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Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

Indian Standard

SAFETY ASPECTS — GUIDELINES FOR THEIR INCLUSION IN STANDARDS

( First Revision )

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NATIONAL FOREWORD

This Indian Standard (First Revision) which is identical with ISO/IEC Guide 51:1999 'Safety aspects — Guidelines for their inclusion in standards' issued by the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendations of the Basic Standards Sectional Committee and approval of the Medical Instruments, General and Production Engineering Division Council.

This standard was first published in 1996 based on ISO/IEC Guide 51:1990. This revision has been taken up to update our Indian Standard and to align with 1999 edition of ISO/IEC Guide 51. The title of the standard is also changed from 'Guidelines for the inclusion of safety aspects in standards' in line with latest ISO/IEC Guide.

The text of this Indian Standard based on the ISO/IEC Guide may approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'Guide' appear referring to this standard, they should be read as 'Indian Standard'.

b) Wherever the term 'Committee(s)' appears, it should be taken to cover BIS Sectional Committees.

CROSS REFERENCES

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<table>
<thead>
<tr>
<th>International Standard</th>
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<tr>
<td>ISO 3864 : 1984 Safety colours and safety signs¹</td>
<td>IS 9457 : 1980 Safety colours and safety signs</td>
<td>Technically equivalent</td>
</tr>
<tr>
<td>ISO 7000 : 1989 Graphical symbols for use on equipment — Index and synopsis²</td>
<td>IS 12857 : 1989 General principles for the creation of graphical symbols for use on equipment</td>
<td>do</td>
</tr>
<tr>
<td>ISO 7001 : 1990 Public information symbols</td>
<td>IS 15504 : 2004 Public information symbols</td>
<td>Identical</td>
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In this adopted standard, normative references are also made to:


¹ ISO 3864 has been revised as ISO 3864-1 : 2002 and ISO 3864-2 : 2004 brought out in two parts.
² ISO 7000 has been revised in 2004.

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Indian Standard
SAFETY ASPECTS — GUIDELINES FOR THEIR INCLUSION IN STANDARDS
(First Revision)

1 Scope

This Guide provides standards writers with guidelines for the inclusion of safety aspects in standards. It is applicable to any safety aspect related to people, property or the environment, or a combination of one or more of these (e.g. people only; people and property; people, property and the environment).

This Guide adopts an approach aimed at reducing the risk arising from the use of products, processes or services. The complete life cycle of a product, process or service, including both the intended use and the reasonably foreseeable misuse, is considered.

NOTE 1 Quality is not a synonym for safety and consequently the respective roles of quality and of safety should not be confused. However it may be necessary to consider quality requirements in standards to ensure that the safety requirements are consistently met.

NOTE 2 The term "standard" used throughout this Guide includes International Standards, Technical Specifications, Publicly Available Specifications and Guides.

NOTE 3 Although this Guide is intended primarily for use by standards writers, its underlying principles may be used wherever safety aspects are being considered.

NOTE 4 Standards may deal exclusively with safety aspects or may include clauses specific to safety.

NOTE 5 Unless otherwise stated, the term "committee(s)", when used in this Guide, is meant to cover both ISO and IEC technical committees, subcommittees or working groups.

NOTE 6 Terms defined in clause 3 are printed in bold type throughout this Guide.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Guide. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Guide are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7000:1989, Graphical symbols for use on equipment — Index and synopsis.
IEC 60417:1998 (all parts), Graphical symbols for use on equipment.


## 3 Terms and definitions

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

NOTE In other publications slightly different definitions may apply for the same terms, but the concepts are broadly the same.

### 3.1 safety
freedom from unacceptable risk


### 3.2 risk
combination of the probability of occurrence of harm and the severity of that harm

### 3.3 harm
physical injury or damage to the health of people, or damage to property or the environment

### 3.4 harmful event
occurrence in which a hazardous situation results in harm

### 3.5 hazard
potential source of harm

NOTE The term hazard can be qualified in order to define its origin or the nature of the expected harm (e.g. electric shock hazard, crushing hazard, cutting hazard, toxic hazard, fire hazard, drowning hazard).

### 3.6 hazardous situation
circumstance in which people, property or the environment are exposed to one or more hazards

### 3.7 tolerable risk
risk which is accepted in a given context based on the current values of society

NOTE See 5.3.

### 3.8 protective measure
means used to reduce risk

NOTE Protective measures include risk reduction by inherently safe design, protective devices, personal protective equipment, information for use and installation, and training.
3.9 residual risk
risk remaining after protective measures have been taken

3.10 risk analysis
systematic use of available information to identify hazards and to estimate the risk

3.11 risk evaluation
procedure based on the risk analysis to determine whether the tolerable risk has been achieved

3.12 risk assessment
overall process comprising a risk analysis and a risk evaluation

3.13 intended use
use of a product, process or service in accordance with information provided by the supplier

3.14 reasonably foreseeable misuse
use of a product, process or service in a way not intended by the supplier, but which may result from readily predictable human behaviour

4 Use of the words “safety” and “safe”

The use of the words safety and safe as descriptive adjectives should be avoided because they convey no useful extra information. In addition, they are likely to be interpreted as an assurance of guaranteed freedom from risk.

The recommended approach is to replace, wherever possible, the words safety and safe by an indication of the objective.

Examples are:
- “protective helmet” instead of “safety helmet”;
- “protective impedance device” instead of “safety impedance”;
- “non-slip floor-covering” instead of “safety material”.

5 The concept of safety

5.1 Safety is dealt with in standards work in many different forms across a wide range of technologies and for most products, processes and services. The increasing complexity of products, processes and services entering the market requires that the consideration of safety aspects be given a high priority.

There can be no absolute safety; some risk will remain, defined in this Guide as residual risk. Therefore a product, process or service can only be relatively safe.

5.2 Safety is achieved by reducing risk to a tolerable level — defined in this Guide as tolerable risk. Tolerable risk is determined by the search for an optimal balance between the ideal of absolute safety and the demands to be met by a product, process or service, and factors such as benefit to the user, suitability for purpose, cost effectiveness, and conventions of the society concerned. It follows that there is a need to review continually the tolerable level, in particular when developments, both in technology and in knowledge, can lead to economically feasible improvements to attain the minimum risk compatible with the use of a product, process or service.
5.3 **Tolerable risk** is achieved by the iterative process of **risk assessment** (risk analysis and risk evaluation) and risk reduction (see Figure 1).

![Diagram of iterative process of risk assessment and risk reduction](image)

**Figure 1 — Iterative process of risk assessment and risk reduction**

6 **Achieving tolerable risk**

The following procedure (see Figure 1) should be used to reduce **risks** to a tolerable level:

- **a)** identify the likely user group(s) for the product, process or service (including those with special needs and the elderly), and any known contact group (e.g. use/contact by young children);

- **b)** identify the **intended use** and assess the **reasonably foreseeable misuse** of the product, process or service;

- **c)** identify each **hazard** (including any **hazardous situation** and **harmful event**) arising in all stages and conditions for the use of the product, process or service, including installation, maintenance, repair and destruction/disposal;

- **d)** estimate and evaluate the **risk** (see Figure 1) to each identified user/contact group arising from the **hazard(s)** identified;
e) judge if the risk is tolerable (e.g. by comparison with similar products, processes or services);

f) if the risk is not tolerable, reduce the risk until it becomes tolerable.

When reducing risks the order of priority should be as follows:

1) inherently safe design;
2) protective devices;
3) information for users.

This procedure is based on the assumption that the user has a role to play in the risk reduction procedure by complying with the information provided by the designer/supplier (see Figure 2).

Figure 2 — Risk reduction

The steps taken in the design procedure are shown in order of priority. The steps to be taken by the user are not in order of priority because this would depend on the application. It is emphasized that the additional protective devices, personal protective equipment and provision of information to users should not be used as substitutes for design improvements.

7 Safety aspects in standards

7.1 Types of safety standard

Close coordination within and among committees (see clause 1, note 5) responsible for preparing standards on different products, processes or services is necessary in order to achieve a coherent approach to the treatment of safety. The use of a structured approach is recommended to ensure that each specialized standard is restricted to
specific aspects and makes reference to wider-ranging standards for all other relevant aspects. The structure is built on the following types of standard:

— basic safety standard, comprising fundamental concepts, principles and requirements with regard to general safety aspects applicable to a wide range of products, processes and services;

— group safety standard, comprising safety aspects applicable to several or a family of similar products, processes or services dealt with by more than one committee, making reference, as far as possible, to basic safety standards;

— product safety standard, comprising safety aspect(s) for a specific, or a family of, product(s), process(es) or service(s) within the scope of a single committee, making reference, as far as possible, to basic safety standards and group safety standards;

— product standards containing safety aspects but which do not deal exclusively with safety aspects; these should make reference to basic safety standards and group safety standards.

See IEC Guide 104 for a structured approach in the fields of electrical and electronic engineering.

7.2 Analysis of proposed new standards

Every proposal for preparing or revising a standard on aspects of safety should identify what is to be included in the standard and for whom it is intended. This is usually achieved by answering the following questions.

a) To whom is the standard addressed?

— Who is going to use the standard and how?

— What do the users require from the standard?

NOTE The term "users" of the standard includes those implementing the requirements of the standard, those affected by it (such as consumers of a product or service) and those affected by the environmental impact.

b) What is the purpose of the standard?

Is it to become

— a basic safety standard,

— a group safety standard,

— a product safety standard, or

— a product standard containing safety aspects?

Consider its purpose, as follows.

— Which aspects relating to safety arise?

— Will the standard be used for testing?

— Will the standard serve as a basis for conformity assessment? (Full details are given in ISO/IEC Guide 7.)

c) How should the standard be written?

— What background or knowledge can one assume users of the standard to have?
7.3 Preparatory work

Work on a standard starts with the identification of all the safety aspects to be covered. At this stage, it is essential to gather all relevant information (e.g. accident data, research reports). A detailed outline should then be prepared which will serve as a basis for the standard.

Before the work of drafting a standard begins, it is necessary to assemble within the committee expertise that reflects the knowledge required to develop the standard. Such knowledge includes, for example, the following:

- detailed working knowledge of the product, process or service;
- accident/incident history;
- feedback based on experience by users of the product, process or service;
- knowledge of the available protective measures;
- knowledge of the future development of the product, process or service;
- legal framework. (More details are given in ISO/IEC Directives, Part 2, 1992, subclause 5.1.3.)

Once the content of the standard has been established, the following safety aspects should be considered (not all of these may be relevant to a given standard):

- intended use and reasonably foreseeable misuse;
- ability to perform under expected conditions of use;
- environmental compatibility;
- ergonomic factors;
- regulatory requirements;
- existing standards;
- reliability;
- serviceability (including "service maintenance", such as ease of access to serviceable items, method of refuelling/lubrication);
- durability;
- disposability (including any relevant instructions);
- special needs of users [e.g. children (see ISO/IEC Guide 50), elderly people, the disabled] of the product, process or service;
- failure characteristics;
- markings and information.
7.4 Drafting

7.4.1 General

The rules and recommendations given below apply to the drafting of documents intended to become safety standards and, whenever applicable, to the inclusion of safety aspects in other standards. They are more specific, being either additional or complementary, than those contained in the ISO/IEC Directives, Part 3.

The standard should contain those requirements important in eliminating hazards whenever possible, or otherwise in reducing risks. These requirements should be expressed in terms of protective measures which shall be verifiable.

Requirements for protective measures should be laid down

— in precise and clearly understandable language, and

— have to be technically correct.

Standards should contain clear and complete statements specifying methods for verifying that the requirements have been met.

Subjective terms or words should not be used unless they are defined in the standard.

7.4.2 Information for safe use

7.4.2.1 Type of information

The standard should specify all information necessary for safe use to be provided to persons involved with the product, process or service (e.g. purchasers, installers, operators, users, service personnel).

In the case of products, the standard should clearly indicate:

— what information for safety is to be displayed on the product itself or on its packaging;

— what information for safety is it essential to make clearly visible at the point of sale; or

— what information for safety is to be given in the instruction manual(s) for installation, for use and for maintenance.

In addition, this information should describe safe working practices which, if followed by the persons involved, will significantly reduce the risks.

Where the safety of a product, process or service depends to a considerable degree upon safe working practices and these practices are not self-evident, a marking referring to the instruction manual(s) should be specified as a minimum.

In principle, superfluous or unnecessary information should be avoided as it tends to decrease the value of the information that is essential for safety.

Markings and symbols (if suitable symbols exist) should be specified in accordance with International Standards (e.g. ISO 7000, IEC 60417).

7.4.2.2 Instructions

Instructions and information provided shall cover safe conditions for operating the product, process or service.
In the case of products, the instructions shall cover the use, cleaning, maintenance, dismantling and destruction/disposal, as appropriate.

In this context, see ISO/IEC Guide 14 and ISO/IEC Guide 37.

7.4.2.3 Warning notices

Warning notices shall

— be conspicuous, legible, durable and understandable,

— be worded in the official language(s) of the country(ies) where the product, process or service is intended to be used unless one of the languages associated with a particular technical field is more appropriate, and

— be concise and unambiguous.

Safety signs shall comply with ISO 3864, ISO 7000, ISO 7001 and IEC 60417, and shall be comprehensible to users in all intended countries of use.

7.4.3 Packaging

When relevant, standards shall specify requirements for the packaging of the product, to ensure safe handling of the packed product, to maintain the safety of the product and to eliminate or minimize hazards, including contamination or pollution. In this context, see ISO/IEC Guide 41.

7.4.4 Safety during testing

Standards specifying test methods may prescribe procedures and/or the use of substances or equipment which could create a risk, for example to the laboratory staff. Where relevant, the standard shall include warning statements, as follows:

— a general warning statement appearing at the beginning of the standard;

— specific warning statement(s), as appropriate, preceding the relevant text within the standard.

NOTE This is in accordance with the ISO/IEC Directives, Part 2, 1992, subclause 6.2.3.

EXAMPLES

a) General warning statement:

CAUTION — Some of the tests specified in this standard involve the use of processes which could lead to a hazardous situation.

b) Specific warning statement:

DANGER — Attention is drawn to the hazard deriving from the use of the sodium salt of fluoroacetic acid, which is an extremely strong poison.
Bibliography

ISO/IEC 60417
(All Parts) : 1998

Graphic symbols for use on equipment

ISO/IEC Directives, Part 2:
Methodology for the development of International Standards, 1992

General terms and definitions concerning standardization and related activities

ISO/IEC Directives, Part 3:
Rules for the structure and drafting of International Standards

Guidelines for drafting of standards suitable for use for conformity assessment

Product information for consumers

ISO/IEC code of principles on "reference to standards"

Instructions for use of products of consumer interest

ISO/IEC Guide 41 : 1984
Standards for packaging — Consumer requirements

Child safety and standards — General guidelines

ISO Guide 64 : 1997
Guide for the inclusion of environmental aspects in product standards

IEC Guide 104 : 1997
The preparation of safety publications and the use of basic safety publications and group safety publications

In this adopted standard normative references appear to ISO/IEC Guide 2 : 1991 'General terms and definitions concerning standardization and related activities'. The requirements of this guide are identical to and are covered in Chapter I of SP 60 : 1993 'Guidelines for competence, acceptance and accreditation of Laboratories inspection bodies, certification bodies and systems of certification'. Also similarly for normative references appearing for ISO/IEC Guide 14 : 1977 'Product information for consumers', ISO/IEC Guide 37 : 1995 'Instructions for use of products of consumer interest', ISO/IEC Guide 41 : 1984 'Guide for packaging — Recommendations to comply with consumer needs and protection' are identical to and are covered in Chapters 1, 3 and 4 of SP 59 'Guidelines on matters of interest to consumers — Product information including instructions for use and packaging, standard methods of measuring performance and comparative testing'.

Where there are no corresponding Indian Standards for the International Standards referred in this Indian Standard reference to the relevant International Standards may be made.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. MGP 01 (480).

Amendments Issued Since Publication

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