TECHNICAL REPORT

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Comparison of worldwide escalator and moving walk safety standards —

Part 2: Abbreviated comparison and comments

Comparaison des normes mondiales de sécurité des escaliers mécaniques et trottoirs roulants —

Partie 2: Comparaison abrégée et commentaires

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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 exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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/TR 14799-2 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

ISO/TR 14799 consists of the following parts, under the general title *Comparison of worldwide escalator and moving walk safety standards*:

— *Part 1: Rule by rule comparison*

— *Part 2: Abbreviated comparison and comments*

Introduction

At the 1995 Plenary Meeting of ISO/TC 178, the work on a comparison of world-wide standards which includes the American, Australian, European, Russian, and Japanese escalator and moving walk safety code was passed to ISO/TC 178 WG 5 (Resolution Singapore 1995/114). In October 1995, Working Group 5 was officially formed to carry out the task of preparing a cross reference between the relevant sections of these standards and to analyse the differences on selected subjects. The goal at that time was to prepare a technical report which would provide reference information to assist national committees when reviewing and revising individual standards which may initiate a gradual convergence of the technical requirements. In 1996 the study was expanded to include the Korean safety standard.

The content of this report is based on the information provided by the WG 5 members acting in personal capacity.

This Technical Report is intended to aid standards writers in developing their safety requirements, and to help standards users understand the basis for the requirements as they are applied throughout the world.

This Technical Report is not intended to replace existing safety standards which may have been updated. Conclusions are arrived at in some cases, but only where is unanimity amongst the various experts. In other cases, the reasons for the divergent views are expressed.

This Technical Report must be read in conjunction with the various safety standards. Unless approved by the relevant standard writing organisations the information contained in this report does not necessarily represent the opinions of these standards writing organizations (see bibliography for references).

The Technical Report was done with the European Standard EN 115: 1995 and its amendment A1: 1998 as a reference document shown as the only one in its normal sequence. All other codes are not in their normal sequence and logical order. They are structured differently to EN 115. The result incorrectly leaves the impression of incompleteness of these standards. These standards in their original structure inclusive of their references to other standards and requirements are however complete.

Comparison of worldwide escalator and moving walk safety standards —

Part 2: Abbreviated comparison and comments

1 Scope

This Technical Report consists of a comparison of the requirements of selected topics as covered by the following world-wide safety standards (excluding local deviations):

a) Europe (CEN) – EN 115; Safety rules for the construction and installation of escalators and passenger conveyors (Edition January 1995 and amendment A1: 1998);

b) USA - ASME A 17.1-1996; Safety Code for Elevators and Escalators

NOTE The requirements for Canada (B 44) are generally the same as for the USA. Any differences are stated in the text.

c) Australia - AS 1735 parts 5 and 6 for escalators and moving walks (Edition 1996);

d) Japan – Safety requirements mainly comprised of Building Standard Law Enforcement Order (BSLJ-EO), Notifications of Ministry of Construction (MOC-N, No. 1110-1981) and draft of Japan Elevator Association Standard (JEAS);

e) Russia – PUBEE 10-77-94, Regulations for the installation and safe use of escalators (Edition 1995);

f) Korea –The Elevator Inspection Standards, KATS 2001-414 Edition according to the Korea Elevator Law 4482, both cover the safety requirements on the escalator and moving walk.

It should be noted that in addition to the above listed standards and other regulations, escalators and moving walks may be required to conform to the requirements of other standards as appropriate. Where ISO/TC 178/WG 5 was aware of these standards they are mentioned in the bibliography.

2 Acronyms, abbreviated designations and terminology

2.1 Acronyms and abbreviated designations

The following acronyms and abbreviated designations are used by the codes compared when making reference to regulations and organisations:

- ANSI American National Standards Institute
- AS Australian Standard
- ASME American Society of Mechanical Engineers
- BSLJ The Building Standard Law of Japan
- BSLJ-EO The Building Standard Law Enforcement Order (Japan)
- CEN/CENELEC Comité Européen de Normalisation (European Committee for Standardisation)
- CIRA Commission Internationale pour la Réglementation des Ascenseurs et Monte-charge
- CSA Canadian Standards Association

— EIS The Elevator Inspection Standard (Korea)

— EMSIS Elevator Manufacturing, Safety and Inspection Standard under KOSHA (Korea)

— EN European Norm (Standard)

— EUIL-MO Electrical Utilities Industry Law - Ministerial Ordinance of technical standards for electrical equipment

— EXP. Explanation/ interpretation of BSLJ-EO, MOC-N (Japan)

— IEC International Electrotechnical Commission

— ISO International Organization for Standardization

— JEAC Japan Electrical Association Code

— JEAS Japan Elevator Association Standard

— JIS Japanese Industrial Standard

— KATS Korean agency for technology and standards

— KEL Korea Elevator Law

— KOSHA Korean Occupational Safety and Health Act

— MINR Ministry of Industry and Natural Resources (Korea)

— MITI Ministry of Trade and Industry (Korea)

— MOC-N Notifications of the Ministry of Construction (Japan)

— NEC National Electrical Code

— NFPA National Fire Protection Association (USA)

— OSHA Occupational Safety and Health Administration (USA)

— PUBEE Regulations for Installation and Safe Operation of Escalators (Russia)

2.2 Terminology (List of terms used in the codes)

Table 1 shows those terms which are used differently for the same item in the standards dealt with. Definitions in the Russian, Japanese and Korean standard are based on unofficial translation whereas the terms in European, American and Australian codes are official language.

The items in parenthesis reference the clauses where the terms are used in the various standards.

Table 1 — Differences in terminology (List of terms used in the codes)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
auxiliary brake (12.3.1, 12.4.1, 12.6)	main drive shaft brake (804.3b)	brake (additional) (5.5.2)	main drive shaft brake	emergency brake (5.2.6)	
balustrade decking (5.1.5.1.4)	high deck balustrades (802.3g, 802.3h, 805.1b)		deck board	balustrade cornice	
balustrade exterior panelling (5.1.5.1.5)	exterior panel		exterior panel		
balustrade interior panelling (5.1.5.1.3)	interior panel 802.3a, 802.3d)		interior panel		
brake load (3.9b))	brake rated load (802.9c, 804.3a, 904.3b, 805.1h)	brake rated load (5.5.1 (parts 5 and 6), same as rated load)			
criss-cross (5.2.4, 7.3.1)		crossed-trusses (3.3.6)	criss-cross		
factor of safety (9.1.2, 9.2.1)	design factor of safety (802.10)	factor of safety (2.7, 3.7, 5.2)	safety factor		
height above the steps (7.3.1, 7.6)	head-room (802.12)	head-room (3.6.9)	height above the steps		height from the step (EIS 4.3.2 (10))
inclination (10)	slope/inclination (802.1, 802.9b, 802.9c)	slope (2.157.19 (part 1), 2.3)			3.3.1 (2), (4)
inspection doors and trap door (5.3)	access door/plate (US) (806.1a, 806.1b, 806.3); access (Can)	hatch cover (4.2)			
interior profile (5.1.5.1.2)	low-deck interior (802.3d)	transition (3.3.1.2, Fig. 2.2)			

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
multiplex chain (12.3.1)	multi-strand chain				
newel (5.1.5.1.6)	newel (802.3a, 802.6d, 805.1b, 805.1t,805.2b)	newel (2.157.15 (part 1), 3.4.5)		handrail inlet	
not easy to ignite (0.5.1)	non/limited combustible (801.1)	not combustible (3.1, 3.6)			non/limited combustible
passenger conveyor	moving walk	moving walk	moving (side) walk		moving walk
rated load[a]	rated load[a] (802.9, 802.9a, 802.9b, 802.9c, 804.3a(2), 804.3b, 805.1b	rated load[a] (2.119 (part 1), 2.6 (parts 5 and 6))	rated load[a]		rated load (4.3.1 (2) and (3))
rated speed[a] (3.6)	rated speed[a] (803, 803.1, 805.1c)	rated speed[a] (2.4)	rated speed[a]		- speed of stepping plates (3.3.1 (4)) - rated speed (EIS Inspection Report)
skirting (3.5, 5.1.5.1.1)	skirt (panel) (802.3d, 802.3e, 802.3f, 802.5d, 805.1h)	skirting (2.157.18 (part 1), 3.3.7 (part 5)	skirt guard (panel)	skirting	skirt guard (4.3.1 (11) and (12))
structural load	structural rated load (802.9a)	structural rated load (2.6.1 (part 6)			
supporting structure (5.3)	truss 801, 801.1, 802.7, 802.9a, 802.10, 806.1, 806.1b, 806.3)	truss (2.157.21 (part 1), 3.2)	truss		
supporting structure (of the combs) (8.3.2.4, 8.3.2.6, 16.2.1.1.1)	comb plate (805.1h, 805.1k, 805.1s, 805.1u, 802.4b, 802.6a, 807.3), access plate (806.1b, 806.3)	comb plate (3.5)	comb plate		

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
theoretical capacity (3.8)		full capacity (2.1.1)		carrying capacity	transport capacity (EIS Inspection Report)
underside enclosure (5.1.1.3)					
	machinery rated load (802.9b)	machine rated load (same as rated load in part 5), 2.6.2 (part 6)			
	conventional/modular moving walk (802.9b, 802.9c, 802.10)				
	skirt obstruction device (805.3f)	skirt pressure switch (6.16)	skirt guard switch (JEAS-406G (draft), 2.1)		
	skirtless balustrade (902.3e)				
		end plate (8.3, part 6)			
					stepping plate (generic term for step, pallet, rubber belt) (3.3.1 (2), 3.3.1 (3), 3.3.1 (4)
					- fixed type handrail (3.3.1 (3), 4.3.2 (7)) - moving type handrail (4.3.2 (4), 4.3.2 (5))
					surface of stepping plate (3.3.1 (2))

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
					non-reversal device and/or braking device (3.3.2 (7), 4.3.1 (4), 4.3.1 (5))
(diff. definition)	flat step (802.6e)	*(diff. definition)*	(flat step)		
[a] definitions vary from code to code (see annexes); terms in European, American and Australian code are official language					

3 Basis for escalator and moving walk safety standards

3.1 Historical origin and development of standards

3.1.1 The European Standard EN 115

3.1.1.1 Why do we have EN 115?

The ever increasing number of escalators put in operation in Europe after the Second World War required the drawing up of guidelines for models and safety for escalators, especially as not all European countries had their own standard or National Regulation for escalators.

So, in the early 1960s specialists/experts from 7 European countries joined together and founded the “Commission Internationale pour la Réglementation des Ascenseurs et Monte-charge“ (CIRA). The CIRA draft for escalators was produced in June 1972, containing safety guidelines for escalators to protect persons and objects against possible accidents and injury.

The Technical Committee CEN/TC10 “lifts“ established the group WG2 in June 1974 with the request to prepare a draft European Standard for escalators and moving walks.

The convenorship of this work group was initially given to a member of the German delegation. In December 1974 the German convenor distributed a first proposal for the construction and installation of escalators founded on the CIRA guidelines, which after careful examination through the “CEN/TC10 WG2“ was submitted to all member countries of the CEN for consideration in June 1977.

It should be noted that the EC Committee BTS2 gave the CEN a mandate for drawing up this standard in 1976.

Finally following a second and a third draft the final edition of the European Standard EN 115 was prepared and accepted by CEN on 3rd January, 1995 (firstly amended January 1998).

According to the Internal Regulations of CEN/ CENELEC, the CEN Members are bound to give this EN 115 the status of a National Standard without any national deviations.

The following countries are CEN Members:

Austria, Belgium, Czech Republic, Denmark, Germany, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland, Spain and the United Kingdom.

3.1.1.2 How did we get EN 115?

The drawing up of the harmonised European Standard removed the technical trade restraints on the escalators and moving walks within the CEN countries listed above. The safety level of the CIRA Directives Edition June 1972 and the existing national regulations or standards of the CEN Member States essentially became reference documents which illustrate how the new standard was derived.

Therefore all CEN members are bound to follow the CEN/ CENELEC requirements and all national standards for escalators and moving walks are superseded by the harmonised EN 115 standard.

3.1.1.3 What is the code (law, standard, requirement)?

The purpose of the EN 115 is to define minimum safety requirements in order to reduce the possibility of accidents on escalators and moving walks.

The harmonised standard is essentially a method of demonstrating compliance with the essential safety requirements of the machinery directive which is embodied in the laws of each country member of CEN/CENELEC and therefore demonstrates compliance with the laws of the member states.

3.1.1.4 Is EN 115 a compulsory standard?

Some exceptions are possible (such as sections 0.3 and 1.3).

3.1.1.5 Is EN 115 a technical description, a requirement or a recommendation?

Compliance with EN 115 is one way to satisfy the requirements of the European Machinery Directive.

3.1.1.6 Is EN 115 a performance or a design standard?

EN 115 has to be considered as a minimum requirement for safe operation of escalators and moving walks.

3.1.2 The American Standard A17.1

3.1.2.1 Why do we have A17.1?

A17.1 is intended to enhance public health and safety. It serves as the basis for state, municipal, and other jurisdictional authorities in drafting regulations governing the installation, testing, inspection, maintenance, alteration, and repair of elevators, dumbwaiters, escalators, moving walks, material lifts with automatic transfer devices, wheelchair lifts, and stairway chair lifts. It is also intended as a standard reference of safety requirements for the guidance of architects, engineers, insurance companies, manufacturers, and contractors, and as a standard of safety practices for owners and managements of structures where equipment covered in the Scope of the Code is used.

3.1.2.2 How did we get A17.1?

The use of elevators and escalators began to rapidly expand in the early 1900's, as larger and taller buildings were transforming American cities into high rise population centers. With the growth of the elevator industry, came a proliferation of new manufacturers and maintenance organizations that lacked the knowledge and background of the industry developers. They often, because of this lack of experience, failed to understand or enforce safe practices in the work they performed.

It became apparent that in order for these cities with their high rise buildings to remain viable, the public had to have unwavering faith in the safety of the elevators that made these buildings usable. A safety code developed by experts in the field of vertical transportation would help develop this public confidence.

In 1915, ASME assembled a committee of engineers who were knowledgeable about elevators and charged them with developing a set of standards for elevator manufacturers, architects, consulting engineers, insurance inspectors, and building owners. The committee recognized the harmful influence of wear, rough usage, and atmospheric conditions under which elevator apparatus must operate, particularly on door locks, interlocks, and electrical contacts.

This effort resulted in the first edition of the A17.1 code being developed in 1921. New editions are periodically published, which in recent years has been every third year. An addenda is published annually between editions. The 16th edition is now in the process of being finalized and published.

3.1.2.3 What is the code (law, standard, requirement)?

The A17.1 Safety Code for Elevators and Escalators is a voluntary reference standard that is used by people and organizations involved in the industry. Developed by a consensus of experts in the industry, it is used to guide them in maintaining a high level of safety in their respective functions.

After it is developed by the ASME under the auspices and consensus procedures established by ANSI, it becomes an American National Standard.

3.1.2.4 Is A17.1 a compulsory standard?

As published, A17.1 is a voluntary standard. It is used by authorities having jurisdiction as a basis for the code they enforce and becomes law when the governing legislative body over their jurisdiction, adopts it.

3.1.2.5 Is A17.1 a technical description, a requirement or a recommendation?

A17.1 presents most of its requirements as mandatory when following the standard. However, some rules may be in the form of a permissive recommendation.

3.1.2.6 Is A17.1 a performance or a design standard?

The A17.1 code is developed as a performance standard under the procedures established by the ASME. Because of the unique nature of the industry, some rules are of a design nature, but efforts are continually underway to replace them with performance language.

3.1.3 The Australian Standards AS 1735 parts 5 and 6

3.1.3.1 Why do we have AS 1735 parts 5 and 6?

The mission statement of Standards Australia (The body writing the above mentioned standards in Australia) states the general position relative to having appropriate standards namely:

"To excel in meeting the needs of Australia's technical infrastructure for contemporary, internationally aligned Standards and related services which enhance the nation's economic efficiency, international competitiveness, and fulfil community desire for a safe and sustainable environment"

In the specific case of escalators and moving walks, the accent is on writing standards that provide for a minimum level of safety for the users of these units and for the mechanics servicing the equipment.

All state government safety relevant acts provide for public and employee safety.

The "Occupational Health and Safety Acts", through their regulations and code of practices, require escalators and moving walks comply with the provisions in AS 1735 parts 5 and 6. (In the case of Victoria the requirement is to employ "published technical standards" in the hazard control process and AS 1735 is the example shown in the code of practice tables).

AS 1735 parts 5 and 6 are the "reference tools" employed by the various state inspectorates of lifts, escalators and moving walks and they form the basis of the newly emerging self regulatory legislative frame work.

3.1.3.2 How did we get AS 1735 parts 5 and 6?

Standards Australia was founded in 1922. Its original name was the Australian Commonwealth Engineering Standards Association. It became the Standards Association of Australia in 1929 and in 1950, it was granted a Royal Charter. In 1988 its trading name was changed to Standards Australia.

The workings of the original Australian Commonwealth Engineering Standards Association was to produce hand-written minutes of all meetings in minute books.

The first reference to escalator installations can be found in a record dated 18 July 1932.

The first reference to glass is in the 1935 edition of the standard ASCA3. (ASCA 3 is the predecessor to AS 1735).

In a 1944 minute book there is a reference to A.S.A. 17.1 1937.

Standards were and are produced under the umbrella of Standards Australia and its predecessors by an open process of consultation and consensus in which all interested parties are invited to participate.

Specifically the interested parties in AS 1735 parts 5 and 6 are the lift companies, governmental institutions, consultants, architects and, through an owners association, the users.

3.1.3.3 What is the code (law, standard, requirement)?

The intent and purpose of AS 1735 Parts 5 and 6 is to prescribe uniform requirements for use within Australia and Australian territories that will provide for the safety of the users and mechanics of escalators and moving walks.

