*NOTE: Subjects highlighted in grey are already written or reserved			
No.	**SUBJECTS**	**DEFINITIONS OF SUBJECTS**	**STATUS**
1.	**Maintenance within Physical Asset Management**		
1.1	Relations between maintenance and other processes	Maintenance is one of the processes of industrial companies with a strong impact on performance. It has also strong relations with other processes (acquisition/creation, operation, modernisation, disposal, support) and with the company's strategic plan. These relations must be identified and managed, so maintenance contributes effectively to the management of assets. Business, corporate, and maintenance objectives must be consistent to properly manage assets, asset systems, and asset portfolios. Maintenance can be considered within asset management.	WRITTEN
1.2	Life cycle management	Management of costs over the life cycle of assets encompasses the total cost of acquisition, ownership, and disposal of the assets. Maintenance costs are of particular concern because they have a significant impact on direct costs (direct maintenance costs) and indirect costs (availability of assets, plant safety, company image, etc.). Continuous improvement methods, such as Plan-Do-Check-Act (PDCA), apply to the maintenance process during the asset's life cycle.	WRITTEN
1.3	Life cycle extension	Maintenance is particularly concerned with the decision to extend the lifetime of assets. Indeed, the durability of assets and their renovation costs can be decisive factors in the choices made by asset managers.	RESERVED
1.4	**Replacement investments**	Replacement investment is generally an optimisation problem often linked to items' life extension. Operational research techniques are used to find the best trade-off between costs and expected benefits of replacements.	FREE
1.5	Maintenance and investment decisions	Investment decisions often depend on the maintenance costs and unavailability factor of installed assets and on the estimation of the maintenance costs of future investments. Moreover, maintenance must be taken into account in the choices of the assets to be acquired and/or to be designed to minimise the overall cost of ownership.	WRITTEN
1.6	**Rebuilding and reinvestment strategies**	Rebuilding and reinvestment strategies depend in part on maintenance effectiveness and maintenance costs. The assets' reliability and maintainability assessed through the analysis of experience feedback are important elements in decision-making.	FREE
1.7	Value based maintenance	This approach was introduced to quantify the economic added value of maintenance in terms of cash flow (especially through calculation of net present value). It helps to identify the value drivers and to measure and benchmark performance in order to apply best practices (e.g., equipment probability improvement, work processes, information systems, etc.).	WRITTEN
1.8	Integrated logistic support	Integrated logistic support (ILS) is a "management process to co-ordinate the provision of all materials and resources required to meet the needs for the operation and maintenance" [IEV 50(192)]. ILS was introduced by the US Army (MIL- STD1388) to consider the activities and resources required to operate and maintain a product in service. It covers maintenance actions, manpower, training, spare parts provisioning, technical documentation, packaging and handling, storage and transportation, support equipment (tools, test and monitoring equipment, software) and disposal. Logistic support analysis (LSA) must be performed iteratively throughout the design process to ensure the product can be operated and supported at an affordable cost. The expenses due to logistic support are a major contributor to the life cycle cost (LCC) of a product, and customers are now making purchase decisions based on LCC rather than initial purchase price alone.	RESERVED
1.9	Uncertainty in maintenance management	Reliability data, maintenance costs of assets, and effectiveness of maintenance plans are often uncertain data. Decision-makers use stochastic techniques that evaluate uncertainty using models calculating the performance of these assets and thus make their decisions more robust.	WRITTEN

1.10	**Regulations and relations with auditing and safety organisations**	Some maintenance tasks are required by regulations, and close relationships must be established with the organisations/authorities in charge of safety of the installations to perform and monitor the mandatory tasks. In addition, internal or external audits are often carried out to verify the implementation and results of maintenance; this is a strategic function. Knowledge of regulations and relevant technical standards is paramount.	FREE
1.11	Maintenance and sustainability	Maintenance is an essential lever for sustainable development. When maintenance is involved in the design phase of assets and when these assets are designed to be maintainable and reliable, their useful life is increased. Ensuring a longer useful life and appropriate maintenance actions reflect economic, ecological, and social aspects of companies and ensure sustainability of assets. In particular, maintainability is a guarantee of sustainable development.	RESERVED
1.12	**Facility management**	To ensure, support, and improve the effectiveness of the organisation's core activities, actions such as cleaning operations and routine maintenance on buildings (painting, plumbing, glazing, etc.) must be carried out.	FREE
1.13	Maintenance and Industry 4.0	Industry 4.0 is a new concept based on digitalisation of information. It includes cyber- physical systems, the Internet of Things, cloud computing, and cognitive computing. Maintenance is directly concerned with these new technologies, as diagnosis, prognosis, and all maintenance processes based on data collection and analysis are strongly impacted. Therefore, the management process must take these new techniques into account to establish a maintenance strategy.	WRITTEN
2.	**Maintenance Management**		
2.1	**Maintenance process description – roles and responsibilities**	The maintenance process includes corrective maintenance, preventive maintenance, and the process of improving the intrinsic reliability and maintainability of equipment. It also includes all the support processes that make it possible to carry out maintenance actions on assets (management of resources, maintenance during design phase, etc.). The description of these processes and their interrelationships is useful to determine the roles and responsibilities of the stakeholders, to define indicators, and to manage the entire maintenance process	FREE
2.2	Total Productive Maintenance	Total Productive Maintenance (TPM) is a method to manage maintenance activities in order to improve the productivity of manufacturing processes, especially by reducing downtimes and increasing overall equipment effectiveness (OEE). While Reliability- Centred Maintenance (RCM) is essentially technical, TPM is more concerned with organisation and work process. It involves operators, as well as maintenance staff, starting with simple but efficient actions, such as 5S (sort, straighten, shine, standardise, sustain), then prioritising and solving problems through teamwork.	WRITTEN
2.3	**Lean Maintenance**	The objective of Lean Maintenance is to link different methods, such as TPM, RCM, Kaisen, etc., to improve productivity and quality and to reduce the amount of input and waste. The use of a computerised maintenance management system (CMMS) or Enterprise Asset Management (EAM) is strongly advised. Lean maintenance is principles than a formalised method.	FREE
2.4	Contracting and outsourcing and insourcing	Maintenance is often outsourced, and the division between tasks to be carried out internally and externally must be established. Then, competent companies must be selected, and maintenance contracts drawn up to help the parties to manage their relations so that the tasks are carried out in accordance with the expectations.	WRITTEN
2.5	Performance indicators and dashboards	Maintenance key performance indicators (KPIs) are measured characteristics related to an item or a maintenance activity to support management in achieving maintenance excellence. The use of sets of associated, consistent, and complementary indicators (dashboard) providing synthetic and global information allows the development of strategies to meet the maintenance objectives. KPIs can be focused on the past (lagging indicators) or on the future (leading indicators), and dashboards must combine these two categories. The definition and collection of indicators is the first step in a maintenance improvement process.	WRITTEN

2.6	Benchmarking	When KPIs have been collected, the next step is to compare their values to a point of reference. Benchmarking is a process which consists of comparing KPIs of different but similar items, possibly belonging to different companies. Reference targets are taken from the items with the best performances. Benchmarking helps maintenance decision-makers find opportunities for improvement that will yield competitive advantages. Methods can be used to take into account differences between items in order to provide adjusted and realistic targets.	WRITTEN
2.7	Maintenance process diagnosis and audits	Audits and diagnostics consist of methodical and formal examinations of the maintenance process to identify the strengths and weaknesses, determine objectives and targets to be reached, and plan improvement actions. Results from benchmarking and questionnaires covering all the different maintenance/ maintenance support sub- processes can be used for this purpose.	WRITTEN
2.8	Budgetary control	To establish the yearly maintenance budget, it is necessary to identify both regular and exceptional costs. It is then necessary to know the rules of budgetary control to follow deviations and signal them to management so as to take the necessary measures.	WRITTEN
2.9	Customer satisfaction surveys	An effective customer satisfaction survey program will measure customer perceptions of how well the requested performance is met. This also includes perceptions of how well problems are understood. Different techniques can be used to collect customer satisfaction (face to face, questionnaires, automatic notifications, etc.) and to analyse the results.	RESERVED
2.10	**Decision-making in maintenance**	Maintenance decision-making must often consider multiple criteria leading to complex choices. Decision-making techniques can be used to aggregate criteria, to evaluate the costs and benefits of the alternatives, and to synthesise the opinions of experts.	FREE
2.11	Reliability-Centred Maintenance and criticality analysis	Criticality analysis focuses on the maintenance organisation's ability to reach its main objectives, such as availability, safety, costs, etc. Reliability-Centred Maintenance (RCM) is a "systematic method for determining the respective maintenance tasks and associated frequencies, based on the probability and consequences of failure" [IEV 50(191)]. The method consists of identifying failure modes and their causes, and then determining the most efficient and cost-effective maintenance tasks to prevent the occurrence of these failures. The data may be derived from experience feedback analysis and used in failure modes, effects, and criticality analysis (FMECA). RCM may also initiate modifications of design or procedures to carry out improvements	WRITTEN
2.12	Maintenance and risk management	Although maintenance is crucial to optimise assets' performance, it also aims to prevent failures and shutdowns which can have serious consequences. It therefore constitutes a risk control measure. It is a shield to defend against undesirable events. As such, maintenance implements defensive tasks and contributes to risk management and dependability.	RESERVED
2.13	**Risk-based inspection**	Risk-based inspection (RBI) is a method used to determine when and where inspections (generally non-destructive testing) must be performed to avoid serious failures. This approach applies more especially to passive items characterised by high impact – low probability (HILP) failures (e.g., pipes, structures, etc.). Reliability modelling is used to identify where and when degradation mechanisms are more likely expected in order to focus inspections on critical areas. Approaches based on expert opinion are often called risk-informed inspection (RII).	FREE
2.14	Reliability, availability, maintainability and safety management during design	Reliability, availability, maintainability, and safety (RAMS) is a generic term to encompass analysis performed in the early stages of an industrial or building project. It covers reliability analysis (failure modes, effects, and criticality analysis, human error analysis, etc.), safety analysis (preliminary hazard analysis, probabilistic safety assessment, sneak analysis, vulnerability analysis, etc.), preliminary definition of maintenance (preventive and corrective actions), maintainability and supportability analysis (accessibility, repairs, spare parts, tools, etc.). RAMS is the implementation of several methods rather than a single method, and it results	WRITTEN

		in global trade-offs between allocation of reliability, maintainability, and logistic support to meet dependability and safety requirements.	
2.15	Maintainability studies	Maintainability studies must be carried out during the design and development phase. In conjunction with reliability studies, they are used to guide design decisions and predict the item maintainability. Maintainability studies cover many factors, such as accessibility, interchangeability modularity, ability to tolerate faults, ability to detect degradations, ability to be safe for maintenance personnel, testability, etc.	WRITTEN
2.16	**Allocation of reliability and maintainability in the design stage**	During the design phase of a system, it is appropriate to define the levels of maintainability and reliability for its various equipment to achieve the required levels of availability and costs. The allocation involves optimally distributing requirements among the equipment based on their contribution to the risks of unavailability, their technical and organizational constraints, and the costs of competing solutions. This allocation process enables finding the best compromise between the reliability and maintainability of each piece of equipment in the system, thereby satisfying operational requirements at the lowest life cycle cost, including investment and operating costs.	FREE
2.17	**Design-out maintenance**	Design-out maintenance consists of eliminating the need for maintenance during the design phase of an item. That can be done by over-sizing items or opting for any other solution which makes it possible to avoid critical degradation mechanisms or the consequences of these mechanisms. It can also result in the determination of ways to detect hidden failures	FREE
3.	**Maintenance Execution**		
3.1	Work preparation and scheduling	Preparation of maintenance tasks consists of writing and updating the maintenance procedures describing the actions to be performed (including safety of individuals), defining the necessary resources, and estimating the workload. Scheduling consists of setting in order the tasks to be done and determining the starting and ending dates according to the constraints (e.g., production).	RESERVED
3.2	Shutdown and turnaround management	Shutdowns require a special organisation to secure the installation, carry out maintenance tasks according to an established schedule, organise logistic support, take the hazards into account, and carry out the necessary tests and requalifications to return the equipment to the operator. All these activities must be optimised to minimise costs and unavailability, given existing constraints.	RESERVED
3.3	e-maintenance	e-maintenance is maintenance performed via computing, usually remotely, to monitor equipment and detect early degradation so that it is possible to refurbish the equipment at a convenient time.	RESERVED
3.4	**Operator-based maintenance**	These are maintenance actions carried out by an operator. They are generally simple and can be early preventive actions to mitigate failure mechanisms. They can also detect symptoms, leading to subsequent actions carried out by maintenance personnel.	WRITTEN
3.5	**Remote maintenance**	Remote maintenance consists of maintenance actions performed without the direct physical intervention of personnel. Robots can be used to perform this kind of maintenance.	FREE
3.6	**Disassembly and reassembly studies**	The disassembly and reassembly of items sometimes requires special studies because of the items' or their components' lack of accessibility. Computerised simulations of items' handling, storage, and repair can be used to determine feasibility and to optimise maintenance times.	FREE

3.7	**Reliability and maintainability improvements**	When preventive maintenance does not provide good operational reliability or when maintainability is not sufficient to achieve a good level of availability, the reliability and/or maintainability of items must be improved. Analysis must be carried out to assess dependability characteristics and identify efficient and cost-effective changes in the item design or manufacturing.	FREE
3.8	**Relations between operation and maintenance staff**	Maintenance and operation are two processes, generally carried out by separate teams, but with strong inter-relationships. There is a need for communication and meeting facilities within companies to coordinate these two teams. It is important to have a good knowledge of the work of the operators and conversely to be able to clearly explain the activities performed by the maintenance staff.	FREE
3.9	Maintenance data collection	Observations and resulting data are needed for an effective maintenance improvement process. These maintenance data must be collected, which means they must be defined (i.e., determining what must be measured), measured, and stored in appropriate databases. Maintenance data include data related to preventive and corrective activities, costs, spare parts, tools, human resources, sub-contractors, safety of individuals, reliability and maintainability of equipment, global performance of systems/plants (availability, environment, quality, safety, value, etc.), customer/client satisfaction, and so on.	WRITTEN
4.	**Health, Safety, and Environment in Maintenance**		
4.1	Occupational diseases and accidents	Maintenance occupations cause a higher proportion of occupational accidents and diseases than most occupations, making it essential to identify hazards and investigate and address the risks associated with maintenance activities. The identification of hazards (energies, products, work situations, etc.) is the first step in managing personal health and safety.	WRITTEN
4.2	Occupational risk assessment in maintenance	Risks analyses related to health and safety of maintenance personnel must be carried out systematically during the preparation of maintenance tasks. More generally they must be carried out to identify and to prevent risks in the workplace, especially in workshops, warehouses, and all areas where maintenance activities are carried out. After identifying the hazards, the criticality of the risks must be determined in order to determine the priorities in the research on and implementation of the prevention and protection barriers. Regulations relating to safety, health, and the environment must be known and applied.	WRITTEN
4.3	Good practices in health and safety	In the field of safety, good practices must be identified and shared to reduce accidents and occupational diseases. The pooling of good practices, both to prevent risks and to reduce their consequences, must be undertaken systematically and as widely as possible. Prevention and protection barriers must be sought, evaluated, and put in place when relevant.	RESERVED
4.4	Good practices in environmental preservation	In the field of environment preservation, good practices must be identified and shared to reduce pollution and damage to the environment. The pooling of good practices, both to prevent risks and to reduce their consequences, must be undertaken systematically and as widely as possible. Prevention and protection barriers must be sought, evaluated, and put in place when relevant.	RESERVED
4.5	**Machine safety**	Maintenance is essential to ensure the continued safety and compliance of machinery, and it plays a vital role in protecting the health and well-being of workers, particularly those involved in maintenance activities. Manufacturers, operators, and owners of machinery are responsible for implementing a well-defined maintenance plan to comply with the requirements of the European Machinery Directive.	FREE
4.6	**Lock-Out Tag-Out Try-Out (LOTOTO)**	Energy and fluids cause work accidents and health damage during maintenance activities. Practices and procedures must be implemented to control all energy sources and fluids to prevent accidents and exposure to a hazardous work environment. Depending on the maintenance task, processes must be implemented to isolate energies and fluids by lockout or to neutralise them by control systems. Specific provisions must be established for activities that require the presence of energies and fluids.	FREE

5.	Maintenance Engineering Techniques		
5.1	**Failure reporting analysis corrective action system**	Failure reporting analysis corrective action system (FRACAS) methods are based on the principles of problem-solving techniques. They aim to improve the dependability of current and future designs by feedback of testing, modification, and user experience. They include such methods as: Plan-Do-Check-Act (PDCA), Define, Measure, Analyse, Improve Control (DMAIC), Ishikawa technique, Kaisen (i.e., improvement), six sigma, 8D (8 Disciplines), A3 (Toyota method), etc.	FREE
5.2	**Fault diagnosis**	Fault diagnosis covers the methods and techniques that make it possible to detect faults and to locate them. This includes testing for fault detection on standby items and techniques for localisation of faulty components when an item is in downstate due to failure.	FREE
5.3	**Root Cause Analysis**	Root cause analysis (RCA) is a "systematic process to identify the cause of a fault, failure or undesired event, so it can be removed by design, process or procedure changes" [IEV 50(192)]. RCA identifies the preliminary causes of an event (especially failures). Different techniques can be used to find root causes: why-because analysis, Ishikawa diagrams, fault trees, Bayesian networks, etc. It is based on past events and aims to avoid the recurrence of similar situations by changing conditions, actions, or organisation and to improve continuously the maintenance process.	FREE
5.4	Condition monitoring techniques	Condition monitoring techniques are part of condition-based maintenance which consists of measuring "at predetermined intervals the characteristics and parameters of the physical actual state of an item" [EN13306]. These techniques include vibration analysis, thermography, tribology, etc. and don't lead to unavailability of the asset.	WRITTEN
5.5	**Non-destructive testing**	Non-destructive testing techniques are maintenance techniques, part of condition- based maintenance, which consist of measuring, observing, or testing the relevant characteristics of an item. They include ultrasonic testing, Eddy current, radiography, gammagraphy, etc. and lead generally to unavailability of the asset.	FREE
5.6	Big Data for maintenance and asset management	The information digitalisation techniques related to Industry 4.0, such as Internet of Things (IoT), cloud computing, data lakes, cognitive computing, etc., make it possible to treat a big volume of data and to increase the efficiency of diagnosis and prognosis. Condition-based and predictive maintenance benefit from these new opportunities.	RESERVED
5.7	**Equipment health analysis**	Prognosis and Health Management (PHM) is a discipline which uses new technologies (especially digital electronics) to assess the health of items (degradation levels) and to predict in real-time their reliability and remaining useful life. It is used in different industrial sectors, such as aerospace, military systems, automobiles, etc., to improve maintenance and logistic support. That allows organisations to carry out maintenance based on the current and predicted health of items and to be more efficient in detecting faults or degradation and decreasing downtimes and costs.	FREE
5.8	**Ageing and degradation mechanism modelling**	Prediction of failures requires representing the failure mechanisms of items. This can be done using: "black box" approaches based on the statistics of time to failure (distribution of useful lifetimes); "grey box" approaches showing the evolution of degradation over time from measurements but without describing the physical mechanism; "white box" approaches based on simulation of a physical model of the failure mechanism.	FREE
5.9	Remaining useful life assessment	Useful life is the "time interval from a given instant until the instant when a limiting state is reached. The limiting state may be a function of failure rate, maintenance support requirement, physical condition, economics, age, obsolescence, changes in the user's requirements or other relevant factors" [EN13306]. Estimation of the remaining useful life (RUL) takes into account the knowledge of the current state of an item. Estimation of RUL is a part of prognosis and health management. It provides key information in decision-making by quantifying how much time is left until failure.	WRITTEN

5.10	Diagnosis and prognosis and predictive maintenance	Predictive maintenance is a part of condition-based maintenance “carried out following a forecast derived from repeated analysis or known characteristics and evaluation of the significant parameters of the degradation of the item” [EN13306]. These techniques consist of a diagnosis to evaluate the state of the item and a prognosis to estimate its evolution over time.	WRITTEN
5.11	Human error analysis	Certain methods may be used to assess the probability of a human error during the completion of a maintenance task and to reduce this probability. These methods consider human factors with a significant effect on performance and may use cognitive models of human behaviour to understand how and why humans make mistakes in order to propose preventive actions.	RESERVED
5.12	Modelling and simulation of maintenance strategies	Maintenance decisions to control risks and to increase competitiveness can be based on quantitative information provided by modelling and simulation. Computational models make it possible to assess the performance of different maintenance strategies, taking into account operating and environmental conditions of the system. Models must represent the causal chain leading to the malfunctioning of a system in order to estimate the costs of maintenance and downtime. Modelling can include degradation mechanisms, symptoms, failure modes, preventive and corrective maintenance tasks, and maintenance logistic support.	RESERVED
5.13	**Robotics and remote handling**	Special constraints (safety, accessibility, precision, etc.) may lead to the use of robots or remote handling to carry out maintenance tasks. Many industrial sectors, such as space, aeronautics, energy, medical, etc., use these techniques.	FREE
5.14	**Augmented reality techniques**	Augmented reality (AR) allows information about an item or a document to be superimposed, so that maintenance personnel have up-to-date technical documentation, safety information, lists of operations to be performed, diagnostic tools, etc., while they carry out maintenance tasks on an item.	FREE
5.15	**Maintenance tasks modelling and simulation**	Computer aided design (CAD) models can be used to test maintenance tasks to optimise disassembly, repairs, assembly, handling, etc., to decrease time to restoration and costs, and to increase safety. These simulation tools are also useful to help trainees learn maintenance procedures in interactive exercises.	FREE
5.16	**Qualification of equipment**	Some equipment must be qualified to be put into service. It must be tested to demonstrate its ability to meet the requirements, especially those related to safety. Some equipment must be re-qualified after maintenance tasks.	FREE
5.17	**Maintenance of real estate**	Warehouses, workshops, and offices are infrastructures that require constant maintenance to ensure they function properly and to prevent unforeseen expenses. In particular, emergency items and infrastructures must be maintained according to regulations.	FREE
6.	**Maintenance Support**		
6.1	Organisational models, work cycles, and responsibilities	The maintenance process must be carried out by an organisation adapted to the company and the activity sector. It is therefore necessary to determine the best organisational model and to allocate responsibilities. To do this, it is necessary to determine the interfaces with the other processes and choose a maintenance service organisation model (e.g., centralised maintenance or decentralised maintenance by trade, division into departments according to the production system, etc.).	WRITTEN
6.2	Project and control management	Project management plays a crucial role in achieving objectives. Various methods can be used to determine tasks, milestones, and schedules. They allow organisations to identify critical paths and know how to react quickly and be agile in case of unexpected events. They are used to create teams, to communicate, to prioritise everyone's tasks, and to monitor the progress of the project.	RESERVED
6.3	Negotiation techniques and industrial relations	The maintenance manager must set up a network of industrial relations and know negotiation techniques. These techniques consist of knowing how to set specific goals, how to listen other parties, ask the right questions, propose innovative solutions, make concessions to find a compromise, and finalise agreements. The manager must develop the necessary qualities to be a good negotiator.	RESERVED

6.4	**Best practices identification**	Identification and measurement of KPIs and comparison to points of reference, for example, through benchmarking or modelling and simulation, provide directions for improvement. The final step of the improvement process is to propose and to implement actions. Identification of best practices with questionnaires, interviews, etc., especially from the best organisations identified through benchmarking, and adjustment of these practices to the company can be used to carry out appropriate improvement actions.	FREE
6.5	Maintenance information systems	A maintenance information system is a tool to manage all the information needed for maintenance. In particular, the information system manages information on assets, maintenance activities (corrective, preventive, etc.), safety of individuals, maintenance resources (spare parts, documentation, tools, personnel, etc.), budgets, purchases, performance indicators, collection of feedback experience, etc.	RESERVED
6.6	**Tools for expert evaluation**	Expert judgments are very often useful when decisions have to be made without available quantitative data. Various methods and tools are available for assessing and combining expert opinions. They allow elicitation of quantities and uncertainties, frequencies, probabilities, etc. and can lead to consensus, which is expected to be better than individual judgments.	FREE
6.7	**Maintenance documents**	Maintenance documentation includes equipment technical data, maintenance plans, maintenance procedures, spare parts catalogues, etc. which must be managed in order to be available when required with relevant and updated information.	FREE
6.8	Maintenance standards	Many maintenance standards are produced by various technical committees of standardisation bodies at the national, European (CEN/TC319), and international levels (IEC/TC56, ISO/TC108, 135, 251, etc.). These standards are documents, usually of voluntary application, that represent a consensus of experts on a given subject. It is important to monitor them, to participate in their development, and to keep an up-to-date list of the topics covered.	RESERVED
6.9	Spare part management	Corrective and preventive maintenance tasks often require spare parts and materials to maintain and restore assets. The management of these items consists of defining the necessary spare parts and materials and their optimum quantities, ordering, receiving, and storing these items at defined locations, providing the items to maintenance personnel when required, and monitoring the stock to satisfy the needs at minimum cost.	RESERVED
6.10	Obsolescence management	Obsolescence is "the inability of an item to be maintained due to the unavailability on the market of the necessary resources at acceptable technical and/or economic conditions" [EN13306]. This situation must be managed by maintenance personnel in charge of logistic support and selection of maintenance tasks by detecting, prioritising, and mitigating obsolescent items.	RESERVED
6.11	**Maintenance knowledge and best practices**	Maintenance improvement is based on maintenance knowledge and best practices. This requires learning, training, benchmarking, and implementation of better ways of ensuring high maintenance performance. Benchmarking makes it possible to identify best practices which must be analysed and adapted to another context. Maintenance knowledge must be capitalised upon and carefully transferred within the company; this requires an ad hoc organisation.	FREE
6.12	Education and training in maintenance, e-learning in maintenance	This includes all the pedagogical resources that allow the initial education and continuous training in maintenance methods, techniques, and practices, along with the support knowledge which is required at the different levels of responsibility. It calls for knowledge of techniques and methods of training and coaching, as well as communication techniques.	RESERVED
6.13	**Communication, training and coaching: basic principles and techniques**	The explanation of maintenance objectives and strategies, the supervision and coordination of activities, and the presentation of maintenance results all require good knowledge of oral and written communication techniques. The ability to establish effective relationships with people involved in maintenance activities, both company employees and external service providers, is essential to manage all the tasks to be performed with maximum efficiency. Communication, training, and coaching techniques must be mastered by everyone involved in maintenance management.	FREE

6.14	**Competence, qualifications, and certification of maintenance personnel**	Different maintenance work profiles require different levels of competence, and some require qualification or certification. It is necessary to establish the relationships between the positions and the requirements in terms of competence, qualifications, and certification. Human resources must be managed to enable staff to evolve and be paid according to their responsibilities. Human resources must also be adapted to the workload.	FREE
6.15	Instrumentation and wireless techniques	Instrumentation techniques are progressing, thus improving the monitoring and diagnosing of equipment and the ability to predict future behaviours. As a result, the effectiveness of condition-based maintenance techniques, and more particularly of predictive maintenance tasks, will improve.	RESERVED
6.16	**Visualisation for maintenance diagnosis**	Maintenance diagnosis requires visualisation techniques to compare signals or images with references. These techniques reveal deviations and allow maintenance organisations to deduce the level of severity of the degradations or failures observed.	FREE
6.17	**Traceability**	Traceability is an important characteristic for maintenance, as it allows the causal chain between events to be established, thus permitting maintenance organisations to understand the phenomena, the situations, and the root causes. The traceability of components is also sometimes necessary to manage risks and ensure a high level of reliability.	FREE