BS EN 17007:2017



BSI Standards Publication

Maintenance process and associated indicators

bsi.

Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

National foreword

This British Standard is the UK implementation of EN 17007:2017.

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.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 94080 4

ICS 03.080.10

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 November 2017.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 17007

October 2017

ICS 03.080.10

English Version

Maintenance process and associated indicators

Processus maintenance et indicateurs associés

Instandhaltungsprozess und verbundene Leistungskennzahlen

This European Standard was approved by CEN on 14 August 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

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

© 2017 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 17007:2017 E

Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

Contents

Page

European foreword ... 3
Introduction ... 4
1 Scope ... 5
2 Normative references ... 5
3 Terms and definitions ... 5
4 Abbreviated terms and notations ... 8
5 Principles of maintenance process breakdown ... 9
5.1 Process families ... 9
5.2 Breakdown into levels ... 10
5.3 Use of the Maintenance process breakdown ... 12
6 Breakdown of the maintenance process and process profiles ... 13
6.1 Maintenance process ... 13
6.2 MAN process: Manage maintenance ... 15
6.3 PRV process: Prevent undesirable events by avoiding failures and faults ... 19
6.3.1 General ... 19
6.3.2 PRV.1 – Characterize the undesirable events ... 19
6.3.3 PRV.2 – Use and update the Maintenance Plans ... 21
6.4 COR process: Restore the items to their required state ... 23
6.4.1 General ... 23
6.4.2 COR.1 – Classify the actual events ... 24
6.4.3 COR.2 – Diagnose the state of the items in question ... 24
6.5 ACT process: Act preventively and/or correctively on the items to maintain ... 27
6.5.1 General ... 27
6.5.2 ACT.1 – Rank the events ... 28
6.5.3 ACT.2 – Prepare for the maintenance tasks ... 29
6.5.4 ACT.3 – Set in order the tasks ... 30
6.5.5 ACT.4 – Schedule the tasks ... 31
6.5.6 ACT.5 – Start the scheduled tasks ... 32
6.5.7 ACT.6 – Perform the maintenance tasks ... 33
6.5.8 ACT.7 – Finalise the maintenance tasks ... 34
6.6 IMP process: Improve the items ... 36
6.7 HSE process: Ensure personal health and safety to individuals and preserve environment in maintenance ... 39
6.8 BUD process: Budget maintenance of items ... 42
6.9 DOC process: Deliver the operational documentation ... 45
6.10 DTA process: Manage data ... 48
6.11 IST process: Provide the needed infrastructures ... 52
6.12 MRG process: Deliver maintenance requirements during items design and modification ... 55
6.13 OPT process: Improve the results ... 58
6.14 RES process: Provide internal human resources ... 61
6.15 SER process: Provide external maintenance services ... 64
6.16 SPP process: Deliver spare parts ... 67
6.17 TOL process: Deliver the tools, support equipment and information system ... 72
Bibliography ... 75

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

European foreword

This document (EN 17007:2017) 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 April 2018 and conflicting national standards shall be withdrawn at the latest by April 2018.

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.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

Introduction

According to EN ISO 9001, maintenance is a process since it consists of organized, coordinated tasks using resources and performed by various stakeholders to obtain a given result.

Terminology standard EN 13306 defines it as the "combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function."

It seemed appropriate to formalize the maintenance process through a breakdown into processes that provides the following advantages:

— it makes it possible to clearly indicate the activities to be carried out with a relevant level of detail;

— it indicates the inputs/outputs of each sub-process and defines all the links that join them together and allow the realization of the overall process;

— it provides the ability to define indicators for measuring the realization of each process and monitoring its effectiveness.

The aim of this document is to allow an understanding of the actions and interactions between maintenance processes. It provides maintenance managers with a management tool by giving them a way to compare their organization to the generic representation described and to detect insufficient actions, unassigned responsibilities and/or poorly established links. It gives information to define indicators, dedicated to specific processes, allowing the creation of scorecards that are appropriate for monitoring activities and measuring performance.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

1 Scope

This European Standard provides a generic description of the maintenance process. It specifies the characteristics of all the processes, parts of maintenance process, and establishes a maintenance model to gives guidelines for defining indicators.

This European Standard is applicable to all organizations (company, institution, agency, etc.) in charge of maintaining physical assets. Therefore, it has been established without a particular organization in mind and does not aim to propose one. This description could be adapted based on the type and size of organization chosen to perform the maintenance, the complexity of the systems maintained and the scope of the external contracted services.

The purpose of the breakdown into processes and the representation of their inter-relationships[1)] is to help maintenance personnel, and particularly management at different levels, to:

— clearly identify the actions to be taken in order to meet the overall objectives set by Management in terms of maintenance;

— delegate responsibilities that ensure the realization of the actions with the required performance levels;

— for each process, clearly determine:

  a) the necessary inputs and their origin;

  b) the required results and their intended uses;

— monitor and quantitatively assess the performance obtained at various levels of the breakdown into processes;

— improve the collection and the distribution of data.

This standard does not cover software maintenance itself, but applies to items containing software.

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, *Maintenance - Maintenance terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13306 as well as the following terms and definitions apply.

3.1
activity
set of tasks organized within a process

1) Relationships between several elements or members of the same unit or group.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

3.2
indicator
measured characteristic (or a set of characteristics) of a phenomenon, according to a given formula, which assess the evolution

Note 1 to entry: Indicators are related to objectives.

[SOURCE: EN 15341:2007, 3.1]

3.3
exceptional maintenance
preventive maintenance which is infrequent and has a significant impact in terms of total life cycle costs

Note 1 to entry: Exceptional maintenance includes large maintenance actions that may be:

— unavoidable and planned, thereby leading to the development of alternative strategies (e.g. life extension);

— unexpected, as a result of design, manufacturing, installation, operation or maintenance errors or accidental situations (fire, flood, etc.).

Note 2 to entry: The cost of exceptional maintenance is generally accounted as capital investment.

Note 3 to entry: Exceptional maintenance is sometimes called replacement investments.

[SOURCE: EN 13306, 8.13]

3.4
maintenance budget
determination of the maintenance expenditures over a given period in the future to ensure the availability of the necessary financial resources

3.5
maintenance documentation
set of documents needed to perform the maintenance tasks, including:

— work order;

— technical instructions;

— maintenance procedures;

— list of necessary resources;

— plans;

— schedule;

— maintenance records

— any other document needed to perform maintenance

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

3.6
maintenance record
part of maintenance documentation which contains the history of all maintenance related data for an item

Note 1 to entry: The history may contain records of all failures, faults, costs, item availability, up time and any other relevant data.

[SOURCE: EN 13306, 10.6]

3.7
maintenance plan
structured and documented set of tasks that include the activities, procedures, resources and the time scale required to carry out maintenance

[SOURCE: EN 13306, 2.5]

3.8
maintenance policy
general approach to the provision of maintenance and maintenance support based on the objectives and policies of owners, users and customers

Note 1 to entry: The maintenance policy entails establishing the direction (method, programme, budget, etc.) based on the goals and objectives set by the company's Management.

The management focus in the policy statement can be:

— availability and useful life of the item;

— safety of the items and individuals, product quality, environmental protection;

— optimization of maintenance costs, etc.

In particular, the maintenance policy give guidance to maintenance strategy that leads to choices being made between:

— planning corrective and/or preventive, predetermined or condition-based maintenance;

— internal or external service provision.

[SOURCE: EN 60300-3-14:2004, 3.1.12 – Note 1 to entry has been added.]

3.9
maintenance procedure
document that describes in detail preventive and corrective maintenance tasks

Note 1 to entry: These procedures indicate the dismantling and reassembly actions (with the help of diagrams, expanded views, etc.) and give the time periods of the tasks, permissible wear-out rates, the various faults that may occur, and their diagnosis.

Note 2 to entry: Maintenance procedures also include resources, the company's health and safety rules as well as the regulatory aspects (environment, safety, etc.).

3.10
maintenance strategy
management method used in order to achieve the maintenance objectives

EXAMPLE Outsourcing of maintenance, allocation of resources, etc.

[SOURCE: EN 13306, 2.4]

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

3.11
maintenance support equipment
set of equipment needed to perform the maintenance tasks based on the recommended procedures

Note 1 to entry: This set of equipment includes:

— tools;
— measuring and control equipment;
— computer equipment;
— handling equipment (slings, fork-lift trucks, hoists, etc.);
— means of access (scaffolding, ladders, platforms, etc.);
— individual and collective protective equipment;
— environmental protection equipment;
— etc.

3.12
process
set of interrelated or interacting activities that use inputs to deliver an intended result

[SOURCE: EN ISO 9000:2015, 3.4.1]

3.13
spare part
item intended to replace a corresponding item in order to retain or maintain the original required function of the item

Note 1 to entry: The original item may be subsequently repaired.

Note 2 to entry: In English, any item that is dedicated and/or exchangeable for a specific item is often referred to as replacement item.

[SOURCE: EN 13306, 3.5]

4 Abbreviations and notations

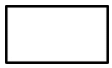
For the purposes of this document, the abbreviations and notations given in Table 1 and Table 2 apply.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

Table 1 — Abbreviations

ACT	Implement preventive and/or corrective actions on the item
BUD	Budget maintenance of items
COR	Restore the items in required state
DOC	Deliver the operational documentation
DTA	Manage data
HSE	Ensure personal health and safety to individuals and preserve environment in maintenance
IMP	Improve the items
IST	Provide the needed infrastructures
MAN	Manage maintenance (strategy and improvement, human resources, continuous improvement, compliance, etc.)
MRQ	Deliver maintenance requirements during items design and modification
OPT	Improve the results
PRV	Prevent undesirable events by avoiding failures and faults
RES	Provide internal human resources
SER	Provide external maintenance services
SPP	Deliver spare parts
TOL	Deliver the tools, support equipment and information system

Table 2 — Notations (BPMN 2.0 notations)

	represent processes
	parallel gateway
	sequence flows between processes, defines execution order of activities

5 Principles of maintenance process breakdown

5.1 Process families

To more easily identify processes, it is helpful to classify them into three main families

a) Management process

This includes determining the objectives and the policy to be implemented in order to achieve them, deploying the company's means and allocating the resources. It ensures the coherence of the realization and support processes. It includes measuring and monitoring the process system and using the results to improve performance.

b) Realization processes

These contribute directly to achieving the expected result and are designed to ensure that the needs expressed by the customer are satisfied. They encompass all activities related to the realization cycle of the product or service.

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

c) Support processes

These are essential to the functioning of the other processes (realization processes, other support processes, management process) as they provide them with the necessary resources.

They include activities related to:

— human resources;

— financial resources;

— material resources and their maintenance (premises, equipment, software, etc.);

— information processing.

5.2 Breakdown into levels

Level 1 of the breakdown is an overall mapping that identifies the processes and classifies them into each of the families based on the diagram shown in Figure 1.

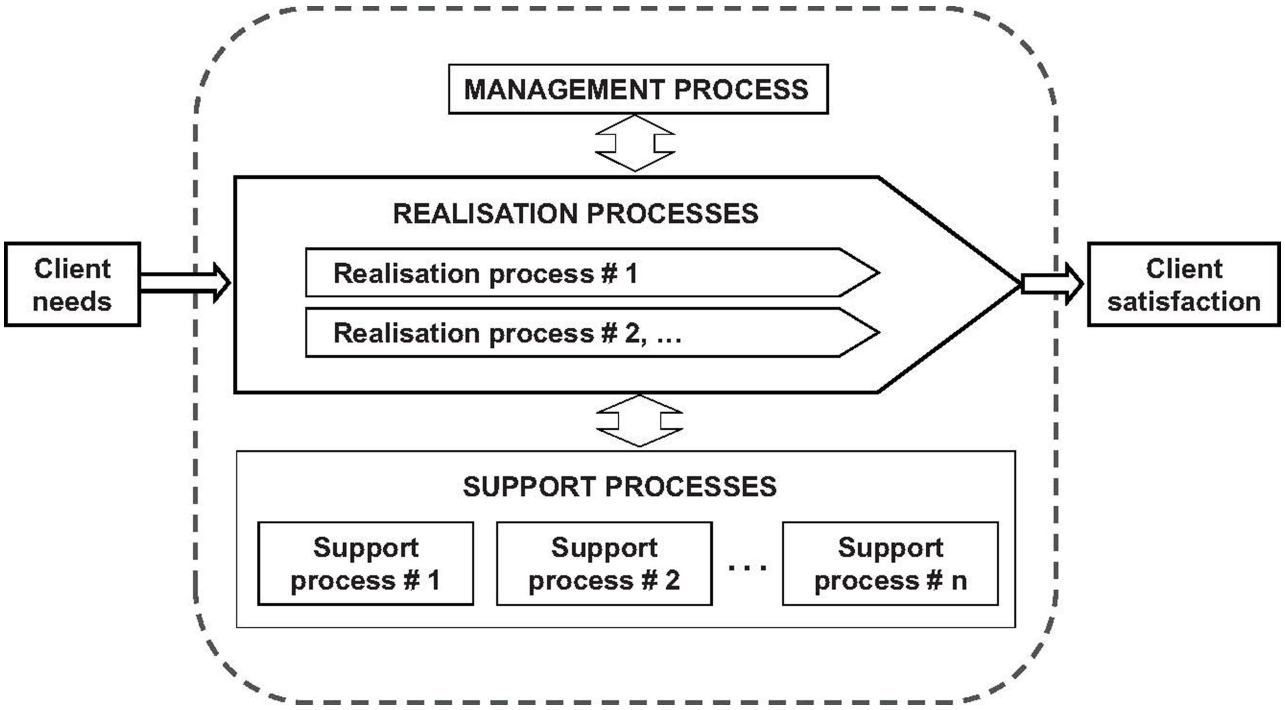


Figure 1 — Level 1 of the process mapping

Each level 1 process is in turn broken down into level 2 processes. In addition to the component processes, this level shows the input and output data of each process as well as its origins and destinations.

This provides a sequenced representation of the level 2 processes that contribute to the realization of the level 1 process (see Figure 2).

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

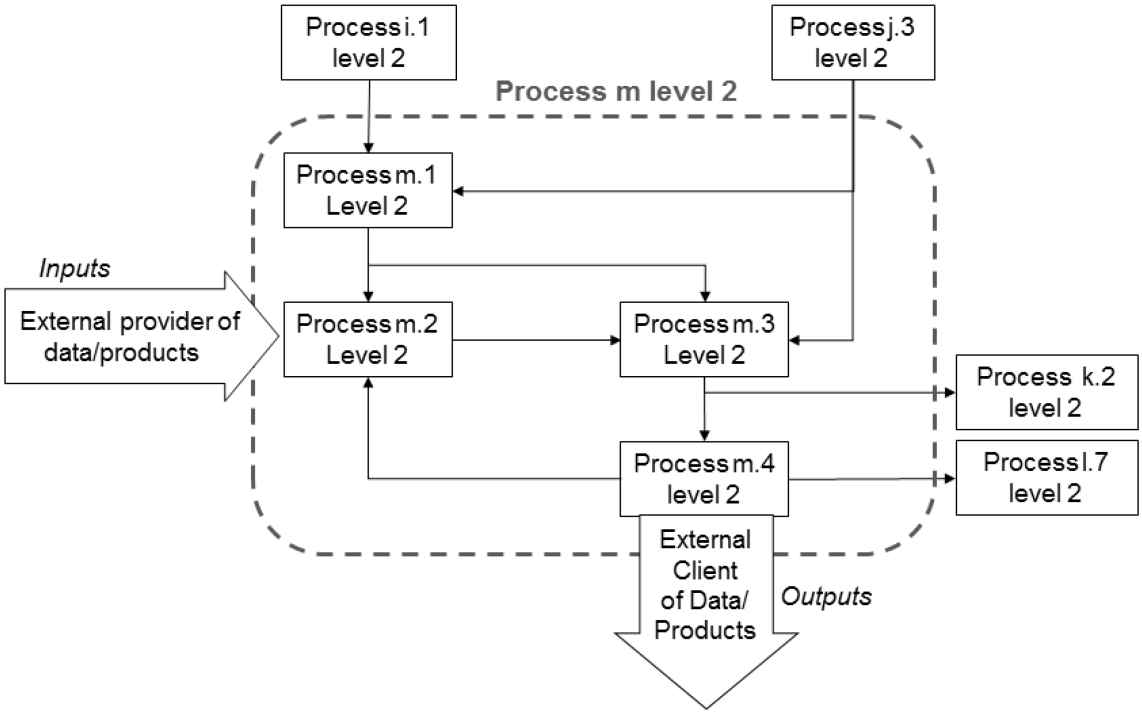


Figure 2 — Level 2 of the process mapping — Example

Some input data are output data from processes outside the process broken down or is supplied by entities outside the maintenance process. The same may be true for output destinations. These external origins and destinations are indicated on the diagram.

A third level may be described, where necessary, to further clarify the actions, but this level is not discussed in this standard.

A profile is drawn up for each level 2 process. It includes:

— the name of the process;

— the purpose(s) of the process, which is expressed in terms of action(s) with clearly stated goals;

— the activities that comprise the process. These activities constitute level 3 of the breakdown, which is not shown in the form of a diagram in this document;

— the input data and products which are needed to realize the process. They come from either other level 2 processes, other level 1 processes or entities outside the maintenance process;

— the output data and products which are created or modified by the process and are intended for either other level 2 processes, other level 1 processes or entities outside the maintenance process;

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

— regardless of the level of the process, the stakeholders are: the person who requested the process, the process manager, the customer, the beneficiary of the process and input data suppliers. These stakeholders are relative to the company's organization and can therefore not be generic. As a result, information about them is not provided in this standard and it is up to each company to do so. This makes it possible to clearly identify the stakeholders' responsibilities, detect any insufficiencies and assign tasks to each stakeholder, identify customers, objectives and suppliers;

— the interfaces with the other processes summarize all the related processes. These can be data or product suppliers or customers of the output data or products;

— the constraints related to realization of the process are a way to specify certain requirements or situations. They shall be taken into account by the process;

— Elements to define indicators related to the process. Each company shall define its own indicators, first to assess the effectiveness of its processes and attainment of the targets assigned to them, and secondly to monitor the realization of the actions taken to ensure their progress and adherence to timeframes. The proposed elements serve to define relevant indicators.

5.3 Use of the Maintenance process breakdown

The representation of the maintenance process, established according to the aforementioned principles, is provided in Clause 5. It is generic, which means that it is not based on any particular organization and draws on best practices generally implemented in the maintenance sector. It is then up to each company to use this breakdown to build or update its organization.

This can be achieved by identifying, within its own organization, the structural entities that realize the various processes defined. It is then necessary to ensure that:

— each process exists and is managed;

— each process is unique;

— the inputs/outputs are clearly defined (products, data, timeframes, etc.);

— the suppliers and customers of the inputs/outputs are clearly designated by name;

— the responsible persons for the processes (process owners) has been defined;

— the indicators are regularly analysed and published in order to monitor the progress of the actions and measure the effectiveness of the processes and their ability to achieve the assigned objectives.

This task offers many advantages:

— the result obtained provides a basis for understanding how the company's maintenance process is performed and improves the confidence of the customer into the ability of the maintenance provider;

— each entity of the organization clearly sees its position in relation to the others and the importance of its actions within the maintenance process. Each person's work is more easily recognized thanks to a greater ability to communicate the results obtained;

— responsibilities are defined without overlaps or ambiguities and objectives are established and quantified;

— the responsible persons have a better understanding of the objectives, which improves synergy and teamwork;

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

— management of the processes is significantly easier. Management shall have the means to detect malfunctions, measure non-conformities and any deviations from the objectives and take appropriate measures to correct or update the processes in question (e.g. it provides framework for assessment and benchmarking);

— formalization of the processes is a tool for training the various job profiles and developing the company's knowledge and facilitates changes through a better understanding of their consequences;

— formalizing the sequencing of actions and using indicators to detect deviations helps to ensure the continuous improvement of the maintenance process.

— provides a framework for systematic Information System support.

It should be noted that each company shall adapt the various processes according to its field of activity and economic, geographic, political, cultural and other contexts.

6 Breakdown of the maintenance process and process profiles

6.1 Maintenance process

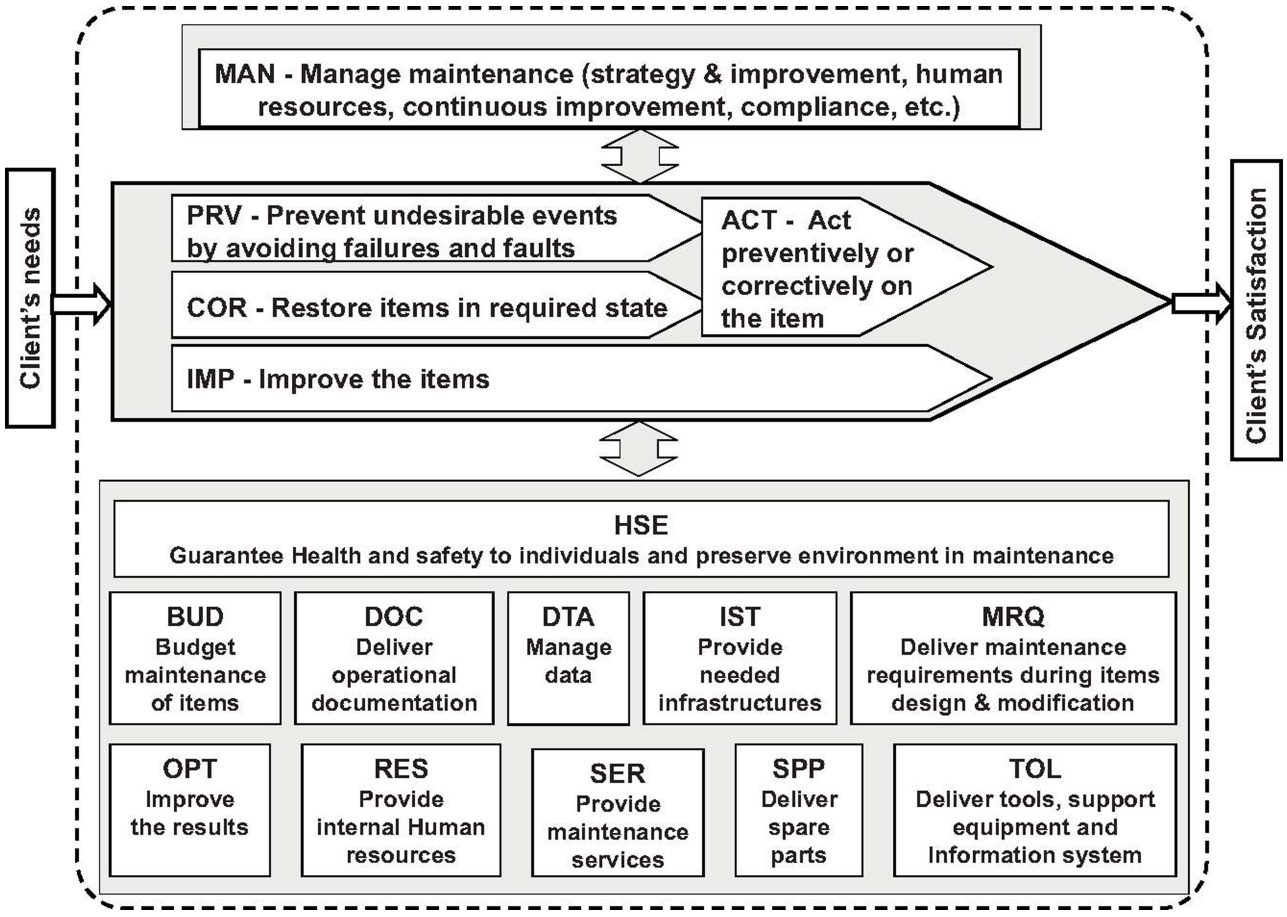


Figure 3 — Maintenance process (level 1 of the mapping)

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

The maintenance process consists of the following processes:

a) the management process:

   — MAN: Manage maintenance (strategy and improvement, human resources, continuous improvement, compliance, etc.);

b) the realization processes:

   — PRV: Prevent undesirable events by avoiding failures and faults;

   — COR: Restore the items in required state;

   — ACT: implement preventive and/or corrective actions on the item.

   — IMP: Improve the items;

c) the support processes:

   HSE: Ensure personal health and safety to individuals and preserve environment in maintenance;

   BUD: Budget maintenance of items;

   DOC: Deliver the operational documentation;

   DTA: Manage data;

   IST: Provide the needed infrastructures;

   MRQ: Deliver maintenance requirements during items design and modification;

   OPT: Improve the results;

   RES: Provide internal human resources;

   SER: Provide external maintenance services;

   SPP: Deliver spare parts;

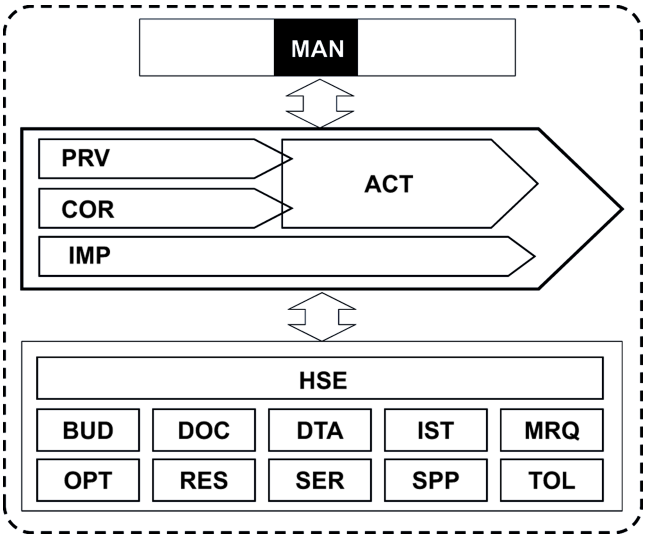
   TOL: Deliver the tools, support equipment and information system.

Each of these processes is broken down at level 2 in the following figures.

Elements (variables, quantities, characteristics, etc.) to define indicators are provided for each process. Each organization can adapt them to its own requirements.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

6.2 MAN process: Manage maintenance



See Figure 4.

Purpose(s) of the Process

The aim of this process is to manage maintenance in order to achieve the objectives set by the company's management.

Key activities / elementary processes

— **MAN.1 – Establish the maintenance policy, strategy and development actions**

Based on the company's missions, values, regulations compliance and general objectives, the policy establishes the direction, which gives priority to:

- safety of individuals and items, product quality, environmental protection;
- availability and useful life of the items;
- optimization of maintenance costs, etc.

The maintenance strategy, which results from the maintenance policy, requires that choices be made for:

- developing, adapting or implementing maintenance methods;
- organizing the internal resources (maintenance teams, stocks of spare parts and consumables, documentation, tools, etc.);
- insourcing and/or outsourcing and/or contracting some or all of the maintenance tasks;
- studying the economic impact of item modifications or improvements.

The development of maintenance processes according to the strategy and the process to determine and prioritize improvements are defined and decided.

— **MAN.2 – Identify the internal or external activities (carried out by the staff of the user company or participating companies)**

The maintenance policy and strategy make it possible to clearly identify the activities carried out internally and those assigned to participating companies. In connection to budgeting this identification leads to choosing between “making” and “buying” and specifying the required skills.

— **MAN.3 – Determine the organization, job profiles and responsibilities**

Based on the direction and choices expressed in the policy and strategy, an organization is set up to realize the maintenance processes. Tasks and job profiles are established as well as possible needs to update present skills. Responsibilities are defined and assigned to the company's personnel.

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

— **MAN.4 – Prepare and negotiate the budgets**

Economic plans (Budgets) are approved and adjusted by Management based on the budgeting process (BUD).

— **MAN.5 – Oversee the actions**

All the actions included in the maintenance process are coordinated, supervised and, if applicable, decided on by Management in order to achieve the goals and objectives defined in terms of safety, availability, costs, environment, quality, etc.

— **MAN.6 – Define, select, analyse and communicate the information**

The technical, organizational, economic and social information that shall be communicated internally and/or externally is defined, selected, analysed and made available to the relevant entities.

— **MAN.7 – Define policy and strategy areas of improvement**

All information (technical, organizational, economic and social) is analysed in order to continuously adjust and improve the maintenance policy and strategy.

Input data/products	**Output data/products**
— the company's missions, values, general objectives, rules, knowledge about asset portfolio, asset systems, assets, operating profiles, operating constraints and conditions — laws, decrees, codes, regulations and standards external to the company — external constraints (user of the item, owner, etc.) — documentation (DOC.6) — required skills or training needs (MRQ.11) — maintenance budget (BUD.5) — notice of conformity (MRQ.8) — contribution of maintenance to development of prevention and Safety Plan (HSE.4) — information regarding activities carried out (DTA.11, OPT.2, RES.4, SER.4) — budget estimates for maintenance during operation and for exceptional maintenance and analysis of projected-actual deviations (BUD.5) — indicators, best practices, scorecards (OPT.4) — improvements to be made (OPT.2,3,4,5,6,7)	— company's maintenance policy, strategy, operational objectives, directions, choices, improvements — internal and external activities to be carried out, organization, job profiles, responsibilities — maintenance budgets — information obtained from the process for the purpose of other processes, scorecard, best practices
Stakeholders To be completed by the organization in order to answer the questions: — who is realizing the process? — who is the customer of the process?	**Interfaces with other processes** All processes

Constraints related to realization of the process

The large amount of diversified data that shall be collected, formatted and analysed on a regular basis requires an efficient information management system.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

Elements to define indicators related to the process

— ($i1_{man}$) The following documents or information exist: (scoring may be used to quantify indicators built from the following elements):
  - maintenance policy;
  - maintenance strategy;
  - description of the organization related to the processes;
  - establishment of responsibilities for each function;
  - description of job profiles and desired skills;
  - list of improvement measures;
  - maintenance scorecard;
  - maintenance budgets (multi-annual and annual) to allow regular monitoring of expenditures during the year (preventive, corrective, etc.);
  - maintenance activities to be carried out by the company's staff or subcontracted;
  - deviations in order to re-prioritize maintenance activities;
  - collection of clients satisfaction;
  - collection of employees satisfaction;
  - internal and external communication.
— ($i2_{man}$) production losses due to maintenance (corrective, preventive)
— ($i3_{man}$) maintenance cost (per year)
— ($i4_{man}$) corrective maintenance (in time and/or costs)
— ($i5_{man}$) preventive maintenance (in time and/or costs)
— ($i6_{man}$) condition-based maintenance (in time and/or costs)
— ($i7_{man}$) maintenance assigned to a service provider (in cost and number of hours)
— ($i8_{man}$) down time due to maintenance (corrective, preventive)
— ($i9_{man}$) unscheduled (and scheduled) unavailability due to maintenance
— ($i10_{man}$) successful starts
— ($i11_{man}$) unscheduled maintenance costs
— ($i12_{man}$) maintenance cost due to staff costs
— ($i13_{man}$) cost due to spare parts (and materials)
— ($i14_{man}$) spare parts stock value

Observations

Aside from the main aspect, i.e. determining the objectives of the maintenance process (the what) according to the overall objectives set by the company's management, the process shall indicate the completion dates (the when), the required resources (the who) and the way how to get there (the how). The maintenance process shall also keep in mind possible obstacles (risks) along with the strengths and weaknesses of maintenance.

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

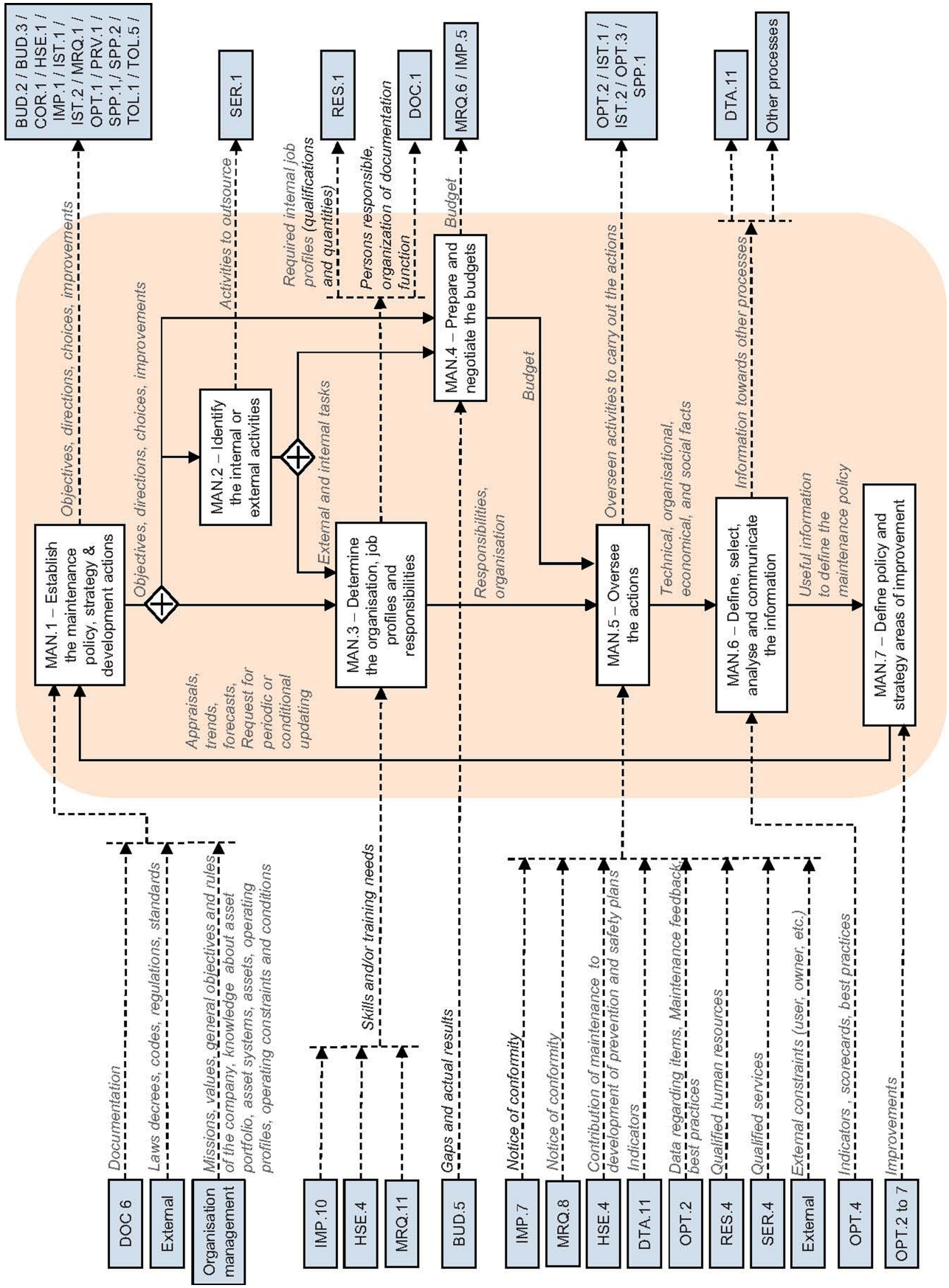
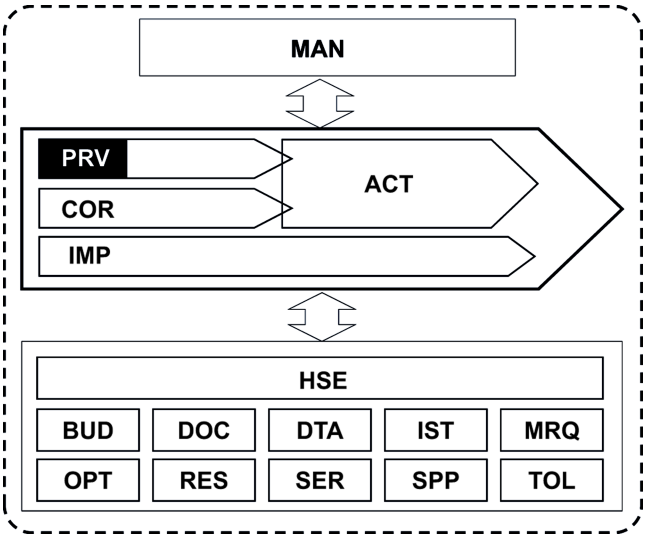


Figure 4 — Manage maintenance process (level 2 of the mapping)

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

6.3 PRV process: Prevent undesirable events by avoiding failures and faults

6.3.1 General



See Figure 5.

The PRV and COR processes share common sub-process and activities grouped into the process ACT: Act preventively and/or correctively on items to maintain (see 5.3 and Figure 7).

The differences between the PRV and COR processes are their elementary processes:

— PRV.1: Characterize the undesirable events;

— PRV.2: Use and update the Maintenance Plans;

and,

— COR.1: Classify the actual events;

— COR.2: Diagnose the state of the items in question.

6.3.2 PRV.1 – Characterize the undesirable events

Purpose(s) of the Process
Characterize and prioritize the events (failures, malfunctions due to latent or hidden faults) that can have harmful and significant consequences on availability, reliability, personal safety, the environment, product or service quality, the value of the assets and costs. The result obtained shall make it possible to define the actions to be taken in order to avoid these events or control their consequences.
Key activities / elementary processes
1. Draw up a list of proven and/or potential events whose consequences on the issues at stake (availability, reliability, personal safety, environment, operating costs, value of the assets, product or service quality and the associated thresholds) have been, or may be significant. 2. Determine the primary causes, the chain of causes and/or proven or potential failure modes that lead to the undesirable events. 3. Determine the effects of the causes and/or failure modes identified. 4. Compile the failures and/or degradations that have led to a repair action (corrective) or a preventive restoration action.

AVA Documents
Document Sharing Hub

Full document details: BS EN 17007:2017

5. Determine whether the undesirable event and/or failure modes leading to it are apparent or hidden to the user of the items.
6. Prioritize the events based on their effects and occurrence.
7. Choose the methods used to detect hidden causes and failure modes.

Input data/products	**Output data/products**
— Documentation from manufacturer and engineering (operating constraints, etc.) — Operational objectives (availability, operation time, reliability, safety, environmental safety, quality, costs, etc.), directions (corrective/preventive, outsourcing/insourcing, line and levels of maintenance, etc.), choices (method used to compile and analyse events)(MAN.1) — General documentation, technical documentation (DOC.6) — Item history, Maintenance record (OPT.2) — Initial maintenance plan (MRQ.9)	— Undesirable events and their consequences occurrence and criticality — Required items' improvements — Required operating procedures' improvements
Stakeholders To be completed by the organization in order to answer the questions: — who is realizing the process? — who is the customer of the process?	**Interfaces with other processes** MAN.1 – DOC.6 – OPT.2

Constraints related to realization of the process

Elements to define indicators related to the process

— ($i1_{prv1}$) identified undesirable events (failures, malfunctions due to latent or hidden faults)
— ($i2_{prv1}$) changed number of identified undesirable events over a given period
— ($i3_{prv1}$) undesirable events which have occurred and are not identified in the initial list of identified failures
— ($i4_{prv1}$) identified undesirable events which have not occurred over a given period and are included in the list of identified failures
— ($i5_{prv1}$) identified undesirable events which effects were not expected

Observations

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

6.3.3 PRV.2 – Use and update the Maintenance Plans

Purpose(s) of the Process

Determine the actions to be taken on the items to achieve the objectives set in the maintenance policy (availability, reliability, safety, costs, etc.).

Key activities / elementary processes

1. Determine the feasible predetermined and/or condition-based preventive maintenance tasks, and their occurrence based on the number of units of use, that can prevent the causes of the undesirable events if it is economically acceptable.
2. Consider item improvements to reduce or prevent the causes of the undesirable events and to make preventive actions more efficient in a way that is technically and economically advantageous.
3. Consider improvements of operating procedures to reduce the causes of the undesirable events in a way that is technically and economically advantageous.
4. Consider improvements to protect against the consequences of the undesirable events in a way that is technically and economically advantageous.
5. Select the actions to be performed (tasks/improvements).

Input data/products	**Output data/products**
— Undesirable events, causes, effects, criticality of events, occurrence of events (PRV.1) — General documentation, technical documentation (list of the items to be maintained, operating constraints, maintenance documents of manufacturers / OEMs / maintenance providers) (DOC.6) — Item history, maintenance record (OPT.2) — Initial maintenance plans (MRQ.9)	— Preventive maintenance plans — Required improvements of items — Required improvements of procedures (operation, maintenance)
Stakeholders To be completed by the organization in order to answer the questions: — who is realizing the process? — who is the customer of the process?	**Interfaces with other processes** PRV.1 – OPT.2 – DOC.6 – MRQ.9 – ACT.1 – ACT.2 – OPT.3.

Constraints related to realization of the process

Elements to define indicators related to the process

— ($i1_{prv2}$) equipment covered by a maintenance plan
— ($i2_{prv2}$) maintenance plans revised or created per year
— ($i3_{prv2}$) date of the last version of the maintenance plan
— ($i4_{prv2}$) recommendations made to improve the equipment (financial impact)
— ($i5_{prv2}$) non-detected failures in relation to total number of faults, although CBM is applied
— ($i6_{prv2}$) non-detected failures because of lack of CBM (although available)

Observations

The maintenance plan shall be revised based on the number and consequent evaluations of corrective actions (including fault diagnosis), modifications and improvements made, or according to a defined timetable.

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017

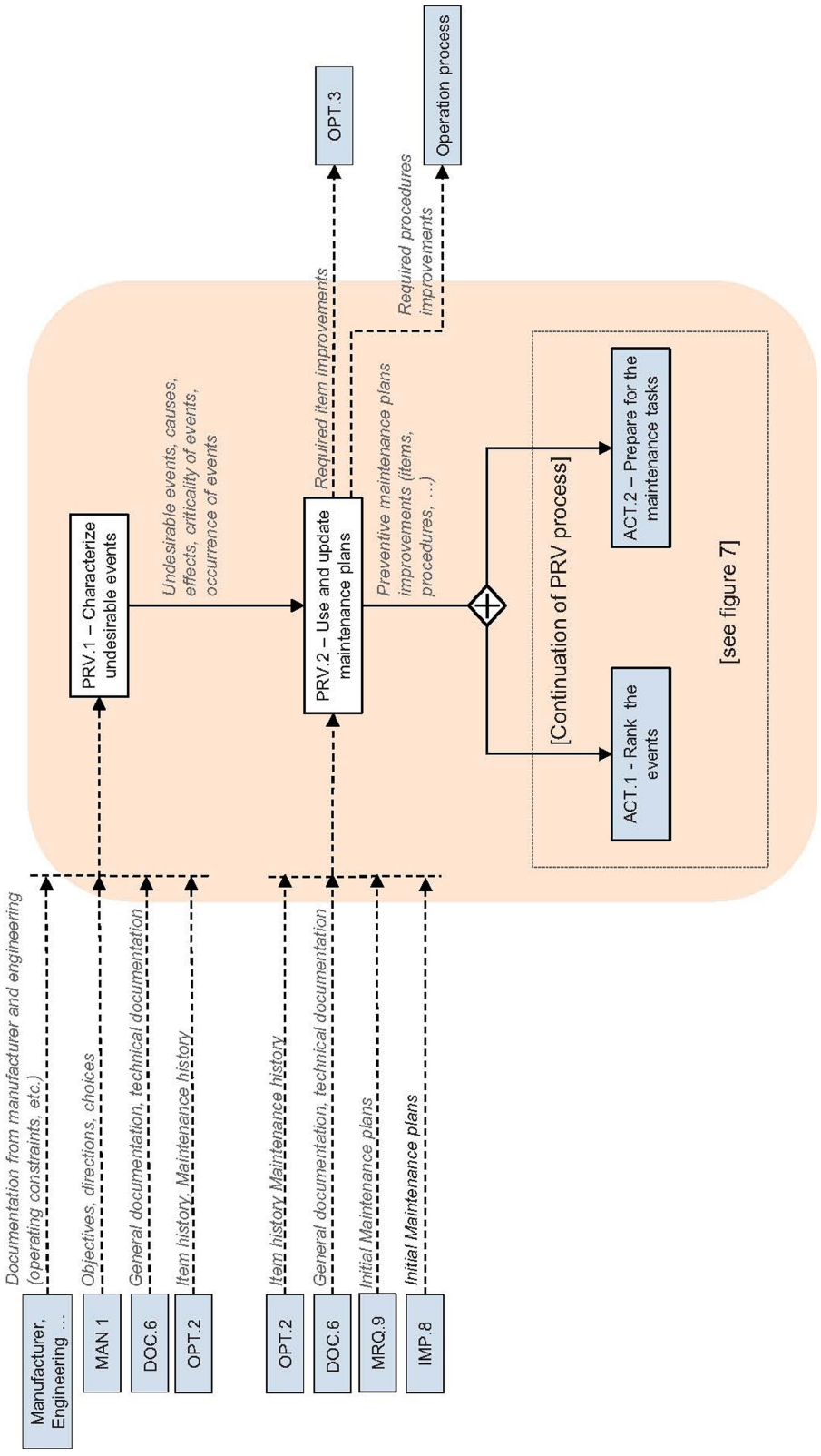


Figure 5 — Process: "Prevent undesirable events by avoiding failures and faults" (level 2 of the mapping) (The PRV and COR processes share the common sub-process ACT: "Act preventively and/or correctively on the items to be maintained")

Documents
Document Sharing Hub
Full document details: BS EN 17007:2017