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NORME INTERNATIONALE

Dependability management – Part 3-16: Application guide – Guidelines for specification of maintenance support services

Gestion de la sûreté de fonctionnement – Partie 3-16: Guide d'application – Lignes directrices pour la spécification des services de support de maintenance

IEC 60300-3-16:2008

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DEPENDABILITY MANAGEMENT –

Part 3-16: Application guide – Guidelines for specification of maintenance support services

FOREWORD

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The text of this standard is based on the following documents:

FDIS	Report on voting
56/1271/FDIS	56/1290/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60300 series, under the general title *Dependability management* can be found on the IEC website.

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- reconfirmed,
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- replaced by a revised edition, or
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INTRODUCTION

The use of maintenance agreements is now a common means of providing maintenance support services to owners and operators of products, systems and equipment. These services may be included in the initial design and development phase but they may also be considered and implemented during the operation and maintenance phase.

Specification of maintenance support services requires not only the preparation of an agreement but also management and monitoring of services during its implementation. Agreements may be informal arrangements between the two parties or they may entail a formal contract. Maintenance support services can range in scope from simple ones that might entail repair of a specific type of item to long term, inclusive arrangements with guarantees based on a relevant measure of performance.

The agreement must address responsibilities of both the service provider and the company (and possibly the responsibilities of any warrantee service provided, if another company is involved) with respect to scope and level of services, technical arrangements, organizational arrangements, commercial aspects, legal obligations and contractual requirements. This standard deals only with the service aspects of the agreement and not with legal or contractual requirements.

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DEPENDABILITY MANAGEMENT –

Part 3-16: Application guide – Guidelines for specification of maintenance support services

1 Scope

This part of IEC 60300 describes a framework for the specification of services related to the maintenance support of products, systems and equipment that are carried out during the operation and maintenance phase. The purpose of this standard is to outline, in a generic manner, the development of agreements for maintenance support services as well as guidelines for the management and monitoring of these agreements by both the company and the service provider.

This standard is intended for use by a wide range of suppliers, maintenance support organizations and users and can be applied to all items. For consistency in this standard, the user, operator and owner are referred to as the company and the organization or vendor providing the maintenance support service is called the service provider.

This standard is applicable to items, which include all types of products, equipment and systems (hardware and software). Most of these require a certain level of maintenance to ensure that their required functionality, dependability, capability, economic, safety and regulatory requirements are achieved.

NOTE For consistency, this standard will use the term “item” as defined in 3.1.4, except where the context requires otherwise.

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.

IEC 60300-3-2, *Dependability management – Part 3-2: Application guide – Collection of dependability data from the field*

IEC 60300-3-3, *Dependability management – Part 3-3: Application guide – Life cycle costing*

IEC 60300-3-10, *Dependability management – Part 3-10: Application guide – Maintainability*

IEC 60300-3-12, *Dependability management – Part 3-12: Application guide – Integrated logistic support*

IEC 60300-3-14, *Dependability management – Part 3-14: Application guide – Maintenance and maintenance support*

IEC 60706-2, *Maintainability of equipment – Part 2: Maintainability requirements and studies during the design and development phase*

IEC 62402, O*bsolescence management – Application guide*

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3 Terms, definitions and acronyms

For the purposes of this document, the following terms, definitions and acronyms apply.

3.1 Terms and definitions

3.1.1
company
recipient of a maintenance support service provided by the maintenance support service provider

3.1.2
corrective maintenance
maintenance carried out after fault recognition and intended to put an item into a state in which it can perform a required function

NOTE In French, the term “dépannage” sometimes implies a provisional restoration.

[IEV 191-07-08:1990]

3.1.3
integrated logistic support
ILS
management method by which all the logistic support services required by a customer can be brought together in a structured way and in harmony with a product

3.1.4
item
entity
any part, component, device, subsystem, functional unit, equipment or system that can be individually considered

NOTE 1 An item may consist of hardware, software or both, and may also, in particular cases, include people.

NOTE 2 In French the term “entité” is preferred to the term “dispositif” due to its more general meaning. The term “dispositif” is also the common equivalent to the English term “device”.

NOTE 3 In French the term “individu” is used mainly in statistics.

NOTE 4 A number of items, e.g. a population of items or a sample, may itself be considered as an item.

NOTE 5 A software item may be source code, object code, job control code, control code or a collection of these items.

[IEV 191-01-01:1990, modified]

3.1.5
maintenance
combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function

[IEV 191-07-01:1990]

3.1.6
maintenance action
maintenance task
sequence of elementary maintenance activities carried out for a given purpose

NOTE Examples are fault diagnosis, fault localization, function check-out, or combinations thereof.

[IEV 191-07-18:1990]

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3.1.7
maintenance concept
interrelationship between the maintenance echelons, the indenture levels and the levels of maintenance to be applied for the maintenance of an item

3.1.8
maintenance policy
general approach to the provision of maintenance and maintenance support based on the objectives and policies of owners, users and customers

3.1.9
maintenance support
resources required to maintain an item, under a given maintenance concept and guided by a maintenance policy

NOTE Resources include human resources, support equipment, materials and spare parts, maintenance facilities, documentation, information and maintenance information systems.

3.1.10
preventive maintenance
maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item

NOTE 1 Preventive maintenance includes condition-based tasks that consist of condition monitoring, inspection and functional testing.

NOTE 2 Predetermined intervals apply to repair or replacement that are carried out at specific intervals such as elapsed time, operating hours, distance, number of cycles or other relevant measures.

[IEV 191-07-07:1990, modified]

3.1.11
service provider
party (e.g. internal or external organization, manufacturer, etc.) that has agreed to undertake responsibility for providing a given maintenance support service and obtaining, when specified, supplies in accordance with an agreement

NOTE This may include the provision of a consultancy service.

3.2 Acronyms

ILS	integrated logistic support
LTSA	long term service agreement
SLA	service level agreement
RCM	reliability centred maintenance

4 Specification of maintenance support services

4.1 Purpose of using maintenance support services

Many organizations and users of products, systems and equipment may require the assistance of internal or external service providers for maintenance support during the operation and maintenance phase of the life cycle. Many of these services involve an agreement that details the services being provided and how they are to be managed, monitored and controlled.

Some of these services are short-term and limited in their scope of application. Other services continue for a longer time period and may involve guarantees of performance related to customer requirements. The latter necessitate a more complicated agreement and ongoing management and monitoring between the parties.

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The reasons for obtaining maintenance support services may include:

– to optimize availability;
– to reduce costs or achieve cost stability;
– a lack of available expertise and resources by customer or user;
– low frequency of maintenance activities;
– lower costs due to economies of scale that can be achieved by a service provider;
– higher level of expertise available from equipment manufacturers and third parties.

4.2 Types of maintenance support services

Externally provided maintenance support services can be divided into three major categories:

– basic maintenance support agreements;
– limited service agreements;
– long term service agreements (LTSA).

The interrelationship between these types of services is illustrated in Figure 1.

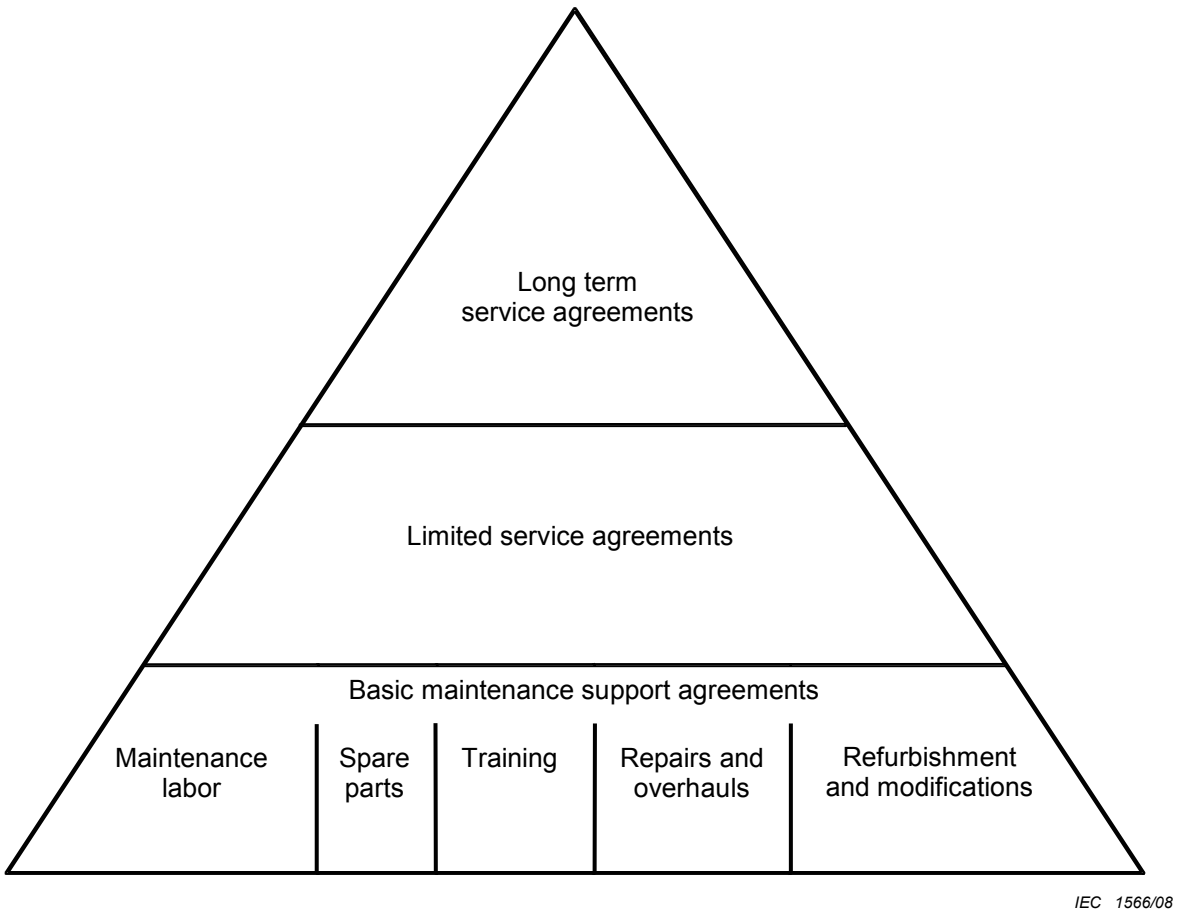

Figure 1 – Interrelationship between types of maintenance support services

Typically, the lowest level of maintenance support service is provided on the basis of a specific need, normally for a specific type or manufacturer of hardware and software. Manufacturers traditionally provide these basic services to support their off-the-shelf products. Limited service agreements and LTSAs are generally applicable to major equipment, systems or facilities. They consist of many of the service components at the

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lowest level but in addition, include performance guarantees and a specifically tailored agreement.

4.3 Basic maintenance support agreements

4.3.1 Maintenance labour

External service providers may supply maintenance staff who have specified skills to carry out preventive or corrective maintenance tasks. These skills also include work-related activities such as safety and environmental procedures. A single expert or a larger number of workers may be provided along with the necessary supervision.

Maintenance staff will have maintenance-related skills and qualifications that might include:

– basic labour skills;
– trades qualifications such as millwright, mechanic, electrical or instrumentation with certification as required;
– operation of special tools and support equipment;
– equipment-specific knowledge (hardware and software);
– manufacturer-specific knowledge; and
– other specialized knowledge, training and experience.

4.3.2 Spare parts

Spare parts and other materials needed for maintenance are available not only from the original equipment manufacturer but often also from other sources. The specifications and quality of the spare parts and materials are determined by the original equipment manufacturer and also based on their operational environment and use. Ensuring that this quality is met is a shared responsibility between the manufacturer of the spare parts and the company unless transferred by contract to the service provider.

4.3.3 Training

Many manufacturers of more complex items will offer training on operation and maintenance of their equipment. This training may be held at the manufacturer or facilities operated by the company. The use of specialized tools and support equipment may be a major focus of the training.

4.3.4 Repairs and overhauls

A very common maintenance support service is the repair or overhaul of item. The item may undergo a repair by replacement only of a failed component. An overhaul is done with the intent of restoring it to virtually new condition or upgrading the item. Some type of warranty may be included in the agreement to protect the company against the consequences of premature failures caused by the overhaul or repair.

For smaller items, the process is straightforward and the repaired item may not be returned to the original company. It may instead become part of an exchange program.

With a major piece of equipment, the scope of the repair tasks may depend on its condition which can only be determined after disassembly.

The repairs or overhauls are normally carried out in a special repair shop fully staffed and equipped to complete them in the most efficient manner possible with strict quality processes. However, for large items that are difficult to transport, the work may be done on site.

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4.3.5 Refurbishment and modifications

Refurbishment usually applies to major items and may involve improvements in functionality such as output and efficiency. Modifications may be implemented which are not necessarily related to maintenance needs. Refurbishment may be performed close to the normal end of an item's life to extend it for a longer time period.

4.4 Limited service agreements

It may be advantageous for a company to establish an agreement with a service provider or equipment manufacturer that entails a more comprehensive set of maintenance support services. These agreements may include a combination of the basic services listed in 4.3. The time period and level of service should be defined accordingly. The time period of the agreement is normally relatively short, e.g. on a yearly basis. The agreement may also be restricted to providing agreed upon services to only a portion of the item.

Limited service agreements may include services such as:

– maintenance labour to assist with a major maintenance activity such as a facility shutdown;
– provision of maintenance staff for regular preventive and corrective maintenance actions for a specified time period;
– single sourcing of spare parts where the supplier guarantees a certain availability, response time and pricing;
– provision of repair and overhaul services for certain items for a specified time period;
– training of staff;
– condition monitoring of items;
– a program to refurbish and modify items;
– development of maintenance policy and concept;
– preparation or review of maintenance tasks using a method such as RCM.

The performance of the agreement is verified by the measurement of a quality indicator appropriate for the service provided. Normally a limited warranty is provided for the services provided, work being done or parts that have been supplied.

4.5 Long term service agreements

4.5.1 Purpose

Long term service agreements consist of a comprehensive set of maintenance support services for a longer time period with performance guarantees that relate to the major function of the item. A LTSA is often provided by a supplier or manufacturer of major items at a facility. It may also include in its scope all of the other items at that facility, known as balance of plant.

LTSAs assure comprehensive item coverage with predictable costs so that a company can better forecast annual budgeting requirements and minimize the variability of life cycle costs (see IEC 60300-3-3). All or most costs are covered and item risk related to maintenance is removed or reduced. One disadvantage may be that the costs may be higher than a company could potentially achieve by performing its own maintenance activities and assuming its own risk.

Another major reason for a LTSA is the expertise that an original item manufacturer has in its design or that a service provider may have obtained through extensive experience with a certain type of item. There is also the benefit of economy of scale if the services are supplied to a large number of item users.

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A LTSA may be referred to as a service level agreement (SLA) and the performance guarantees may be defined in terms of Quality of Services (QoS) indicators which may be qualitative and/or quantitative.

4.5.2 Scope of a LTSA

The scope of a LTSA is comprehensive and long term, typically a period of 3-10 years and even longer in some circumstances. It may include

– maintenance management services consisting of development of maintenance policy and concept, planning and scheduling of maintenance actions, managing of spare parts inventory and management of maintenance data using a computerized maintenance management system;
– provision of maintenance staff for regular preventive and corrective maintenance actions possibly by dedicated staff located at the facility;
– supply of all spare parts and materials;
– repair and overhaul services for specified items;
– training of staff;
– condition monitoring of items;
– refurbishment and modification of items;
– regular reporting of services supplied and item performance achieved;
– obsolescence management.

4.5.3 Performance guarantees

The performance and success of the LTSA is measured by means of a guarantee that is related to the major function of the item to the company. Service or QoS “guarantees” to specific performance levels are becoming more predominant. Guarantees may consist of a dependability measure such as availability or a performance measure such as power output or energy delivered. A performance target may be set with an incentive if a higher threshold is exceeded. If the performance does not meet the target, a financial penalty may be charged against the service provider.

The method used to measure performance has to be clearly defined and carefully monitored. As well, the extent of liability by the service provider has to be defined. For example, business-related losses are generally excluded from performance guarantees.

4.6 Life cycle aspects

4.6.1 Design and development phase

The evaluation of maintainability during the design phase (see IEC 60300-3-10 and IEC 60706-2) may include the possibility or necessity for the use of external service providers to supply either limited maintenance support services or a more comprehensive LTSA to the company. Trade-offs can then be considered and the most effective solution for maintainability and maintenance support can then be implemented in the design.

Implementation of a service agreement may be possible only when the user of the item is known. The company has three options:

– provision of all of the maintenance by the company;
– giving part of the maintenance to a service provider;
– entrusting all of the maintenance to a service provider.

For products where an integrated logistics support (ILS) approach is applied (see IEC 60300-3-12), all maintenance and maintenance support activities are completely

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planned and provided for prior to the operation and maintenance phase. This often entails the use of external service providers and the need for service agreements.

4.6.2 Operation and maintenance phase

When existing products are incorporated in complex systems by another manufacturer or organization and are then supplied to a company, maintenance support is usually established by the company during the operation and maintenance phase (see IEC 60300-3-14). External maintenance support services are determined by a company since each one will have different capabilities for performing maintenance and maintenance support activities and thus the need and economic viability of external maintenance support services will vary. Other factors that will influence the use of external services are the availability and accessibility of those services to a specific company.

4.6.3 Obsolescence

The major reasons for parts obsolescence is the cessation of production capability as well as diminishing demand. However, the use of service providers may hasten or extend the obsolescence of items since maintenance support, in their parts consumption, is a major factor in the ability of a company to successfully operate and maintain items. Obsolescence may be forced on a company if a service provider ceases to provide maintenance support services and no alternatives are available. On the other hand, the life of an item may be extended if a third party service provider is able to continue maintenance support even though the original manufacturer has ceased support for that item. Please refer to IEC 62402 for further details on the management of obsolescence.

5 Preparation of service agreements

5.1 Management responsibility

Management has overall responsibility for establishing the maintenance policy for all items, including the extent to which level of maintenance support services should be outsourced to external service providers. This policy may change over time as economic factors and the availability and accessibility of service providers changes.

Management is thus responsible for the preparation, evaluation and monitoring of maintenance agreements that are put in place.

5.2 Process for selecting a service provider

Prior to a maintenance agreement being agreed upon, a user or operator of items will normally go through a process of selecting a maintenance service provider. The actual process used will be guided by company policy for obtaining services. In general, this process may involve the preparation of a Formal Request for Proposal which documents:

– the specific services being requested;
– the response that is required and possibly a list of questions that need to be answered;
– a draft of the agreement terms that are expected to be part of the final agreement;
– the process and method for selecting the successful bidder;
– where and when the response is to be delivered.

Service providers allowed to bid on an agreement may need to be pre-qualified to establish basic conditions for an agreement. The Formal Request for Proposal is then sent to the list of acceptable vendors. Once the bids are received, a selection process is used to decide on the successful bidder. At this point, a negotiation process may need to be initiated to finalize the scope, terms and conditions and deal with exceptions. The final agreement can then be prepared.

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5.3 Purpose of a maintenance support service agreement

A maintenance support service agreement is a functional as well as a legal agreement between a company and a service provider. It defines the services being provided and clarifies objectives and respective responsibilities. Agreements are usually set up with an external service provider but may also be made with a service group internal to the company. Internal agreements may be easier to execute but the same approach should be taken in order to ensure that both parties will be satisfied with the end result.

The purpose of a maintenance support service agreement is:

– to specify the services being provided and any constraints that may apply;
– to define performance guarantees that are to be met and incentives or penalties that may apply if the performance guarantee is exceeded or not met, respectively;
– to clearly establish and document contractual responsibilities;
– to define legal and regulatory obligations that have to be met;
– to assist with resolution of conflicts that may arise;
– to make provisions for extra work that may arise such as the incorporation of modifications requested by the company or suggested by the service provider;
– to enable expected benefits to be realized by both company and service provider.

5.4 Preparation of a maintenance agreement

The preparation of a maintenance agreement consists of the following steps:

– deciding which maintenance support services are desired to be outsourced;
– deciding on the type of maintenance agreement which may be appropriate;
– defining the specific scope of services required;
– setting out performance guarantees and related incentives or penalties;
– determining legal and regulatory obligations that must be met by the service provider and the owner / operator;
– outlining the commercial terms that will apply.

Each individual agreement should be drafted, and negotiated where appropriate, to take into account the specific aspects arising from the work required on the items to be maintained, the parties involved and any applicable laws and regulations.

5.5 Agreement structure and elements

The following standard elements and a template are provided to simplify preparation of maintenance agreements. An agreement will typically have these major elements:

– general section with descriptive information on the nature of the agreement and its objectives;
– scope of services agreed upon;
– technical arrangements related to the performance of duties;
– organizational arrangements;
– commercial aspects;
– legal obligations by both parties;
– contractual requirements.

Since legal obligations and contractual requirements will vary with the jurisdictions where the items are located, they will not be described in this standard.

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