TECHNICAL SPECIFICATION

ISO/TS 25740-1

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Safety requirements for escalators and moving walks —

Part 1: Global essential safety requirements (GESR)

Exigences de sécurité des escaliers mécaniques et trottoirs roulants —

Partie 1: Exigences essentielles de sécurité globale

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 25740-1 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

ISO/TS 25740 consists of the following parts, under the general title *Safety requirements for escalators and moving walks*:

— *Part 1: Global essential safety requirements (GESR)*

Future parts will address safety parameters for escalators and moving walks.

Introduction

After the publication of ISO/TR 14799-1 and ISO/TR 14799-2, discrepancies were noted in the safety standards for escalators and moving walks. A need for the establishment of global essential safety requirements (GESR) for escalators and moving walks was identified, which resulted in the publication of ISO 14798. This methodology was a critical tool in the development of this Technical Specification on safety requirements for escalators and moving walks.

The objective of this Technical Specification is to:

a) define a common global level of safety for all people using, or associated with, escalators and moving walks;

b) facilitate innovation of escalators and moving walks not designed according to existing local, national or regional safety standards, while maintaining equal levels of safety (if such innovations become state of the art, they can then be integrated into the detailed local safety standard at a later date);

c) remove trade barriers.

NOTE ISO/TS 25740-2 will contain global essential safety parameters (GESPs) for escalators and moving walks that should further assist in the use and implementation of the GESRs specified in this part of ISO/TS 25740.

Clause 4 gives the approach and methodology used in the development of this part of ISO/TS 25740. Clause 5 gives instructions for the use and implementation of GESRs. The GESRs are given in Clause 6. Each GESR specifies a safety objective, i.e. what is to be achieved rather than how to do it, in order to allow innovation and development of future technologies.

Annex A gives an overview of GESRs in relation to subsystems of escalators and moving walks. Annex B demonstrates compliance of this document with the European Directive for Machinery 2006/42/EC.

This part of ISO/TS 25740 is a basic safety standard according to the principles given in ISO/IEC Guide 51.

Safety requirements for escalators and moving walks —

Part 1:
Global essential safety requirements (GESR)

1 Scope

This part of ISO/TS 25740:

— specifies global essential safety requirements (GESRs) for escalators and moving walks, their components and functions, and

— establishes a system and provides methods for minimizing safety risks that might arise in the course of the operation and use of, or work on, escalators and moving walks.

NOTE See Clause 5 regarding the use and application of this part of ISO/TS 25740.

This part of ISO/TS 25740 is applicable to escalators and moving walks that are intended to carry persons. The escalators and moving walks to which this part of ISO/TS 25740 applies can:

a) be located in any permanent and fixed structure or building;

b) have any

1) rated load, size of load carrying unit (LCU) and speed, and

2) travel height;

c) be affected by fire in the environment of the LCU and weather conditions;

d) be misused.

This part of ISO/TS 25740 does not specifically cover:

— all needs of users with disabilities[1)];

— risks arising from work on escalators and moving walks under construction or during alterations and dismantling; vandalism; fire in the environment outside the LCU.

1) Although the GESRs specified in this part of ISO/TS 25740 have been identified and evaluated by risk assessment, not all disabilities or combinations of such disabilities of users have necessarily been addressed.

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.

ISO/IEC Guide 51:1999, *Safety aspects — Guidelines for their inclusion in standards*

ISO 14798, *Lifts (elevators), escalators and moving walks — Risk assessment and reduction methodology*

3 Terms, definitions and abbreviated terms

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

3.1
authorized person
suitably trained person with authorization to access restricted areas of escalators and moving walks (e.g. machinery spaces, separate machine rooms) and to work there for the purpose of inspection, testing and maintenance

3.2
cause
circumstance, condition, event or action that in a hazardous situation contributes to the production of an effect

[ISO 14798:2009, definition 2.1]

3.3
control
system that governs the starting, acceleration, speed, deceleration and/or stopping of the LCU

3.4
corrective action
action taken to reduce risk

3.5
electromagnetic compatibility
EMC
degree of immunity to incident electromagnetic radiation and level of emitted electromagnetic radiation of electrical apparatus

3.6
ESR
essential safety requirement
requirement intended to eliminate or sufficiently mitigate the risk of harm to users, non-users, and authorized persons using or associated with escalators and moving walks

3.7
GESR
global essential safety requirement
globally agreed upon essential safety requirement

3.8
harm
physical injury or damage to the health of people, or damage to property or the environment

[ISO/IEC Guide 51:1999, definition 3.3]

3.9
harmful event
occurrence in which a hazardous situation results in harm

[ISO/IEC Guide 51:1999, definition 3.4]

3.10
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).

[ISO/IEC Guide 51:1999, definition 3.5]

3.11
hazardous situation
circumstance in which people, property or the environment are exposed to one or more hazards

[ISO/IEC Guide 51:1999, definition 3.6]

3.12
enclosure of the travel path
structural elements which isolate the travel path from all other areas or space

3.13
incident
effect
event or occurrence, which can, but does not necessarily, create a risk of harm, including possible risks due to shearing, crushing, falling, impact, trapping, fire, electric shock, exposure to weather etc.

3.14
landing
floor, balcony or platform used to receive and discharge persons from the LCU

3.15
escalator
power-driven, inclined, continuous moving stairway, including guards adjacent to the travel path, used for raising or lowering persons in which the user carrying surface of the LCU (e.g. steps) remains horizontal

3.16
moving walk
power-driven installation for the conveyance of persons, including guards adjacent to the travel path, in which the user carrying surface of the LCU remains parallel to its direction of motion and is uninterrupted (e.g. pallets, belt)

3.17
LCU
load carrying unit
step, pallet or belt designed to carry persons for the purpose of transportation

3.18
machinery
escalator or moving walk machine(s) mechanisms and associated equipment

3.19
maintenance
process of examination, lubrication, cleaning, adjustments, repair and replacement of parts of escalators and moving walks to ensure the safe and intended functioning of escalators and moving walks and its components after the completion of the installation and throughout its life cycle

3.20
non-user
person in the vicinity of an escalator or moving walk who is not intending to access or use it

3.21
protective measure
means used to reduce risk

[ISO 14798:2009, definition 2.8]

NOTE 1 Protective measures include risk reduction by inherently safe design, protective devices, personal protective equipment, information for use and installation, and training.

NOTE 2 See also definition for “corrective actions” in 3.4.

3.22
rated load
load that the escalator or moving walk is designed to move

3.23
relative movement
situation where a component of an escalator or moving walk moves in the vicinity of other components of escalators or moving walks that are stationary, or that move at a different speed or in a different direction; also a situation where a component of an escalator or moving walk moves in the vicinity of a structure where persons might be present

EXAMPLE Building floor surrounding the escalator or moving walk.

3.24
risk
combination of the probability of occurrence of harm and the severity of that harm

[ISO/IEC Guide 51:1999, definition 3.2]

3.25
risk analysis
systematic use of available information to identify hazards and to estimate the risk

[ISO/IEC Guide 51:1999, definition 3.10]

NOTE This method aims at systematically identifying and assessing hazards, evaluating risks and recommending risk reduction measures.

3.26
risk assessment
overall process comprising a risk analysis and a risk evaluation

[ISO/IEC Guide 51:1999, definition 3.12]

3.27
risk evaluation
consideration of the risk analysis results to determine if the risk reduction is required

[ISO 14798:2009, definition 2.13]

3.28
severity
qualitative measure of the worst possible incident (effect) that could be caused by a specific hazard

3.29
transportation
process whereby persons step onto a moving LCU, which then travels from one landing to another landing, where the person exits the LCU

3.30
travel path
path and related space within which the LCU travels between the landings

3.31
uncontrolled movement
situation where

— LCU moves when the escalator or moving walk was to remain stationary, or

— LCU travels at a speed that is out of control of the means designed and intended to control the LCU speed during operation.

EXAMPLE 1 LCU starts to move, due to failure of, or breakdown in, escalator or moving walk components, such as speed control, drive or brake system.

EXAMPLE 2 The LCU speed exceeds its designed speed or does not decelerate or stop as intended, due to failure of, or breakdown in, components of an escalator or moving walk, such as speed control, drive or brake system.

3.32
user
person using the escalator or moving walk for the purpose of transportation

3.33
working area or space
area or space defined for use by authorized persons to perform maintenance, inspection or testing of an escalator or moving walk

4 Approach and methodology

4.1 Background

4.1.1 ISO 9589 specifies the building dimensions necessary to permit installation of escalators and moving walks.

4.1.2 In order to facilitate further standardization of escalator and moving walk installations and components, ISO/TC 178 carried out extensive comparison of regional and national safety standards and codes for escalators and moving walks. The results were published in ISO/TR 14799. This Technical Report gave directions for possible harmonization of several specific design and safety related rules in the regional and national standards. No agreement among the experts could be reached for global harmonization of most rules, mainly for the following reasons:

a) the compared standards and codes were based on different assumptions and experience, written at different stages of industry development, without using a consistent methodology and procedures as recommended in ISO/IEC Guide 51;

b) they were written in prescriptive rather than performance language.

4.1.3 It further became clear that prescriptive standards not only continuously lag behind the development of escalator and moving walk technologies and the state of the art, but present impediments to the progress

and innovation of industry. Differences in regional and national safety requirements affecting the designs of escalators or moving walks also pose barriers to free trade. Therefore, a new approach in the development of standards for escalators and moving walks affecting safety shall be taken.

4.2 Approach

4.2.1 This Technical Specification has been developed as a product safety standard. See 7.1 of ISO/IEC Guide 51 for the definition of the term “product safety standard”.

4.2.2 The intention was to develop essential safety requirements (ESRs) for escalators and moving walks. In broad terms, the escalator or moving walk is defined as a power-driven unit, including guards adjacent to the travel path, which carries persons from one landing to another, without any design constraints such as those that are usually specified in the regional or national escalator and moving walk standards.

Consequently, a load carrying unit (LCU) of an escalator or moving walk in this document is not necessarily a platform with fully enclosed sides. The space in which the LCU travels is not necessarily fully enclosed as may be defined in national standards.

4.2.3 By taking this approach and by using the systematic risk analysis and assessment process in accordance with ISO 14798, it was possible to establish ESRs for escalators and moving walks without imposing restrictions on the designs of, or materials and technologies used in, the escalators or moving walks.

NOTE The types of escalator and moving walk covered in this part of ISO/TS 25740 are described in the Scope.

4.3 Methodology

Following the risk analysis and assessment process set out in ISO/IEC Guide 51 and the methodology specified in ISO 14798, the working group

a) identified all safety risk scenarios, including hazardous situations, harmful events (cause), effect and harm, that could arise in all stages and conditions of the operation and use of escalators and moving walks;

b) estimated and evaluated the risk;

c) formulated ESRs when the risks required mitigation.

NOTE Table 1 gives examples of risk scenarios related to several GESRs.

5 Understanding and implementing GESRs

5.1 Overall objective

5.1.1 This part of ISO/TS 25740 may be used on its own, independently from future publications in this series, as an effective method of providing safety on escalators and moving walks.

5.1.2 Clause 6 contains a complete set of safety objectives for escalators and moving walks in the form of global essential safety requirements (GESRs), which shall be taken into consideration when mitigating safety risks that escalators and moving walks can present.

5.1.3 The objectives of the GESRs in Clause 6 are to:

a) introduce a universal approach to identifying and mitigating potential safety risks on new designs of components for escalators and moving walks that use new technologies, materials or concepts that are not adequately addressed in existing standards;

b) stimulate harmonization of existing safety standards for escalators and moving walks.

Table 1 — Examples of risk scenarios related to GESRs

Example risk scenarios	Proposed solution	Applicable GESR (see Clause 6)
Users are on a moving LCU; a user extends hand or protrudes foot out beyond the LCU perimeters; the hand or foot is engaged with external escalator objects and becomes sheared, crushed or cut.	Prevent exposure to shearing, crushing or abrasion hazards when travelling on the LCU.	**6.2.7 Hazards due to relative movement** Users and non-users shall be protected from the effects of falling, shearing, crushing or abrasion, or other injuries due to: a) movement of the LCU and other components moving in concert with the LCU relative to stationary objects; b) relative movement of the escalator or moving walk component parts.
Users are preparing to enter or exit the LCU. People are crushed and sheared or destabilized, possibly resulting in an injury if the person falls.	Prevent exposure to shearing, crushing or abrasion hazards when entering/exiting the LCU.	
Non-users are at the floor area in the vicinity of the escalator entrance or at the floor around the LCU travel path. Persons can fall, or extend hand or protrude foot towards, and engage, the moving LCU or any other escalator equipment; hand or foot is sheared, crushed or cut.	Prevent exposure to shearing, crushing or abrasion hazards when located at the floor area in the vicinity of an operating escalator or moving walk.	
There are no balustrades between the LCU travel path and floors surrounding the travel path. If a person leans over the LCU the person can fall down.	Wherever there is risk of people falling down or off the LCU, adequate guards should be provided on the sides.	**6.2.2 Falling down or off the area containing the travel path** Means shall be provided to prevent users, non-users and authorized persons from falling down or off the area containing the travel path of the LCU and related equipment.
If guards or balustrades are provided but have no adequate strength, a person could lean against such guards or balustrades, break through them and fall down.		

5.1.4 The objectives of the GESRs contained in this part of ISO/TS 25740 shall be followed. Changes in the state of the art shall not adversely affect the required level of safety.

5.1.5 A GESR states only the safety objective, or what outcomes are required, not how to accomplish that objective. Therefore, in order to achieve the safety objective of a GESR, appropriate design of components and functions of escalators and moving walks shall be selected and their compliance with the GESR shall be verified. In other words, the ability of the selected components or functions to eliminate or sufficiently mitigate the safety risks shall be demonstrated.

5.2 Use of GESRs

5.2.1 Basis

Each GESR specified in Clause 6 was established after performing the risk assessment of one or more risk scenarios that can result in harm to persons (see Table 1). Consequently, when assessing safety of an escalator or moving walk or its components or function, all risk scenarios shall be analysed and applicable GESRs shall be identified.

NOTE Risk assessment was carried out in accordance with the principles of ISO 14798.

5.2.2 Ways of using GESRs

With respect to a specific task affecting safety of escalators and moving walks, such as designing an escalator or moving walk, or their components, GESRs can be used in two ways:

— one can begin with the risk analysis of risk scenarios related to the task in order to identify the applicable GESRs as in 5.2.2.2, or

— one can begin with a review of all GESRs in order to identify those that could be applicable to the task, as in 5.2.2.3.

NOTE In addition to designing, tasks could include installing or servicing of, or writing design-prescriptive safety standards for escalators and moving walks or components thereof.

5.2.2.2 When designing an escalator or moving walk or its components, a review of the design should be made in which all possible risk scenarios are formulated. This is done by applying risk analysis and assessment in order to find out which, if any, GESRs are applicable to the design. All possible risk scenarios that could occur during operation and use should be considered, as well as during the maintenance or inspection of the escalator or moving walk.

The risk scenarios shall include specification of all possible hazardous situations, combined with all possible harmful events (causes), effects and possible levels of harm. The risk analysis of a scenario shall be followed by the process of risk estimation and evaluation in accordance with the methodology specified in ISO 14798. As long as a risk is assessed as not acceptable, the designer shall continue to improve the design or implement other protective measures until the applicable GESR has been fully complied with.

EXAMPLE By following this process, risk scenarios similar to those in the first three examples in Table 1 could be formulated and it could be concluded that there is a possibility of injury to persons exposed to shearing, crushing or abrasion hazards. The assessment of the risk will indicate that the risk needs further mitigation, which can be achieved by changing the design or by implementing other protective measures in order to comply with 6.2.7.

NOTE 1 For practical use of GESRs, see 5.3.

NOTE 2 Rationales for GESRs are given in Clause 6, following each GESR. They should assist in the understanding of the intent and use of GESRs.

5.2.2.3 The process can start with a review of GESRs specified in Clause 6. In this case, one considers the design or actual installation of the escalator or moving walk or its components with the intention of identifying those GESRs that can be applicable to the design, installation or component. Compliance with each identified GESR shall be assessed. If compliance is not self-evident, risk analysis and assessment shall be completed to demonstrate compliance.

EXAMPLE In the case of the GESR in 6.2.7 in Table 1, the design or installation of an escalator or moving walk would be observed to find out whether any person travelling on the LCU, entering or exiting the LCU, being around the travel path of the escalator or moving walk, or being in any similar situation could be exposed to shearing, crushing, abrasion or a similar hazard that could cause harm.

5.2.3 Applicability of GESRs

When analysing the safety of the design of an escalator or moving walk or a component, or when writing a design prescriptive requirement or standard, the applicability of all GESRs should be determined. Only systematic descriptions of all possible risk scenarios, combined with the risk assessment of all scenarios (see ISO 14798), determines applicability of individual GESRs.

NOTE The GESR in 6.2.13, related to the effects of earthquakes on escalators and moving walks is an example of GESRs that are not applicable to every escalator or moving walk.

5.2.4 Safety objectives of GESRs

5.2.4.1 GESRs are not “corrective actions” or “protective measures” as defined in ISO 14798. A GESR states only the safety objective; it does not specify how to achieve the objective. Therefore, when designing an escalator or moving walk, appropriate components and functions shall be selected in terms of size, dimensions, strength, force, energy, material, acceleration, reliability of performance of safety related parts, etc., as applicable. Also, their ability to eliminate or sufficiently mitigate risks in order to achieve compliance with the objective specified in the GESR shall be established.

EXAMPLE In the case of the first three examples in Table 1, in order to eliminate or mitigate the risks to persons on the LCU, in the landing area and in the area around the LCU travel path, as described in the example, one would have to determine

— the provision of a minimum height balustrade on the sides of the LCU;

— the maximum size of perforations (openings) in the balustrade and guards, if any;

— the maximum permissible force, speed, kinetic energy, if any, on the person.

NOTE There are additional GESRs applicable to the balustrades on LCU sides (see 6.2.2) and LCU travel paths, in relation to the risk of persons falling into the travel path from the LCU.

5.2.4.2 When assessing the risk on an escalator or moving walk, it is recommended that the escalator or moving walk be divided into subsystems and all risk scenarios be formulated and all risks be assessed in relation to one subsystem at a time. However, one GESR can be applicable to more than one subsystem (see Annex A).

5.2.5 Verification of compliance

In order to establish the ability of a selected component or function of an escalator or moving walk to eliminate or sufficiently mitigate a risk, as required in 5.2.4, risk analysis in accordance with ISO 14798 shall be carried out.

Furthermore, a component can be assessed as being able to eliminate or sufficiently mitigate a risk, but the same component can create a new hazard, or the component can incorporate elements that could fail and make the protective function of the whole component void. For that reason, the reliability of components, built-in elements and functions to perform as intended shall be established through the risk analysis and assessment process.

EXAMPLE A failure of a solid state or software element in the LCU speed-control components, which are provided for compliance with the GESR in 6.5.5, can make the component non-functional, allowing the LCU to move out of control.

5.3 Use of this part of ISO/TS 25740

5.3.1 General considerations

This part of ISO/TS 25740 provides a uniform process for assessing the safety of escalators and moving walks. The GESRs are intended for use by:

a) developers of safety or safety-related standards for escalators and moving walks (this can be a product safety standard or a product standard containing safety aspects as defined in ISO/IEC Guide 51:1999, 7.1);

b) designers of escalators and moving walks, manufacturers and installers, and maintenance and service organizations;

c) independent third-party conformity assessment bodies (if any);

d) inspection and testing bodies and similar organisations.

5.3.2 Standards developers

5.3.2.1 Standards developers, e.g. Technical Committees, should use GESRs when:

a) reviewing, updating or revising existing standards;

b) formulating new standards, including those related to new innovative designs and concepts of escalators and moving walks or their components not previously covered in published standards.

5.3.2.2 When reviewing, updating or revising existing standards, standards developers should refer to the applicable GESRs to verify that the existing standards provide sufficient rules to ensure full compliance with the safety objectives in the GESRs.

5.3.2.3 New standards relating to the safety of escalators or moving walks can be performance-type (goal-oriented) or design-prescriptive type standards. In either case, each GESR should be considered, adopted or referenced and used as a basis when specifying safety requirements.

EXAMPLE The GESR in 6.5.2 states “means shall be provided to support the fully loaded LCUs”. Based on this GESR, which addresses the means supporting the LCU (e.g. supporting structure and building supports), standards developers should:

— in the case of performance-type standards, establish more specific performance requirements for the LCU support means, such as the minimum working life, resistance to environmental conditions, inspection criteria;

— in the case of a design-prescriptive-type standard, specify design requirements, such as the minimum number and type of supports, minimum safety factor, maximum deflection requirements.

5.3.3 Designers, manufacturers, installers, maintenance and service organisations

5.3.3.1 Escalator and moving walk components and functions

Escalator and moving walk components and functions should be designed, manufactured, installed, adjusted and maintained in accordance with:

a) locally adopted standards for escalators and moving walks or other applicable standards intended to meet the protection level required by the GESRs,

b) this part of ISO/TS 25740, in which case the selected components and functions shall be proved to meet the safety objective of the GESRs through the risk analysis and assessment process in accordance with ISO 14798, or

c) a combination of a) and b), and, if necessary, tested, certified and assessed for conformity with applicable regional or local regulations.

5.3.3.2 Proof of compliance

5.3.3.2.1 Compliance with 5.3.3.1 a) is achieved by meeting all the requirements of a standard that is harmonized with the GESRs and other regulations applicable to the jurisdiction in which the escalator or moving walk is to be operated (e.g. building standards).

5.3.3.2.2 Compliance with 5.3.3.1 b) is achieved by identifying all risk scenarios (see 5.2.2) related to the particular design of an escalator or moving walk, and by conducting risk assessment using the methodology of ISO 14798 in order to demonstrate that the requirements specified in all applicable GESRs have been complied with, and their safety objectives achieved.

NOTE According to ISO 14798, a balanced team of experts with experience in the design, manufacture, installation, maintenance and inspection of escalators and moving walks should conduct the risk assessment. The team should be led by a facilitator who is well versed and experienced in escalator and moving walk technology and in the use of ISO/ 14798. The results of the study should be documented and any identified risks should be sufficiently mitigated. This approach is particularly useful for innovative products that have not been covered by existing design-prescriptive standards.

5.3.3.2.3 The approach in 5.3.3.1 c) applies to escalators and moving walks that meet most requirements of a standard harmonized with the GESRs, but that have certain innovative features not specifically covered by the standard. Such cases may be handled as follows:

a) Identify all areas where the escalator or moving walk does not comply with specific prescriptive requirements of the harmonized standard.

b) Identify specific requirements of the harmonized standard that the innovative features of an escalator or moving walk do not meet. In addition, identify all GESRs related to the requirements that the escalator or moving walk, in combination with the innovative features, cannot meet.

c) Conduct risk assessment, as described in 5.3.3.2.2, of the aspects, areas or features of the escalator or moving walk that are expected to meet the GESRs identified in b). Any identified risk should be sufficiently mitigated as to achieve a safety level that is at least equivalent to that required by the harmonized standard.

5.3.4 Conformity assessment bodies

When independent third party conformity assessment bodies are involved in the assessment of compliance of an escalator or moving walk or its components with the GESRs, they should use this part of ISO/TS 25740 in various ways. These include:

a) verifying the designer's, manufacturer's or other organization's documentation (e.g. designs, testing procedures, reports on risk assessments) that demonstrate conformity with GESRs, and

b) formulating their own risk scenarios and verifying applicability to, and compliance with, specific GESRs.

For this purpose a procedure similar to that described in 5.2 and 5.3.3 should be followed.

NOTE Some jurisdictions require verification of compliance with GESRs by a third party. Furthermore, sometimes designers, manufacturers, purchasers or other parties wish to obtain an independent third party verification of conformity with GESRs.

5.3.5 Inspection and testing bodies

Where the inspection and testing procedure is not specified in the applicable harmonized standards, inspectors use this part of ISO/TS 25740 when:

a) verifying that applicable GESRs have been taken into account by the designer, manufacturer, installer or maintainer;

b) verifying the suitability of the inspection and testing procedures proposed in the designer's or manufacturer's documentation, or when establishing own procedure by using GESRs and analyzing related risk scenarios;

c) assessing the inspection and test results.

For this purpose, a procedure similar to that described in 5.2 and 5.3.3 should be followed.

6 Global essential safety requirements (GESRs)

6.1 General

An escalator and moving walk shall comply with the applicable safety requirements specified in this clause.

NOTE 1 The ESRs are grouped in this clause on the basis of the locations where a person could be exposed to a hazard, hazardous situation or event. The locations include the space adjacent to escalators and moving walks (see 6.3), landing areas (see 6.4), space on the LCU (see 6.5), and working areas (see 6.6). The common requirements that are applicable to more than one location are listed in 6.2.

NOTE 2 Annex A is provided to give an overview of the GESRs that are potentially applicable to therein specified subsystems of escalators and moving walks.

6.2 Common GESRs related to persons at different locations

6.2.1 Strength and size

The equipment of an escalator or moving walk shall be capable of sustaining and accommodating all loads and forces (including impact forces) imposed during normal and emergency operation.

6.2.2 Falling down or off the area containing the travel path

Means shall be provided to prevent users, non-users and authorized persons from falling down or off the area containing the travel path of the LCU and related equipment.

NOTE This GESR addresses the risk of falling into, onto or from the travel path

— from surrounding floors, and

— from an LCU.

The rate of change in the direction of the LCU shall be limited to prevent users from losing balance and falling.

To minimize the risk of falling during any stopping phase, the deceleration of the LCU shall be limited.

Compliance with this GESR can be achieved by guards or barriers adjacent to the travel path of the LCU in relation to falling off.

6.2.3 Supports for escalator and moving walk equipment

The means used to support the escalator and moving walk equipment shall be capable of sustaining all loads and forces (including impact forces) imposed during normal operation and emergency situations.

NOTE The forces referred to in 6.2.1 are those that result from the intended use and emergency situations (e.g. emergency brake operations).

6.2.4 Maintenance of escalators and moving walks

Where maintenance is required to ensure continued safety, appropriate instructions shall be provided and suitably trained personnel shall perform any required work.

NOTE This applies to the components of escalators and moving walks and functions that are subject to wear and tear; not to those designed for maintenance-free operation. Adequate maintenance is a key element in keeping escalators and moving walks in safe operating condition. This GESR aims to prevent the performance of maintenance work by untrained persons.

6.2.5 Equipment inaccessible to users and non-users

Equipment that is hazardous shall not be directly accessible to users and non-users.

NOTE Inaccessible locations include enclosed areas, a locked cover or door, out-of-reach locations or separate machine rooms.

6.2.6 Surfaces of the LCU, landing and working areas

The risk of tripping and slipping shall be minimized on the surface of the LCU, at landings and standing areas of workplaces.

NOTE When considering non-slip materials, attention should be given to the fact that the roughness of a material does not remain consistent over time and can vary depending on housekeeping operations (e.g. cleaning).

6.2.7 Hazards due to relative movement

Users and non-users shall be protected from the effects of falling, shearing, crushing or abrasion, or other injuries due to:

a) movement of the LCU and other components moving in concert with the LCU relative to stationary objects;

b) relative movement of the escalator or moving walk component parts.

NOTE 1 For authorized persons, see 6.6.

NOTE 2 This GESR addresses the safety of persons located on the LCU, at the landing areas and adjacent to the escalator or moving walk.

6.2.8 Sharp edges

Means shall be provided to sufficiently mitigate the risk to users and non-users of exposure to sharp edges.

NOTE For authorized persons, see 6.6.

6.2.9 Hazards arising from the risk of electric shock

Where electricity is present, means shall be provided to sufficiently mitigate the risk to users and non-users of being exposed to electric shock.

NOTE For authorized persons, see 6.6.

6.2.10 Electrical equipment

The electrical equipment of escalators and moving walks shall be so designed, manufactured and installed as to ensure protection against hazards arising from it.

NOTE Compliance with this GESR is achieved by ensuring that the electrical components or systems in a failure mode do not create a hazardous situation.

6.2.11 Electromagnetic compatibility

The safe operation of escalators and moving walks shall not be influenced by electromagnetic interferences (EMC). The electromagnetic emission of escalators and moving walks shall be restricted to specified limits.

NOTE The immunity should be sufficient to prevent unsafe situations if an escalator or moving walk is submitted to foreseeable radiation. “Immunity” includes immunity to internal (self-generated radiation) and immunity to external influences. The tolerable amount of electromagnetic emission depends on the environment in which an escalator or moving walk is operating and is defined in specific standards.

6.2.12 Illumination of LCU and landings

LCU and landings shall be provided with adequate illumination during use.

NOTE 1 Adequate illumination means that the level of light is sufficient for safe transportation on the LCU (including access and egress).

NOTE 2 For illumination of working areas, see 6.6.10.

6.2.13 Effects of earthquake

In areas vulnerable to earthquake, means shall be provided to minimize the risk to users and authorized persons of the foreseeable effects of earthquakes on the escalator and moving walk equipment.

This GESR requires suitable support of the building interface such that the escalator or moving walk remains in position on the structure.

6.2.14 Hazardous materials

The characteristics and quantity of material used for the construction of escalators and moving walks shall not lead to hazardous situations.

Fire protection and the use in case of fire shall be addressed.

NOTE Hazardous situations for users, non-users and authorized persons include toxicity, fumes, exposure to chemicals, flammability, exposure to asbestos, etc.

6.2.15 Environmental influences

Users and authorized persons shall be protected from environmental influences.

NOTE Environmental influences include the foreseeable weather conditions of the area where the escalator or moving walk is installed. Users and authorized persons should be protected against exposure to the influences (e.g. by heating or cooling working spaces, protective coverings). In addition, there should be adequate protection of safety-related escalator and moving walk elements that are susceptible to weather conditions.

6.2.16 Noise and vibration

Machinery shall be designed and constructed in such a way that risks resulting from vibrations produced by the machinery are reduced to the lowest level, taking account of technical progress and the availability of means of reducing vibration, in particular at source.

The level of vibration emission may be assessed with reference to comparative emission data for similar machinery.

This GESR requires users, non-users and authorized persons not to be subjected to levels of noise and vibration which are a risk to health.

6.2.17 Exclusive use of machinery spaces

Objects not used directly in connection with the escalator or moving walk shall not be installed in their machinery spaces.

NOTE Sprinkler systems and other heat detection system directly connected with the machinery are permitted.

6.2.18 Starting

Starting of the LCU (or making it available for use when starting is automatic by a user passing a certain point) shall be effected by one or more switches available to authorized persons only and shall be reachable from an area outside the LCU. The person who operates the switch shall have means of ensuring that nobody is using any LCU before making this operation.

6.3 GESRs related to non-users

6.3.1 Contact with moving or rotating parts

Means shall be provided to prevent an unsafe condition occurring as a result of contact with moving or rotating parts by non-users.

6.3.2 Failure mode

Failure of any part of an escalator or moving walk shall not cause injury to non-users.

NOTE This GESR addresses the risk of injury arising from a single component failure.

6.3.3 Environmental influence

Non-users shall be protected from environmental influences.

NOTE This GESR addresses the risk of falling in a landing area, especially when non-users are traversing landing areas which are affected by weather conditions.

6.4 GESRs related to persons on the landings

6.4.1 Falling from the landings

Means shall be provided to prevent persons falling from the landing areas immediately adjacent to the escalator or moving walk.

NOTE This GESR addresses the risk of persons climbing or being carried over the barriers immediately adjacent to the escalator or moving walk.

6.4.2 Access and egress

Safe means of access and egress shall be provided to the LCU at landings by way of adequate spaces, dimensions and instructions.

NOTE This GESR is applicable to the process of entering and leaving the LCU during normal use of the escalator or moving walk.

6.4.3 Alignment of LCU and landing

Any tripping hazard at the transfer from LCU to the landings and vice versa shall be minimized.

NOTE This intention of this GESR is to facilitate safe access and egress to and from the LCU.

6.5 GESRs related to users on the LCU

6.5.1 Strength and size

The LCU shall accommodate and adequately support rated load.

NOTE This GESR primarily addresses the transportation of people. “Accommodate” in this context means to provide space (volume) for the intended number of users, considering dimension and weight of persons.

6.5.2 LCU support

Means shall be provided to support the fully loaded LCUs.

NOTE This GESR addresses the strength of the supporting structure, guiding and retention system, when the LCUs are loaded with their rated load.

6.5.3 Entrapment between LCU component parts

The likelihood of entrapment between LCU components shall be minimized.

NOTE This GESR addresses the profile, tolerances and integrity of fixings of the LCU components and the interface between LCUs.

6.5.4 Entrapment between LCU and adjacent surfaces

Means shall be provided to minimize entrapment between the LCU and adjacent surfaces.

NOTE This GESR addresses the clearances, the retention system, the strength and the friction characteristics of the adjacent surfaces.

6.5.5 Uncontrolled movement of LCU

Means shall be provided to limit uncontrolled movement of the LCU and to minimize the resulting risk of injury.

NOTE Uncontrolled movement of the LCU includes overspeed, reversal, moving from a stationary condition, power failure, etc.

6.5.6 LCU collision with objects in the travel path

Means shall be provided to avoid collision of the LCU with any equipment in the travel path that could cause injuries to users.

NOTE The intention of this GESR is to minimize the risk of injury that occurs when the LCU moves out of the travel path, e.g. loss of LCU support.

6.5.7 Change of speed of the LCU

Means shall be provided to ensure that any change of speed of the LCU shall be limited, in order to minimize the risk of injury to the users.

NOTE This GESR addresses user-initiated starting or changing the speed of the LCU.

6.5.8 Stopping means adjacent to the LCU

Means shall be provided, adjacent to the LCU, for users and non-users to intentionally stop the movement of the LCU.

This GESR requires that stopping devices shall be positioned so that users and non-users can operate them to minimize the risk of injury to users.

6.5.9 Succeeding LCUs

Succeeding LCUs shall be controlled in such a way that a failure or stop of one LCU does not create a hazard to users.

6.5.10 Stopping the LCU

There shall be no intentional delay in the application of the braking system.

6.6 GESRs related to authorized persons at working areas

6.6.1 Working space

Adequate and safe working space shall be provided.

NOTE “Adequate” takes into account the ergonomics principles related to the task to be performed.

6.6.2 Accessible equipment

All equipment requiring maintenance shall be safely accessible.

6.6.3 Access to and egress from working spaces

Access to and egress from working spaces in or adjacent to the escalator or moving walk shall be safe.

6.6.4 Strength of working areas

Means shall be provided to accommodate and support the mass of person(s) and associated equipment in any designated working area.

NOTE The number of persons and associated equipment needed to fulfil the anticipated working activities should be determined. Those activities do not include major repairs when the working area needs to be enlarged and reinforced.

6.6.5 Movement of the LCU under the sole control of an authorized person

Means shall be provided to enable movement of the LCU under the sole control of an authorized person.

NOTE This GESR is intended to mitigate the risk of shearing or entrapment of a person when working on the escalator or moving walk.

6.6.6 Protection from moving parts

Means shall be provided to prevent injury from moving parts.

6.6.7 Stopping devices in working areas

For working areas where there is exposure to movement of the escalator or moving walk equipment, means shall be provided to stop the escalator or moving walk and to prevent unintentional starting.

This GESR requires the fitting of stopping devices that require manual resetting before the escalator or moving walk can operate.

6.6.8 Means of protection from various hazards

Means shall be provided to adequately protect an authorized person in working spaces from the effects of shearing, crushing, abrasion, laceration, high temperature or entrapment.

6.6.9 Electric shock in working spaces

Equipment shall be designed and installed to minimize the risk of harm to authorized persons due to the effects of electricity.

NOTE Servicing of escalators and moving walks sometimes requires that authorized people access live parts of electrical equipment.

6.6.10 Illumination of working spaces

All working spaces and access thereto shall be provided with adequate illumination when authorized persons are present.

NOTE “Adequate illumination” means that the level of light is sufficient for safe access and for performance of any maintenance operation of the escalator or moving walk equipment. Illumination may be switched off in the absence of authorized persons. Emergency lighting should be provided in places where movement of authorized persons in darkness is dangerous.

6.6.11 Harmful materials and environment

Authorized persons shall be protected against harmful material and harmful environmental influence.

6.6.12 Ergonomic principles

It shall be possible to carry out routine maintenance operations taking account of ergonomic principles.

This GESR requires that routinely handled parts can be safely moved (e.g. using lifting equipment for heavy loads).

6.6.13 Handling and transportation

Complete escalators and, moving walks, or sub-assemblies and components of escalators and moving walks which cannot be handled by hand shall:

a) either be equipped with fittings for movement by a lifting device or means of transportation, or

b) be designed in a way that such fittings can be attached (e.g. threaded holes), or

c) be shaped in a way that the lifting device or means of transportation can be attached easily.

Annex A
(informative)

Overview of GESRs in relation to subsystems of escalators and moving walks

A.1 General

Global essential safety requirements (GESRs) are specified in Clause 6 and grouped according to the locations of escalators and moving walks where a person could be exposed to a hazard, a hazardous situation or event. This annex is provided to assist users who view an escalator or moving walk as a combination of clearly distinguishable subsystems. Table A.1 gives an overview of all GESRs listed in Clause 6 in relation to subsystems.

A.2 Summary of GESRs specified in Clause 6

Table A.1 — Cross-referencing of GESRs in Clause 6 and escalator and moving walk subsystems

Reference for GESR	GESR in Clause 6	Balustrade	Building [a]	Control subsystem [b]	Drive unit / brake system	Landing	Supporting structure	Travel path of LCU	Handrail system	Load carrying unit (LCU)	Safety devices	Working area or space
6.2	**Common GESRs related to persons at different locations**											
6.2.1	Strength and size	x			x	x	x	x	o	x		o
6.2.2	Falling down or off the area containing the travel path	x		o		x		x		x	x	
6.2.3	Supports for escalator and moving walk equipment		x				o					
6.2.4	Maintenance of escalators and moving walks	o		o	o	o	o	o	o	o	o	o
6.2.5	Equipment inaccessible to users and non-users				x		o				o	x
6.2.6	Surfaces of the LCU, landing and working areas					x				x		x
6.2.7	Hazards due to relative movement	x	x			x		x	x	x		
6.2.8	Sharp edges	x	o			x	x	x	x	o		x
6.2.9	Hazards arising from the risk of electrical shock			x	x		o		x	x	x	
6.2.10	Electrical equipment			x	x						x	
6.2.11	Electromagnetic compatibility			x	x						x	
6.2.12	Illumination of LCU and landings		o			x		o		x		
6.2.13	Effects of earthquake	x	o			x	x				o	
6.2.14	Hazardous materials	o	o	x	x			o	x	o		o

Table A.1 *(continued)*

Reference for GESR	GESR in Clause 6	Balustrade	Building [a]	Control subsystem [b]	Drive unit / brake system	Landing	Supporting structure	Travel path of LCU	Handrail system	Load carrying unit (LCU)	Safety devices	Working area or space
6.2.15	Environmental influences	o	o	o		x	o		o	x	o	o
6.2.16	Noise and vibration				x				x	x		
6.2.17	Exclusive use of machinery spaces		o				o					x
6.2.18	Starting			o	o					x	o	
6.3	**GESRs related to non-users**											
6.3.1	Contact with moving or rotating parts					o	x		x			
6.3.2	Failure mode	x				x	x					
6.3.3	Environmental influence		x			x						
6.4	**GESRs related to persons at the landing**											
6.4.1	Falling from the landings	x	x			x			x			
6.4.2	Access and egress		x			x			x	x		
6.4.3	Alignment of LCU and landing		x			x		x		x	o	
6.5	**GESRs related to users on the LCU**											
6.5.1	Strength and size						o	x		x	o	
6.5.2	LCU support						x	o		o	o	
6.5.3	Entrapment between LCU component parts									x	o	
6.5.4	Entrapment between LCU and adjacent surfaces	x				x		x		x	o	
6.5.5	Uncontrolled movement of LCU			x	x		o	o			x	
6.5.6	LCU collision with objects in the travel path	x				x	x	x		x	x	
6.5.7	Change of speed of the LCU			x	x				o		x	
6.5.8	Stopping means adjacent to the LCU	x	o	x		o					x	
6.5.9	Succeeding LCUs			x	o	o		o			x	
6.5.10	Stopping of the LCU			x	o						x	
6.6	**GESRs related to authorized persons at working areas**											
6.6.1	Working space		o	o								x
6.6.2	Accessible equipment	o		o	o	o	o	o	o	o	o	x
6.6.3	Access to and egress from working spaces		x	o								x
6.6.4	Strength of working areas		o				x					x
6.6.5	Movement of the LCU under the sole control of an authorized person		o	x							o	o

Table A.1 *(continued)*

Reference for GESR	GESR in Clause 6	Balustrade	Building [a]	Control subsystem [b]	Drive unit / brake system	Landing	Supporting structure	Travel path of LCU	Handrail system	Load carrying unit (LCU)	Safety devices	Working area or space
6.6.6	Protection from moving parts							o			x	x
6.6.7	Stopping devices in working areas				o					o	x	x
6.6.8	Means of protection from various hazards	o		o	o	o	o	o	o	o	o	x
6.6.9	Electric shock in working spaces	o		x	x						x	x
6.6.10	Illumination of working spaces			x								x
6.6.11	Harmful materials and environment	o	o	o	o	o	o	o	o	o	o	x
6.6.12	Ergonomic principles	o	o	o	o	o	o	o	o	o	o	x
6.6.13	Handling and transportation	o	o				x			o		x

Explanation of symbols:

X identifies a GESR that is primarily applicable to the escalator or moving walks subsystem(s) identified in the heading

O identifies a GESR that might be applicable to the escalator or moving walks subsystem(s) identified in the heading

[a] Including its structure, surrounds, machinery space and building equipment not provided by the escalator or moving walk contractor.

[b] Including electrical equipment and wiring, except safety devices.

Annex B
(informative)

Compliance of this part of ISO/TS 25740 with the European Directive for Machinery 2006/42/EC

B.1 Introduction

The objective of this annex is to demonstrate that the same safety objective can be achieved by complying with either the GESRs of ISO/TS 25740-1 or the ESRs of the Machinery Directive (2006/42/EC).

This annex does not provide a legal interpretation of the ESRs of the Machinery Directive. While there may not be a one-to-one correlation between specific ESRs and GESRs meeting all of the relevant ESRs or all of the relevant GESRs, an equivalent level of safety will be achieved.

This annex applies the "Guidance on the implications of the ISO Global Relevance policy for CEN standardization" with the intention of supporting the European New Approach Directives applicable to escalators and moving walks. Route C as specified in B.4 is being used (see Figure B.1).

The basic hazards associated with escalators and moving walks are similar for typical escalator and moving walk installations around the world. Therefore, safety objectives to be achieved by designers and manufacturers can be formulated in a commonly acceptable form.

This Technical Specification is a collection of GESRs that should be considered when assessing and reducing risk for any new escalator or moving walk, regardless of the geographical location of the installation.

Safety objectives to be achieved and related assessments are an integral part of many national regulations. Where no national regulation on safety assessment exists, this specification can be used for establishing such regulations. Where national regulations already exist, this specification can be considered to complement and assist those regulations in practical use. However, due to historical reasons and market differences, some differences between the existing regulations and the GESRs of this Technical Specification already exist. For these known cases, this Technical Specification highlights and clarifies such differences and demonstrates equivalence. Market participants and stakeholders should make every effort to remove the differences and bring the requirements closer to this Technical Specification GESRs.

The Machinery Directive (2006/42/EC) specifies requirements for machines in the European Union. The directive formulates the relevant ESRs and also the assessment procedures to be followed in order to demonstrate conformity to those ESRs for machines. Reference to the EMC Directive (2004/108/EC) is made through the Machinery Directive.

The Machinery Directive came into force on 29 December 2009 and has been transposed into the national laws by all EU Member States. By means of this transposition, all legal obligations of the Machinery Directive have identically been incorporated into the national laws of each Member State and enforced. Since that date, all escalators and moving walks introduced to the market in any EU Member State have had to comply with the requirements of the Machinery Directive.

B.2 General

B.2.1 This annex compares the ESRs of the Machinery Directive and the GESRs of this Technical Specification, which highlights and clarifies the differences and demonstrates equivalence of the safety objectives.

B.2.2 This annex is not applicable to other considerations such as conformity assessment procedures, market surveillance, markings, documentation, etc. which are beyond the scope of this document.

B.2.3 The ISO 25740 series provides the necessary tools for performance-based design.

This annex can be considered in addition to this Technical Specification by designers and manufacturers wishing to introduce products conforming to this Technical Specification to the EU market.

NOTE This Technical Specification in combination with this annex provides a set of ESRs to be considered in design and installation of escalators or moving walks. Importers to the EU or their representatives in the EU should also comply with the conformity assessment procedures leading to the CE Marking of escalators and moving walks.

B.3 Comparison of GESRs with Machinery Directive 2006/42/EC

The application of the GESRs of this Technical Specification or ESRs of the Machinery Directive will result in products with equivalent safety. However, there are differences in the formulation of the GESRs and ESRs which makes it difficult to have a one-to-one comparison. Therefore this Technical Specification indicates the equivalence of the requirements taken as a whole as shown in Table B.1.

GESRs listed in this Technical Specification which are not clearly identified by the Directive 2006/42/EC can be seen in Table B.2.

Table B.1 — Comparison of GESRs with the Machinery Directive (2006/42/EC)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.1.1 Definitions For the purpose of this annex: (a) “hazard” means a potential source of injury or damage to health; (b) “danger zone” means any zone within and/or around machinery in which a person is subject to a risk to his health or safety; (c) “exposed person” means any person wholly or partially in a danger zone; (d) “operator” means the person or persons installing, operating, adjusting, maintaining, cleaning, repairing or moving machinery; (e) “risk” means a combination of the probability and the degree of an injury or damage to health that can arise in a hazardous situation; (f) “guard” means a part of the machinery used specifically to provide protection by means of a physical barrier; (g) “protective device” means a device (other than a guard) which reduces the risk, either alone or in conjunction with a guard; (h) “intended use” means the use of machinery in accordance with the information provided in the instructions for use; (i) “reasonably foreseeable misuse” means the use of machinery in a way not intended in the instructions for use, but which may result from readily predictable human behaviour.	**3.1 to 3.33 Terms, definitions and abbreviated terms**

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.1.2 Principles of safety integration (a) Machinery must be designed and constructed so that it is fitted for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof. The aim of measures taken must be to eliminate any risk throughout the foreseeable lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping. (b) In selecting the most appropriate methods, the manufacturer or his authorized representative must apply the following principles, in the order given: — eliminate or reduce risks as far as possible (inherently safe machinery design and construction), — take the necessary protective measures in relation to risks that cannot be eliminated, — inform users of the residual risks due to any shortcomings of the protective measures adopted, indicate whether any particular training is required and specify any need to provide personal protective equipment. (c) When designing and constructing machinery and when drafting the instructions, the manufacturer or his authorized representative must envisage not only the intended use of the machinery but also any reasonably foreseeable misuse thereof. The machinery must be designed and constructed in such a way as to prevent abnormal use if such use would engender a risk. Where appropriate, the instructions must draw the user's attention to ways — which experience has shown might occur — in which the machinery should not be used. (d) Machinery must be designed and constructed to take account of the constraints to which the operator is subject as a result of the necessary or foreseeable use of personal protective equipment. (e) Machinery must be supplied with all the special equipment and accessories essential to enable it to be adjusted, maintained and used safely.	**5 Understanding and implementing GESRs**
1.1.3 Materials and products The materials used to construct machinery or products used or created during its use must not endanger persons' safety or health. In particular, where fluids are used, machinery must be designed and constructed to prevent risks due to filling, use, recovery or draining.	**6.2.14 Hazardous materials** The characteristics and quantity of material used for the construction of escalators and moving walks shall not lead to hazardous situations. **6.6.11 Harmful materials and environment** Authorized persons shall be protected against harmful material and harmful environmental influence.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.1.4 Lighting Machinery must be supplied with integral lighting suitable for the operations concerned where the absence thereof is likely to cause a risk despite ambient lighting of normal intensity. Machinery must be designed and constructed so that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects on moving parts due to the lighting. Internal parts requiring frequent inspection and adjustment, and maintenance areas must be provided with appropriate lighting.	**6.2.12 Illumination of LCU and landings** LCU and landings shall be provided with adequate illumination during use. **6.6.10 Illumination of working spaces** All working spaces and access thereto shall be provided with adequate illumination when authorized persons are present
1.1.5 Design of machinery to facilitate its handling Machinery, or each component part thereof, must: — be capable of being handled and transported safely, — be packaged or designed so that it can be stored safely and without damage. During the transportation of the machinery and/or its component parts, there must be no possibility of sudden movements or of hazards due to instability as long as the machinery and/or its component parts are handled in accordance with the instructions. Where the weight, size or shape of machinery or its various component parts prevents them from being moved by hand, the machinery or each component part must: — either be fitted with attachments for lifting gear, or — be designed so that it can be fitted with such attachments, or — be shaped in such a way that standard lifting gear can be fitted easily. Where machinery or one of its component parts is to be moved by hand, it must: — either be easily moveable, or — be equipped for picking up and moving safely. Special arrangements must be made for the handling of tools and/or machinery parts which, even if lightweight, could be hazardous.	**6.6.13 Handling and transportation** Complete escalators and moving walks, or sub-assemblies and components of escalators and moving walks which cannot be handled by hand shall: a) either be equipped with fittings for movement by a lifting device or means of transportation, or b) be designed in a way that such fittings can be attached (e.g. threaded holes), or c) be shaped in a way that the lifting device or means of transportation can be attached easily.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.1.6 Ergonomics Under the intended conditions of use, the discomfort, fatigue and physical and psychological stress faced by the operator must be reduced to the minimum possible, taking into account ergonomic principles such as: — allowing for the variability of the operator's physical dimensions, strength and stamina, — providing enough space for movements of the parts of the operator's body, — avoiding a machine-determined work rate, — avoiding monitoring that requires lengthy concentration, — adapting the man/machinery interface to the foreseeable characteristics of the operators.	**6.6.1 Working space** Adequate and safe working space shall be provided. **6.6.12 Ergonomic principles** It shall be possible to carry out routine maintenance operations, taking account of ergonomic principles. This GESR requires that routinely handled parts can be safely moved e.g. using lifting equipment for heavy loads.
1.1.7 Operating positions	**N/A**
1.1.8 Seating	**N/A**
1.2.1 Safety and reliability of control systems Control systems must be designed and constructed in such a way as to prevent hazardous situations from arising. Above all, they must be designed and constructed in such a way that: — they can withstand the intended operating stresses and external influences, — a fault in the hardware or the software of the control system does not lead to hazardous situations, — errors in the control system logic do not lead to hazardous situations, — reasonably foreseeable human error during operation does not lead to hazardous situations. Particular attention must be given to the following points: — the machinery must not start unexpectedly, — the parameters of the machinery must not change in an uncontrolled way, where such change may lead to hazardous situations, — the machinery must not be prevented from stopping if the stop command has already been given, — no moving part of the machinery or piece held by the machinery must fall or be ejected, — automatic or manual stopping of the moving parts, whatever they may be, must be unimpeded, — the protective devices must remain fully effective or give a stop command, — the safety-related parts of the control system must apply in a coherent way to the whole of an assembly of machinery and/or partly completed machinery. For cableless control, an automatic stop must be activated when correct control signals are not received, including loss of communication.	**6.2.10 Electrical equipment** The electrical equipment of escalators and moving walks shall be so designed, manufactured and installed as to ensure protection against hazards arising from it. **6.5.5 Uncontrolled movement of LCU** Means shall be provided to limit uncontrolled movement of the LCU. **6.5.7 Change of speed of the LCU** Means shall be provided to ensure that any change of speed of the LCU is limited in order to minimize the risk of injury to the users. **6.5.10 Stopping the LCU** There shall be no intentional delay in the application of the braking system. **6.6.5 Movement of the LCU under the sole control of an authorized person** Means shall be provided to enable movement of the LCU under the sole control of an authorized person. **6.6.7 Stopping devices in working area** For working areas where there is exposure to movement of the escalator or moving walk equipment, means shall be provided to stop the escalator or moving walk and prevent unintentional starting.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.2.2 Control devices Control devices must be: — clearly visible and identifiable, using pictograms where appropriate, — positioned in such a way as to be safely operated without hesitation or loss of time and without ambiguity, — designed in such a way that the movement of the control device is consistent with its effect, — located outside the danger zones, except where necessary for certain control devices such as an emergency stop or a teach pendant, — positioned in such a way that their operation cannot cause additional risk, — designed or protected in such a way that the desired effect, where a hazard is involved, can only be achieved by a deliberate action, — made in such a way as to withstand foreseeable forces; particular attention must be paid to emergency stop devices liable to be subjected to considerable forces. Where a control device is designed and constructed to perform several different actions, namely where there is no one-to-one correspondence, the action to be performed must be clearly displayed and subject to confirmation where necessary. Control devices must be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles. Machinery must be fitted with indicators as required for safe operation. The operator must be able to read them from the control position. From each control position, the operator must be able to ensure that no-one is in the danger zones, or the control system must be designed and constructed in such a way that starting is prevented while someone is in the danger zone. If neither of these possibilities is applicable, before the machinery starts, an acoustic and/or visual warning signal must be given. The exposed persons must have time to leave the danger zone or prevent the machinery starting up. If necessary, means must be provided to ensure that the machinery can be controlled only from control positions located in one or more predetermined zones or locations. Where there is more than one control position, the control system must be designed in such a way that the use of one of them precludes the use of the others, except for stop controls and emergency stops. When machinery has two or more operating positions, each position must be provided with all the required control devices without the operators hindering or putting each other into a hazardous situation.	**6.5.8 Stopping means adjacent to the LCU** Means shall be provided, adjacent to the LCU, for intentionally stopping the movement of the LCU by the user and non-user. **6.6.7 Stopping devices in working area** For working areas where there is exposure to movement of the escalator or moving walk equipment, means shall be provided to stop the escalator or moving walk and prevent unintentional starting.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.2.3 Starting It must be possible to start machinery only by voluntary actuation of a control device provided for the purpose. The same requirement applies: — when restarting the machinery after a stoppage, whatever the cause, — when effecting a significant change in the operating conditions. However, the restarting of the machinery or a change in operating conditions may be effected by voluntary actuation of a device other than the control device provided for the purpose, on condition that this does not lead to a hazardous situation. For machinery functioning in automatic mode, the starting of the machinery, restarting after a stoppage, or a change in operating conditions may be possible without intervention, provided this does not lead to a hazardous situation. Where machinery has several starting control devices and the operators can therefore put each other in danger, additional devices must be fitted to rule out such risks. If safety requires that starting and/or stopping must be performed in a specific sequence, there must be devices which ensure that these operations are performed in the correct order.	**6.2.18 Starting** Starting of the LCU (or making it available for use when starting is automatic by a user passing a certain point) shall be effected by one or more switches available to authorized persons only and be reachable from an area outside the LCU. The person who operates the switch shall have means of ensuring that nobody is using the LCU before making this operation. **6.6.7 Stopping devices in working area** For working areas where there is exposure to movement of the escalator or moving walk equipment, means shall be provided to stop the escalator or moving walk and prevent unintentional starting.
1.2.4 Stopping **1.2.4.1 Normal stop** Machinery must be fitted with a control device whereby the machinery can be brought safely to a complete stop. Each workstation must be fitted with a control device to stop some or all of the functions of the machinery, depending on the existing hazards, so that the machinery is rendered safe. The machinery's stop control must have priority over the start controls. Once the machinery or its hazardous functions have stopped, the energy supply to the actuators concerned must be cut off.	**6.5.8 Stopping means adjacent to the LCU** Means shall be provided, adjacent to the LCU, for intentionally stopping the movement of the LCU by the user and non-user.
1.2.4.2 Operational stop Where, for operational reasons, a stop control that does not cut off the energy supply to the actuators is required, the stop condition must be monitored and maintained.	**N/A**

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.2.4.3 Emergency stop Machinery must be fitted with one or more emergency stop devices to enable actual or impending danger to be averted. The following exceptions apply: — machinery in which an emergency stop device would not lessen the risk, either because it would not reduce the stopping time or because it would not enable the special measures required to deal with the risk to be taken, — portable hand-held and/or hand-guided machinery. The device must: — have clearly identifiable, clearly visible and quickly accessible control devices, — stop the hazardous process as quickly as possible, without creating additional risks, — where necessary, trigger or permit the triggering of certain safeguard movements. Once active operation of the emergency stop device has ceased following a stop command, that command must be sustained by engagement of the emergency stop device until that engagement is specifically overridden; it must not be possible to engage the device without triggering a stop command; it must be possible to disengage the device only by an appropriate operation, and disengaging the device must not restart the machinery but only permit restarting. The emergency stop function must be available and operational at all times, regardless of the operating mode. Emergency stop devices must be a back-up to other safeguarding measures and not a substitute for them.	**6.6.7 Stopping devices in working area** For working areas where there is exposure to movement of the escalator or moving walk equipment, means shall be provided to stop the escalator or moving walk and prevent unintentional starting.
1.2.4.4 Assembly of machinery In the case of machinery or parts of machinery designed to work together, the machinery must be designed and constructed in such a way that the stop controls, including the emergency stop devices, can stop not only the machinery itself but also all related equipment, if its continued operation may be dangerous.	**6.5.9 Succeeding LCUs** Succeeding LCUs shall be controlled in such a way that a failure or stop of one LCU does not create a hazard to the user.
1.2.5 Election of control or operating modes The control or operating mode selected must override all other control or operating modes, with the exception of the emergency stop. If machinery has been designed and constructed to allow its use in several control or operating modes requiring different protective measures and/or work procedures, it must be fitted with a mode selector which can be locked in each position. Each position of the selector must be clearly identifiable and must correspond to a single operating or control mode.	**6.6.5 Movement of the LCU under the sole control of an authorized person** Means shall be provided to enable movement of the LCU under the sole control of an authorized person.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
The selector may be replaced by another selection method which restricts the use of certain functions of the machinery to certain categories of operator. If, for certain operations, the machinery must be able to operate with a guard displaced or removed and/or a protective device disabled, the control or operating mode selector must simultaneously: — disable all other control or operating modes, — permit operation of hazardous functions only by control devices requiring sustained action, — permit the operation of hazardous functions only in reduced risk conditions while preventing hazards from linked sequences, — prevent any operation of hazardous functions by voluntary or involuntary action on the machine's sensors. If these four conditions cannot be fulfilled simultaneously, the control or operating mode selector must activate other protective measures designed and constructed to ensure a safe intervention zone. In addition, the operator must be able to control operation of the parts he is working on from the adjustment point.	
1.2.6 Failure of the power supply The interruption, the re-establishment after an interruption of the fluctuation in whatever manner of the power supply to the machinery must not lead to dangerous situations. Particular attention must be given to the following points: — the machinery must not start unexpectedly, — the parameters of the machinery must not change in an uncontrolled way when such change can lead to hazardous situations, — the machinery must not be prevented from stopping if the command has already been given, — no moving part of the machinery or piece held by the machinery must fall or be ejected, — automatic or manual stopping of the moving parts, whatever they may be, must be unimpeded, — the protective devices must remain fully effective or give a stop command.	**6.2.10 Electrical equipment** The electrical equipment of escalators and moving walks shall be so designed, manufactured and installed as to ensure protection against hazards arising from it. **6.5.5 Uncontrolled movement of LCU** Means shall be provided to limit uncontrolled movement of the LCU and to minimize the resulting risk of injury. Uncontrolled movement of the LCU includes overspeed, reversal, moving from a stationary condition, power failure, etc.
1.3.1 Risk of loss of stability Machinery and its components and fittings must be stable enough to avoid overturning, falling or uncontrolled movements during transportation, assembly, dismantling and any other action involving the machinery. If the shape of the machinery itself or its intended installation does not offer sufficient stability, appropriate means of anchorage must be incorporated and indicated in the instructions.	**6.2.3 Supports for escalator and moving walk equipment** The means used to support the escalator and moving walk equipment shall be capable of sustaining all loads and forces (including impact forces) imposed during normal operation and emergency situations.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.3.2 Risk of break-up during operation The various parts of machinery and their linkages must be able to withstand the stresses to which they are subject when used. The durability of the materials used must be adequate for the nature of the working environment foreseen by the manufacturer or his authorized representative, in particular as regards the phenomena of fatigue, ageing, corrosion and abrasion. The instructions must indicate the type and frequency of inspections and maintenance required for safety reasons. They must, where appropriate, indicate the parts subject to wear and the criteria for replacement. Where a risk of rupture or disintegration remains despite the measures taken, the parts concerned must be mounted, positioned and/or guarded in such a way that any fragments will be contained, preventing hazardous situations. Both rigid and flexible pipes carrying fluids, particularly those under high pressure, must be able to withstand the foreseen internal and external stresses and must be firmly attached and/or protected to ensure that no risk is posed by a rupture. Where the material to be processed is fed to the tool automatically, the following conditions must be fulfilled to avoid risks to persons: — when the workpiece comes into contact with the tool, the latter must have attained its normal working condition, — when the tool starts and/or stops (intentionally or accidentally), the feed movement and the tool movement must be coordinated.	**6.2.1 Strength and size** The equipment shall be capable of sustaining all loads and forces (including impact forces) imposed during normal and emergency operation. **6.2.3 Supports for escalator and moving walk equipment** The means used to support the escalator and moving walk equipment shall be capable of sustaining all loads and forces (including impact forces) imposed during normal operation and emergency situations. **6.2.4 Maintenance of escalators and moving walks** Where maintenance is required to ensure continued safety, appropriate instructions shall be provided and suitably trained personnel shall perform any required work. **6.5.1 Strength and size** The LCU shall accommodate and adequately support rated load. **6.5.2 LCU support** Means shall be provided to support the fully loaded LCUs. **6.6.4 Strength of working areas** Means shall be provided to accommodate and support the mass of person(s) and associated equipment in any designated working area.
1.3.3 Risks due to falling or ejected objects Precautions must be taken to prevent risks from falling or ejected objects.	**N/A**
1.3.4 Risks due to surfaces, edges or angles Insofar as their purpose allows, accessible parts of the machinery must have no sharp edges, no sharp angles and no rough surfaces likely to cause injury.	**6.2.6 Surfaces of the LCU, landing and working areas** The risk of tripping and slipping shall be minimized on the surface of the LCU, at landings and standing areas of workplaces. **6.2.8 Sharp edges** Means shall be provided to sufficiently mitigate the risk to users and non-users of exposure to sharp edges.
1.3.5 Risks related to combined machinery	**N/A**
1.3.6 Risks related to variations in operating conditions	**N/A**

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.3.7 Risks related to moving parts The moving parts of machinery must be designed and constructed in such a way as to prevent risks of contact which could lead to accidents or must, where risks persist, be fitted with guards or protective devices. All necessary steps must be taken to prevent accidental blockage of moving parts involved in the work. In cases where, despite the precautions taken, a blockage is likely to occur, the necessary specific protective devices and tools must, when appropriate, be provided to enable the equipment to be safely unblocked. The instructions and, where possible, a sign on the machinery shall identify these specific protective devices and how they are to be used.	**6.2.5 Equipment inaccessible to users and non-user** Equipment that is hazardous shall not be directly accessible to users and non-users. **6.2.7 Hazards due to relative movement** Users and non-users shall be protected from the effects of falling, shearing, crushing or abrasion, or other injuries due to — movement of the LCU and other components moving in concert with the LCU relative to stationary objects; — relative movement of the escalator or moving walk component parts. **6.3.1 Contact with moving or rotating parts** Means shall be provided to prevent an unsafe condition occurring as a result of contact with moving or rotating parts by non-users. **6.3.2 Failure mode** Failure of any part of an escalator or moving walk shall not cause injury to non-users. **6.5.3 Entrapment between LCU component parts** The likelihood of entrapment between LCU components shall be minimized. **6.5.4 Entrapment between LCU and adjacent surfaces** Means shall be provided to minimize entrapment between the LCU and adjacent surfaces **6.6.6 Protection from moving parts** Means shall be provided to prevent injury from moving parts.
1.3.8 Choice of protection against risks arising from moving parts Guards or protective devices designed to protect against risks arising from moving parts must be selected on the basis of the type of risk. The following guidelines must be used to help to make the choice. **1.3.8.1 Moving transmission parts** Guards designed to protect persons against the hazards generated by moving transmission parts must be: — either fixed guards as referred to in section 1.4.2.1, or — interlocking movable guards as referred to in section 1.4.2.2. Interlocking movable guards should be used where frequent access is envisaged.	**6.2.7 Hazards due to relative movement** Users and non-users shall be protected from the effects of falling, shearing, crushing or abrasion, or other injuries due to a) movement of the LCU and other components moving in concert with the LCU relative to stationary objects; b) relative movement of the escalator or moving walk component parts. **6.6.6 Protection from moving parts** Means shall be provided to prevent injury from moving parts.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
1.3.8.2 Moving parts involved in the process Guards or protective devices designed to protect persons against the hazards generated by moving parts involved in the process must be: — either fixed guards as referred to in section 1.4.2.1, or — interlocking movable guards as referred to in section 1.4.2.2, or — protective devices as referred to in section 1.4.3, or — a combination of the above. However, when certain moving parts directly involved in the process cannot be made completely inaccessible during operation owing to operations requiring operator intervention, such parts must be fitted with: — fixed guards or interlocking movable guards preventing access to those sections of the parts that are not used in the work, and — adjustable guards as referred to in section 1.4.2.3 restricting access to those sections of the moving parts where access is necessary.	**N/A**
1.4 Required characteristics of guards and protective devices **1.4.1 General requirements** Guards and protective devices must: — be of robust construction, — be securely held in place, — not give rise to any additional hazard, — not be easy to by-pass or render non-operational, — be located at an adequate distance from the danger zone, — cause minimum obstruction to the view of the production process, and — enable essential work to be carried out on the installation and/or replacement of tools and for maintenance purposes by restricting access exclusively to the area where the work has to be done, if possible without the guard having to be removed or the protective device having to be disabled. In addition, guards must, where possible, protect against the ejection or falling of materials or objects and against emissions generated by the machinery. **1.4.2 Special requirements for guards** **1.4.2.1 Fixed guards** Fixed guards must be fixed by systems that can be opened or removed only with tools. Their fixing systems must remain attached to the guards or to the machinery when the guards are removed.	**6.2.7 Hazards due to relative movement** Users and non-users shall be protected from the effects of falling, shearing, crushing or abrasion, or other injuries due to a) movement of the LCU and other components moving in concert with the LCU relative to stationary objects; b) relative movement of the escalator or moving walk component parts. **6.6.8 Means of protection from various hazards** Means shall be provided to adequately protect an authorized person in working spaces from the effects of shearing, crushing, abrasion, laceration, high temperature or entrapment.

Table B.1 — (*continued*)

Machinery Directive 2006/42/EC, Annex I	Means of Compliance of ISO/TS 25740-1:2010 and Machinery Directive 2006/42/EC
Where possible, guards must be incapable of remaining in place without their fixings. **1.4.2.2 Interlocking movable guards** Interlocking movable guards must: — as far as possible remain attached to the machinery when open, — be designed and constructed in such a way that they can be adjusted only by means of an intentional action. Interlocking movable guards must be associated with an interlocking device that: — prevents the start of hazardous machinery functions until they are closed and — gives a stop command whenever they are no longer closed. Where it is possible for an operator to reach the danger zone before the risk due to the hazardous machinery functions has ceased, movable guards must be associated with a guard locking device in addition to an interlocking device that: — prevents the start of hazardous machinery functions until the guard is closed and locked, and — keeps the guard closed and locked until the risk of injury from the hazardous machinery functions has ceased. Interlocking movable guards must be designed in such a way that the absence or failure of one of their components prevents starting or stops the hazardous machinery functions. **1.4.2.3 Adjustable guards restricting access** Adjustable guards restricting access to those areas of the moving parts strictly necessary for the work must be: — adjustable manually or automatically, depending on the type of work involved, and — readily adjustable without the use of tools. **1.4.3 Special requirements for protective devices** Protective devices must be designed and incorporated into the control system in such a way that: — moving parts cannot start up while they are within the operator's reach, — persons cannot reach moving parts while the parts are moving, and — the absence or failure of one of their components prevents starting or stops the moving parts. Protective devices must be adjustable only by means of an intentional action.	