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(RCJ/JSA)

**Fire hazard testing—Part 1 :
Guidance for assessing fire hazard
of electrotechnical products—
Section 1 : General guidance**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by the Reliability Center for Electronic Components of Japan (RCJ)/the Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS C 0063 : 1993** is replaced with this Standard.

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In the event of any doubts arising as to the contents,
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Fire hazard testing—

Part 1 : Guidance for assessing fire hazard of electrotechnical products—

Section 1 : General guidance

Introduction This Japanese Industrial Standard has been prepared based on the second edition of **IEC 60695-1-1** *Fire hazard testing—Part 1 : Guidance for assessing fire hazard of electrotechnical products—Section 1 : General guidance* published in 1995 without modifying the technical contents.

Where there is any portion underlined with dots, the matter is not stated in the original International Standard.

The **IEC** Standard number is based on the new numbering system of **IEC** Standards put in force on January 1st 1997, and the Standard published before the said date is numbered by adding 60000 to the former number. This is only the change in the numbering system and the contents remain unchanged.

1 Scope This Standard provides guidance for assessing the fire hazard of electrotechnical products (see clause 4) and for the resulting development of fire hazard testing (see clause 5) as related directly to harm to people, animals or property. Products, as defined in this Standard, relate to materials, components or complete end-use products.

This Standard is intended as guidance to **IEC** committees, and should be used with respect to their individual applications. Attention is drawn to the principles in **IEC Guide 104**, and to the role of committees with safety pilot functions and safety group functions.

2 Normative reference The following standard contains provisions which, through reference in this Standard, constitute provisions of this Standard. Subsequent amendments to, or revisions of this publication do not apply.

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

3 Definitions For the purposes of this Standard, the following definitions apply.

3.1 fire hazard The potential degree of personal injury or damage to property by a fire.

3.2 fire risk The expected loss from a fire. The expected loss is described in terms of probability as the product of:

- frequency of occurrence of an undesired event to be expected in a given technical operation or state, and
- the extent of damage (i.e., the hazard) to be expected when the event occurs.

4 Fire hazard assessment

4.1 General It is important to understand and maintain the differences between “fire hazard” and “fire risk”. The primary concern for hazard assessment is to minimize the risk of fires caused by electrically induced ignition within electrotechnical products and, should one start, to limit fire propagation. External events, such as the outbreak of a fire in the environment, shall also be considered, but as a secondary matter and to a lesser extent; however, deliberate misuse of an electrotechnical product shall, in general, be disregarded.

Consideration shall also be given to heat release and opacity, toxicity and corrosivity of the smoke from a burning product, and any necessary ability to function under fire conditions. These hazards are all related to ignition and fire growth. The emission of gases may also lead to a risk of explosion under certain circumstances.

Certain electrotechnical products, such as large enclosures, insulated cables and conduits, may in fact cover large portions of surfaces and finishing materials of building construction or may penetrate fire-resisting walls. In these circumstances, electrotechnical products, when exposed to an external fire, shall be evaluated from the standpoint of their contribution to the fire hazard in comparison to the building materials or structure lacking the installation of electrotechnical products.

Following a detailed review of all the hazards related to a fire scenario, the final product standards, as drafted, should include a series of tests or a single test, as appropriate, to address the specific hazard(s) defined.

4.2 Development of fire hazard assessment

4.2.1 Overview of fire hazard elements The fire hazard of an electrotechnical product depends on its characteristics, service conditions and the environment in which it is used, including the number and type of people, the value and vulnerability of property to be exposed to a fire involving that product. Therefore, a fire hazard assessment procedure for a particular product shall describe the product, its conditions of operation and its environment.

4.2.2 Basic steps The basic steps to follow in developing a fire hazard assessment are:

- a) the definition of the scope (for example, the electrotechnical product range concerned) and the context (for example, where and how the products are used) (see 4.2.2.1);
- b) the identification of the scenarios concerned (see 4.2.2.2);
- c) the selection of the criteria to be used (see 4.2.2.3);
- d) the interpretation of results (see 4.2.2.4).

4.2.2.1 Definition of the scope and context The first step involves defining the range of electrotechnical products to which the fire hazard assessment is to apply, examining the points of variability and commonality in the product range and its uses which may define the parameters of the fire hazard assessment procedure. This may be done by answering the questions set out below.

- a) **Range of electrotechnical products** What is the definition of the product to be covered? Is the product described well enough that it can always be determined whether the product is in the range? Is it described by an applicable **JIS** standard? Is the description broad enough so that all products capable of substituting for the products covered are also included? Does the scope allow it to be determined if a given product is covered?
- b) **Circumstances of use** What are the service conditions of the electrotechnical product: continuous or intermittent use? Is the product attended or not during service? Is the surrounding temperature controlled?

What does the location of the electrotechnical product indicate about its role in causing or propagating fire, resulting from its interaction with other objects in the environment?

Is the product always in an enclosed or exposed space?

What are the number and capabilities of persons involved?

How close is the exposed population or critical equipment to the fire?

- c) **Testing of the defined scope and context** Using the answers to the above questions, formulate a trial description of the product and its circumstances of use. The trial description can then be tested against a list of products, which are potentially candidates for inclusion in the scope and context, by making use of the procedure outlined in annex A, flow chart 1.

4.2.2.2 Identification of scenarios of concern A fire scenario is a detailed description of conditions of one or more stages in an actual fire from before ignition to completion of combustion, or a full-scale simulation. There will often be more than one fire scenario in which the electrotechnical product can participate, and in principle, the product can be assumed to contribute differently to the fire hazard associated with each scenario. Therefore, a separate hazard assessment is required for each important scenario identified.

Whether the focus of assessment is a product or a system, typically the most important scenario characteristics will be those that either define the fire conditions that cause the product to become involved in fire, or that indicate the time in the fire when its contribution will cause the greatest hazard consequences.

- a) **Electrotechnical product involvement in fire** The knowledge of the source of ignition is of prime importance in the case of electrotechnical products. If the product is its own source of ignition, conditions through which the ignition could take place are to be analysed in detail in terms of electrical behaviour (see table 1). Is it a short circuit (which is seldom the case), a hot spot (cause of the hot spot), or a general overheating? How long did the electrical malfunction continue before ignition took place? Each scenario should give a precise description of the detailed conditions governing the initiation of the fire, including the possible accumulation of gases within an enclosed space.

If the electrotechnical product is not its own source of ignition, describe when and how it tends to become involved in fire:

— Is the product likely to be the first item ignited?

- Is the product a potentially significant fuel source, even if it is not the first item ignited?
- Is the product a potential agent for fire propagation?

If one of these situations can be identified as being the greatest concern, then this may mean that a single fire performance characteristic is of the greatest importance, such as that product's ability to generate a significant hazard quickly, the quantity of products in use, or the persistence of the hazard during and after suppression operations. Such determinations can then be used to define test methods or calculation procedures that will measure the product's contribution to fire hazard at these stages of a fire.

- b) **Relevant aspects of fire behaviour** This exercise applies to both electro-technical products and other objects in the environment which may participate in the initiation, growth and development of fire.

The purpose of answering the questions posed is to characterize those hazard aspects which are listed below (see also annex A flow chart 2, charts 2A to 2F):

- potential to be an ignition source;
- ignitability;
- rate of flame spread;
- glowing, smouldering, melting;
- peak heat-release rate, fire growth rate, total heat release;
- mass loss or fire effluent generation rate;
- opacity of smoke produced;
- corrosivity of fire effluents produced;
- profile of toxic [irritant and asphyxiant (especially, gaseous)] substances produced: rate, total toxic potency;
- maintenance of functions under fire conditions (for example structural integrity, continuity of service, mechanical response);
- quantity of products in use relative to size and type of occupancy.

- c) **Use of scenarios to define key parameters** A test method or calculation procedure will require a number of specifications or input values. For example, a test for rate of heat release of a burning product will require specification of the type of ignition (for example, piloted ignition), the level of incident heat flux, and any requirements for control of oxygen or humidity levels in the combustion atmosphere. Where the product is not the first item ignited, nearby combustibles involved will be important in determining the thermal conditions to which the product is exposed.

Each of the specifications and input values required by the test method or calculation procedure should be determined from the characteristics of the scenario selected. This is likely to require the use of statistics of relevant fires and some documented judgements by experts. In completing these steps, the developer of a fire hazard assessment will need to identify appropriate measurements and