GUIDE 50

Child safety and standards — General guidelines

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Foreword

ISO/IEC Guide 50 has been drawn up by an ad hoc group of experts set up by the ISO Council, on a recommendation of its committee on consumer policy (COPOLCO), to deal with child hazards and their relevance to the development of standards. The group represented the medical profession, governmental interests, architects, consumers, manufacturers and standardizers.

The document secured the necessary support of both the members of ISO and IEC, and was subsequently accepted by the Councils of the two Organizations in March 1987.

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Child safety and standards — General guidelines

0 Introduction

Accidents to children at home, at play and at school are a cause of injury that in some instances may lead to permanent handicap and disability and in extreme cases death. Unintended exposure to hazardous chemicals can also harm and injure children.

In order to reduce injuries, attention has to be paid to the child (age, sex, personality, social background, etc.), the agent or product which causes the injuries, and the environmental circumstances under which the agent and the child come into contact with one another to cause the injury. The main concern here is the safety of children in their relationship with products, but one should not forget that children have different types of accidents and injuries depending upon their stage of development, and that the major environment of the home itself may not be designed with the needs of children in mind. Architects, designers and builders should be encouraged to remember that houses are designed for families to live in, and that families include children who have needs which differ from adults.

How far can standards reduce injuries to children ?

The major impact of standardization in the field of safety lies in whatever preventive measures can be taken at the stage of designing a product. Standards help a producer in designing and manufacturing products, a distributor in selecting products, a consumer in making purchase decisions and in using, maintaining and servicing the product purchased. Can standards alone address the totality of the problem of safety, with special emphasis on child safety, or do other means need to be brought to bear in particular in the form of laws and regulations ? Although standards form a vital part of safety they cannot be the complete answer and supplementary measures have to be considered in conjunction with standardization. However, if standards related to products are formulated with children in mind there can be no doubt about their importance in reducing children's injuries. The safety of children should always be considered, therefore, when drafting a standard for a product intended for use or likely to be used by children or with which they are likely to come into contact, and consumer representatives should be included on relevant standards committees whenever possible.

0.1 The importance of design

It is evident that "built-in" safety which does not require any further human action is the most effective means of preventing accidents and injuries associated with products. It is best built in at the design and manufacturing stages of product development so that no safety device or action is needed thereafter when the product is used. The rôle of standards embodying ergonomic principles giving a user-orientated approach is obvious here. If some sort of safety device is needed, it should wherever possible be one which works automatically without human intervention. Next in order of effectiveness is a safety precaution or device which requires one single action by a human being, and least effective of all is where safety has to be remembered in relation to the product each time it is used. A well-known example relates to the problem of tap-water scalds in the home : a thermostat set at a safe temperature in the factory before the system is installed ensures safety. Next in order of effectiveness is to require the householder to re-set the thermostat or mixer valve at a lower temperature, and least effective is the instruction always to put cold water in the bath first before adding hot water.

0.2 The rôle of education

A number of injuries, if not the majority, originate from the natural desire of young children to explore their surroundings, and from their complete lack of awareness of the hazards their curiosity may engender. Even the most diligent supervision of children at play cannot prevent the occasional misadventure. As the child grows he begins to appreciate the concept of risk and danger : this is a form of education that occurs in normal development. Other forms of education also have a part to play in the prevention of accidents and injuries, especially to children.

The ultimate aim of safety education is to alter human behaviour and this can be a long-term problem. As has been indicated above, education is more effective in persuading people to carry out a one-time safety measure, but it is less so in getting people to take an action which has to be repeated frequently. The limitations of educational methods of accident/injury prevention should be understood but nevertheless the effects of education may become visible in the long term. In the context of this Guide, it is clear that "education" should include education about the value and use of standards, but it is also true that education increases knowledge of hazards and risks and — it is to be hoped — results in an alteration in behaviour by some people, in a climate of opinion in which environmental changes and the adoption of standards become acceptable and desirable.

The rôle of education varies with the age and development of the child. A small baby or young toddler cannot be "taught" in the conventional sense of the term, and young schoolchildren, although obviously capable of learning, are nevertheless unpredictable and unreliable in their behaviour. They all must, therefore, be protected from danger by their parents or other adults, who may themselves need education and help. Their environment should also be made as safe as is reasonably possible by safety devices and standards. Older children and adolescents are more capable of receiving and understanding education on safety, but may not apply their knowledge.

An important target for education consists of people responsible for forming public opinion, for creating the environment in

which we live, and for making and enforcing laws and regulations concerning safety. This includes the media, architects, planners, designers, engineers, and politicians.

1 Scope

This Guide establishes basic safety principles intended for technical bodies preparing national and international standards for products which are intended specifically for use by children; these principles should also apply to products with which children are likely to come into contact.

The term "product" is used to denote any part of the "product" that can be individually considered and separately examined (e.g. a defined quantity of material, a component, equipment, sub-assembly or system). This includes building components, but not the entire structure as such.

NOTE — Although at first sight some standards do not appear to relate to child safety, consideration should be given to any direct or indirect effects on children in drafting standards which are general in scope.

2 Definitions

For the purpose of this Guide the following specific terms are used with the meanings given below.

safety : The concept of achieving the optimum balance of factors that, to the maximum practical extent, will reduce risks of injury.

NOTE — It should be understood that young children cannot be expected to appreciate risk adequately. Risks generally considered by society as acceptable have to be taken into account when referring to the safety of children.

safety equipment : Equipment designed to prevent injuries by separating the child from the potential danger or to reduce the risks of injury.

reasonably expected misuse (by children) : The use of a product in ways not originally intended by the designer, manufacturer, etc., and related to the activities of children at various stages of their development.

3 General

Products should be safe when used for their intended purpose. Users need to be aware, however, of risks inherent in misuse of the kind which commonly occurs. Products that are not made specifically for children, but with which they are likely to come into contact, should be so designed that they reduce the danger to children to a minimum compatible with their intended use. In the case of products which are intended for use by children, the need for them to be designed so as to minimize hazards under intended and anticipated conditions of use is even more important. When a specific standard is written, its wording of requirements should be such as to enable clear determination of compliance. It should always be remembered that children have a remarkable ability to use products in ways not originally contemplated by designers, manufacturers and parents.

When safety is the principal aim of a standard requirements may need to have certain characteristics with limit values (maximum or minimum) or closely defined sizes and, in some cases, constructional stipulations. In this respect, it is not infrequently seen that preference is given to minimum performance levels for economic reasons. Where children are concerned, these minima are sometimes inadequate. Therefore, the levels at which these limits are placed should be such that the element of risk is reduced as much as practicable. Risk data should be used to identify those areas that are creating hazards to children.

In the context of this Guide a standard is a technical document offering information on how to achieve safety. Standards should offer technical solutions and not get involved in ethical judgements, particularly in the international context where the field of application is so varied. Where accident statistics indicate the need for remedial measures, cost/benefit or cost/effectiveness considerations have to be borne in mind. They should not, however, be the overriding considerations.

In addition, standards often provide a technical basis for safety legislation and regulation and, indeed, some countries base their safety legislation entirely on either specific or general standards. Requirements dealing with safety which could form part of governmental regulations should be published in a separate part to the standard, in order to facilitate the principle of reference to standards [see ISO/IEC Guide 15]. The safety of children is of particular concern to many governments and there are many legal requirements concerning child safety. The relationship between child safety and regulated standards is therefore a close one.

Depending on the degree of economic and social development reached in a given community, safety standards and education may have to operate in a different framework. However, the principles underlying safety considerations should be the same.

4 Ergonomic considerations

Consideration should be given to aspects such as behaviour, response patterns, levels of cognitive development and conceptual abilities at different ages. These will affect such things as the colour, smell and decoration of the product, appreciation of risk and ability to react appropriately to danger.

In addition, standards for products should consider the anthropometric data relating to those children for whom the product is mainly designed, in terms of age, sex, weight, strength, body dimensions — height, reach, etc. — bearing in mind reasonably expected misuse by that age of child or by other children. This consideration is particularly important in relation to safety equipment. Standards should specify appropriate ages and any limitations on use.

5 Specific considerations

When drafting standards consideration should be given to hazards that are unique or particularly severe to children. These are dealt with in the following paragraphs and also in annex A

where many product-related accidents suffered by children are detailed, as follows :

a) Poisoning (toxicity) and other chemical hazards

b) Injuries from fire and flammability

c) Burns from contact with heated surfaces

d) Scalds

e) Suffocation, strangulation

f) Ingestion and inhalation of foreign bodies

g) Falls

h) Injuries from other mechanical hazards including cuts/lacerations, abrasions, eye and head injuries and damage in the hearing

i) Electric shock

j) Injuries from aquatic hazards (drowning)

5.1 Poisoning (toxicity)

Because of their lesser body weight, and other reasons, toxic effects tend to harm children more than adults relative to the quantity ingested or inhaled. In addition, young children will ingest potentially toxic products more often than older children or adults by reason of their stage of development.

Potentially toxic substances in products should not exceed nationally or internationally agreed amounts. Non-toxic and non-hazardous materials should be used whenever possible. Highly allergenic and potentially cancerogenic materials should be prohibited.

5.2 Flammability, thermal injuries

The frequency and severity of thermal injuries (burns and scalds) in children justify special attention being paid in standards to the flammability properties of the materials used for such products as furniture and furnishings, sleepwear, toys, tents; and also in standards and codes of practice relating to cooking and heating appliances and of hot water systems.

5.3 Ingestion and inhalation of foreign bodies

Young children pass through a stage of development in which any small object is put into the mouth, and this should be borne in mind in drawing up standards and in designing toys, novelties, clothes, etc. This applies particularly to objects designed for use by children under three years of age. Some standards specify that toys and novelties should not be capable of fitting into a truncated cylinder of specified dimensions as the one shown in annex B, for information. The test method for defining small parts in toys should be applied to all articles designed for use by children under three years of age. Powder and other granulated fillings which could be inhaled and create lung injuries should be prohibited. (See also 5.7 "Marking and labelling".)

Young children cannot be expected to recognize the difference between a real object which is harmless, and an imitation or model which may be harmful. This can lead to the ingestion or inhalation of objects : objects which are not meant to be put in the mouth, such as rubbers (erasers) or small toys, should not be made to resemble food or sweets which a child would normally eat. Likewise food, such as chocolate eggs, should not contain inedible toys or other products which a child might inhale or ingest while eating the food.

5.4 Mechanical hazards and construction features

Safety standards are of special importance in relationship to such products as nursery furniture, toys, play equipment and other products used by children or with which they will come into contact. Standards should ensure that the products are safe and do not become unsafe through any deficiency in design, construction or materials. This should apply in normal use and warnings should be given to caution users against reasonably expected misuse by children. Openings, for instance, should be so designed that they cannot trap a child's finger or offer access to moving parts. The use of an appropriate standard test finger is recommended to verify sizes of apertures [1]. Designers, manufacturers and retailers should be prepared to meet existing standards voluntarily if they are not enforced by regulation or legislation.

Mechanical hazards which have to be considered in drafting standards include the following :

— suffocation by materials;

— sharp points or edges which may cause cuts/lacerations;

— small components which may be swallowed or inhaled;

— entrapment of head, fingers or limbs in both moving and stationary equipment;

— strangulation by cords;

— falls from equipment or from furniture;

— projections on which clothing may be caught or which may result in (unnecessary) injury from falls or in play;

— penetrating injuries including eye injuries;

— excessive noise.

The strength and suitability of materials to be used in the product should also be considered. Annealed glass is particularly hazardous to children and safety glazing should be used in appropriate areas of houses and public buildings.

Further details are given in annex A.

1) Detailed information on standard test fingers can be obtained from national and international standards bodies.

5.5 Electrical safety

Safety has been given special attention for a long time in the preparation of standards for electrical products and continues to play an important rôle.

For this purpose, the essential elements are described in IEC Guide 104 "Guide to the drafting of safety standards". This Guide lists the most important safety publications to be followed when preparing product standards. These publications are contained in the IEC Safety Handbook under the following headings : Protection against electric shock, Insulation coordination for low voltage, Test methods for resistance to tracking, Test methods for assessing fire hazards, Identification systems, Degrees of protection by enclosures.

5.6 Radiation

Radiation has more serious effects on growing children than on adults. While most environmental radiation is uncontrollable, any standards involving radioactive materials should consider the higher vulnerability of children.

5.7 Marking and labelling

One important principle which applies to warning labelling generally is that warning labels should not be relied on to warn consumers of hazards which ought to have been eliminated by following generally accepted levels of safety or by replacing hazardous ingredients by safer ones where they are equally effective.

Safety warnings relating to products should, where practicable, be permanently affixed on or attached to them so that the advice or warnings continue to be available to users. In addition, where practicable, products should bear markings identifying the manufacturer and his address (or that of a responsible vendor) together with the model number, type, reference or designation of the product and sufficient identification to enable recall if necessary. Marking can be applied, *inter alia*, by means of "name-plates", labels, stamps, etc., as appropriate. The location of warning and identification labels on the product should be specified in the standard.

It is of the utmost importance that manufacturers give adequate and easily understood instructions for use in order to reduce the chances of dangerous misuse [see ISO/IEC Guide 37]. Warnings about hazards or restrictions on use are crucial to safety and should be given equal prominence to other instructions issued with the product, and should be clearly visible at the point of sale.

Certain toys and novelties are labelled as being "not suitable for children under the age of three years". While it is right that parents should be informed of this, designers, manufacturers, retailers and parents should recognize the virtual impossibility of this instruction being obeyed in a house where there is more than one young child. The possible hazardous consequences should be considered and common sense applied to the ethics of producing the toy or product.

Adoption of internationally harmonized safety symbols should be encouraged. Symbols, although primarily aimed at adults, in some cases are intended to be understood by children. These should be pre-tested in order to prove that children in the age-group for which they are intended do, in fact, understand them. Hazard symbols should be supported by educational or informational programmes.

5.8 Packaging

Packaging of products harmful to children, such as certain pharmaceuticals and some household and garden chemicals, should be in child-resistant containers. Standards should require warning labels for all harmful products. Bags made of thin polyethylene or other type of plastics should carry a warning of the risk of suffocation and of the need to keep them out of the reach of children. Big plastics bags should, when possible, be perforated. [More details are given in ISO Guide 41.]

5.9 Marketing

A product which is dangerous for children under a certain age should not be designed, decorated or marketed in a way that makes the product specially attractive for children under this age.

A product which is modelled on safety equipment should not be marketed in such a way that it could be mistaken for such safety equipment. The product should include a warning such as "does not provide protection in the event of an accident". (See also 5.7 "Marking and labelling".)

Bibliography

ISO/IEC Guide 15, *ISO/IEC code of principles on "reference to standards"* (1971).

ISO/IEC Guide 37, *Instructions for use of products of consumer interest* (1983).

ISO/Guide 41, *Standards for packaging — Consumer requirements* (1984).

IEC Guide 104, *Guide to the drafting of safety standards* (1984).

IEC Safety Handbook (1985).

Annex A

Possible preventive measures for specific types of product-related accidents

For each product-related accident identified and listed in this annex indications are given as to the frequency of an accident occurrence, and the degree of severity of the injury incurred by the child.

The following two scales are used for this purpose :

a)	frequency : (See Note 1)	+	infrequent
		+ +	intermediate
		+ + +	frequent
b)	severity :	+	mild
		+ +	moderate
		+ + +	severe
		(+)	potentially fatal (See Note 2)

NOTES

1 Frequency can differ from one country to another.

2 A "+" between brackets, (+), after the severity indicates potentially fatal.

Type of accident/injury	Specific type/product involved	Most vulnerable age group[1]	Frequency	Severity	Possible preventive measures
Poisoning (toxicity) and other chemical hazards	1) Pharmaceutical preparations	9 months — 3 years	+ + +	+	— Standards should specify child-resistant containers or single dispensing packages such as blister packs — Store medicines in cupboards with locks — Warning labels — Reduction of toxicity
	2) Household fluids and chemicals	9 months — 3 years	+ + +	+	— Warning labels — Reduction of toxicity — Standards should specify child-resistant containers where appropriate — Store out of the reach of young children
	3) Toxic chemicals, lead in paints, solvent, etc.	up to 14 years	+	+ + +	— Reduction of heavy metals contents in products — Adoption of internationally recognized safe levels — Standards for adhesives, etc., containing organic solvents should be examined to see if alternative non-hazardous solvents are available or appropriate warnings given — Information programme for retailers
	4) Chemistry sets, etc.	10 — 14 years	+ +	+ +	— Adoption of international and national standards
	5) Specific solvents	8 — 14 years	+ +	+ + (+)	— Substitution of harmful solvents by non-hazardous ones where possible — Solvents that can lead to addiction should not be used — Restrictions on sale — Education of children, parents, manufacturers and retailers
	6) Gases, fumes, toxic effects of burning foams or fabrics (See also "Injuries from fire and flammability")	all ages	+	+ + +	— Warning labels — Standards for upholstered furniture should include requirements to minimize toxic fume emissions
	7) Natural products : berries, fungi, houseplants, etc.	1 — 10 years	+	+	— Education — Removal of dangerous plants
	8) Agricultural products : weedkillers, pesticides and other agro-chemicals	3 — 9 years	+	+ +	— Child-resistant containers — Education and safe storage
	9) "Button" batteries	1 — 14 years	+	+ + (+)	— Store out of the reach of children under three years — Education and labelling

1) Upper limit included.

Type of accident/injury	Specific type/product involved	Most vulnerable age group	Frequency	Severity	Possible preventive measures
Poisoning (*continued*)	10) Fillings of toys	6 months — 5 years	+	+	— Fillings for toys should be clean and pure, i.e. free from vermin or hard or sharp foreign matter, non-hazardous and non-irritant, and should be free from disease-producing bacteria and allergens — Prohibition of dangerous seeds in toys
Injuries from fire and flammability Burns from fire and flames					General — Reduction in possible sources of ignition — Reduction in flammability of materials ignited — Prevention of contact of child with fire Specific
	1) Furniture and furnishings Upholstered furniture and bedding	all ages (but especially up to 4 years)	+	+ + + (+)	— Reduction in flammability and in use of fillings which produce toxic smoke/gases — Standards for upholstered furniture should include requirements to minimize ignitability and flammability
	2) Sleepwear Children's nightdresses and other loose-fitting garments	up to 12 years	+	+ + +	— Standards should specify design that inhibits flame spread and construction from flame-resistant material — Man-made fibres which may melt into a burn in the skin in case of fire should be avoided
	3) Clothes	3 — 12 years	+	+ + + (+)	— Use of tighter-fitting garments should be promoted — Use of fire retardants and reduction of surface flash
	4) Toys, tents, etc.	2 — 14 years	+	+ +	— In construction of toys standards should specify use of materials which do not release toxic smoke/gases — Toy-tents should be designed for easy exit
	5) Fires and heaters	9 months — 5 years	+	+ +	— Fireguards to standards which adequately protect children (should be compulsory in building regulations)
	6) Matches, smokers' materials	all ages	+ +	+ +	— Abolition of "strike-anywhere" matches — Information campaigns to promote safe storage and to keep material away from children
	7) Bonfires and barbecues	10 — 14 years	+	+ + +	
	8) Flammable liquids (such as igniting liquid for grill, including petroleum, gases)	10 — 14 years	+	+ + +	— Supervision and education — Store out of the reach of children
	9) Cooking fat fires (chip pan, etc.)	all ages	+ +	+ +	— Thermostatically-controlled pans, hazard warnings, etc. — Pans with a specially shaped base which fits the heating plate (to prevent them slipping off)

Type of accident/injury	Specific type/product involved	Most vulnerable age group	Frequency	Severity	Possible preventive measures
Injuries from fire and flammability (*continued*)	10) Fireworks	10 — 14 years	+	+ +	— Reduction in production of hazardous types, or total abolition
	11) Portable heating equipment	3 — 6 years	+	+ + +	— Fireguards to standards which adequately protect children — Standards should specify stability Other general measures — Use of smoke detectors especially in multiple occupancy housing — Adoption of international or national standards of electrical safety
Burns from contact with heated surfaces	1) Space-heating equipment	9 months — 4 years	+ +	+	— Fireguards to standards which adequately protect children
	2) External surfaces of cookers/ovens	1 — 4 years	+	+	— Reduction of surface temperature, e.g. by additional insulation — Standards should specify a convenient maximum temperature (if such a temperature is exceeded a warning should be affixed on the product)
	3) Cooking surfaces	1 — 4 years	+	+ +	— Cooker guards
	4) Hot irons	1 — 4 years	+ +	+ +	— Coiled iron flexes (provided that they are made of materials resistant at least to the temperature of the iron)
	5) Electric burns from fires and other appliances	1 — 5 years	+	+ + +	— Fireguards to standards which adequately protect children
Scalds	1) Electric kettles and coffee-makers	1 — 4 years	+ +	+ + +	— Coiled kettle flexes — Supervision — Maintenance of the product
	2) Other kettles and tea-pots	1 — 4 years	+ +	+ +	— Spout-filling kettles — Safety lids — Standards should require stability
	3) Hot liquids in cups and mugs	9 months — 4 years	+ + +	+ +	— Better stability — Good kitchen design
	4) Hot cooking liquids	1 — 4 years	+	+ +	— Cooker guards
	5) Hot tap-water	up to 2 years	+ +	+ + + (+)	— Thermostatically-controlled taps — Mixer taps — Standards for hot water heaters should specify maximum preset temperature (e.g. 55 °C)
	6) Washing machines	all ages	+	+ + +	— Door should not be openable when machine is in use
Suffocation, strangulation	1) Cots (cribs), high-chairs	up to 3 years	+	+ + + (+)	— Adoption of international or national standards
	2) Bedding/Baby nests	up to 6 months	+	+ + + (+)	— Properly fitting mattresses

Type of accident/injury	Specific type/product involved	Most vulnerable age group	Frequency	Severity	Possible preventive measures
Suffocation, strangulation (*continued*)	3) Bunk beds	1 — 8 years	+	+ + + (+)	— Avoidance of openings in which the child can get entrapped
	4) Plastics bags	1 — 5 years	+	+ + (+)	— Use of thicker plastics films — Standards should specify warning label for parents and air-holes where practicable
	5) Clothing/neck cords	6 months — 5 years	+	+ + + (+)	— Elimination of neck cords in children's clothing
	6) Adventure play (ropes, etc.)	10 — 14 years	+	+ + + (+)	— Supervision and education
	7) Playground equipment	2 — 14 years	+ +	+ + (+)	— Design to avoid entrapment of head, limbs or clothes
Ingestion and inhalation of foreign bodies	1) Small parts in toys, etc.	9 months — 3 years	+	+ + (+)	— Adoption of international or national standards using a truncated cylinder
	2) Food (peanuts, etc.)	all ages	+ +	+ +	— Education — Warning labelling
Falls	1) Associated with structural features in house				
	a) from windows	2 — 7 years	+	+ + (+)	— Safety catches, avoidance of low floor-window height, avoidance of window-sills — Building regulations should specify safety glass, minimum height from floor, maximum opening, etc.
	b) through bannisters and balcony railings	1 — 5 years	+	+ +	— Avoid horizontal bannister and balcony railings. Spacing of vertical and horizontal bars to be limited (the use of a test sphere of e.g. 10 cm diameter is recommended)
	c) down stairs	9 months — 5 years	+ +	+ +	— Use of stair-gates, avoid winding-stairs and long flights (Mainly a problem of supervision)
	d) through glass doors, windows, patio doors	1 — 14 years	+ +	+ + + (+)	— Use of safety glazing to recognized international or national standards in all doors and in all glazing at the floor level up to e.g. 800 mm
	2) Associated with nursery furniture, etc.				
	a) cots (see also under "Suffocation")	up to 3 years	+	+	— Adoption of international or national standards, avoidance of horizontal bars
	b) bunk beds	1 — 8 years	+	+ +	— Standards should specify stability, maximum vertical bars spacing, lack of projection, guard rails, etc.
	c) prams (carriages), push-chairs (strollers), high-chairs, baby walkers, bouncing cradles, etc.	up to 3 years	+ +	+	— Adoption of international or national standards, including stability tests — Use of harness restraints made to recognized standards
	d) pushing toys	1 — 4 years	+ +	+	— Use of recognized stability tests