5.0 Assessment of proposed standards and the Step/Skirt Performance Index

The proposed standards are as follows:

- For already installed escalators covered under A17.1d-2000 and A17.3, escalators with a Index of more than 0.4 will not be in compliance, those with Index values between 0.15 and 0.4 will require a deflector and those under 0.15 will not require a deflector.
- For new escalators covered under A17.1-2000, escalators with an Index value of more than 0.25 will not be in compliance, those with Index values between 0.15 and 0.25 will require a skirt deflector and those with Index values below 0.15 will not require a deflector.
- In addition, new escalators will not be allowed to have a loaded gap of more than 5mm (0.2").

To translate Index specifications into values of loaded gap and coefficient of friction, equation (2b) was solved for either *COF*, or *Loaded Gap* given *y* and the other variable, where the Index is $e^y/(1+e^y)$.

Table 10
Loaded Gap and Coefficient of Friction Values at Selected Index Values

	Loaded Gap		COF	
Index	Minimum	Maximum Gap	Minimum	Maximum
0.40	0.0625	0.33	0.12	1.17
0.25	0.0625	0.26	0.12	0.88
0.15	0.0625	0.14	0.12	0.61

Note: minimum loaded gap and maximum COF are pairs, as are maximum loaded gap and minimum COF. For example, an Index of 0.40 could be achieved with a loaded gap of 0.0625 inches and a COF of 1.17 or a loaded gap of 0.33 inches and a COF of 0.12.

Minimum gap values were chosen at 0.0625 (1/16") because those were believed to be the practical limit for the gap. Minimum coefficient of friction values were chosen from the lowest recorded values during the additional factory escalator tests (ADL, 1999e). Recall that this would be the coefficient of friction from the polycarbonate test object.

Escalators with Index values exceeding 0.40, will not be in compliance with the new ASME standards. The first line of the table, should then be taken as the most extreme combinations of gap and COF that might be observed for a compliant escalator. That is, for an escalator with an Index of 0.40, if the gap is as small as 1/16" (0.0625), the coefficient of friction cannot exceed 1.17. (The highest coefficient of friction observed during testing was 0.8; see ADL, 1999a, page 2-16). With the coefficient of friction set at its lowest observed value of 0.12, the gap can be no higher than 0.33" (slightly greater than 5/16"). The largest value used during tests with generic objects was 6/16 inch.

High values of the coefficient of friction are more likely to lead to entrapment of large objects than predicted by the Index (see table 8). However, large objects such as the simulated child's calf, are precisely the type of objects where deflectors are likely to help. Deflectors will be required for existing escalators at indexes between 0.25 and 0.40 and for new escalators when the Index exceeds 0.15.

Step/skirt Performance Indexes of 0.25 are the maximum allowed for new escalators, with an attached deflector. Table 9 shows that for both hand and calf entrapments at Index ranges between 0.2 and 0.3, for example, 22% of trials involved hand entrapments. The maximum gap at an Index of 0.25 is 0.26" (slightly greater than 4/16"), while the largest possible coefficient of friction would be 0.88.

Escalators with Indexes below 0.15 will not require deflectors. This could involve gaps as small as 0.0625" (1/16) at a coefficient of friction of 0.61 or gaps as large as 0.14" (slightly over 2/16") at a coefficient of friction of 0.12. Index values of 0.15 and below did produce simulated calf entrapments.

It appears that the Index predicts entrapments most accurately for the hand object. The calf object seems affected by the coefficient of friction in addition to the Index. The child's shoe object was not entrapped except at very high values of the Index. Such values were greater than those observed in ADL's measurement of escalators in the field (ADL 1999a, page 3-4), although a more extensive study might find values this high or greater. Values of the Index at 0.8 would correspond to a loaded gap of 0.50" (8/16") at a COF of 0.2 or .33" (slightly more than 5/16"), at a COF of 0.9.

ADL's research program of simulating escalator entrapments with generic and simulated objects was a sound idea. As a result, there are data available for exploring the relationship between escalator parameters and entrapments. Objects are entrapped under extreme conditions, and as ADL often pointed out, the experimental data are from simulating the conditional probability of entrapment when objects are pressed against the side wall or are in the gap. This conditional probability greatly overestimates the probability that a typical rider is entrapped on an escalator in real life.

As discussed earlier, of the large number of values of the important escalator variables such as gap, coefficient of friction, and step and skirt stiffness, only a few combinations could be modeled. There is much more to learn about how these combinations work to produce entrapments, especially for large objects.

Measuring the entrapment hazard in a single figure, as in the Index improves on the present code. The present code requires a maximum of 3/16" static gap, and specifies that the skirt panel shall be "smooth and made from a low friction material or treated with a friction reducing material." The present code does not require deflectors at any gap and is not specific about measurement techniques. In this regard, the proposed modifications to ASME Standard A17 seem to be progressing toward safer escalators.

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Arthur D. Little (1999a), "Escalator Step/Skirt Performance Standard, Final Report." Report to the National Elevator Industry, Inc. Reference 39813-00. Cambridge, MA 02140. (TAB F)

Arthur D. Little (1999b), "Escalator Step-Skirt Performance Standard Study: Phases II and III: Review of Entrapment Index Formulation and Tests." CPSC Meeting, July 15, 1999.

Arthur D. Little (1999c), "ADL Skirt/Step Entrapment Study: Preliminary Addendum Testing Results," November 8-19, 1999.

Arthur D. Little (1999d), "CPSC Index Variation Evaluation Test Plan," December, 1999.

Arthur D. Little (1999e), "ADL Skirt/Step Entrapment Study: Preliminary Addendum Testing Results, November 8-19." January 19, 2000. (TAB G)

Tinsworth, D.K. and McDonald, J (1999), "Deaths and Injuries Associated with Escalators." US Consumer Product Safety Commission, January 7, 2000 (TAB B)

TAB I

000244

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: December 17, 1999

TO : Patricia Hackett, Project Manger, Escalators

THROUGH: Robert B. Ochsman, Ph. D.
Director, HF

FROM : Terry Van Houten, HF

SUBJECT : Deflector Brushes for Escalators

The purpose of this memo is give a summary of a study entitled: "Ergonomics Evaluation of Deflector Devices on Escalators in Retail Organizations' and to relate the results to the work of the proposals pending before the American Society of Mechanical Engineers A17 committee. The study was completed in 1987 and conducted at the request of the Health and Safety Executive of the United Kingdom.

The purpose of the study was to determine whether brush type deflector devices would be effective in encouraging consumers to stand away from the junction of the moving step and the stationary side skirt of the escalator. This area has been identified as a significant source of entrapment for hands and legs resulting in severe injuries.

The Institute for Consumer Ergonomics contacted a number of retail organizations and escalator manufacturers to determine the most appropriate sites for conducting this study. Two sites were chosen and video cameras were placed to record consumer foot placement before and after installation of the brush deflectors. The two descending escalators were selected based on optimum camera placement and potential traffic.

A total of 6,295 observations were recorded on the two escalators. The distribution of the observations was approximately half each before and after the installation of the deflector devices. For both escalators, the results demonstrated that there was a definite shift of people's feet away from the side skirt after the brushes were installed. For both escalators, the average increase in distance from the side skirt after the deflectors were installed was approximately 2 centimeters. This increase is for the shoe nearest the side skirt. The range in the distances from the side skirt also increased by approximately two centimeters. The implication of these observations is that the feet of a large part of the sample had effectively moved away from the side skirt by the installation of the brushes. This shift was shown to be statistically significant in all cases.

The specific shift in distance away from the side skirt was shown to be dependent on the width of the escalator. Of the two escalators used in the study, escalator number 2 was 10 centimeters narrower than escalator 1. The influence from this width on the foot placement is that on the wider escalator, individuals placed their feet 1 – 1.5 centimeters further away from the side skirt than on escalator 2. The researchers concluded that on wider escalators people travel further away from the side skirt than on narrower ones although not by an amount equal to the additional width available to them.

The researchers concluded that the installation of brush deflectors had a demonstrable effect on the placement of feet on escalators. People were effectively moved away from the danger zone in the majority of cases by a distance of approximately 2 centimeters. Further, as a general rule, people travel further away from the side skirt, either with or without brushes, on wider escalators.

Human Factors has reviewed this study and found the methodology to be technically sound. A sufficient number of observations were performed to demonstrate the effect of the devices and the variables were properly accounted for to the extent possible.

The application of this study's results to the CPSC's work on escalators is to demonstrate that deflector brushes do have the potential to move people away from the gap that exists between the moving step and the side skirt. Increasing the distance between the escalator gap and the person significantly reduces the potential for contact or entrapment. Therefore, properly installed brush deflectors would reduce the incidence of entrapments associated with the calf. Brush deflectors do not appear to have the potential to reduce hand entrapments since these incidents are associated with accidental falls or curiosity on the part of children sitting on the moving step.

Human Factors concludes that the brush deflectors have the potential to reduce the number of entrapment incidents reported.

TAB J

000247

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: February 2, 2000

To: Patricia Hackett,
Project Manager, Escalator Petition CP 97-1
Directorate for Engineering Sciences

Through: Jacqueline Elder
Deputy Assistant Executive Director
Office of Hazard Identification and Reduction

Through: Robert B. Ochsman, Ph.D.,
Director, Division of Human Factors

From: Timothy P. Smith,
Engineering Psychologist, Division of Human Factors

Subject: Human Factors Assessment for Petition CP 97-1 on Escalator Safety

Introduction

The Division of Human Factors (ESHF) has written this memorandum in response to an issue raised within Petition CP 97-1, the petition of Scott and Diana Anderson, on escalator safety. This issue is whether appropriately designed warning signs that "educate and inform riders" will address the side-entrapment hazard on escalators. The side-entrapment hazard often involves the direct entrapment of limbs within the gap that exists between the escalator step and adjacent sidewall. This usually occurs when an individual positions his/her feet or fingers near the gap, either deliberately or inadvertantly. It can also result from an initial entrapment of loose clothing that directly leads to limb entrapment. This memorandum also responds to petition comments relating to warning signs.

Evaluation of Warning Sign Effectiveness

Probably the ultimate measure of effectiveness for any safety approach is the extent to which it alone reduces injuries. By definition, a warning sign can never completely eliminate a hazard. Also, one should not automatically assume that warning signs will be beneficial since it is commonly recognized that they are the least reliable approach to reducing injuries. Warnings shift the responsibility for safety to the user, making the sign's success dependent on modifying behavior in an appropriate way. This is often difficult and certainly is not guaranteed. For example, some people still refuse to wear seatbelts despite exposure to numerous warnings and legal mandates requiring their use in many states.

In spite of this, there are some potential benefits to acknowledging the escalator side-entrapment hazard on warning signs. Consumers are unlikely to view the relatively small gap involved in side entrapments as particularly hazardous. Thus, this hazard is not an open and obvious one, and warning signs may help educate and inform consumers of the hazard. Of those consumers that have knowledge of the hazard, most are unlikely to be thinking about it at the time it is encountered due to potential distractions in the environment (e.g., noise, other riders, focusing on another task or other parts of the environment). A warning sign may be useful as a reminder for these people.

An effective warning sign must appropriately change the behavior of those most likely to be involved in incidents, yet over 40% of entrapment injuries occur to children under five years old (Ayers, 1989; Rutherford, 1998). Children this young are unlikely to read or understand warning signs. Since adults are likely to be riding escalators with children of this age, it would be more effective to direct any warning sign at the caregiver. This means that the effectiveness of any warning sign would depend on the caregiver's ability to control the behavior of the child. Perhaps a caregiver could maintain some control over how close a child stands to the sides of an escalator, but the extent of this control depends on several factors including the motivation of the child, distractions in the environment, and the other tasks the caregiver may be performing at the same time (e.g., attending to other children, carrying objects).

In the early toddler months, children learn by touching and manipulating objects, and they often put their hands and fingers into holes and other openings (Woodson, 1992). While toddlers may understand how certain things behave, they have a lack of experience and do not yet fully understand the consequences of their actions (Shelov, 1993). These children also have limited attention spans and therefore are easily distracted. Because of this, many children who have been warned about a particular danger still will be unable to resist performing these actions. Consequently, new and improved warning signs are unlikely to be as effective at reducing side-entrapment injuries as more passive measures that would automatically protect users, such as designing the hazard out of escalators or shielding the hazard from users.

Even if a well designed warning sign could elicit appropriate responses, there is no chance of success unless consumers notice it. People typically do not look for warnings, so any warning sign must be positioned such that a consumer will notice it when and where it is needed. Based on the characteristics of escalator side entrapments, it would be best for people to see the warning before or while stepping onto the escalator so they have enough time to avoid the gaps on the sides. Although a warning sign generally should be near the hazard, it may be difficult to do this and still have the sign clearly visible to the intended viewer. Presently, escalator warning signs appear to be located primarily to the side of the escalator or on the sidewall. Sometimes these are presented periodically to the consumer during travel. Unfortunately, repeatedly seeing the same sign can cause habituation and the consumer may eventually filter out any such warning. Consumers who are stepping onto an escalator are more likely to notice warning signs that are near the steps, and these warnings would have the added advantage of being closer to the hazard. However, in times of high traffic these signs are more likely to be obscured than those positioned to the side of the escalator.

Another problem with any warning sign in this situation is that consumers are in motion once they step onto an escalator, giving them limited exposure to the sign. These consumers are more likely to see and attend to warning signs that are stationary with respect to them, something that may be difficult to accomplish. One particular organization has proposed placing warning signs on the risers of escalator steps, and a study to assess the effectiveness of these signs indicates that people are better able to recall these riser signs than the current stationary signs (Barkow, 1995). Unfortunately, this study did not assess the ability of people to recall stationary signs alone, before adding the riser signs. Thus, the novelty of these riser signs may have drawn attention away from the stationary signs. A significant disadvantage of riser signs is that only consumers approaching or riding on up-traveling escalators can see them. In addition, they are unlikely to be fully visible during periods of high traffic due to their location on the escalator. Although these riser warnings were clearly visible in the pictures within industry literature, escalators are often in areas with a high volume of people, such as subway stations, and consumers are likely to be blocking the riser view of those people behind them.

Responses to Petition Comments

Issue: ASME A17.1 Warning Sign Signal Word Choice

Comments: The current ASME A17.1 warning sign uses the hazard signal word "CAUTION" (see petition comment CA97-2-2b/c for a copy of this sign). In petition comments CA97-2-2b/c and CA97-2-15, Carl J. White and Hubert H. Hayes state that use of "CAUTION" conflicts with ANSI Z535.4 and that "WARNING" is a more appropriate hazard signal word for addressing side-entrapment injuries.

Response: According to ANSI Z535.4, *Product Safety Signs and Labels* (1991), the word "CAUTION" typically indicates a situation which "may result in minor to moderate injury," whereas "WARNING" indicates one which "could result in death or serious injury." The injuries resulting from side-entrapments include amputations, fractures, crushing injuries, lacerations, and avulsions (Rutherford, 1998). This is confirmed in an article by Platt, et al. (1997) which states that side-entrapment injuries typically include lacerations, avulsions and degloving injuries, tendon and nerve damage/lacerations, digit fractures and amputations, and possibly death. Dr. Campbell Reid from the Plastic & Jaw Department of the Royal Hospital Annexe in Sheffield, UK also found that many escalator entrapment cases involve extensive lacerations and damaged tendons, and one incident even involved a girl who was nearly scalped after her hair became entangled (Cooper, 1996). Based on the severity of these injuries, ESHF believes that "WARNING" is a more appropriate signal word than "CAUTION."

Issue: ASME A17.1 Warning Sign Identified Hazards

Comments: In petition comments CA97-2-2b/c and CA97-2-15, Carl J. White and Hubert H. Hayes note that the present warning sign does not warn passengers about the side-entrapment hazard. Mr. Hayes also points out that there is no warning about falling hazards on the current sign.

Response: Since there are multiple hazards associated with escalators, a certain amount of prioritization must take place to assess which hazards a warning sign should acknowledge. In general, the most likely and severe injuries have the highest priority. However, warnings are unlikely to be effective for hazards that are open and obvious. CPSC data indicate that entrapments are the second most common injury mechanism associated with escalators (Rutherford, 1998). This, in combination with the potential severity of the resulting injury that was discussed in the response to the previous issue, warrants that the escalator warning sign acknowledge the side-entrapment hazard. The apparent exclusion of the side-entrapment hazard from the current warning sign appears the result of a deficient design rather than an actual omission of the hazard. The current sign does state to avoid the sides and to attend to children, and the pictorial highlights the gap locations with circles. However, the sign does not adequately communicate the hazard because the nature of the hazard is open to interpretation and the consequences of being exposed to the hazard are unspecified.

There is no explicit description of the falling hazard in the current warning sign. Although falling occurs with greater frequency than side entrapments, it is an open and obvious hazard of escalators. It is unlikely that specifying this hazard would have a significant impact on consumer behavior or prevent future falls. Therefore, the current advisory to "Hold Handrail" may be enough to address this particular hazard.

Issue: Alternative ASME A17.1 Warning Sign

Comments: In petition comments CA97-2-2b/c and CA97-2-15, Carl J. White and Hubert H. Hayes have submitted a formerly-proposed warning sign as an alternative to the current ASME A17.1 sign. A copy of this sign can be found in comment CA97-2-2b/c.

Response: The proposed warning sign is similar to the current one in that everything that appears below the signal word in the current sign appears in the proposed sign. However, there are several differences. The following are differing characteristics of the proposed sign:

- A safety alert symbol appears in front of the signal word
- The signal word is "WARNING" instead of "CAUTION"
- There are three smaller pictorials above the phrase "Passengers Only"; two identify entrapment hazards (one for hand and one for foot) and the other identifies the falling hazard
- The phrase, "Can Cause Personal Injury," appears between the signal word and the three new pictorials

As stated earlier, ESHF prefers the signal word "WARNING" to "CAUTION." ANSI Z535.4 (1991) also recommends the use of a safety alert symbol in front of the hazard signal word. The proposed sign is consistent with these recommendations. The phrase "Can Cause Personal Injury" is vague in describing the consequences of the hazard. Perhaps this wording was selected because it was intended to address both the entrapment and falling hazards. More specific and meaningful wording that describes only the side-entrapment hazard is likely to be more effective.

The proposed warning sign includes the fall hazard through a small pictorial. As stated earlier, this is likely to be an open and obvious hazard. Consequently, ESHF does not believe that this pictorial would provide a significant benefit to an escalator warning sign. Though some consumers may find it difficult to see the two additional side-entrapment pictorials due to their small size, those who can see them satisfactorily are more likely understand the nature of the side-entrapment hazard. It is unclear if two pictorials, rather than one, are necessary to illustrate this concept. The gaps involved in side entrapments appear at the bottom of the pictorial of the parent and child. Positioning the new entrapment pictorials beneath the parent-and-child pictorial may help consumers make the logical connection between the entrapment hazard and the step-sidewall gaps, but this is unclear.

Issue: Use of Voice Warnings

Comment: In petition comment CA97-2-15, Hubert H. Hayes suggests considering the use of audible messages in addition to a warning sign.

Response: Written warnings have the disadvantage of requiring the consumer to understand the written language. This effectively eliminates the meaningfulness of written warnings to those who are not fluent at reading the language in which they were written, as well as those who are very young or illiterate. The use of auditory warnings or messages can benefit these people, especially if the message is recited in several languages. They also do not require the consumer to be facing or looking in a particular direction, a characteristic that is especially useful for visually impaired or disabled consumers, and even those who are simply busy with another task. They have the added advantage of providing visual and auditory redundancy for those who do see the warning sign.

Still, repetitious auditory warnings are likely to suffer from problems similar to visual warnings, such as being filtered out due to habituation. Also, a continuous auditory warning regarding escalator side entrapments is likely to annoy some people since it usually will be a "false alarm." Supplemental voice warnings may provide some benefit, but it is unclear how effective such warnings would be in this situation.

Conclusions

The use of warning signs is the least preferred and least reliable safety approach. Warnings can never eliminate the hazard and depend on changing the behavior of the consumer. To be effective they must appropriately change the behavior of those most likely to be exposed to the hazard, requiring the consumer to notice, understand, and believe the warning first. Over 40% of entrapment incidents occur to children under five years old—people who are unlikely to read and understand warning signs. While it is possible that a warning sign could convey the proper message to some consumers and may prevent some entrapments to children through appropriate caregiver responses, several factors are likely to limit the effectiveness of this approach. Ultimately, warning signs are unlikely to be as effective at addressing escalator side entrapments as designing the hazard out of escalators or shielding the hazard from consumers.

In response to petition comments regarding the current ASME A17.1 warning sign, it is ESHF's opinion that the severity of side entrapments warrants the use of the signal word "WARNING" rather than "CAUTION." In addition, the nature and consequences of the side-entrapment hazard should be more specifically stated. While the alternate warning sign proposed by commenters has some advantages over the current sign, it also has similar failings. The use of supplemental voice warnings may be beneficial, but it is unclear how effective they would be in preventing side entrapments.

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TAB K

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000255

Schindler

January 20, 2000

Patricia L. Hackett
General Engineer
U.S. Consumer Product Safety Commission
Washington, DC 20207

Dear Patty:

Schindler Elevator Corporation (Schindler) is committed to meeting or exceeding safety standards around the world. Schindler's long standing commitment to passenger safety is demonstrated by our continuous product safety enhancements. For example, in 1991, Schindler greatly enhanced escalator safety with the introduction in the U.S. of a unique escalator step guidance system. This system allows Schindler to minimize the skirt-to-step gap while significantly improving the step resistance to lateral movement. Tests have shown that Schindler is already exceeding the requirement for maximum loaded gap (i.e., the Schindler loaded gap is smaller than the requirement) proposed by NEII to ASME as a result of the recent ADL, Inc. study of step to skirt entrapments. In addition, Schindler escalators offer deflector brushes as an optional feature and we have supported their recognition in the A17.1 and A17.3 code. Schindler is prepared to comply with the most stringent NEII step-skirt Index proposals including those slated for the A17.1- 2000 edition of the code. Schindler also offers our unique step guidance system and skirt deflector brushes as upgrades to existing escalators so owners can comply with the proposed A17.3 requirement for step-skirt Index. These are just two of the many safety enhancements for escalators offered by Schindler.

In the future, look for further safety enhancements on Schindler's new equipment and additional safety upgrades available to owners of Schindler installed equipment. Passenger safety is at the forefront of Schindler design, manufacturing, and service philosophies.

Sincerely,

Michael W. Thomas
Vice President

ISO 9001 CERTIFIED

000236

Otis Elevator Company

One Farm Springs
Farmington, Connecticut 06032-2500
(860) 676-5005

Raymond J Moncini
Vice President and Senior Area Executive

Otis
A United Technologies Company

Via Facsimile (301) 504-0533 & Overnight Mail

January 26, 2000

Patty Hackett
Consumer Product Safety Commission
4330 East West Highway, Suite 611
Bethseda, Maryland 20814

Dear Ms. Hackett,

Otis fully supports the proposed revisions to the ASME A17.1 Code which resulted from the National Elevator Industry, Inc.'s (NEII) recent efforts to improve escalator safety. Once the revisions are adopted by the Code, Otis plans to actively support adoption by local code enforcement authorities.

As you know, these proposed revisions were the result of a comprehensive scientific study conducted by Arthur D. Little, Inc. (ADL), one of the world's most respected independent testing laboratories. Otis was among the leading members of NEII to support the selection of ADL to perform this study, and ADL's selection reflects both Otis' and NEII's commitment to base its actions and recommendations on technically valid, independently verifiable data.

With the exception of a few very early designs, Otis' current installed base of equipment, when properly maintained and fitted with deflector devices, will meet the side-step safety standards in the ASME A17.1 Code (as modified by the pending revisions). Additionally, Otis' newly developed and manufactured escalators, when properly maintained, will meet or exceed the heightened side-step safety standards set forth by the revised Code.

As the world's leader in the vertical transportation industry, Otis has been, and will continue to be committed to innovating new products and designs which will enhance both the safety and comfort of the escalator riding public.

Sincerely yours,

Raymond J. Moncini
V.P. & Senior Area Executive
North American Area

cc: Edward A. O'Donoghue, via facsimile, (518) 854-3257

FUJITEC

000237

elevators
escalators
autowalks

January 27 1999
Our Ref. No. ESC-D-1260

Ms. P. Hackett
Consumer Products Safety Commission
4330 East West Highway, Suite 611
Bethesda, MD 20814

Re: Escalator Step/Skirt Code Changes

Dear Ms. Hackett,

Fujitec is a supplier of high quality elevator and escalator systems in the United States and throughout the world. Our elevators and escalators are designed for reliable and safe operation and our products therefore, meet or exceed all Safety Code requirements.

Fujitec, as a member of NEII, has fully participated in the development of the new code change proposals regarding the Escalator Step to Skirt interface. Our company supports the A17.1 Escalator Safety Code changes contained in TR96-10: Deflector Device and TR99-74: Step/Skirt Performance Index, and will design our escalators to be in compliance with these new requirements. Already, escalators we are now manufacturing incorporate some of these features. Design and testing is now underway to insure that all Fujitec escalators meet the new requirement when the code becomes effective.

Sincerely yours,

Edward F. Parvis
Escalator Director

EFP/nb

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DOVER ELEVATORS

February 3, 2000

Ms. Patty Hackett
CPSC
4330 East West Highway Suite 611
Bethesda, MD 20814

Re: Proposed ASME Code Changes

Dear Patty,

We understand that you are interested in our position on the new Code changes that have been proposed to the ASME A17.1 Code, particularly regarding the new entrapment index provisions. Thyssen Dover Elevator has participated with NEII during both the ADL testing and subsequent recommendations made to the ASME Code based on the results of these tests. We fully support the changes to Code that have been forwarded by NEII as a result of the ADL testing.

We are fortunate in that the Thyssen escalator product lines are a new series that have only recently been introduced to the worldwide market. Key elements of these new product lines are improved manufacturing processes that allow tighter control of assembly and operational tolerances during the fabrication and assembly of the products. These tolerances also have improved the maintainable gaps between the escalator step and skirt panel which are a key element of the skirt entrapment index.

Our new series of escalators meet the requirements of the proposed skirt entrapment Code changes noted above. We are still evaluating additional improvements that we may offer on our delivered products in the future to further improve performance and safety to the riding public.

You had asked about our projected testing interval for the skirt entrapment index for our products. Our philosophy at Thyssen Dover Elevator is to provide equipment and services that exceed the requirements of the governing Code wherever we can. As such, we plan to test equipment under our service at an interval that exceeds the minimum annual requirement contained in the proposed Code changes. The entrapment index is a new tool to evaluate the safety of escalators in service. We believe that there must be a process of refinement and evaluation for the inspection frequency based on specific escalator designs in service.

We trust that this information helps you have a better understanding of our position on the matter. Please contact me if I can provide any more information or be of other service.

Sincerely,

Kenneth G. Hamby
Thyssen Dover Elevator
Escalator Product Planning Group Manager

KONE

Elevators Escalators

000239

January 21, 2000

Ms Patty Hackett
CPSC
4330 East West Highway, Suite 611
Bethesda, MD 20814

Dear Ms Hackett,

Kone Escalator has been actively involved with design work in the reduction of "entrapment probably" on escalators for several years even though an entrapment index was not officially developed or defined at the time. This is evidenced by the release of a product line in the mid 90's with a step guidance system designed to specifically reduce and stiffen step/skirt running clearance and stiffen skirts. As a result, this product is proving to measure well with respect to the new index being adopted by the ASME Code.

You can be sure that Kone is not only in solid support of the new index, but also believes in its value as a tool and criteria to improve the design and maintenance of our products. To this end, future products, including some on the design board now, will be designed with the index criteria. Literally, the lower index value being adopted by the ASME Code is being injected as a design/performance specification requirement for new product designs.

Sincerely,
Tom Nurnberg
Assistant Vice President
Manager of Engineering
Kone Inc.
Escalator Division

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