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Vzdrževanje - Kvalificiranje vzdrževalcev

Maintenance - Qualification of Maintenance personnel

Instandhaltung - Qualifizierung von Instandhaltungspersonal

Maintenance - Qualification du personnel de la maintenance

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Maintenance - Qualification of Maintenance personnel

Maintenance - Qualification du personnel de la maintenance

Instandhaltung - Qualifizierung von Instandhaltungspersonal

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Contents

Page

Foreword

This document (CEN/TR 15628:2007) has been prepared by Technical Committee CEN/TC 319 “Maintenance”, the secretariat of which is held by UNI.

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Introduction

At the time of the publication of this report, there are more than twenty Maintenance Societies in Europe, and each of them is active in education and training on a national level. In view of the ongoing developments in European integration, training and qualification of maintenance personnel should be carried out within a more structured framework of mutually accepted European guidelines.

In the last years of the 20th century an initiative was taken to develop European guidelines for qualifying maintenance personnel at a management level. This project is still progressing with great success. One of the reasons for this success is that the qualification procedure has no link with any national school system hindering the initiative. In fact all individuals have a right to make an application to enter the examinations arranged by the National Member Societies.

At the beginning of the 1990s, the Societies decided uniformly, to categorize the European maintenance personnel into three levels and to link these levels to national school systems.

The following three levels were described:

— The European Maintenance Technician.

— The European Maintenance Supervisor.

— The European Maintenance Manager.

The European Maintenance Technician is a craft person with at least two years of practical experience in maintenance and sufficient theoretical knowledge to independently perform and coordinate maintenance activities (responsible for short term decisions and communication).

The European Maintenance Supervisor is a person with at least two years of practical experience in maintenance and possesses sufficient theoretical knowledge to independently perform and coordinate maintenance projects (responsible for medium term decisions).

The European Maintenance Manager is a person with an approved engineering background and sufficient theoretical knowledge to perform and co-ordinate maintenance.

Each country has to apply its National regulations.

1 Scope

The scope of this document is to report about the current situation for defining the competence levels for personnel operating in maintenance and the knowledge levels required to be addressed to carry out those competencies.

2 Normative references

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

EN 13269, *Maintenance - Guideline on preparation of maintenance contracts*

EN 13306:2001, *Maintenance terminology*

EN 13460, *Maintenance – Documents for maintenance*

EN 15341, *Maintenance – Maintenance Key Performance Indicators*

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

EN ISO 9001, *Quality management systems – Requirements (ISO 9001:2000)*

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

IEC 60050-191:1990, *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 13306:2001, IEC 60050-191:1990 and EN ISO 9000:2005 apply.

4 Three competence levels for qualification of Maintenance personnel

This document lists the knowledge requirements proposed to be incorporated within maintenance training. There are three proposed levels of competence. The knowledge requirements are typically covered within the following education systems, see Table 1:

Table 1- Example of the three levels for qualification of maintenance personnel

Title	European Maintenance Manager	European Maintenance Supervisor	European Maintenance Technician
Qualification document	Bachelor degree or Postgraduate diploma / Master degree	e. g. National diploma	e. g. National diploma
Education system / school	Technical university Private schools or courses	National school for improving theoretical knowledge	National school for improving theoretical knowledge
Starting conditions	Baccalaureate **or** Bachelor **or perhaps** European Maintenance Supervisor	Person with at least two years of practical experience in maintenance **or** European Maintenance Technician	Craft person with at least two years of practical experience in maintenance
Requirements	See Annex A (informative)	See Annex B (informative)	See Annex C (informative)
NOTE 1 The three competence levels described should be integrated in the lifelong learning programs of the EU in accordance with the Bologna and Copenhagen declarations. NOTE 2 At the Maintenance Manager level, the education should be integrated into Bachelor or Master education syllabuses.			

5 The three levels of required knowledge

5.1 General

Requirements have been set out under 5.2 and 5.3. These sub-clauses have sub-readings in each syllabus area with the level of required knowledge specified.

The three levels of required knowledge are:

— **Level 1: Very good knowledge**, ability to lead change and handle special tasks;

— **Level 2: Good knowledge**, ability to understand the implications of change and making the correct decisions;

— **Level 3: Understanding**, ability to participate in decision making within the team and carry out the tasks.

In each syllabus the overall approach is to ensure that maintenance tasks are:

a) carried out in a safe manner;

b) carried out in a correct manner first time: and

c) carried out on time and cost effectively.

5.2 General Competences for the three levels

		LEVEL OF REQUIRED KNOWLEDGE		
		Maintenance Manager	**Maintenance Supervisor**	**Maintenance Technician**
5.2.0 5.2.0.1 5.2.0.2 5.2.0.3 5.2.0.4	**Corporate/Company Environment** Corporate/company situation Corporate/company organization Departmental organization Costs	**1** **Has** knowledge to impact on social/economic impact of own organization/ enterprise.	**2** **Has** good knowledge of social/economic impact of own organization/ enterprise.	
5.2.1 5.2.1.1 5.2.1.2	**Work Planning** Planning — Maintenance request/Process sheet/ Job ticket — Personnel planning — Equipment planning — Time sheet Control and reporting	**1** **Has** very good knowledge for organizing all maintenance activities, how to **choose** a suitable organization and **assure** the right competence within the organization.	**1** **Does** preparation and reporting on team maintenance tasks and is supervising some team jobs. **Carries out** planning of shutdowns, and group planning coordination.	**1** **Does** preparation and reporting on own maintenance tasks and on some team jobs. **Plans** own work and suppliers'/ contractors' work.
5.2.2 5.2.2.1 5.2.2.2	**Team Working and Communication** Authority and Responsibility Basic Management Techniques — Personnel Management — Reporting Techniques — Team organization techniques	**1** **Has** very good knowledge in project management. **Has** social capability to lead and communicate with people in and outside the team, such as in the production, with contractors, suppliers, etc. **Has** good knowledge about human reliability.	**1** **Has** ability to create and communicate procedures and systems. Reports orally and in writing within a team and to the management. **Has** social capability to communicate with people in and outside the team, such as in the production, with contractors, suppliers, etc.	**1** **Reports** orally and in writing within a team. **Has** social capability to communicate with people in and outside the team, such as in the production, with contractors, suppliers, etc.
5.2.3	**English Language** Technical English	**1** **Has** good knowledge about the maintenance terms in the English language, in order to **be able** to handle international maintenance management matters within Europe.	**2** **Is able** to understand instructions in technical English and to make a summary in the national language. **Is able** to conduct a conversation in English. **Is able** to write a case-study report in English.	**3** **Is able** to understand instructions in technical English.

5.2.4 5.2.4.1 5.2.4.2 5.2.4.3	**Information Technology** Basics of Electronic Data Processing (EDP) related to maintenance management Processing/calculation techniques — Data base handling — Computation of tables The PC-Work station — Organization of the PC-Work station — Use of networks	**1** **Knows** how to specify the requirements for an information system. **Has** good knowledge about the use of an information system.	**2** **Uses** the information system for entering and collecting data. **Has** good knowledge to use the system interactively for tactical purposes.	**2** **Uses** the information system for entering and collecting data. **Has** the basic knowledge to use the system interactively.
5.2.5 5.2.5.1 5.2.5.2 5.2.5.3 5.2.5.4	**Training and Instructions** Basics of the Learning Process Basics of Training Strategies Basics of Planning a Lecture Training facilities	**1** **Has** very good knowledge for defining and implementing human resources development policy. **Has** very good knowledge needed for training and instructing. **Is** familiar with training facilities in and outside the organization.	**1** **Has** very good knowledge needed for training and instructing team members. **Is** familiar with training facilities in and outside the organization.	**2** **Has** the basic knowledge needed for training and instructing team members. **Is** familiar with training facilities in and outside the organization.
5.2.6 5.2.6.1 5.2.6.2 5.2.6.3	**Quality Assurance (Systems)** Scope and objectives of Quality Assurance (QA) — QA Standards (see EN ISO 9000 series), Terminology — Elements of QA systems (see EN ISO 9001) Basics of Quality Assurance QA techniques and procedures — Concepts — Definitions — QA techniques and procedures	**1** **Has** very good knowledge about the relationship between maintenance and quality assurance.	**1** **Has** very good knowledge of the impact of maintenance on product quality. **Is able** to act as an active member of a quality team.	**2** **Has** basic knowledge of the impact of maintenance on product quality. **Is able** to act as an active member of a quality team.
5.2.7 5.2.7.1 5.2.7.2	**Environment** Scope and objectives of Environmental Management (see EN ISO 14001) Influence on the environment	**1** **Has** very good knowledge and impacts on environmental issues. **Has** very good knowledge of the environmental consequences of carrying out and not carrying out maintenance.	**1** **Has** very good knowledge of the impact of maintenance on environmental issues. **Is able** to act as an active member of an environmental team.	**1** **Has** basic knowledge of the impact of maintenance on environmental issues. **Is able** to act as an active member of an environmental team.

5.2.8 5.2.8.1 5.2.8.2 5.2.8.3	**Automation** Basics of Process Control Basics of machine automation Common system design	**1** **Has** very good knowledge of systems at present. **Understands** the principles of design of modern automation systems.	**1** **Has** very good knowledge of systems at present.	**2** **Has** general knowledge of systems.
5.2.9 5.2.9.1 5.2.9.2	**Occupational Health and Safety** Scope and objectives of Health and Safety Management Influence on health and safety.	**1** **Has** very good knowledge and impacts on health and safety issues. **Has** very good knowledge of the health and safety consequences of carrying out maintenance. **Has** knowledge of hazards, and protection and prevention techniques.	**1** **Has** very good knowledge of the impact of maintenance on health and safety issues. **Is able** to act as an active member of a health and safety team.	**1** **Has** knowledge of the consequences of maintenance on health and safety issues, and of protection devices and their use. **Has** good knowledge of procedures and working instructions, the requirements and the purpose. **Has** good knowledge of handling potentially hazardous materials. **Is able** to act as an active member of a health and safety team.

5.3 Responsibilities and Competences for the three levels

		LEVEL OF REQUIRED KNOWLEDGE		
		Maintenance Manager	**Maintenance Supervisor**	**Maintenance Technician**
5.3.1	**Maintenance Objectives, Policies and Strategies** Corporate Maintenance Engineering — Objectives, Tasks, Significance — Policies on maintenance — Investment considerations, Life Cycle Cost (LCC) — Key Performance Indicators (KPIs) and key targets (see EN 15341)	**1** **Knows** well the importance and consequences of maintenance objectives, policies and strategies. **Knows** the economic impact of maintenance and the importance of operation and capital costs within the asset management framework. **Has** an impact on design aspects from a maintenance point of view. **Knows** different methods of life extensions. **Knows** how to formulate the maintenance needs and goals. **Knows** key-figures for maintenance control.	**2** **Knows** the importance of maintenance objectives and policies. **Knows** the consequential impact of maintenance and the importance of operation and capital costs within the framework of asset management.	**3** **Understands** the importance of maintenance objectives and policies. **Understands** the consequential impact of maintenance and the importance of operation and capital costs within the framework of asset management.
5.3.2 5.3.2.1 5.3.2.2 5.3.2.3 5.3.2.4	**Maintenance Concepts and Methodologies** All maintenance procedures and systems Reliability and Maintainability principles Maintenance Asset Strategies (e.g. preventive, corrective) Condition Based Maintenance (see 5.3.7)	**1** **Applies** the concepts and methods related to the collection and evaluation of information, the principles of maintenance asset strategy development, and its implementation and impact.	**1** **Knows** and recommends the principles of the preventive, corrective and opportunity based maintenance, including condition monitoring.	**1** **Carries out** the collection and assessment of data and information, and practices the concepts and methodologies developed.
5.3.3 5.3.3.1 5.3.3.2	**Restoration Techniques** Basis of Technology — Mechanical Technology/ mechanical equipment — Electrical Technology/ electrical equipment — PLC's (Programmable Logic Controllers) and PC's applications — Hydraulics and Pneumatics — Building Repair techniques	**1** **Knows** the different restoration techniques. Knows how to implement them.	**1** **Knows** general restoration principles and is able to apply them in practice.	**1** **Knows** specific restoration principles and is able to apply them in practice.

5.3.4	**Maintenance Terminology** Terminology (See EN 13306 and IEC 60050-191)	**1** **Knows and manages** the implementation of the correct general and specific maintenance terminologies, **understands** them and **is able** to use them effectively.	**1** **Knows and understands** maintenance terminologies, understands them and **is able** to use them actively.	**1** **Knows and understands** maintenance terminologies, **understands** them and **is able** to use them actively.
5.3.5 5.3.5.1 5.3.5.2 5.3.5.3	**Partnering and Contracting** Basics of Contractual Law The CEN Maintenance Contract (See EN 13269) Guidelines — Practical applications	**1** **Knows** the principles of partnering and contracting. **Knows** well the laws, regulations, and procedures regarding human resources, liability, guarantee, environment, and energy, etc.	**1** **Knows** the requirements and scope to which a contractor should comply. **Is able** to instruct and supervise contractors on maintenance jobs.	**1** **Knows** the requirements and scope to which a contractor should comply. **Is able** to instruct and supervise contractors on maintenance jobs.
5.3.6 5.3.6.1 5.3.6.2 5.3.6.3 5.3.6.4 5.3.6.5 5.3.6.6	**Laws and Regulations** Basics of Human Resources Law and regulations on Health Care & Safety Laws and regulations on environmental protection Safety practice — First aid training — Preventive health protection and safety measures Equipment Safety Systems All Laws and Regulations concerning the maintenance function	**1** **Knows and can ensure** implementation of all functions, laws and regulations related to maintenance management.	**2** **Knows** all relevant laws, regulations, and training procedures concerning job safety, fire protection and environment.	**2** **Knows** all relevant laws and regulations concerning job safety, fire protection and environment.
5.3.7 5.3.7.1 5.3.7.2 5.3.7.3	**Condition Based Maintenance (CBM)** Significance of CBM in maintenance CBM procedures and techniques Measuring Techniques — Calibration of measuring tools and instruments — Disturbance, interference and noise	**1** **Knows, and can apply** economically, different types of condition monitoring systems, measurement techniques and other suitable inspection systems. **Knows** how to implement them.	**1** **Knows** the most common condition monitoring methods and devices and is familiar with their use in practice. **Can** project manage and assure the correct.	**2** **Knows** the most common condition monitoring methods and devices and is familiar with their use in practice.