6. What are the guidelines laid down by your organisation that limit what you can do within your job.
7. What are the limits of your own authority and when do you need to seek agreement with or permission from others.
8. What are the organisational targets relevant to your job, your role in meeting them and the implications for your organisation if those targets are not met.
9. What are the organisational procedures and systems for delivering customer service.
10. What are the methods that your organisation uses or might use to measure its effectiveness in delivering customer service.
11. What are the systems in place for checking service delivery.
12. How you would communicate in a clear, polite, confident way and why this is important.
13. How to deal with persons with diverse backgrounds and abilities (e.g. age, cultural, social and religious backgrounds).

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

You must prove that you:

a) consistently follow the steps of preparing, delivering and checking customer service
b) have worked with different customers who have different needs and expectations

As well as providing routine delivery of customer service, you need to include evidence which relates to:

a) busy periods
b) quiet periods
c) times when people, systems or resources have let you down
d) working with colleagues

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **is not allowed.**

U53802 Participate in workplace communication

Unit Descriptor: This unit describes the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Gather and convey workplace information	1.1 Access relevant and up-to-date information from **appropriate sources**.
	1.2 Use effective **communication strategies** to gather and convey information.
	1.3 Use the appropriate **medium** to transfer information and ideas.
	1.4 Identify and follow lines of communication with management and colleagues.
	1.5 Define procedures for the location and **storage** of information.
	1.6 Record information according to organizational procedures.
2. Participate in workplace meetings and discussions	2.1 Make useful contributions in meetings and discussions.
	2.2 Express opinions clearly in a courteous and respectful manner.
	2.3 Confirm that discussions are appropriate to the purpose and proposed outcome of the meeting.
	2.4 Interpret and implement meeting outcomes.
3. Complete work-related documents	3.1 Select correct documentation and complete accurately and legibly according to organizational requirements.
	3.2 Identify and correct errors on forms and documents.

RANGE STATEMENT

All range statements must be assessed:

1. Appropriate sources:

- Team members
- Suppliers
- Trade personnel
- Public sector (government)
- Industry

2. Communication strategies:

- Questioning
- Listening
- Speaking
- Writing
- Non-verbal communication

3. Medium:

- Memorandum
- Circular
- Notice
- Information discussion
- Follow-up or verbal instruction
- Face to face communication

4. Storage:

- Manual filing system
- Electronic filing system

5. Protocols:

- Organizational policies and procedures
- Legislation

6. Workplace interactions:

- Face to face
- Telephone
- ICT
- Written (electronic, memos, instructions, forms)
- Non-verbal (gestures, signals, signs, diagrams)

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the organisational policies and procedures that relate to the communication of information.
2. How to locate, interpret and provide information in response to organisational requirements or customer requests.
3. What are appropriate sources of information.
4. What is effective communication.
5. What are the different modes of communication and how to use them.
6. What are the different communication strategies and how to use them.
7. How to communicate effectively with management, colleagues and clients to provide information and feedback.
8. How to participate in workplace meetings and discussions.
9. How to identify the purpose and proposed outcomes of a meeting and make positive contributions to achieve them.
10. How to express opinions in a clear and courteous manner.
11. How to use basic ICT resources (fax, telephone, computer).
12. What is the range of work-related documentation and how this should be completed.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out all the elements, meeting **all** of the performance criteria, range and underpinning knowledge on more than one occasion**.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both on. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not** be used, except in exceptional circumstances where natural work evidence is unlikely to occur.

U92702 Craft personal entrepreneurial strategy

Unit Descriptor:

This unit deals with the skills and knowledge required to craft an entrepreneurial strategy that fits with the attitudes, behaviours, management competencies and experience necessary for entrepreneurs to meet the requirements and demands of a specific opportunity.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Demonstrate knowledge of the nature of entrepreneurship	1.1 Define clearly, **concepts** associated with entrepreneurship.
	1.2 Identify and explain **factors** which influence entrepreneurship locally and regionally.
	1.3 Explain clearly the importance of entrepreneurship to economic development and employment.
	1.4 Present clearly, the findings of research conducted on entrepreneurial ventures and successes in the Caribbean region in the appropriate format.
	1.5 State the difference between wage employment and entrepreneurial ventures correctly.
2. Identify and assess entrepreneurial characteristics	2.1 Carry out relevant research and identify the required entrepreneurial characteristics.
	2.2 Assess and rank identified entrepreneurial characteristics.
	2.3 Demonstrate an understanding of the process and discipline that enable an individual to evaluate and shape choices and to initiate effective action correctly.

	2.4 Identify **factors** that will help an entrepreneur to manage the risk and uncertainties of the future, while maintaining a future orientated frame of mind.
3. Develop a self-assessment profile	3.1 Use self-assessment tools/methods to properly identify personal entrepreneurial potential.
	3.2 Demonstrate the ability to apply creatively problem-solving techniques and principles to solve business-related problems.
	3.3 Obtain appropriate feedback from others for the purpose of becoming aware of blind spots and for reinforcing or changing existing perceptions of strengths or weaknesses.
4. Craft an entrepreneurial strategy	4.1 Develop a profile of the past that includes accomplishments and preferences in terms of likes and work styles, coupled with a look into the future and an identification of what one would like to do.
	4.2 Identify areas for development to determine commitment, determination and perseverance; orientation towards goals; taking initiative and accepting personal responsibility; and recognising management competencies.
	4.3 Develop written guidelines to obtain feedback that is solicited, honest, straightforward and helpful, but not all positive or negative, to facilitate reviews.
	4.4 Develop a framework and process of setting goals which demand time, self-discipline, commitment, dedication and practice.
	4.5 Establish goals that are specific and concrete, measurable, relate to time, realistic and attainable.

4.6 Establish priorities including identifying conflicts and trade-offs and how these may be resolved.

4.7 Identify potential problems, obstacles and risks in meeting goals.

4.8 Identify specific action steps that are to be performed in order to accomplish goals.

4.9 Indicate the method by which results will be measured.

4.10 Establish milestones for reviewing progress and tying these to specific dates on a calendar.

4.11 Identify sources of help to obtain resources.

4.12 Demonstrate evidence of the ability to review process and periodically revise goals.

RANGE STATEMENT

All range statements must be assessed:

1. **Concepts:**

    - Risk
    - Entrepreneurship
    - Macro-screening
    - Micro-screening
    - Competition
    - Wage employment

2. **Factors:**

    - Market conditions
    - Markets – demand/supply
    - Global trends
    - Level of economic activities
    - Funding
    - Economic stability
    - Social stability
    - Resources available

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What is a personal entrepreneurial profile system.
2. What are the following effective management systems:
    - marketing
    - operations/productions
    - finance
    - administration
    - law
3. How to measure feedback.
4. What are the methods for developing a personal business plan.
5. What is the difference between entrepreneurial and management culture.
6. How to determine barriers to entrepreneurship.
7. How to minimise exposure to risk.
8. How to exploit any available resource.
9. How to tailor a reward system to meet a particular situation.
10. How to effectively plan and execute activities.
11. How to use computer technology to undertake assessments.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** the performance criteria, range and underpinning knowledge. This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Products of work
- Observation
- Written/ oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used** except in exceptional circumstances where natural work evidence is unlikely to occur.

Level 3 Glossary of Terms

Assessment methods

The methods which can be used to determine competence in performance and underpinning knowledge.

Assessors

The Assessor's role is to determine whether evidence presented by a candidate for assessment within the programme meets the required standard of competence in the relevant unit or element. The Assessor needs to be competent to assess to national standards in the area under assessment.

Approved Centre

Organisation/Centre approved by the TVET Council to offer full National Vocational Qualifications.

Case Studies

In situations where it is difficult for workplace assessment to take place, case studies can offer the candidate an opportunity to demonstrate potential competence.

A case study is a description of an actual or imaginary situation presented in some detail. The way the case study is presented will vary depending upon the qualification, but the most usual methods are written, taped or filmed.

The main advantage of a case study is the amount of evidence of underpinning knowledge it can generate and the specific nature of the evidence produced.

Competence

In the context of vocational qualifications, competence means: the ability to carry out prescribed activities to nationally pre-determined standards in an occupation. The definition embraces cognitive, practical and behavioural skills, underpinning knowledge and understanding and the ability to react appropriately in contingency situations.

Element

An element is a description of an activity which a person should be able to do. It is a description of an action, behaviour or outcome which a person should be able to demonstrate.

Level 3 Glossary of Terms

Explanation of NVQ Levels

NVQs cover five (5) levels of competence, from entry level staff at Level 1 through to senior management at Level 5.

Level 1 - Entry Level

Recognises competence in a range of varied work activities performed in a variety of contexts. Most work activities are simple and routine. Collaboration with others through work groups or teams may often be a requirement. Substantial supervision is required especially during the early months evolving into more autonomy with time.

Level 2 - Skilled Occupations:

Recognises competence in a broad range of diverse work activities performed in a variety of contexts. Some of these may be complex and non-routine and involve some responsibility and autonomy. Collaboration with others through work groups or teams and guidance of others may be required.

Level 3 - Technician and Supervisory Occupations:

Recognises competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts, with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources are often a requirement. The individual is capable of self-directed application, exhibits problem solving, planning, designing and supervisory capabilities.

Level 4 - Technical Specialist and Middle Management Occupations:

Recognises competence involving the application of a range of fundamental principles and complex techniques across a wide and unpredictable variety of contexts. Requires very substantial personal autonomy and often significant responsibility for the work of others, the allocation of resources, as well as personal accountability for analysis, diagnosis, design, planning, execution and evaluation.

Level 5 - Chartered, Professional and Senior Management Occupations:

Recognises the ability to exercise personal professional responsibility for the design, development or improvement of a product, process, system or service. Recognises technical and management competencies at the highest level and includes those who have occupied positions of the highest responsibility and made outstanding contribution to the promotion and practice of their occupation.

Level 3 Glossary of Terms

External Verifier

The External Verifier is trained and appointed by the TVET Council and is competent to approve and ensure an approved Centre's quality of provision.

Internal Verifier

The Internal Verifier acts in a supporting role for Assessors to ensure consistent quality of assessment and competence. They need to be competent to assess to national standards in the area under assessment.

NVQ

National Vocational Qualifications (NVQs) are work-based qualifications that assess an individual's competence in a work situation and certify that the individual can perform the work role to the standards expected in employment.

NVQs are based on national occupational standards of competence drawn up by standards-setting bodies known as Industry Lead Bodies. The standards describe the level and breadth of performance that is expected of persons working in the industry or sector which the NVQ covers.

NVQ Coordinator

Within each approved Centre offering NVQs, there is a centre contact who has overall responsibility for the operation and administration of the NVQ system.

Observation

Observation of the candidate carrying out his/her job in the workplace is the assessment method recommended in the vast majority of units and elements. Observation of staff carrying out their duties is something that most supervisors and managers do every day.

Performance criteria

Performance criteria indicate what is required for the successful achievement of an element. They are descriptions of what you would expect to see in competent performance.

Level 3 Glossary of Terms

Product of Work

This could be items produced during the normal course of work which can be used for evidence purposes such as reports, menus, promotional literature, training plans, etc.

Questioning

Questioning is one of the most appropriate ways to collect evidence to assess a candidate's underpinning knowledge and understanding.

Questioning can also be used to assess a candidate in those areas of work listed in the range which cannot be assessed by observation. Guidance on when this assessment method can be used is given in the assessment guidance of each individual element.

As an assessment method, questioning ensures you have all of the evidence about a candidate's performance. It also allows you to clarify situations.

Range statements

The range puts the element of competence into context. A range statement is a description of the range of situations to which an element and its performance criteria are intended to apply.

Range statements are prescriptive; therefore each category must be assessed.

Role-plays

Role-plays are simulations where the candidate is asked to act out a situation in the way he/she considers "real" people would behave. By using role-play situations to assess a candidate you are able to collect evidence and make a judgment about how the candidate is most likely to perform. This may be necessary if the range specified includes a situation in which the candidate is unlikely to find himself/herself in the normal course of their work, or where the candidate needs to develop competence, before being judged competently, for example in a disciplinary situation,

Simulations

Where possible, assessment should always be carried out by observing **natural performance** in the workplace. **Simulated performance,** however, can be used where specified to collect evidence about an aspect of the candidate's work which occurs infrequently or is potentially hazardous, for example dealing with fires.

Glossary of Terms

By designing the simulated situation, briefing the candidate and observing his/her performance, you will be able to elicit evidence which will help you judge how a candidate is **most likely** to perform in real life.

Supplementary evidence

Supplementary evidence can be used to confirm and support performance evidence. Types of supplementary evidence include witness testimonies, reports, journals or diaries, records of activities, personal statements, simulation (see note in glossary).

Underpinning knowledge

Underpinning knowledge indicates what knowledge is essential for a person to possess in order to successfully achieve an element and prove total competence.

Units

A unit of competence describes one or more activities which form a significant part of an individual's work. Units are accredited separately but in combination can make up a vocational qualification. There are three categories of units:
Mandatory units - are core to a qualification and must be completed.

Optional units - candidates must choose the required number of individual units, specified in the qualification structure, to achieve the qualification.

Additional units - are units which the candidate can undertake but are not a requirement to achieve a qualification.

Work-based projects

Work-based projects are a useful way for you to collect evidence to support any decision you make about a candidate's performance. They are particularly appropriate in determining the level of a candidate's underpinning knowledge and understanding where it may be insufficient to rely only on questioning observation.

A project often involves the identification of a solution to a specific problem identified by you and/or the candidate (such as looking at ways to redress a recent drop in sales) or may be a structured programme of work built around a central situation or idea (such as the introduction of a new job rostering process).