Zambia Qualifications Authority

NATIONAL OCCUPATIONAL STANDARD FOR PRODUCTION MANAGER

NOS.PM.01
FIRST EDITION

APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on 25th February 2021

ZAMBIA QUALIFICATIONS AUTHORITY

The Zambia Qualifications Authority Act No. 13 of 2011 was enacted by the Government of the Republic of Zambia to ***"provide for the development and implementation of a national qualifications framework; establish the Zambia Qualifications Authority; provide measures to ensure that standards and registered qualifications are internationally comparable; and provide for matters connected with, or incidental to the foregoing".*** Among other functions, ZAQA is responsible for ***determining national standards for any occupation***, through various sector specific National Occupational Standards Development Teams (NOSDTs).

REVISION OF NATIONAL OCCUPATIONAL STANDARDS

National Occupational Standards shall be revised every after **5 years**, or whenever necessary, by the issue of either amendments or of revised editions. It is important that users of National Occupational Standards (NOS) should ascertain that they are in possession of the latest amendments or editions.

NOS DEVELOPMENT TEAM RESPONSIBLE

This National Occupational Standard was prepared by the Manufacturing National Occupational Standards Development Team, upon which the following organisations were represented:

1. Bigtree Beverages Ltd
2. Copperbelt University
3. Evelyn Hone College
4. Lafarge Cement (Z) Plc
5. Lusaka Business and Technical College
6. Trade Kings Group
7. University of Zambia
8. Zambia Association of Manufacturers
9. Zambian Breweries Plc
10. Zambia Bureau of Standards
11. Zambia Qualifications Authority – Secretariat.

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FOREWORD

The Zambia Qualifications Authority (ZAQA) is a statutory body under the Ministry of Higher Education established by ZAQA Act No. 13 of 2011 to "***provide for the development and implementation of a national qualifications framework; provide measures to ensure that standards and registered qualifications are internationally comparable; and provide for matters connected with, or incidental to the foregoing***".

Among other functions, ZAQA is responsible for ***"determining national standards for any occupation"***, through various sector specific National Occupational Standards Development Teams (NOSDTs) of experts composed of representation from appropriate authorities, government departments, industry, academia, regulators, consumer associations and non-governmental organisations, etc.

This National Occupational Standard (NOS) has been developed by the Manufacturing National Occupational Standards Development Team in accordance with the procedures and guidelines of ZAQA. All users should ensure that they have the latest edition of this publication as National Occupational Standards are revised from time to time.

This NOS shall be used by, among others, industry, employers, quality assurance bodies, awarding and professional bodies and education and training institutions, as a benchmark to identify training needs, develop job profiles/descriptions, develop curricula and learning programmes, in various sectors where the occupation exists. In the Manufacturing sector, demonstration of competence against this NOS may be required in order to run a business or practice a craft or profession.

JUSTIFICATION

The Production Manager is critical in the Manufacturing sector because she/he carries out the following roles:

- Production planning; which is concerned with thinking in advance of what is to be produced, how it is to be produced and by what time it should be produced.
- Production Control; which is concerned with the successful implementation of production planning.
- Quality Control; which is concerned with controlling the undesirable variables which affect the ultimate quality of the product
- Method Analysis; which is concerned with analysing the available alternative methods of manufacturing a product/service and selecting the most effective alternative.
- Inventory Control; which involves minimising wastages of materials by determining the economic order quantity, minimum, maximum, average and danger levels of materials so that problems of overstocking and understocking do not arise.
- Plant Layout; which is concerned with the internal set up of an enterprise in a proper manner in order to achieve maximum and effective utilisation of

available resources (Men, money, machines, materials and methods of production) at minimum operating costs.

- Work Measurement; which involves accurately measuring the levels of performance of work by a worker.
- Systems Engineering; which is an interdisciplinary field of engineering and engineering management that focusses on how to design, integrate, and manage complex systems over their life cycles.

The consequences of not having a Production Manager in a manufacturing company/institution include:

- Lack of planning may lead to production of unwanted goods and services resulting in waste creation.
- Customer dissatisfaction due to poor quality of products/services and ultimately lead to loss of business as the organisation loses its market share.
- Lack of method analysis may prove costly as there could be no rational basis for selecting a particular method for manufacturing products.
- Poor inventory control may result in increased wastage of materials thereby reducing the profit base of the company.
- Poor plant layout may result in accidents, lengthy production times, and uneconomic utilisation of resources.
- Lack of work measurement may lead to the inability to evaluate the productivity of workers in the company.

This National Occupational Standard highlights core knowledge, skills, competences and personal attributes that Production Managers must possess to be successful in their jobs.

ACRONYMS AND ABBREVIATIONS

CS	Core Skill
NOS	National Occupational Standard
NOSDT	National Occupational Standards Development Team
OK	Organisational Knowledge
PC	Performance Criteria
PS	Professional Skill
PM	Production Manager
RK	Regulatory Knowledge
RPL	Recognition of Prior Learning
TK	Technical Knowledge
ZAQA	Zambia Qualifications Authority
ZQF	Zambia Qualifications Framework

GLOSSARY OF TERMS

For the purposes of this NOS, the following terms and definitions shall apply:

Core Skills/Generic Skills: are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles.

Function: is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of NOS.

Job Title: defines a unique set of functions that together form a unique employment opportunity in an organisation.

Knowledge and Understanding: are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

National Occupational Standards (NOS): are statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding. They are precise descriptions of what an individual is expected to be able to do in his/her work role.

National Occupational Standards (NOS) Code: is a unique reference code that identifies a NOS.

National Occupational Standards Development Team (NOSDT): means an established group of national stakeholders/experts responsible for the development of National Occupational Standards within a specific economic sector or occupation.

Occupation: is a set of job roles, which perform similar/related set of functions in an industry.

Organisational Context: includes the way the organisation is structured and how it operates, including the extent of operative knowledge that managers have in their relevant areas of responsibility.

Performance Criteria: are statements that together specify the standard of performance required when carrying out a task.

Scope: is the set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on the quality of performance required.

Sector: is a conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.

Sub Sector: is derived from a further breakdown based on the characteristics and interests of its components.

Technical Knowledge: is the specific knowledge needed to accomplish specific designated responsibilities.

Unit Title: gives a clear overall statement about what the incumbent should be able to do.

1. OVERVIEW

This is an introductory section providing a brief summary and specific information or commentary about the content of the NOS and the targeted sector and occupation to help the user judge whether it is relevant to them.

NOS Code	NOS.PM.01
Occupation	Production Management
Job Title	Production Manager
Job Description	1. The individual on the job understands the product requirement, interprets the product design and develops product for manufacturing. The individual acts an interface between design and production department. 2. To ensure goods and services are produced safely, cost effectively and on time and that they meet the required quality standards 3. Should be able to conduct research in his/her field to monitor productivity rates and product standards and implement quality systems management. 4. Should be able to plan and draw up a Master production schedule. 5. Should be able to establish and run an effective maintenance schedule. 6. Should be able to collate and analyse data, putting together production reports for both factory managers and customers. 7. Should liaise with different departments, teams and stakeholders such as suppliers, managers, clients etc. 8. Should be able to review worker performance and identify training needs. 9. Supervise and motivate a team of workers 10. Ensure that production is be cost effective estimating costs, negotiating and agreeing budgets with both clients and managers, etc.
Job Purpose	To enhance the company's share value by overseeing the production process, coordinating all production activities and operations
ZQF Level	7
Sector	Manufacturing
Sub sector	All subsectors of the Manufacturing sector

Other Economic Sector(s) in which the Occupation is Practiced	All production related sectors
Other Similar Jobs that can be performed by the Production Manager	• Corporate Manager • Industrial Engineer • Engineering Manager • Logistics Manager • Operations Manager • Supply Chain Manager • Maintenance Manager • Technical Manager • Production Planner • Quality Manager
Minimum Educational Job Entry Qualification(s)	Bachelor's Degree in Production Management, or equivalent
Practicing License Requirements (if any)	Membership with the Engineering Institution of Zambia (EIZ) and Practicing Licence from the Engineering Registration Board (EngRB), as applicable
Training/RPL	• Use of ICTs (Internet, Computer packages, Email, Computer Software and Hardware necessary for the job, etc.) • Quality Enhancement Methods
Minimum Job Entry Age	21
Prior Experience (Suggested)	Minimum of 1 year internship
Performance Criteria	As described in the Units under Section 4

2. SCOPE

This National Occupational Standard specifies the fundamental knowledge and understanding, skills and competences that Production Managers must possess to be successful in their jobs.

3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)

The job of a Production Manager requires a Jobholder to possess the following values, ethical orientation and attitudes towards work:

- Have a better grasp of human characteristics that tend to either facilitate or impede ethical decision making.
- Should have a strong knowledge of health and safety procedures that promote manufacturing.
- The job requires the individual to have: attention to details, logical thinking, analytical skills and ability to work for long hours in their quest to attain optimality in resource utilisation.

- Should embrace manufacturing practices that are environmentally sustainable.
- Conduct a thorough risk assessment, then take regulatory actions
- Should be able to display honesty, integrity and professionalism.
- Should have confidence, ability to communicate effectively and team working skills.
- Should promote organisational efficiency by providing effective leadership and interpersonal skills.
- Should have problem solving skills coupled with IT and numerical skills
- Systems thinking approach.
- Constantly update performance enhancing skills through training and development
- Streamline key administrative production processes and maintain dynamic product structures.

4. UNITS AND ELEMENTS

This National Occupational Standard is divided into four (4) Units representing the tasks that a jobholder should undertake in his/her day to day work. Each unit is further broken down into elements depicting the number of activities to be carried out for the successful execution of a particular task.

UNIT 1 This unit is about planning to produce goods and services while observing safety, hygiene and sanitation practices for manufacturing/service operations.

Unit No.	**01**
Unit Title	**Maintain Health and Safety in the Workplace**
Description	Ensure the production of goods and services while observing safety, hygiene and sanitation practices for operations.
Scope	This Unit covers the following: • Develop safety measures and upkeep of workplaces in manufacturing processes • Maintain personal hygiene and safety • Maintain safety and efficiency of equipment
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria (PC)**
Develop safety measures and upkeep of workplaces in manufacturing processes	To be competent, the individual must be able to: PC1. Apply suitable measures for protection of workers from chemicals, sharp objects, rotating machines, and loose items PC2. Perform visual checks to the safety components (such as protective clothing, machine leakages, gangways, electrical fittings.) prior to their use for concealed wiring purposes in order to ascertain their appropriate specifications and usability PC3. Demonstrate necessary checks around the workplace to ensure that the workplace is safe to conduct work PC4. Mark clearly on walls and floors where concealed hazards could be posing danger to workers PC5. Assist in planning and mark locations of gangways and electrical fixtures/fittings to be installed on walls PC6. Arrange machines in the workshop in a logical sequence to promote safe movement between workstations. PC7. Design safety and healthy schedule for specific workplaces
Maintain Personal hygiene and safety	To be competent, the individual must be able to: PC8. Identify the possibilities of environmental (water borne, air borne, chemical) and other contamination by humans operating in workshops. PC 9. Create effective routines to ensure healthy and hygienic conditions during all workshop practice processes including transportation of materials within. PC 10. Design work premises that are constantly monitored/inspected for undesirable breaches in the protection provided by health and hygiene measures PC11. Perform safety checks before operation of any equipment PC12. Wear protective clothing and gear as and when required and ensure adherence to safety guidelines PC13. Report potential hazards to the manager immediately PC14. Create standard procedures to deal with accidents and emergency situations PC15. Use first aid kit as and when required and provide appropriate treatment in case of any injuries

Maintain safety and efficiency of equipment	To be competent, the individual must be able to: PC16. Analyse workshop equipment so that it is maintained to specifications at all times with frequent tests PC17. Perform routine checks/tests for occupational related infections PC18. Examine all equipment and tools used so that they are decontaminated, cleaned and switched off after use. PC19. Restrict access only to authorised personnel PC20. Implement effective security measures for prevention of theft/sabotage
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the company/ organisation and its processes)	To be competent, an individual on the job must demonstrate knowledge and understanding of: OK1. Organisation standards and procedures followed safety, hygiene and sanitation OK2. Personal hygiene and fitness requirements OK3. Job responsibilities/duties for following work place safety, hygiene and sanitation OK4. Personal protective equipment and clothing to be used OK5. Safe methods to use in materials and equipment handling OK6. Housekeeping methods and importance OK7. Safe disposal methods for waste OK8. Methods for minimising environmental damage
B. Technical Knowledge	To be competent, an individual on the job must demonstrate knowledge and understanding of: TK1. Different safety units/specifications like wattage, resistance, voltage, frequency, current, kWh, electrical systems, water pressure and their specifications etc. TK2. Sketches and diagrams for safety symbols and procedures on the equipment installation TK3. Different types of tools and electrical equipment TK4. Different types of measuring equipment and techniques TK5. Statutory provisions under relevant safety laws, environmental laws, electrical laws and rules prescribed by relevant authorities TK6. Hazards and safety aspects involved, and usage of relevant personal protective equipment TK7. Selection of appropriate equipment to work with TK8. Fire precautions such as fire drills TK9. Applicable rules set by the Government regulatory agencies TK10. Types of machines used in the in an organisation TK11. Types of lubricants and their recommended usage
C. Regulatory context (Knowledge of Rules and Regulations)	To be competent an individual on the job must demonstrate knowledge and understanding of: RK1. Relevant government regulatory agencies RK2. Factories Act and regulations RK3. Metrology Act and regulations RK4. Food Safety Act and regulations RK5. Compulsory Standards Act and regulations RK6. Environmental Management Act and regulations RK7. Competition and Consumer Protection Act and regulations

	RK8. Occupational Health and Safety Act and regulations RK9. Workers' Compensation Act RK10. Public Health Act and regulations, as applicable
Skills (S)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The individual on the job must be able to: CS1. Read and interpret information documents sent by internal teams CS2. Read equipment manuals and process documents to understand the equipment operation and process requirement CS3. Read requisitions to procurement/stores on the requirement of apparatus, tools etc. CS4. Read and interpret safety signs and assist in explaining details where required to do so
	Writing Skills
	The individual on the job must be able to: CS5. Note down observations (if any) related to operating systems and share the same with the supervisor and workers CS6. Note down the data for the respective shifts in the log sheets/ online systems as per applicability in the organisation CS7. Draw and interpret design diagrams CS8. Draw and interpret symbols and measuring instruments CS9. Formulate equipment manuals and process documents to understand the equipment and processes better CS10. Prepare reports to be sent to supervisor/other teams
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS11. Discuss task lists, schedules, and work-loads with co-workers CS12. Effectively communicate with the team members CS13. Question supervisor/other co-workers appropriately in order to understand the nature of the problem and make a diagnosis CS14. Attentively listen and comprehend the information given by the speaker CS15. Interpret technical designs and convey clear message to users
B. Professional Skills	**Plan and Organise**
	The individual on the job must be able to: PS1. Plan and organise the work instruction and jobs received from the supervisor/other teams PS2. Organise all process/equipment manuals so that sorting out/accessing information is easy PS3. Support the supervisor in scheduling tasks for machinists/ helpers PS4. Plan work schedules and load balancing
	Judgment and Critical Thinking
	The individual on the job must be able to: PS5. Use common sense and make judgments in day to day activities PS6. Use reasoning skills to identify and resolve basic problems

	PS7. Use intuition to detect any potential problems which could arise PS8. Use relevant rational methodologies to resolve problems
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS9. Keep up-to-date with latest trends and changes in industry and the profession PS10. Follow instructions and work on areas of improvement identified PS11. Complete the assigned tasks with minimum supervision PS12. Complete the job defined/assigned by the supervisor within the timelines and quality norms
	Problem Solving and Decision Making
	The individual on the job must be able to: PS13. Detect problems in day to day tasks PS14. Discuss possible solutions to address problems, with the supervisor PS15. Support supervisor in using specific problem solving techniques and detailing out the problems PS16. Make decisions in emergency situations in the absence of the supervisor

UNIT 2 This unit is about production planning for goods and services while coordinating scheduled maintenance to optimise the usage of facilities at the disposal of the Production Manager].

Unit No.	**02**
Unit Title	**Production planning**
Description	Ensure the establishment of a production plan that drives the effective and efficient production of goods and services while coordinating scheduled maintenance to optimise the usage of facilities at the disposal of the Production Manager
Scope	This Unit covers the following: • Develop a production plan that reflects the manufacturing processes • Maintain an effective maintenance schedule • Apply lean management approach to enhance productivity • New product development and sustainability
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria (PC)**
Develop a production plan that reflects the manufacturing processes	To be competent, the individual must be able to: PC1. Design a clear production plan that is clearly communicated and effectively to the team members. PC2. Design a plan that ensures usage rates are calculated, recorded and communicated to team members to monitor progress. PC3. Develop and implement production plan for shifts. PC4. Create a production plan that has a systems thinking outlook PC5. Design products with reference to available equipment/capacity and monitor the production processes
Maintain an effective maintenance schedule	To be competent, the individual must be able to: PC 6. Design a maintenance schedule to ensure equipment availability and implement it according to the production plan PC7. Create a clear platform for linkage of maintenance types to the production process efficiency PC8. Design a preventive maintenance program PC9. Prescribe maintenance engineering roles and responsibilities PC10. Maintain fundamental requirements of effective preventive maintenance PC11. Discuss with production workers' need to be conversant with the maintenance schedule and its specific activities PC 12 Explain to production workers the life cycle of engineered products and the technologies for maintenance PC13. Design plant/equipment maintainability and availability through reliability and maintenance modelling

Apply lean management principles to enhance productivity	To be competent, the individual must be able to: PC14. Identify necessary process deviations, record them, analyse and take appropriate action. PC15. Minimise barriers to meeting the production plan and take and corrective steps. PC16. Create quality and productivity information that is analysed and communicated to team members to monitor progress and identify areas for progress. PC17. Apply Total Quality Management to highlight the importance of quality and waste management. PC18.Support the team to improve process quality and productivity PC19. Build and foster relationships with suppliers and customers to create a lean enterprise. PC 20. Apply concurrent Engineering concepts to rapidly develop low cost, high quality, high quality products for lean production.
Ensure new product development and sustainability	To be competent, the individual must be able to: PC21. Prepare to face competition for new ideas, resources and customers. PC22. Design disruptive innovation technologies approach. PC23. Adopt continuous project management as a successful innovation. PC24 Implement new growth platforms for innovations. PC25. Adopt Innovative production strategies such as lean production methods. PC26. Converge lean thinking and Total Productive Maintenance (TPM) to present a comprehensive blueprint for business-led change. PC27. Create value long term planning of facilities, location and layout. PC28. Execute Value Analysis (VA) and Value Engineering (VE) principles to promote innovations.
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: OK1. Organisation standards and procedures followed for productivity and maintenance OK2. Components of a master production schedule OK3. Coordination of scheduled maintenance to be executed according to plan OK4. Interpretation of maintenance reports, Reliability reports, and budget variance reports. OK5. Requirements for quality systems management OK6. Lean systems thinking and its impact on profitability OK7. Housekeeping methods and importance OK8. Safe disposal methods for waste OK8. Methods for minimising environmental damage
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. Different quality control tools such as Pareto Chart, SPC, Cause and Effect, Scatter diagram. TK2. Sketches and diagrams for production planning sequences. TK3. Different types of tools and manufacturing equipment TK4. Different types of measuring equipment and techniques

	TK5. Statutory provisions under relevant safety laws, environmental laws, production laws and rules prescribed by relevant authorities TK6. Hazards and safety aspects involved, and usage of relevant personal protective equipment TK7. Working at heights and appropriate equipment to select TK8. Fire precautions such as fire drills TK9. Applicable rules set by the government regulatory agencies TK10. Various types of machines and maintenance used in the organisation
C. Regulatory context (Knowledge of Rules and Regulations)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant government regulatory agencies RK2. Factories Act and regulations RK3. Metrology Act and regulations RK4. Food Safety Act and regulations RK5. Compulsory Standards Act and regulations RK6. Environmental Management Act and regulations RK7. Competition and Consumer Protection Act and regulations RK8. Occupational Health and Safety Act and regulations RK9. Workers' Compensation Act RK10. Public Health Act and regulations, as applicable
Skills (S)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The individual on the job must be able to: CS1. Read and interpret information documents sent by internal teams CS2. Read equipment manuals and process documents to understand the equipment operation and process requirement CS3. Read requisitions to procurement/stores on the requirement of apparatus, tools etc. CS4. Read lean systems thinking documents and its impact on productivity
	Writing Skills
	The individual on the job must be able to: CS5. Note down observations (if any) related to operating systems and share the same with the supervisor and workers CS6. Note down the data for the respective shifts in the log sheets/ online systems as per applicability in the organisation CS7. Design and interpret design diagrams CS8. Design and interpret symbols and measuring instruments CS9. Draft equipment manuals and process documents to understand the equipment and processes better CS10. Prepare reports to be sent to supervisor/other teams
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS11. Discuss task lists, schedules, and work-loads with co-workers CS12. Effectively communicate with the team members CS13. Question supervisor/other co-workers appropriately in order to understand the nature of the problem and make a diagnosis CS14. Attentively listen the information given by the speaker CS15. Interpret technical designs and convey clear message to users CS16. Explain the latest developments in lean management

B. Professional Skills	**Plan and Organise**
	The individual on the job must be able to: PS1. Plan and organise the work instruction and jobs received from the supervisor/other teams PS2. Organise all process/equipment manuals so that sorting out/accessing information is easy PS3. Support the supervisor in scheduling tasks for machinists/helpers PS4. Plan work schedules and load balancing
	Judgment and Critical Thinking
	The individual on the job must be able to: PS5. Use common sense and make judgments in day to day activities PS6. Use reasoning skills to identify and resolve basic problems PS7. Use intuition to detect any potential problems which could arise PS8. Use relevant rational methodologies to resolve problems
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS9. Keep up-to-date with latest trends and changes in industry and the profession PS10. Follow instructions and work on areas of improvement identified PS11. Complete the assigned tasks with minimum supervision PS12. Complete the job defined/assigned by the supervisor within the timelines and quality norms
	Problem Solving and Decision Making
	The individual on the job must be able to: PS13. Detect problems in day to day tasks PS14. Discuss possible solutions to address problems, with the supervisor PS15. Support supervisor in using specific problem solving techniques and detailing out the problems PS16. Make decisions in emergency situations in the absence of the supervisor

Unit 3 [This unit is about managing the manufacturing systems that the Production Manager will face in the course of his/her duties]

Unit No.	**03**
Unit Title	**Manufacturing systems engineering**
Description	Ensure the management of manufacturing/production processes and related systems and methodologies
Scope	This Unit covers the following: • Design essentials of manufacturing systems • Plan process systems for manufacturing • Create management systems for manufacturing • Create value systems for manufacturing • Manage automation systems for manufacturing • Managing information/social systems for manufacturing
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria (PC)**
Design essentials of manufacturing systems	To be competent, the individual must be able to: PC1. Design the fundamentals of manufacturing systems that are clearly communicated and effectively to the team members. PC2. Create integrated manufacturing and manufacturing systems designs. PC3. Design usage rates that are calculated, recorded and communicated to team members to monitor progress. PC4. Create modes of production and product diversification.
Plan process systems for manufacturing	To be competent, the individual must be able to: PC 5. Develop material and technological information flows in manufacturing systems PC6. Develop designs for both product planning and process planning to effectively manage the manufacturing process. PC7. Create a clear platform for linkage of maintenance types to the production process efficiency PC8 Design an ergonomic layout to enable manufacturing optimisation PC9. Create maintenance engineering roles and responsibilities PC10. Train production workers to be conversant with the maintenance schedule and its specific activities PC 11 Train production workers to understand the life cycle of engineered products and the technologies for maintenance PC12. Model plant/equipment maintainability and availability through reliability and maintenance
Create management systems for manufacturing	To be competent, the individual must be able to: PC13. Design a systems of managerial information flow in manufacturing systems to facilitate manufacturing PC14. Create an aggregate production plan with a long term multiple objectives. PC15. Build teams that use production scheduling tools such PERT and CPM PC 16. Analyse quality and productivity information and communicated to team members to monitor progress and identify areas for progress

	PC17. Design multiple product inventory management systems approach PC18. Introduce production control and quality engineering tools such as JIT and Quality Function Deployment (QFD) to improve systems performance
Create value systems for manufacturing	To be competent, the individual must be able to: PC19. Prepare value and cost flows in manufacturing systems to monitor value creation over time PC20. Create manufacturing cost and product cost structure to avoid production technologies that lead to product innovation failures PC21. Carry out profit planning and break-even analysis and capital investment analysis for manufacturing PC 22. Create evaluation methods for capital investment to monitor and ensure growth in the organisation PC23. Develop long term plans through facilities, location and layout design
Manage automation systems for manufacturing	To be competent, the individual must be able to: PC24. Use industrial automation through the use of Computer Integrated Manufacture (CIM) and Computer Aided Design (CAD) to enhance efficiency in the manufacturing processes PC25. Manage factory automation Computer Aided Designs and Computer Integrated Manufacture by using the following tools and technologies: • Automatic machine tools for mass production • Numerically Controlled (NC) machines • Machine tools • Computer-controlled manufacturing systems • Flexible Manufacturing System (FMS) • Automated assembly • Automatic materials handling • Automatic inspection and testing • Computer-integrated automation system – unmanned factory
Managing information/ social systems for manufacturing	To be competent, the individual must be able to: PC26. Apply fundamentals of information technology to enhance the development of a parts oriented production information system PC27. Be conversant with the computer based production management system PC28. Adopt best practices of manufacturing strategy and tactics to enhance operation effectiveness PC29. Develop industrial and manufacturing structure that enhance industrial efficiency PC30. Apply manufacturing excellence for future production perspectives
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the company/ organisation	The individual on the job must demonstrate knowledge and understanding of: OK1. Organisation standards and procedures followed for manufacturing systems engineering OK2. Fundamentals of a manufacturing system engineering

and its processes)	OK3. Coordination of the information and social systems for manufacturing according to the master production plan OK4. Interpretation of value systems for manufacturing in order to minimise costs operating costs and capital costs, and budget variance reports. OK5. Requirements for manufacturing systems engineering OK6. Lean systems thinking and its impact on manufacturing systems engineering
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. Different building blocks of manufacturing systems engineering. TK2. Sketches and diagrams for manufacturing systems engineering framework. TK3. Different types of automation tools manufacturing industries TK4. Different types of social variables in manufacturing systems engineering TK5. Hazards and safety aspects involved, and usage of relevant personal involved in automated environment TK6. Working principles of industrial robots TK7. Fire precautions, such as fire drills TK8. Integration of automation to manufacturing processes
C. Regulatory Context (Knowledge of Rules and Regulations)	The individual on the job needs to know and understand: RK1. Relevant government regulatory agencies RK2. Factories Act and regulations RK3. Metrology Act and regulations RK4. Food Safety Act and regulations RK5. Compulsory Standards Act and regulations RK6. Environmental Management Act and regulations RK7. Competition and Consumer Protection Act and regulations RK8. Occupational Health and Safety Act and regulations RK9. Workers' Compensation Act RK10. Public Health Act and regulations, as applicable
Skills (S)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The individual on the job must be able to: CS1. Read and interpret information documents sent by internal teams CS2. Read equipment manuals and process documents to understand the equipment operation and process requirement CS3. Read requisitions to procurement/stores on the requirement of apparatus, tools etc. CS4. Read lean systems thinking and its impact on productivity
	Writing Skills
	The individual on the job must be able to: CS5. Note down observations (if any) related to operating systems and share the same with the supervisor and workers CS6. Note down the data for the respective shifts in the log sheets/ online systems as per applicability in the organisation CS7. Draft and interpret design diagrams CS8. Draw and interpret symbols and measuring instruments CS9. Formulate equipment manuals and process documents to understand the equipment and processes better

	CS10. Prepare reports to be sent to supervisor/other teams
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS11. Discuss task lists, schedules, and work-loads with co-workers CS12. Effectively communicate with the team members CS13. Question supervisor/other co-workers appropriately in order to understand the nature of the problem and make a diagnosis CS14. Attentively listen and comprehend the information given by the speaker CS15. Interpret technical designs and convey clear message to users CS16. Explain the latest developments in automated equipment and processes
B. Professional Skills	**Plan and Organise**
	The individual on the job must be able to: PS1. Plan and organise the work instruction and jobs received from the supervisor/other teams PS2. Organise all process/equipment manuals so that sorting out/accessing information is easy PS3. Support the supervisor in scheduling tasks for machinists/helpers PS4. Plan work schedules and load balancing
	Judgment and Critical Thinking
	The individual on the job must be able to: PS5. Use common sense and make judgments in day to day activities PS6. Use reasoning skills to identify and resolve basic problems PS7. Use intuition to detect any potential problems which could arise PS8. Use relevant rational methodologies to resolve problems
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS9. Keep up-to-date with latest trends and changes in industry and the profession PS10. Follow instructions and work on areas of improvement identified PS11. Complete the assigned tasks with minimum supervision PS12. Complete the job defined/assigned by the supervisor within the timelines and quality norms
	Problem Solving and Decision Making
	The individual on the job must be able to: PS13. Detect problems in day to day tasks PS14. Discuss possible solutions to address problems, with the supervisor PS15. Support supervisor in using specific problem solving techniques and detailing out the problems PS16. Make decisions in emergency situations in the absence of the supervisor

Unit 4 [This unit is about managing the supply chain which is the total value creation process in an organisation that the Production Manager will face in the course of his/her duties].

Unit No.	**04**
Unit Title	**Supply chain management**
Description	Ensure supply chain management to meet customer requirements
Scope	This Unit covers the following: • Planning for logistics • Making procurement and inventory decisions • Manage warehousing and storage • Freight transport • Operational management
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria (PC)**
Planning for logistics	To be competent, the individual must be able to: PC1. Formulate a logistics planning framework to address the demands of the logistics processes PC2. Create an integrated logistics network plan within the logistics management and organisation structure PC3. Formulate a management framework for usage of the manufacturing materials
Making procurement and inventory decisions	To be competent, the individual must be able to: PC 4. Create warehouse operations, packaging and unit loads PC5. Design strategic issues affecting warehousing PC 6. Decide different inventory requirements in the supply chain. PC7. Set the procurement objectives PC8. Determine collaborative planning, forecasting and replenishment techniques PC9. Differentiate between inventory planning for manufacturing and inventory planning for retailing PC10. List problems associated with the traditional approaches to inventory planning. PC11. Design a storage and handling system for palletised and non-palletised PC12. Design order picking and replenishment plans PC13. Create Performance monitoring in warehouse management and information
Manage warehousing and storage	To be competent, the individual must be able to: PC14. Develop a set of effective warehousing and storage principles PC15. Manage inventory levels PC16. Check containers to check for special handling, damage or contamination of materials PC 17. Store inventory received according to any special handling and production requirements PC18. Rotate raw materials and stock to minimise old and outdated inventory PC19. Prepare and distribute monitoring reports in a timely way

	PC20. Design multiple product inventory management systems approach PC21. Conduct research to determine viability of ventures for sources of materials and services PC22. Evaluate internal/external, local/global environments for threats or opportunities PC23. Compare costs/benefits of utilising local, national and/or international markets PC24. Develop forecasts and Set lot sizes, inventory levels and order lead-time PC25. Document forecasts using graphs and charts in written reports or master file for ordering levels PC26. Evaluate most appropriate and cost-effective carrier or method is used to distribute products PC27. Maintain inventory records by using appropriate computer codes, formatting, charts, spreadsheets, etc. PC28. Develop a production plan for customer order PC29. Record and summarise financial data PC30. Monitor tool/equipment certification regularly by reviewing documentation and through observation of use PC31. Calibrate tools and instruments accurately and correctly
Manage Freight Transport	To be competent, the individual must be able to: PC32. Establish availability of transport and capacity for various goods PC33. Carry out packing, crating, warehousing and storage duties in preparation for site specific program and shipment PC34. Oversee customer based queues, plan and allocate tasks to meet configuration requirements PC35. Conduct a comparative analysis of in-house versus contracted-out operations PC36. Design logistics planning networks through logistics modelling PC37. Assessing and selecting modes of transport PC38. Use of Intermodal transport and impact of international trade PC39. Ensure adherence to legislation in road freight transport PC40. Provide measures for transportation of hazardous goods PC41. Establish and evaluate fleet management best practices
Operations Management	To be competent, the individual must be able to: PC42. Create cost and performance monitoring processes PC43. Use information and communication technology in the supply chain PC44. Conduct benchmarking exercises in distribution operations PC45. Monitoring an outsourced logistics operation PC46. Provide measures for security and safety in distribution process PC47. Adopt logistics and environment best practice.
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the company/ organisation	The individual on the job must demonstrate knowledge and understanding of: OK1. Organisation standards and procedures followed for distribution management OK2. Fundamentals of a logistics and distribution system OK3. Coordination of the information regarding trends that affect logistics and distribution

and its processes)	OK4. Interpretation of value systems for distribution management in order to minimise costs operating costs and capital costs, and budget variance reports OK5. Economic implications of outsourcing goods and services OK6. Best practices in distribution management such lean systems thinking and its impact on production processes
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. Different building blocks of distribution management systems TK2. Sketches and diagrams for a distribution management system framework TK3. Different types of equipment and tools used in warehouses in manufacturing industries TK4. Hazards and safety aspects involved, and duties of relevant personal involved in distribution of goods TK5. Working principles of warehouse equipment and goods vehicles TK6. Procedures for handling dangerous goods TK7.Fire precautions, such as fire drills TK8. Integration of supply chain to manufacturing processes
C. Regulatory Context (Knowledge of Rules and Regulations)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant government regulatory agencies RK2. The Roads and Road Traffic Act and regulations RK3. Factories Act and regulations RK4. Metrology Act and regulations RK5. Food Safety Act and regulations RK6. Compulsory Standards Act and regulations RK7. Environmental Management Act and regulations RK8. Competition and Consumer Protection Act and regulations RK9. Occupational Health and Safety Act and regulations RK10. Workers' Compensation Act RK11. Public Health Act and regulations, as applicable
Skills (S)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The individual on the job must be able to: CS1. Read and interpret information documents sent by internal teams CS2. Read equipment manuals and process documents to understand the equipment operation and process requirement CS3. Read requisitions to procurement/stores on the requirement of apparatus, tools etc. CS4. Read lean systems thinking and its impact on productivity
	Writing Skills
	The individual on the job must be able to: CS5. Note down observations (if any) related to operating systems and share the same with the supervisor and workers CS6. Note down the data for the respective shifts in the log sheets/ online systems as per applicability in the organisation CS7. Draft and interpret design diagrams CS8. Draw and interpret symbols and measuring instruments CS9. Formulate equipment manuals and process documents to understand the equipment and processes better

	CS10. Prepare reports to be sent to supervisor/other teams
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS11. Discuss task lists, schedules, and work-loads with co-workers CS12. Effectively communicate with the team members CS13. Question supervisor/other co-workers appropriately in order to understand the nature of the problem and make a diagnosis CS14. Attentively listen and comprehend the information given by the speaker CS15. Interpret technical designs and convey clear message to users CS16. Explain the latest developments in warehouse equipment
B. Professional Skills	**Plan and Organise**
	The individual on the job must be able to: PS1. Plan and organise the work instruction and jobs received from the supervisor/other teams PS2. Organise all process/equipment manuals so that sorting out/accessing information is easy PS3. Support the supervisor in scheduling tasks for machinists/helpers PS4. Plan work schedules and load balancing
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	The individual on the job must be able to: PS13. Detect problems in day to day tasks PS14. Discuss possible solutions to address problems, with the supervisor PS15. Support supervisor in using specific problem solving techniques and detailing out the problems PS16. Make decisions in emergency situations in the absence of the supervisor

5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS

These include, but not limited to: workshops, warehouses, hand tools (e.g. hammer, scribers, chisels, drilling machines, etc.), power tools (e.g. drilling machines), first aid box, computer with appropriate software and hardware, personal protective equipment, company's standard operating procedures, reporting templates, comparators, transducers, micrometre instruments, angle gauges, optical instruments, jigs and fixtures, metal forming equipment, metal rolling equipment, sheet metal forming equipment, cutting fluids, joining equipment (e.g. soldering, brazing and welding), transportation equipment and facilities, note pads/books and pens.

6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER

Dilemmas associated with the job of Production Manager include:

- Working in dangerous areas
- Handling heavy equipment
- Long working hours
- Fast changing technology
- Likelihood of accidents
- Pressure to meet deadlines
- Exposure to fumes and dust
- Having to work with limited budgets
- Exposure to smells from chemicals, etc.

6.1 Alternative Choices (Solutions) to Dilemmas and Complexities

Alternative solutions to dilemmas and complexities include:

- Adopting lean systems thinking
- Adopting critical thinking approach
- Stress management
- Making use of PPEs
- Proper work planning and organisation
- Adherence to organisational standard operating procedures
- Familiarisation with and implementation of local and international standards and regulations.

7. WORKING CONDITIONS/ENVIRONMENT

Production Managers spend part of their time working in offices. However, they spend much of the time on the ground in the manufacturing plant or industrial facility. In most facilities, Production Managers occupy offices next to the plant or facility. This location reduces transit time and allows the Production Manager to respond to emergency situations quickly. The work can prove stressful, especially when working under tight deadlines.

Production Managers are likely to work in environments that are dusty, wet, noisy, areas with limited lighting and ventilation. They could also be subjected to walking or standing for long hours.

8. PARTIES INVOLVED/INTERACTING WITH THE JOB HOLDER OR TRAINEE

8.1 Internal/Within the Organisation

Supervisors, trainers, safety team/section members, other colleagues, etc.

8.2 External/Outside the Organisation

Government regulators, trainers, suppliers of equipment/tools/consumables, fellow Production Managers from other companies, labour unions/occupational health and safety associations, etc.

9. PHYSICAL DEMANDS ON THE BODY

- Physically straining
- Continuous concentration
- Exposure to heat, dust and similar extreme conditions
- Be able to distinguish colours, odours and smells
- Etc.

ANNEX A
Criteria for Assessments based on this NOS

A.1 Guidelines for Assessment

A.1.1 Criteria for assessment for curricula and learning programmes based on this NOS will be created by curricula and programmes developers. Each Performance Criteria (PC) will be assigned marks proportional to its importance in the NOS. Curricula and programmes developers will also lay down proportion of marks for theory and practical skills for each performance criteria, giving more weight to practical skills.

There shall be allocated the 'Total Mark', which will be the sum of all marks in each Unit, distributed across the number of PCs in that particular Unit. The 'out of' mark will be the mark allocated to each PC, which will be shared between theory and skills practical assessments.

A.1.2 Individual awarding/assessment bodies or institutions and other users of the NOS will create unique question papers for the theory part and evaluations for skill practical part for their respective candidates.

ANNEX B
NOS Version Control

This Annex gives details necessary for the tracking of the NOS versions based on the number of revisions.

NOS Code	NOS.PM.01		
ZQF Level	7	**Version Number**	01
Sector	Manufacturing	**Date of Approval**	February, 2021
Sub Sector	All subsectors in the Manufacturing sector	**Date of Last Review**	N/A
Occupation	Production Management	**Date of Next Review**	March, 2026

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