2013 Edition

ASME A17.1/CSA B44 Handbook

ASME A17.1-2013, Safety Code for Elevators and Escalators

CSA B44-13, Safety Code for Elevators

Edward A. Donoghue, CPCA

The American Society of Mechanical Engineers

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INTRODUCTION

In 1976 I was appointed to the A17 Editorial Committee with Al Land (Chair), William "Bill" Crager (A17 Chair), and Manuel Gutierrez (ASME Secretary). At the time, the A17 Editorial Committee was charged with a total editorial review of the A17.1 Code for the 1978 edition. Every Rule was scrutinized and editorially revised for clarification when appropriate.

The Committee met weekly for this massive project. To avoid unintentionally changing the content of a Rule, it was essential that the Committee members had a clear understanding of the technical requirements and their intent. Bill Crager had a long history as a member of the A17 Committee, including 15 years as Committee Chairman. At the meetings, the members would look to Bill for his recollection of why a Rule was in the Code. Bill possessed an encyclopedic knowledge of the history of A17 requirements. His typical response would start by stating, "At the (date) A17 Meeting, the Committee approved the Rule for the following reason." At our next meeting, Bill would arrive with documents from his home file backing up his recollection — including the meeting dates.

I quickly came to the conclusion that the "Bill Cragers" on the A17 Committee were mostly retired or would be retiring from Committee activities over the next few years. Their expansive knowledge of the past committee work and the rationale for the A17.1 Rules would no longer be available. This would be a loss not only to the A17 Committee but also to the users of the Code.

I concluded that a Handbook for A17.1 would be an invaluable addition to the A17.1 Code, as the NEC® Handbook was an invaluable supporting document for the NEC®. I approached Mel Green, then director of ASME Codes and Standards, with a proposal to write an ASME A17.1 Handbook. He thought the idea had merit, and the first edition of the A17.1 Handbook was published at the time of publication of the 1981 edition of the A17.1 Code. A new edition of the Handbook was published thereafter with each new edition of the A17.1 Code and later the A17.1/B44 Code, with this being the 11th edition of the ASME A17.1/CSA B44 Handbook.

As I gaze into my crystal ball at my future, it looks like this may be the last edition of the Handbook I will author. Time will tell, but if I decide to completely retire, I trust ASME will continue to publish new editions of the Handbook with each new edition of the ASME A17.1/CSA B44 Code.

—Ed Donoghue

FOREWORD

The ASME A17.1/CSA B44 Safety Code for Elevators and Escalators is written by a committee of technically qualified persons with a concern and competence in the subject within the Committee's scope and a willingness to participate in the work of the Committee. The ASME A17 Standards Committee is restricted to a maximum of 35 members of which no more than one-third can be from any single interest category. This requirement serves to assure balance in the consensus process. In addition, there are over 300 members serving on the Regulatory Advisory Council, National Interest Review Group, Technical Committees, Administrative Committees, and Ad Hoc Committees. Technical revisions to ASME A17.1/CSA B44 are also submitted to the CSA B44 Technical Committee for their concurrence.

This Handbook incorporates the harmonization of the ASME A17.1, *Safety Code for Elevators and Escalators* and CSA B44, *Safety Code for Elevators*. Since 2000, editions of the CSA B44 and ASME A17.1 Codes have been identical, except for application deviations noted in CSA B44. Starting with the ASME A17.1-2007/CSA B44-07, a single Code book has been published for use in the United States and Canada. A joint effort of the CSA B44 Technical Committee and the ASME A17 Standards Committee to harmonize requirements between CSA B44 and ASME A17.1 was started in the mid-1990s. The harmonization process compared and studied differences between the two codes over a number of years through discussions by joint ASME/CSA working groups. A harmonized requirement was formulated and proposed for review and approval through formal balloting by both the ASME A17 Standards Committee and CSA B44 Technical Committee. If any member did not approve a proposed requirement, the member's rationale for disapproval was returned to the working committee for resolution. The working committee either revised the proposal or provided a reason for rejecting the comment. The revised proposal or rejection was once again balloted until negatives were resolved or the Chairman of the ASME A17 Standards Committee ruled consensus had been achieved. Many requirements went through multiple ballots before a consensus was achieved. As a result, requirements in the ASME A17.1-2000 and CSA B44-00 and later editions of the Code are different from corresponding Rules and Clauses in the previous editions of ASME A17.1 and CSA B44. The harmonization process identified technical and editorial problems with requirements in both codes and in such cases formulated new requirements. The ASME A17 and CSA B44 Committees recognized that not all requirements could be fully harmonized, in particular requirements based on, or which depended on, other national codes or regulations, such as building, electrical, and fire codes. In such cases, two separate requirements were formulated, one for "jurisdictions enforcing NBCC" (meaning National Building Code of Canada or "NBCC" for short) and another for "jurisdictions not enforcing NBCC" (meaning the United States).

In cases where no agreement on a requirement could be achieved or the publication schedule precluded continuation of discussions, the CSA B44 Technical Committee created Canadian exceptions from the ASME A17.1 requirements, known as Canadian deviations. These Canadian deviations appeared in the CSA B44-00 and CSA-B44-04 Elevator Safety Code. Both committees continue the harmonization process and endeavor to reduce the number of Canadian deviations in future editions. In January 2006, the list of deviations had shrunk to the point where the ASME A17 Standards Committee felt they could all be incorporated in the next edition of the ASME A17.1 Code with an objective of publishing a single Safety Code for Elevators and Escalators for use in both the United States and Canada. That objective was met with the publication of ASME A17.1-2007/CSA B44-07.

ASME and CSA recognize that the Code must be written in a form suitable for enforcement by state, municipal, and other jurisdictional or regulatory authorities often referred to in the United States as "Authorities Having Jurisdiction (AHJ)" and in Canada as "Regulatory Authorities (RA)"; and as such, the text is concise, without examples or explanations. It is also recognized that this Code cannot cover every situation nor can it cover new technology before it is developed and field experience is gained. For these reasons, ASME agreed that a handbook would be useful to augment the Code by providing a commentary on the Code requirements.

This Handbook contains rationale for the ASME A17.1/CSA B44 Code requirements along with explanations, examples, and illustrations of the implementation of requirements. In addition, it contains excerpts from other nationally recognized standards referenced by the Code. This information is intended to provide users of the ASME A17.1/CSA B44 Code with a better understanding of, and appreciation for, the requirements. The net result should be increased safety for owners, manufacturers, installers, maintainers, consultants, the inspection community, and users of equipment covered by the ASME A17.1/CSA B44 Code.

Commentary in this Handbook was compiled from ASME A17 Committee minutes, correspondence, and interpretations, as well as conversations with past and present ASME A17 and CSA B44 committee members.

The original intent for requirements in ASME A17.1 and CSA B44 Codes may be obscure in the Committee's records. Therefore, this Handbook will convey, through text, examples of calculations, tables, and illustrations, the end result of Code requirements as applied to equipment installed today where the original intent cannot be found. It should not be construed that examples and illustrations in this Handbook are the only means of complying with ASME A17.1/CSA B44 Code requirements, or that all illustrations necessarily represent all requirements contained in the Code. Some illustrations simply reflect general industry or specific company practices. With information of this type, it is hoped the reader will develop a better understanding of, and appreciation for, requirements in ASME A17.1/CSA B44.

Commentary contained in this Handbook is the opinion of the author. It does not necessarily reflect the official position of ASME, the ASME A17 Standards Committee for Elevators and Escalators, CSA, or the CSA B44 Technical Committee. When an official interpretation of an ASME A17.1/CSA B44 requirement is required, the user should write to the Secretary of the ASME A17 Standards Committee in accordance with instructions in the Preface to the ASME A17.1/CSA B44 Code. Comments and suggestions for this and future editions of the ASME A17.1/CSA B44 Handbook should be addressed to:

Secretary
A17 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, New York 10016-5990
http://go.asme.org/Inquiry

ASME Elevator and Escalator Courses. ASME Professional Development is a leader in top-quality elevator and escalator education. Courses range from an introduction to elevators and escalators, inspection techniques, equipment modernization code requirements, and maintenance evaluation, to an in-depth review of ASME A17.1/CSA B44 using this Handbook as the course text. The course titled *Introduction to Elevators and Escalators (PD 100)* is recommended as a prerequisite for persons with little or no experience in the industry. Other courses meet the needs for those with elevator and escalator experience as well as those who have an extensive background in the industry. To obtain a catalog of course material, contact:

ASME Professional Development
Two Park Avenue
New York, NY 10016-5990
Phone: 800-THE-ASME, or
973-882-1167
www.asme.org/shop/courses

ABBREVIATIONS

Throughout this Handbook, references are made to the ASME A17 Standards Committee and CSA B44 Technical Committee. The term "ASME A17/CSA B44 Committee" is used for that purpose. References are also made to the *Safety Code for Elevators and Escalators*, ASME A17.1/CSA B44. The term "ASME A17.1/CSA B44 Code" is used for that purpose. The reader should keep in mind the reference to the "ASME A17/CSA B44 Committee" is not intended to imply there is only one committee.

METRIC

The ASME A17.1/CSA B44 Handbook includes both metric and imperial units. Both are included in the commentary.

ASME A17.1/CSA B44 CODE REVISIONS

A summary of code changes from ASME A17.1-2010/CSA B44-10 through ASME A17.1-2013/CSA B44-13 along with approved balloted rationale are in the front of this Handbook. Revisions are made periodically to the Code to incorporate necessary or desirable changes determined from experience gained from the application of the procedures, and address developments in the elevator art. Approved revisions are published periodically. See Diagram 1 in the Foreword for the flowchart of the ASME A17 revision process. The Committee welcomes proposals from Code users. Such proposals should be as specific as possible, citing Section number(s), proposed wording, pertinent documentation, and a detailed description of the reasons for the proposal. Proposed revisions should be sent to:

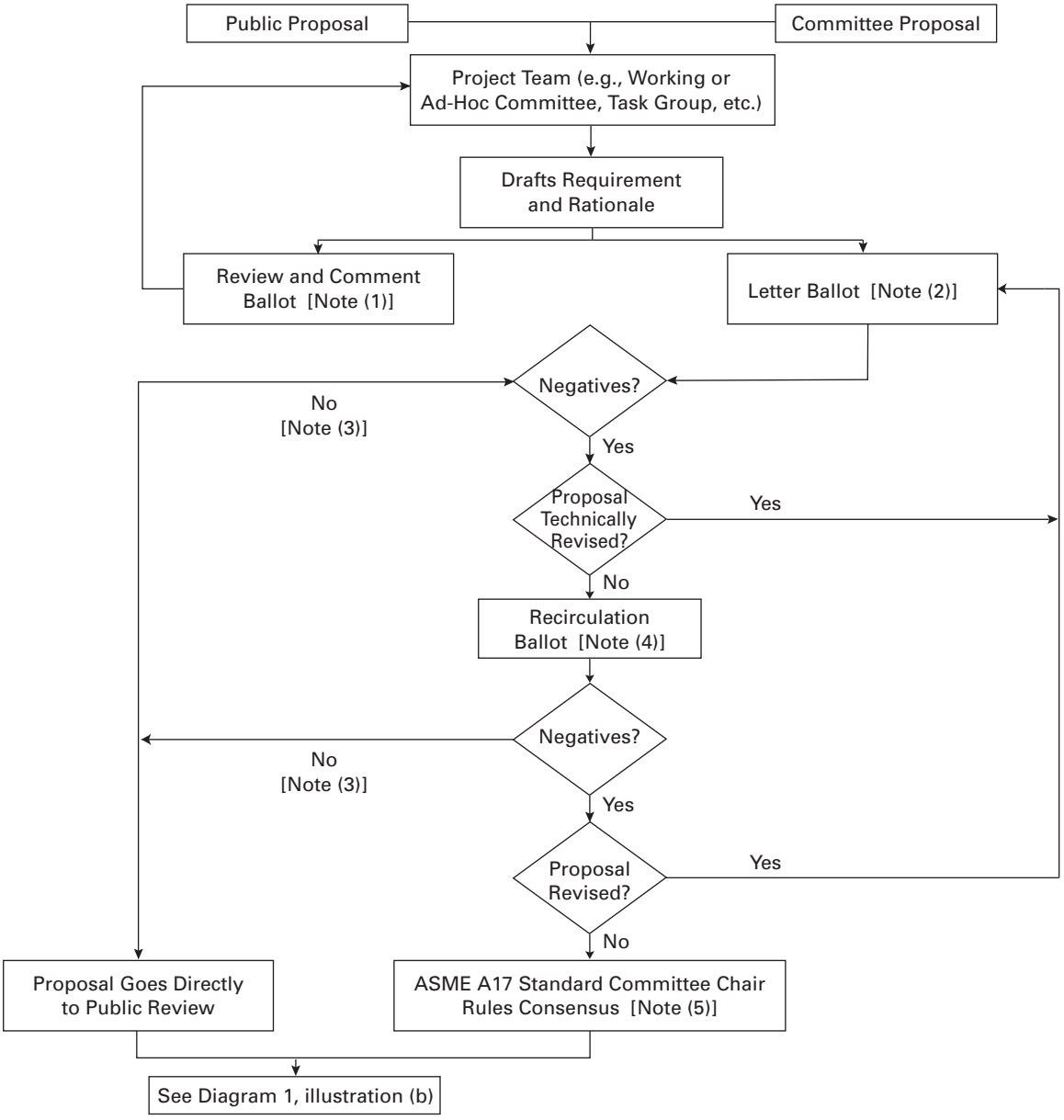
Secretary
A17 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Revisions to the ASME A17.1/CSA B44 Code occur after an intense formal process assuring due process for all affected parties. The ASME A17 process is illustrated in Diagram 1, illustrations (a) and (b). The CSA process is the same as illustrated in Diagram 1.

ERRATA

Errata to the current ASME A17.1/CSA B44 is published on the ASME A17 Committee Web page. Errata to prior editions of the Code are not readily available. The errata to ASME A17.1-2010/CSA B44-10 can be found in this Handbook immediately following summary of code changes.

Diagram 1 ASME A17 Technical Revision Flowchart



(a)

NOTES:

(1) Project team determines who receives Review and Comment Ballot, e.g., Working Committee only, other Working Committees, ASME A17 Standards Committee, NIRG, RAC, and/or CSA B44.

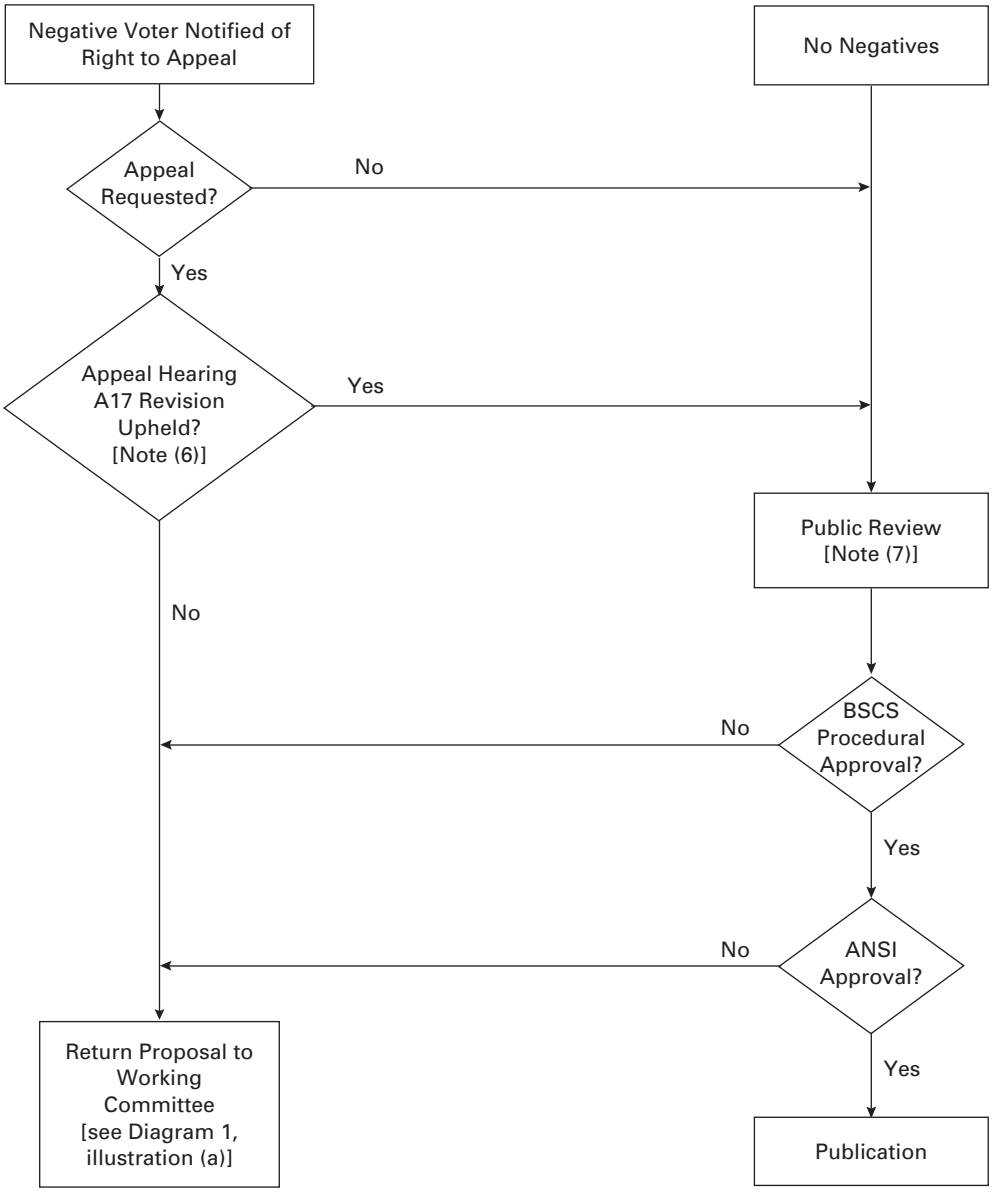
(2) Letter Ballot of ASME A17 Standards Committee, NIRG, RAC, and CSA for distribution to CSA B44 Committee.

(3) All comments must be addressed. Editorial revision allowed with ASME A17 Standards Committee approval.

(4) Secretary contacts all negative voters (this includes ASME A17, CSA B44, RAC, NIRG) and asks them if they want to withdraw their negatives and notifies them of their rights to appeal. If all negatives are withdrawn, proposal proceeds to public review. See Diagram 1, illustration (b). Recirculation Ballot of ASME A17 Standards Committee if any remaining negatives. Ballot may include editorial revisions. Copy of ballot sent to CSA.

(5) Assuming at least two-thirds affirmative vote by ASME A17 Standards Committee on proposed revision.

Diagram 1 ASME A17 Technical Revision Flowchart (Cont'd)



(b)

NOTES (Cont'd):

(6) Three levels of appeal. First appeal to ASME A17 Standards Committee. Second appeal to ASME BSCS. Third appeal to ASME Board on Hearings and Appeals.

(7) Public review comments sent to Working Committee. Working Committee may draft response, revise proposal, or withdraw proposal. If proposal is revised technically, it is subject to 1st consideration ballot [see Diagram 1, illustration (a)]. Working Committee action subject to approval of ASME A17 Standards Committee.

ACKNOWLEDGMENTS

The author gratefully acknowledges the time, effort, and dedication of the many people and organizations that assisted and contributed in the preparation of this 2013 edition of the ASME A17.1/CSA B44 Handbook.

The following deserve special recognition for their participation on the ASME A17.1/CSA B44 Handbook Review Group for this edition:

Brian D. Black, National Elevator Industry, Inc., Hamburg, NY

Jonathan R. Brooks, Wagner Consulting Group, Inc., Eden, NC

James W. Coaker, P.E., Coaker & Company, PC, Fairfax Station, VA

Norman B. Martin, Chief Elevator Inspector, Ret., State of Ohio; Schindler Elevator Corp., Morristown, NJ

James Runyan, Education Director, National Association of Elevator Safety Authorities International, Salem, OR

Julian Shull, J. H. Shull Engineering, LLC, Boulder City, NV

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John Carlson, Schindler Elevator Corp., Morristown, NJ — Section 2.27

Richard Gregory, Vertix Corp., Chicago, IL — Sections 8.6 and 8.7

John Koshak, Elevator Safety Solutions, LLC, Collierville, TN — Section 5.11

Zack McCain, Jr., McCain Engineering Associates, Inc., Norman, OK — Sections 8.10 and 8.11

Davis Turner, Consultant, D. L. Turner Associates, Mission Viejo, CA — Part 6

I would also like to thank David McColl, Otis Canada, Inc., for the CEC-11 summary of changes, and Jim Runyan for the smoke/heat detector shunt-trip decision-making flowchart.

I extend special thanks and appreciation to my partner, friend, and wife, Janet, for her patience and understanding during the countless hours that it took to prepare this Handbook. I am very fortunate for having her support. She deserves as much credit as I do, for her invaluable assistance in the preparation of the manuscript. My appreciation for her contributions cannot be expressed in words.

SUMMARY OF CODE CHANGES ASME A17.1-2010/CSA B44-10 AND ASME A17.1-2013/CSA B44-13

This summary of Code changes identifies the requirements that have been revised or added in ASME A17.1-2013/CSA B44-13 from those in ASME A17.1-2010/CSA B44-10. The rationale for the revisions are from the public review drafts that closed September 17, 2012, and December 23, 2012.

The "Rationale" reflects the balloted position of the ASME A17 Standards Committee and CSA B44 Technical Committee for revising or adding the requirement. The technical number (TN) in parentheses immediately following each revision or addition is an administrative number used by the ASME A17 Committee.

Requirement 1.1.1(c) Revised

RATIONALE: To clarify that other devices with hoisting and lowering mechanism equipped with a car serving two or more landings and restricted to the carrying of materials but not classified as a dumbwaiter or material lift are not covered by A17.1/B44. [TN 09-1137]

Requirement 1.1.4 Revised

RATIONALE: Revised language to address ASME Council policy change. [TN 12-668]

Section 1.3 Added definition of "accredited certifying organization"

RATIONALE: The term "accredited certifying organization" is utilized throughout the proposed QEI-1–2013 Standard. It will be defined in the QEI-1–2013 Standard and should also be defined in A17.1. [TN 12-1341]

Section 1.3 Added definition of "accrediting body"

RATIONALE: All organizations which certify inspectors and inspection supervisors must be accredited. Future accreditation of certifying organizations must be implemented in accordance with a credible and authoritative national or international standard by an independent nationally or internationally recognized organization. It is important that the A17.1 Code recognize that future accreditations of certifying bodies must be implemented in accordance with a credible national/international standard. [TN 12-1341]

Section 1.3 Added definition of "base, building"

RATIONALE: See Rationale for Section 8.4. [TN 06-1007]

Section 1.3 Revised definition of "control, electrohydraulic"

RATIONALE: To determine what a change to motion control means for a hydraulic elevator, it is essential to first understand the possible methods of motion control. Currently there is only one defined method of motion control for hydraulic elevators therefore difficult to know when and if the method was changed. To facilitate in understanding a motion control change for hydraulic elevators, provide a more complete list of motion control methods.

Therefore, although obsolete in use, we must define an older, potentially existing form of motion control.

The existing definition does not recognize older mechanical control valves which will be replaced during an alteration. The existing definition was revised to include the use of pilot valves in modern valve designs.

See also Inquiry 93-47 as clarification related to these proposed definitions. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Section 1.3 Added definition of "control, mechanical-hydraulic"

RATIONALE: To determine what a change to motion control means for a hydraulic elevator, it is essential to first understand the possible methods of motion control. Currently there is only one defined method of motion control for hydraulic elevators therefore difficult to know when and if the method was changed. To facilitate in understanding a motion control change for hydraulic elevators, provide a more complete list of motion control methods.

Therefore, although obsolete in use, we must define an older, potentially existing form of motion control.

The existing definition does not recognize older mechanical control valves which will be replaced during an alteration. The existing definition was revised to include the use of pilot valves in modern valve designs.

See also Inquiry 93-47 as clarification related to these proposed definitions. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Section 1.3 Added definition of "conveyor, vertical reciprocating (VRC)"

RATIONALE: To cross reference appropriate ASME standard for definition and safety requirements. [TN 09-1137]

Section 1.3 Added definition of "driving machine, traction, climbing"

RATIONALE: To provide a differentiation and a definition of a new type of driving machine. [TN 10-2024]

Section 1.3 Added definition of "electrical/electronic/programmable electronic" (E/E/PE)

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Section 1.3 Added definition of "electrical/electronic/programmable electronic system" (E/E/PES)

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Section 1.3 Added definition of "elevator discharge level"

RATIONALE: To clarify where the elevators take building occupants during OEO. [TN 09-2041]

Section 1.3 Added definition of "elevator, outside emergency"

RATIONALE: To include outside emergency elevators in ASME A17.1/CSA B44. [TN 10-923]

Section 1.3 Added definition of "elevator, wind turbine tower"

RATIONALE: To add the common name of the location of the wind turbine tower elevator and to assure these devices are not to be used by the general public. [TN 10-2024]

Section 1.3 Added definition of "guide rope fixes"

RATIONALE: To provide a definition considering the common term of the art. [TN 10-2024]

Section 1.3 Added definition of "guiding means, ladder"

RATIONALE: To provide a definition. [TN 10-2024]

Section 1.3 Added definition of "hard copy"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes a standard dictionary definition. [TN 08-1348]

Section 1.3 Added definition of "maintenance control program (MCP)"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes a standard dictionary definition. [TN 08-1348]

Section 1.3 Added definition of "maintenance interval"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes a standard dictionary definition. [TN 08-1348]

Section 1.3 Added definition of "maintenance procedure"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes a standard dictionary definition. [TN 08-1348]

Section 1.3 Added definition of "maintenance task"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes a standard dictionary definition. [TN 08-1348]

Section 1.3 Revised definition of "manual reset, escalator and moving walk"

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Section 1.3 Revised definition of "material lift"

RATIONALE: To define a material lift and differentiate material lifts from vertical reciprocating conveyors as unique and distinct devices covered by different safety provisions by use of the term "elevator." [TN 09-1137]

Section 1.3 Added definition of "Occupant Evacuation Operation"

RATIONALE: To help readers of the Code understand the purpose of this operation (OEO) is for occupant evacuation in emergencies. [TN 09-2041]

Section 1.3 Added definition of "operation, automatic call"

RATIONALE: To provide a definition of send operation typically found on wind turbine elevators. [TN 10-2024]

Section 1.3 Revised definition of "operation, group automatic"

RATIONALE: To recognize other possible devices and supervisory (dispatching) systems used in group automatic operation. [TN 09-2041]

Section 1.3 Added definition of "pallet band"

RATIONALE: To add a definition for the terms "step band" and "pallet band" based on Inquiry 10-1815. The term "pallet band" appears in requirement 6.2.7.3.4 and is also undefined. [TN 10-1939]

Section 1.3 Added definition of "platform, landing"

RATIONALE: To distinguish the usage of the term "platform" when referring to wind turbine towers from the elevator use of the term. [TN 10-2024]

Section 1.3 Added definition of "records, electronic"

RATIONALE: Definitions help to clarify terms in proposed revisions regarding the MCP, maintenance records, and related documentation as well as provide clarification for the proposed Code revisions.

Also utilizes standard dictionary definition. [TN 08-1348]

Section 1.3 Added definition of "safety integrity level (SIL)"

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Section 1.3 Added definition of "seal, adjustment"

RATIONALE: To provide a definition of "adjustment seal," used for determining when the adjustment means have been tampered with for components that are required to be sealed. The term "seal" is used throughout the Code and can have more than one meaning (e.g., governor tripping speed adjustment seal, piston/plunger seal, cylinder head seal, relief valve seal, grooved pipe seal).

The inspection community has requested that the seal be traceable through a means of identification, and the information related to the person and firm as well as the date the seal was applied meets this need and provides traceability. Safety may be compromised where seals have been replaced after adjustment and the devices have not been set correctly or there has been random adjustment. Sealing is becoming more important with the introduction of new technology, and it is essential to safety for traceability and accountability for the setting of the safety parameter.

Inspection authorities typically apply seals provided by the authority; however, where a seal is applied by persons other than the authority having jurisdiction during maintenance or repair, it needs to be identifiable and traceable. [TN 09-807]

Section 1.3 Added definition of "SIL rated"

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Section 1.3 Added definition of "step band"

RATIONALE: To add a definition for the terms "step band" and "pallet band" based on Inquiry 10-1815. The term "pallet band" appears in requirement 6.2.7.3.4 and is also undefined. [TN 10-1939]

Section 1.3 Added definition of "sway control guide"

RATIONALE: See rationale for 2.30. [TN 02-2351]

Section 1.3 Added definition of "sway control guide suspension means"

RATIONALE: See rationale for 2.30. [TN 02-2351]

Section 1.3 Added definition of "tail line"

RATIONALE: To provide a definition considering the common term of the art. [TN 10-2024]

Section 1.3 Revised definition of "terminal stopping device, final"

RATIONALE: Requirements should not be included in the definition. [TN 19-148]

Section 1.3 Revised definition of "terminal stopping device, normal"

RATIONALE: Requirements should not be included in the definition. [TN 19-148]

Section 1.3 Added definition of "travel path"

RATIONALE: To provide a definition. [TN 10-2024]

Section 1.3 Revise definition of "unlocking zone"

RATIONALE: Where a car is stopped below the landing, there is a possibility that someone in the car can reach the interlock at the landing below and unlock the door, exposing users on the landing to the risk of falling into the hoistway. The 7 in. dimension in conjunction even with a small building slab thickness will prevent this from happening. In addition, to limit the maximum step up or down to the typical stairway step height. Review of these issues supports reduction of the unlocking zone from 18 in. to 7 in.

The 18 in. zone for freight elevators with vertically sliding doors is to recognize the size and nature of the equipment, including that accessibility to the door and interlock below, is not the same as what exists for elevators with horizontally sliding/swinging doors. The risk of tripping and falling is dramatically lower than on passenger elevators since freight elevators are used by authorized personnel who are trained and familiar with the operating conditions. [TN 02-3046]

Requirement 2.2.6.2 Revised

Requirement 2.2.6.3 Deleted

RATIONALE: In the A17.1-1996 edition of the Code, the requirement that is currently 2.2.6.3 appeared as the last sentence in the paragraph that required two pit stop switches where the pit depth exceeds 66 in. (which changed to 67 in. in later editions), mandating that the two pit stop switches required in this situation were wired in series. However, as it is currently written, that requirement now appears to apply not only to deep pits but also to the situation in 2.2.6.1 involving multiple hoistways (and therefore, multiple stop switches — one for each elevator pit).

The following is the requirement as it appears in A17.1-1996:

> **106.1f Stop Switch in Pits.** There shall be installed in the pit of each elevator an enclosed stop switch or switches meeting the requirements of Rule 210.2(9).
>
> This switch shall be so located as to be accessible from the pit access door. Where access to the pits of elevators in a multiple hoistway is by means of a single access door, the stop switch for each elevator shall be located adjacent to the nearest point of access to its pit from the access door.
>
> In elevators where access to the pit is through the lowest landing hoistway door, a stop switch shall be located approximately 18 in. (457 mm) above the floor level of the landing, within reach from this access floor and adjacent to the pit ladder if provided. When the pit exceeds 66 in. (1 676 mm) in depth, an additional stop switch is required adjacent to the pit ladder and approximately 4 ft (1 219 mm) above the pit floor. Where more than one switch is provided, they shall be wired in series.

The following is the Handbook explanation:

> In a pit where the point of access is more than 1 700 mm or 67 in. above the pit floor, two pit stop switches which are wired in series must be provided: one approximately 450 mm or 18 in. above the access floor, and the second 1 200 mm or 47 in. above the pit floor. This allows personnel entering the pit to engage the upper stop switch, 450 mm or 18 in. above the access floor, then descend the pit ladder to the pit floor and engage the lower switch located 1 200 mm or 47 in. above the pit floor. If operation of the elevator is then necessary, elevator personnel can ascend the pit ladder and place the upper stop switch in the run position. The elevator can then be controlled from the lower stop switch. When leaving the pit, the upper stop switch is to be placed in the stop position before the lower stop switch is placed in the run position.

[TN 11-1147]

Requirement 2.3.2.1 Revised

RATIONALE: To recognize that suspension means as well as compensating ropes (chains) can alert personnel of the presence of the counterweight runway. [TN 04-1478]

Requirement 2.4.1.6 Revised

RATIONALE: Revise wording to conform to the wording from the Ad Hoc Signage Committee and TN 03-624. [TN 07-1806]

Requirement 2.4.7.2 Revised

RATIONALE: Revise wording to conform to the wording from the Ad Hoc Signage Committee and TN 03-624. [TN 07-1806]

Requirement 2.7.3.1.3 Added

RATIONALE: To limit the access to machine rooms and related spaces by persons who do not need to access those rooms and spaces except when access is needed for equipment directly related to the elevator. This reduces the frequency of exposure to the hazards related to elevator equipment by other persons. These hazards could include rotating machinery and high voltage. [TN 10-1153]

Requirement 2.7.3.2.2 Revised

RATIONALE: To provide safe passage under all environmental conditions. To add strength requirements to the railing. [TN 11-1029]

Requirement 2.7.5.3.2 Editorially revised

RATIONALE: To correct a spelling error. [TN 11-1031]

Requirement 2.7.5.3.5 Revised

RATIONALE:

(a) Revision of the requirement to specify an electric contact in lieu of an electromechanical device. Clarification of intent to permit a lock and contact. Interlocks

are not being provided today; this is not a reduction in safety.

(b) Working platform access panels or doors should have equivalent safety to blind hoistway doors.

(c) Consistency with pit access door requirements.

(d) The emergency door is protected by

- Group 1 Security key
- a cylinder-type lock having not less than five pins or five discs, which is self-locking
- a hinged self-closing barrier independent of the door [TN 10-630]

Requirement 2.10.2.1 Revised

RATIONALE: It has been reported that some AHJs interpret the height of the top rail of the standard railing as an exact dimension. Research of the current OSHA requirements as well as various building codes in the USA and Canada was conducted to determine a safe tolerance value which will satisfy the intent of the various requirements. The end result is a safe and adequate tolerance for the top rail of the standard railing. [TN 10-632]

Requirement 2.11.1.2(e) Revised

RATIONALE:

(a) Revision of the requirement to specify an electric contact in lieu of an electromechanical device. Clarification of intent to permit a lock and contact. Interlocks are not being provided today; this is not a reduction in safety.

(b) Working platform access panels or doors should have equivalent safety to blind hoistway doors.

(c) Consistency with pit access door requirements.

(d) The emergency door is protected by

- Group 1 Security key
- a cylinder-type lock having not less than five pins or five discs, which is self-locking
- a hinged self-closing barrier independent of the door [TN 10-630]

Requirement 2.11.5(a) Revised

RATIONALE: To recognize that door guiding devices and retaining devices can project beyond the line of the landing sill. [TN 06-1445]

Requirement 2.11.6.3 Revised

RATIONALE: To provide requirements, when permitted by the building code, for additional doors and similar devices mounted adjacent to the elevator hoistway opening, the purpose of which is to minimize the migration of smoke into or out of the elevator hoistway.

These devices are currently being permitted by the building codes and may affect the operation of the elevator; it is important to address these potential safety and certification issues.

To provide requirements which assure firefighters can safely use the elevator on Phase II as intended. [TN 06-1446]

Requirement 2.11.10.1.4 Added

RATIONALE: 10 mm ($^3/_8$ in.) is the allowable gap between the door and the sill [see 2.11.11.5.2(d)]. Sight guards are allowed to be 12 mm above the sill, which is a gap that exists today. Prohibiting pre-door opening and preventing releveling up before the car sill surface reaches the groove assures that the door guiding groove is not exposed to users in the car. [TN 06-1445]

Requirement 2.11.11.1 Revised

RATIONALE: To clarify that a sill/sill structure is permitted as a guiding component. When a sill/sill structure is used as a guiding component, then it must meet the strength requirement of 2.11.11.5.7. [TN 06-1445]

Requirement 2.11.19.3 Revised

RATIONALE: To require certification of the basic types of entrances in 2.11.2 with gasketing material. To require certifying agency identification on the label. [TN 09-621]

Requirement 2.12.4.1 Revised

RATIONALE: To correct a cross reference. The type testing of interlocks in the CSA B44 S1-97 code edition was required by Clause 11.4, titled "Test of Devices for Landing Door and Car Doors and Gates." The current reference to Clause 11.5, which is titled "Type Tests of Escalators," is not the intended cross reference. [TN 12-595]

Requirement 2.12.7.2.1 Revised

RATIONALE: The control and operation circuit requirements and the appropriate marking of the associated switches and their function have been clearly specified, and it is clarified that it is automatic power operation of doors that is disabled while on hoistway access operation. Additionally, it is now made clear as to when the elevator is on hoistway access operation. [TN 09-1907]

Requirement 2.12.7.2.3 Revised

RATIONALE: To clarify the requirements in accordance with intent Inquiry 09-44. [TN 09-1599]

Requirement 2.12.7.3 Revised

RATIONALE: The control and operation circuit requirements and the appropriate marking of the associated switches and their function have been clearly specified, and it is clarified that it is automatic power operation of doors that is disabled while on hoistway access operation. Additionally, it is now made clear as to when the elevator is on hoistway access operation. [TN 09-1907]

Requirement 2.12.7.3.2 Revised

RATIONALE: The changes clarify that the independence is limited to the speed-limiting means as compared to the normal speed control. The provisions and requirements in (a) and (b) reflect acceptable industry practices with appropriate monitoring. [TN 10-148]

Requirement 2.12.7.3.4 Added

RATIONALE: To permit a controlled method for stopping the elevator level with the floor at the conclusion of hoistway access operation. [TN 09-1907]

Requirement 2.13.2.1.1 Revised

RATIONALE: To reconcile a conflict between power opening and restricting opening, Nonmandatory Appendix B. [TN 02-3046]

Requirement 2.13.2.2.1 Revised

RATIONALE: Reconcile a conflict between power opening and restricting opening, Nonmandatory Appendix B. [TN 02-3046]

Requirement 2.13.3.4.9 Revised

RATIONALE: Editorial clarifications.

(a) Signal is to be sent to the control that initiates the starting, stopping, and direction of motion of the door(s). This control may or may not be included in the operation control portion of the control system.

(b) The term "device(s)" agrees with language in referenced requirements. The term "detection means" does not.

(c) Other grammatical corrections. [TN 1-174]

Requirement 2.14.2.1.2 Revised

RATIONALE: Revised to coordinate with changes in the 2010 edition of the NBCC. NBCC requirements are shown below. [TN 11-609]

From NBCC 2005

3.1.13.7. High Buildings

1) Except as permitted by Sentences (2) to (4), the interior wall, ceiling and floor finishes in a *building* regulated by the provisions of Subsection 3.2.6. shall conform to the *flame-spread rating* requirements in Article 3.1.13.2. and to the *flame-spread* rating and smoke developed classification values in Table 3.1.13.7.

Table 3.1.13.7. Flame-Spread Rating and Smoke Developed Classification in a High Building
Forming Part of Sentence 3.1.13.7.(1)

	Maximum *Flame-Spread Rating*			Maximum Smoke Developed Classification		
Location or Element	Wall Surface	Ceiling Surface (1)	Floor Surface	Wall Surface	Ceiling Surface (1)	Floor Surface
Exit stairways, vestibules to *exit* stairs and lobbies described in Sentence 3.4.4.2.(2)	25	25	25	50	50	50
Corridors not within *suites*	(2)	(2)	300	100	50	500
Elevator cars and vestibules	25	25	300	100	100	300
Service spaces and service rooms	25	25	25	50	50	50
Other locations and elements	(2)	(2)	No Limit	300	50	No Limit

Notes to Table 3.1.13.7.:
(1) See Article 3.1.13.4. for lighting elements.
(2) Other requirements of this Part apply.

From NBCC 2010

3.1.13.7. High Buildings

1) Except as permitted by Sentences (2) to (4), the interior wall, ceiling and floor finishes in a *building* regulated by the provisions of Subsection 3.2.6. shall conform to the *flame-spread rating* requirements in Articles 3.1.13.2. and 3.1.13.11. and to the *flame-spread rating* and smoke developed classification values in Table 3.1.13.7.

3.1.13.11. Elevator Cars

1) The wall and ceiling surfaces of elevator cars shall have a *flame-spread rating* not more than 75.

2) The wall, ceiling and floor surfaces of elevator cars shall have a smoke developed classification not more than 450.

Table 3.1.13.7. Flame-Spread Rating and Smoke Developed Classification in a High Building
Forming Part of Sentence 3.1.13.7.(1)

	Maximum *Flame-Spread Rating*			Maximum Smoke Developed Classification		
Location or Element	Wall Surface	Ceiling Surface (1)	Floor Surface	Wall Surface	Ceiling Surface (1)	Floor Surface
Exit stairways, vestibules to *exit* stairs and lobbies described in Sentence 3.4.4.2.(2)	25	25	25	50	50	50
Corridors not within *suites*	(2)	(2)	300	100	50	500
Elevator cars	75	75	300	450	450	450
Elevator vestibules	25	25	300	100	100	300
Service spaces and service rooms	25	25	25	50	50	50
Other locations and elements	(2)	(2)	No Limit	300	50	No Limit

Notes to Table 3.1.13.7.:

(1) See Article 3.1.13.4. for lighting elements.

(2) Other requirements of this Part apply.

Requirement 2.14.5.7 Revised; formerly numbered 2.12.5

RATIONALE: Permitting the opening of car doors exposes passengers to hazards in the hoistway. A means to restrict the opening of car doors, or using a car door interlock, is the safest way to protect passengers from the hoistway hazards. Moved requirements into the section pertaining to car doors since the revised requirements no longer pertain to hoistway doors. [TN 02-3046]

Requirement 2.14.5.7.1 Revised; formerly numbered 2.12.5.1

RATIONALE: Update and clarification to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 2.14.5.7.2 Revised; formerly numbered 2.12.5.2

RATIONALE: Update and clarification to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 2.14.5.7.3 Revised; formerly numbered 2.12.5.3

RATIONALE: Update to agree with requirements in 2.14.5.7.4(b) and renumbered 2.14.5.8. [TN 02-3046]

Requirement 2.14.5.7.4 Added

RATIONALE: To add and clarify requirements for means to restrict door opening as a result of the use of new technology that requires electrical power and resulting requests for interpretation (Inquiries 00-30, 04-43, 06-02, 06-11, and 08-36).

The portion of the means dependent on power would include the circuitry incorporated in the means, and a solenoid coil and plunger, where used, but not the mechanical portion of the means.

The specification of one hour is sufficient time for the restricting means to initiate unrestricting in the unlocking zone. One hour is also sufficient in the case where power is required to initiate restriction, including when power is lost and the car is moving from inside the unlocking zone to outside the unlocking zone.

The use of power to initiate but not maintain a function is permitted in the Code. See 2.7.5.2.1(b)(6). [TN 02-3046]

Requirement 2.14.5.7.5 Added

RATIONALE: To require similar forces for means used to restrict car doors as those required for door interlocks in 8.3.3.4.8. [TN 02-3046]

Requirement 2.14.5.8 Revised; formerly numbered 2.14.5.7

RATIONALE: To update to agree with requirements in 2.14.5.7.4(b). [TN 02-3046]

Requirement 2.14.5.9 Editorially revised; formerly numbered 2.14.5.8

RATIONALE: [TN 02-3046]

Requirement 2.14.5.10 Editorially revised; formerly numbered 2.14.5.9

RATIONALE: [TN 02-3046]

Requirement 2.15.2 Revised

RATIONALE: The proposed change improves the safety of the guiding means by requiring a minimum factor of safety while eliminating language that is overly prescriptive. To prevent displacements greater than 13 mm (0.5 in.) which could occur on sliding members when gibs are lost or on roller guides when a roller fails. [TN 04-636]

Requirement 2.15.9 Revised

RATIONALE: To have requirements for platform guards that are consistent with landing sill guards (see 2.11.10.1.2). [TN 06-1445]

Requirement 2.15.16.1 Editorially revised

RATIONALE: The present reference to 2.12.5 in requirement 2.15.16.1 is incorrect. While this proposal contains no technical change to electric contact requirements when a hinged platform sill is provided, the requirements are clearer when wholly contained in requirement 2.15.16.1. Previously, the rule created confusion by referencing electric contacts applicable to car doors or gates, or to the requirements for mechanical locks and contacts. [TN 10-188]

Requirement 2.16.1.1 Revised

RATIONALE: To delete an incorrect reference. [TN 10-908]

Requirement 2.16.3.3 Revised

RATIONALE: To revise wording to conform to the wording from the Ad Hoc Signage Committee. [TN 07-1806]

Requirement 2.16.4 Revised

RATIONALE: With the renumbering of 2.12.5 to 2.14.5.7, this requirement is covered by 2.16.4.5. [TN 02-3046]

Requirement 2.16.4.7 Deleted, and 2.16.4.8 and 2.16.4.9 renumbered

RATIONALE: With the renumbering of 2.12.5 to 2.14.5.7, this requirement is covered by 2.16.4.5. [TN 02-3046]

Requirement 2.16.5.2 Revised

RATIONALE: To revise wording to conform to the wording from the Ad Hoc Signage Committee. [TN 07-1806]

Requirement 2.18.4.1.2 Revised

RATIONALE: To move the requirement for this switch to be positively opened from 2.18.4.4, which is being eliminated in this proposal. [TN 09-1601]

Requirement 2.18.4.1.3 Added

RATIONALE: To move the requirement for this switch to be of the manual reset type from 2.18.4.4, which is being eliminated in this proposal. [TN 09-1601]

Requirement 2.18.4.2.5 Revised

RATIONALE: To reference the new requirement for the switch to be of the manually reset type, which also contains the note explaining manual reset. [TN 09-1601]

Requirement 2.18.4.4 Deleted

RATIONALE: The speed-governor speed-reducing switch is not an EPD, as it is not listed in 2.26.2. However, it is being treated like an EPD in 2.18.4.4 by requiring it to be a positively opened switch, though there doesn't appear to be a valid reason for doing so. In today's controllers, this switch is likely to feed a simple software input that will cause the controller to reduce its speed and stop at the next available floor. If it fails to do so and the car reaches 100% of the governor trip speed, the positively opened speed-governor overspeed switch is still there to remove power from the driving-machine motor and brake.

The requirement for the speed-governor overspeed switches to be of the manually reset type should be addressed in the area where general requirements for this switch are listed. The requirement for the speed-governor speed-reducing switch to be of the manually reset type is already addressed in 2.18.4.2.5(a), so there's no need to repeat it here. [TN 09-1601]

Requirement 2.19.2.2(b) Revised

RATIONALE: The revisions are being made to help clarify the requirement, as was done in Inquiries 04-50 and 04-50a. [TN 10-148]

Requirement 2.19.3.1.3 Added, and existing 2.19.3.1.3 renumbered as 2.19.3.1.4

RATIONALE: See rationale for 2.25.4.1.1. [TN 09-118]

Requirements 2.19.3.2(c) and (d) Revised
RATIONALE: See rationale for 2.25.4.1.1. [TN 09-118]

Requirement 2.20.8 Revised

RATIONALE: To update references to reflect proposed changes in Section 8.6. [TN 08-1348]

Requirement 2.21.1.3 Revised

RATIONALE: The proposed change improves the safety of the guiding means by requiring a minimum factor of safety while eliminating language that is overly prescriptive. To prevent displacements greater than 13 mm (0.5 in.) which could occur on sliding members when gibs are lost or on roller guides when a roller fails. [TN 04-636]

Table 2.22.4.1 Revised

RATIONALE: Prior to and during the harmonization process, there were transcription errors and errors of conversion in the table which have been recently noticed. These are not material differences and no buffer strokes have been changed. [TN 10-180]

Requirement 2.22.4.6 Revised

RATIONALE: Buffers of this design have been used in Europe for over 9 yr with no reports of false-positive oil levels or of shattering of the acrylic sight gauge upon buffer engagement, except for 0.125% of installed units related to manufacturing defects as a result of leakage around the sight gauge seal. This history includes over 5,400 buffers in use for over 9 yr. All buffers are type, acceptance, and periodic tested, which would demonstrate the suitability of materials used in the sight gauge. [TN 09-1137]

Requirement 2.24.4 Revised

RATIONALE: Changed to reflect the requirements covered in 2.24.4.1 and 2.24.4.2. [TN 05-777]

Requirement 2.24.4.1 Revised

RATIONALE: To ensure that when transmitting torque, all bolts share load or, alternatively, the connection is designed to have enough friction between the clamped surfaces generated by the fasteners. [TN 05-777]

Requirements 2.25.2.1.1 and 2.25.2.1.2 Revised

RATIONALE: The above changes clarify the intent and scope of the term "function independently" based on past interpretations and accepted practice, without changing the scope of the existing requirements. The provision and requirement listed in (b) reflect acceptable industry practices with appropriate monitoring. [TN 10-148]

Requirement 2.25.3.3 Revised

RATIONALE: See requirement 2.30. [TN 02-2351]

Requirement 2.25.4.1 Revised

RATIONALE: The changes clarify the intent and scope of "independent" based on past interpretations, Code revisions, and acceptable industry practice with appropriate monitoring. [TN 10-148]

Requirement 2.25.4.1.1 Revised

RATIONALE: An A17 Task Group on Reduced Stroke Buffers was formed to review the following items:

- allowable reduction of stroke of the buffer
- necessary overhead clearance required with the reduced stroke buffer
- measures required of the system to ensure the buffer is not struck at a velocity greater than its rating

After completing a hazard assessment, a deficiency in the Code was discovered when a driving-machine brake failure occurs with the car near the terminal landing, in which case the ascending car overspeed limit may not be reached to activate the emergency brake. In that case, a full stroke buffer should prevent the car from striking the overhead, but with a reduced stroke buffer, not only might the buffer rating be exceeded, but it may be possible that the car could still hit the overhead since the emergency terminal speed-limiting (ETSL) device only removed power from the driving-machine brake, which is what failed to begin with. The Task Group recommended that the ETSL device not be rendered ineffective by a driving-machine brake failure. The proposed revision adds additional requirements to ensure that a reduced stroke buffer is not struck at above its speed rating.

The prohibition against the activation of the car safety by the emergency speed-limiting device was removed since if it is permissible to use a car or counterweight safety to provide ascending car overspeed protection or unintended movement protection, then they should also be permitted to be used to prevent the car from striking a reduced stroke buffer above its rating. Also note the requirement for the retardation not in excess of 1g still applies. [TN 09-118]

Requirement 2.25.4.1.4 Deleted, and subsequent requirements renumbered

RATIONALE: See rationale for 2.25.4.1.1. [TN 09-118]

Requirement 2.25.4.2 Revised

RATIONALE: The changes clarify the intent and scope of the term "function independently" based on past interpretations and acceptable industry practice with appropriate monitoring, without changing the scope of the existing requirements.

Requirement 2.26.1.4.1(b)(4)(c) Revised

RATIONALE: To clarify the requirements in accordance with intent Inquiry 09-44. [TN 09-1599]

Requirement 2.26.1.4.1(d)(1) Revised

RATIONALE: The changes clarify that the independence is limited to the speed-limiting means as compared to the normal speed control. The provisions and requirements listed in (a) and (b) reflect acceptable industry practices with appropriate monitoring. [TN 10-148]

Requirement 2.26.1.4.3(d) Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. [TN 09-1907]

Requirement 2.26.1.5.1 Revised

RATIONALE: To clarify the requirements in accordance with intent Inquiry 09-44. [TN 09-1599]

Requirement 2.26.1.6.6 Revised

RATIONALE: The above changes clarify that the independence is limited to the speed-limiting means as compared to the normal speed control. The provisions and requirements listed in (a) and (b) reflect acceptable industry practices with appropriate monitoring. [TN 10-148]

Requirement 2.26.2 Revised

RATIONALE: See requirement 2.30. [TN 02-2351]

Requirement 2.26.2.4 Revised

RATIONALE: The above changes help clarify the intent and scope of "independent of" based on past accepted practice, without changing the scope of the existing requirements. [TN 10-148]

Requirement 2.26.2.10 Revised

RATIONALE: The requirement for this switch to be of the manually resetting type was never referenced here previously, but it should be. [TN 09-1601]

Requirement 2.26.2.25 Revised

RATIONALE:

(a) Revision of the requirement to specify an electric contact in lieu of an electromechanical device. Clarification of intent to permit a lock and contact. Interlocks are not being provided today; this is not a reduction in safety.

(b) Working platform access panels or doors should have equivalent safety to blind hoistway doors.

(c) Consistency with pit access door requirements.
(d) The emergency door is protected by
- Group 1 Security key
- a cylinder-type lock having not less than five pins or five discs, which is self-locking
- a hinged self-closing barrier independent of the door [TN 10-630]

Requirement 2.26.2.39 Added

RATIONALE: See requirement 2.30. [TN 02-2351]

Requirement 2.26.4.3.1 Revised

RATIONALE: To editorially correct the terminology in 2.26.4.3.1 to be consistent with 2.25.1.1. [TN 11-1696]

Requirement 2.26.4.3.2 Revised

RATIONALE: To modify Part 2 requirements to specify requirements for identification and be consistent with the language proposed in Part 8. [TN 08-802]

Table 2.26.4.3.2 Revised

RATIONALE: To update references to reflect proposed changes in Section 8.6. [TN 08-1348]

Table 2.26.4.3.2 Revised

RATIONALE: To clarify the requirements in accordance with intent Inquiry 09-44. [TN 09-1599]

Table 2.26.4.3.2 Revised

RATIONALE:
(a) Revision of the requirement to specify an electric contact in lieu of an electromechanical device. Clarification of intent to permit a lock and contact. Interlocks are not being provided today; this is not a reduction in safety.
(b) Working platform access panels or doors should have equivalent safety to blind hoistway doors.
(c) Consistency with pit access door requirements.
(d) The emergency door is protected by
- Group 1 Security key
- a cylinder-type lock having not less than five pins or five discs, which is self-locking
- a hinged self-closing barrier independent of the door [TN 10-630]

Requirement 2.26.4.4 Revised

RATIONALE: To reference an ISO standard in lieu of a European standard. The revisions are not due to any known deficiencies with current products or the previous EN standard. Products tested to date have an excellent safety record and should remain acceptable. [TN 10-151]

Requirement 2.26.8.2 Revised

RATIONALE: See rationale for 2.26.4.3.2. [TN 08-802]

Requirement 2.26.9.3(c) Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. [TN 09-1907]

Requirement 2.26.9.4 Revised

RATIONALE: See rationale for 2.26.4.3.2. [TN 08-802]

Requirement 2.26.9.5.1 Revised

RATIONALE: See rationale for 2.26.4.3.2. [TN 08-802]

Requirement 2.26.9.6.1 Revised

RATIONALE: See rationale for 2.26.4.3.2. [TN 08-802]

Requirement 2.27.1.1.3(f) Revised

RATIONALE: A timer feature is required to ensure elevator phones hang up upon completion of the call in those cases where the telephone network (public or building) does not provide disconnect signals. If not properly disconnected, it will not be possible to place another call from inside the car or cars served by the phone line. Using voice notification enables any authorized personnel to properly respond to calls from any manufacturer's equipment. [TN 09-1930]

Requirement 2.27.1.1.4(b) Revised

RATIONALE: A timer feature is required to ensure elevator phones hang up upon completion of the call in those cases where the telephone network (public or building) does not provide disconnect signals. If not properly disconnected, it will not be possible to place another call from inside the car or cars served by the phone line. Using voice notification enables any authorized personnel to properly respond to calls from any manufacturer's equipment. [TN 09-1930]

Requirement 2.27.1.1.6(a) Revised

RATIONALE: To clarify the original intent of the Committee that silencing the signal shall provide a meaningful period of quiet even if the two-way communication means is checked continuously. [TN 10-1162]

Requirement 2.27.1.1.6(b)(3) Revised

RATIONALE: To clarify the original intent of the Committee that silencing the signal shall provide a meaningful period of quiet even if the two-way communication means is checked continuously. [TN 10-1162]

Requirement 2.27.1.1.6(b)(4) Revised

RATIONALE: The alarm signals shall be silenced, extinguished, and reset as soon as practical after the phone

line operability has been restored. Five minutes is a reasonable time to verify that reinstatement of the line has occurred. Reorganized for clarity, coordination with TN 10-1162, and to ensure there is no misunderstanding that the signal needs to reactivate every 5 min. [TN 10-1165]

Requirement 2.27.2.3 Revised

RATIONALE: To clarify the intent of the requirement. Buildings with multiple groups may include one or more single elevators. These single elevators should also be provided with the illuminated emergency power signal. The previous requirement did not clearly mandate that an illuminated emergency power signal was required for single elevators. [TN 11-627]

Requirement 2.27.2.4.4 Revised

RATIONALE: To clarify operation of elevator with alternate doors. [TN 10-1881]

Requirement 2.27.3.1.1(b) Revised

RATIONALE: The current requirement does not forbid red text on a red background if the text color contrasts with the background. See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.3.1.2 Revised

RATIONALE: To provide consistency with NFPA 72. Also see general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.3.1.6(a) Revised

RATIONALE: To clarify that any door (side, rear, etc.) that does not have an associated "FIRE RECALL" switch is not to be automatically opened when the car returns to the designated level.

Because the existing language only addresses when the door open button(s) are to be rendered inoperative, additional language is needed to clarify that the door open button(s) for doors that do not have an associated "FIRE RECALL" switch are required to be operative when the car is at the designated level.

To provide a maximum time that a door can be held open by a door open button associated with an entrance other than the door serving the lobby at the designated level. A 15-s maximum is a consensus value chosen by the Committee as a door stand-open time, and it is consistent with similar situations for hydraulic elevators [see requirement 3.27.1(d)] and for traction elevators with alternate source of power [see 2.27.3.1.6(n)(3)]. [TN 10-1880]

Requirement 2.27.3.1.6(d)(2) Revised

RATIONALE: To correct a reference; 2.13.2.4 does not exist. [TN 11-1506]

Requirement 2.27.3.1.6(f) Revised

RATIONALE: To provide consistency with NFPA 72. Also see general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.3.2.1 Revised

RATIONALE: Although the term "fire alarm initiating device" is used some 20 times in A17.1, no definition is provided. However, providing a definition for this term that is specific to the function of Phase I Emergency Recall may result in further confusion because fire alarm initiating devices are also used for elevator shutdown (shunt trip). Providing specific text that addresses the type of detection intended, similar to that provided in 2.27.3.2.2, provides clarity and consistency without the need for a new definition. [TN 08-1476]

Requirement 2.27.3.2.1 Revised

RATIONALE: See rationale for 2.27.4.2. [TN 09-1937]

Requirement 2.27.3.2.1 Revised

RATIONALE: To clarify that only FAIDs located in/at the elevator lobbies shall cause recall of the associated elevator(s). [TN 10-1883]

Requirement 2.27.3.2.2 Revised

RATIONALE: See rationale for 2.27.4.2. [TN 09-1937]

Requirement 2.27.3.2.2 Revised

RATIONALE: To clarify that only FAIDs located in/at the elevator lobbies shall cause recall of the associated elevator(s). [TN 10-1883]

Requirement 2.27.3.2.2(c) Added

RATIONALE: To harmonize with 2.27.3.2.1 and to ensure that detectors are located in the hoistway when there are sprinklers in the hoistway. [TN 09-1944]

Requirement 2.27.3.2.3 Revised

RATIONALE: See rationale for 2.27.4.2. [TN 09-1937]

Requirement 2.27.3.2.6 Revised

RATIONALE: See rationale for 2.27.4.2. [TN 09-1937]

Requirement 2.27.3.2.7 Added

RATIONALE: This requirement would specify that a listed relay or listed appliance that complies with

NFPA *72* (Requirement 6.16.2.2) interface with fire alarm systems in jurisdictions not enforcing the NBCC and does not require the fire alarm company employees to enter dangerous areas. This is essentially a correlation, acknowledging these devices are to be installed per the NFPA code. This requirement will clarify the interface device should not be located in Group 1 Security areas (pit and hoistway) but should be located in Group 2 Security areas (such as machine room, control room). [TN 09-1940]

Requirement 2.27.3.3 Revised

RATIONALE: The current requirement does not forbid red text on a red background if the text color contrasts with the background. To provide consistency with NFPA *72*. See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.3.3.1(b) Revised

RATIONALE: To provide consistency with NFPA *72*. See also general rationale/background for 2.27.11. [TN 09-2041]

Requirements 2.27.3.3.1(d) and (e) Revised

RATIONALE: These requirements are redundant with the requirements of 2.27.3.3.7. [TN 11-621]

Requirement 2.27.3.3.1(n) Revised

RATIONALE:

(a) Power supplies (auxiliary power supplies) are currently being installed which offer limited operating capability when electric elevators lose mainline power.

(b) This addressed the requirements for firefighters' Phase II Emergency In-Car Operation on electric elevators equipped with an auxiliary power supply.

(c) While the "FIRE OPERATION" switch in the car is in the "ON" position, door operation at a landing must still remain in the control of the firefighter in the car, in order to protect the firefighter from the possibility to exposure of extreme heat and/or smoke from the landing side.

(d) Illuminating the visual signal [2.27.3.1.6(h)] intermittently informs the firefighter that the car will soon be unavailable for Phase II operation. This requirement is also consistent with 3.27.4 for hydraulic elevators.

(e) Door operation with respect to the "FIRE OPERATION" switch in the car in the "OFF," "HOLD," and "ON" positions should be consistent with the requirements of 2.27.3.4(b) through (d) following an interruption of power. [TN 11-626]

Requirement 2.27.3.3.2 Revised

RATIONALE: See rationale to 2.27.3.3.1(n). [TN 11-626]

Requirement 2.27.3.3.4 Revised

RATIONALE: See rationale to 2.27.3.3.1(n). [TN 11-626]

Requirement 2.27.4.1 Revised

RATIONALE: To provide consistency with NFPA *72*. See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.4.2 Revised

RATIONALE:

(a) To improve readability of the Code.

(b) Motor controllers and machines are supplied with sufficient power to start a fire. We should monitor for smoke in these areas. If the fire initiates in one of these devices, the firefighters should be warned not to use the affected elevator.

(c) To harmonize 2.27.4.2 and delete the Canadian exceptions. The requirements for all elevators to have automatic recall have now been harmonized and will be reflected in the next edition of the Code. During the process, this area of the Code was overlooked unintentionally and needs to be brought in line with the requirements for automatic elevators in order to provide an increased level of safety.

(d) The detector does not need to be located inside the space but needs to be able to detect when there is smoke in the space. As an example, an appropriately designed smoke detector placed in an exhaust air duct leading from the control or machinery space could be used to detect fire in the space. [TN 09-1937]

Requirement 2.27.4.2(a) Revised

RATIONALE: To clarify that only FAIDs located in/at the elevator lobbies shall cause recall of the associated elevator(s). [TN 10-1883]

Requirement 2.27.5 Revised

RATIONALE: Operators of cars on attendant service must be notified that there is a fire emergency in the building and given the opportunity to take appropriate action based on their training. See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.6 Revised

RATIONALE: See general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.6 Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. [TN 09-1907]

Requirement 2.27.6 Revised

RATIONALE: To clarify the location of where the signal must be audible, not the location of the signaling device, and to provide additional editorial revisions for clarity and consistency. [TN 11-1504]

Requirement 2.27.8 Revised

RATIONALE: Different key-cutting conventions exist within the lock industry. For tube keys, some manufacturers cut clockwise while others cut counterclockwise. Additionally, it has been recognized that simply specifying a bitting code could result in nonmatching keys. This is due to different industry conventions used to specify bitting code versus cutting depth.

In order to ensure uniformity in the FEO-K1 key, 2.27.8 must clearly define all applicable variables related to the manufacture of this key. For the requirement to be enforceable, the requirements for the key must reside in the body of the Code and not in a nonmandatory appendix. [TN 09-1018]

Requirement 2.27.8 Revised

RATIONALE: See general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11 Added

RATIONALE:

(a) General Rationale/Background. When a fire occurs in a high-rise building, Firefighters' Emergency Operation (FEO) operates as it has for many years. If the fire/smoke is remote from the elevators, they can safely be used to supplement the stairs in evacuating the building. With this added capacity, many of the building occupants who were most directly threatened by the fire, including those who are unable to use the stairs on that day, can be safely out of the building by the time the firefighters arrive. This allows the firefighters to focus more of their attention on fighting the fire.

While on Occupant Evacuation Operation (OEO), the cars will shuttle between the five floors closest to the fire (e.g., fire floor, two floors above, and two floors below) and the elevator discharge level (typically the ground floor). Occupants will not be able to travel to or from any other floor. Signs and voice announcements on all floors will inform occupants about the emergency, and whether or not the elevators are available for their use.

If the fire is remote from the elevators and the fire alarm system has not recalled the cars, the arriving firefighters can do what they have always done: turn a switch [in the lobby, or in the fire command center (FCC)] and recall all the cars to the lobby, and then use as many cars as they want on Phase II. However, this system provides them with another option as well. If they see that evacuation is progressing but is not complete, they can choose to recall only the cars they plan to use on Phase II, leaving the rest in evacuation mode. This is done using a "per car" Phase I recall switch located next to each car. If their needs grow, they can take more cars by turning additional "per car" recall switches at any time, or turning the "group" switch if they want all the cars.

(b) Human Factors Research. Like the use of any technological system, the safe and effective use of elevators during emergencies will be partially dependent on correct assumptions on occupant behavior during the emergency. In this light, the Task Group has considered the different aspects of occupant behavior which will be important to the use of the elevator system.

The Task Group identified the following occupant behavior assumptions:

(1) Floor wardens will carry out the responsibilities correctly.

(2) Occupant Training

- will attend initial training sessions
- will attend ongoing training

(3) Occupants and Lobby Signage/Voice Notification (SVN)

- will take the time to observe the SVN
- will understand the SVN symbols and language
- will follow the SVN instructions
- will have a workable sense of acceptable wait times in the elevator lobby
- will make the correct decision regarding using elevators or the stairs
- if having decided to leave the elevator lobby, will go to the stairway in an orderly manner

(4) Occupants and Elevators. The design and training on the two-way communication system will ensure correct use.

(5) Occupants — General

- will accurately gauge their ability to take the stairs
- will provide correct assistance to others who cannot use the stairs
- visitors will follow the lead of trained occupants

The Task Group feels that the issues involving fire wardens, the signage/voice notification system, and in-car communication system are those with the greatest potential impact if the assumptions made are incorrect.

While some of the occupant behavior issues can be addressed through building policy (e.g., mandatory training for new and existing occupant employees), others need investigation to determine if the assumptions made are correct. This investigation can take the form of elevator component mock-up or observations in buildings where similar systems are currently in use.

Research on these aspects of occupant behavior is needed to enable emergency-use elevator systems to be put in place with the greatest degree of confidence regarding their safe and effective use. To the extent that research confirms these assumptions, it will be easier to design elevator evacuation systems that perform well.

Elevator evacuation systems should not be designed that require 100% human reliability, just as systems should not be designed that depend solely on the reliability of any single hardware feature. To the extent that research does not support these assumptions, systems should be designed to improve human performance and to use redundancy and other measures to compensate for inherent limits in human reliability.

(c) 2.27.11. Hazard analysis shows that the use of elevators by occupants during a building evacuation starting prior to Phase I Emergency Recall Operation provides a reasonable degree of safety for the occupants when the following provisions are met, but that unacceptable hazards remain if any of them are omitted. [TN 09-2041]

Requirements 2.27.11.1.1, 2.27.11.1.2, and 2.27.11.1.3 Added

RATIONALE: Firefighters normally do not use all elevators. This allows them the option of using as many as they need while allowing the rest to continue evacuating occupants from the building. In some cases, they will still want to recall the entire group without having to turn numerous keys, so the current group recall switch is retained. Note that 2.29 requires the car identification to be marked at the designated level and in the car operating panel. Each must be labeled in case they are mounted one above the other between two cars.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.1.4 Added

RATIONALE: Requirement 2.27.3.1.5 puts a lamp by every "FIRE RECALL" switch. When the group goes on fire service, they all come on. When only a single car is placed on fire service, only the lamp for that car should come on. This makes it easy for a firefighter standing in the lobby to understand the current status of the cars.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirements 2.27.11.1.5, 2.27.11.1.6, and 2.27.11.1.7 Added

RATIONALE: In most buildings, the ground floor is both the level of exit discharge (terminology per IBC and NFPA *101*) and the designated level. Some buildings, particularly those on hills or attached to large complexes, may have them on different floors. If Occupant Evacuation Operation is to be used, they must be the same floor so firefighters can observe and manage the situation.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.2 Added

RATIONALE: Occupants need information to help them decide whether to wait for elevators or take the stairs. By positioning the sign up high, it will be visible to most people, even if the elevator lobby is crowded with people. Those who still don't or can't see it can be informed by others in the crowd.

NOTE: Actual wording and symbols to be used must be determined by further human factors studies.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.3 Added

RATIONALE: If a hoistway pressurization system exists, it can operate more effectively when the doors are closed. The hall button allows firefighters a way to check that cars are there and are unoccupied, or enter them for use on Phase II.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.4 Added

RATIONALE: When the doors are closed, the firefighters cannot determine the location of the car without the position indicator.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.5.1 Added

RATIONALE: Occupant Evacuation Operation can be used for fires that do not impact the elevator system. If there is smoke detected in an elevator lobby, hoistway, or machine room, those elevators recall on Phase I Emergency Recall Operation. Generally a fire starts on a single floor, and only that floor and the adjoining floors are evacuated. Occupants on other floors stay in place. If smoke or fire spreads to another floor, even if it skips floors, all floors in between must be evacuated. If the fire is on the ground floor, a trained person must decide if there is a safe path from the elevators to the exit. Zoned evacuation plans in high-rise construction typically require evacuation of at least the floor with an active fire alarm initiating device, the adjacent floor above, and the adjacent floor below. OEO shall evacuate the two floors above the active fire alarm initiating device in recognition of the potential for upward smoke

spread, particularly through convenience stairs or other floor penetrations. OEO shall also evacuate the two floors below the fire alarm initiating device in recognition of the standard practice of the fire service of staging response operations two floors below the fire, as specified in A17.4. The fire alarm system is assigned the responsibility of adding the two floors above and below the fire floor to the evacuation zone, as well as filling in the floors between separated alarms to be consistent with the next rule, and to simplify the interface when a fire zone spans between two groups of elevators. The method used for the fire alarm system to indicate to the elevator system the floors to be evacuated is left for the alarm system and elevator manufacturers to work out; parallel wires or serial communications are each acceptable.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.5.2 Added

RATIONALE: The decision to evacuate the building due to fire growth or some other threat must be made by the person in charge, not by an automated system.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirements 2.27.11.6 and 2.27.11.6.1 Added

RATIONALE: The system needs to keep occupants informed of the current status, consistent with the voice announcements, so they can make their own decisions whether to wait for an elevator or take the stairs. The format, resolution, and accuracy of the message and time estimate is left undefined until human factors studies determine what is most effective and manufacturers determine what is feasible.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.2 Added

RATIONALE: The signals instruct passengers to exit quickly so that the cars can return as quickly as possible to the evacuation floor(s).

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.3 Added

RATIONALE: Any hall call from an affected floor is an indication that someone is there that needs to be evacuated. Therefore, a car will be sent and the person will be taken to the elevator discharge level. For total building evacuation, occupants on the fire floor and adjacent floors are in the greatest danger and should get the best elevator service. The highest floors get the next best service, because the time to evacuate the entire building is minimized if the elevators first evacuate the occupants from the highest floors, since they would have the longest stair evacuation time. Even as priorities change and new hall calls are entered, the cars should never bring occupants higher into the building than they were. Once a car stops and passengers enter, it should only go downward. For buildings with particularly unique layouts and populations, the AHJ might approve other priority schemes.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirements 2.27.11.6.4 and 2.27.11.6.5 Added

RATIONALE: Combined with the next rule, this gets all the cars headed to the fire floor to evacuate the first group of occupants. After that, they will go back to the fire floor, or go to the other floors being evacuated based on entered hall calls. Note that landing calls at any of the affected floors will end this "parked with doors closed" period.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.6 Added

RATIONALE: While these people might have been headed for non-fire-involved floors, they are still safer outside the building because the fire could grow. The fewer people in the building, the better.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.7 Added

RATIONALE: Traditional dispatch systems will send only a single car at a time to answer a hall call; this will slow the evacuation process. This rule brings more than one car at a time to the floor if there are calls indicating people are waiting. Destination systems will routinely send multiple cars if enough calls are entered to indicate more than one carful of passengers are waiting.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.8 Added

RATIONALE: For the evacuation to proceed quickly, the cars should be well loaded, without the delay caused by overloading and then unloading. The closing doors will limit some of the debate about whether or not one more person can squeeze in. The trigger point for closing the doors is given as a maximum amount to give flexibility to manufacturers due to inaccuracies of typical load-measuring devices and to suit building conditions.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.9 Added

RATIONALE: Standard emergency evacuation strategies are for people in the rest of the building to stay where they are until the firefighters evaluate the situation. Firefighters can then initiate total building evacuation, if warranted.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.27.11.6.10 Added

RATIONALE: Smoke detection in an elevator lobby, machine room, or hoistway shuts down Occupant Evacuation Operation.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 2.29.1 Revised

RATIONALE: The reformatting of 2.29.1 into 2.29.1.1 and 2.29.1.2 is to clarify that the marking requirements related to size of alphanumeric marking and marking methods apply only to those items listed in the proposed 2.29.1.2.

The addition of requirement 2.29.1.3 is to address the possible mal-operation of these devices due to the lack of proper identification where such devices for multiple elevators are located in the same enclosure. It is also permitted to group these devices with demarcation for identification. [TN 08-801]

Requirement 2.30 Added

RATIONALE: Environmental effects such as wind cause high-rise buildings of modern-day construction to sway. Such building sway induces vibration in all hanging systems within the elevator system, such as suspension and compensating means, travel cables, governor ropes, selector tapes, etc. When the forcing frequency of the building vibration matches the natural frequency of the hanging members, the amplitudes of the excursions (displacements) of these members increase. The resulting problem is that the swaying members snag rail brackets, locks, cams, and switches, etc. In extreme cases, compensating ropes twist around each other and in passing over compensating sheave assemblies, become jammed and thus cause one or more ropes to break. Sway control guides will reduce or eliminate this problem, except in extreme conditions of building sway. Those extreme cases will require additional methods to reduce the effects of sway, e.g., for elevators that travel to all floors in the building, speed reduction of the elevator and/or limiting travel to the upper and lower floors (i.e., keep the elevator only running in the middle rise of the building). If complete shutdown is required due to the sway severity, then arrange to park the elevator at or near rise center.

The requirement is not intended to mandate the use of sway control guides or establish the specific criteria which would trigger the use for these devices. Parameters affecting building sway should be evaluated on a project-by-project basis, and the need for such a device should be evaluated and determined prior to, or in conjunction with, the planning of the building. There are many variables that drive the requirement of such a device; among the parameters to be considered are

(a) applicable wind loading with gust predictions for the appropriate area of the country and how it is influenced by surrounding buildings or landscape features.

(b) the building's lateral stiffness/resulting peak displacement during wind load estimates (with respect to each principle axis). This varies from one building design to another.

(c) the building's period/natural frequency (with respect to each principle axis). This varies from one building design to another.

(d) the elevator's acceleration, jerk, and top speed.

(e) the unit weight (or linear mass) of the hoist and comp ropes.

(f) the rope comp assembly's weight/resulting tension in the hoist and comp ropes.

(g) the elevator's travel height within the building and the number of stops and where these stops are located within the travel height.

(h) the elevator's hoistway configuration, which would govern the allowable hoist and comp rope displacement from the neutral axis (vertically) of the hoistway.

A shorter flexible building (with higher wind load estimates) with slow elevators could be more prone to this problem than a taller, stiffer building (with lower wind load estimates) with fast elevators. Additionally, there are many other techniques that could be utilized to mitigate rope sway. [TN 02-2351]

Requirement 3.4.1.6 Revised

RATIONALE: These changes are made per the suggestion of the Ad Hoc Committee on signage. This is a safety sign, and changes have been made in accordance with Ad Hoc Committee recommendation. [TN 08-902]

Requirement 3.12.1 Revised

RATIONALE: Unlike a title, 3.12.1 is a requirement. All requirements in 2.12 are equally applicable to hydraulic and electric elevators. Other devices not specifically mentioned in the title of 3.12 apply in their entirety. [TN 08-1801]

Requirement 3.17.1.1 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 3.17.3.2 Revised

RATIONALE: To provide clearer language covering required actuation means based on response to Inquiry 08-35. The second sentence of former 3.17.3.2.1 (stricken below) has been added to this requirement.

Inquiry 08-35 indicated that a clarification to the requirements was needed to indicate that either 3.17.3.2.1 or 3.17.3.2.2 must be complied with if a plunger gripper was used. The inquiry also made clear that alternate means for testing purposes in accord with 8.10.3.2.5(n) need not meet either of these two requirements. [TN 09-254]

Requirement 3.17.3.2.1 Revised

RATIONALE: Restated as a requirement when electrical actuation means are used. See also rationale for 3.17.3.2. [TN 09-254]

Requirement 3.17.3.2.2 Added

RATIONALE: Added requirements for inspection and test means as a result of Inquiry 08-35. See also rationale for 3.17.3.2. [TN 09-254]

Requirement 3.17.3.4 Revised

RATIONALE: Since two requirements apply to the normal retracted position, they are now both included. See also rationale for 3.17.3.2. [TN 09-254]

Requirement 3.17.3.4.2 Revised

RATIONALE: This requirement was misplaced in 3.17.3.2.1 and has been moved to apply to the normally retracted position. See also rationale for 3.17.3.2. [TN 09-254]

Requirement 3.17.3.8 Revised

RATIONALE: The proposed requirements allow stamped characters which are depressed. Such characters would require a metal punching tool, and a simple rubber ink stamp could not be used. Additional requirements suggested by the Ad Hoc Committee were deemed to be not suitable. It is noted that hydraulic equipment is often located in pits, which have minimal illumination. [TN 08-902]

Requirement 3.18.1.2 Revised

RATIONALE: Propose deletion of 3.18.1.2.2, since there should be no exceptions to the two ropes per jack. Requirement 2.20 (new suspension means requirements) should stand on its own and therefore should now eliminate exception this requirement created to 3.18.1.2.1.

Deletion of 3.18.1.2.3 since experience has shown that clear plastic coating does not correspond with new suspension means requirements (2.20). [TN 11-1453]

Requirements 3.18.1.2.4 Through 3.18.1.2.8 Renumbered as 3.18.1.2.2 through 3.18.1.2.6, respectively, and editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 3.18.3.8.3 Editorially revised

RATIONALE: Editorial clarification. Language also parallels that in 3.19.5. [TN 10-946]

Requirement 3.18.6 Revised

RATIONALE: This is not a data plate. It was felt that a data tag is not required and drilling holes on the cylinder to attach tag not recommended. It would be preferred to apply the markings directly to the cylinder. The proposed requirements allow stamped characters which are depressed. Such characters would require a metal punching tool, and a simple rubber ink stamp could not be used. [TN 08-902]

Requirement 3.19.2.5 Revised; formerly numbered 3.19.4.5

RATIONALE: Relocated to a more appropriate location. In addition, distinguishes between a shutoff valve (3.19.4.1) versus a small valve solely to protect the pressure gauge. [TN 09-793]

Requirement 3.19.2.7 Added

RATIONALE: Damage to piping can occur as a result of excavating overburied pipe. A hazard assessment indicates that this occurrence is remote; however it is deemed prudent to protect against this occurrence. The proposed wording will mitigate possible damage to piping as a result of excavation. [TN 06-602]

Requirement 3.19.4.5 Relocated to 3.19.2.5

RATIONALE: Relocated to a more appropriate location. In addition, distinguishes between a shutoff valve (3.19.4.1) versus a small valve solely to protect the pressure gauge. [TN 09-793]

Requirement 3.19.4.6.2(f) Revised

RATIONALE: The valve coil is interchangeable based on the voltage, frequency, and whether AC/DC is used in the system; therefore, the coil data should not be on the valve body itself but on the coil. [TN 08-902]

Requirement 3.24.1.1 Revised

RATIONALE: Some of the recommendations of the Ad Hoc Committee were accepted in principle for usage and updating of this marking plate, whereas some were not felt to be warranted. [TN 08-902]

Requirement 3.25.1.1 Revised

RATIONALE: The changes clarify the intent and scope of the term "function independently" based on past interpretations and accepted practice, without changing the scope of the existing requirements. [TN 10-148]

Requirement 3.25.2.2.1 Revised

RATIONALE: The changes help clarify the intent and scope of the term "operate independently" based on past accepted practice, without changing the scope of the existing requirement. [TN 10-148]

Part 5 Scope Revised

RATIONALE: To include outside emergency elevators in ASME A17.1/CSA B44 and to apply the ASME A17.7/CSA B44.7 procedures to the design and testing of these elevators. Modifications to GESRs assure that the unique operating environment of outside emergency elevators is taken into consideration. The risk assessment assures that the viewpoint of firefighters is taken into consideration. Operating instructions assure emergency personnel and elevator personnel are provided with appropriate information. [TN 10-923]

Part 5 Scope Revised

RATIONALE: To add the new requirements for wind turbine tower elevators to the Scope of Part 5. [TN 10-2024]

Requirement 5.1.10.3 Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. [TN 09-1907]

Requirement 5.1.11.4 Revised; formerly numbered 5.1.9

RATIONALE: To update references to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 5.1.11.5 Revised; formerly numbered 5.1.11.4

RATIONALE: To update references to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 5.2.1.2 Revised

RATIONALE: The requirement for a sump is not necessary since Phase II Firefighters' Emergency Operation is prohibited on LULA elevators. [TN 10-1085]

Requirement 5.2.1.4.4(b) Revised

RATIONALE: To clarify that the brake cannot be used as the mechanical means. [TN 10-1092]

Requirement 5.2.1.4.4(b)(1) Revised

RATIONALE: To recover language that was lost in the 2009 edition changes in Part 2. A new TN will be opened to address this requirement relative to the current language in Part 2. [TN 12-426]

Requirement 5.2.1.4.5 Added

RATIONALE: To recover language that was lost in the 2009 edition changes in Part 2. A new TN will be opened to address this requirement relative to the current language in Part 2. [TN 12-426]

Requirement 5.2.1.12 Revised

RATIONALE: To update references to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 5.2.1.12(d) Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. [TN 09-1907]

Requirement 5.2.2.1 Revised

RATIONALE: To recover language that was lost in the 2009 edition changes in Part 3. A new TN will be opened to address this requirement relative to the current language in Part 3. [TN 12-427]

Requirement 5.2.2.1.1 Added

RATIONALE: To recover language that was lost in the 2009 edition changes in Part 3. A new TN will be opened to address this requirement relative to the current language in Part 3. [TN 12-427]

Requirement 5.2.2.6 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Section 5.3 Editorially revised

RATIONALE: Corrections to first paragraph are editorial. The new paragraphs are added based on the results of Inquiry 09-25. [TN 09-1000]

Requirement 5.3.1.1 Revised

RATIONALE: The current text does not include any criteria for glass. This proposal provides the criteria and is consistent with requirements in other Parts of the standard. [TN 08-753]

Requirement 5.3.1.2.3 Added

RATIONALE: Residential elevators have very shallow pits. The addition of the pit switch is for safety. [TN 08-639]

Requirements 5.3.1.11.1 and 5.3.1.11.2 Revised

RATIONALE: To clarify that the provisions of 2.17.5 apply to private residence elevators and that the counterweight safety must conform to all requirements in 5.3.1.11. [TN 10-222]

Requirement 5.3.1.11.7 Added, and existing 5.3.1.11.7 renumbered as 5.3.1.11.8

RATIONALE: Additional requirement added which was not previously addressed. [TN 09-1828]

Requirement 5.3.1.14.1 Revised

RATIONALE: To add requirements to permit other types of buffers presently permitted by Part 2 and Part 3 and bumpers presently permitted in Section 5.2. [TN 09-1819]

Requirement 5.3.1.18.2 Revised

RATIONALE: To harmonize the requirements between jurisdictions enforcing the NBCC and those that do not. [TN 09-1817]

Requirement 5.3.2.4.6 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Section 5.4 Revised

RATIONALE: Section 5.4 has not had any recent significant changes. Reformatting Section 5.4 removes sections that no longer apply and adds new requirements based on new technology and the evolution of elevators. The reformatting avoids redundancy by referencing the Private Residence Elevator section to provide consistency for private residence lift systems. [TN 05-802]

Section 5.11 Added

RATIONALE: To provide requirements for wind turbine tower elevators.

Requirement 5.11.1 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.1.1: To provide requirements for hoistway enclosures.

5.11.1.2: Most wind turbine tower elevators have no hoistway enclosure or machine room.

5.11.1.3: Wind turbine towers do not have room for overhead floors and their required clearances.

5.11.1.3.2: While most wind towers cannot have a floor over a hoistway, there are designs which have a floor below the nacelle deck, so provisions were added to provide parameters for them. [TN 10-2024]

Requirement 5.11.2 Added

RATIONALE: To coordinate numbering with Part 2.

Wind turbine tower elevators rest on the bottom landing platform. The travel path stops at the bottom landing. A wind turbine tower elevator does not have a "pit" by definition.

Wind turbine tower elevators are limited in speed that justifies the use of bumpers instead of buffers, and typically locate equipment (i.e., cable bin and guide rope wire tie-downs) in a space directly beneath the lowermost landing that is accessed via a ladder located outside of the travel path and not through the travel path. Since wind turbine tower elevators do not have a full hoistway enclosure, machinery mounted on the car bottom can be reached from the landing.

80 ft/min (0.4 m/s) is the maximum allowed speed in this proposal; however, the bumpers or buffers must conform to the retardation levels required in 2.22. [TN 10-2024]

Requirement 5.11.3 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for counterweight enclosures. To protect personnel in the car or personnel on floors, landing platforms, ladders, or stairs from injury due to the hazards of a moving counterweight. Maintenance and repair inside a wind turbine tower is performed outside the car enclosure on the climbing side of the ladder. In addition, self-evacuation from the elevator requires the ladder to be accessible from anywhere in the wind turbine tower.

5.11.3.2: To protect personnel on floors, platforms, ladders, or stairs from injury due to a moving counterweight. [TN 10-2024]

Requirement 5.11.4 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.4.1: To protect personnel working on car tops. Where access to the car top is not required by design, there is no need to provide for refuge space.

5.11.4.1.4: To provide clearance requirements for a car top railing, when provided.

5.11.4.2: To protect personnel working on car tops. Where access to the car top is not required by design, there is no need to provide for refuge space.

5.11.4.3: To assure the counterweight does not strike any structure. [TN 10-2024]

Requirement 5.11.5 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.5.1: To provide requirements for running clearances.

5.11.5.2: Due to the close proximity of the car and fall arrest systems in ladder-guided systems, requiring adequate clearance for proper application of the fall arrest system is required and is considered a "stationary object" in context of compliance.

5.11.5.3: Due to the taper of the wind turbine tower at the extreme top of the travel path, some rope-guided wind turbine tower elevator designs utilize rollers mounted on the car to ride against the tower wall, maximizing usable space at the nacelle deck. Such operation has not reduced safety; therefore, this exception was codified. [TN 10-2024]

Requirement 5.11.6 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for protection of spaces below the bottom of the travel path. [TN 10-2024]

Requirement 5.11.7 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for spaces.

5.11.7.2: To provide a safe work environment for personnel.

Many controllers are installed with limited working clearance and must have elevator power removed from the controller by design, therefore with no shock hazard exists and a lower lighting level is acceptable.

There is typically no reason for branch circuits for these conveyances due to their simplicity and location; one power cable feeds the car and controller. The tower is lit with adequate light for operations. In the event of problems requiring troubleshooting, the cars will be lowered to the bottom landing where power for temporary lighting is always available.

5.11.7.3: The environment of the wind turbine is typically not controlled, so the elevator manufacturer must design to the expected range of temperatures and humidity provided by the turbine manufacturers. [TN 10-2024]

Requirement 5.11.8 Added

RATIONALE: To coordinate numbering with Part 2.

Wind turbine tower elevators do not typically have an enclosed hoistway; therefore, the "hoistway" is considered the "travel path," defined as the area encompassed by the bottom landing platform to the uppermost point of travel or the final limit within the projected horizontal footprint of the car and its guiding means, inclusive of any deflection of the elevator guidance system.

Nonelevator equipment could be located in the spaces accessed by elevator personnel (e.g., the basement, under the first-floor landing).

Access to the wind turbine tower is limited to trained and authorized personnel.

The available spaces for machinery in a wind turbine tower is severely limited; however, there is ample room for all nonelevator-related wiring and piping.

Compliance with the electric code is required to ensure electrical safety against fire and shock hazards.

No nonelevator-related wiring should be in the travel path of the elevator, and no wiring of any type should interfere with the travel of the elevator.

The space below the bottom landing platform where the trailing cable is stored is considered machinery space. [TN 10-2024]

Requirement 5.11.9 Added

RATIONALE: To coordinate numbering with Part 2. To provide similar requirements as all other special purpose personnel elevators. [TN 10-2024]

Requirement 5.11.10 Added

RATIONALE: To coordinate numbering with Part 2. To provide guarding and railing requirements for equipment. [TN 10-2024]

Requirement 5.11.11 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for protection of landing platform openings.

5.11.11.1 Through 5.11.11.3: To provide requirements for the wind turbine tower elevators' fixed railings and doors or gates and the edge of the landing platform to assure that personnel cannot inadvertently access the travel path.

"People" or "general public" are not permitted access; only "authorized personnel" or "elevator personnel" are permitted access to the turbine.

Authorized and trained personnel are required to be PPE tied-off when a fall hazard exists.

5.11.11.4: To provide the minimum light level for illumination that is the same as for freight and SPPEs.

5.11.11.5: "People" or "general public" are not permitted access to the wind turbine tower. Only "authorized personnel" or "elevator personnel" are permitted access to the wind turbine tower.

Full-height (84 in.) enclosures interfere with tower flange bolt annual inspection and retorqueing at the upper landings.

Authorized and trained personnel are required to have a personal fall arrest system (PFAS) tied off when exposed to a fall hazard.

To provide requirements for protection of landing platform openings.

5.11.11.6 and 5.11.11.7: To provide requirements for protection of landing platform openings. [TN 10-2024]

Requirement 5.11.12 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.12.1: To provide requirements when these devices are provided.

5.11.12.2: These devices are not mandatory because of the working environment they are in and type of use. [TN 10-2024]

Requirement 5.11.13 Added

RATIONALE: To coordinate numbering with Part 2.

Presently there are no designs with power-operated doors and therefore no need to develop the appropriate requirements for them; therefore, the decision was made to prohibit them. [TN 10-2024]

Requirement 5.11.14 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.14.1 Through 5.11.14.3: To provide requirements for car enclosures and illumination.

5.11.14.4: Allows for the use of materials other than metal in the construction of the car enclosure for vision panels, but those components must meet the flame spread, smoke development, and material properties.

The clear height is described as the three-dimensional space above the platform standing area exclusive of wall-mounted equipment.

5.11.14.5 and 5.11.14.6: To provide for requirement for car tops.

5.11.14.7: Lighting requirements are necessary to ensure authorized personnel are able to see the threshold and any potential hazards.

Wind turbine tower elevators typically have adequate lighting in many cases external to the elevator car that also provides emergency lighting for 30 min after a power failure.

Portable lighting is required to be carried by all wind turbine tower elevator and authorized personnel.

The important safety consideration is to be able to see the car platform.

5.11.14.8: Providing requirements for emergency lighting ensures that sufficient lighting is provided to wind turbine tower elevator and authorized personnel such that they can safely exit the elevator and tower in the event of a power failure.

The requirement for 30 min duration for auxiliary lighting is because exit procedures from wind turbine towers are well defined and the wind turbine tower elevator personnel are trained in these procedures. It also does not take more than 15 min to exit the tower.

The lighting power is not from a branch circuit; it is from the same power source as the driving-machine controller, properly fused at the car. An interruption in the electrical power to the elevator will trigger the lighting to turn on.

Typical towers have ambient light levels that exceed minimum lighting requirements for the elevator.

5.11.14.9: Since these devices do not have a full height travel path hoistway enclosure, emergency exit can be via the car door or gate, or by top of the car exit or bottom of the car exit on ladder-guided system. To prevent persons from falling from the car with open car door or gate, personnel are required to wear fall protection systems and personal fall arrest systems when in the car.

The out-of-reach dimension is 1 500 mm; therefore, anything within 1 500 mm is within reach. See A17.7, safety parameter 3.5.1.

The anchorage point in the car is capable of transferring all forces into the elevator support structure, and that the structure will resist the forces adequately.

Exit via an unenclosed hoistway requires riders employ the appropriate personal protective devices prescribed by the appropriate safety codes and that a path for safe exit exists.

All wind turbine towers are provided with a ladder.

If an exit cover is provided, the switch is required to ensure safety.

On some ladder-guided systems, emergency exit is through the car enclosure floor; therefore, requirements for the design of the platform are required.

5.11.14.10 and 5.11.14.11: Since there is normally no hoistway enclosure, means are needed to assure the car door and gate remain closed while the elevator is in operation.

Allows perforations in the car door or gate to 25 mm (1 in.) because one of the functions of the elevator is to visually inspect the interior of the wind turbine tower.

As the car door or gate is a method for emergency exit, the car door or gate must be openable from within the car in addition to being openable when at the landing from the outside.

Unlocking or opening the car door or gate will cause the car to stop.

The change allows for the use of materials other than metal in the construction of the car door or gate, but those requirements must meet the flame spread, smoke development, and other requirements. [TN 10-2024]

Requirement 5.11.15 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.15.1 Through 5.11.15.3: To provide requirements for car frames and platforms.

5.11.15.4 Through 5.11.15.7: Existing 5.7 prescriptive Code language partially applies to 5.11 wind turbine tower elevators.

Guiding device requirements were added to provide design guidelines.

The safety factor is based on current language in A17.1:

> *factor of safety:* the ratio of the ultimate strength to the working stress of a member under maximum static loading, unless otherwise specified in a particular requirement.

5.11.15.8: The toeboard requirement was added to mitigate the risk of falling object from the car during entrance to and egress from the car during normal operation.

5.11.15.9: To require an obstruction detection system that assures that objects in the travel path are detected reliably and the car stopped safely to prevent injury.

Added to prevent the automatic restarting of the elevator after a device is tripped and then resets. Specifically, if a ladder climber is on the ladder and an elevator overruns the climber tripping the obstruction device, when the climber moves further up or down the ladder, the device would reset and potentially the elevator would move again in the direction of the climber. This requirement intends to prevent this situation.

5.11.15.10: The requirement for audible or visual warning when the car is moving is to warn personnel climbing ladders during manual lowering of ladder-guided systems. The selection of the lux values are based on the ANSI minimum levels for warning and commonly available light systems.

5.11.15.10.2: The recommended minimum is 70 dB in the 1 kHz to 4 kHz range; recommend the maximum shall not exceed the 90-dB level allowable for 8-h/day exposure, according to OSHA 1910.95.

5.11.15.11: The limited use and control of the elevators reduces the probability of falling dangers.

There is a need to have visibility below and above the elevator when using ladder-guided systems. [TN 10-2024]

Requirement 5.11.16 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.16.1 and 5.11.16.2: To provide requirements for capacity and loading.

5.11.16.3 and 5.11.16.4: Wind turbine tower elevator applications operate at a car speed less than Section 5.7 elevators.

The environment in the wind turbine tower includes tremendous sway, even when the turbine is feathered and turned off. The rated elevator speeds in the industry historically are 0.4 m/s (80 ft/min) or less.

5.11.16.5: To provide requirements for a system that will limit the descending speed of the elevator when the manual brake released is used. [TN 10-2024]

Requirement 5.11.17 Added

RATIONALE: To provide requirements for safeties.

5.11.17.1: To define the requirements for the commonly used wire rope gripping type of safety. Type A, B, or C safeties are not included because there will not be guide rails to apply on, in a wind turbine tower.

Wind turbine tower elevators operate at lower speeds. Because of deviation in the travel path from vertical, low speeds are required for safe passage through platform landings.

To require clearances for the gripping device.

To require similar design requirements for this type of safety.

5.11.17.2: To provide requirements for a safety for rack-and-pinion drive systems. For a dual-drive machine, each rack and pinion provides safety protection against uncontrolled movement. The components are required to have a factor of safety of 8 (see 5.7.18.1.2). This inherent factor of safety exceeds the minimum factor of safety required for safeties.

5.11.17.3: To require a marking plate on all safety devices.

5.11.17.4: A means to remove power from the driving-machine motor and brake when the safeties actuate is required. If another device that performs the function of the safety is provided (i.e., device conforming to 5.11.17.3), then this device must remove power as well.

5.11.17.5: To provide requirements regarding the application of the safety. [TN 10-2024]

Requirement 5.11.18 Added

RATIONALE: There is not a current design which can utilize a traditional safety and speed governor. [TN 10-2024]

Requirement 5.11.19 Added

RATIONALE: Due to the limited use, lack of requirements in 5.7, the requirements for an emergency brake, ACOP and UCM are not necessary. [TN 10-2024]

Requirement 5.11.20 Added

RATIONALE: To coordinate numbering with Part 2.

To provide requirements for suspension means. On traditional elevators, a working space is naturally provided when standing on the car top. With wind turbine elevators, the car top space is limited, not allowing ease of inspection. Therefore, a requirement to provide access to the suspension means for inspection must be provided.

5.11.20.1: To require requirements for suspension ropes.

5.11.20.2: Added a new section to separate the distinction between counterweighted and uncounterweighted traction elevators.

The environment of wind turbine towers includes humid environments, and the time between uses does not allow full inspection of the rope; therefore, unseen damage due to rust could accumulate unless protected against.

5.11.20.2.1: 8-mm ($^{5}/_{16}$-in.) ropes have been in use successfully by the wind industry for many years.

5.11.20.2.2: A conservative factor of safety is required. Added formula for design guidance.

5.11.20.2.3: The drive machines mounted in the uncounterweighted traction wind turbine tower elevator are generally single V-groove traction type with suspension provided by a single wire rope. The specification of factor of safety in 5.11.20.2.2 ensures adequate safety.

5.11.20.2.4: To prevent splicing.

5.11.20.2.5: To provide requirements for swaging and clevis fastening for wind turbine tower elevators. This is the common method of fastening, with many thousands of installations globally.

Wind turbine tower elevators are considerably limited in mass and capacity, and have a lower number of cycles than most other elevators.

Further requirements ensure that wire ropes remain safe by having a replacement.

Swaging has been allowed for elevator applications of similar duties by interpretation.

The European Norm for swaging is EN 13411-3:2004, which provides the specification that applies to this type of rope termination.

5.11.20.2.6 Through 5.11.20.2.8: The prohibition of the use of U-bolt type clips is to assure that when loads are on a rope, the known damage caused by these types of connectors does not reduce the tensile forces of the suspension rope. It is allowed to use them on the parts of the rope not subjected to the forces due to the weight of the car or counterweight, such as the tail end of the ropes under the platform.

To require a minimum breaking force criterion for the swage fittings that is equivalent to Code requirements and industry standards.

5.11.20.2.8: The use of a single suspension rope in wind turbine tower elevators is justified for the following reasons:

(a) The load and speeds are limited.

(b) The use of wind turbine tower elevators is very low; there are typically less than 30 cycles/yr on average.

(c) The secondary safety wire rope is always available in the event the primary wire rope fails and never undergoes stress of bending.

(d) The factor of safety of the suspension rope is a minimum of 10.

(e) The replacement is required at frequent intervals specified by the wind turbine tower elevator manufacturers (i.e., never exceeding 5 yr).

(f) Required replacement criteria are based on A17.6 unfavorable condition, wire break, and diameter reduction.

(g) Ropes are subject to annual inspection.

(h) Wind turbine tower elevators are provided with galvanized steel wire ropes in all cases, considering the environment they are in.

5.11.20.2.9: To provide requirements for replacement.

A wind turbine tower elevator controller includes an hour meter to record actual motor operation of the wind turbine tower elevator and monitors the time-use of the wire ropes.

The time-use criterion primarily limits rope damage due to undersized sheave wire fatigue failure and crown wear.

The addition of a 5-yr replacement criterion is to assure environmental damage (humidity), other fatigue failure due to the lack of use, infrequent inspection interval, and lack of history do not allow the single rope to fail.

5.11.20.2.10: To require a safety steel wire rope that the safety device acts upon in the event of overspeed.

5.11.20.2.11: The steel wire ropes used in the wind turbine tower elevator industry are not presently listed in A17.6. The tables are being reviewed by the Mechanical Design Committee. Once their review is complete, the tables will be a subsequently balloted document.

5.11.20.2.12: To add requirements for suspension means data tags.

5.11.20.3: Chain suspension is being balloted on a concurrent ballot. [TN 10-2024]

Requirement 5.11.21 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for counterweights, where provided.

5.11.21.1: To provide requirements for counterweights, where provided.

5.11.21.2: To provide requirements for counterweights parameters. [TN 10-2024]

Requirement 5.11.22 Added

RATIONALE: To coordinate numbering with Part 2.

To provide requirements for buffers. The maximum speed of all wind turbine tower elevators is 0.4 m/s (80 ft/min); there is not a risk of injury due to the small impact force. The average acceleration is of short duration and is lower than 1g momentarily.

The occupants are aware and can see the floor when operating in the down direction therefore can expect the stop; hazards from acceleration or deceleration are considered minimal.

In normal use, the elevator is electrically stopped. The bumpers only strike the floor when the elevator is manually lowered onto them. [TN 10-2024]

Requirement 5.11.23 Added

RATIONALE: To coordinate numbering with Part 2.

To provide requirements for rails and supports.

Wire rope guide systems are commonly used by many types of wind turbine tower elevators.

5.11.23.1: To provide requirements for steel wire guide rope systems.

5.11.23.1.1 Through 5.11.23.1.4: The steel wire ropes used in the wind turbine tower elevator industry are not presently listed in A17.6. The tables are being reviewed by the Mechanical Design Committee. Once their review is complete, the tables will be a subsequently balloted document.

An analysis demonstrated the increased tensile forces due to sway do not significantly increase the tension that may affect the safety factor.

5.11.23.1.5: To assure that the forces applied to the fixes (rail bracket) do not exceed the materials' and mounting's ability to resist the loads imposed.

5.11.23.1.6: Swaged fittings have been allowed by interpretation for LULAs; wind turbine tower elevators have similar speed and loading limitations.

The use of these terminations globally has a long history.

The fastenings will be inspected annually.

Loss of tension will be noticed by inspection and by horizontal movement of the car.

The tension is monitored and adjustable.

5.11.23.1.7 Through 5.11.23.1.11: To prevent any part of the elevator, particularly the roller guides or slide guides, from striking anything in the travel path of the elevator.

5.11.23.2: To provide requirements for ladder-guided systems.

5.11.23.2.1, 5.11.23.2.2, 5.11.23.2.4, 5.11.23.2.7, and 5.11.23.2.8: To provide requirements for ladder-guided systems.

5.11.23.2.3: Deflections of the tower require ladder materials to have inherently more elastic materials; therefore, the deflection allowances were increased.

5.11.23.2.5: With ladder-guided systems, where a ladder climber is at risk of being impacted by a manually lowering car, means must be provided to assure the operator can see the ladder below the car. [TN 10-2024]

Requirement 5.11.24 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for machines and sheaves and a short reference to permitted types of machines. There are no known belt-drive, winding-drum, or screw-drive machines which could be codified. [TN 10-2024]

5.11.24.1: Current designs of drive machines conform to AGMA 218.01 (with minor deviations), the typical minimum standard for conventional rack-and-pinion driving machines, which exceeds the requirements specified in 5.7.18.1.2.

The centrifugal brake is separate from the driving-machine brake. The function of the centrifugal brake is to act as a speed-limiting device.

Where the braking system in a dual drive unit rack-and-pinion drive machine is used as the safety (see 5.11.17.2), a data plate is required.

In multiple drive systems, if one drive system were to fail electrically or mechanically, means must be provided to detect that failure. This could be a form of monitoring rotational nonsynchronous motion between the drive systems or high current imbalance between electric motors in each drive system. The requirement is in performance language to allow flexibility of design.

5.11.24.2: To provide driving-machine, sheave, and brake requirements.

To provide traction sheave requirements.

The allowance for the reduced traction sheave D to d is permitted because the suspension rope and traction driving machine have a limited load and speed range.

There have been many years of history for the use of 20 to 1, D to d in the suspended access industry (ANSI A120-2008) that are designed to carry workers.

The replacement criteria (see 5.11.20) ensures rope residual tensile force remains above 60%.

The reduction for deflector sheaves is permitted on uncounterweighted traction systems on the unloaded rope only; therefore, no fatigue occurs.

To provide driving-machine requirements.

5.11.24.3: Chain driving machines are being balloted on a concurrent ballot.

5.11.24.4: The allowance for the reduced traction sheave D to d is permitted because the suspension rope and traction driving machine have a limited load and speed range.

There have been many years of history for the use of 20 to 1, D to d in the suspended access industry (ANSI A120-2008) that are designed to carry workers. The replacement criteria (see 5.11.20) assures rope residual tensile force remains above 60%.

The reduction for deflector sheaves is permitted on uncounterweighted traction systems on the unloaded rope only; therefore, the fatigue is significantly reduced.

5.11.24.5: To provide drive-machine requirements.

5.11.24.6: To provide requirements that all drive machines shall conform to usual and customary engineering parameters for elevators.

5.11.24.7 and 5.11.24.8: To provide requirements for clutch prohibitions.

5.11.24.9: To provide requirements for driving-machine braking systems.

5.11.24.10: To provide requirements for manual brake release. [TN 10-2024]

Requirement 5.11.25 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.25.1: To provide requirements for terminal stopping devices.

Discussing the various systems, the need for a bottom final limit switch was discussed relative to the kinetic energies resulting from rotating masses which would be present if the normal limits failed to actuate. In rope-guided systems, the rope would loosen, the motor could continue to run, and no tensioning or kinetic energy can accrue, creating a danger to the user or persons around the system.

In rack-and-pinion and chain climbing systems, the drive machine could continue to operate, causing a locked position where the drive machine would have to trip on overcurrent or similar means.

To assure that a final limit switch is required and that the locations of the cam (actuating means, striker plate) and switch are not limited to a particular location. The design of current wind turbine tower elevators includes the driving machine on the car with little to no hoistway wiring.

This requirement allows the use of nonmetal provided that the force requirements and temperature, saltwater environment conditions are considered.

Switches are required to meet Code (positively opened; opening not solely dependent upon springs).

5.11.25.2: By virtue of the rated speed being less than 0.4 m/s (80 ft/min), small stopping distance, function,

and location of these devices, it is acceptable for the dual function to be permissible.

In suspended uncounterweighted wind turbine tower elevators, the underside of the car has an obstruction detection device which also acts as a normal stopping device.

5.11.25.3: A slack rope switch is provided to asssure the car stability is assured should the car become hung up on the landing platform.

Switches must be positively opened and opening not solely dependent upon springs. [TN 10-2024]

Requirement 5.11.26 Added

RATIONALE: To coordinate numbering with Part 2.

5.11.26.1: To provide requirements for operating devices.

The reference back to Part 2 had more nonapplicable requirements than applicable requirements. The applicable requirements were added to requirement 5.11 to ensure consistent enforcement.

See also the Scope; this is a case where full conformance with the requirements of Part 2 is not practicable. These types of operation are common to all wind turbine tower elevators.

Presently there are no designs with SIL ratings, and due to the simple nature of these devices, there is no foreseeable need to develop SIL values. If a manufacturer wishes to provide a SIL device, they can do so using A17.7.

5.11.26.1.3: Wireless systems must be continuous-pressure operation to assure the elevator moves under full control of the operator.

5.11.26.2: To provide requirements for operating devices.

The reference back to Part 2 had more nonapplicable requirements than applicable requirements. The applicable requirements were added to requirement 5.11 to ensure consistent enforcement.

Presently there are no designs with SIL ratings, and due to the simple nature of these devices, there is no foreseeable need to develop SIL values. If a manufacturer wishes to provide a SIL device, they can do so using A17.7.

5.11.26.3: To provide requirements for operating devices.

The reference back to Part 2 had more nonapplicable requirements than applicable requirements. The applicable requirements were added to requirement 5.11 to ensure consistent enforcement.

5.11.26.4: To provide requirements for operating devices.

There are tens of thousands of elevators using various certified traveling and trailing cables which have been vetted by the manufacturers for the application and environment of turbine towers.

The environment of wind turbine towers has extreme temperatures requiring a cable that is different from traditional traveling cables referenced in NFPA 70. The experience of manufacturers, testing, and success in these environments is considered in this exception. In addition, the number and size of required conductors limit the availability of ETT and ETP products in the marketplace; they are not available.

A task group of the Wind Turbine Elevator Committee will begin identifying the necessary characteristics and open a TR to modify the requirement after the language is published.

The reference back to Part 2 had more nonapplicable requirements than applicable requirements. The applicable requirements were added to requirement 5.11 to ensure consistent enforcement.

5.11.26.5: To provide requirements for motor protection.

5.11.26.6: To provide a prohibition against use of capacitors and other devices to render EPDs ineffective.

5.11.26.7: To provide requirements for control and operating circuits.

The reference back to Part 2 had more nonapplicable requirements than applicable requirements. The applicable requirements were added to requirement 5.11 to ensure consistent enforcement.

5.11.26.8: Language added to assure brake requirements are consistent with Part 2.

Presently there are no designs with SIL ratings, and due to the simple nature of these devices, there is no foreseeable need to develop SIL values. If a manufacturer wishes to provide a SIL device, they can do so using A17.7. [TN 10-2024]

Requirement 5.11.27 Added

RATIONALE: To coordinate numbering with Part 2.

To require communication availability for personnel. Mandatory practice on wind turbine sites is to require all technicians to carry two-way radios to communicate with all other technicians on the wind farm as well as the main office. [TN 10-2024]

Requirement 5.11.28 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for layout drawings.

Existing prescriptive Code language applies to 5.11 wind turbine tower elevators with some modifications. [TN 10-2024]

Requirement 5.11.29 Added

RATIONALE: To coordinate numbering with Part 2. To provide requirements for welding.

Existing prescriptive Code language applies to 5.11 wind turbine tower elevators. [TN 10-2024]

Requirement 5.11.30 Added

RATIONALE: To provide requirements for interlock testing.

Certification and testing is required in accordance with Section 8.3. However, the requirement for 960 000 test cycles is far in excess of what the actual demand is and is consistent with the requirement for residential elevators.

The design and use of wind turbine tower elevators is expected to be 250 h of use in 20 yr. At 80 ft/min, this equates to less than 2 000 cycles (an up-and-down full run of 300 ft at 80 ft/min). [TN 10-2024]

Requirement 5.11.31 Added

RATIONALE: To provide maintenance and testing requirements. [TN 10-2024]

Requirement 5.11.32 Added

RATIONALE: To provide acceptance testing requirements. [TN 10-2024]

Requirement 5.11.33 Added

RATIONALE: To provide periodic testing requirements. [TN 10-2024]

Requirement 5.12 Added

RATIONALE: To include outside emergency elevators in ASME A17.1/CSA B44 and to apply the ASME A17.7/CSA B44.7 procedures to the design and testing of these elevators.

Modifications to GESRs assure that the unique operating environment of outside emergency elevators is taken into consideration. The risk assessment assures that the viewpoint of firefighters is taken into consideration. Operating instructions assure emergency personnel and elevator personnel are provided with appropriate information. [TN 10-923]

Requirement 6.1.1.1 Editorially revised

RATIONALE: To correct reference in 6.1.3.4.5 and remove repetitive wording. [TN 12-910]

Requirement 6.1.3.3.9 Revised

RATIONALE: The reference to 8.11.4.2.19 was changed to 8.6.8.15.19 in TN 08-788. This proposal is to correct the reference as currently published. [TN 11-1369]

Requirement 6.1.3.4.5 Editorially revised

RATIONALE: Requirement 6.1.3.4.5 still references 6.1.3.6.6 and should read as editorially revised. Requirement 6.1.3.6.6 was deleted. [TN 12-910]

Requirement 6.1.3.15 Revised

RATIONALE: To clarify the type of water that we want to prevent from accumulating. [TN 06-798]

Requirement 6.1.6.3.6 Revised

RATIONALE: The "manual reset" definition is revised to realign the definition with the changes made to the definition of "authorized personnel" and the addition of "elevator personnel" definition that occurred in the 2000 Code. This requires that manual resets be done by elevator personnel rather than by authorized personnel. In addition, the manual-reset-type protective devices that are prone to nuisance activation and that can be visually and properly inspected by authorized personnel were identified for conversion to self-resetting types.

Escalator protective devices which remain self-resetting, such as 6.1.6.3.1, 6.1.6.3.5, 6.1.6.3.7, 6.1.6.3.15, 6.1.6.6, and 6.1.6.8, and moving walk items such as 6.2.6.3.1, 6.2.6.3.5, 6.2.6.3.6, 6.2.6.3.12, 6.2.6.6, and 6.2.6.7 are not the subject of this ballot.

Escalator protective devices which cannot be properly examined externally in some manner and shall remain manual reset, such as 6.1.6.3.2, 6.1.6.3.3, 6.1.6.3.4, 6.1.6.3.8, 6.1.6.3.10, 6.1.6.3.11, 6.1.6.3.13, 6.1.6.3.14, 6.1.6.3.16, and 6.1.6.5, or moving walk items such as 6.2.6.3.2, 6.2.6.3.3, 6.2.6.3.4, 6.2.6.3.7, 6.2.6.3.8, 6.2.6.3.9, 6.2.6.3.11, and 6.2.6.5 are not the subject of this ballot.

Some protective devices currently require manual reset but can be visually examined externally and can be allowed to be self-resetting with occurrence restrictions. It is known from experience that if there is a failure of the safety function, repetitive shutdowns will occur in a short period of time. These shutdowns increase the possibility of falls when all riders must walk up and down an escalator. Therefore, the function was added to require a manual reset and, therefore, onsite intervention by elevator personnel in case there are two shutdowns within a 24-h time period of operation. The requirement of two shutdowns is based on experience and field trial.

External examination of the handrail entry device (6.1.6.3.12) and handrail speed-monitoring device

(6.1.6.4) can be performed by a visual check. Therefore, the manual reset requirements are removed to permit self-resetting provided not more than one activation occurs in a 24-h period of operation for either of these protective devices.

The function to require a manual reset in case there are two shutdowns within a 24-h time period of operation was also added to the self-resetting escalator skirt obstruction device (6.1.6.3.6) and the step upthrust device (6.1.6.3.9). This will provide additional safety to these devices as multiple shutdowns within a relatively short period of time will indicate a more serious issue with the equipment that will require onsite intervention by elevator personnel. [TN 07-296]

Requirement 6.1.6.3.9 Revised

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Requirement 6.1.6.3.12 Revised

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Requirement 6.1.6.4 Revised

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Requirement 6.1.6.9.2 Revised

RATIONALE: The current requirement wording has evolved into a design-oriented rule, is confusing as to the objective of the rule, and generates broad and varying interpretations and degrees of enforcement by AHJs in its application. One such view is that the rule applies only to additional safety signs and not to advertising. The proposed requirement is rewritten in performance language with the clear and enforceable objective of prohibiting any additional signage or graphics that obstruct passenger access to and from escalator/moving walk steps/pallets, handrails, or obstruct view of the required boarding safety signs. This proposed requirement would not permit the installation of items such as stanchion signs placed within the safety zone of the escalator.

The exceptions in 6.1.6.9.3 and 6.2.6.8.3 would allow motion indicators, signs, or graphics on escalator handrails and step risers. Professional studies have shown that there are improvements in passenger safety and escalator awareness resulting from the addition of these signs or graphics. This requirement would not permit the installation of items such as stanchion signs placed in the safety zone of the escalator or walk. [TN 10-342]

Requirement 6.1.6.9.3 Added

RATIONALE: See rationale for 6.1.6.9.2. [TN 10-342].

Requirement 6.1.8.2.2 Revised

RATIONALE: The phrase "where groundwater and runoff can collect within the equipment" was added to requirement to clarify the type of water that is to be prevented from accumulating any place within the equipment. [TN 06-798]

Requirement 6.2.6.3.10 Revised

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Requirement 6.2.6.4 Revised

RATIONALE: See rationale for 6.1.6.3.6. [TN 07-296]

Requirement 6.2.6.8.2 Revised

RATIONALE: The current requirement wording has evolved into a design-oriented rule, is confusing as to the objective of the rule, and generates broad and varying interpretations and degrees of enforcement by AHJs in its application. One such view is that the rule applies only to additional safety signs and not to advertising. The proposed requirement is rewritten in performance language with the clear and enforceable objective of prohibiting any additional signage or graphics that obstruct passenger access to and from escalator/moving walk steps/pallets, handrails, or obstruct view of the required boarding safety signs. This proposed requirement would not permit the installation of items such as stanchion signs placed within the safety zone of the escalator.

The exceptions in 6.1.6.9.3 and 6.2.6.8.3 would allow motion indicators, signs, or graphics on escalator handrails and step risers. Professional studies have shown that there are improvements in passenger safety and escalator awareness resulting from the addition of these signs or graphics. This requirement would not permit the installation of items such as stanchion signs placed in the safety zone of the escalator or walk. [TN 10-342]

Requirement 6.2.6.8.3 Added

RATIONALE: See rationale for 6.2.6.8.2. [TN10-342].

Requirement 6.2.8.2.2 Revised

RATIONALE: The phrase "where groundwater and runoff can collect within the equipment" was added to requirement to clarify the type of water that is to be prevented from accumulating any place within the equipment. [TN 06-798]

Requirement 7.1.11.4 Revised

RATIONALE: To move vertical position requirement to new requirement number. [TN 09-2110]

Requirement 7.1.11.4.1 Added

RATIONALE: Existing requirement for the vertical position of dumbwaiter doors is renumbered. [TN 09-2110]

Requirement 7.1.11.4.2 Added

RATIONALE: To establish a clearance for dumbwaiters to match residence elevators requirement 5.3.1.7.2. [TN 09-2110]

Requirement 7.1.12.4 Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. Also, the switch location and security requirements are already included in the referenced requirements and so are unnecessary to be restated. [TN 09-1907]

Requirement 7.2.12 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.2.12.16 Deleted, and subsequent requirements renumbered

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.3.11.4.1 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 7.4.14.2 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.4.15.7 Revised; formerly numbered 7.4.14.4

RATIONALE: To update references to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 7.5.12.1 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.5.12.1.12 Deleted

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.5.12.1.15 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.5.12.2 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.5.12.2.15 Deleted

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.6.8.1 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 7.6.8.3 Revised

RATIONALE: Requirement 2.26.2.17 was deleted from A17.1 with the A17.1-2002a Addenda. A17.1-2002a introduced requirement 2.14.1.10, which prohibits side emergency exits. [TN 09-2109]

Requirement 8.1.2(n) Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. Also, in Table R-1, the title was changed to complete the description. [TN 09-1907]

Requirement 8.3(b)(5) Editorially revised

RATIONALE: To reference the correct requirement. [TN 10-1680]

Section 8.4 Revised

RATIONALE:

(a) Introductory Rationale. All requirements in Section 8.4 have been revised to include seismic force levels as specified in the latest building codes in the U.S. (IBC) and Canada (NBCC). Existing force levels related to

seismic zones and A_v/Z_v levels also remain to ensure full coverage of all applicable enforced building codes. Direction is provided as to which levels apply for a given elevator design application.

In the past, allowable stress design was solely used by engineers for structural or steel design. In recent years, strength design [also referred to as load and resistance factor design (LRFD) in the U.S. or limit states design (LSD) in Canada] has become more prevalent in use amongst many industries. Strength design methods have been largely accepted in Canada but are still not wholly adopted in the U.S. The American Institute of Steel Construction (AISC), in their latest *Steel Construction Manual* (13th edition), has included both design methodologies for use by the engineer. However, the two design methods must be kept separate and cannot be used interchangeably. For further information regarding LSD/LRFD development and use, the user can refer to other publications, such as AISC *Steel Construction Manual*, 13th edition; *Principles of Limit State Design*; and *A Beginner's Guide to Structural Engineering* and *A Beginner's Guide to ASCE7-05* by T. Bartlett Quimby.

The latest building codes (IBC and NBCC 2010) list loads and load combinations in terms of strength design (LRFD or LSD), usually expressed in dimensional terms such as pounds, kips, newtons, or kilo newtons (kN). A17.1 Safety Code is based on allowable stress design, usually expressed in dimensional terms of load per unit area, such as psi, ksi, or N/mm^2.

In its *Steel Construction Manual* commentary, AISC notes that "ASD safety factors are calibrated to give the same structural reliability and the same component size as the LRFD method at a live to dead load ratio of 3." Allowable stress design is considered a more conservative approach when dealing with a greater concentration of predictable loads (i.e., dead loads or component loads) or an AISC live/dead load ratio less than 3. Strength design is considered more conservative when dealing with a greater concentration of unpredictable loads (i.e., live loads, seismic loads) or an AISC live/dead load ratio greater than 3. Given the predictable load nature of the elevator system (component loads and known live loads), Section 8.4 revised requirements were kept in allowable stress levels to maintain a more conservative design approach as well as maintain consistency with the other sections of A17.1, still based on allowable stress design.

(b) Section 8.4 Rationale. The definition of "building code" has been changed in the 2005 addenda to A17.1-2004 to include the latest building codes. Building codes now referenced no longer use seismic risk zones. Requirements 8.4(a), (b), and (c) have been added/revised to ensure full coverage of all applicable enforced building codes.

Additions indicate how to find correct seismic force to properly correlate with existing building code requirements.

Requirements 8.4(a)(1) through (a)(5) reference whether seismic requirements apply as detailed by appropriate building code editions.

Requirement 8.4(b) indicates the appropriate force level to use to properly match levels dictated by building code editions.

Item (3) is modified to account for component force level equations where A_v or Z_v are not provided (i.e., 1997 UBC). [TN 06-1007]

Requirements 8.4.2.1, 8.4.2.2, and 8.4.2.3 Revised

RATIONALE: The allowable values specified in these reference standards can be used at their full published values, which have inherent conservatism in their formulation. These standards reflect values which are limited below failure points. Threaded fastener standards have never specified yield strength, thus the 88% of yield is not applicable. Proper definition of allowable stress is based on the fastener's ultimate strength. Also see introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.2.3.4 Added

RATIONALE: To cover the special anchorage requirements in IBC. Also see introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.5.2.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.6 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.7 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.8.1.1 Added

RATIONALE: Conventional standard designs of car frames and counterweight frames embody upper and lower guiding members located above and below the respective frames, which results in the one-third/two-thirds load distribution between upper and lower guiding members. Counterweights with two-thirds full frame have historically been used to keep the space necessary to tilt and insert the topmost filler weight. Figures 8.4.8.2-1 through 8.4.8.2-7 are based off this conventional standard. However, design conditions might require the location and quantity of guiding members to be different than conventional designs used in the industry. The A17.1 Code has long recognized that the traditional formulas do not generally apply to special structures (see 8.2.2.1). [TN 06-1007]

Requirement 8.4.8.2.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Figures 8.4.8.2-1 Through 8.4.8.2-7 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.8.2.6 Revised

RATIONALE: It is most probable that vertical excitations caused by the P-waves to the structural equipment will continue into the time domain during which horizontal S-waves during an earthquake event will occur. The addition of the vertical forces also accounts for the latest elevator designs, such as MRL, where the guide rails act as a column to support vertical loads. [TN 06-1007]

Requirement 8.4.8.3 Revised

RATIONALE: Force levels noted are now specified in 8.4.8.2.6. Additional paragraph added to indicate the allowable stress level for IBC/NBCC.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.8.4 Revised

RATIONALE: Revised to be consistent with force levels specified in 8.4.8.2.6. New 8.4.8.2 added to cover anchorage requirements in ASCE 7-10, NBCC-2010.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.8.7 Revised

RATIONALE: Revised to be consistent with force levels specified in 8.4.8.2.6.

See introductory rationale for Section 8.4. [TN 06-1007]

Table 8.4.8.7 Revised

RATIONALE: Due to the variety of rail-bracket designs possible, bending stress alone is an insufficient limit state to determine the safety of brackets.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirements 8.4.8.8 and 8.4.8.9 Revised

RATIONALE: The forces imposed by the position restraints does not vary with respect to the distance between them or the distance between the guide-rail brackets. The formulas shown in 8.4.8.9.1 et al are bracket reactions for the given loadings.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirements 8.4.8.9.1 and 8.4.8.9.2 Revised

RATIONALE: Equations utilizing the IBC/NBCC seismic force of F_p have been added for convenience. These formulas have been derived in the same manner as the original equations based on *W*. For detailed derivations, see *Guide for Elevator Seismic Design*, Part 2, Derivations.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.9.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.10.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.10.1.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Figure 8.4.10.1.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.2.1 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.3.1 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 8.4.11.5.2 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.9 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.12 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.13 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.11.15 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirements 8.4.11.15.1 and 8.4.11.15.2 Revised

RATIONALE: Equations utilizing the IBC/NBCC seismic force of F_p have been added for guidance. These

formulas have been derived in the same manner as the original equations based on W_p. See *Guide for Elevator Seismic Design*, Part 2, Derivations, for detailed derivations.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirements 8.4.12.1.1 and 8.4.12.1.2 Revised

RATIONALE: Equations utilizing the IBC/NBCC seismic force of F_p have been added for guidance. These formulas have been derived in the same manner as the original equations based on W_p. See *Guide for Elevator Seismic Design*, Part 2, Derivations, for detailed derivations.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.12.2.1 Revised

RATIONALE: Equations utilizing the IBC/NBCC seismic force of F_p have been added for guidance. These formulas have been derived in the same manner as the original equations based on W_p. See *Guide for Elevator Seismic Design*, Part 2, Derivations, for detailed derivations.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.12.2.2 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Table 8.4.12.2.2 Revised

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.13 Revised

RATIONALE: Additional variable definitions are redundant. A_v is already described in correlation chart above. Z_v is not included in this correlation chart.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.14.1(a) Added

RATIONALE: A17.1 provides a basis for earthquake-resistant design of elevator systems and components, and it defines acceptance criteria in terms of allowable stress. IBC/ASCE 7 utilizes strength design methodology. IBC/ASCE 7 provides conversion from strength design to allowable stress design by multiplying by 0.7. Reference ASCE 7-10, 13.1.7.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.14.1(b) Added

RATIONALE: A17.1 provides a basis for earthquake-resistant design of elevator systems and components, and it defines acceptance criteria in terms of allowable stress. NBCC utilizes strength design methodology. IBC/ASCE 7 provides conversion from strength design to allowable stress design by multiplying by 0.7. Reference ASCE 7-10, 13.1.7. This same conversion method is utilized for NBCC 2010.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.14.1.1 Added

RATIONALE: The vertical seismic force is defined in IBC/ASCE 7. NBCC does not provide for a vertical seismic load. A vertical seismic force for jurisdictions enforcing NBCC has been added to demonstrate best engineering practice.

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.14.1.2 Added

RATIONALE: The equations relating D and E were published in the referenced codes. The derivation is beyond the scope of A17.1. Allowable stress conversion factor (0.7) has been added for NBCC 2005 and later editions. The allowable stress load combination in A17.1 considers dead, live, operating, and earthquake loads.

Basis for the IBC/ASCE 7 equation is as follows:

$$D + H + F + (W \text{ or } 0.7E) \tag{1}$$

Since

$F = 0$ (loads due to fluids)
$H = 0$ (lateral earth pressure)
$W = 0$ (wind loads)

Therefore, eq. (1) becomes

$$D + 0.7E \text{ (controlling equation)}$$

See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.14.1.3 Added

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Requirement 8.4.15 Added

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Section 8.6 Revised

RATIONALE: To provide clarity on the scope of 8.6 requirements and include repair and replacement since 8.6 includes all three. [TN 08-1348]

Requirement 8.6.1.1.3 Revised

RATIONALE: To identify requirements that may mandate changes to existing equipment. [TN 08-1348]

Requirement 8.6.1.2.1 Revised

RATIONALE: It was not the intent that the SIL rated components be labeled with a SIL rating. This is evident in the wording of the current requirements in Part 2. Also, it is not always practical that a listed/certified label/mark be affixed to a particular component or part. The dimensions of relevant SIL rated components and the distribution of the components involved may not accommodate viewing a SIL rating label.

Practical requirements for identification of SIL rated devices are addressed in Part 2 requirements. There are also safety/technical and practical reasons for not requiring a SIL value on a component. From the safety/technical standpoint, the SIL rating alone is not a sufficient parameter to assure proper application of the component. Part identification is needed to identify the components that are part of a SIL rated device or assembly. [TN 08-802]

Requirement 8.6.1.2.1 Revised

RATIONALE: To specify content of MCP and to move former 8.6.1.2.1(a)(1) to the heading.

8.6.1.2.1(a): The MCP documents compliance with the maintenance in 8.6 and must be available for viewing during acceptance turnover (compliance with 8.10), and periodic inspection (8.11) and tests (8.6). AHJ acceptance inspection criteria may be implemented in various forms, for example, require it on-site, or during type examination, or during permit and plan check. To clarify that the MCP addresses the relevant safety-related maintenance activities as prescribed in 8.6.

8.6.1.2.1(b): Added requirements to mandate MCP is updated as a result of changes in equipment, maintenance procedures, or code. Other requirements have been revised and moved to other sections within 8.6.

8.6.1.2.1(c): Documentation for maintenance task is needed on-site.

8.6.1.2.1(d): The MCP must be available on-site and instruction for location or viewing be posted in a common location. This will make it available to all elevator personnel without delay.

8.6.1.2.1(e): This was moved from 8.6.1.2.1(a), and (e)(7) was added to address A17.7/B44.7 requirement 8.6.1.2.1. Also, (e) was revised to remove statement of repair and replacement per TN 08-634, which adds new language on SIL devices replacement in 8.6.3.12 and alteration in 8.7.1.9 original equipment certification.

8.6.1.2.1(f): Addresses specific identified procedures required in the MCP. [TN 08-1348]

Requirement 8.6.1.2.2 Added

RATIONALE: Identified all Code-required procedures, inspections, and tests to consolidate documentation that must be permanently kept on-site.

8.6.1.2.2(a): Moved here from 8.6.1.6.3 to locate all on-site documents in one place.

8.6.1.2.2(b): Referenced ASME A17.2 to recognize inspection and test procedures are required only where those procedures will not work for the equipment. Relocated these existing requirements to (b) and added new requirement for ASME A17.7/CSA B44.7 AECO-certified equipment in 8.6.1.2.2(b)(3).

8.6.1.2.2(c): Identified and consolidated existing Code-required written procedures. [TN 08-1348]

Requirement 8.6.1.2.3 Revised; formerly 8.6.1.2.2

RATIONALE: To move existing language in 8.6.1.2.2 to new 8.6.1.2.3. [TN 08-1348]

Requirement 8.6.1.4 Revised

RATIONALE: To combine all written records to be maintained on-site and to distinguish types of records [8.6.1.4.1(a), records related to maintenance (MCP records); 8.6.1.4.1(b), records related to repairs and replacements of components or devices relevant to the safe operation of the conveyance; and new 8.6.1.4.1(c), other records such as the oil usage].

The 5-yr record retention will allow sufficient length of time to access prior records related to the activity for safety evaluation and repair planning. This language also allows jurisdictions that have different retention periods to adopt this without the need for legislative exceptions. [TN 08-1348]

Requirement 8.6.1.4.1 Revised

RATIONALE: Moved from 8.6.1.2.1 to clearly distinguish maintenance procedures from record keeping.

Maintenance intervals are included in the MCP record because the conditions that drive the maintenance interval are dynamic and may change with time. [See 8.6.1.4.1(a)].

This requires the records to be available to elevator personnel.

Continuity of maintenance between service providers is facilitated by maintaining these records. In addition to the on-site record of tests [new 8.6.1.4.1(c)(3)], a record of all completed maintenance tasks and their last completion dates will maintain that continuity. Electronic format or hard copy that is viewable on-site by elevator personnel without delay satisfies the requirement that the information is available.

The documentation of periodic tests will be documented with the existing test tag requirement (8.6.1.7.2) and checklist. The sample in the Appendix is provided as guidance only of one acceptable format.

Other tests may need to be performed during maintenance, such as tests required by the OEM for SIL rated, unique product-specific tests required by an A17.1/B44.7 Code Compliance Document (CCD).

8.6.1.4.1(a)(3): It is understood that in most jurisdictions the requirements are subject prerogatives of the AHJ. This change is made to provide a means for those that do not have these prerogatives. This is constant with similar language under periodic inspection frequency.

Five years was chosen to allow sufficient length of time to cover periodicity of maintenance tasks.

The 5-yr record retention will allow sufficient length of time to access prior records related to the activity for safety evaluation and repair planning. This language also allows jurisdictions that have different retention periods to adopt this without the need for legislative exceptions.

(1) Specific identification of areas where repair records are required.

(2) Specific identification of areas where replacement records are required.

Identified other records required.

The 5-yr record retention will allow sufficient length of time to access prior records related to the activity for safety evaluation and repair planning. This language also allows jurisdictions that have different retention periods to adopt this without the need for legislative exceptions.

Moved "trouble calls" in 8.6.1.4.1(c) to new section 8.6.1.4.2. [TN 08-1348]

Requirement 8.6.1.4.1(d) Added

RATIONALE: To provide a similar requirement for an acceptance test tag as now exists for periodic test tags in 8.6.1.7.2. [TN 10-962]

Requirement 8.6.1.4.2 Revised

RATIONALE: Expanded and moved to new 8.6.1.4.1 to specify types of records, retention, and availability.

This information is needed by elevator personal performing corrective action, including necessary repairs and replacements. This improves safety by emphasizing the need for elevator personnel performing corrective action to be capable of accessing those records to assist in determining the corrective action prior to performing the action, and give allowances on the timeliness in giving other elevator personnel access to this same information on as-needed basis. Other elevator personnel not involved with corrective action may request the records. For example, the authority having jurisdiction may require that the records be available during periodic inspection.

On-site records for repairs, replacements of applicable components, and other records such as periodic tests are required. See 8.6.1.4.1(b) and (c). These repairs and replacements include those made as a result of trouble calls. [TN 08-1348]

Requirement 8.6.1.6.3 Revised

RATIONALE: Moved wiring diagrams [8.6.1.6.3(a)] from this paragraph to 8.6.1.2.2(a) and renumbered to consolidate documentation that must be permanently kept on-site.

8.6.1.6.3(c): The equipment owner, maintenance provider, or industry may have more stringent jumper control procedures. [TN 08-1348]

Requirement 8.6.1.7.2 Revised

RATIONALE: An indication that alternative testing was conducted would allow AHJ to

- verify that the MCP contains the required "alternative testing information"
- determine who established the original baseline records versus who completed the alternative test
- request a copy of the original baseline test results, if desired

In jurisdictions where the AHJ has authorized others to conduct/oversee category testing, this could allow for an audit function.

(a) General Rationale. New alternative measuring and testing techniques make practicable the simulation of car load conditions in periodic testing of safeties, buffers,

driving-machine brakes, braking system, and traction limits.

These alternative test methods and their acceptable results are validated based on an engineering standard of equivalence established relative to results of standard acceptance testing with load.

This proposal is aimed at permitting alternative Category 5 test methods with loads in the car less than the rated load, including no load, and at not less than rated speed for

- car and counterweight safeties
- oil buffers
- driving-machine brakes
- braking system, traction, and traction limits

New or altered elevators are subject to acceptance inspections. Acceptance tests are intended to demonstrate compliance of an installation, including requirements such as safety stopping distances or traction limits, etc. The results of these successful tests demonstrate Code compliance, and simultaneously, a record of such tests can establish a baseline reference measure for elevator components tested via traditional methods.

During the acceptance test, this is also an ideal time to capture "alternative" baseline reference measures. Knowing, for example, the equipment is capable of achieving a compliant safety stopping distance with rated load at rated speed, a follow-up test can be performed to establish an alternative baseline reference measure for the condition of less than full load at rated speed. These alternative tests and the record of baseline measures are the subject of this proposal. The alternative baseline reference measures are what would be expected if the same equipment was tested during a future Category 5 periodic test.

(1) With new measuring and testing techniques, it is possible to simulate car load condition and to predict the behavior of

- car safeties, or
- driving-machine brakes, or
- braking system, traction, and traction limits

at various loads and at rated speed, without fully loading the car during testing.

(2) The Code need not specify design requirements for specific alternative test methods but should allow elevator companies to come up with their own, as long as they meet the Code requirements. Ultimately, the elevator manufacturer could conduct tests with full load at rated or tripping speed and then perform an empty-car test at not less than rated speed to establish a baseline reference measure.

Future tests at no load and at rated speed should equal the baseline reference measure (within tolerances).

(3) The relationship between the full-load and no-load stopping distances need not be linear but must be predictable. The current Code stopping distances are based on predictability principles.

(4) The alternative method, which eliminates the means for full-load test weights, reduces the potential for injury to personnel, transportation, and fuel consumption.

(b) Additional Rationale for Car Safeties. Conventional safety testing is a functional test that exercises all components in the safety system.

Full-load testing at rated speed causes potentially undesirable degradation of the active components.

Alternative safety testing is also a functional test that exercises all components in the safety system. Moreover, since Type B safeties offer a constant braking force by nature of their design, it is easily demonstrated that testing at no load will result in a faster deceleration of the car and subject components in or on the car to greater forces. In nearly all cases, car deceleration rates greater than $1g$ would result and thereby cause the counterweight to jump. This effect would further impact machines, ropes, hitches, etc., and also for a short period of time, would serve to simulate a car free-fall condition since the car is no longer counterweighted while the counterweight is airborne.

While this testing may reduce the undesirable degradation of safeties to a minimal amount, it should be understood that the no-load testing clearly has the capacity to exercise system components and, through correlation analysis of test results, can show the safeties' capability to perform when fully loaded.

Verification that the method of testing provides assured performance is the critical feature of the alternative test.

The kinetic energy the system can retard is a function of the components operating as designed with no degradation. If the components have been degraded since acceptance, any alternative method will illustrate degraded performance.

It is realized that compensation tie-down affects the performance of safeties, which the alternative method must take into consideration.

(c) Additional Rationale for Oil Buffers. There is no safety justification for requiring the rated-load buffer tests. There is no reason to expect any change in the buffers' performance during the life of the buffers after the initial installation or alteration and the acceptance tests, when taking into account the following:

(1) The strength and operational reliability of the buffers is established through the type testing and certification by certifying organizations (see definition) in accordance with 8.3.2.

(2) The buffers are serviced and maintained in accordance with 8.6; level and grade of the oil is maintained in accordance with the manufacturer's specification that was certified by the certifying organization; no

mechanical changes are possible; wear and tear is not anticipated, considering the frequency of their use.

(3) The buffer plunger return is tested annually (see 8.6.4.19.1), which should highlight any major problem resulting from neglect in maintenance or physical damage.

(4) Any change to the buffer performance characteristics is an alteration (8.7.2.23), requiring a full-load acceptance test.

Consequently, there is no justification for conducting an impact test on oil buffers, unless a "change" is suspected. The annual inspection requirements of 5.9.1.1(a)(4) should mitigate these possible concerns. The expectation that a buffer whose condition is unchanged will perform as intended is further supported by the fact that spring buffers are not tested at 5-yr intervals; in fact, there are no spring buffer tests identified in 8.10.2.2.5(c) at the time of acceptance testing.

Despite a strong rationale to remove oil buffer tests completely, since the prime objective of alternative testing is the elimination of weights, this proposal retains buffer testing at rated speeds without load.

(d) Additional Rationale for Driving-Machine Brakes

(1) Driving-machine brakes installed in accordance with A17.1-2000 and B44-1990 or a later edition have "the brake setting and method of measurement permanently marked on the machine," which enables checking of its setting for compliance with the Code, without load testing.

(2) On most modern elevators, the car is slowed and stopped at a landing electrodynamically. This component of the braking system does not change with time. The mechanical component only holds the car at the landing. Its setting can be positively verified by measuring torque.

NOTE: Rationale given in (1) and (2) are mentioned as factors that could be considered when developing an alternative method.

(3) It has been shown that there is correlation between the full-load and no-load brake tests on geared elevators. German inspection bodies have been conducting empty-car safety tests and documenting the results using alternative electronic testing systems and have successfully demonstrated that undercar safeties operating with empty-car loading is a viable method to ascertain the safety stopping capability. These systems have been used for more than 15 yr in Europe involving all major elevator companies and are now being deployed in other world markets.

(4) The correlation between a full-load brake test and a no-load brake test is the premise for escalator brake certification. Escalator brakes are not subject to 5-yr load testing; rather, tests are made to confirm conformance to torque values established during type testing. The alternative test method for machine brakes would utilize this rationale to create a correlation between full-load and no-load behavior. [TN 02-2275]

Requirement 8.6.1.7.2 Revised

RATIONALE: To provide for flexibility in different jurisdictions where logbooks or other means may be used to record periodic tests. [TN 11-825]

Requirement 8.6.2.6 Added

RATIONALE: To address the requirements involving E/E/PES device(s). Authorities having jurisdiction have expressed concern over potential modifications that may be made to the SIL rated design of safety functions after initial installation of the equipment and their ability to monitor installations for such changes. SIL ratings can be invalidated, for example, due to misapplication involving parameters such as temperature, humidity, and noise immunity, not to mention many other electrical limitations/phenomena. A non-OEM may not know the specific limitation and application criteria used in the SIL device listing/certification. Therefore, unless it is an OEM-approved replacement component installed per OEM requirements, the change must be considered an alteration. SIL rated designs may have safety functions whose SIL depends upon the integrity of interfaces to other safety functions and control and operating circuits. Since all electronic interfaces take the form of an electrical connection (inductive, optical, and other types of signal coupling are included), any changes or modifications of a SIL designed safety function and control and operating circuit must take into account the possible impact on SIL designed safety functions and control and operating circuits that in the electrical influence of the change or modification.

(a) Repair

(1) The certification/listing of an E/E/PES device listed/certified to a SIL rating to be in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 will be invalidated when repaired in the field.

(2) Where a repair of other components may impact the certification/listing of an E/E/PES device listed/certified to a SIL rating to be in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3, the certification/listing of the E/E/PES device must be reevaluated.

(b) Replacement

(1) A replacement of an E/E/PES device listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 may only be made with another E/E/PES device that is listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 for specifications and application of use in the equipment. Otherwise, the modification should be reinspected as an alteration.

(2) Where a replacement of other components may impact the certification/listing and label/mark of an

E/E/PES device listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3, the certification/listing of the E/E/PES device must be reevaluated.

(3) An E/E/PES device listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 that replaces a E/E/PES device that is not listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 or vice versa should be reinspected as an alteration.

(c) Alteration

(1) Where an alteration of other components may impact the certification/listing of an E/E/PES device listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3, the certification/listing of the E/E/PES device must be reevaluated.

(2) An E/E/PES device that is listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3 that replaces a E/E/PES device that is not listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3, or vice versa, should be reinspected as an alteration.

(3) Wiring diagrams and the MCP should be updated to reflect alterations involving E/E/PES devices listed/certified to a SIL rating that is in accordance with the applicable requirements of IEC 61508-2 and IEC 61508-3. [TN 08-634]

Requirement 8.6.3.4.6 Revised

RATIONALE: To update references to reflect changes in 8.6. [TN 08-1348]

Requirement 8.6.3.5 Editorially revised

RATIONALE: The first word in the second sentence should be "Sprockets," not "Spockets." Editorial revision needs to add the letter "r." [TN 11-275]

Requirement 8.6.3.12 Added

RATIONALE: To allow application of new lighting technology in units installed under previous Code editions requiring only fluorescent fixtures. [TN 09-1106]

Requirement 8.6.3.13 Added

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Requirement 8.6.4.1.3 Revised

RATIONALE: To establish guidelines regarding "equal tensioning" of suspension members. The range of "within 10% of the highest tensioned member" was found to be standard practice and provides a relatively small yet attainable range in tension differences between suspension members in an elevator suspension system.

The following are examples using proposed requirement 8.6.4.1.3:

Example 1. Five Suspension Member System

Member #1 measurement = 500 lb (the highest tension measured; therefore, all other tensions must be equal to or greater than 450 lb = 500 lb − 0.10 × 500 lb)

Member #2 measurement = 480 lb (tension is okay)

Member #3 measurement = 472 lb (tension is okay)

Member #4 measurement = 435 lb (tension is unacceptable)

Member #5 measurement = 413 lb (tension is unacceptable)

Example 1 Results: Since tensions in suspension members #4 and #5 were less than 450 lb, tension adjustment is required.

Example 2. Seven Suspension Member System

Member #1 measurement = 746 lb (tension is okay)

Member #2 measurement = 695 lb (tension is okay)

Member #3 measurement = 750 lb (the highest tension measured; therefore, all other tensions must be equal to or greater than 675 lb = 750 lb − 0.10 × 750 lb)

Member #4 measurement = 700 lb (tension is okay)

Member #5 measurement = 689 lb (tension is okay)

Member #6 measurement = 702 lb (tension is okay)

Member #7 measurement = 715 lb (tension is okay)

Example 2 Results: Since tensions in all suspension members were equal to or greater than 675 lb, no tension adjustment is required. [TN 09-531]

Requirement 8.6.4.3.2 Revised

RATIONALE: To update references to reflect changes in 8.6. [TN 08 1348]

Requirement 8.6.4.3.3 Editorially revised

RATIONALE: A17.1-2007 referenced 8.11.2.3.1, which is the requirement for Category 5 test. This was not intended to be changed. Therefore, the Category 5 safety should be referenced. [January 2011 meeting]

Requirement 8.6.4.3.5 Revised

RATIONALE: To reference the correct requirement. Prior to moving the test requirements to Section 8.6 (A17 1a-2008), requirements 8.6.4.3.5 referenced

8.11.2.3.1, which is the Category 5 tests for safeties. This is requirement 8.6.4.20.1 in the current Code.

The TN that moved the test requirement to Section 8.6 did not justify the Category change and noted the change as editorial. It is concluded that it was done inadvertently.

Note that 8.6.4.3.3 was already editorially approved at the January 26, 2011, Standards Committee meeting. [TN 11-1902]

Requirement 8.6.4.6.2 Revised

RATIONALE: The increased frequency of testing of the critical braking system will aid in monitoring the performance of the braking system. The sealing of the brake adjustment will ensure that the adjustment is not inadvertently changed between testing periods. It is necessary to identify the party that applied the seal. [TN 08-295]

Requirement 8.6.4.10.2 Revised

RATIONALE: To add a requirement for minimum number of turns of wire rope on the drum. [TN 09-605]

Requirement 8.6.4.13.1 Revised

RATIONALE: To update requirements and terminology to agree with requirements in 2.14.5.7 [TN 02-3046]

Requirement 8.6.4.19.2 Revised

RATIONALE: Incorrect reference to A17.2. Correct reference is to A17.2 Item 2.29.2(d) below.

> *(d) Yearly Test of Wood Guide Rail Safeties (for A17.1d-2000 and Earlier Editions); Category 1 Test of Wood Guide Rail Safeties (for A17.1-2000 and Later Editions).* With governor-operated safeties, set the governor in the applied position and run the car in the down direction from the controller to see that it will operate the safety. Continue to operate until the ropes slip on traction machines or slacken on drum machines. For Type A safeties without governors, set blocking in the pit securely and run the car down slowly to see that the jaws come into proper position when a slack rope is obtained.

Correct references in A17.1 and A17.2 in the latest edition of the Code and Guide. [TN 10-1659]

Requirements 8.6.4.19.4 and 8.6.4.19.5 Revised

RATIONALE: To address operation and testing of all final limits and machine limits located on winding drum machines and past edition of the Code. [TN 09-803]

Requirement 8.6.4.19.5 Revised

RATIONALE: A need exists to see that these devices are tested on an annual basis and to verify proper operation. [TN 11-283]

Requirement 8.6.4.19.11 Revised

RATIONALE: To make the requirement applicable in all jurisdictions and to clarify two separate tests. [TN 09-812]

Requirement 8.6.4.19.12 Added

RATIONALE: To provide periodic testing (Category 1) of Occupant Evacuation Operation. Testing should include but not be limited to hall calls, car calls, and audible and visual signals, as well as variable message signs, in car and in hall, call prioritization, etc.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 8.6.4.19.15 Added

RATIONALE: To provide periodic testing requirement for emergency communications. [TN 02-3046]

Requirement 8.6.4.19.16 Added

RATIONALE: To provide periodic testing requirement for means to restrict car door opening. [TN 02-3046]

Requirement 8.6.4.20.1 Revised

RATIONALE: To add language which recognizes possibility of alternative testing. To indicate alternative test methods must be developed, performed, and recorded as per new requirement 8.6.11.10. To state the objective of the alternative test. To require test tags to show alternative methods where used. To retain consistency with the A17 Interpretation 86-2.

Rationale for changing references to "(Item 2.29 . . .)": To harmonize with numbering of A17.2-2007 edition.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.6.4.20.3 Revised

RATIONALE: To add language which recognizes possibility of alternative testing. To indicate alternative test methods must be developed, performed, and recorded as per new requirement 8.6.11.10. To state the objective of the alternative test and permit two alternative options for buffer testing with respect to impact speed. To require test tags to show alternative methods where used.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.6.4.20.4 Revised

RATIONALE: To change the title to indicate the purpose of the requirement. The static load holding requirements of driving-machine brakes are tested here as is the ability to decelerate an empty car during up overspeed. Braking system tests are moved to 8.6.4.20.10.

To add language which recognizes possibility of alternative testing. To indicate alternative test methods must be developed, performed, and recorded as per new requirement 8.6.11.10. To state the objective of the alternative test and permit two alternative options for brake testing with respect to impact speed. To require test tags to show alternative methods, where used.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.6.4.20.4 Revised

RATIONALE: The increased frequency of testing of the critical braking system will aid in monitoring the performance of the braking system. The sealing of the brake adjustment will ensure that the adjustment is not inadvertently changed between testing periods. It is necessary to identify the party that applied the seal. [TN 08-295]

Requirement 8.6.4.20.5 Deleted

RATIONALE:

(a) Safety of elevator operation on emergency or standby power is assured by acceptance tests. If an elevator system is designed to operate using power from the building emergency power system, the elevator designer/manufacturer/installer presents the building owner with a specification of power that the elevator will consume and return (if the elevator system regenerates energy during overhauling).

(b) During the building commissioning, the emergency or standby power is tested with all building loads connected to the system, some simultaneously, including elevators, as required in the design of the system. The testing is being performed in accordance with applicable emergency or standby power standards, not elevator standards.

(c) After this test, the elevator power needs from the emergency or standby power do not change for the life of the elevator, unless the elevator has undergone a major alteration, in which case it would be subjected to acceptance inspection, including operation on emergency power system.

(d) The testing of emergency power for elevators alone is not sufficient to conclude how an entire building-related emergency power system would function when called upon. It is also unlikely that the elevator maintenance contractor or the elevator AHJ would undertake the responsibility of disabling all relevant building power sources while simultaneously ensuring all relevant building loads are applied in order to verify the elevators operate as intended.

(e) The testing of elevators on emergency or standby power could be carried out without loads. Typically, in a building where the emergency or standby power is designed to supply only one elevator at a time, the tests could be carried out with two empty elevators simultaneously. The energy consumption or regeneration would be approximately equivalent to that of one elevator when loaded with 125% of rated load.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.6.4.20.7 Revised

RATIONALE: Since the requirements will vary according to the vintage of the equipment, a generic periodic test is specified here. The specific test procedure, depending on what code the elevator was installed under, will need to be specified in the A17.2 Inspection Guide. [TN 02-3046]

Requirement 8.6.4.20.10 Revised

RATIONALE: To change the title to reflect the purpose of the requirement. To add language which recognizes possibility of alternative testing. To indicate alternative test methods must be developed, performed, and recorded as per new requirement 8.6.11.10. To state the objective of the alternative test.

Alternative test for traction allows for different methods that will demonstrate loss of traction and is written in performance-based language to allow latitude in demonstrating the alternative performance.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirements 8.6.4.22 and 8.6.4.22.1 Added

RATIONALE: Requirement 8.6.4.22.1 has been added to address the maintenance of seismic devices. [TN 09-1508]

Requirement 8.6.4.22.2 Added

RATIONALE:

(a) Requirement 8.6.4.22.2 has been added to address the maintenance of seismic devices.

(b) Grounding wire tension, ring misalignment, dirt, debris, and contaminates on the stationary wire can interfere with proper operation of the counterweight derailment device. The stationary wire should be kept clean. [TN 09-1508]

Requirement 8.6.5.9 Editorially revised

RATIONALE: This section should have editorial change as noted. [TN 10-963]

Requirement 8.6.5.13 Revised

RATIONALE: Added to address the maintenance of seismic devices. [TN 09-1508]

Requirement 8.6.5.13 Revised

RATIONALE: When the requirement moved to 8.6, the reference was not changed; in addition to 8.11.3.2 being redesignated, so was 8.11.3.3. [TN 09-1623]

Requirement 8.6.5.14.1 Revised

RATIONALE: This section should add the pretest requirement, as noted. [TN 10-963]

Requirement 8.6.5.14.3 Editorially revised

RATIONALE: To correct references. [TN 10-1659]

Requirement 8.6.5.14.7 Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 8.6.5.17 Added

RATIONALE: Requirement 8.6.5.17 has been added to address the maintenance of plunger gripper. [TN 09-1508]

Requirement 8.6.6.1.1 Revised

RATIONALE: To remove incorrect references. Requirements 8.6.5.14 through 8.6.5.16 are test for hydraulic elevators. [TN 11-1731]

Requirement 8.6.7.9 Editorially revised

RATIONALE: To correct the omission of requirements 8.6.7.9.4 and 8.6.7.9.5, which were added in A17.1a-2008 but were not included in TN 02-4174. [January 2011 meeting]

Requirement 8.6.7.11 Added

RATIONALE: To provide maintenance and testing requirements. [TN 10-2024]

Requirement 8.6.7.12 Added

RATIONALE: To include outside emergency elevators in the applicable sections of Part 8. [TN 10-923]

Requirement 8.6.8.5 Revised

RATIONALE: When the Step/Skirt Performance Index was adopted into A17.1d-2000 Code (TR 96-10), the requirement for skirts to be made from low-friction material or treated with friction-reducing material was dropped from Rule 802.3f. This was due to the Index incorporating many entrapment variables into it, with one measurement being the coefficient of friction of the skirt panel.

This TR also added the Step/Skirt Performance Index into Rule 1206.6c (Maintenance of Escalators). This additional requirement from 8.6.8.5 should have been removed to keep consistency with Part 6, where it is not required and redundant to the Index. Escalators meeting the Index requirements are permitted to have friction-reducing materials, but should not be required to add additional friction-reducing materials.

This is consistent with the last paragraph of the rationale for TR 96-10:

> The current ASME A17.1 Code parameters of step-to-skirt gap and skirt treatment are redundant and replaced by the proposed new ASME A17.1 Code requirements. If these requirements were maintained they would be misleading, as compliance with the old requirements would not assure compliance with the new loaded gap and step/skirt performance index requirements.

[TN 08-1350]

Requirement 8.6.8.5(a) Revised

RATIONALE: Repaired or replaced skirt panels must conform to the applicable Step/Skirt Performance index. [TN 11-762]

Requirement 8.6.8.15.23 Added

RATIONALE: Requirement 8.6.8.15.23 has been added to address the maintenance of seismic devices. [TN 09-1508]

Requirement 8.6.11.5 Revised

RATIONALE: To codify good and accepted industry practice of restricting nonauthorized persons from using a stopped escalator as a stairwell. [TN 07-1198]

Requirement 8.6.11.5.4 Revised

RATIONALE: To clarify that persons using these elevators need to be trained in and provided with emergency evacuation procedures because of the isolated locations typical to the wind industry. [TN 10-2024]

Requirement 8.6.11.10 Added

RATIONALE: This section deals with the requirement related to development of alternative testing method, verification of method, procedure for conducting the alternative test, and the records associated with alternative testing. Originally proposed as a new section 8.3.1.5, these requirements have been moved to 8.6.11, which is a more appropriate location for the stated requirements.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.6.11.13 Added, and subsequent requirements renumbered

RATIONALE: To add a periodic check of the OEO system by authorized personnel to be done in conjunction with testing of the fire alarm system.

See also general rationale/background for 2.27.11. [TN 09-2041]

Requirement 8.7.1.7 Revised

RATIONALE: Requirement 8.6.12 no longer exists. [TN 10-790]

Requirement 8.7.1.9 Added

RATIONALE: See rationale for 8.6.2.6. [TN 08-634]

Requirement 8.7.2.7.2 Revised

RATIONALE: To include requirements for control rooms and controller spaces when an alteration is completed, incorporating changes that TN 07-1593 did not include. [TN 09-1460]

Requirement 8.7.2.11.5 Revised

RATIONALE: To update references to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 8.7.2.12 Revised

RATIONALE: The requirements of 8.7.2.27.4(b) have been moved here, in a more appropriate location. Readers of the Code may not look under "controller alteration" when dealing with power door operation. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Requirement 8.7.2.13 Revised

RATIONALE: To incorporate modifications made to 8.6.3.8 by TN 04-536. [TN 06-1227]

Requirements 8.7.2.14.3 and 8.7.2.14.4 Revised

RATIONALE: To update requirements 8.7.2.14.3 and 8.7.2.14.4 to be consistent with changes made by TN 07-1753. [TN 09-654]

Requirement 8.7.2.16.2 Revised

RATIONALE: Passenger elevators are permitted to carry freight under the provisions of 2.16.1.3, Carrying of Freight on Passenger Elevators. Also, the passenger elevator shall be designed to carry the applicable class of freight elevator loading per 2.16.1.3.2.

If there is a need to introduce a freight loading class on a passenger elevator or if an existing freight loading class on a passenger elevator needs to be changed, the change in loading class should be considered an alteration and the requirements for compliance should be specifically stated. The proposal is to specify the minimum requirements when passenger elevators used to carrying freight have their freight loading classification changed. [TN 09-655]

Requirement 8.7.2.17.1 Revised

RATIONALE: This alteration scope is to address increase or decrease in rise, with additional requirements for emergency doors if a blind hoistway section is created with an increase/decrease of travel. Change in location of the driving machine is addressed in a different requirement. [TN 07-24]

Requirement 8.7.2.25.2 Revised

RATIONALE: To clarify which requirements must be conformed to when changing driving-machine location. [TN 07-24]

Requirement 8.7.2.27.1 Revised

RATIONALE: To add requirements to cover addition or alteration to other forms of inspection operation beside top of car, including in-car inspection operation, machinery space outside the hoistway, machine room, control room, control space outside the hoistway, control room, pit, landing, and working platform inspection operations. Deleted top-of-car inspection operation is covered by new requirement (a).

To add requirements to address addition or alteration of door bypass switches. [TN 10-1634]

Requirement 8.7.2.27.4 Revised

RATIONALE: See general rationale for 8.7.2.27.6.

8.7.2.27.4(a): Requirement 8.7.2.27.5 provides requirements for when the motion control is changed to a different type of motion control. This requirement specifies some basic essentials and some safety enhancements when the motion control is updated but where the method of motion control remains the same.

8.7.2.27.4(a)(1): Adds requirements for path, clearance, and lighting as related to the new equipment. Also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.2.27.4(a)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.2.27.4(a)(3): Adds an important safety requirement if not already present, but permits reduced redundancy and checking of the detection means for installations installed prior to A17.1-2000/B44-00 where the current controllers or control systems may be lacking in this regard.

8.7.2.27.4(a)(4): Provides requirements related to the design of control and operating circuits of the newly installed equipment.

8.7.2.27.4(b): Requirement 8.7.2.27.6 provides requirements for when the operation control is changed from a form of constant pressure to automatic. This requirement specifies some basic requirements and some safety enhancements when operation control is updated but where the method of operation control remains the same.

8.7.2.27.4(b)(1): Adds requirements for path, clearance, access, and lighting as related to the new equipment; also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.2.27.4(b)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.2.27.4(b)(3): Provides requirements related to the design of "control and operating circuits" of the newly installed equipment, but limits the scope of 2.26.9 to 2.26.9.3.1(d) and (e), 2.26.9.32, and 2.26.9.4, which have or may have implications for "operation control" design.

8.7.2.27.4(b)(4) NOTE: Operation controller upgrades can easily accomplish aspects of FEO. If operation control changes include changes to FEO, then the provisions of 8.7.2.28 are applicable. This Note is intended to provide guidance about other existing alteration requirements.

8.7.2.27.4(c): Permits individual installations of motion control or operation controller as outlined in (a) and (b) to facilitate upgrades aimed at enhancing reliability, but without forcing major upgrades to current Code requirements.

8.7.2.27.4(c)(1): Adds requirements for path, clearance, and lighting as related to the new equipment. Also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.2.27.4(c)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.2.27.4(c)(3): Adds an essential safety requirement if not already present. There are few to none other alteration opportunities which would invoke the requirements of 2.19; therefore, it is targeted at this opportune time.

8.7.2.27.4(c)(5): Retains the existing requirement. Adds 2.26.1.2 to be consistent with hydraulic requirements. Clarifies requirements are applicable to newly installed equipment only.

Former 8.7.2.27.4(d): Deleted. Requirement (d) was intended to be a subrequirement to the alterations listed in 8.7.2.27.4; however, as written, it is a standalone alteration. Requirement (d) has been relocated as appropriate. See proposed locations 8.7.2.28 and 8.7.3.28, and relocation in 8.7.2.27.4 and 8.7.31.5.

8.7.2.27.4(d): The requirements of 2.26.4.1 are already covered by general requirement 8.7.2.8, which deals with the installation of all new or altered electrical equipment. Move this requirement and conformance to 2.26.4.1 to alteration requirement 8.7.2.12, which deals with power operation of hoistway doors. This is a more appropriate location for the stated requirements. Readers of the Code may not look under "controller alteration" when dealing with power door operation.

Retain the current requirement as a cross reference for readers who may search in this location.

8.7.2.27.4(e): The requirements of 2.26.4.1 are already covered by general requirement 8.7.2.8, which deals with the installation of all new or altered electrical equipment. Move this requirement and conformance to 2.26.4.1 to alteration requirement 8.7.2.28, which deals with emergency operation, standby power, and FEO alterations or additions.

Retain the current requirement as a cross reference for readers who may search in this location. [TN 09-652]

Requirement 8.7.2.27.5 Revised

RATIONALE: See general rationale for 8.7.2.27.6.

8.7.2.27.5(a): Adds requirements for path, clearance, and lighting as related to the new control equipment; also adds temperature and humidity requirements to ensure operation within specified limits.

8.7.2.27.5(b): Adds requirement for electrical equipment related to this alteration.

8.7.2.27.5(c)(1): To review the details of 2.11.1 through 2.11.13 and determine the validity of the requirement. Provides concessions where the new requirement is overly excessive (which might result in the complete removal of the entrances due to minor failings). Allows minor deficiencies to today's Code, where possible.

Allows smaller-size entrances to remain.

Excludes the requirement to provide cleaning openings — the motion control change is not related to access openings for cleaning.

8.7.2.27.5(c)(2): While a change in motion control has little implications related to protection of hoistway openings, the majority of installations will likely be in compliance with these requirements — therefore, includes requirements related to types of entrances, closing of hoistway doors, location of hoistway doors, projection of sills, and opening of hoistway doors. Includes weights for door balancing, hoistway-door locking devices, and landing sill guards.

8.7.2.27.5(c)(3): Purposely excludes the majority of 2.11.11 as full compliance would likely result in the

removal of all entrances due to a motion control change. Includes the requirements for bottom guides, multipanel entrances, hoistway door safety retainers, and hoistway door to sill clearance.

8.7.2.27.5(c)(4): Same rationale as above; includes basic requirement related to pull straps.

8.7.2.27.5(d): Modifies 2.12.2.4.3 to permit a known interlock with a 6-mm engagement to be retained; excludes the requirement for listing/certification of existing locks if locks are being retained.

8.7.2.27.5(e): Retains requirements related to power operation of hoistway doors, including door force and kinetic energy.

8.7.2.27.5(f)(1): Two horizontal (refuge) areas on the car top are not required if car tops are retained. Permits glass to be retained in the car interior. Allows car interiors equipment inside cars to be retained. Side exits, if existing, must be removed.

8.7.2.27.5(f)(2): Allows car headroom and vision panels to remain.

8.7.2.27.5(f)(3): Access panels need not comply with the self-locking requirement, and their location does not need to be modified.

8.7.2.27.5(f)(5): Excludes the requirement for interlocks or car gate contacts to be tested/listed if existing locks/contacts are retained.

8.7.2.27.5(f)(6): Permits the number of entrances on the car to be retained, to match existing building entrance configuration. Permits existing car door panel overlaps, panel depressions, and other dimensional attributes to remain. Retains manual opening of car door requirement, and permits glass in car doors to remain.

8.7.2.27.5(f)(7): Requires compliance for freight elevator car door and gates, except read applicable 2.14.5 requirements as shown above.

8.7.2.27.5(f)(8): Requires compliance to illumination of cars and lighting fixtures, except excludes emergency lighting requirement and permits existing means to be retained. Excludes requirement for car top receptacle, excludes details related to light control switch requirements, excludes requirements related to car lighting and protection of light bulbs — thereby allowing this portion of the cab interior may be retained as a result of a motion control change.

8.7.2.27.5(g): Recognizes that a standard railing height may not be feasible, in which case an alternate solution of equivalency is permitted. The solution must be acceptable to the authority having jurisdiction. (Ref: see TN 10-791.)

8.7.2.27.5(h): Requirement 2.17.12.1 is a factor of safety requirement which may not be available as a calculation during this alteration — in this case, permit physical testing so that the safety can be retained if the actual factor of safety is unknown.

Updates reference to be more exact.

8.7.2.27.5(i): A complete verification of capacity and loading during a motion control change is unwarranted. However, testing with 125% load as required by the referenced sections is retained. By requiring full compliance with 2.16, the extensive review of the elevators capacity and loading compliances may prohibit this upgrade.

8.7.2.27.5(m): Clarifies that 2.27.1 car emergency signaling devices are required in all cases, and emergency operation and signaling devices of 2.27.2 through 2.27.9 are required if previously provided as a result of compliance to either NBCC or prior editions of B44. [TN 09-652]

Requirement 8.7.2.27.6 Revised

RATIONALE:

(a) General Rationale. The proposal reviews current alteration requirements related to control, operation control, and motion control, to assess the current requirements and proposes changes where required. This proposal looks at the following:

(1) 8.7.2.27.4, Controllers (electric); and 8.7.3.31.5, Controllers (hydraulic)

(2) 8.7.2.27.5, Change in Type of Motion Control (electric); and 8.7.3.31.6, Change in Type of Motion Control (hydraulic)

(3) 8.7.2.27.6, Change in Type of Operation Control (electric); and 8.7.3.31.7, Change in Type of Operation Control (hydraulic)

(4) adds and amends a definition in Section 1.3

(5) introduces an alteration scope in 8.7.3.31.12 related to hydraulic motor starters

(6) proposes minor changes to 8.7.2.12 and 8.7.3.12, Power Operation of Hoistway Doors

(7) proposes minor changes to 8.7.2.28 and 8.7.3.28, Emergency Operations and Signaling Devices

(8) introduces a Nonmandatory Appendix Y, which diagrams these alterations

Recent changes to controller requirements have prompted a review of these requirements. While these alteration scopes are somewhat interrelated, the objective of this proposal is to establish a logical progression of increasing safety requirements based on each alteration scope. In A17.1a-2005/CSA B44-04 Update 1, significant additions were added to change in motion control scope — so much that there was virtually no distinction between a motion control change and an operation control change — and given the scope of what

a motion control change involves, these new requirements in many ways are unnecessary. The progression of safety requirements in this proposal is dependent upon the potential hazards related to the alteration and the mitigations needed to adequately address the scope of the proposed work.

(b) Regarding Change of Operation Control, 8.7.2.27.6 and 8.7.3.31.7. This alteration scope is used to establish requirements when the mode of operation is altered from a form of continuous-pressure operation to a form of automatic operation, or vice versa, although the latter change may not be a common occurrence. The requirements primarily address hazards associated with an elevating device that was previously manually controlled by an operator but will now be permitted to travel through the hoistway automatically. This alteration scope includes the greatest number of alteration requirements that are necessary to ensure safety for the rider and elevator personnel. As you will see in the proposal, changes to motion control will introduce lesser requirements, and finally changes to controllers requiring even less (provided the method of motion and operation remain unchanged).

(c) Regarding Change of Motion Control, 8.7.2.27.5 and 8.7.3.31.6. The A17.1 definition for *motion control* means the portion of a control system that governs the acceleration, speed, retardation, and stopping of the elevator. If the method of motion control (the method that governs the acceleration, speed, retardation, and stopping of the elevator) is not identical to the original method of motion control, then the scope of 8.7.2.27.5 applies. Examples of identical might be SSAC to SSAC, or two-speed AC to two-speed AC, or VVVF to VVVF, or VFAC to VFAC. A change from SSAC to VVVF, or from MG to SCR, is not an identical method of motion control. Since a motion control alteration does not have the same extent of hazards that can be associated with a change in operation control (as outlined in 8.7.2.27.6 and 8.7.3.31.7), the proposed requirements associated with a motion control are less than those required for an alteration to operation control.

(d) Regarding Change of Controller, 8.7.2.27.4 and 8.7.3.31.5. This alteration scope requires the least amount of alteration requirements — as compared to motion or operation control change — since this alteration scope requires that the method of motion control or operation control remains unchanged. As shown in Nonmandatory Appendix A, controllers are primarily comprised of two main items, motion and operation control. To effectively define the requirements within this alteration scope, it is essential to discuss changes to these components individually as well as collectively. To properly address this, this proposed alteration scope is separated into the following three parts:

(1) where only a motion controller is changed for same method

(2) where only an operation controller is changed for same method

(3) where both motion and operation controllers are changed with same overall method

8.7.2.27.6: Operation control as currently defined in 1.3 covers a variety of different operation control types. While a change from down collective to selective collective is a change to operation control, it is not significant enough to require conformance to 8.7.2.27.6. For 8.7.2.27.6 to make sense from a safety standpoint, we need to concern ourselves with operation control changes where the starting and stopping of the elevating device was solely in the hands of the attendant/operator to a form of operation control where either or both the starting and stopping are no longer under full control of the attendant/operator.

This is the primary premise for a change in operation control; however, it may also be possible to change from automatic to manual, in which case the current level of safety should not be diminished and requirements should be stated even though the potential for such an alteration scope is slight.

8.7.2.27.6(a): Adds requirements for worker safety to ensure access, lighting, drainage, and stop switches are provided; excludes requirements which are related to physical construction.

8.7.2.27.6(b): Adds requirement for worker safety to address counterweight guarding, since operation may now be automatic.

8.7.2.27.6(c): Adds requirement for user safety to ensure vertical clearances, and refuge space is addressed for mechanic safety.

8.7.2.27.6(d): Adds requirement for user safety to ensure horizontal car and counterweight clearances are adequate, since operation may now be automatic and not under attendant control.

8.7.2.27.6(e): Adds requirements for path, clearance, working areas in the pit, locations of equipment related to inspection and tests, and lighting as related to the new control equipment; also adds temperature and humidity requirements to ensure operation within specified limits.

8.7.2.27.6(f): Adds requirement for electrical equipment related to this alteration.

8.7.2.27.6(h)(1): Where existing car enclosures and/or car doors or gates are retained, requires conformance to 2.14.1.3 as far as running clearances are concerned, to ensure clearance between the car and hoistway or counterweight is maintained. Requires conformance to 2.14.1.5.1, Top Emergency Exit, to ensure means are provided to rescue passengers. Existing glass is permitted to remain by exempting 2.14.1.8.

Former 8.7.2.27.6(h)(3): Requires freight-car enclosures to meet these dimensional requirements if openwork (perforated enclosures) are intended to be retained.

8.7.2.27.6(h)(3): As the installation may now run automatically, qualifies that the door or gate strength should be sufficient to not deflect beyond the car sill.

8.7.2.27.6(i): Recognizes that a standard railing height may not be feasible, in which case an alternate solution of equivalency is permitted. The solution must be acceptable to the authority having jurisdiction. (Ref: see TN 10-791.)

8.7.2.27.6(l): Requires conformance to 2.19. [TN 09-652]

Requirement 8.7.2.27.7 Revised

RATIONALE: To assist in improving personal safety for the riding public. If an alteration consists only of the change to the in-car stop switch to a keyed switch, the current requirement (2.26.2.21) requires meeting requirements which may require extensive controller changes for single-failure fault protection.

The in-car stop switch was modified from the toggle to be behind-a-locked-cover/key switch with the A17.1d-1986 Code. This allowed the emergency switch on freights and passenger perforated car enclosures, but required the in-car stop switch (cover/key) for nonperforated car enclosures. The requirement for single-failure fault protection was not incorporated into the Code until A17.1-1987; therefore, these units that are affected by this alteration would have been installed prior to these 1987 Code requirements. [TN 08-649]

Requirement 8.7.2.28 Revised

RATIONALE: The requirements of 8.7.2.27.4(b) have been moved here, in a more appropriate location. Readers of the Code may not look under "controller alteration" when dealing with emergency power, standby power, or FEO alterations. Also moved requirement for equipment identification. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Requirement 8.7.2.28(c) Revised

RATIONALE: To address alterations to emergency operations for elevators in a group operation. [TN 09-1589]

Requirement 8.7.2.27.9 Added

RATIONALE: To add requirements to cover addition or alteration of a door monitoring system for power-operated car doors that are mechanically coupled with landing doors. [TN 10-1635]

Requirement 8.7.3.7 Revised

RATIONALE: To include requirements for control rooms and controller spaces when an alteration is completed, incorporating changes that TN 07-1593 did not include. [TN 09-1460]

Requirement 8.7.3.12 Revised

RATIONALE: The requirements of 8.7.2.27.4(b) have been moved here, in a more appropriate location. Readers of the Code may not look under "controller alteration" when dealing with power door operation. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Requirement 8.7.3.13 Revised

RATIONALE: To make requirements for hydraulic elevators the same as those for electric elevators. [TN 09-1591]

Requirement 8.7.3.18 Revised

RATIONALE: Passenger elevators are permitted to carry freight under the provisions of 2.16.1.3, Carrying of Freight on Passenger Elevators. Also, the passenger elevator shall be designed to carry the applicable class of freight elevator loading per 2.16.1.3.2.

If there is a need to introduce a freight loading class on a passenger elevator or if an existing freight loading class on a passenger elevator needs to be changed, the change in loading class should be considered an alteration and the requirements for compliance should be specifically stated. The proposal is to specify the minimum requirements when passenger elevators used to carrying freight have their freight loading classification changed. [TN 09-655]

Requirement 8.7.3.31.5 Revised

RATIONALE: See general rationale for 8.7.2.27.6.

8.7.3.31.5(a): Requirement 8.7.3.31.6 provides requirements for when the motion control is changed to a different type of motion control. This requirement specifies some basic essentials and some safety enhancements when the motion control is updated but where the method of motion control remains the same.

8.7.3.31.5(a)(1): Adds requirements for path, clearance, access, and lighting as related to the new equipment; also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.3.31.5(a)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.3.31.5(a)(3): Provides requirements related to the design of control and operating circuits of the newly installed equipment.

8.7.3.31.5(b): Requirement 8.7.3.31.7 provides requirements for when the operation control is changed from a

form of constant pressure to automatic. This requirement specifies some basic requirements and some safety enhancements when operation control is updated but where the method of operation control remains the same.

8.7.3.31.5(b)(1): Adds requirements for path, clearance, and lighting as related to the new equipment; also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.3.31.5(b)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.3.31.5(b)(3): Provides requirements related to the design of "control and operating circuits" of the newly installed equipment, but limits the scope of 2.26.9 to 2.26.9.3 and 2.26.9.4, which have implications for "operation control" design.

8.7.3.31.5(b)(4) NOTE: Operation controller upgrades can easily accomplish aspects of FEO. If operation control changes include changes to FEO, then the provisions of 8.7.3.31.8 are applicable. This Note is intended to provide guidance about other existing alteration requirements.

8.7.3.31.5(c): Permits individual installations of motion control or operation controller as outlined in (a) and (b) to facilitate upgrades aimed at enhancing reliability, but without forcing major upgrades to current Code requirements. Where the upgrade is extensive and includes both operation and motion controllers (controller completely replaced), utilize this alteration scope to force essential upgrades commonly associated with newer controllers.

8.7.3.31.5(c)(1): Adds requirements for path, clearance, access, and lighting as related to the new equipment; also adds temperature and humidity requirements to ensure operation within manufacturer's specified limits.

8.7.3.31.5(c)(2): Electrical equipment to meet electrical code and, as applicable, meet requirements of B44.1/A17.5.

8.7.3.31.5(c)(4): Retains existing requirement. Clarifies requirements are applicable to newly installed equipment only.

Former 8.7.3.31.5(d): Deleted. Requirement (d) was intended to be a subrequirement to the alterations listed in 8.7.3.31.5; however, as written, it is a standalone alteration. Requirement (d) has been relocated as appropriate. See proposed locations 8.7.2.28 and 8.7.3.28, and relocation in 8.7.2.27.4 and 8.7.31.5.

8.7.3.31.5(d): The requirements of 2.26.4.1 are already covered by general requirement 8.7.2.8, which deals with the installation of all new or altered electrical equipment. Move this requirement and conformance to 2.26.4.1 to alteration requirement 8.7.3.12, which deals with power operation of hoistway doors. This is a more appropriate location for the stated requirements. Readers of the Code may not look under "controller alteration" when dealing with power door operation.

8.7.3.31.5(e): The requirements of 2.26.4.1 are already covered by general requirement 8.7.3.8, which deals with the installation of all new or altered electrical equipment. Move this requirement and conformance to 2.26.4.1 to alteration requirement 8.7.3.28, which deals with emergency operation, standby power, and FEO alterations or additions. [TN 09-652]

Requirement 8.7.3.31.6 Revised

RATIONALE: See general rationale for 8.7.2.27.6.

8.7.3.31.6(a): Adds requirements for path, clearance, and lighting as related to the new control equipment; also adds temperature and humidity requirements to ensure operation within specified limits.

8.7.3.31.6(b): Adds requirement for electrical equipment related to this alteration.

8.7.3.31.6(c)(1): To review the details of 2.11.1 through 2.11.13 and determine the validity of the requirement. Provides concessions where the new requirement is overly excessive (may warrant the complete removal of the entrance for minor failings) and allows, where possible.

Allows smaller-size entrances to remain.

Excludes the requirement to provide cleaning openings — the motion control change is not related to access openings for cleaning.

8.7.3.31.6(c)(2): While a change in motion control has little implications related to protection of hoistway openings, the majority of installations will likely be in compliance with these requirements — therefore, includes requirements related to types of entrances, closing of hoistway doors, location of hoistway doors, projection of sills, and opening of hoistway doors. Includes weights for door balancing, hoistway-door locking devices, and landing sill guards.

8.7.3.31.6(c)(3): Purposely excludes the majority of 2.11.11 as full compliance would likely result in the removable of all entrances due to a motion control change. Includes the requirements for bottom guides, multipanel entrances, hoistway door safety retainers, and hoistway door to sill clearance.

8.7.3.31.6(c)(4): Same rationale as above; includes basic requirement related to pull straps.

8.7.3.31.6(d): Modifies 2.12.2.4.3 to permit a known interlock with a 6-mm engagement to be retained.

Excludes the requirement for listing/certification of existing locks if locks are being retained.

8.7.3.31.6(e): Retains requirements related to power operation of hoistway doors, including door force and kinetic energy.

8.7.3.31.6(f)(1): Two horizontal (refuge) areas on the car top are not required if car tops are retained. Permits glass to be retained in the car interior. Allows car interiors equipment inside cars to be retained; side exits, if existing, must be removed.

8.7.3.31.6(f)(2): Allows vision panels to be retained.

8.7.3.31.6(f)(3): Access panels need not comply with the self-locking requirement, and their location does not need to be modified.

8.7.3.31.6(f)(5): Excludes the requirement for interlocks or car gate contacts to be tested/listed if existing locks/contacts are retained.

8.7.3.31.6(f)(6): Permits the number of entrances on the car to be retained — to match existing building entrance configuration. Permits existing car door panel overlaps, panel depressions, and other dimensional attributes to remain. Retains manual opening of car door requirement and permits glass in car doors to remain.

8.7.3.31.6(f)(7): Requires compliance for freight elevator car doors and gates, except read applicable 2.14.5 requirements as shown above.

8.7.3.31.6(f)(8): Requires compliance to illumination of cars and lighting fixtures except excludes emergency lighting requirement and permits existing means to be retained. Excludes requirement for car top receptacle, excludes details related to light control switch requirements, and excludes requirements related to car lighting and protection of light bulbs — thereby allowing this portion of the cab interior to be retained as a result of a motion control change.

8.7.3.31.6(g): Recognizes that a standard railing height may not be feasible, in which case an alternate solution of equivalency is permitted. The solution must be acceptable to the authority having jurisdiction. (Ref: see TN 10-791.)

8.7.3.31.6(h): Requirement 2.17.12.1 is a factor of safety requirement which may not be available as a calculation during this alteration — in this case, permit physical testing so that the safety can be retained if the actual factor of safety is unknown.

Updates reference to be more exact.

8.7.3.31.6(l): Clarifies 2.27.1 car emergency signaling devices are required in all cases and emergency operation and signaling devices are required if previously provided as a result of compliance with either NBCC or prior editions of B44.

Revises the NBCC requirement to require 3.27 as applicable for hydraulic installations. [TN 09-652]

Requirement 8.7.3.31.7 Revised

RATIONALE: See general rationale for 8.7.2.27.6.

8.7.3.31.7: Operation control as currently defined in 1.3 covers a variety of different operation control types. While a change from down collective to selective collective is a change to operation control, it is not significant enough to require conformance to 8.7.2.31.7. For 8.7.2.31.7 to make sense from a safety standpoint, we need to concern ourselves with operation control changes where the starting and stopping of the elevating device was solely in the hands of the attendant/operator to a form of operation control where either or both the starting and stopping are no longer under full control of the attendant/operator.

This is the primary premise for a change in operation control. However, it may also be possible to change from automatic to manual, in which case the current level of safety should not be diminished and requirements should be stated even though the potential for such an alteration scope is slight.

8.7.3.31.7(a): Adds requirements for worker safety to ensure access, lighting, drainage, and stop switches are provided; excludes requirements which are related to physical construction.

8.7.3.31.7(b): Adds requirement for worker safety to address counterweight guarding, since operation may now be automatic.

8.7.3.31.7(c): Adds requirement for user safety to ensure vertical clearances, and refuge space is addressed for mechanic safety.

8.7.3.31.7(d): Adds requirement for user safety to ensure horizontal car and counterweight clearances are adequate, since operation may now be automatic and not under attendant control.

8.7.3.31.7(e): Adds requirements for path, clearance, working areas in the pit, locations of equipment related to inspection and tests, and lighting as related to the new control equipment; also adds temperature and humidity requirements to ensure operation within specified limits.

8.7.3.31.7(f): Adds requirement for electrical equipment related to this alteration.

8.7.3.31.7(h)(1): Where existing car enclosures and/or car doors or gates are retained, requires conformance to 2.14.1.3 as far as running clearances are concerned, to

ensure clearance between the car and hoistway or counterweight are maintained.

Requires conformance to 2.14.1.5.1, Top Emergency Exit, to ensure means are provided to rescue passengers.

Existing glass is permitted to remain by exempting 2.14.1.8.

Former 8.7.3.31.7(h)(3): Requires freight-car enclosures to meet these dimensional requirements if openwork (perforated enclosures) are intended to be retained.

8.7.3.31.7(h)(3): As the installation may now run automatically, qualifies that the door or gate strength should be sufficient to not deflect beyond the car sill.

8.7.3.31.7(i): Recognizes that a standard railing height may not be feasible, in which case an alternate solution of equivalency is permitted. The solution must be acceptable to the authority having jurisdiction. (Ref: see TN 10-791.) [TN 09-652]

Requirement 8.7.3.31.8 Revised

RATIONALE: The requirements of 8.7.2.27.4(b) have been moved here, in a more appropriate location. Readers of the Code may not look under "controller alteration" when dealing with emergency power, standby power, or FEO alterations. Also moved requirement for equipment identification. Also see general rationale for 8.7.2.27.6. [TN 09-652]

Requirement 8.7.3.31.8 Revised

RATIONALE: To make consistent with electric elevator requirement 8.7.2.28. [TN 12-608]

Requirement 8.7.3.31.8(c) Revised

RATIONALE: To address alterations to emergency operations for hydraulic elevators. [TN 09-1589]

Requirement 8.7.3.31.8(d) Revised

RATIONALE: To address alterations to emergency operations in hydraulic elevators in group operation, and to make the hydraulic elevator alterations consistent with the electric elevator alterations. [TN 09-1589]

Requirement 8.7.3.31.10 Revised

RATIONALE: To assist in improving personal safety for the riding public. If an alteration consists only of the change to the in-car stop switch to a keyed switch, the current requirement (2.26.2.21) requires meeting requirements which may require extensive controller changes for single-failure fault protection.

The in-car stop switch was modified from the toggle to be behind-a-locked-cover/key switch with the A17.1d-1986 Code. This allowed the emergency switch on freights and passenger perforated car enclosures, but required the in-car stop switch (cover/key) for nonperforated car enclosures. The requirement for single-failure fault protection was not incorporated into the Code until A17.1-1987; therefore, these units that are affected by this alteration would have been installed prior to these 1987 Code requirements. [TN 08-649]

Requirement 8.7.3.31.12 Added

RATIONALE: A change to the pump motor starter is a replacement, unless the starter also controls the upward motion of the car (i.e., a design that does not incorporate a hydraulic valve to control upward motion), then the change must meet 8.7.3.31.12.

The Rationale for individual requirements is as follows:

- 2.8.2.1, electrical equipment to meet electrical code
- 2.26.4.1, electrical equipment and wiring to electrical code
- 2.26.4.2, equipment to be listed for elevator use
- 3.26.5, phase reversal protection
- 3.26.6.4, important if design does not incorporate a valve, then we need two means to remove power

Also see general rationale for 8.7.2.27.6. [TN 09-652]

Requirement 8.7.5.12 Added

RATIONALE: To include outside emergency elevators in the applicable sections of Part 8. [TN 10-923]

Requirement 8.7.6.1.17 Added

RATIONALE: To add requirements for the addition of or alteration to a variable frequency drive motor control on an escalator. This is to handle potential overspeed faults caused by a loss of a phase, undervoltage, or an open delta. Incorporating new requirements initiated with the balloting and approval of TN 07-1120. [TN 09-1588]

Requirement 8.7.6.2.16 Added

RATIONALE: To add requirements for the addition of or alteration to a variable frequency drive motor control on a moving walk. This is to handle potential overspeed faults caused by a loss of a phase, undervoltage, or an open delta. Incorporating new requirements initiated with the balloting and approval of TN 07-1120. [TN 09-1588]

Requirement 8.9.1 Revised

RATIONALE: See rationale for 8.6.1.1 [TN 08-802]

Section 8.10 Revised

RATIONALE: Since alternative testing is contingent on results obtained during an acceptance test, the Note

intends to alert readers that if no load Category 5 testing is intended to be performed in the future, readers can refer to the requirements that will apply at the Category 5 test.

See also general rationale for 8.6.1.7.2. [TN 02-2275]

Requirement 8.10.1.1.3 Revised

RATIONALE: Revised language reflects ASME's recent decision to discontinue accreditation of certifying organizations and allows organizations to seek accreditation elsewhere while continuing certification of inspectors and inspection supervisors to the QEI-1 Standard. [TN 12-668 and TN 12-1341]

Requirement 8.10.1.1.4 Added

RATIONALE: To provide a similar requirement for an acceptance test tag as now exists for periodic test tags in 8.6.1.7.2. [TN 10-962]

Requirement 8.10.1.1.5 Added

RATIONALE: To provide permanent records of test results on the job site for future use. [TN 10-962]

Requirement 8.10.1.2 Added

RATIONALE: Accreditation of organizations which certify elevator inspectors and inspection supervisors will be discontinued by The American Society of Mechanical Engineers, effective January 1, 2014. Effective that date, requirements relating to such accreditation are not included within the scope of this Standard. ASME does not "approve," "certify," "rate," or "endorse" any person certified by an organization holding a Certificate of Accreditation, and there shall be no statement or implication that might so indicate. This new statement is important since many AHJs will be faced with the need to have enabling legislation in their respective jurisdictions changed to reflect the discontinuance of ASME accreditation. [TN 12-1341]

Requirement 8.10.1.4 Revised

RATIONALE: To update references to reflect changes in 8.6. [TN 08-1348]

Requirement 8.10.1.5 Added

RATIONALE: The MCP is needed and on-site equipment documentation is needed for safe operation and maintenance. [TN 08-1348]

Requirement 8.10.2.2.1 Revised

RATIONALE: To update to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 8.10.2.2.2 Revised

RATIONALE: The increased frequency of testing of the critical braking system will aid in monitoring the performance of the braking system. The sealing of the brake adjustment will ensure that the adjustment is not inadvertently changed between testing periods. It is necessary to identify the party that applied the seal. [TN 08-295]

Requirement 8.10.2.2.2(ii)1(b) Revised

RATIONALE: Requirement 2.18.2 refers to the car speed at which the governor trips, not the governor speed. Additionally, some governors are not adjustable, and these governors require replacement if the car speed at which the governor trips is outside of the allowable range. [TN 12-161]

Requirement 8.10.2.2.2(nn) Revised

RATIONALE: Revised references to reflect changes in 8.6. [TN 08-1348]

Requirement 8.10.2.2.8 Revised

RATIONALE: See rationale for 8.6.1.2. [TN 08-802]

Requirement 8.10.2.2.9 Added

RATIONALE: See general rationale/background for 2.27.11. [TN 09-2041]

Requirement 8.10.3.2.2(cc) Revised

RATIONALE: To correct reference. [TN 10-1660]

Requirement 8.10.3.2.2(gg) Revised

RATIONALE: Revised references to reflect changes in 8.6. [TN 08-1348]

Requirements 8.10.3.2.3(z) and 8.10.3.2.3(aa) Editorially revised

RATIONALE: Editorial update of cross references due to removal of 3.18.1.2.2 and 3.18.1.2.3. [TN 11-1453]

Requirement 8.10.3.3.2(i) Revised

RATIONALE: Definition of "driving machine" changed prior to 1996 and is now titled "hydraulic jack" (see 8.7.3.23.5). [TN 12-162]

Requirement 8.10.3.3.2(s) Revised

RATIONALE: Requirement 8.10.3.3.2 was reorganized without checking all places where the requirements were referenced, in violation of our procedures. [TN 10-966]

Requirement 8.10.4 Revised

RATIONALE: To reflect that step demarcation lighting is no longer required. [TN 11-1718]

Requirement 8.10.4.1.2 Revised

RATIONALE: To update the escalator and moving walk inspection guidelines and requirements of A17.1 and A17.2 to correspond with the latest electrical requirements in A17.1, Part 6, and provide consistency with new technology in A17.7-2007/B44.7-07, *Performance-Based Safety Code for Elevators and Escalators*, 2.10.1 and 2.10.2. [TN 02-2273]

Requirement 8.10.5.12 Added

RATIONALE: To include outside emergency elevators in the applicable sections of Part 8. [TN 10-923]

Requirement 8.10.5.14 Added

RATIONALE: To provide acceptance testing requirements. [TN 10-2024]

Requirement 8.11.1.1 Revised

RATIONALE: Revised language reflects ASME's recent decision to discontinue accreditation of certifying organizations and allows organizations to seek accreditation elsewhere while continuing certification of inspectors and inspection supervisors to the QEI-1 Standard. [TN 12-668 and TN 12-1341]

Requirement 8.11.1.1.2 Revised

RATIONALE: To clarify that the inspector is not responsible for conducting the periodic tests. This could result in a conflict of interest. According to QEI-1, para. 2.2, the inspector's only duty is to witness the tests. [TN 09-1624]

Requirement 8.11.1.7 Revised

RATIONALE: Revised references to reflect changes in 8.6. [TN 08-1348]

Requirement 8.11.1.8 Added

RATIONALE: The MCP is needed and on-site equipment documentation is needed for safe operation and maintenance. Adds to 8.10 and 8.11 a reference to 8.6.1.2.1. [TN 08-1348]

Requirement 8.11.2.1.1 Revised

RATIONALE: Updated to agree with requirements in 2.14.5.7. [TN 02-3046]

Requirement 8.11.2.1.2(ii) Revised

RATIONALE: Revised references to reflect proposed changes in 8.6. [TN 08-1348]

Requirement 8.11.2.1.8 Added

RATIONALE: The increased frequency of testing of the critical braking system will aid in monitoring the performance of the braking system. The sealing of the brake adjustment will ensure that the adjustment is not inadvertently changed between testing periods. It is necessary to identify the party that applied the seal. [TN 08-295]

Requirement 8.11.2.2.6 Revised

RATIONALE: Testing of fire alarm initiating devices is covered in NFPA *72* and/or the local building code. Elevator personnel will verify that once the proper signal is received from the fire alarm initiating devices, the elevator responds correctly. [TN 08-799]

Requirement 8.11.2.2.10 Revised

RATIONALE: See rationale for 9.6.1.2.1. [TN 08-802]

Requirement 8.11.3.1.2(cc) Revised

RATIONALE: Revised references to reflect proposed changes in Section 8.6.

Requirement 8.11.5.12 Added

RATIONALE: To include outside emergency elevators in the applicable sections of Part 8. [TN 10-923]

Requirement 8.11.5.14 Added

RATIONALE: To provide periodic testing requirements. [TN 10-2024]

Part 9 Editorially revised

RATIONALE: To update references. [May 2012 meeting]

Section 9.1 Added ASME A17.6

RATIONALE: Per TN 07-1970, the above reference has been added to Section 9.1. The Editorial Committee noted that the applicability to Canada was left out and should be added since A17.1 is applicable to both the U.S. and Canada and via reference to A17.6, A17.6 should be applicable in both countries. [TN 10-590]

Section 9.1 Added ANSI/BHMA A156-19-2007

RATIONALE: Update of referenced documents and procurement information, based upon revisions made to Nonmandatory Appendix E. [TN 11-1502]

Section 9.1 Added ANSI/AF&PA NDS-205

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Section 9.1 Added ANSI/AISC 360-05

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Section 9.1 Added ANSI/ISO/IEC 17024

RATIONALE: None given. [TN 12-1341]

Section 9.1 Added ANSI Z535.4

RATIONALE: Ad Hoc Committee on Signage advised that inclusion of this reference is applicable. [TN 08-902]

Section 9.1 Added CSA 086-01

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Section 9.1 Added ISO 22200:2009

RATIONALE: To add the required reference document information to Section 9.1. [TN 10-151]

Section 9.1 Revised NBCC

RATIONALE: See introductory rationale for Section 8.4. [TN 06-1007]

Nonmandatory Figure B-1 Revised

RATIONALE: Updated to agree with requirements in 2.14.5.7. [TN 02-3046]

Nonmandatory Clause E-1 Revised

RATIONALE: To clarify that only automatic passenger elevators are permitted. [TN 11-1502]

Nonmandatory Figure E-1 Deleted

RATIONALE: Figure E-1 is deleted as it is out of date and the requirements are contained in the text of Clause E-9. No equivalent figure is included in A117.1-2009. [TN 11-1502]

Nonmandatory Table E-1 Revised

RATIONALE: LULA application car and door dimensions are addressed in the text of Clause E-19. [TN 11-1502]

Nonmandatory Clause E-2 Added definition of "destination-oriented elevator system"

RATIONALE: Editorial clarification to harmonize with A117.1. [TN 11-1502]

Nonmandatory Clause E-2 Added definition of "elevator car call sequential step scanning"

RATIONALE: To define an alternate means of inputting a car call. [TN 11-1502]

Nonmandatory Clause E-2 Added definition of "variable message signs (VMS)"

RATIONALE: To provide a definition for new clauses on VMS. [TN 11-1502]

Nonmandatory Clause E-2 Added definition of "variable message sign (VMS) characters"

RATIONALE: To provide a definition for new clauses on VMS characters. [TN 11-1502]

Nonmandatory Clause E-3 Revised

RATIONALE: Editorial clarification to harmonize with A117.1. The requirement for automatic operation is now in Clause E-1. [TN 11-1502]

Nonmandatory Clause E-6.1 Revised

RATIONALE: Editorial clarification, and to require the door to automatically stop and reopen. [TN 11-1502]

Nonmandatory Clause E-7.1 Revised

RATIONALE: To provide a minimum door-open time for hall calls based on the configuration and size of the building. Reduction of the time is not permitted by using the door-close button, in order to maintain the minimum accessible time. Harmonization with A117.1. [TN 11-1502]

Nonmandatory Clause E-7.2 Added

RATIONALE: To clarify the application of door timing requirements for elevators with in-car lanterns. [TN 11-1502]

Nonmandatory Clause E-7.3 Added

RATIONALE: Editorial restructuring and renumbering. [TN 11-1502]

Nonmandatory Clause E-8.1 Revised

RATIONALE: To recognize nonrectangular accessible car sizes. [TN 11-1502]

Nonmandatory Clause E-8.2 Added

RATIONALE: To recognize nonrectangular accessible car sizes. [TN 11-1502]

Nonmandatory Clause E-9 Revised

RATIONALE: Figure E-1 is deleted as it is out of date and the requirements are contained in the text of Clause E-9. No equivalent figure is included in A117.1-2009. [TN 11-1502]

Nonmandatory Clause E-9.2 Deleted

RATIONALE: This is covered by the requirements of Clause E-8. [TN 11-1502]

Nonmandatory Clause E-9.2 Revised; formerly numbered E-9.3

RATIONALE: To ensure that floor buttons are at an accessible height for persons with disabilities. The allowance for a sequential step-scanning device provides an

alternative where higher buttons are necessary due to design constraints. [TN 11-1502]

Nonmandatory Clause E-9.3 Revised; formerly numbered E-9.4

RATIONALE: To renumber Clause E-9.4 as E-9.3 since Clause E-9.2 was deleted. Subclauses were also renumbered. [TN 11-1502]

Nonmandatory Clause E-9.3.1 Revised; formerly numbered E-9.4.1

RATIONALE: To renumber Clause E-9.4 as E-9.3 since Clause E-9.2 was deleted. Subclauses were also renumbered. [TN 11-1502]

Nonmandatory Clause E-9.3.2 Revised; formerly numbered E-9.4.2

RATIONALE: Harmonization with A117.1 and standardization of floor designations for all languages. [TN 11-1502]

Nonmandatory Clause E-9.3.2.1 Added

RATIONALE: To not require renumbering of floors in existing buildings. [TN 11-1502]

Nonmandatory Clauses E-9.3.3 and 9.3.3.1 Revised; formerly numbered E-9.4.3 and E-9.4.3.1, respectively

RATIONALE: Editorial clarification and renumbering. Note that raised characters are also visual characters. "Tactile" is being changed to "raised" or "raised characters" for clarification and harmonization with A117.1. (Braille is also tactile.) [TN 11-1502]

Nonmandatory Clause E-9.3.3.2 Revised; formerly numbered E-9.4.3.2

RATIONALE: Editorial clarification and to indicate how to specify negative numbers in Braille. [TN 11-1502]

Nonmandatory Clause E-9.3.4 Editorially revised; formerly numbered E-9.4.4

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-9.3.5 Editorially revised; formerly numbered E-9.4.5

RATIONALE: None given. Renumbering. [TN 11-1502]

Nonmandatory Clause E-9.3.6 Revised; formerly numbered E-9.4.6

RATIONALE: To provide access to floor selection to those who cannot reach buttons over 1 220 mm (48 in.) in height above the floor. [TN 11-1502]

Nonmandatory Clause E-9.4 Editorially revised; formerly E-9.5

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-10.2 Editorially revised

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-10.2.1 Added

RATIONALE: To facilitate passenger transfer at the desired floor. [TN 11-1502]

Nonmandatory Clauses E-10.3 and E-10.3.1 Revised

RATIONALE: To specify the frequency of the verbal annunciator and clarify when the annunciator sounds. [TN 11-1502]

Nonmandatory Clause E-10.3.2 Added

RATIONALE: Editorial clarification to specify when the audible signal is provided and that it is not a permitted option for destination-oriented elevators. [TN 11-1502]

Nonmandatory Clauses E-11 and E-11.1 Revised

RATIONALE: Editorial clarification and to specify a minimum height for the operable parts. To recognize the operable parts are not located in a compartment. [TN 11-1502]

Nonmandatory Clause E-11.2 Deleted

RATIONALE: Telephone handsets are no longer permitted by ASME A17.1/CSA B44, 2.27.1. [TN 11-1502]

Nonmandatory Clause E-11.2 Revised; formerly E-11.3

RATIONALE: To clarify that the operating instructions required in 2.27.1 are provided in both tactile and visual forms. [TN 11-1502]

Nonmandatory Clause E-12 Editorially revised

RATIONALE: Editorial clarification to harmonize with CSA B651 and A117.1. [TN 11-1502]

Nonmandatory Clause E-14 Revised

RATIONALE: Illumination of the car threshold, etc., is addressed in B44 section 2.14.7.1.2. [TN 11-1502]

Nonmandatory Clause E-15.1 Revised

RATIONALE: To add keypad buttons to address destination-oriented elevator systems. To editorially move imperial dimensions. [TN 11-1502]

Nonmandatory Clause E-15.2 Revised

RATIONALE: To add keypad buttons to address destination-oriented elevator systems. Editorially move

imperial dimensions. To correct error by deleting incorrect "±" sign and adding the word "by." To clarify that both dimensions are minimums. [TN 11-1502]

Nonmandatory Clause E-15.4 Revised

RATIONALE: To allow for nonmechanical buttons that still provide accessible feedback when a call is registered. [TN 11-1502]

Nonmandatory Clause E-15.6 Added

RATIONALE: To recognize the use of keypads in the hall. [TN 11-1502]

Nonmandatory Clause E-16.2 Revised

RATIONALE: The new range specified for verbal annunciators is appropriate whereas the 1 500 Hz does not work for a vocal range. [TN 11-1502]

Nonmandatory Clause E-16.3.2 Revised

RATIONALE: To clarify that it is the vertical dimension that is being specified and to be consistent with Clause E-10.2 and A117.1-2009. [TN 11-1502]

Nonmandatory Clause E-17 Revised

RATIONALE: To clarify that audible signals include voice announcements. To provide a raised/tactile indicator for the function button. [TN 11-1502]

Nonmandatory Clause E-18.2 Revised

RATIONALE: To clarify that audible signals include voice announcements. To provide a raised/tactile indicator for the function button. [TN 11-1502]

Nonmandatory Clause E-18.3.1 Editorially revised

RATIONALE: Editorial clarification to ensure that visible and audible signals are consistent with call button operation. [TN 11-1502]

Nonmandatory Clause E-18.4 Revised

RATIONALE: To clarify that alarms are no longer required. Car sizes are covered by Clause E-8. [TN 11-1502]

Nonmandatory Clause E-18.5.2 Revised

RATIONALE: To harmonize with A117.1. To clarify that destination-oriented elevators are not required to have traditional position indicators where the necessary destination displays are provided. [TN 11-1502]

Nonmandatory Clause E-18.5.3 Revised

RATIONALE: To specify the frequency of the verbal annunciator and clarify when the annunciator sounds. [TN 11-1502]

Nonmandatory Clause E-18.6 Editorially revised

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-18.7 Added

RATIONALE: Timing formula is not needed because the system indicates a specific car immediately after entering a hall call, allowing a passenger to go to the hoistway door before the car arrives. [TN 11-1502]

Nonmandatory Clause E-19 Editorially revised

RATIONALE: Editorial clarification due to the addition of new LU/LA-specific requirements. [TN 11-1502]

Nonmandatory Clause E-19.1 Added

RATIONALE: To permit swinging hoistway doors on LU/LAs. [TN 11-1502]

Nonmandatory Clause E-19.1.1 Added

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-19.1.2 Added

RATIONALE: To permit automatic swinging hoistway doors and ensure that they will not open into and hit a passenger. [TN 11-1502]

Nonmandatory Clause E-19.1.2.1 Added

RATIONALE: To provide technical safety standard for power-operated door. [TN 11-1502]

Nonmandatory Clause E-19.1.2.2 Added

RATIONALE: To provide the same level of safety as for an elevator door with a reopening device. [TN 11-1502]

Nonmandatory Clause E-19.1.3 Added

RATIONALE: To permit various configurations for LU/LAs. [TN 11-1502]

Nonmandatory Clause E-19.1.3.1 Added

RATIONALE: To permit an 815 mm door on specific LU/LA cars. [TN 11-1502]

Nonmandatory Clause E-19.1.3.2 Added

RATIONALE: To permit LU/LAs with doors on adjacent sides. [TN 11-1502]

Nonmandatory Clause E-19.2 Added

RATIONALE: Editorial clarification. [TN 11-1502]

Nonmandatory Clause E-19.2.1 Added

RATIONALE: To require LU/LAs to have adequate cab size for accessibility. [TN 11-1502]

Nonmandatory Clause E-19.3 Added

RATIONALE: To ensure that the controls are in an accessible location. [TN 11-1502]

Nonmandatory Clause E-20 Revised in its entirety

RATIONALE: Editorial clarification.

E-20.2.12: Editorial clarification due to the addition of VMS requirements.

E-20.7: Variable message signs may be used in Occupant Evacuation Elevator applications and should be accessible. [TN 11-1502]

Nonmandatory Figure E-20 Added

RATIONALE: None given. [TN 11-1502]

Nonmandatory Table E-20.4 Revised; formerly Table E-20.5

RATIONALE: None given. [TN 11-1502]

Nonmandatory Figure E-20.7.2.1 Renumbered as Figure 20.6.3

RATIONALE: None given. [TN 11-1502]

Nonmandatory Figures E-20.7.2.2, E-20.7.2.3, and E-20.7.2.4 Deleted

RATIONALE: These figures are no longer referenced in Nonmandatory Appendix E since "hands-free" communication systems are required. [TN 11-1502]

Nonmandatory Table F-1 Revised

RATIONALE: See rationale for 2.25.4.1.1. [TN 09-118]

Nonmandatory Table R-1 Revised

RATIONALE: References required changing due to relocation and renumbering of requirements for hoistway access operation. Also, in Table R-1, the title was changed to complete the description. [TN 09-1907]

Nonmandatory Appendix V Added

RATIONALE: See general rationale/background for 2.27.11. [TN 09-2041]

Nonmandatory Appendix W Added

RATIONALE: See rationale for referenced requirements. [TN 10-2024]

Nonmandatory Appendix X Added

RATIONALE: The requirements for acceptance tests are buried with other requirements in 8.10 and difficult to identify. Also, some installers are using periodic test tags for acceptance test. Both of these results in failure to conduct some of the acceptance tests that are necessary to verify proper installation for safe operation.

Editorially updated testing requirement to match current edition. [TN 10-962]

Nonmandatory Appendix Y Added

RATIONALE: See revisions to 8.6, MCP. [TN 08-1348]

ASME A17.1-2010/CSA B44-10 ERRATA

The following errata for the 2010 edition of the ASME A17.1/CSA B44 Code have been posted on the ASME Web site under the ASME A17 Committee Page and were current at the time the Handbook was being prepared. The ASME A17 Committee Page can be found at http://asme.cstools.org/.

Requirement 2.12.7.3.8 Errata correction

2.12.7.3.8 Control circuits related to, or operated by, the hoistway access switches shall comply with 2.26.9.3.1(c), (d), and (e), 2.26.9.3.2, and 2.26.9.4.

Requirement 2.20.3 Errata correction

N = number of runs of suspension members under load. For 2:1 arrangements, N shall be two times the number of suspension members used, etc.

Requirement 2.26.1.4.2(g) Errata correction

(g) When on top-of-car inspection operation, a separate additional device shall be permitted to render ineffective the top final terminal stopping device, and the buffer switch for gas spring-return counterweight oil buffers, in conformance with the requirements of 2.26.4.3, 2.26.9.3.1(a), 2.26.9.3.2, and 2.26.9.4, and it shall allow the car to be moved to a position in conformance with the requirements of 2.7.4.5 and 2.7.5.1.3(c).

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SAFETY CODE FOR ELEVATORS AND ESCALATORS

Part 1
General

SECTION 1.1
SCOPE

The ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*, and ASME A17.7/CSA B44.7, *Performance-Based Safety Code for Elevators and Escalators*, are the accepted guides for design, construction, installation, operation, inspection, testing, maintenance, alteration, and repair of elevators, dumbwaiters, escalators, moving walks, and material lifts. They are the basis in total or in part for elevator codes used throughout the United States and Canada.

The ASME A17.1/CSA B44 and ASME A17.7/CSA B44.7 Codes are only guides unless adopted as law or regulation by an authority having jurisdiction.

Local jurisdictions may, in their adopting legislation, occasionally revise and/or include requirements in addition to those found in the ASME A17.1/CSA B44 and ASME A17.7/CSA B44.7 Codes. It is therefore advisable to check with the local jurisdiction before applying Code requirements in any area.

Requirement 1.1.1(c) was revised in ASME A17.1-2013/CSA B44-13 to clarify that devices with hoisting and lowering mechanisms equipped with a car serving two or more landings and restricted to the carrying of materials but not classified as a dumbwaiter or material lift are not covered by the Code.

Requirement 1.1.2 outlines examples of equipment not covered by the ASME A17.1/CSA B44 and ASME A17.7/CSA B44.7 Codes. Requirement 1.1.3 specifies those Parts and requirements of the Code that apply only to new installations, as well as those that apply to both new and existing installations.

1.1.4 Effective Date

In ASME A17.1-2013/CSA B44-13, the effective date for ASME QEI-1 inspector certification is immediate, as ASME has discontinued accrediting organizations that certify elevator inspectors and elevator inspector supervisors. The American National Standards Institute (ANSI) is now offering to accredit organizations that are certifying elevator inspectors and elevator inspector supervisors. At the time this edition of the Handbook was being written, one QEI certifying organization had been awarded ANSI accreditation.

SECTION 1.2
PURPOSE AND EXCEPTIONS

The ASME A17.1/CSA B44 Code requirements provide a framework for standards of safety for current products whose technologies have become state-of-the-art and commonplace. The ASME A17 and CSA B44 Committees have demonstrated in the past their responsiveness to prepare new requirements throughout their long history, to address new designs and technologies.

However, elevator technology is advancing at a rapid pace. The advent and wide use of the Essential Safety Requirements (ESRs) of the Lift Directive in the European Union (EU) has accelerated the pace of change. As safe elevators based on new technology become available, worldwide demand for these products increases. Elevator codes based on prescriptive language take time to change, given the nature of the consensus process upon which they are based. This hampers introduction of new technology into jurisdictions without a uniform, structured process acceptable to Authorities Having Jurisdiction (AHJ).

ASME A17.1-2004 and CSA B44-04 recognized the need for a method to introduce new technology. The preface to those Codes stated the following:

> **"Application of Requirements to New Technology**
>
> "Where present requirements are not applicable or do not describe new technology, the authority having jurisdiction should recognize the need for exercising latitude and granting exceptions where the product or system is equivalent in quality, strength or stability, fire resistance, effectiveness, durability, and safety to that intended by the present Code requirements."