BS EN 15628:2014

BSI Standards Publication

Maintenance — Qualification of maintenance personnel

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 15628:2014. It supersedes PD CEN/TR 15628:2007 which is withdrawn.

The UK committee voted for this standard at the final stage, however they draw users' attention to the following:

In the UK, it is recommended that maintenance personnel serve an apprenticeship in a maintenance discipline (such as Plant, Production, Aircraft, Marine etc.) for at least 3 years before they are classified as competent and qualified, ideally progressing to Engineering Technician (Eng Tech) status and beyond as part of their continued professional development (CPD).

The UK participation in its preparation was entrusted to Technical Committee DS/1, Dependability.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2015

ISBN 978 0 580 80948 4

ICS 03.080.10; 03.100.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2015.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15628

August 2014

ICS 03.080.10; 03.100.30

Supersedes CEN/TR 15628:2007

English Version

Maintenance - Qualification of maintenance personnel

Maintenance - Qualification du personnel de la maintenance

Instandhaltung - Qualifikation des Instandhaltungspersonals

This European Standard was approved by CEN on 18 July 2014.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 15628:2014 E

Contents

Page

Foreword

This document (EN 15628:2014) has been prepared by Technical Committee CEN/TC 319 “Maintenance”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 15628:2007.

This document includes the following significant technical changes with respect to CEN/TR 15628:2007:

— substantial improvement;

— revision of the structure to orient the document to the tasks rather than to the knowledge;

— full consideration of the recommendation included in the European Qualification Framework (*Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning*) [4].

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Due to the growing extent and the increasing complexity of maintenance in the European industry, very diverse occupational profiles have evolved for maintenance personnel in the different member states. This European Standard specifies requirements such as competences, essential knowledge as well as basic and target qualifications. These requirements are recommended to obtain a specific qualification and to ensure highly qualified professional personnel at the different functions and/or positions in maintenance.

1 Scope

This European Standard specifies the qualification of the personnel with regard to the tasks to be performed in the context of the maintenance of plant, infrastructure and production systems.

In this European Standard, maintenance of plants and buildings is included in terms of technical aspects of services.

This European Standard guides to define the knowledge, skills and competencies required for the qualification of maintenance personnel.

This European Standard covers the following professional persons in the maintenance organization:

— Maintenance Technician Specialist;

— Maintenance Supervisor and Maintenance Engineer;

— Maintenance Manager (Responsible of Maintenance Function or Service).

This European Standard does not specify the verification criteria nor the specialized training of the personnel, which is related to the specific commodity sector.

NOTE Specialization and profession are the subject of the training carried out in the relevant sector.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13306:2010, *Maintenance — Maintenance terminology*

EN ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2005)*

EN ISO 14001:2004, *Environmental management systems — Requirements with guidance for use (ISO 14001:2004)*

IEC 60050-191:1990[1)], *International Electrotechnical Vocabulary — Chapter 191: Dependability and quality of service*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13306:2010, EN ISO 9000:2005, EN ISO 14001:2004 and IEC 60050-191:1990, and the following apply.

3.1
competence
proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development

1) IEC 60050-191:1990 is impacted by the stand-alone amendments IEC 60050-191:1990-am1:1999 and IEC 60050-191:1990-am1:2002.

Note 1 to entry: Competence is described in terms of responsibility and autonomy.

[SOURCE: EU Recommendation 2008/C 111/01 [4], Annex A, (i), modified — The present Note 1 to entry was a sentence that completed the original definition.]

3.2
knowledge
outcome of the assimilation of information through learning

Note 1 to entry: Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study.

[SOURCE: EU Recommendation 2008/C 111/01 [4], Annex A, (g), modified — The present Note 1 to entry was a sentence that completed the original definition.]

3.3
level of qualification
classification of qualifications according to different professional persons: Maintenance Technician Specialist, Maintenance Supervisor and/or Maintenance Engineer, Maintenance Manager (Responsible for Maintenance Function or Service)

3.4
procedure
document and instructions which indicate standardized practices, operational instructions and technical rules referred to the involved competence

3.5
qualification
formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards

[SOURCE: EU Recommendation 2008/C 111/01 [4], Annex A, (a)]

Note 1 to entry: The types of qualification, subject of this European Standard and outlined below, are consistent with the European Qualifications Framework for lifelong learning (EQF) [4]. Specifically, the maintenance personnel has adequate competences, skills and knowledge to operate safely, properly, effectively and efficiently, as described in Clause 4.

3.6
skills
ability to apply knowledge and use know-how to complete tasks and solve problems

Note 1 to entry: Skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

[SOURCE: EU Recommendation 2008/C 111/01 [4], Annex A, (h), modified — The present Note 1 to entry was a sentence that completed the original definition.]

4 Competences

NOTE The competences are not listed in a prioritized importance.

4.1 Competences of a Maintenance Technician Specialist

Based on the maintenance objectives, the competences of the maintenance technician specialist consists in the independent execution of maintenance tasks, including the following key competences:

— A.1: to perform or ensure the safe execution of the maintenance plans according to business strategies;

— A.2: to act promptly in case of failure or malfunction, ensuring the effectiveness of the restoration;

— A.3: to perform or ensure the proper execution according to rules and procedures relating to safety, health and environmental protection;

— A.4: to ensure the availability of materials, tools and equipment necessary for the execution of maintenance tasks;

— A.5: to coordinate and / or supervise on-site maintenance tasks;

— A.6: to ensure the quality of the maintenance tasks;

— A.7: to use and ensure the use of the ICT (Information and communication technology) systems.

The professional person ensures compliance with the relevant laws, ordinances, directives, operational instructions and the commonly accepted good practices.

An example of a Maintenance Technician Specialist tasks can be found in Annex A, stipulated by the respective member states.

NOTE Tentatively, this professional person can refer to the EQF levels 4 or 5.

4.2 Competences of a Maintenance Supervisor and Maintenance Engineer

With the Maintenance Supervisor or Maintenance Engineer there are specific roles which can be executed exclusively or in a joint responsibility.

The Maintenance Supervisor or Maintenance Engineer coordinates the maintenance tasks according to the annual budget, related maintenance plans and unplanned maintenance tasks. Furthermore, the Maintenance Supervisor or Maintenance Engineer contributes to ensure the required plant availability/plant performance (measured by key performance indicators), based on the company's or department's technical objectives of availability and quality, including the following key competences:

— B.1: to ensure the implementation of maintenance strategies and policies;

— B.2: to plan the maintenance tasks within his area of responsibility, defining and organizing the necessary resources;

— B.3: to organize, manage and develop the maintenance resources: personnel, materials and equipment;

— B.4: to ensure compliance with regulations and procedures related to safety, health and environment;

— B.5: to ensure technical and economic efficiency and effectiveness of maintenance tasks based on current state of technology;

— B.6: to participate in the technical aspects of contracts and procurement process and manage the performance of the contractors;

— B.7: to communicate to all necessary partners such as staff, contractors, customers and suppliers.

The Maintenance Engineer works with or supports the Maintenance Manager on the definition of maintenance plans and the identification of the required resources for the execution, the control and the analysis of budget variances. Furthermore, the Maintenance Engineer recommends improvement projects related to availability, reliability, maintainability and safety of assets, including the following key competences.

— B.8: to use their technical/engineering knowledge and the organizational tools to improve maintenance tasks and plant efficiency in terms of availability and reliability;

— B.9: to fulfil organizational and economical obligations in the field of his undertaken tasks.

Both professionals ensure compliance with the relevant laws, ordinances, directives, operational instructions and the current state of technology.

A detailed description of a Maintenance Supervisor's and Maintenance Engineer`s tasks can be found in Annex B, stipulated by the respective member states.

NOTE Tentatively, this professional person can refer to the EQF levels 5 or 6.

4.3 Competences of a Maintenance Manager

Based on the company's objectives, particularly those relating to availability and quality, the Maintenance Manager is responsible for ensuring the required plant availability/plant performance (based on key performance indicators), including the following key competences with the ability:

— C.1: to define and develop maintenance policies according to company strategies;

— C.2: to define processes and tools to support maintenance tasks;

— C.3: to define, manage and develop the organizational model of maintenance;

— C.4: to ensure the levels of availability, reliability, maintainability, supportability, safety and quality required for the entire useful life of assets;

— C.5: to ensure appropriate management and continuous improvement of maintenance;

— C.6: to ensure and control the compliance with maintenance and company budget, the respect of the planned maintenance tasks and the proper condition of assets;

— C.7: to define strategies, policies and criteria for performance management of contractors and for the definition of maintenance materials requirements.

The professional person ensures compliance with the relevant laws, ordinances, directives, operational instructions and the current state of technology.

A detailed description of a maintenance Manager's tasks can be found in Annex C, stipulated by the respective member states.

NOTE Tentatively, this professional person can refer to the EQF levels 6 or 7.

5 Required minimum skills and essential knowledge (profile)

NOTE The competences are not listed in a prioritized importance.

5.1 Required minimum skills and essential knowledge for a Maintenance Technician Specialist

The competences listed under 5.1 result in the minimum required skills and essential knowledge given in Table 1.

Table 1 — Competences, skills and knowledge for a Maintenance Technician Specialist

	Competences	Minimum skills	Essential knowledge
A.1	To perform or ensure the safe execution of the maintenance plans according to business strategies	a) To perform planned task according to the maintenance plans; b) To perform the inspection tasks in order to highlight and prevent the item degradation; c) To identify and propose actions or projects to improve reliability, availability and maintainability of assets; d) To take care, within the limits of his responsibility, organization and discipline of operating personnel; e) To use the machines, equipment and tools necessary for the execution of maintenance tasks; f) To comply with the required procedures, standards and operational methods of work; g) To apply the diagnostic techniques (failure analysis and troubleshooting techniques) and the on condition maintenance.	a) Maintenance plans, standards and operational methods of work; b) Technical documentation and maintenance manuals; c) Procedures; d) Business job descriptions and roles; e) Risk assessment tools/methodologies; f) Principles and techniques distinctive of the individual profession; g) Principles, logic and parameters of operation and utilization of asset and item; h) Maintenance objectives.
A.2	To act promptly in case of failure or malfunction, ensuring the effectiveness of the restoration	a) To interpret the first signs of failures and use fault diagnosis methods; b) To detect promptly the failure causes and determine appropriate corrective actions; c) To work according to quality and safety principles; d) To perform restoration tasks in accordance	a) Standards and operational methods of work; b) Technical documentation and maintenance manuals; c) Procedures; d) Business job descriptions and roles; e) Risk assessment tools/methodologies; f) Processes and work cycles; g) Principles and techniques distinctive of the profession; h) Principles, logic and parameters of

	Competences	Minimum skills	Essential knowledge
		with the required methodologies and standard works; e) To take care and coordinate, within the limits of his responsibility, the execution of repair and restoration tasks.	operation and utilization of asset and item; i) Fault diagnosis methods.
A.3	To perform or ensure the proper execution according to rules and procedures relating to safety, health and environmental protection	a) To use the required individual and collective protective equipment; b) To comply with the objectives and directives of the "management system": 1) of quality, 2) of safety and workers' health, 3) of environment; c) To observe laws, procedures and business rules; d) To take care and / or comply with the organization of the workplace protection; e) To use the machines, equipment and instruments required by laws and European regulations.	a) Legislation and technical standards; b) Procedures; c) Being aware of the effects of choices and actions on safety, health and environment; d) Safety and health management system; e) Quality management system; f) Environmental management system.
A.4	To ensure the availability of materials, tools and equipment necessary for the execution of maintenance tasks	a) To define the needs of technical materials related to maintenance plans; b) To ensure the availability of materials and equipment required for corrective maintenance in accordance with corporate procedures; c) To perform the preparation and regulation of machines, instrumentation and equipment necessary for the work.	a) Materials management techniques and methods; b) Regulatory and procedural constraints related to the management of maintenance equipment and tools.

	Competences	Minimum skills	Essential knowledge
A.5	To coordinate and / or supervise on-site maintenance tasks	a) To define and guarantee the availability of materials, machines, equipment and labour necessary for the assigned work; b) To use in an efficient and effective mode the available resources; c) To organize the work of operating personnel, assigning the necessary tasks and ensuring the use of individual and collective protective equipment; d) To take care of the completion of tasks performed; e) To ensure the discipline of employees; f) To take care, within the limits of his responsibility, of training, coaching and professional development of personnel; g) To verify that collaborating personnel is able to meet the minimum requirements for the assigned tasks.	a) Techniques of communication, training and coaching; b) Methods and rules about preparing and scheduling tasks; c) Manage the work organization; d) Procedures; e) Business job descriptions; f) Legislation and technical standards.
A.6	To ensure the quality of the maintenance tasks	a) To perform properly, efficiently and effectively the assigned maintenance tasks; b) To control the correct execution of the work and the personnel productivity; c) To verify the proper functionality of the maintained object, when the task is complete; d) To pursue the	a) Be aware of choices and actions on safety, health and the environment; b) Quality management system and principles; c) Communication techniques.

	Competences	Minimum skills	Essential knowledge
		continuous improvement in maintenance.	
A.7	To use and ensure the use of the ICT systems	a) To use and ensure the utilization of the maintenance management system; b) To use and ensure the utilization of the technological tools related to his job; c) To finalize the technical and economic completion in printed form or electronic form, according to procedures.	a) Maintenance ICT systems and tools; b) Procedures.

Depending on the individual previous experience, further knowledge related requirements for the Maintenance Technician Specialist can be derived from the description given in Annex A.

5.2 Required minimum skills and essential knowledge for a Maintenance Supervisor/Engineer

The skills and competences listed under 5.2 result in the minimum required skills and essential knowledge for a Maintenance Supervisor/Engineer listed in Table 2. Depending on organizational complexity and size of the company, the Supervisor of the work and the Maintenance Engineer can be two separate professionals or be traced to a unique person.

If they are two separate professionals, the following criteria apply:

— key competences of Maintenance Supervisor are marked by letter ***(S)***;

— key competences of Maintenance Engineer are marked by letter ***(E)***;

— key competences of both Maintenance Supervisor and Maintenance Engineer are not marked.

Table 2 — Competences, skills and knowledge for a Maintenance Supervisor/Engineer

	Competences	Minimum skills	Essential knowledge
B.1	To ensure the implementation of maintenance strategies and policies	a) To contribute to the development of the maintenance budget according to business objectives; b) To cooperate in the development of annual and perennial maintenance plans; c) To define criteria, methods and frequency of maintenance tasks; d) To provide within his area of responsibility, the necessary information to the maintenance manager for the definition of investment proposals relating to assets according to their status; e) To control costs, progress and quality of services; f) To provide essential key performance indicators of maintenance process; g) To develop and propose insourcing/outsourcing concepts to meet the maintenance strategy.	a) Maintenance strategies and policies, methods and technologies; b) Methods and techniques of organization and planning; c) Principles, logic and parameters of operation and utilization of asset and item in combination with wear and damage mechanisms; d) Procedures; e) Business job descriptions and roles; f) Maintenance and diagnostic techniques; g) Principles and techniques of design, construction and maintainability; h) Communication techniques; i) Business objectives.
B.2	To plan the maintenance tasks within his area of responsibility, defining and organizing the necessary resources	a) To negotiate the program of required maintenance works with the physical asset owner/operating manager; b) To define the organizational arrangements for the execution of maintenance tasks; c) To plan maintenance tasks falling under his area of responsibility, define the necessary resources and control the tasks organization and the reporting; d) To coordinate maintenance works performed by	a) Communication techniques; b) Methods and techniques of organization, planning and project management; c) Principles, logic and parameters of operation and utilization of asset and item; d) Standards and operational methods of work.

		maintenance personnel or contractors, ensuring the effectiveness and efficiency of the execution and verifying the proper functionality of asset by conducting a formal hand-over together with the physical asset owner/operating manager at the end of the work, before using it; e) To provide the necessary information to employees to carry out the assigned works; f) To optimize the use of human and technical resources; g) To provide project leadership.	
B.3	To organize, manage and develop the maintenance resources: personnel, materials and equipment	a) To educate and train maintenance specialized professionals, developing and enhancing their skills and the ability to work as a team; b) To organize and diffuse technical, technological and process solutions knowledge; c) To manage employees and ensure compliance with legislation, technical standards and company procedures on safety, health and environment; d) To define types and quantities of equipment and machines for maintenance tasks; e) To develop plans for maintaining and updating the equipment and machines, according to current legislation on safety, health and environmental protection; f) To support human resource by assistance in recruiting, assessment and training of staff; g) To execute training and education for staff.	a) Methods and techniques of organization and planning; b) Principles, logic and parameters of operation and utilization of asset and item; c) Procedures; d) Business job descriptions and roles; e) Legal constraints related of the management of resources, equipment and tools; f) Skills of employees; g) Training and coaching techniques and methods.

B.4	To ensure compliance with regulations and procedures related to safety, health and environment	a) To comply with the objectives and directives of the management system in terms of quality, safety, workers health and the environment; b) To ensure compliance of employees with company standards and procedures on safety, health and the environment; c) To identify the risks arising from maintenance tasks; d) To ensure the proper documentation management.	a) Legislation, technical standards and integrated management systems for safety, health and environmental protection; b) Procedures; c) Quality management system; d) Techniques and methods for risk assessment.
B.5	To ensure technical and economic efficiency and effectiveness of maintenance tasks based on a technical state of the technology	a) To control and improve technical and professional skills of maintenance personnel; ***(S)*** b) To verify and test the proper functionality of the asset by conducting a formal hand-over together with the physical asset owner/operating manager at the end of the work, before using it; ***(S)*** c) To monitor the development of abnormalities and check the performance parameters; d) To supervise the compliance with the maintenance budget through the summarizing data; e) To monitor performance, reliability, availability of asset and maintenance costs through the indicators; ***(E)*** f) To carry out reliability studies and technical analysis to improve the availability of asset; ***(E)*** g) To perform audits and, inspections to control the	a) Fundamentals of data acquisition and control management; b) Business objectives; c) Principles, logic and parameters of operation and utilization of asset and item; d) Tools and techniques for technical, organizational and economic monitoring; e) Reliability analysis methods and techniques.

		status of asset and processes. ***(E)***	
B.6	To participate in the technical aspects of contracts and procurement process and manage the performance of the contractors	a) To define the request for technical materials and ensure the logistics operations; ***(S)*** b) To provide, in the framework of a contract, the necessary information to the contractor to carry out the assigned work, supervise the execution of the work in progress, ensure the proper, effective and efficient execution of work and ensure the technical and economic completion of work (to-do-list) together with the contractor; ***(S)*** c) To collaborate to define the criteria and procedures for the management and procurement of materials and services, d) To negotiate the needs of stocks of technical and strategic materials necessary to maintenance tasks with the maintenance manager; e) To control and update the information in the maintenance information system useful for the proper materials and services management.	a) Methods and policies for the procurement of materials, materials and spare parts logistics and the management of materials and warehouses; b) Contractors policies and management systems; c) Contractual general conditions and technical specifications; d) Procedures and company policies.
B.7	To communicate to all necessary partners like staff, contractors, customers, suppliers	a) To communicate with different types of persons like workers, master craftsmen, technicians and engineers; b) To present different solution options to the customers or physical asset owner/operating manager; c) To prepare a decision making process; d) To reduce complexity to essential parameters;	a) Basic principles of the communication b) Sound capability of customers language, needs and requirements c) Negotiation techniques; d) Communication and presentation techniques; e) Problem solving methods.

		e) To negotiate positions due to fixed limits; f) To moderate conflict situations to accepted solutions.	
B.8	To use the engineering knowledge and the organizational tools to improve maintenance tasks and plant efficiency in terms of availability and reliability	a) To develop policies and criteria for maintenance planning and scheduling according to the assigned objectives of availability, reliability, maintainability and cost; ***(E)*** b) To develop and update policies, tools, methodologies and technical standards for maintenance in accordance with the laws and rules on safety, health and environmental protection; ***(E)*** c) To support the maintenance manager to propose improvements; ***(E)*** d) To promote the continuous improvement of reliability, availability, maintainability and safety performance of assets; ***(E)*** e) To ensure the preparation of manuals and instructions for training and continuous technical updating; ***(E)*** f) To assess the reliability, availability and maintainability of asset and the lifecycle cost; ***(E)*** g) To control the execution of maintenance plans and define corrective actions; ***(E)*** h) To propose technical and organizational solutions aiming at optimizing cost and time of maintenance tasks; ***(E)*** i) To perform analysis and studies for the re-engineering of maintenance and logistics processes to	a) Sustainability principles; b) Communication techniques; c) Fundamentals of processes and projects management; d) Methods and techniques of organization and planning; e) Technical training and coaching; f) Features and capabilities of computerized maintenance management systems and tools; g) Materials and equipment technologies; h) Principles, logic and parameters of operation and utilization of assets and items; i) Maintenance and diagnostic techniques; j) Concepts / methodologies, techniques and tools of continuous improvement; k) Methods and tools of engineering maintenance; l) Legislation and technical standards; m) Procedures; n) Methodologies and tools for continuous improvement; o) Reliability analysis methods and

		improve quality and reduce maintenance costs; ***(E)*** j) To use the computerized maintenance management systems and tools for data acquisition, monitoring and reporting. ***(E)***	techniques; p) Process re-engineering techniques; q) Documentation and knowledge management.
B.9	To fulfil organizational and economical obligations in his field of taken tasks	a) Economical thinking and acting; ***(E)*** b) To take decisions; ***(E)*** c) To perform analysis and studies of the given processes and applied methods during actions taken; ***(E)*** d) To choose the appropriate organization; ***(E)*** e) To ensure consideration of legal and technical standards for the given tasks; ***(E)*** f) To manage own and third party forces. ***(E)***	a) Organizational responsibilities; b) Economical decision options; c) Cost calculation methods and schemes; d) Productivity measurement and improvement methods; e) Legislation and technical standards; f) Methodologies and tools to develop fit-for-purpose organizations; g) Management tools to conduct combined teams of own and third party forces.

Depending on the individual previous experience, further knowledge-related requirements for the Maintenance Supervisor and/or Engineer can be derived from the description given in Annex B.

5.3 Required minimum skills and essential knowledge for a Maintenance Manager

The competences listed under 5.3 result in the minimum required skills and essential knowledge for a Maintenance Manager listed in Table 3.

Table 3 — Competences, skills and knowledge for a Maintenance Manager

	Competences	Minimum skills	Essential knowledge
C.1	To define and develop maintenance policies according to company strategies	a) To define strategies, policies, guidelines and objectives, controlling the implementation; b) To ensure compliance with legislation, technical standards and company strategies, objectives and procedures on safety, health, environmental protection and quality; c) To develop the maintenance budget in accordance with business strategies, company strategies, objectives and procedures and according to the current state of assets and their life cycle; d) To operate with respect to business strategy, availability target of assets and seek continuous cost optimization; e) To promote process re-engineering analysis and studies for maintenance and logistics with the aim to ensure the improvement of availability, reliability and maintainability and to optimize maintenance costs; f) To follow the development of the relationships with technical organizations, institutes and associations for the issues concerning the area of maintenance.	a) Relevant company procedures; b) Relevant business and company strategies, targets and business processes; c) Legislation, technical standards, management system for safety, health, environment and quality, company's and external specialist resources; d) Fundamentals of business administration and economy; e) Communication techniques; f) Principles, logic and parameters of operation and utilization of items and assets; g) Criteria, logic, methodologies and tools for maintenance management; h) Professional leadership; i) Management of working groups j) Industrial relations; k) To seek relevant industry best practices and aim to implement locally.

	Competences	**Minimum skills**	**Essential knowledge**
C.2	To define processes and tools to support maintenance tasks	a) Evaluation of effectiveness and efficiency of the maintenance process and techniques and implementation of improvements, according to health, safety, quality and economy; b) To ensure the proper and timely use of maintenance information systems, promoting the upgrade; the development of systems and tools necessary to meet the business requirements; c) To define criteria for the development and implementation of diagnostic systems; d) Standardization of internal maintenance processes; e) To define a structured system for plant documentation, assign responsibilities and make sure that all relevant documentation is kept up to date.	a) Maintenance methodologies, terminology and techniques; b) Strategies and business processes; c) Fundamentals of planning and scheduling; d) Fundamentals of processes and projects management; e) Maintenance information systems, technological tools and innovations; f) Legislation, technical standards; g) Procedures; h) Principles, logic and parameters of operation and utilization of asset and item; i) Maintenance within physical asset management; j) Technical and commercial risk assessment related to maintenance aspects.
C.3	To define, manage and develop the organizational model of maintenance	a) To identify the most appropriate organizational model to achieve corporate strategic objectives in terms of effectiveness and efficiency; b) To ensure the implementation of company policies for the organization, management and training of employees; c) To collaborate in the definition of individual professional development according to the	a) Organizational models; b) Strategy and business processes; c) Human resources selection policies; d) Technical training and upgrading; e) Remuneration policies; f) Competence of employees; g) Labour agreements of reference for the sector.

	Competences	Minimum skills	Essential knowledge
		company policies; d) To ensure the communication between different organizational levels and business processes; e) To define needs and proposals for recruitment plans, training of the employees and for the development of the organization.	
C.4	To ensure the levels of availability, reliability, maintainability, supportability, safety and quality required for the entire useful life of assets	a) To collaborate in the design of new assets, providing all the information and experience useful to the success of the project; b) To evaluate the availability, reliability, maintainability, supportability and the cost of life cycle of asset; c) To improve the above characteristics according to technical and commercial opportunities; d) To ensure the execution of maintenance plans; e) To ensure compliance with legislation, technical standards and company procedures on safety, health and environmental protection; f) To ensure that maintenance tasks meet or improve the safety conditions of the asset and the service levels; g) To ensure failure analysis on critical assets, in order to identify the root	a) Procedures and business processes; b) Safety and health management system; c) Quality management system; d) Legislation and technical standards; e) Fundamentals and tools of management control; f) Principles, logic and parameters of operation and utilization of asset and item; g) RAMS parameters (Availability, Reliability, Maintainability, Safety) and supportability; h) Problem solving techniques.

	Competences	**Minimum skills**	**Essential knowledge**
		causes and propose actions.	
C.5	To ensure right management and continuous improvement of maintenance	a) Professional leadership, communication techniques and management of working groups; b) Safeguarding, that immediate action is taken in cases of exceptional events; c) To ensure that maintenance tasks meet or improve the safety conditions of the asset and the service levels; d) To ensure the process of re-engineering and continuous improvement of maintenance; e) To ensure the proper right and timely use of maintenance information systems, promoting the upgrade and the development of systems and tools necessary to make them consistent with the technical and management needs; f) To promote the use of professional skills and technical resources available; g) To coordinate staff and employees, promoting the synergistic integration of tasks of available resources; h) To collaborate in the design of training courses and coaching of maintenance personnel to ensure continuous improvement of professional competencies;	a) Principles and tools for the continuous improvement; b) Process re-engineering techniques; c) Maintenance information systems and tools; d) Fundamentals and tools of management control; e) Corporate objectives; f) Principles and methods for planning and controlling; g) English language including technical English; h) Basic methods and techniques of health and safety.

	Competences	**Minimum skills**	**Essential knowledge**
		i) To presentation and visualization, such as for maintenance budget, human resources requests of additional capital expenditures.	
C.6	To ensure and control the compliance with maintenance and company budget, the respect of the planned maintenance tasks and the proper condition of assets	a) To verify the consistency of policies, methods and standard works in use; b) To ensure the proper execution of maintenance work; c) To verify technical and economic performance through the use of key performance indicators (KPIs); d) To control the compliance with the maintenance budget, identifying any corrective action in case of non-compliance; e) To ensure the preservation of assets according to their useful life.	a) Fundamentals and tools of control management; b) Business objectives; c) Principles, logic and parameters of operation and utilization of asset and item; d) Maintenance manuals; e) Targets of other departments that interact with maintenance; f) KPIs used by benchmarking methodologies.
C.7	To define strategies, policies and criteria for performance management of contractors and for the definition of maintenance materials requirements	a) To evaluate the technical capability according to the specifications and the needs for selection of suppliers; b) To manage maintenance contracts in relation to legislation, technical standards and business practices and verify the contractors effectiveness and efficiency; c) To collaborate in the definition of strategies for the supply of maintenance services on the basis of technical requirements	a) Procurement policies; b) Materials logistics; c) Methods and policies for the management of materials and warehouses; d) Contractual models and standards; e) Legislation and technical standards; f) Procedures; g) Purchasing requirements.

	Competences	Minimum skills	Essential knowledge
		and business objectives; d) To provide guidelines for the definition of necessary spare parts and equipment to ensure the availability and according to the business requirements.	

Depending on the individual previous experience, further knowledge related requirements for the maintenance Manager can be derived from the description given in Annex C.

6 Essential requirements and experience

NOTE Certain sectors have additional requirements (such as experience, specific training on the job, certificates) to gain adequate competency.

6.1 Maintenance Technician Specialist

The Maintenance Technician Specialist shall have successfully completed a technical vocational training of several years. Furthermore, two years of recently obtained work experience in the field of maintenance are recommended. Table 4 shows an overview of the minimum requirements and experiences.

6.2 Maintenance Supervisor and/or a Maintenance Engineer

The Maintenance Supervisor shall have successfully completed a technically-based training to become a master craftsman or engineer. Furthermore, three years of recently obtained work experience in the field of maintenance are requested. Table 4 shows an overview of the minimum requirements and experiences.

The Maintenance Engineer shall have successfully completed a technically-based training to become an engineer.

6.3 Maintenance Manager

The Maintenance Manager shall have successfully completed an engineering training. Furthermore, five years of recently obtained work experience in the technical field are requested. Table 4 shows an overview of the minimum requirements and experiences.

Table 4 — Overview of essential entry requirements and experience

Professionals	Maintenance Technician Specialist	Maintenance Supervisor and / or Maintenance Engineer	Maintenance Manager (Responsible for Maintenance Function or Service)
Degree	EQF Level 4 ÷ 5 or equivalent	EQF Level 5 ÷ 6 or equivalent	EQF Level 6 ÷ 7 or equivalent
Time needed for the theoretical and practical training (on-the-job) of maintenance personnel	at least two years of experience in maintenance	at least three years of experience in maintenance [a] or personnel already qualified as technician and two additional years of experience in maintenance or at least bachelor graduates with two years of experience in maintenance	graduates with at least five years of experience in maintenance (operation + management + maintenance engineering)
During the professional development of a maintenance manager, it is necessary to include at least two years of team leadership or staff management experience, with direct responsibility, of maintenance function or service.			

[a] Diplomas, degrees and master shall be science and technology specialization, in graduate classes that provide a sufficient number of credits dedicated to the development and enhancement of competence in the field of maintenance.

Annex A
(informative)

Example of a Maintenance Technician Specialist tasks

A.1 Economics

No tasks.

A.2 Customers

Execution of the commissioned tasks in a proper, high-quality and on-schedule manner fulfilling additional customer-specific requirements.

A.3 Processes

Conduct of necessary risk assessment before commencing any maintenance work.

Identification of hazards and appropriate mitigating actions.

Selection of suitable working steps for the implementation of maintenance measures.

Selection of suitable equipment and resources.

Monitoring of current orders, associated work plans and schedules.

Recording and evaluation of individual plant statuses.

Providing diagnostic feedback to the engineering supervisor/team/reliability engineers.

Recording and evaluation of deliveries and services.

Detection of problems and selection of suitable solution alternatives.

Contribution to the optimization of working processes.

Working with performance indicators.

A.4 Staff

Target-oriented cooperation with colleagues and superiors.

A.5 External partners

Target-oriented and safety-conscious cooperation.

Annex B
(informative)

Example of a Maintenance Supervisor/Engineer tasks

B.1 Economics

Budget planning in cooperation with the Maintenance Manager.

Control of the booking of maintenance services within the framework of the maintenance system.

Monitoring of costs in the following fields of activity:

— services on own account;

— contracted services;

— materials and stocks of materials.

Performance controlling.

B.2 Customers

Ensuring the required technical plant availability in the respective field of activity.

Creation of competitive offers.

Ensuring compliance to schedules and quality of work.

Establishment of a lasting customer loyalty.

Internal and external representation of the line of maintenance.

B.3 Processes

Conduct of necessary risk assessment before commencing any maintenance work.

Ensuring that work executioners first identify hazards and appropriate mitigating actions before starting any work.

Reviewing high-risk work plans, ensuring that risk is minimized to acceptable level before work starts.

Preparation of Job Safety Analysis and Safety Plans together with the safety specialists.

Ensuring that a Safe Work Culture is implemented and compiled with by all staff and contractors.

Implementation of a predefined resource strategy, such as insourcing/outsourcing.

Contribution to the selection of the appropriate maintenance strategy.

Implementation of the maintenance strategy.

Provision of information corresponding to the predefined control and measurement quantities.

Collection and control of predefined characteristics.

Contribution to improvement processes, together with his superior, his own personnel and his customers.

Optimization of work plans and schedules in the respective field of activity.

Procurement, selection and implementation of new tools and knowledge.

Gathering information about the state of technologies.

Introduction of innovations in consultation with the Maintenance Manager.

Preparation and approval of plans for preventative maintenance and inspections.

Preparation of work plans.

Execution of tasks regarding materials management and material disposition.

Planning and execution of maintenance measures in coordination with other lines of maintenance and the customers (coordination of different trades, communication with Maintenance Supervisor/Engineer of other fields of activity).

Analysis of failures and common faults that occur and how to take action to prevent them reoccurring .

Knowledge transfer by passing on the acquired know-how.

Taking over management functions within projects.

Ensuring an economical work sequence by selecting and optimizing the equipment and persons.

Continuing professional development.

B.4 Staff

Leading and motivation of the subordinate staff in technical and disciplinary terms.

Selection of new staff to be recruited, in cooperation with the maintenance manager and the personnel department.

Assessment of the staff's performance.

Contribution to and implementation of the tool-time/wrench-time monitoring work-model.

Planning of staff requirements.

Preparation of a plan for personnel development — determination of the need for further training and adoption of the responsibility for the implementation of the required measures.

Communicate maintenance strategy and actual status to the staff.

B.5 External partners

Coordination and engagement of external companies and third parties.

Briefing of external companies and briefing on site.

Control of adherence to the budget as well as of the proper and on-schedule implementation of the purchased contracted services.

Annex C
(informative)

Example of a Maintenance Manager tasks

C.1 Economics

Budget planning.

Specification of cost rates.

Cost management regarding:

— services on own account;

— contracted services;

— materials and stocks of materials.

Performance controlling.

C.2 Customers

Ensuring the required technical plant availability.

Offering competitive prices.

Executing maintenance work cost effectively.

Control of adherence to schedules and of quality.

Establishing effective communication system for the customers.

External representation of maintenance aspects.

Representation of the added value created by maintenance.

Apply the concept of LCC (Life Cycle Costs) in the company.

C.3 Processes

Specification and implementation of a resource strategy, such as insourcing/outsourcing.

Plant-specific specification of a maintenance strategy.

Supporting, planning and execution of projects.

Preparation of specifications regarding work system, plant, work planning and selection of equipment.

Establishment of KPIs (Key performance indicators) system.

Processing of the characteristics and design of the required control circuits for controlling these processes, in cooperation with the personnel, Maintenance Supervisor/Engineer and customers.

Benchmarking, such as regarding the cost quota and maintenance intensity as well as the reaction times, cycle times and cost rates.

Obtaining and keeping an overview of internal and external know-how.

Setting of objectives for the organization.

Implementation of the innovation management, such as, market surveillance, introduction of new techniques/innovations, continuous improvement process (CIP), promotion of an innovative climate.

Design of management systems regarding quality, health and safety, and the environment.

Development and application of internal norms and standards.

C.4 Staff

Creation of a performance-based compensation system.

Creation of a suitable shift model for working time.

Evaluation and optimization of required work force.

Implementation of an appropriate personnel development to ensure the required qualifications.

Specification of the decision-making competencies.

Ensuring information of the staff.

C.5 External partners

Establishing and keeping a good relation with the external companies.

Establishing and keeping a network of service providers and suppliers.

Bibliography

[1] EN 13269:2006, *Maintenance — Guideline on preparation of maintenance contracts*

[2] EN 13460:2009, *Maintenance — Documentation for maintenance*

[3] EN 15341:2007, *Maintenance — Maintenance Key Performance Indicators*

[4] 2008/C 111/01, *Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning*, OJ C 111, 6.5.2008, p. 1–7

[5] *Regulation (EC) No 452/2008 of the European Parliament and of the Council of 23 April 2008 concerning the production and development of statistics on education and lifelong learning*, OJ L 145, 4.6.2008, p. 227–233

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™