MEMORANDUM

TO: Principal and Alternate Members of the Technical Committee on
NFPA 130 Fixed Guideway Transit & Passenger Rail Systems
(FKT-AAA)

FROM: Sandra Stanek, NFPA Staff Liaison

DATE: December 15, 2011

SUBJECT: AGENDA – NFPA 130 ROP Meeting (Annual 2013 revision
cycle) for the 2014 edition

Enclosed is the agenda for the Report on Proposals (ROP) meeting for NFPA
130, Fixed Guideway Transit & Passenger Rail Systems Standard which will be
held at 1 PM (MST) on Sunday, January 22nd through Wednesday, January
25th, 2012 in Tempe, AZ.

Please review the meeting notice, sent to your email address of record, for
pertinent information concerning hotels, etc. Notify me immediately if you have
any issues downloading the proposals from the committee website, etc. As your
new staff liaison, I welcome any questions you may have & look forward to
working with all of you.

Office: (617) 984-7498
Cell: (339) 368-1186
Email: sstanek@nfpa.org

For administrative questions, please contact Alma Woodberry at (617) 984-7949.
Technical Committee on NFPA 130 Fixed Guideway Transit & Passenger Rail Systems (FKT-AAA)

Report on Proposals Meeting (A2013) Agenda
January 22-25, 2012

Embassy Suites Phoenix- Tempe
4400 S. Rural Road
Tempe, AZ
1:00 P.M. to 5:00 P.M. MST on Jan 22nd
8:00 A.M. -5:00 P.M. on January 23rd - January 25th

Sunday, January 22, 2012
Meeting room is available from 8:00 AM -12:00 noon
Task Groups will have the ability to meet within the room for Task Group work prior to the meeting

Sunday, January 22, 2012:

1. Call to Order – 1:00 P.M. MST
2. Introductions & Attendance
3. Review Agenda
4. NFPA Staff Liaison presentation & review of key dates within current cycle.
5. Chairman Comments
6. Approval of Previous Meeting Minutes (see Attachment 1)
7. Act on Public Proposals for NFPA 130 (see Attachment #2)
8. Adjourn Meeting @ 5:00 P.M. MST
Technical Committee on NFPA 130 Fixed Guideway Transit & Passenger Rail Systems (FKT-AAA)

Monday, January 23, 2012:
8:00 A.M. -5:00 P.M.

1. Call to Order – 8:00 A.M. MST
2. Act on Public Proposals for NFPA 130 (see Attachment #2)
3. Adjourn Meeting @ 5:00 P.M. MST

Tuesday, January 24, 2012:
8:00 A.M. -5:00 P.M.

1. Call to Order – 8:00 A.M. MST
2. Act on Public Proposals for NFPA 130 (see Attachment #2)
3. Generate Committee Proposals for NFPA 130
4. Adjourn Meeting @ 5:00 P.M. MST

Wednesday, January 25, 2012:
8:00 A.M. -5:00 P.M.

1. Call to Order – 8:00 A.M. MST
2. Act on Public Proposals for NFPA 130 (see Attachment #2)
3. Generate Committee Proposals for NFPA 130
4. Old Business
5. New Business
6. Future ROC Meeting discussion
7. Adjourn Meeting @ 5:00 P.M. MST
Technical Committee on NFPA 130 Fixed Guideway Transit & Passenger Rail Systems (FKT-AAA)

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting.

Please notify the chair and staff liaison as soon as possible if you plan to introduce any committee proposals at the meeting.

Key Dates for the Annual 2013 Revision Cycle
(NFPA 130 2014 edition)

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Closing Date</td>
<td>November 25, 2011</td>
</tr>
<tr>
<td><strong>Final Date for ROP Meeting</strong></td>
<td>February 24, 2012</td>
</tr>
<tr>
<td>Final Date for Mailing TC Ballots</td>
<td>March 16, 2012</td>
</tr>
<tr>
<td><strong>Ballots Returned By</strong></td>
<td>April 20, 2012</td>
</tr>
<tr>
<td>ROP Published &amp; Posted</td>
<td>June 22, 2012</td>
</tr>
<tr>
<td>Comment Closing Date</td>
<td>August 31, 2012</td>
</tr>
<tr>
<td><strong>Final Date for ROC Meeting</strong></td>
<td>November 2, 2012</td>
</tr>
<tr>
<td>Final date for mailing TC ballots</td>
<td>November 16, 2012</td>
</tr>
<tr>
<td><strong>Ballots Returned By</strong></td>
<td>November 30, 2012</td>
</tr>
<tr>
<td>ROC Published &amp; Posted</td>
<td>February 22, 2013</td>
</tr>
<tr>
<td>Closing Date for Notice of Intent to Make a Motion (NITMAM)</td>
<td>April 5, 2013</td>
</tr>
<tr>
<td><strong>Issuance of Consent Document (No NITMAMs)</strong></td>
<td>May 28, 2013</td>
</tr>
<tr>
<td>NFPA Annual Meeting</td>
<td>June 2013</td>
</tr>
<tr>
<td><strong>Issuance of Document with NITMAM</strong></td>
<td>August 1, 2013</td>
</tr>
</tbody>
</table>

Technical Committee deadlines are in **bold**.
Meeting Preparation

Committee members are strongly encouraged to review the published proposals prior to the meeting and to be prepared to act on each item.

Handout materials should be submitted to the chair at least seven days prior to the meeting.

Only one posting of the proposals will be made; it will be arranged in section/order and will be pre-numbered. This will be posted to the NFPA Document information pages located at www.nfpa.org/130. If you have trouble accessing the website please contact Alma Woodberry at awoodberry@nfpa.org.

Materials to have at meeting:
- Last edition of the standard
- Meeting agenda
- Public proposals & associated attachments

Regulations and Guiding Documents

All committee members are expected to behave in accordance with the Guide for the Conduct of Participants in the NFPA Standards Directory (on-line).

All actions during and following the committee meetings will be governed in accordance with the NFPA Regulations Governing Committee Projects. Failure to comply with these regulations could result in challenges to the standards-making process. A successful challenge on procedural grounds could prevent or delay publication of the document.

The style of the document must comply with the Manual of Style for NFPA Technical Committee Documents.
General Procedures for Meetings

- Use of tape recorders or other means capable of producing verbatim transcriptions of any NFPA Committee Meeting is not permitted.

- Attendance at all NFPA Committee Meetings is open. All guests must sign in and identify their affiliation.

- Participation in NFPA Committee Meetings is generally limited to committee members and NFPA staff. Participation by guests is limited to individuals, who have received prior approval from the chair to address the committee on a particular item, or who wish to speak regarding public proposals or comments that they submitted.

- The chairman reserves the right to limit the amount of time available for any presentation.

- No interviews will be allowed in the meeting room at any time, including breaks.

- All attendees are reminded that formal votes of committee members will be secured by letter ballot. Voting at this meeting is used to establish a sense of agreement, but only the results of the formal letter ballot will determine the official action of the committee.

- Note to Special Experts: Particular attention is called to Section 3.3(e) of the NFPA Guide for the Conduct of Participants in the NFPA Codes and Standards Development Process in the NFPA Directory. This section requires committee members to declare any interest they may represent, other than their official designation as shown on the committee roster. This typically occurs when a special expert is retained by and represents another interest category on a particular subject. If such a situation exists on a specific issue or issues, the committee member shall declare those interests to the committee and refrain from voting on any action relating to those issues.

- Smoking is not permitted at NFPA Committee Meetings.
Attachment #1:

Previous Meeting Minutes
NFPA 130 Technical Committee (TC) Meeting Minutes
Fixed Guideway and Passenger Rail Transit Systems
ROC MEETING
October 19-22, 2008 - Atlanta Hilton - Atlanta, GA
&
CONFERENCE CALL ON OCTOBER 27, 2008
*DRAFT*

MEETING AGENDA
(Agenda to be adjusted as required)

Sunday October 19, 2008
• Administrative Meeting of TG Chairs, Committee Chair, Secretary, and Liaison – 11:30 AM
• Call to Order – 1:00 PM
• Introductions
• Chairman Comments
• NFPA Schedule and procedural review (Jason Gamache, NFPA)
• Comments on potential NITMAM’s (Bill Kennedy)
• Approval of last meeting minutes (Harold Levitt)
• Discussion and sense-of-the-committee vote on Committee Scope
• Task Group 12 TIA – Table 8.4.1 Issue (Steve Roman)
• Task Group 11 TIA – Wooden ties below overbuilds (Harold Levitt)
• Task Group 9 – Re-Organization of Chapter 6 (Sal Gilardi)
• Task Group 9 – TIA’s (Sal Gilardi)
• Adjourn by 5:30 PM

Monday October 20, 2008
• Call to Order – 8:30 AM
• John Quintanar Presentation
• Wire and Cable Comments, Toxicity Issue – Stanley Kaufman (Guest)
• Review of public and committee comments (morning session)
• Lunch – 12:00 PM – 1:00 PM
• Review of public and committee comments (afternoon session)
• Adjourn by 5:00 PM

Tuesday October 21, 2008
• Call to Order – 8:00 AM
• Review of public and committee comments (morning session)
• Lunch – 12:00 PM – 1:00 PM
• Casey Grant presentation on train fire heat release rates and fire smoke release rates (Tentative)
• Review of public and committee comments (afternoon session)
• Adjourn by 5:00 PM

Wednesday October 22, 2008
• Call to Order – 8:30 AM
• Review of public and committee comments (morning session)
• Lunch – 12:00 PM – 1:00 PM
• Review of public and committee comments (afternoon session)
• Adjourn by 4:30 PM

October 19, 2008

MEETING CALLED TO ORDER
Chairman Kennedy called the meeting to order at 1:00 PM and outlined the intent of the meeting, which was that: All ROC Comments, of which there are 109 entered by the closing date of August 29.
2008. HAVE TO BE ACTED UPON AT THIS SESSION and that, “NO NEW MATERIAL COULD BE INTRODUCED AT THE ROC”, but could be held over for the next edition.

Chairman Kennedy stated that he would follow the format outlined in the provided agenda as they appear in the standard, by Chapter and Paragraph. It is also anticipated that a potential of 3 Tentative Interim Amendment’s (TIA’s) will be taken care of at this meeting as well as a potential revision to the committee’s scope/mission.

List of Potential TIA’s:
1 - Modify Table 8.4.1;
2 - Reorganize Chapter 6, and
3 - Overbuild situation with combustible vs. non-combustible ties.

For the Proposed Committee Scope/Mission Change, the Technical Committee does not have the authority to approve a scope/mission change; it does however, have the right to accept a motion to modify it by consensus; the change must be presented to the Standards Council for approval. The Standards Council is the only body authorized to change the scope of any committee. As a result of the accepted consensus for the change, the Committee Secretary was directed to prepare a Committee Memorandum requesting its approval.

CHAIRMAN KENNEDY ALSO STRONGLY STATED, “THAT ANYONE FILING A NITMAM, SHOULD THAT INDIVIDUAL NOT APPEAR BEFORE THE STANDARDS COUNCIL WHEN THE NITMAM IS DISCUSSED, THAT, THAT INDIVIDUAL WILL FACE SANCTIONS FROM THE NFPA”.

APPROVAL OF JANUARY 27-30, 2008/FEBRUARY 21, 2008 MINUTES OF MEETING

The Chairman requested a motion to approve the Minutes of Meeting from the January 27-30, 2008 meeting in Phoenix, AZ/February 21, 2008 supplemental web conference meeting held at NFPA’s HQ’s in Quincy, Mass. The committee secretary was informed of one omission; Robert Montfort was inadvertently left off as a new alternate member (Alternate to MTA Metro-North) of the committee. Corrections to the meeting minutes will be made and a motion to approve as modified was made, the motion carried.

NFPA STAFF LIAISON REPORT

Jason Gamache reviewed the NFPA 130 revision cycle (See table 1 below) and reiterated “Robert’s Rules of Order” would be followed. Thus, all guests present and committee members would be permitted to speak only at the discretion of the Chairman for a length of time deemed reasonable by him. Jason also stated that all ROC comments MUST BE acted upon at this session and that NO NEW MATERIAL CAN BE INTRODUCED. He also notified us that, if the committee was not able to finish disposing of all ROC comments by the end of this session (Wed. October 22, 2008) then a follow-up session would have to be arranged and held prior to October 31, 2008, the mandatory closing date in order not to slip the schedule and move into the next cycle. Jason went on to explain the balloting process; he explained that the ROC meeting is a consensus meeting and that formal voting would be through official balloting; the official ballots will be mailed to all committee members, (including alternates) approximately one (1) month after this meeting concludes.

<table>
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<tr>
<th>PROCESS STEPS – A2009 CYCLE – ACTIVITIES</th>
<th>DATES</th>
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<tr>
<td>Final Date for TC ROP meeting</td>
<td>02/22/2008</td>
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<tr>
<td>ROP Published and Posted</td>
<td>06/20/2008</td>
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<td>Comment Closing</td>
<td>08/29/2008</td>
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<td>Final Date for ROC meeting</td>
<td>10/31/2008</td>
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<td>New US President takes office</td>
<td>01/20/2009</td>
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<td>ROC Published and Posted</td>
<td>02/20/2009</td>
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<td>NITMAN Closing Date</td>
<td>04/03/2009</td>
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<td>NFPA Association Meeting for Document</td>
<td>06/07-10/2009</td>
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<tr>
<td>Issue Document</td>
<td>09/2009</td>
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Strikeout denotes a completed activity
There are six comment dispositions used during the process and a summary of their status as of the end of the ROC meeting:

### ROC COMMENT DISPOSITION ABBREVIATIONS AND STATUS’S – TABLE 2

<table>
<thead>
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<th>Abbreviations</th>
<th>Definition</th>
<th>Number ROC Comments</th>
<th>Committee Comments</th>
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<td>A</td>
<td>Accept</td>
<td>15</td>
<td>6</td>
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<td>APR</td>
<td>Accept In Principle</td>
<td>41</td>
<td>-</td>
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<tr>
<td>APA</td>
<td>Accept In Part</td>
<td>2</td>
<td>-</td>
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<td>APP</td>
<td>Accept In Principle In Part</td>
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<tr>
<td>R</td>
<td>Reject</td>
<td>43</td>
<td>1</td>
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<tr>
<td>H</td>
<td>Hold</td>
<td>5</td>
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### Present Committee Composition - Voting Members - TABLE 3

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<th>COMMITTEE COMPOSITION</th>
<th>NO. OF VOTING MEMBERS</th>
<th>% OF MEMBERS</th>
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<tr>
<td>(E) Enforcer</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td>(I) Insurance</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>(M) Manufacturer</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>(RT) Research/Testing</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>(SE) Special Expert</td>
<td>11</td>
<td>37%</td>
</tr>
<tr>
<td>(U) User</td>
<td>10</td>
<td>33%</td>
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<tr>
<td>TOTAL</td>
<td>30</td>
<td>100%</td>
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### Meeting Attendance - TABLE 4

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<tr>
<th>NFPA STAFF</th>
<th>PRINCIPAL</th>
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<tbody>
<tr>
<td>Jason Gamache</td>
<td>NFPA Staff Liaison</td>
<td></td>
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<tr>
<td>William D. Kennedy, Tech. Committee Chair</td>
<td>Parsons Brinckerhoff</td>
<td></td>
<td>P</td>
</tr>
<tr>
<td>Harold Levitt, Tech. Committee Secretary</td>
<td>Port Authority of NY &amp; NJ</td>
<td></td>
<td>P</td>
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<tr>
<td>David M. Casselman</td>
<td>Lea &amp; Elliott</td>
<td></td>
<td>P</td>
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<tr>
<td>Mark Chan</td>
<td>Bay Area Rapid Transit</td>
<td></td>
<td>NP</td>
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<tr>
<td>James Chatham</td>
<td>Bombardier Transportation</td>
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<td>John Devlin</td>
<td>Schirmer Engineering</td>
<td></td>
<td>NP</td>
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<tr>
<td>John Gentzel</td>
<td>Maryland State Fire Marshal’s Office</td>
<td></td>
<td>NP</td>
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<tr>
<td>Salvatore Gilardi</td>
<td>Parsons Transportation Group</td>
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<td>Sean Hunt</td>
<td>Hughes Associates</td>
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<td>Joseph Krempasky</td>
<td>WMATA</td>
<td></td>
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<tr>
<td>Kwok Weng Leong</td>
<td>Land Transport Authority – Singapore</td>
<td></td>
<td>NP</td>
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<tr>
<td>Harold A. Locke</td>
<td>Locke &amp; Locke, Inc</td>
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<tr>
<td>Donald MacLennan</td>
<td>MTA-Metro-North</td>
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<td>NP</td>
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<tr>
<td>James K. Mann</td>
<td>Amtrak</td>
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<tr>
<td>David Mao</td>
<td>USDOT-Federal Railroad Administration</td>
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<tr>
<td>Stephanie Markos</td>
<td>USDOT-Volpe Center</td>
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<tr>
<td>Daniel M. McKinney</td>
<td>Earth Tech</td>
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<tr>
<td>John Nelson</td>
<td>Seattle FD</td>
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<td>NP</td>
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<td>Bruce Nelson</td>
<td>Chicago Transit Authority</td>
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<tr>
<td>Name</td>
<td>Organization</td>
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<tr>
<td>Richard Peacock</td>
<td>NIST</td>
<td>NP</td>
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<td>Thomas Peacock</td>
<td>American Public Transit Association</td>
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<tr>
<td>John Quintanar</td>
<td>Los Angeles City Fire Department</td>
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<tr>
<td>James Quitter</td>
<td>Arup</td>
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<tr>
<td>Susan Reed Tanaka</td>
<td>Toronto Transit Commission</td>
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<tr>
<td>Steven Roman</td>
<td>LTK</td>
<td>P</td>
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<tr>
<td>Richard Schiehl</td>
<td>R.B. Schiehl &amp; Associates</td>
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<tr>
<td>Lee Sorensen</td>
<td>MTA-LIRR</td>
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<td>Christian Thibault</td>
<td>Montreal Transit Corporation (STM)</td>
<td>NP</td>
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<td>Robert C. Till</td>
<td>John Jay College of Criminal Justice</td>
<td>P</td>
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<tr>
<td>Joseph B. Zickerman</td>
<td>IFT Fire Cause Analysis</td>
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<tr>
<td>Shane Allen</td>
<td>LA City Fire Department</td>
<td>NP</td>
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<td>Richard Arvin</td>
<td>International Fire Marshals Association</td>
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<tr>
<td>Jason Averill</td>
<td>NIST</td>
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<tr>
<td>John Bumanis</td>
<td>PTG</td>
<td>NP</td>
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<tr>
<td>Michele Champagne</td>
<td>Montreal Transit Corp</td>
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<tr>
<td>Matthew Davy</td>
<td>Schirmer Engineering</td>
<td>NP</td>
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<tr>
<td>Angelo Duggins</td>
<td>Seattle Fire Department</td>
<td>NP</td>
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<tr>
<td>Katherine Fagerlund</td>
<td>Senez Reed Calder Fire Eng</td>
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<td>Michael Ferreira</td>
<td>Hughes Associates, Inc.</td>
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<td>Paul Fok</td>
<td>Land Transport Assoc – Singapore</td>
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<tr>
<td>Martha Gulick</td>
<td>PANYNJ/PATH</td>
<td>NP</td>
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<tr>
<td>Ritch Hollingworth</td>
<td>LTK</td>
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<td>Silas Li</td>
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<td>Thomas Middlebrook</td>
<td>McCormick-Rankin Corp.</td>
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<td>Robert Montfort</td>
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<td>Neil Nott</td>
<td>WMATA</td>
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<td>Craig Quaglini</td>
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<td>Julian Sandu</td>
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<td>Lurae Stuart</td>
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<td>DMJM+Harris/AECOM</td>
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<td>Kevin Lewis</td>
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The following are the committee membership changes since January 27-30, 2008:

- Michele Champagne - Montreal Transit Corp Named Alternate to Christian Thibault (3/4/08)
- Dennis Arvin - Maryland State Fire Marshal’s Office named Alternate to John Gentzel (7/23/08)
- Dilip Shah – Earth Tech named alternate to Daniel M. McKinney (7/23/08)

Committee appointments to be acted upon at the 10/28/08 Standards Council Meeting:

- BART - Mark Dana to be named Alternate to Mark Chan
- Seattle Fire Department (SFD) - Gary English to replace Angelo Duggins as Alternate
- Montreal Transit Corp - Luc Martineau to replace Christian Thibault as Principal.
- McCormick Rankin Company - Tom Middlebrook to change positions from Alternate to Principal with Richard Schiehl

Comments during the ROC session will be handled as follows:

- All 109 comments, 3 potential TIA’s as well as a revised committee scope **MUST** be acted upon by the close of this session and be properly disposed of.

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<th>TASK GROUP NO.</th>
<th>TASK GROUP NAME</th>
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<td>TG – 1</td>
<td>Man of Style – SI Conversion</td>
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<td>TG - 14</td>
<td>Ancillary Area Cable</td>
<td>Robert Montfort</td>
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The Chairperson for Task Group’s 6 and 9 was not present for the meeting, as a result his groups activities were, at the request of the Committee Chairman passed to the Task Group Chair 5, Katherine Fagerlund for presentation to the full committee. Chapter 6 was tabled until Tuesday morning.

The committee commenced the process of disposing of comments as they related to chapters and paragraphs.

**Adjourned at 5:30 PM**

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**October 20, 2008**

Three (3) presentations were given:

1 - **John Quintanar** (LA City Fire Department) gave a presentation on the collision between the Union Pacific Freight train and an LA Metro-Link Passenger Train that occurred on September 12, 2008 at 4:20 PM. The following is a brief synopsis of the findings:
There were:
224 Passengers were on the Metro-Link including Engineer and a Conductor; 3 Employees were on Union Pacific Freight Train; 98 Passengers were Transported to nearby Hospitals, however, there were 25 Fatalities.
A fully established Unified Incident Command hierarchy was established early and worked effectively, it consisted of the following organizations:
NTSB; LAFD; LASD; LAPD; Metro-Link; California Public Utilities Commission (CPUC); FRA and Mutual Aide organizations from surrounding communities responded.
What went well:
Critical Incident De-briefing; Chatsworth High School Opened; Access road for Heavy Equipment made it easy to approach the accident site; Hospital Availability-12 Different local hospitals were able to handle the patient load and the HERT Team Sent to Incident.

At the request of the Committee Chairman, all Wire and Cable (W&C) ROC Comments would be handled at one time due to the concerns of the TC of not being able to effectively dispose of all and because of the amount of critical issues to be covered with each comment. Rather than putting all W&C comments on HOLD until the next edition of the standard, the TC Chair formed a Task Group to come up with reasonable recommendations to dispose of W&C related comments. Later that day all related Wire and Cable comments were disposed of.

2 - Stanley Kaufman – A representative of the Society of Plastics gave a presentation that in essence declared that the TC did not follow appropriate NFPA procedures when it set forth a requirement for low smoke/zero-halogen cable in the standard. Mr. Kaufman stated that the toxicity of halogens should be directed to the NFPA Toxicity Advisory Committee for acceptance before it was included as a requirement in the standard; this issue would be referred to them through our TC NFPA Liaison.

3 - Marcello Hirschler – His presentation to the TC also disputed the content of the ROC/ROP documents and questioned the committee’s use of the various test/material rating guidelines/procedures. He also raised the issue that Halogens provided a sufficient level of fire resistance and that no other material had been found that could effectively replace the element. The deletion of Halogens from the wire and cable sections of the standard is a highly contentious issue.

After all presentations were heard, we then went back into depoing ROC comments until the day’s adjournment that included the TG 13’s recommendation on how to handle W&C comments.

Adjourned at 5:15 PM

October 21, 2008

MEETING CALLED TO ORDER AT 8:00 AM.

Katherine Fagerlund presented her attempt at the Re-Organization of Chapter 6 in the absence of the official TG 6 chair, many thanks to Katherine for her effort.

Just before lunch, after Katherine had completed her presentation, Casey Grant provided the committee with an update of the NFPA's Fire Protection Research Foundations - “Rail Vehicle Design Fire Validation” study. This was an update to the kick-off meeting convened in April 2008 at the Amtrak Office in Philadelphia, Pa. He stated that the Fire Test Program was back on-line as the once unavailable AMTRAK car that was to be used for testing is still available. The Foundation is presently looking for funding from various organizations/properties.

The last presentation was of the ROC session was made by Gary English, Seattle Fire Department on the issue of sprinklers in Seattle’s Rail Tunnels and the importance thereof.

After all presentations were heard, we then went back to disposing of ROC comments until the day’s
MEETING CALLED TO ORDER AT 8:00 AM.

The last day was dedicated to reviewing the following three issues:
- Re-Organization Chapter 6;
- Non-Combustible Rail Tie;
- Fire Heat Release Rate (FHRR).

In total, five (5) Comments were placed on HOLD for the next edition of NFPA 130, they are:
1) ROC 130-Log # 2  (ROP Log#130-61)  Automatic Sprinkler Systems
2) ROC 130-Log#65  (ROP Log#130-61)   Same subject as 1)
3) ROC 130-Log#74  (ROP Log#130-21)  Engineering Analysis vs. fire Hazard Analysis
4) ROC 130-Log#89  (ROP Log#130-67)   Traction Power Requirements

Unanimously, the committee decided that the Re-Organization of Chapter 6 would be placed on HOLD and moved into the next edition of NFPA 130.

The FHRR rate issue was dropped from further consideration by its rejection of ROC Log #74. It would be considered once again for the next edition. It is also hoped that an interim task group could be formed early in the process to get a head start on this critical issue.

The committee also felt that a TIA was not required, because it was not an emergency, to resolve the Non-Combustible Rail Tie Issue and that a letter would be sent to the requester explaining why a TIA nor a FI would not be entertained.

Adjourned at 2:12 PM

CONFERENCE CALL – MONDAY OCTOBER 27, 2008

TELE-CONFERENCE CALLED TO ORDER AT 1:05 AM

Chairman Kennedy stated the purpose of the teleconference was to respond to a request for a TIA that based on his prior to the teleconference session resulted in a CC instead. We were asked to consider accessibility issues with elevators and not conflict with standards and codes already in place; the
ROP/ROC proposals/comments affected are ROP 130-54 contained on ROP Pages 19 & 20 and ROC 130 contained on Page 19. There was a unanimous vote by phone of all voting members present. Thus, a Committee Comment (CC) hereinafter known as CC-7 was generated in response to a memo from Allan Fraser of the NFPA regarding proposal 130-54 of the NFPA 130 A09 ROP.

CC-7 will read as follows: **MTA** - carried

Revise 5.5.6.3.3.4(3) in proposal 130-54 as follows:

(3) In order to limit unwanted water flow into the shaft, entrances to elevators shall be raised 40 mm (1 1/2 in.) above the normal floor level in a manner compatible with requirements for accessibility.

(3)* The design shall limit water flow into the shaft.

Add annex material as follows:

A 5.5.6.3.3.4(3) See B.8.6 of NFPA 101 and ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators* for additional guidance.

Committee Statement:

The Committee believes the requirement should be performance based rather than prescriptive based. The Committee has also revised the language to avoid already in-place accessibility requirement conflicts.

**Conference Call adjourned at 1:45 PM**

Respectfully submitted,

Harold L. Levitt
Technical Committee Secretary
Attachment #2:

Report on Proposals
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Submittor: Technical Committee on Fixed Guideway Transit and Passenger Rail Systems,
Recommendation: Review entire document to: 1) Update any extracted material by preparing separate proposals to do so, and 2) review and update references to other organizations documents, by preparing proposal(s) as required.
Substantiation: To conform to the NFPA Regulations Governing Committee Projects.

Submittor: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Add new text to read as follows:
While the 2003 edition was reformatted in accordance with the 2003 Manual of Style for NFPA Technical Committee Documents, including presenting measurements in SI Units followed in parentheses by the equivalent value in inch-pound units.
Substantiation: Provides historical clarity as to when the Standard switched formally to SI Units.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 001

Submittor: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Add new text to read as follows:
The units of measurement in the standard have been updated in accordance with the Manual of Style for NFPA Technical Committee Documents.
Substantiation: Provides clarity that the measurements are presented in SI Units followed in parentheses by the equivalent value in inch-pound units.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 002
1.1.1  This standard shall cover life safety from fire and fire protection requirements for underground, surface, and elevated fixed guideway transit and passenger rail systems, including but not limited to stations, trainways, emergency ventilation systems, vehicles, emergency procedures, communications, and control systems, and vehicle storage areas.

3.3.52.1 Fixed Guideway Transit System. An electrified transportation system, utilizing a fixed guideway, operating on right-of-way for the mass movement of passengers within a metropolitan area, and consisting of its fixed guideways, transit vehicles, and other rolling stock; power system; buildings; maintenance facilities; stations; transit vehicle yard; and other stationary and movable apparatus, equipment, appurtenances, and structures.

3.3.52.2 Passenger Rail System. A transportation system, utilizing a rail guideway, operating on right-of-way for the movement of passengers within and between metropolitan areas, and consisting of its rail guideways, passenger rail vehicles, and other rolling stock; power systems; buildings; maintenance facilities; stations; passenger rail vehicle yard; and other stationary and movable apparatus, equipment, appurtenances, and structures.

Substantiation: The chapter on vehicle storage and maintenance facilities was previously deleted from the standard, however, the term “vehicle storage areas” was not deleted from section 1.1.1. Sections 3.3.52.1 and 3.3.52.2 also address vehicle yards. For clarification, these references should be deleted.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Amend the headings under “3.3.31 Occupancy” to amalgamate the terms ‘incidental’ and ‘non-system’ as follows:

The use of the station by others who are neither transit system employees nor passengers.

An occupancy not under the control of the system operating authority used by persons who are neither transportation system employees nor passengers.

Revise text in the introductory section and in Clause 1.1.2 to refer to ‘non-system’ occupancies.

Revise Clause 5.1.1.2 as follows:

Where contiguous commercial non-system occupancies share common space with the station, or where the station is integrated into a building which is used for the non-system occupancy of which is neither for fixed guideway transit nor for passenger rail, special considerations beyond this standard shall be necessary.

Revise Clause 5.5.5.5 as follows:

Where an area a non-system occupancy is located within a station is intended for use by other than passengers or employees, the occupant load for that area shall be determined in accordance with the provisions of NFPA 101 as appropriate for the class of occupancy.

Substantiation: The terms ‘incidental’ and ‘non-system’ refer to the similar concepts, but are not used consistently in the document—i.e.,

· The term ‘incidental’, although used in the introductory sections, is not used in defining requirements in the remainder of the document.

· The term ‘non-system’ is used in Chapter 5 to define requirements for fire separation.

· Neither term is used in Clauses 5.1.1.2 and 5.5.5.5, which refer to the same type of occupants.

The proposed revision retains the original concept of the term ‘incidental’, but uses the clearer term ‘non-system’, and brings consistency to the use of that term and concept throughout the document.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
This standard shall also apply as a basis for fixed guideway transit and passenger rail systems where nonelectric and combination electric/other (such as diesel) vehicles are used. Where such vehicles are not passenger-carrying vehicles or are buses or trolley coaches, the standard shall not apply to those vehicles, but shall apply to the fixed guideway transit and passenger rail system in which such vehicles are used.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 101 & 103

**Grammar.**

**NFPA 3: Recommended Practice on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems**

Draws reader of NFPA130 to the NFPA standard for commissioning of fire protection and life safety systems.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 206

Draws reader of NFPA130 to the NFPA standard for fire safety and emergency symbols.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 207

This proposal updates ASTM standards to the most recent editions.
130- Log #14
(2.3.9) Final Action:

Submitter: John F. Bender, Underwriters Laboratories Inc.
Recommendation: Revise text as follows:

2.3.9 UL Publications. Underwriters Laboratories Inc.,
333 Pfingsten Road, Northbrook, IL 60062-2096.
Substantiation: Reason: Update title of ANSI/UL 44 and update referenced standards to most recent revisions.

130- Log #87
(2.3.9) Final Action:

Submitter: John F. Bender, Underwriters Laboratories Inc.
Recommendation: Revise text as follows:

2.3.9 UL Publications. Underwriters Laboratories Inc.,
333 Pfingsten Road, Northbrook, IL 60062-2096.
Substantiation: Update referenced standards to most recent edition.
Air plenum (as related to trainways). A location used for ventilation where electrical appurtenances are mounted.

Plenum. A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system. (NFPA 90A)

Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10.

5.4.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10.

6.3.3.2.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but shall not be installed, exposed, or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10.

7.4.4 Ventilation plenums shall be permitted to serve more than one trainway. Dampers compliant with 7.4.1 through 7.4.3 and that serve each trainway from a common plenum or duct system shall not be required to have a fire rating.

8.9.5.2 Heater-forced air distribution ducts and plenums shall incorporate over temperature sensors, fusible links, airflow devices, or other means to detect over temperature or lack of airflow.

A.5.4.6.1 Cables in the air plenum might be exposed to air at elevated temperature accompanying fire emergency conditions.

A.6.3.3.2.6 The trainway, although used for ventilation, should not be considered as an air plenum for purposes of mounting electrical appurtenances.

A.6.3.3.2.6.1 Cables in the air plenum might be exposed to air at elevated temperature accompanying fire emergency conditions.

A.7.7.7 The trainway, although used for ventilation, should not be considered as an air plenum for purposes of mounting electrical appurtenances.

Substantiation: Within the NFPA set of documents, the word “plenum” or “plenums” is contained in numerous documents, including NFPA 70 (NEC), 90A, 101 and 5000. The meaning of the term is very clear, as shown by the definition: “A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.”, which originates in NFPA 90A as the responsible document and has been adopted by NFPA 101, NFPA 5000, NFPA 70, NFPA 909 and others. Whenever the two words “air” and “plenum” are used together they tend to address part of the phrase “return air plenum” or “supply air plenums” or they are separated by a comma (such as the NEC where the index states “Air plenums see Plenums”).

At the last edition I proposed to add the unique NFPA definition of plenum into NFPA 130 and to eliminate the word “air” in the term “air plenum”. The committee rejected the proposal and comment with contradictory reasoning. On the one hand it stated that “plenum” is already defined in NFPA 101 (which is correct and that is the definition that was proposed; moreover NFPA 130 does not reference NFPA 101 for the term) but it also stated that the meaning within NFPA 130 is unique, but it did not explain what the NFPA 130 meaning is. Committee member John Devlin pointed out this inconsistency in his negative to one of the proposals (130-124).

In NFPA 130 there are nine references to the term “plenum”, which include six cases where the term is “air plenum”. They are all shown in the proposal. They will all be considered in detail.

1. The references to “plenum” in 7.4.4 and 8.9.5.2 appear to correspond to the normal NFPA definition of plenum.

2. The reference to “air plenum” in 5.4.6.1 (which addresses wiring in stations) must also be similar to the normal NFPA meaning of plenum since a station is a normal building where NFPA 101, NFPA 70 and NFPA 90A would apply, with some exceptions as included in NFPA 130. The same is true for the reference to “air plenum” in A.5.4.6.1.

3. The reference to “air plenum” in 6.3.3.2.6.1 and A.6.3.3.2.6.1 (which addresses wiring in trainways) has the potential to be a unique term for train systems. However, the similarity between the requirements contained in 5.4.6.1 and 6.3.3.2.6.1 and in A.5.4.6.1 and A.6.3.3.2.6.1 is striking and suggests that the same is meant in both sets of clauses. However, it may be necessary to define this term “air plenum” for wiring in trainways if the committee believes it is different from the term “plenum” used for wiring in stations.

4. The reference to “air plenum” in A.6.3.3.2.6 and in A.7.7.7 is also potentially unique because it is not logical for anyone to confuse a trainway with a plenum in the normal NFPA meaning of plenum, as a trainway is neither a “compartment” nor a “chamber”, while a “plenum” is. It is probably important to define this term “air plenum”, which
appears to be some unique characteristic of trainways.

In conclusion it would appear that it is important for NFPA 130 to use two terms, "plenum" and "air plenum", and to define both. The term "plenum" would appear to apply to the references in 7.4.4, 8.9.5.2, 5.4.6.1, A.5.4.6.1, 6.3.3.2.6 and A.6.3.3.2.6.1. The term "air plenum" would apply to A.3.3.2.6 and A.7.7.7 and a potential definition is being proposed.

130- Log #1 Final Action:
(3.1.1.14, 6.2.4, and 6.2.4.1)

Note: This proposal appeared as Comment 130-10 (Log #74) which was held from the Annual 2009 ROC on Proposal 130-21.
Submitter: Stephanie H. Markos, US Department of Transportation/Volpe Center
Recommendation: Clarify in a meaningful way what the term "engineering analysis" and "fire hazard analysis" means throughout the standard. i.e., are there common items that should be included? In addition, Section 6.2.4 requires a non-specific "fire hazard analysis," but 6.2.4.2 uses term "Engineering Analysis" in the heading.
Substantiation: Many uses of the term in the standard have different items included in the analysis. For example, section 5.5.6.2.3 has three items to consider, subsection 6.2.4.2.1 (which is currently "out of place") has a lengthy list, and Section 5.12 does not have any items to consider.

130- Log #75 Final Action:
(3.3.x Emergency Communications System and 10.6.1.1 (New) )

Submitter: John Nelsen, Seattle Fire Department
Recommendation: Add new text to read as follows:

3.3.XX Emergency Communications System. A system for the protection of life by indicating the existence of an emergency situation and communicating information necessary to facilitate an appropriate response and action.

10.6.1.1 Where required by the authority having jurisdiction, stations shall be provided with an approved Emergency Communication System in accordance with NFPA 72 - Fire Alarm and Signaling Code, 2.01.0 Edition.

Substantiation: The 2010 edition of NFPA 72 - Fire Alarm and Signaling Code now contains design and intelligibility criteria for utilization of public address type equipment in concert with fire alarm systems for the purpose of making mass notifications. NFPA 130 currently contains no provisions to allow or require emergency communications capability beyond public address systems. A corresponding new definition taken from NFPA 72 is being proposed for NFPA 130 to distinguish the emergency communication system for other forms of communications systems required by the standard. This is not original material; its reference/source is as follows:

NFPA 72 - Fire Alarm and Signaling Code, 2010 Edition
3.3.XX Public Safety Radio Enhancement System, A system installed to assure the effective operation of radio communication systems used by fire, emergency medical services, or law enforcement agencies.

10.3.2 Wherever necessary for reliable communications, a separate network capable of two-way radio communication for fire department personnel to the fire department communication center shall be provided in accordance with NFPA 72 - Fire Alarm and Signaling Code, 2010 Edition.

Substantiation: This proposal is intended to reconcile the terminology between NFPA 72 and NFPA 130 with respect to the requirements for radio communications for public safety agencies. The definition is taken directly from NFPA 72 - National Fire Alarm Code and Signaling Code, 2010 Edition. NFPA 72 contains design and performance criteria for these systems.

This is not original material; its reference/source is as follows:

3.3.6 Carbon Monoxide. Annex B suggests carbon monoxide (CO) concentration criteria as a function of exposure time. CO is a constituent of the fire product gas emitted during a fire. The CO yield rate is defined as the mass (weight) of CO emitted per weight (mass) of the fuel consumed (units: g of CO emitted per kg of fuel burnt or lbs of soot emitted per lb of fuel burnt).

3.3.17 Fire Carbon Monoxide Release Rate. (FCORR) Rate of carbon monoxide release for a given fire scenario expressed as a function of time (units: g/s or lbs/s).

3.3.20 Fire Profile. For a given fire scenario, the fire carbon monoxide, heat release, smoke and soot release rates expressed as a function of time from the initiation of the fire until at least the end of the time of tenability.

3.3.23 Fire Scenario. A set of conditions that defines the development of a fire, the spread of combustion products in a fixed guideway transit or passenger rail system, the reaction of people to the fire and the effects of the products of combustion. [101, 2012 modified.

In Chapter 3, Paragraph 3.3.18, after the words “Fire Growth Rate”, insert (FGR).

In Chapter 3, Paragraph 3.3.20, after the words “Fire Smoke Release Rate”, insert (FMSRR).

In Chapter 3, Paragraph 3.3.26.2, after the word “Fire Heat Release Rate for Ventilation Calculations” insert (FHR). In Chapter 7, Paragraph 7.2.3, delete subparagraphs (1) and (2).

In Chapter 7, Paragraph 7.2.3, renumber (3), (4), (5), (6) and (7) as 7.2.3.1, 7.2.3.2, 7.2.3.3, 7.2.3.4, 7.2.3.5 and 7.2.3.6 respectively.

In Chapter 7, Paragraph 7.2.3, after “The design shall encompass the following:”, insert:

7.2.3.1* One or more design fire scenarios plus gas inflows where geological conditions deem it appropriate. Fires causes including arson, vandalism, spontaneous combustion and equipment failures shall be considered. The following design fire scenarios shall be considered. Each design fire scenario shall have a fire profile.

7.2.3.1.1 A vehicle fire originating outside the vehicle interior such as below the floor or rooftop.

7.2.3.1.2 A vehicle fire originating in the vehicle interior. If the vehicle has an onboard fire suppression system meeting the requirements of NFPA 750, the design FCORR, FHR, FSORR and FMSRR for this design fire scenario shall be considered zero. This shall not negate the need to have a minimum tunnel air velocity for the removal of cold smoke.

7.2.3.1.3 For dual-powered vehicles (diesel and electric traction), a fire resulting from the puncture of a fuel tank or rupture of a fuel line. This shall be in addition to 7.2.3.1.1 and 7.2.3.1.2.

7.2.3.1.4 A station or tunnel fire consuming trash, luggage, wayside electrical equipment, etc.

7.2.3.1.5 A fire in a non-transit occupancy such as a kiosk or small shop that is unsprinklered.

7.2.3.1.6 A maintenance vehicle or work-train fire. If maintenance vehicles are never in the stations or tunnels during periods of revenue operations, then maintenance vehicle or work train fire scenarios do not have to be considered as design fire scenarios.

In Annex A, After Section 7.2.6, add:

A.7.3.2.1

Annex D presents information concerning rail vehicle fires.

Annex E presents an approach to fire hazard analysis.

Annex H presents background and approaches to the development of fire profiles.

Add the below after Annex G

Annex H Fire Profile Methodologies
This annex is not part of the requirements of this NFPA document but is included for informational purposes only.

H.1  Introduction  This annex presents information on methodologies used for predicting fire profiles. This is a rapidly changing field and designer should assure himself/herself of the appropriateness of the methodology selected.

H.2  General

H.2.1  Use of Fire Profile  As per Section 7.2.1 (2), critical velocity is the criteria for determining the required tunnel airflow and hence the ventilation system fan capacities required for tunnel fire incidents. The most commonly used software is the Subway Environment Simulation (SES) computer program, Reference (AAA). The steady FHRR is the primary "fire" input.

Tenability in stations is usually predicted by computational fluid dynamics (CFD) programs such as the Fire Dynamics Simulator (BBB), FLUENT (CCC), CFX (DDD), Star-CD (EEE) and Flow 3D (FFF). The predicted fire profile is an input to these programs which predict temperatures, visibilities, and carbon monoxide concentrations as a function of the three-dimensional location in the station and time since the initiation of the fire.

H.2.3  Fire Causes  Fire causes selected are not the same for all fixed guideway and passenger rail systems. For example, some systems design for arson and others do not. This decision may be based on cost, the inferred risk or a formal threat and vulnerability assessment. Arson may be defined as using man-portable quantity of a flammable fluid, etc with the intent of causing a large fire with causalities and significant damage. Vandalism may be defined as setting fire to newspapers, trash etc with the intent of causing a nuisance.

H.2.4  Soot and Carbon Monoxide Yield Rates  Soot and CO yield rates are published in a number of sources such as the Fire Protection Handbook (GGG). This data is most often those for well-ventilated fires. As a result, soot and CO yield rates and therefore their concentrations may be higher in the early stages of a fire before the ventilating airflows reach design values. Data on this phenomena has been published for some liquid fires but NOT for all materials.

H.2.5  Impacts of Ventilation System Design  FHRR is the governing criteria for the design of tunnel ventilation. Experience to date has shown that visibility is most often the governing criteria for the design of stations and their ventilation. Temperature has been on rare occasions to be the governing criteria. Carbon monoxide has not been found to be the governing criteria. Since FCORR and FSORR are scalars, it is possible to relate visibility and CO criteria via their yield rates and not have to present CO concentrations.

H.3  Vehicle Fires

H.3.1  History  Two approaches were used prior to the late 1990s. The first consisted of spread sheet calculations based on the train total fire load and an assumed time to combust were used to estimate the fire FHRR. Fire carbon monoxide, fire smoke and fire soot release rates were not estimated. The emphasis was on the determining the steady-state fire heat release rates which were used to determine the capacities and operating modes of the tunnel ventilation system. A paper published in the 1998 ASHRAE Proceedings (HHH) presents the details of this approach. The second approach was comparing the properties of the design vehicle to a similar one and using a similar FHRR.

Another manual approach was developed the year 2005. This paper (III) assumes a well-ventilated flashed-over interior car fire. The FHRRs for each interior material are summed to the total FHRR. The methodology can be used to estimate the maximum FCORRs, FHRRs and FSORRs but NOT the FGR. As a result, the volume and geometry of the station smoke reservoir needed prior to the ventilation airflow reach steady-state can be significantly under-estimated.

Beginning about 1995, at least two computer programs came into use for predicting fire profiles. In the USA, they have been applied to two commuter rail projects, one heavy rail transit project and one light rail project. These applications are described in References (JJJ) through (PPP).

In 2008, the fire profile for fuel tank spill caused by a puncture was predicted. This application is described in Reference (PPP).

H.3.2  Computer Programs for Predicting Fire Profile  The most widely used are HAIFIRE (QQQ) and the Fire Dynamics Simulator (FDS) (CCC). They predict pre- and post-flashover fire profiles. They are very well validated. Their documentation explains their validation. Their input includes the following car data:

(1)  Interior geometry including seating layouts, orientations and dimensions
(2)  Overall thermal transmission value for vehicle body
(3)  Openings including windows and doors, whether they are composed of plastic or glass and at what temperatures they become open. The latter may occur because of melting or failure of retaining seals.
(4)  Mechanical ventilation – quantity and location
(5)  Characteristics of car interior materials measured according to ASTM 1354
(6)  Ignition temperatures of car interior materials
(7)  Initial conditions including doors and windows open or closed
(8)  Quantity of accelerant or characteristic of initiator

When selecting a computer program it is important to select the program that best fits the need of the problem rather than to select the program on availability.
H.3.3 Car-to-Car Fire Spread. The fire may spread from car to car. Parameters that affect this are the fire resistances of the car ends, whether the interior car doors are left open or closed, whether the cars have "bellows" connecting them or not, the tunnel ventilation moving the heat from the fire site downstream to the next car, whether the car exterior windows are glass or polycarbonate, whether the station has sprinklers or not. A typical assumption is the "next" car will ignite 15 minutes after the first car reaches steady FHRR.

H.3.4 Fizzle or Flashover. Some of the references below conclude that an NFPA 130 2007 compliant car will not flashover unless an arson event with two liters (one-half gallon) or more of flammable liquid occurs. The designer should seek to verify this possibility. It could reduce the ventilation required significantly.

H.4 Trash, Luggage and Wayside Electrical Fires
Tests on luggage have been formed (RRR). They indicate FHRRs on the order of 300 kW (1.02 MBtu/hr) to 1000 kW (3.41 MBtu/hr). It has become common to use a FHRR of 1 MW (3.41 MBtu/hr); however, one transit system has designed for 2 MW (6.82 MBtu/hr). Because of its soot yield, polystyrene has often been used to estimate the accompanying FCORR and FSORRs.

H.5 Fires in non-transit public area occupancies such as a kiosk or small shop that are unsprinklered. NFPA 92B (SSS) and “Principles of Smoke Management” (TTT) provide guidance on the estimation of FHRRs and ventilation for these occupancies. Assumptions concerning materials being consumed may have to be made to properly estimate FCORRs and FSORRs.

H.6 Maintenance vehicle and work train fires
Little work has been done in predicting fire profiles for maintenance vehicles and work trains. The primary risk appears to be a fuel spill fire resulting from the puncture of a fuel tank or the rupture of a fuel lines. See Reference (PPP).

H.7 References. The following references are cited in this annex.

The details of some of these references have to be confirmed.


(BBB) National Institute of Standards and Technology, “Fire Dynamics Simulator”

(CCC) FLUENT CFD package by ANSYS

(DDD) CFX CFD package by ANSYS

(EEE) Star-CD by CD Adapco

(FFF) Flow 3D by Flow Science

(GGG) Fire Protection Handbook


(III) Paper describing methodology for predicting maximum FHRR.

Note:

It must be noted that in following 7 reports the fire profiles predicted are NOT in the public domain but the methodologies are. We will have to work with the authors and possibly the clients to make the methodologies available.


(MMM) PATH PA-4 Train Heat Release Rate History Design Fire for the World trade Center Permanent PATH Terminal. 24 April 2009. Documents Fire and Smoke Release Rates for PATH PA-4 Cars.


(PPP) NJT Fuel Spills

(QQQ) Haifire by Hughes Associates, Inc.

(RRR) 19 Oct 2007 e-mail from Richard Custer of Arup to WD Kennedy


**Substantiation:** The Committee has for sometime recognized the need for the Standard to provide minimum requirements concerning the selection of design fires. This proposal does that. All numerical data presented is provided in the references listed in the new Annex H.

130- Log #156

**Final Action:**
(3.3.4 Blue Light Station and A.3.3.4 (New) )

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.

**Recommendation:** Revise definition to read as follows:

3.3.4* Blue Light Station. A location along the trainway, indicated by a blue light, where emergency service or authorized personnel can communicate with the operations control center and disconnect traction power.

A.3.3.4 The definition states the minimum functional requirements for a blue light station. The design provisions to accomplish those functions, as well as the need for other functions and/or equipments should be determined based on emergency response planning for the system.

**Substantiation:** The definition clearly states that a blue light station is a location where someone can communicate with the OCC AND disconnect traction power. The annex note is intended to address comments that the minimum equipment requirements should be stated as well. Instead, the proposed annex language recognizes that equipment solutions should reflect the specific conditions and emergency response planning for each system. Requirements in addition to the minimum performance function (e.g., a camera video, a WIFI access point, a defibrillator or any other emergency equipments and/or systems) would be at the discretion of the AHJ in consultation with the system authority.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
3.3.6* Butterfly Door: A single two-leaf panel that pivots vertically on a central axis so that one leaf moves inward and the other moves outward.

A.3.3.6 The pivoting door movement on the vertical axis helps to equalize the air pressure on both sides of the door, considerably reducing the strength required to push open the door, especially when an emergency ventilation scenario is in effect.

5.5.6.3.4 Doors, Gates and Exit Hatches.

A 5.5.6.3.4 Butterfly doors (figure 1) should be permitted in means of egress for stations as follows:

- Door panels must be at a 9° angle when closed,
- The minimum clear width on either side of the pivot point with the door in the open position must be 760 mm;
- A permanent marking indicating the opening side must be applied, and
- The egress capacity for this type of door should be calculated as 120 ppm (2 x 60 ppm).

NRCC (National Research Council of Canada) tested the butterfly door (Assessment of the butterfly door as a means of egress, by Guylène Proulx and Darlene Higgins, Internal Report No. 748, Date of issue: September 1997) and the conclusion was, and I quote: “Due to its ease of use, the butterfly door appears superior on all points as a means of egress to a traditional door during daily use, to handle a large exiting crowd or during the evacuation of a station. The design of the Butterfly Door posed no problem to passengers exiting a station, as shown by the results of the three studies. Still, the unique design of the Butterfly Door is against the NFPA 130 requirement which stipulates that "doors to the exit access shall open in the direction of exit travel." This very important requirement on door opening direction was essential in light of past tragedies, where an arriving crowd of occupants had been trapped behind a door that involved the kinetics movement of a person pulling a handle to open a door inward. The Butterfly Door does not necessitate this kinetics movement The leaf that opens inward is not pulled, this leaf simply pivots inward from the action of a person pushing the right leaf to exit. Consequently, the only exiting problem that could be expected would be a person attempting to exit by pushing the wrong leaf, the left leaf, of the door. This problem was observed on a few occasions during the daily use of the Butterfly Door, but the same situation was observed as often for the Traditional Door, when a few people attempted to push on the hinges side. In these few cases, in a matter of seconds the person realized the mistake and pushed the right side of the door or another person arriving pushed the door open. These occurrences are rare since the use of the Butterfly Door is made easy by its angled position and the STCUM logo on the push plate pad.” end of quote.

Even if this door does not fully comply with NFPA 101 LIFE SAFETY CODE, this door has proven over the years to be safe and reliable, and totally qualified in case of an evacuation.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
130- Log #222

Final Action:

(3.3.13 Airflow Control Devices, 7.2.7, 7.3.2, 7.4, and A.3.3.13 (New) )

Submitter: William D. Kennedy, Parsons Brinckerhoff

Recommendation: Add to Chapter 3:

3.3.13* Airflow Control Devices. Non-traditional equipment used to minimize tunnel airflow including air curtains, barriers, brattices, tunnel doors, downstands, enclosures, tunnel gates, etc.

In Chapter 7, after Section 7.2.6, insert Section 7.2.7 Ventilation Plenums shall be permitted to serve more than one trainway.

In Chapter 7, Section 7.3.2:

After the word "motors", insert dampers, damper operators, sound attenuators.

In Chapter 7, Section 7.4:

Change the word Devices to Airflow Control Devices.

In Chapter 7: Delete Section 7.4.4 in its entirety.

Add to Annex A:

A.3.3.13 Air curtains have been used to minimize tunnel airflow in transit systems. Barriers are similar to life rafts with inflatable rings or collars and could be used to minimize tunnel airflow. Brattices are parachute- or curtain-like devices that have been used in mine headings to minimize airflow. Doors have been used to minimize tunnel airflow in transit systems. Downstands and enclosures have been used to minimize airflow and smoke movement in rail stations. Gates are guillotine-type doors mounted at tunnel portals and have been used in passenger rail tunnels to minimize tunnel airflow.

Substantiation: Comments that “Devices” as used in Section 7.4 is not defined in NFPA 130 and is differently used in other NFPA documents. Section 7.4 was originally proposed by Melba Bayne of WMATA. “Barriers” were being tested at the time in WMATA. A3.3.13 was added to document this intent.

130- Log #19

Final Action:

(3.3.19.1 Effective Fire Load and A.3.3.19.1)


Recommendation: Revised text to read as follows:

3.3.19.1 Effective Fire Load. The portion of the total fire load under a given, specific fire scenario of a certain fuel package that would be expected to be released in a design fire incident (units: joules or Btu). This can include transit and/or passenger rail vehicle(s), luggage, fuel, and/or wayside facilities or structures, that, because of the fuel package configuration, separation, and combustion characteristics, would be expected to be released in a design fire incident.

A.3.3.19.1 The effective fire load can include transit and/or passenger rail vehicle(s), luggage, fuel, and/or wayside facilities or structures, that, because of the fuel package configuration, separation, and combustion characteristics, would be expected to be released in a design fire incident.

Substantiation: The NFPA Manual of Style states that definitions need to be in single sentences. The second sentence in the present text is really clarification and is best placed in the annex, although it could also be placed somewhere in the body of the standard, outside of the definitions section.
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130- Log #20 Final Action: (3.3.19.2 Total Fire Load and A.3.3.19.2)

Recommendation: Revised text to read as follows:

3.3.19.2 Total Fire Load. The total heat energy of all combustibles available from the constituent materials of a certain fuel package (units: joules or Btu). This can include a transit and/or passenger rail vehicle(s), luggage, fuel, and/or wayside facilities or structures.

A.3.3.19.2 The total fire load can include a transit and/or passenger rail vehicle(s), luggage, fuel, and/or wayside facilities or structures.

Substantiation: The NFPA Manual of Style states that definitions need to be in single sentences. The second sentence in the present text is really clarification and is best placed in the annex, although it could also be placed somewhere in the body of the standard, outside of the definitions section.

130- Log #91 Final Action: (3.3.26.1 Average Heat Release Rate (HRR))

Submitter: Silas K. Li, Parsons Brinckerhoff, Inc.
Recommendation: Revise text to read as follows:

3.3.26.1 Average Heat Release Rate (HRR). The average heat release rate per unit area for the first 180 seconds after ignition, over the time period starting at time to ignition and ending 180 seconds later, as measured in NFPA 271 or ASTM E 1354 (units: kW/m^2).

Substantiation: Change the definition of average heat release rate according to Chapter 9.1 (15) of NFPA 271. The editorial change provides clarity.

This is not original material; its reference/source is as follows:
NFPA 130 Technical Committee, Task Group 3 - Ventilation

130- Log #104 Final Action: (3.3.28)

Submitter: Gary L. English, Seattle Fire Department
Recommendation: Revise text to read as follows:

Local Control - The point of control of a portion of the overall emergency ventilation fire and life safety system(s) and/or system components from any location other than or ventilation plant that is remote from the operations control center or the designated alternate location.

Substantiation: The confusion in the 130 definition comes from trying to define both a physical location (point), as well as ‘local’ referring to only a portion of the system wide systems, e.g. at a station. Presumably, if the location controlled all of the system, it would be either the OCC or an alternate location.

The proposal defines that this is only a part of the overall systems, strikes the emphasis on ‘point’ and replaces this with a generic physical location, ‘any’. In addition, the limiting language of ‘ventilation’ is replaced with more all encompassing language fire any fire and life safety systems.

This is not original material; its reference/source is as follows:
Submitted by Gary English on Behalf of TG 3 - Ventilation
3.3.29 Noncombustible Material and 4.7 (New) 


Recommendation: Revised text to read as follows:

3.3.29 Noncombustible (Material). See 4.7. [101, 2012] A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors, when subjected to fire or heat. Materials that are reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, shall be considered noncombustible materials. [101, 2009] [101, 3.3.160.3, 2012]

4.7 Noncombustible Material.

4.7.1 A material that complies with any of the following shall be considered a noncombustible material. [101, 4.6.14.1, 2012]

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors, when subjected to fire or heat. [101, 4.6.14.1 (1), 2012]

(2) A material that is reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, shall be considered a noncombustible material. [101, 4.6.14.1 (2), 2012]

(3) A material that is reported as complying with the pass/fail criteria of ASTM E 136 when tested in accordance with the test method and procedure in ASTM E 2652, Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750 Degrees C, shall be considered a noncombustible material. [101, 4.6.14.1 (3), 2012]

A 4.7. The provisions of 4.7 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [101, A.4.6.14, 2012]

A 4.7.1 (1) Examples of such materials include steel, concrete, masonry and glass. [101, A.4.6.14.1 (1), 2012]


Substantiation: The definition in NFPA 130-2010 is being extracted from NFPA 101-2009. In the new edition of NFPA 101 the committee made a change to do two things: (a) comply with the NFPA Manual of Style and ensure there are no requirements in the definition and that the definition is in a single sentence and (b) to include two ways of testing for noncombustibility, namely by using ASTM E 136 or by using ASTM E 2652. The proposal recommends that the text still be extracted from NFPA 101 but that the additional text that NFPA 101 placed in section states that definitions need to be in single sentences. The second sentence in the present text is really clarification and is best placed in the annex, although it could also be placed somewhere in the body of the standard, outside of the definitions sections 4.6.14.1 and 4.6.14.2 also be extracted.

The action, at the ROP, from the NFPA 101 committee on fundamentals can be found in the NFPA ROP for proposals 101-54a and 101-64.

The details of the NFPA 101 action at the ROP stage follow:

NFPA 101-54a Accept:

3.3.160.3 Noncombustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors, when subjected to fire or heat. Materials that are reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, shall be considered noncombustible materials.

A 3.3.160.3 See 4.6.14 for additional information on noncombustible material:

Substantiation: The action taken on Proposal 101-64 adds text on Noncombustible Material as a new 4.6.14 so as to permit the definition of Noncombustible Material to be simplified - removing requirements from the definition.

NFPA 101-64 Accept in Principle:

Add new text to read as follows:

4.6.14 Noncombustible Material.

4.6.14.1 A material that is reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, shall be considered a noncombustible material.

4.6.14.2 A material that is reported as complying with the pass/fail criteria of ASTM E 136 when tested in accordance with the test method and procedure in ASTM E 2652, Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750 Degrees C, shall be considered a noncombustible material.

4.6.14.3 Where the term limited-combustible is used in this Code, it shall also include noncombustible.


Printed on 12/15/2011
Committee Statement: The Committee Meeting Action does what the submitter requested but rewords the title from "Combustibility" to "Noncombustible Material" as the added text speaks specifically to noncombustible materials.

At the ROC stage, NFPA 101 acted as follows (NFPA 101-31):
Replace the text of 4.6.14 as proposed by the action at the ROP Proposal 101-64 with the following:

4.6.14* Noncombustible Material

4.6.14.1 A material that complies with any of the following shall be considered a noncombustible material:
1.* A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors, when subjected to fire or heat.

2. A material that is reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

3. A material that is reported as complying with the pass/fail criteria of ASTM E 136 when tested in accordance with the test method and procedure in ASTM E 2652, Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750 Degrees C, shall be considered a noncombustible material.

4.6.14.2 Where the term limited-combustible is used in this Code, it shall also include noncombustible.

A.4.6.14 The provisions of 4.6.14 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials.

A.4.6.14.1 (1) Examples of such materials include steel, concrete, masonry and glass.

3.3.xx Noncombustible material. See 4.6.14.

The complete NFPA 101 action also includes information on a term, limited combustible, not used in NFPA 130, and that portion is not proposed to be extracted from NFPA 101.

130- Log #145
(3.3.31) Final Action:

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise definitions to read as follows:

3.3.31 Occupancy.

3.3.31.1 Incidental Occupancies in Stations. The use of the station by others who are neither transit system employees nor passengers.

3.3.31.2 Nonsystem Occupancy in Stations. An occupancy not under the control of the system operating authority.

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 304

130- Log #146
(3.3.31) Final Action:

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Delete definition to read as follows:

3.3.31 Occupancy.

3.3.31.1 Incidental Occupancies in Stations. The use of the station by others who are neither transit system employees nor passengers.

3.3.31.2 Nonsystem Occupancy in Stations. An occupancy not under the control of the system operating authority.

Substantiation: Definition is not required as term is not used in Standard.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 304a
Revise text to read as follows:

3.3.35 Point of Safety

A point of safety is one of the following: (1) an enclosed fire exit that leads to a public way or safe location outside the station, trainway, or vehicle; (2) an at-grade point beyond the vehicle, enclosing station, or trainway; (3) any other approved location.

5.5.6.2.2, “For enclosed stations equipped with an emergency ventilation system designed in accordance with Chapter 7, where the emergency ventilation system provides protection for the concourse from exposure to the effects of a train fire at the platform or in the tunnel provided the ventilation system and:

1. Maintains tenable environment for occupants to reach a, b, or c above.

2. Confirms by engineering analysis that tenability will be maintained in the event an emergency fan is out of service.

Delete 5.5.6.2.2 in entirety as it is included in definition.

Substantiation: The question was posed whether parts of the 130 definition, should include a tenable environment for a prescribed amount of time? The question requires some history of the definition of Point of Safety (PoS) and the differences in intent between them.

130 has two ‘definitions’

3.3.35 Point of Safety. A point of safety is one of the following: (1) an enclosed fire exit that leads to a public way or safe location outside the station, trainway, or vehicle; (2) an at-grade point beyond the vehicle, enclosing station, or trainway; (3) any other approved location.

5.5.6.2.2, “For enclosed stations equipped with an emergency ventilation system designed in accordance with Chapter 7, where the emergency ventilation system provides protection for the concourse from exposure to the effects of a train fire at the platform or in the tunnel provided the ventilation system and:

1. Maintains tenable environment for occupants to reach a, b, or c above.

2. Confirms by engineering analysis that tenability will be maintained in the event an emergency fan is out of service.

Delete 5.5.6.2.2 in entirety as it is included in definition.

Within NFPA, the 101 definition is slightly different (format changed for ease of reading)

“A location that

(a) is exterior to and away from a building; or

(b) is within a building of any type construction protected throughout by an approved automatic sprinkler system and that is either

(1) within an exit enclosure meeting the requirements of this Code, or

(2) within another portion of the building that is separated by smoke barriers in accordance with Section 8.5, with not less than a 1/2-hour fire resistance rating, and that portion of the building has access to a means of escape or exit that conforms to the requirements of this Code and does not necessitate return to the area of fire involvement; or

(c) is within a building of Type I, Type II(222), Type II(111), Type III(211), Type IV, or Type V(111) construction and is either

(1) within an exit enclosure meeting the requirements of this Code, or

(2) within another portion of the building that is separated by smoke barriers in accordance with Section 8.5, with not less than a 1/2-hour fire resistance rating, and that portion of the building has access to a means of escape or exit that conforms to the 101 preferred requirements.”

(note – 101 8.5 is the subsection on Smoke Barriers and keep in mind that this section of 101 is specific to ‘buildings’ which would be stations, but not include tunnels which are considered ‘structures’.)

For reference there are two other definitions of note.

NFPA 502 - An enclosed fire exit that leads to a public way or safe location outside the structure, or an at-grade point beyond any enclosing structure, or another area that affords adequate protection for motorists.

ICC Point of Safety. An enclosed fire exit that leads to a public way or safe location outside the structure, or an at grade point beyond any enclosing structure, or another area that affords adequate protection for passengers.

Note that in all cases the PoS is a physical barrier of some kind. And, requires a means of escape to the outside. The exception is our 5.6.2.2 which depends on ventilation to protect the PoS in lieu of a physical barrier and does not require a means of escape. Since we know that a fully functional ventilation systems, correctly sized for the fire, can manage the smoke, we need to address possible problems with this approach compared to 101 language.

For ventilation smoke barriers as identified in 5.6.2.2

a) Should we require a means of escape beyond the PoS?

b) Should we require a tenable time limit for PoS?
If we are 100% certain that
1) the ventilation system will not fail during a fire, or
2) be out of service for repair, or
3) the fire load cannot ever be greater than the design fire,
this ventilation smoke barrier language will be fine. However, if any of these 3 are inadequate, then I am recommending we modify the language to address these possibilities. Seattle has simply added language to require ventilation minimums are maintained if one fan is out of service,

Note that although there is not specific requirement that our Concourse have a means of escape, per 101, all concourse in fact have an attached egress path so the question is moot.

Recommendation:
130 has three choices:
1. Leave the current language intact and run risk of a failure that has been recognized
2. Adopt 101 language verbatim – which has unnecessary language for 130 application and does not answer the potential problems with ventilation controlled smoke.
3. Create a simplified version of 101 such as provided below. This is essentially the 101 language revised to fit 130 WITH additional language to address the ventilation failures, and specifically allows ventilation to protect the concourse from train fires in the station and in the tunnel.

All of the language is New to 130, however the key parts are in bold.

DRAFT 130 PoS revised language

3.3.35 Point of Safety

(a) outside and away from the building or structure, or
(b) within a building or structure in an exit corridor, or
(c) within another portion of the building or tunnel separated by smoke barriers with not less than ½ hour fire resistance rating and that portion of the building or structure has access to a means of escape or exit.

(d) For enclosed stations equipped with an emergency ventilation system designed in accordance with Chapter 7, where the emergency ventilation system provides protection for the concourse from exposure to the effects of a train fire at the platform or in the tunnel provided the ventilation system

1) Maintains tenable environment for occupants to reach a, b, or c above.
2) Confirms by engineering analysis that tenability will be maintained in the event an emergency fan is out of service,

These modifications effectively align both 130 definitions with 101, ensures emergency ventilation will be adequate to protect the concourse until occupants can leave by addressing the ventilation out of service phenomena.

To adopt this would require changes to the definition and deletion of 5.5.6.2.2.

This is not original material; its reference/source is as follows:
NFPA 101. NFPA 130 Technical Committee, Task Group 3 - Ventilation

130- Log #90

(3.3.41 Smoke Obscuration)

Submitter: Silas K. Li, Parsons Brinckerhoff, Inc.

Recommendation: Revise text to read as follows:

3.3.41 Smoke Obscuration. The reduction of light transmission by smoke, as measured by light attenuation. [271, 2009]

Substantiation: Editorial change. Change “attenuation)” to “attenuation”.

This is not original material; its reference/source is as follows:
NFPA 130 Technical Committee, Task Group 3 - Ventilation

Printed on 12/15/2011
Revised text as follows:

3.3.41 Smoke Obscuration. The reduction of light transmission by smoke, as measured by which is reported as the average specific extinction area (light attenuation). (units: m²/kg or ft²/lb) [271, 2009]

3.3.42 Specific Extinction Area. A measure of smoke obscuration potential per unit mass burnt, determined as the product of the specific extinction coefficient and the volumetric mass flow rate, divided by the mass loss rate, m²/kg (ft²/lb).

Substantiation: 1. Add units for smoke obscuration to be consistent with NFPA 130 Section A.8.4.1.10 and Chapter 9.1 (21) of NFPA 271.

NFPA 130 Section A.8.4.10 states: “The typical way in which smoke obscuration test results are reported in the cone calorimeter (NFPA 271 or ASTM E 1354) is as specific extinction area.”

Chapter 9.1 (21) of NFPA 271 states: “Smoke obscuration, which shall be reported as the average specific extinction area (m²/kg)”

2. Correct units of Specific Extinction Area according to NFPA 217 Section 1.5, Symbols, states “specific extinction area for smoke (m²/kg)”

This is not original material; its reference/source is as follows:
NFPA 130 Technical Committee, Task Group 3 - Ventilation

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3.3.48 Tenable Environment. In a transportation system, an environment that permits the self-rescue evacuation or rescue, or both, of occupants for a specific period of time.

Substantiation: The time of tenability recommendations in B.2.3 extend the recommended time of tenability well beyond the self-rescue time. This change is consistent with a similar change in NFPA 502.

This is not original material; its reference/source is as follows:
On behalf of TG3

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3.3.49 Tourist, Scenic, Historic, or Excursion Operations. Railroad operations that carry passengers, often using antiquated equipment, with the conveyance of the passengers to a particular destination not being the principal purpose.

Substantiation: Submitted in response to the following comment received by the TC: “Page 11, Section 3.3.49, delete "with the conveyance of the passengers”.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

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Printed on 12/15/2011 20
3.3.52.1 Fixed Guideway Transit System. An electrified transportation system, utilizing a fixed guideway, operating on right-of-way for the mass movement of passengers within a metropolitan area, and consisting of its fixed guideways, transit vehicles, and other rolling stock; power system; buildings; maintenance facilities; stations; transit vehicle yard; and other stationary and movable apparatus, equipment, appurtenances, and structures.

3.3.52.2 Passenger Rail System. A transportation system, utilizing a rail guideway, operating on right-of-way for the movement of passengers within and between metropolitan areas, and consisting of its rail guideways, passenger rail vehicles, and other rolling stock; power systems; buildings; maintenance facilities; stations; passenger rail vehicle yard; and other stationary and movable apparatus, equipment, appurtenances, and structures.

A.1.1.1 Vehicle maintenance facilities are not addressed by this standard because requirements for that occupancy are provided in other codes and standards. Where vehicle maintenance facilities are integrated or co-located with occupancies covered by this standard, special considerations beyond this standard shall be necessary.

Substantiation: The removal of vehicle maintenance facilities is documented in the Origin and Development of NFPA 130 section, on page 130-2, which states "The chapter on vehicle maintenance facilities was removed because requirements for that occupancy are addressed in other codes, and the performance-based vehicle design requirements were substantially revised to more accurately address the unique qualities of rail vehicles." The proposal to delete "maintenance facilities" from the standard in the above-referenced sections is necessary to maintain consistency within the standard. The addition of the annex note will further clarify the standard.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:
4.1.1 Fire safety of systems shall be achieved through a composite of facility design, operating equipment, hardware, procedures, and software subsystems that are integrated to protect provide requirements for the protection of life and property from the effects of fire.

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 401

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:
(1) Protect occupants not aware of intimate with the initial fire development

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 402
(2) Maximize the survivability of occupants aware of intimate with the initial fire development
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 403

4.2.2 This standard is prepared with the intent of providing minimum requirements for those instances where noncombustible materials (as defined in 3.3.29) are not used due to other considerations in the design and construction of the system elements.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 404

Systems shall be designed, constructed, and maintained to protect occupants who are not aware of intimate with the initial fire development for the time needed to evacuate or relocate them, or to defend such occupants in place during a fire or fire-related emergency.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 406

4.3.2 Structural Integrity. Structural integrity of stations, trainways, and vehicles shall be maintained for the time needed to evacuate, relocate, or defend in place occupants who are not aware of intimate with the initial fire development.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 406
4.5 Shared Use by Freight Systems. Where passenger and freight systems are operated concurrently through or adjacent to stations and trainways, the design of the station and trainway fire-life safety and fire protection systems shall consider the hazards associated with both uses, as approved.

**Substantiation:** Revise language to provide clarity.

**This is not original material; its reference/source is as follows:**
NFPA TC - Task Group 1 - Log 406

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**Amend the order of requirements in Chapter 5 as shown:**

**Substantiation:** The reorganization is required to more appropriately group the requirements and to match the re-organization that is proposed for Chapter 6 in another proposal.

**This is not original material; its reference/source is as follows:**
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
CHAPTER 5 - STATIONS

5.1 General.

5.1.1 Applicability

5.1.1.1 <New statement needed, see Chapter 6.>

5.1.2 Use and Occupancy.

5.1.2.1 The primary purpose of a station shall be for the use of the passengers who normally stay in a station structure for a period of time no longer than that necessary to wait for and enter a departing passenger-carrying vehicle or to exit the station after arriving on an incoming passenger-carrying vehicle.

5.1.2.2 Where contiguous commercial occupancies share common space with the station, or where the station is integrated into a building the occupancy of which is neither for fixed guideway transit nor for passenger rail, special considerations beyond this standard shall be necessary.

5.1.2.3 A station shall also be for the use of employees whose work assignments require their presence in the station structures.

5.2 Construction and Compartmentation.

5.2.1 Safeguards During Construction. During the course of construction or major modification of any structure, provisions of NFPA 241 shall apply.

5.2.1.1 Building construction for all new enclosed stations shall be not less than Type I or Type II or combinations of Type I and Type II noncombustible construction as defined in NFPA 220, in accordance with the requirements of NFPA 101, Chapter 12, for the station configuration or as determined by an engineering analysis of potential fire exposure hazards to the structure.

5.2.2 Construction Type.

5.2.2.1 Building construction for all new enclosed stations shall be not less than Type I or Type II or combinations of Type I and Type II noncombustible construction as defined in NFPA 220, in accordance with the requirements of NFPA 101, Chapter 12, for the station configuration or as determined by an engineering analysis of potential fire exposure hazards to the structure.

5.2.2.2 Other types of construction as defined in NFPA 220 shall be permitted for open stations in accordance with the provisions of NFPA 101, Chapter 12, for corresponding station configurations.

5.2.2.3 Where access for firefighting is restricted, standpipes sized for water flow and pressure for the maximum predicted construction fire load shall be installed to within 61 m (200 ft) of the most remote portion of the station. The flow and pressure required at the outlet shall be approved.

5.2.2.4* Illumination levels of enclosed stations shall not be less than 2.7 lx (0.25 ft-candles) at the walking surface.

5.2.3 Storage Tanks and Service Stations.
5.2.3.1 Aboveground storage tanks above subsurface stations shall meet the requirements of 6.6.4.

5.2.3.2 Underground storage tanks above subsurface station structures shall meet the requirements of 6.6.5.

5.2.3.3 Service stations above subsurface station structures shall meet the requirements of 6.6.6.

5.2.3.4 Existing storage tanks in or under buildings shall meet the requirements of 6.6.7.

5.2.4 Compartmentation.

5.2.4.1 Stair and Escalator Enclosure. Stairs and escalators used by passengers shall not be required to be enclosed.

5.2.4.2 Open Stations. Public areas on different levels in open stations are permitted to be interconnected.

5.2.4.3 Enclosed Stations. Public areas on different levels in enclosed stations shall be permitted to be interconnected, provided fire separation is not required for smoke control or other fire protection purposes.

5.2.4.4 Separation Between Public and Nonpublic Floor Areas. All public areas shall be fire separated from adjacent nonpublic areas.

5.2.4.5 Ancillary Spaces. Fire resistance ratings of separations between ancillary occupancies shall be established as required by NFPA 101 in accordance with NFPA 251.

5.2.4.6 Agents’ and Information Booths.

(1) Agents’ or information booths shall be constructed of noncombustible materials.

(2) Booths used only as agents’ and information booths shall not be required to be fire separated from public station areas.

5.2.4.7 Separation Between System and Nonsystem Occupancies. All station public areas shall be fire separated from adjacent non-system occupancies.

5.2.5 Interior Finish.

5.9.1 Enclosed Stations.

5.9.1.1 Interior wall and ceiling finish materials in enclosed stations shall comply with one of the following:

(1) Interior wall and ceiling finish materials shall be noncombustible materials.

(2) Interior wall and ceiling finish materials, other than textile wall coverings or foam plastic insulation, shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 450, when tested by ASTM E 84.

5.9.1.2 Interior wall and ceiling finish materials, when tested in accordance with NFPA 286 in lieu of ASTM E84, shall comply with the following:

(1) Flames shall not spread to the ceiling during the 40 kW (135 kBtu/hr) exposure.
(2) During the 160 kW (545 kBtu/hr) exposure, the following criteria shall be met:

(a) Flame shall not spread to the outer extremities of the sample on the 2.45 m × 3.7 m (8 ft × 12 ft) wall.

(b) The peak heat release rate shall not exceed 800 kW (2730 kBtu/hr).

(c) Flashover shall not occur.

(3) The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).

5.2.5.3 5.9.1.3-Interior Floor Finish. Interior floor finish materials in enclosed stations shall be noncombustible or shall exhibit a critical radiant flux not less than 0.8 W/cm² when tested in accordance with ASTM E 648.

5.2.6 5.9.2 Open Stations.

5.2.6.1 5.11* Combustible Furnishings and Contents. Where combustible furnishings or contents not specifically addressed in this standard are installed in a station, a fire hazard analysis shall be conducted to determine that the level of occupant fire safety is not adversely affected by the furnishings and contents.

5.10 Rubbish Containers.

5.2.6.2 5.10 Rubbish Containers. Rubbish containers shall be manufactured of noncombustible materials.

5.2.6.3 5.2.4 Seating Furniture. Seating furniture in stations shall be noncombustible, or it shall have limited rates of heat release when tested in accordance with ASTM E 1537, as follows:

(1) The peak rate of heat release for the single seating furniture item shall not exceed 80 kW (270 kBtu/hr)

(2) The total energy released by the single seating furniture item during the first 10 minutes of the test shall not exceed 25 MJ (23,700 Btu)

5.3 Ventilation. Emergency ventilation shall be provided in enclosed stations in accordance with Chapter 7.

5.4.7 5.4.1 All wiring materials and installations within stations other than for traction power shall conform to requirements of NFPA 70 and, in addition, shall satisfy the requirements of 5.4.2 through 5.4.9.

5.4.2 Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136.

5.4.3 Other materials when encased in concrete shall be acceptable.

5.4.3.1 Ground wire installed in a metallic raceway shall be insulated.
5.2.7.6  **5.4.3.2** Other ground wires shall be permitted to be bare.

5.2.7.7  **5.4.4** All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant type carrying temperature ratings corresponding to either of the following conditions:

1. 75°C (167°F) for listed fire-resistive cables
2. 90°C (194°F) for all other applications

5.2.7.8  **5.4.4.1** All insulated conductors and cables shall be listed for wet locations.

5.2.7.9  **5.4.5** All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 5.4.5.1 or 5.4.5.2.

5.2.7.10 **5.4.5.1** All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685.

5.2.7.11 **5.4.5.2** Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA 262 shall be permitted for use instead of the wires and cables specified in 5.4.5.1.

5.2.7.12 **5.4.6** All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas or other nonpublic areas.

5.2.7.13 **5.4.6.1** Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface-mounted in air plenums unless cables are listed fire-resistant cables in accordance with 5.4.10.

5.2.7.14 **5.4.7** Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

5.2.7.15 **5.4.8** The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be a listed fire-resistant cable system with a minimum 1-hour rating, in accordance with 5.4.10, and shall be protected from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

5.4.9 **Power Supply for Emergency Ventilation Fans.** See Chapter 7.

5.2.7.16 **5.4.10** Fire-resistant cables shall be listed and have a minimum 1-hour fire-resistant rating in accordance with ANSI/UL 2196 and shall be installed per the listing requirements.

5.4.11 moved to 5.4.8

5.4.11 **Emergency Power.** Emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110 shall be provided for enclosed stations.
5.4.11 moved to 5.4.8

5.4.11.1 The supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.

5.4.11.2 The emergency power system shall have a capacity and rating sufficient to supply all equipment required to be connected by 5.4.11.4.

5.4.11.3 Selective load pickup and load shedding shall be permitted in accordance with NFPA 70.

5.4.11.4 The following systems shall be connected to the emergency power system:

1. Emergency lighting
2. Protective signaling systems
3. Emergency communication system
4. Fire command center

5.4.11 moved to 5.4.8

5.3 Means of Egress.

5.3.1 General

5.3.1.1 General. The provisions for means of egress for a station shall comply with Chapter 7 and Chapter 12 of NFPA 101, except as herein modified.

5.3.1.2 For a station, the design of the means of egress shall be based on an emergency condition requiring evacuation of the train(s) and station occupants to a point of safety.

5.3.2 Occupant Load.

5.3.2.1 The occupant load for a station shall be based on the train load of trains simultaneously entering the station on all tracks in normal traffic direction plus the simultaneous entraining load awaiting trains.

5.3.2.2 The train load shall consider only one train at any one track.

5.3.2.3 The basis for calculating train and entraining loads shall be the peak period ridership figures as projected for design of a new system or as updated for an operating system.

5.3.2.4 For station(s) servicing areas such as civic centers, sports complexes, and convention centers, the peak ridership figures shall consider events that establish occupant loads not included in normal passenger loads.

5.3.2.5 At multilevel, multilane, or multiplatform stations, the maximum occupant load for each platform shall be considered separately for the purpose of sizing the means of egress from that platform.

5.3.2.6 At multilevel stations, multilane, or multiplatform simultaneous loads shall be considered for all egress routes passing through each level of that station.

5.3.2.7 Where an area within a station is intended for use by other than passengers or employees, the occupant load for that area shall be determined in accordance with the provisions of NFPA 101 as appropriate for the class of occupancy.
5.3.8  
**5.5.5**.1–The additional occupant load shall be included in determining the required egress from that area.

5.3.9  
**5.5.5**.2–The additional occupant load shall be permitted to be omitted from the station occupant load when the area has independent means of egress of sufficient number and capacity.

5.3.10  
**5.5.6**–**Calculation of Platform Occupant Load.** The platform occupant load for each platform in a station shall be the maximum peak period loads calculated according to **5.5.5.6**.1 through **5.5.5.6**.4.

5.3.11  
**5.5.5**.1–The peak period occupant load for each platform shall be based on the simultaneous evacuation of the entraining load and the train load for that platform in the peak period.

5.3.12  
**5.5.5**.2–The entraining load for each platform shall be the sum of the entraining loads for each track serving that platform.

5.3.13  
**5.5.6**.1–The entraining load for each track shall be based on the entraining load per train headway factored to account for service disruptions and system reaction time.

5.3.14  
**5.5.6**.2–Where a platform serves more than one line on one track, the calculation of entraining load shall consider the combined effect of accumulation for each of the lines served.

5.3.15  
**5.5.6**.3–The train load for each platform shall be the sum of the train loads for each track serving that platform.

5.3.16  
**5.5.6**.1–The maximum train load for each track shall be based on the train load per train headway factored to account for service disruptions and system reaction time.

5.3.17  
**5.5.6**.4–The maximum train load at each track shall be the maximum passenger capacity for the largest capacity train operating on that track during the peak period.

5.3.3  
**5.5.6**–**Number and Capacity and Location of Means of Egress.**

5.3.3.1  
**5.5.6**.1–**Platform Evacuation Time.** There shall be sufficient egress capacity to evacuate the platform occupant load as defined in **5.5.5.6** from the station platform in 4 minutes or less.

5.3.3.2  
**5.5.6**.2–**Evacuation Time to a Point of Safety.** The station also shall be designed to permit evacuation from the most remote point on the platform to a point of safety in 6 minutes or less.

5.3.3.3  
**5.5.6**.1–For open stations where the concourse is below or protected from the platform by distance or materials as determined by an appropriate engineering analysis, that concourse shall be permitted to be defined as a point of safety.

5.3.3.4  
**5.5.6**.2–For enclosed stations equipped with an emergency ventilation system designed in accordance with Chapter 7, where the emergency ventilation system provides protection for the concourse from exposure to the effects of a train fire at the platform as confirmed by engineering analysis, that concourse is permitted to be defined as a point of safety.

5.3.3.5  
**5.5.6**.1–**Travel Distance.** The maximum travel distance on the platform to a point at which a means of egress route leaves the platform shall not exceed 100 m (325 ft).

5.3.3.6  
**5.5.6**.1–**Common Path of Travel.** A common path of travel from the platform ends shall not exceed 25 m (82 ft) or one car length, whichever is greater.
5.3.3.7  **5.5.1.3-Alternate Egress.** At least two means of egress remote from each other shall be provided from each station platform.

5.3.3.8  **5.5.1.3.1–Means of egress from separate platforms shall be permitted to converge.**

5.3.3.9  **5.5.1.3.2–Where means of egress routes from separate platforms converge, the subsequent capacity of the egress route shall be sufficient to maintain the required evacuation time from the incident platform.**

5.3.3.10  **5.5.6.1.2* Engineering Analysis.** Modification of the evacuation times and travel distances shall be permitted based on an engineering analysis by evaluating material heat release rates, station geometry, and emergency ventilation systems.

**Redundant**

5.5.6.2.3* Modification of the evacuation time shall be permitted based on an engineering analysis by evaluating material heat release rates, station geometry, and emergency ventilation systems.

**Redundant**

5.5.6.3 Capacity of Means of Egress Components. The capacity of the means of egress shall be computed in persons per millimeter per minute (p/mm-min) [persons per inch per minute (pim)], and passenger travel speeds in meters per minute (m/min) [feet per minute (fpm)] in accordance with 5.5.6.3.1 through 5.5.6.3.4.

5.3.4  **5.5.6.3.1-Platforms, Corridors, and Ramps.**

5.3.4.1  **5.5.6.3.1.1–A minimum clear width of 1120 mm (44 in.) shall be provided along all platforms, corridors, and ramps serving as means of egress.**

5.3.4.2  **5.5.6.3.1.2* In computing the means of egress capacity available on platforms, corridors, and ramps, 300 mm (12 in.) shall be deducted at each sidewall and 450 mm (18 in.) at open platform edges.**

5.3.4.3  **5.5.6.3.1.3–The maximum means of egress capacity of platforms, corridors, and ramps shall be computed at 0.0819 p/mm-min (2.08 pim).**

5.3.4.4  **5.5.6.3.1.4–The maximum means of egress travel speed along platforms, corridors, and ramps shall be computed at 38 m/min (124 fpm).**

5.3.4.5  **5.5.6.3.1.5* The means of egress travel speed for concourses and other areas where a lesser pedestrian density is anticipated shall be computed at 61.0 m/min (200 fpm).**

5.3.5  **5.5.6.3.2-Stairs and Escalators.**

5.3.5.1  **5.5.1.2–Stairs and escalators permitted by 5.2.3.1 to be unenclosed shall be permitted to be counted as contributing to the means of egress capacity in stations as detailed in 5.5.2 and 5.5.6.**

5.3.5.2  **5.5.6.3.2.1–Stairs in the means of egress shall be a minimum of 1120 mm (44 in.) wide.**

**Redundant**

5.5.6.3.2.2* Escalators shall be permitted to be used as a means of egress.

5.3.5.3  **5.5.6.3.2.3* Capacity and travel speed for stairs and escalators shall be computed as follows:**

(1) Capacity — 0.0555 p/mm-min (1.41 pim)

(2)* Travel speed — 15 m/min (48 fpm) (indicates vertical component of travel speed)

5.3.5.4  **5.5.6.3.2.4* Escalators shall not account for more than half of the means of egress capacity at any one level.**
5.3.5.5  Escalators shall be permitted to account for more than one-half of the required means of egress capacity at any one level where the following criteria are met:

(1) The escalators are capable of being remotely brought to a stop in accordance with the requirements of 5.5.2.1(3)(b), 5.5.2.1(4), and 5.5.2.1(5).

(2) A portion of the means of egress capacity from each station level is comprised of stairs.

(3) For enclosed stations, at least one enclosed exit stair or exit passageway shall provide continuous access from the platforms to the public way.

5.3.5.6  In calculating the egress capacity of escalators,

(1) one escalator at each level shall be considered as being out of service, and

(2) The escalator chosen shall be the one having the most adverse effect upon egress capacity.

Redundant

5.5.2 Escalators. (See also Section C.2.)

5.3.5.7  Escalators shall be permitted as a means of egress in stations, provided the following criteria are met:

(1)* The escalators shall be constructed of noncombustible materials.

(2)* Escalators running in the direction of egress shall be permitted to remain operating.

(3) Escalators running reverse to the direction of egress shall be capable of being stopped locally and remotely as follows:

(a) Locally by manual stopping device at the escalator

(b) Remotely by one of the following:

   i. A manual stopping device at a remote location

   ii. As part of a pre-planned evacuation response

(4)* Where provision is made for remote stopping of escalators counted as means of egress, where one of the following shall apply:

(a) The stop shall be delayed until it is preceded by a minimum 15-second audible signal or warning message sounded at the escalator

(b) Where escalators are equipped with the necessary controls to decelerate in a controlled manner under the full rated load, the stop shall be delayed for at least 5 seconds before beginning deceleration and the deceleration rate shall be no greater than 0.052 m/sec² (0.17 ft./sec²).

(5) Where an audible signal or warning message is used, the following shall apply:

(a) The signal or message shall have a sound intensity that is at least 15 dBA above the average ambient sound level for the entire length of the escalator.

(b) The signal shall be distinct from the fire alarm signal.

(c) The warning message shall meet audibility and intelligibility requirements.

5.3.5.8  Escalators with or without intermediate landings shall be acceptable as a means of egress, regardless of vertical rise.
5.3.5.9 **5.5.2.3** Escalators exposed to the outdoor environment shall be provided with slip-resistant landing and floor plates, and if they are exposed to freezing temperatures, the landing and floor plates and steps shall be heated to prevent the accumulation of ice and snow.

5.3.5.10 **5.5.2.4** Stopped escalators shall be permitted to be started in the direction of egress in accordance with the requirements for stopping of escalators described in 5.5.2.1(3), (4), and (5), provided that the escalators can be restarted in a fully loaded condition and that passengers are given warning.

5.3.6 **5.5.6.3.3** Elevators.

5.3.6.1 **5.5.6.3.3.1** Elevators meeting the requirements of sections 5.5.6.3.3.2 through 5.5.6.3.3.4 shall be permitted to account for part of the means of egress capacity in stations.

5.3.6.2 **5.5.6.3.3.2 Capacity and Numbers.** Where elevators are counted as contributing to the means of egress capacity, the following shall apply:

1. They shall comprise no more than 50 percent of the required egress capacity.

2. At least one elevator shall be considered out of service, and one elevator shall be reserved for fire service.

3. The capacity of each elevator shall be the carrying capacity of the elevator within 30 minutes.

5.3.6.3 **5.5.6.3.3.3 Holding Area.** Elevators counted as contributing to the means of egress capacity shall be accessed via holding areas or lobbies that shall be designed as follows:

1. The holding areas or lobbies shall be separated from the platform by a smoke-tight fire separation having a fire resistance rating of at least 1 hour, but not less than the time required to evacuate the holding area occupant load.

2. At least one stair shall be accessible from the holding area.

3. The holding area shall be sized to accommodate one person per 0.46 m² (5 ft²).

4. If the holding area includes portions of the platform, the area within 460 mm (18 in.) of the trainway shall not be considered in the calculation.

5. Upon activation of smoke control in the platform or adjacent trainway areas, the holding area shall be pressurized to a minimum of 25 Pa (0.051 in. of water gauge).

6. The holding area shall be provided with emergency voice alarm devices with two-way communication to the system operations control center.

5.3.6.4 **5.5.6.3.3.4 Design Features.** Elevators counted as contributing to the means of egress capacity shall be designed as follows:

1. Shaft enclosures shall be constructed as smoketight fire separations having a 2-hour fire resistance rating.

2. The design shall limit water flow into the shaft.

3. No more than two elevators used for means of egress or fire department access shall share the same machine room.
(4) Machine rooms shall be separated from each other by fire separations having a minimum fire resistance rating of 2 hours.

(5) The elevators shall be connected to emergency power.

(6)* During emergency evacuation, the elevators shall travel only between the incident platform level and a point of safety.

5.3.7 5.5.6.3.4 Doors, Gates, and Exit Hatches.

5.3.7.1 5.5.6.3.4.1 Doors and gates in the means of egress shall have a minimum clear width of 910 mm (36 in.).

5.3.7.2 5.5.6.3.4.2 The maximum means of egress capacity for doors and gates shall be computed as follows:

(1) 60 people per minute (ppm) for single leaf doors and gates

(2)* 0.0819 p/mm-min (2.08 pim) for bi-parting multileaf doors and gates measured for the clear width dimension.

5.3.7.3 5.5.6.3.4.3 Emergency exit gates shall be in accordance with NFPA 101.

5.3.7.4 5.5.6.3.4.4 Gate-type exits shall be provided for at least 50 percent of the required emergency exit capacity unless fare collection equipment provides unobstructed exiting under all conditions.

5.3.7.5 5.5.6.3.4.5 Where used, exit hatches shall comply with the requirements of 6.2.2.5.

5.3.8 5.5.6.3.5 Fare Collection Equipment.

5.3.8.1 5.5.6.3.5.1 Gate-type fare collection equipment shall meet the following criteria:

(1) They shall provide a minimum of 450 mm (18 in.) clear width at and below a height of 960 mm (38 in.) and 710 mm (28 in.) clear width above a height of 960 mm (38 in.) when deactivated.

(2) Consoles shall not exceed 1010 mm (40 in.) in height.

(3) They shall have a capacity of 50 ppm for egress calculations.

5.3.8.2 5.5.6.3.5.2 Turnstile-type fare collection equipment shall be permitted in accordance with NFPA 101 and shall account for a capacity of 25 ppm for egress calculations.

5.3.8.3 5.5.6.3.5.3 Electronically operated fare collection equipment in the required means of egress shall be designed to release, permitting unimpeded travel in the direction of egress upon the following conditions:

(1) Power failure or ground fault condition

(2) Activation of the station fire alarm signal

(3) Manual activation from a switch in a constantly attended location in the station or operations control center

Redundant 5.5.3 Fare Collection Gates or Turnstiles. The design features of 5.5.3.1 and 5.5.3.2 shall be provided to facilitate the exit of passengers in the event of an emergency.

Redundant 5.5.3.1 The fare gates or turnstiles shall assume an emergency exit mode in the event of loss of power to the fare gates or turnstiles or upon actuation of a manual or remote control.
5.3.8.4 **5.5.3.2** Fare collection gates or turnstiles shall be designed so that their failure to operate properly will not prohibit movement of passengers in the direction of the emergency egress.

5.3.9 **Horizontal Exits**

5.3.9.1 **5.5.4** Horizontal exits compliant with NFPA 101 shall be permitted for up to 100 percent of the number and required egress capacity provided that not more than 50 percent of the number and required capacity is into a single building.

5.3.10 **Platform Screen and Edge Doors.** Horizontal sliding platform screen or platform edge doors shall be permitted to separate the platform from the trainway in stations, provided that the following criteria are met:

5.3.10.1 **5.5.4** Horizontal sliding platform screen or platform edge doors shall be permitted to separate the platform from the trainway in stations, provided that the following criteria are met:

1. The doors permit emergency egress from the train to the platform regardless of the stopping position of the train.
2. The doors provide egress when a force not exceeding 220 N (50 lb) is applied from the train side of the doors.
3. The doors are designed to withstand positive and negative pressures caused by passing trains.

5.3.11 **Emergency Lighting.**

5.3.11.1 **5.6.1** Illumination of the means of egress in stations shall be in accordance with Section 7.8 of NFPA 101, except as otherwise noted in this standard.

5.3.11.2 **5.6.2** Means of egress shall be provided with a system of emergency lighting in accordance with Section 7.9 of NFPA 101, except as otherwise noted in this standard.

5.3.11.3 **5.6.2.1** Emergency lighting for stairs and escalators shall be designed to emphasize illumination on the top and bottom steps and landings.

5.3.11.4 **5.6.2.2** All newel- and comb-lighting on escalator steps shall be on emergency power circuits.

5.4 **Fire Protection.**

5.4.1 **5.7.6** Fire Command Center.

5.4.1.1 **5.7.6.1** Underground stations shall be provided with a fire command center in accordance with NFPA 72.

5.4.1.2 **5.7.6.2** The ventilation systems at adjacent tunnels and stations shall be permitted to be omitted from the controls of the fire command center.

5.4.2 **Protective Signaling Systems.**

5.4.2.1 **5.7.1.1** Stations equipped with fire alarm devices shall be protected by a proprietary system as defined in NFPA 72.

5.4.2.2 **5.7.1.2** Each station having fire alarm initiating devices shall be provided with a fire alarm annunciator panel at a location that is accessible to emergency response personnel in accordance with NFPA 72.

5.4.2.3 **5.7.1.2.1** The location of the fire alarm annunciator panel shall be approved.
5.4.2.4  §5.7.1.2.2 Annunciator panels shall announce by audible alarm the activation of any fire alarm–initiating device in the station and visually display the location of the actuated device.

5.4.2.5  §5.7.1.3 When activated, all indicator signals for fire alarms, smoke detection, valve switches, and workflow shall be transmitted simultaneously to the local station and to the operations control center.

5.4.2.6  §5.7.1.4* Separate zones shall be established on local station annunciator panels to monitor workflow on sprinkler systems and supervise main control valves.

5.4.2.7  §5.7.1.5 Automatic fire detection shall be provided in all ancillary spaces by the installation of listed combination fixed-temperature and rate-of-rise heat detectors or listed smoke detectors except where protected by automatic sprinklers.

5.4.3  §5.7.2 Emergency Communication.

5.4.3.1  §5.7.2.1 A public address (PA) system and emergency voice alarm reporting devices, such as emergency telephone boxes or manual fire alarm boxes conforming to NFPA 72, shall be required in stations.

5.4.3.2  §5.7.2.2 The operations control center and each system station shall be equipped with an approved emergency voice/alarm communication system so that appropriate announcements can be made regarding fire alarms, including provisions for giving necessary information and directions to the public upon receipt of any manual or automatic fire alarm signal.

5.4.3.3  §5.7.2.2.1 These notification devices shall be placed in approved locations at each facility.

5.4.3.4  §5.7.2.3 Emergency alarm reporting devices shall be located on passenger platforms and throughout the stations such that the travel distance from any point in the public area shall not exceed 100 m (325 ft) unless otherwise approved.

5.4.3.5  §5.7.2.3.1 Such emergency devices shall be distinctive in color, and their location shall be plainly indicated by appropriate signs.

5.4.4  §5.7.3 Automatic Sprinkler Systems.

5.4.4.1  §5.7.3.1 An automatic sprinkler protection system shall be provided in areas of stations used for concessions, in storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible loadings, except trainways.

5.4.4.2  §5.7.3.1.1 Sprinkler protection shall be permitted to be omitted in areas of open stations remotely located from public spaces.

5.4.4.3  §5.7.3.2 Installation of sprinkler systems shall comply with NFPA 13 or applicable local codes as required.

5.4.4.4  §5.7.3.3 A sprinkler system workflow alarm and supervisory signal service shall be installed.

5.4.4.5  §5.7.3.4 Other fire suppression systems, if approved, shall be permitted to be substituted for automatic sprinkler systems in the areas listed in 5.7.3.1.

5.4.4.6  §5.7.3.5 Automatic fire sprinkler systems shall be tested and maintained in accordance with NFPA 25.

5.4.5  §5.7.4 Standpipe and Hose Systems.
5.4.5.1 Class I or Class III standpipes shall be installed in enclosed stations in accordance with NFPA 14 except as modified herein.

5.4.5.2 Standpipe systems shall not be required to be enclosed in fire-rated construction provided the following conditions are met:

(1) The system is cross-connected or fed from two locations.

(2) Isolation valves are installed not more than 245 m (800 ft) apart.

5.4.5.3 In addition to the usual identification required on fire department connections for standpipes, there shall also be wording to identify the fire department connection as part of the station system.

5.4.5.4 Where underground stations include more than one platform level (such as crossover subway lines), there shall be a cross-connection pipe of a minimum size of 100 mm (4 in.) in diameter between each standpipe system, so that supplying water through any fire department connection will furnish water throughout the entire system.

5.4.5.5 Standpipe and hose systems shall be tested and maintained in accordance with NFPA 25.

5.4.6 Portable Fire Extinguishers. Portable fire extinguishers in such number, size, type, and location as determined by the authority having jurisdiction shall be provided.

5.4.6.1 Portable fire extinguishers shall be maintained in accordance with NFPA 10.

5.7.6 Fire Command Center.

5.7.6.1 Underground stations shall be provided with a fire command center in accordance with NFPA 72.

5.7.6.2 The ventilation systems at adjacent tunnels and stations shall be permitted to be omitted from the controls of the fire command center.

5.4.7 Ventilation.

5.4.7.1 Emergency ventilation shall be provided in enclosed stations in accordance with Chapter 7.

5.4.8 Emergency Power. Emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110 shall be provided for enclosed stations.

5.4.8.1 The supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.

5.4.8.2 The emergency power system shall have a capacity and rating sufficient to supply all equipment required to be connected by 5.4.11.4.

5.4.8.3 Selective load pickup and load shedding shall be permitted in accordance with NFPA 70.

5.4.8.4 The following systems shall be connected to the emergency power system:

(1) Emergency lighting

(2) Protective signaling systems

(3) Emergency communication system
5.8 Storage Tanks and Service Stations.

5.8.1 Aboveground storage tanks above subsurface stations shall meet the requirements of 6.6.4.

5.8.2 Underground storage tanks above subsurface station structures shall meet the requirements of 6.6.5.

5.8.3 Service stations above subsurface station structures shall meet the requirements of 6.6.6.

5.8.4 Existing storage tanks in or under buildings shall meet the requirements of 6.6.7.

5.9 Interior Finish.

5.9.1 Enclosed Stations.

5.9.1.1 Interior wall and ceiling finish materials in enclosed stations shall comply with one of the following:

(1) Interior wall and ceiling finish materials shall be noncombustible materials.

(2) Interior wall and ceiling finish materials, other than textile wall coverings or foam plastic insulation, shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 450, when tested by ASTM E 84.

5.9.1.2 Interior wall and ceiling finish materials, when tested in accordance with NFPA 286, shall comply with the following:

(1) Flames shall not spread to the ceiling during the 40 kW (135 kBTu/hr) exposure.

(2) During the 160 kW (545 kBTu/hr) exposure, the following criteria shall be met:

(a) Flame shall not spread to the outer extremities of the sample on the 2.45 m x 3.7 m (8 ft x 12 ft) wall.

(b) The peak heat release rate shall not exceed 800 kW (2730 kBTu/hr).

(e) Flashover shall not occur.

(3) The total smoke released throughout the test shall not exceed 1000 m$^2$ (10,764 ft$^2$).

5.9.1.3 Interior Floor Finish. Interior floor finish materials in enclosed stations shall be noncombustible or shall exhibit a critical radiant flux not less than 0.8 W/cm$^2$ when tested in accordance with ASTM E 648.

5.9.2 Open Stations.
5.9 moved to 5.2.5

5.10 moved to 5.2.6

5.9.2.1 Interior finish in open stations shall comply with the requirements of NFPA 101, Chapter 12.

5.10 Rubbish Containers.

Rubbish containers shall be manufactured of noncombustible materials.

5.11* Combustible Furnishings and Contents.

Where combustible furnishings or contents not specifically addressed in this standard are installed in a station, a fire hazard analysis shall be conducted to determine that the level of occupant fire safety is not adversely affected by the furnishings and contents.
Add to the list of permitted methods:

The maximum extent of the charred portion measured on the sample shall not have reached a height exceeding 2.5 m above the bottom edge of the burner when tested in accordance with IEC60332-3-24 Cat C.

A cable is listed as Low Smoke when tested to IEC61034-2. The minimum value of light transmission shall be 60% throughout the test.

Cables that meet the requirements of NFPA 130 are not compliant with the European designed systems. The electrical shielding methods and cable flexibility is not suitable and reduces service life. Additionally cables that meet the requirements of NFPA 130 are manufactured to order items (there is not inventory available) adding commercial constraints to the project. Introducing IEC standards solves the technical problems encountered with installation and service life and elevates inventory supply problems.

Note: Supporting material is available for review at NFPA Headquarters.

This is not original material; its reference/source is as follows:
The proposed sentence starting "The maximum extent of" is taken from IEC60332-3-24 Cat C.

After Section 5.1, add new text as follows:

The requirements in this Chapter are intended to supplement the requirements of the local building codes for the design and construction of stations. Where these requirements do not address a specific feature of fire protection or life safety, the requirements of the local building codes shall be considered applicable.

This clause is specifically intended to refer to features that would otherwise normally be required in the design and construction of stations. It is not intended to apply to trainways, or to invoke requirements that would normally be applicable in the design of a building of similar size or configuration as a station.

NFPA 130 is intended as an ‘exceptions document’ to other building codes with respect to requirements for stations, but that intent is not stated anywhere in the Standard. The proposed wording addresses that problem, while the Appendix language is intended to limit the potential that this clause will be used to invoke excessive requirements.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Submitters: Katherine Fagerlund, Sereca Fire Consulting Ltd.  
Recommendation: Add text to read as follows:

5.2.3 Air Rights Structures.
5.2.3.1 Where an air-rights structure encloses a station, the station shall be considered an enclosed station for emergency access, egress, fire-protection and ventilation purposes and shall comply with the requirements of Chapter 5.
5.2.3.2 Where an air-rights structure does not fully enclose the station, the decision to consider it as an open station shall be based on an engineering analysis.
5.2.3.3 All structural elements that support air-rights structures over stations and all components that provide separation between air-rights structures and stations shall have a minimum 3-hour fire resistance rating in accordance with ASTM E 119.
5.2.3.4 Structural members shall be protected from physical damage from vehicle impact.
5.2.3.5 All other construction and compartmentation/separation requirements shall be in accordance with section 5.2 and local codes as approved by the AHJ.
Substantiation: Additional language is needed to address subject matter that is not currently addressed in NFPA 130.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Submitters: George A. Straniero, AFC Cable Systems, Inc.
Recommendation: Revise 5.4.5 as follows to delete “wires” from the requirements of 5.4.5.1 and 5.4.5.2.
5.4.5 All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 5.4.5.1 or 5.4.5.2.
Substantiation: Inclusion of “wires” in the text of 5.4.5 requires that single insulated conductors be listed to the flame and smoke test requirements of 5.4.5.1 and 5.4.5.2. The National Electrical Code does not permit single insulated conductors to be installed unless they are contained within raceways or cables. Section 5.4.2 requires non-combustible raceways, and since cables are required to be listed to the flame and smoke test requirements of 5.4.5.1 and 5.4.5.2, the requirements of 5.4.5 do not apply to single insulated conductors and should be deleted.

Submitters: Gil Shoshani, RSCC
Recommendation: Add text to read as follows:
5.4.5 All wires and cables used in enclosed stations shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 5.4.5.1 or 5.4.5.2.
Substantiation: Presently the standard is unclear with respect to the applicability of the spread of fire and smoke requirements for wire and cables as it applies to either open or enclosed stations. The requirements beyond NFPA 70 are not applicable to open stations.
This is not original material; its reference/source is as follows:
Task Group 7.
Add new Acid gas testing requirements for wire and cable

5.4.6 All wires and cables used for enclosed stations and trainways shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643.

Renumber subsequent sections.

Substantiation: The committee added the requirement for acid gas test per MIL-DTL-24643. Compliance with this requirement will help reduce the presence of acid gas in a fire event. Acid gas acts as both an eye irritant and respiratory inhibitor and degrades tenability.

This is consistent with the wire and cable requirements of NFPA 502 for similar enclosed applications.

Revise 5.4.6.1 by permitting wiring methods in air plenums in accordance with NFPA 90A as follows:

5.4.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10 as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, or shall be installed in metal raceways, metal sheathed cable, or totally enclosed non-ventilated busway.

Substantiation: The NFPA Standards Council has directed to the NEC that NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilation Systems, has jurisdiction over wiring in air handling plenums. The proposed revised text is taken from the requirements of NFPA 90A, section 4.3.11.2.6.1 and should be a requirement in NFPA 130 where wiring is installed in air plenums. Fire resistive cables were deleted since they can be included in the proposed revised requirements.
5.4.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be a listed fire resistive cable system with a minimum 1-hour rating, in accordance with 5.4.10, and shall be protected from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

5.4.8 The emergency power circuits and communication circuits shall be designed and located so as to minimize damage from normal system operations and shall remain functional during a fire utilizing one of the following methods:

1. A fire-resistive cable listed for 2-hours in accordance with ANSI/UL 2196 and tested to ASTM E119
2. Circuits embedded in concrete or protected by a 2-hour fire barrier system in accordance with UL 1724. The cables or conductors shall be suitable to maintain functionality at the temperature within the embedded conduit or fire barrier system.
3. Routing external to the interior underground portion of the system facility
4. Diversity in system routing (such as separate redundant or multiple circuits separated by a 2-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

**Note to Committee:** If this proposal is accepted, section 5.4.10 should be deleted because it will be addressed in the new 5.4.8 (1)

**Substantiation:** Changed from "emergency lighting" to "emergency power" to more globally address the essential emergency circuits that should be connected to the emergency power system. This was necessary to encompass all life safety circuits such as power to the fire alarm panel, protective signaling system etc.

Reworded the opening statement to clarify that the circuit needs to be protected from physical damage and remain functional from fire conditions.

Changed from 1-hour protection from fire to 2-hours to be consistent with the NFPA 70 article 700

Quantified suitable embedded or encasement in concrete with respect to circuit functionality

This is not original material; its reference/source is as follows:

Task Group 7.

Recommendation: Revised text to read as follows:

5.4.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be a listed fire resistive cable system with a minimum 1-hour rating, in accordance with 5.4.10, and shall be protected from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

5.4.8.1 The circuits shall be protected to ensure operation for at least 1 hour when exposed to fire conditions corresponding to the time-temperature curve in the ASTM E 119 fire resistance test by any of the following:

1. Suitable encasement
2. Routing of conductors outside the underground portion of the system facility
3. Diversity in system routing (such as separate redundant circuits or multiple circuits separated by a fire barrier with a 1-hour fire resistance rating so that a single fire or emergency event will not lead to a failure of the system)
4. All circuits consist of listed fire-resistive cable systems with a minimum 1-hour fire resistance rating in accordance with 5.4.10.

Substantiation: "Protection from ASTM E 119 fire conditions" is an unclear statement. ASTM E 119 is a fire resistance test intended for use to assess the fire resistance rating of products or assemblies and it produces a number, which represents the time to failure. It appears that the intent of the committee is that the circuits shall be protected from failure for at least one hour if exposed to a fire corresponding to the ASTM E 119 time-temperature curve. The language in NFPA 130 does not explain how long the protection needs to be. The terms "fire barrier" and "embedment" are not sufficiently clear or potentially misleading.

Consistent language is being proposed for 5.4.8, 6.3.3.2.8 and 7.7.7.1, which all have the same concepts.

Fire Barrier. A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

Embedment is a phenomenon in mechanical engineering in which the surfaces between mechanical members of a loaded joint embed. It can lead to failure by fatigue as described below, and is of particular concern when considering the design of critical fastener joints.
The emergency lighting and communications circuits shall be protected from physical damage by system vehicles and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portions of the system facilities
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system
4. Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 6.3.3.2.10

The circuits shall be protected to ensure operation for at least 1 hour when exposed to fire conditions corresponding to the time-temperature curve in the ASTM E 119 fire resistance test by any of the following:

1. Suitable encasement
2. Routing of conductors outside the underground portion of the system facility
3. Diversity in system routing (such as separate redundant circuits or multiple circuits separated by a fire barrier with a 1-hour fire resistance rating so that a single fire or emergency event will not lead to a failure of the system
4. All circuits consist of listed fire-resistive cable systems in systems with a minimum 1-hour fire resistance rating in accordance with 6.3.3.2.10

Consistent language is being proposed for 5.4.8, 6.3.3.2.8 and 7.7.7.1, which all have the same concepts.

Substantiation: “Protection from ASTM E 119 fire conditions” is an unclear statement. ASTM E 119 is a fire resistance test intended for use to assess the fire resistance rating of products or assemblies and it produces a number, which represents the time to failure. It appears that the intent of the committee is that the circuits shall be protected from failure for at least one hour if exposed to a fire corresponding to the ASTM E 119 time-temperature curve. The language in NFPA 130 does not explain how long the protection needs to be. The terms “fire barrier” and “embedment” are not sufficiently clear or potentially misleading.

Consistent language is being proposed for 5.4.8, 6.3.3.2.8 and 7.7.7.1, which all have the same concepts.

Fire Barrier. A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

Embedment is a phenomenon in mechanical engineering in which the surfaces between mechanical members of a loaded joint embed. It can lead to failure by fatigue as described below, and is of particular concern when considering the design of critical fastener joints.
Gil Shoshani, RSCC

Recommendation:  5.4.11.4 The following systems shall be connected to the emergency power system:
(1) Emergency lighting
(2) Protective signaling systems
(3) Emergency communication system
(4) Fire command center
(5) Elevators

Substantiation:  Since elevators are permitted to account for part of the means of egress capacity in station, elevator emergency power is essential.

This is not original material; its reference/source is as follows:
Task Group 7.

Katherine Fagerlund, Sereca Fire Consulting Ltd.

To Section 5.4.11.4, add “(5) Elevators providing required egress capacity (see Section 5.5.6.3.3.4 (5))”

For consistency, revise Section 5.4.11.4 to include all other items that require emergency power, with cross-references to the location of those items.

Substantiation:  Elevators can be used for emergency egress as long as the smoke detector has not gone off and caused a recall. If they are used but not counted in the egress calculations the elevators do not have to be on the emergency power. They are only being used to facilitate egress.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Katherine Fagerlund, Sereca Fire Consulting Ltd.

Revise text to read as follows:
5.5.1.3 Alternate Egress. At least two means of egress remote from each other shall be provided from each station platform.

5.5.1.3.1*  A means of egress used as a public circulation route is permitted to provide more than 50% of the required egress capacity from a station platform.

Renumber remaining clauses accordingly and add Annex A note as follows:
A.5.5.1.3.1  This requirement is intended to replace the requirement in NFPA 101-2012 Clause 7.3.1.1.2 that the loss of one egress route would leave at least 50% of the egress capacity available. The approach is in recognition that station design inherently requires primary circulation routes to be obvious and readily accessible such that preference for such routes would be anticipated in the event of an emergency evacuation.

Substantiation:  The proposed revision reinstates a provision that was included in Clause 5.5.3.5 of the 2003 edition, which stated: “A second means of egress at least 1120 mm (44 in.) wide shall be provided from each station platform.” This provision was unintentionally dropped during the 2007 revisions.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Printed on 12/15/2011
Where an area within a station is intended for use by other than passengers or employees, the occupant load for that area shall be determined in accordance with the provision of NFPA 101 as appropriate for the use class of occupancy.

Recommendation: The proposed change is consistent with the means by which occupant load is determined by NFPA 101. It is not the occupancy classification that is used to determine the occupant load; but rather, the use of the space. See Section 7.3.1.2 and the heading in Table 7.3.1.2 of NFPA 101 for confirmation.

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5.5.5.6 Calculation of Platform Occupant Load. The platform occupant load for each platform in a station shall be the maximum peak period occupant loads calculated according to 5.5.5.6.1 through 5.5.5.6.4.

Substantiation: Proposed changes are for consistency of terminology with the remainder of this section.
This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Exiting

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5.5.6.2.2 For enclosed stations equipped with an emergency ventilation system designed in accordance with Chapter 7, where the emergency ventilation system provides protection for the concourse or any other approved location from exposure to the effects of a train fire at the platform as confirmed by engineering analysis, that concourse or any other approved location is permitted to be defined as a point of safety.

Substantiation: The current text accepts only concourse as a point of safety, any other approved location is not recognized. The text is expanded to include other approved locations, such as platform corridors connecting two side-platforms, stairways, and enclosed exits at the platform ends.
This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
To 5.5.6.2.2, add the following material in Annex A:

A.5.6.6.2.2 Refer to Clause 7.2.7 for requirements related to the type of protection that is required for the point of safety.

7.2.7 Any point of safety that is adequately protected by an emergency ventilation system shall encompass the following:

(1) After the ventilation system has reached full capacity, it shall maintain a tenable environment within the point of safety such that those able to self-rescue can evacuate to the outdoors and those unable to self-rescue can be removed by emergency personnel.

(2) Prior to the ventilation system reaching full capacity, non-tenability is acceptable, providing evacuation can continue when tenability is achieved.

(3) The zone of non-tenability near the perimeter of the fire is not considered.

(4) Lighting and at least one path of emergency egress/ingress are available to support emergency egress and ingress.

(5) Train movements are controlled such that they cannot compromise the intent of the ventilation system.

Substantiation: The interpretation of the words “the emergency ventilation system provides protection” in 5.5.6.2.2 is not clearly defined. The proposed changes will resolve the issue.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Escalators shall not account for more than one-half of the means of egress capacity at any one level.

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 520
Deletion: 5.5.6.3.2.5 Escalators shall be permitted to account for more than one-half of the required means of egress capacity at any one level where the following criteria are met:

- (1) The escalators are capable of being remotely brought to stop after a warning announcement from a location having visual surveillance of the full escalator.
- (2) A portion of the means of egress capacity from each station level is comprised of stairs.
- (3) For enclosed stations, at least one enclosed exit stair or exit passageway shall provide continuous access from the platforms to the public way.

Substantiation: The Committee reduced (from the 2003 edition) the previous minimum egress element width from 68 inches to 43 inches based on the general minimum width standard offered by NFPA 101.

While on one hand the Committee rests its justification on NFPA 101, it ignores other compelling sections of 101 that imply that escalators are not suitable as a means of egress element. For example:

NFPA 101 “7.2.2.3.1.1 – All stairs serving as required means of egress shall be of permanent fixed construction unless they are stairs serving seating that is designed to be repositioned in accordance with Chapters 12 and 13.”

Escalators should not be calculated as an element of a required means of egress because the movement, which can be reversed, may or may not be in the direction of egress. Additionally, stairs that move cannot be considered “fixed construction.”

NFPA 101 “7.2.2.3.3.1 – Stair treads and landings shall be solid without perforations, unless otherwise provided in 7.2.2.3.3.4.”

The slotted or grooved surface of escalator treads does not conform to 7.2.2.3.1. This is due primarily to the hazard presented by footwear that can hang up or become in the escalator tread surface.

NFPA 101 “7.2.2.3.6 – Dimensional Uniformity.

“7.2.2.3.6.1 Variation in excess of 3/16 in. in the depth of adjacent treads or in the height of adjacent risers shall be prohibited, unless otherwise permitted in 7.2.2.3.6.3.

7.2.2.3.6.2 The tolerance between the largest and smaller riser of between the largest and smallest tread shall not exceed 3/8 in. in any flight.”

As escalator treads emerge and withdraw into landings their tread and riser variance are clearly out of compliance with these requirements. Uniformity in tread and riser dimensional is critical to ensure a fixed egress rate. Variable uniformities negatively affect egress rates and can lead to slips, falls, and injuries.

Section 5.5.6.3.2.4* Escalators shall not account for more than half of the means of egress capacity at any one level.

The Annex note here is a reference to A.5.5.6.3.1.2. the “general” provisions found in NFPA 101. The requirements of NFPA 130 are “specific” to a unique occupancy.

Revise text to read as follows:

For enclosed stations, at least one enclosed exit stair or exit passageway shall provide continuous access from the platforms to a point of safety, to the public way.

This requirement is onerous for stations with multiple platforms that exit to a large concourse, for example large underground commuter rail terminals like New York Penn Station. Each platform cannot have an enclosed stairway without severely affecting the public way above. Once a passenger reaches a point of safety, they can safely reach a public way.
Elevators meeting the requirements of sections 5.5.6.3.3.2 through 5.5.6.3.3.4 shall be permitted to account for part of the means of egress capacity in stations.

Where elevators are counted as contributing to the means of egress capacity, the following shall apply:

1. They shall comprise no more than 50 percent of the required egress capacity.
2. At least one elevator shall be considered out of service, and one elevator shall be reserved for fire service.
3. The capacity of each elevator shall be the carrying capacity of the elevator within 30 minutes.

5.5.6.3.3.3 Holding Area. Elevators counted as contributing to the platform means of egress capacity shall be accessed via holding areas or lobbies at the platform level that shall be designed as follows:

1. The holding areas or lobbies shall be separated from the platform by a smoke-tight fire separation having a fire resistance rating of at least 1 hour, but not less than the time required to evacuate the holding area occupant load.
2. At least one stair shall be accessible from the holding area.
3. The holding area shall be sized to accommodate one person per 0.46 m² (5 ft²).
4. If the holding area includes portions of the platform, the area within 460 mm (18 in.) of the trainway shall not be considered in the calculation.
5. Upon activation of smoke control in the platform or adjacent trainway areas, the holding area shall be pressurized to a minimum of 25 Pa (or 0.051 in. of water gauge).
6. The holding area shall be provided with emergency voice alarm devices with two-way communication to the system operations control center.

5.5.6.3.3.4 Elevator Design Features. Elevators counted as contributing to the means of egress capacity shall be designed as follows:

1. Shaft enclosures shall be constructed as smoketight fire separations having a 2-hour fire-resistance rating.
2. The design shall limit water flow into the shaft.
3. No more than two elevators used for means of egress or fire department access shall share the same machine room.
4. Machine rooms shall be separated from each other by fire separations having a minimum fire resistance rating of 2 hours.
5. The elevators shall be connected to emergency power.
6. During emergency evacuation, the elevators shall travel only between the incident platform level and a point of safety.
7. Phase I emergency recall operation shall be initiated by fire alarm initiating devices located
   (a) in each elevator lobby, or for floors not provided with elevator lobbies, at each floor served by the elevator, and
   (b) in the associated elevator machine room.

A.5.5.6.3.3.4(7) Provisions for emergency recall operation should be designed with consideration of fire scenarios on each level served and should demonstrate safe egress for all potential scenarios.

Substantiation: The 2010 edition of NFPA 130 introduced the concept of permitting some of the elevators to be used as part of the means of egress system, provided that the elevators meet the requirements of Section 5.5.6.3.3. It has come to the attention of the TC that elevator recall specific to transit systems and stations had not been adequately addressed in this new section and because of this, there were questions about how this safety feature should be addressed. Elevator recall is an important safety feature for both station occupants as well as emergency responders. Because elevator recall is addressed extensively in various NFPA documents as well as in ASME A17.1/CSA B44 – Safety Code for Elevators and Escalators, it is recommended that text be provided to the Elevator section in NFPA 130 directing the reader to these documents.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Katherine Fagerlund, Sereca Fire Consulting Ltd.

Amend existing text as follows:

A.5.5.6.3.4.4 For gates used as fare collection equipment, refer to Section 5.5.6.3.5. Refer to Chapter 6 for requirements related to platform end gates.

Substantiation: The new annex note clarifies that the 5.5.6.3.4 requirements are not applicable to gates used as fare collection equipment or for platform end gates.

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting


Revise text to read as follows:

Doors and gates in the means of egress shall have a minimum clear width of 810 mm (32 in.) 910 mm (36 in.).

It is unclear why the minimum clear width requirement in NFPA 130 is 910 mm when the typical requirement for minimum clear width of doors in the means of egress is 810 mm. The 810 mm provides a clear width that is usable by individuals including those who may be using a wheelchair. It should be noted that the requirement, as it currently exists in the Standard, applies to all egress doors including those from ancillary spaces, information booths, equipment rooms, etc. It should also be noted that the minimum door leaf to satisfy the current requirement would be in excess of 910 mm.

Katherine Fagerlund, Sereca Fire Consulting Ltd.

Amend existing text as follows:

5.5.6.3.4.1* Doors and gates in the means of egress serving public areas shall have a minimum clear width of 910 mm (36 in.).

A.5.5.6.3.4.1 Refer to NFPA 101 for requirements applicable to the minimum width of each leaf for bi-parting doors and gates. Doors serving non-public areas should be as otherwise required in NFPA 101 (or OH&S regulations).

5.5.6.3.4.2 The maximum means of egress capacity for doors and gates in a means of egress serving public areas shall be computed as follows:

1) 60 people per minute (ppm) for single leaf doors and gates
2)*0.0819 p/mm-min (2.08 pim) for bi-parting multileaf doors and gates measured for the clear width dimension.

Substantiation: Editorial revisions and clarification that 5.5.6.3.4.1 and 2 are applicable only for means of egress serving public areas. The new annex note clarifies width requirements for bi-parting doors and gates, and provides a reference for requirements governing doors and gates serving non-public station areas.

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
130- Log #66 (5.5.6.3.4.2) Final Action:

Recommendation: Revise text to read as follows:
5.5.6.3.4.2 The maximum means of egress capacity for doors and gates shall be computed as follows:
(1) 60 people per minute (ppm) for single leaf doors and gates
(2)* 0.0819 p/mm-min (2.08 pim) for bi-parting multileaf doors and gates measured for the clear width dimension.
Substantiation: In Annex C, the sample egress calculations show service gates (1219 mm in width) with a capacity of either 99 or 100 ppm, it varies between the examples provided. This would be in excess of the 60 ppm limit in the existing text. The 60 ppm limit appears to be based on a minimum clear width of approximately 733 mm (30 in).
Whereas the Annex note indicates that edge effect need not be subtracted for doors and gates, it would appear as if establishing a maximum capacity of 60 ppm for a single leaf door is overly restrictive. If the proposal is not accepted, the Committee should revise the example egress calculations in Annex C to reflect the limit of 60 ppm.

The original format has been retained should the Committee choose to include a maximum capacity for a single leaf door or gate. However, if no such limit is retained, the Annex note for 5.5.6.3.4.2(2) should be moved to be an Annex note to 5.5.6.3.4.2 and the text editorially revised to a single sentence.

130- Log #183 (5.5.6.3.4.3) Final Action:

Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.
Recommendation: Amend existing text as follows:
5.5.6.3.4.3 Emergency exit Gates in a means of egress shall be designed in accordance with the requirements for doors serving as means of egress NFPA 101.
Substantiation: The proposed changes are necessary because there are no requirements for gates in NFPA 101 (except cross-reference to ICC/ANSI A117.1.12.45.1 Break Out Opening in Doors, Doorways, and Gates in Accessible Routes). However, the intent is that gates in a means of egress should conform to the requirements for egress doors, and having revised the language to confirm that intent, there is no need to provide a cross-reference to NFPA 101 as it is already cross-referenced generically as the ‘reference standard’ for NFPA 130—i.e. NFPA 101 is applicable except as provided in NFPA 130.
This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Amend existing text as follows:

5.5.6.3.5.2 Turnstile-type fare collection equipment shall be permitted in accordance with NFPA 101 and shall in the means of egress shall meet the following criteria:

(1) Dimensions shall be in accordance with the requirements of NFPA 101.

(2) Turnstiles that drop away from the egress opening under the conditions listed in 5.5.6.3.5.2 or 5.5.6.3.5.3 shall be credited with a capacity of 50 people per minute for egress calculations.

(3) Turnstiles that revolve freely in the direction of egress under the conditions listed in 5.5.6.3.5.2 shall meet the following criteria:

(a) Each unit shall be credited with a capacity of 25 people per minute (ppm) for egress calculations, and

(b) Gate-type exits shall be provided for at least the required emergency exit egress capacity for each egress route, unless fare collection equipment provides unobstructed exiting under all conditions.

A.5.5.6.3.4.4 "Unobstructed exiting under all conditions" implies that the fare barrier equipment is the type that does not require collection of a proof of payment to operate, and drops away to create an unimpeded egress path in a fail-safe manner when pressure is applied. Turnstile-type gates are not considered "unobstructed exiting."

A.5.5.6.3.5.5 Refer to A.5.5.6.3.5.4

Substantiation: The proposed revisions in this clause, together with those in Clauses 5.5.6.3.5.3 (renumbered as 5.5.6.3.5.2) as well as new Clauses 5.5.6.3.5.3, provide conditional acceptance for turnstiles in the means of egress in stations, which would not otherwise be permitted in the means of egress in assembly occupancies in accordance with the requirements of NFPA 101-2012 Clause 12.2.2.2.10.

Although anthropomorphic data would suggest slightly greater widths are appropriate, it is considered that the dimensional requirements of NFPA 101 (the reference code) should be applied for turnstiles.

Historical Note: In accordance with NFPA 101 Clause 12.2.2.2.10, turnstiles are not permitted to be installed 'in such a manner as to interfere with required means of egress facilities'. A proposed amendment in the 101-2002 ROP included the TC statement that "there is not an outright prohibition on all turnstiles in assembly occupancies. Rather, 12.2.2.2.7 and 13.2.2.2.7 use performance language to assure that turnstiles do not interfere with required egress." That statement contradicts 12.2.2.2.9, added in the 101-2002 ROC, with reference to consistency with NFPA 5000.

Section 5.5.6.3.4.4 imposes a condition on design of fare collection equipment and is therefore more appropriately located with these requirements. It is incorporated into 5.5.6.3.5.5 as it is considered applicable to turnstile type fare collection equipment that revolves freely in the direction of egress under specified conditions, consistent with NFPA 101-2012 Clause 7.2.1.11.1. Turnstiles that do not meet these requirements are not permitted in the means of egress. Changes to requirements related to gate-type barriers render this clause inappropriate for such equipment—i.e., gate-type fare collection equipment that does not comply with the revised requirements is not permitted to account for means of egress capacity in stations.

The proposed new annex material for Clause 5.5.6.3.5.3 (renumbered as 5.5.6.3.5.2) and revisions to the requirements in this Clause renders the previous A.5.5.6.3.4.4 annex material irrelevant.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Amend existing text as follows:

The terminology change is proposed to recognize that, in some cases, barriers that are provided to divide fare-paid from non-fare-paid zones are not designed to collect fares—e.g., along routes serving only for egress from the station in systems that do not require proof of payment on exiting the system.

Amend terminology in the remainder of the section accordingly.

Amend existing text as follows:

5.5.6.3.5 Gate-type fare collection equipment in the means of egress shall meet the following criteria:

(1) They Each unit shall provide a minimum of 450 mm 455 mm (18 in.) clear width at and below a height of 960 mm (38 in) 1000 mm (39.5 in.) and 510 mm (20 in.) 530 mm (21 in.) clear width above that height, or 960 mm (38 in.) when deactivated.

(2) Consoles shall not exceed 1010 mm (40 in.) in height.

(3) They Each unit shall be credited with have a capacity of 50 people per minute (ppm) for egress calculations.

Substantiation: Renumbering to relocate requirements per re-organization of section as reflected in other related proposals. Editorial changes in the first paragraph and in clause (3) (renumbered as Clause (2)) are consistent with NFPA 101 language. Changes to Clause (1) are intended to provide dimensional requirements that more appropriately reflect current anthropometric data, as follows:

- The dimensional requirements of clause (1) were first included in the 2007 edition of NFPA 130. The change was recorded through the NFPA 130 committee’s ROP in 2006 (130-113 Log #127) and were provided to conform to the NFPA 101, Clause 7.3.4.1.1 requirements for minimum width for access past furniture and movable partitions up to 15m long, which are derived from anthropometric data allowing for body sway at shoulder level.

- Anthropometric data indicates that the 97.5th percentile adult female hip breadth is 455 mm [Error! Reference source not found. ], the 95th percentile adult male shoulder width is 530mm [Error! Reference source not found. ] and the 50th percentile elbow height is equal to 984 mm for adult females and 1110 mm for adult males [Error! Reference source not found. ]. The 95th and 97.5th percentile values are considered to be conservative for hip and shoulder widths as these would represent a width approaching the widest widths required. With respect to the transition height from hip breadth to shoulder width, the adult female 50th percentile elbow height is conservative.

- In the 2006 ROP, it was commented that a minimum metric dimension of 460 mm (rather than the 450 mm adopted) would more closely align with an 18 in width. The 455 mm dimension proposed here is an even closer match.

- For deleted clause (2), if the minimum width above elbow height permits reasonable egress, there is no basis for limiting the height of the console.

References:

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
5.5.6.3.5.1 Fare collection equipment complying with 5.5.6.3.5.2 through 5.5.6.3.5.5 shall be permitted in the means of egress serving stations.

Renumber the remaining clauses accordingly.

Substantiation: The new introductory statement is necessary to confirm that the NFPA 130 requirements override the requirements of NFPA 101, which would otherwise not permit turnstiles or similar obstructions in a means of egress serving an assembly occupancy.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

5.5.6.3.5.2 Except as permitted in 5.5.6.3.5.3, Electronically operated fare collection equipment in the required means of egress shall be designed to release, permitting unimpeded travel in the direction of egress, upon the following conditions:
(1) Power failure or ground fault condition,
(2) Activation of the station fire alarm signal, and
(3) Manual activation from a switch in a constantly attended location in the station or operations control center.

A.5.5.6.3.5.2 "Unimpeded travel in the direction of egress" means that any barriers in the fare collection equipment (such as paddles, gates or turnstiles) either drop away to create a clear opening, or swing or revolve freely in the direction of egress with no latching mechanism.

5.5.6.3.5.3 Fare collection equipment that does not comply with the requirements of 5.5.6.3.5.2 shall be permitted in the means of egress where barriers in the equipment are designed to provide egress when a horizontal force not exceeding 66 N (15 lbf) is applied in the egress direction.

Renumber succeeding clauses accordingly.

Substantiation: The numbering change is to relocate requirements that specify fundamental requirements applicable for all fare collection equipment permitted in means of egress serving stations prior to requirements that stipulate measurements and egress capacity for various types of equipment.

Editorial changes to renumbered 5.5.6.3.5.2 recognize additional criteria proposed as new 5.5.6.3.5.3, to eliminate the words “electronically operated” which limits application of criteria related to fare collection equipment, and to clarify that all of the conditions in (1) through (3) are required by this clause.

The new annex relocates information from A.5.5.6.3.4.4 under the doors and gates heading to be more appropriates linked to the fare gate section. (Refer also to proposed revisions to 5.5.6.3.5.2, to be renumbered as 5.5.6.3.5.5.)

The new 5.5.6.3.5.3 requirement is to permit fare collection equipment in the means of egress that does not comply with existing 5.5.6.3.5.3 (renumbered as 5.5.6.3.5.2), provided the equipment complies with requirements that would be applicable for ‘break-open’ doors. The stated force to open is from NFPA 101-2012, Clause 7.2.1.7 requirements for panic hardware.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Revise to read: 5.6.2 Emergency lighting for stairs and escalators shall be designed to emphasize illumination at the top and bottom steps and landings. Lighting along the entire means of egress shall comply with NFPA 101 Life Safety Code, Section 7.8.

NFPA 101 clearly stipulates that lighting must be provided throughout the means of egress. Escalator segments serving “deep stations” (those that access the lower level of stacked platforms) can exceed 150’. Lighting only the top and bottom of escalator runs is severely inadequate. It is imperative that, for escalators serving as a means of egress component, the entire portion of the escalator walking or standing surface is illuminated.

Section 7.8 Illumination of Means of Egress

“7.8.1.3* The floors and other walking surfaces within an exit and within the portions of the exit access and exit discharge designated in 7.8.1.1 shall be illuminated as follows:

During conditions of stair use, the minimum illumination for new stairs shall be at least 10 ft-candle (108 lux), measured at the walking surfaces”

Revise text to read as follows:

5.7.1.2 Installed fire alarm equipment shall meet the requirements of NFPA 72.

5.7.1.2.3* Each station having fire alarm initiating devices shall be provided with a fire alarm annunciator panel at a location that is accessible to emergency response personnel in accordance with NFPA 72.

5.7.1.2.1 The location of the fire alarm annunciator shall be approved.

5.7.1.2.2 Annunciator panels shall announce by audible alarm the activation of any fire alarm – initiating device in the station and visually display the location of the actuated device.

5.7.1.2.4 When activated, all indicator signals for fire alarms, smoked detection, valve switches, and waterflow shall be transmitted simultaneously to the local station ad to the operations control center.

5.7.1.2.5* Separate zones shall be established on local station annunciator panels to monitor waterflow on sprinkler systems and supervise main control valves.

5.7.1.5.6 Automatic fire detection shall be provided in all ancillary spaces by the installation of listed combination fixed-temperature and rate-of-rise heat detectors or listed smoke detectors except where protected by automatic sprinklers.

A.5.7.1.23 Discrete zone indications are desirable for unmanned stations.

A.5.7.1.45 Separate zones on the annunciator panel to monitor main control valves on standpipe systems should be established.

There is no statement in NFPA 130 that requires the full fire alarm system to comply with the requirements of NFPA 72. This potentially leads to confusion and ambiguity in terms of what the system should look like. An example is whether or not a combined PA and alarm systems is acceptable in NFPA 130, though in the 2007 and later revisions of NFPA 72 it is. The proposed wording requires that any system that is installed should fully meet the requirements of NFPA 72.
**5.7.1.1** Stations equipped with fire alarm devices shall be protected by a proprietary supervising station system as defined in NFPA 72.

**Substantiation:** The purpose of the proposal is an editorial revision to be consistent with the terminology in NFPA 72. However, it is unclear as to why other types of supervising service, such as a central station, would not be acceptable. If the intent of the standard is to require supervising station service, the current terminology would be “supervising station alarm system.”

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**5.7.1.5** Automatic fire detection shall be provided in all ancillary spaces required by 5.2.3.2 or 5.2.3.5 to be separated from the station public areas by the installation of listed combination fixed-temperature and rate-of-rise heat detectors or listed smoke detectors except where protected by automatic sprinklers.

**Substantiation:** In Section 5.7.1.5, it was not clear as to why the only areas that are prescriptively required to have smoke detection are unsprinklered ancillary spaces, though it is likely this is intentional. The revision is intended to make sure that detection is provided in other separated rooms and spaces that do not have sprinkler protection.

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**Katherine Fagerlund, Sereca Fire Consulting Ltd.**

**Add text to read as follows:**

5.7.1.1* Stations equipped with fire alarm devices shall be protected by a proprietary system as defined in NFPA 72. A.5.7.1.1 NFPA 72 requires that fire alarm appliances intended for use in special environments, such as outdoors, high or low temperatures, high humidity, high concentrations of dust, hazardous locations, subject to tampering, shall be listed for the intended use. Further, if ambient conditions prohibit the installation of an automatic smoke detection system, NFPA 72 permits the installation of another type of fire detection systems. Smoke detectors should not be installed in outdoor locations or locations that are open to weather, such as unenclosed elevator lobbies in open parking structures, because such environments can exceed the parameters of the detector listing and can result in unwanted alarms.

Substantiation: Stations may involve a number of different types of ambient environmental conditions ranging from enclosed and climate controlled to outdoors and subject to the local weather conditions. NFPA 72 requires protective signaling devices listed for the environment in which they are subject. The proposed clarification emphasizes this point for station installations.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Fire alarm systems shall be inspected, tested, and maintained in accordance with NFPA 72. Whereas other sections require inspection, testing, and maintenance of sprinkler systems, standpipe systems, and portable fire extinguishers, the document should also specifically require inspection, testing, and maintenance of fire alarm systems.

Such emergency devices shall be distinctive in color, and their locations shall be plainly indicated by appropriate signs.

Automatic Sprinkler Systems. An automatic sprinkler protection system shall be provided in all public areas of enclosed stations, and for all station (open & enclosed) used for concessions, in storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible loadings, except trainways in accordance with NFPA 13, except as modified herein.

We agree with the negative comments of Mr. Nelson. Sprinkler systems have a long and proven record of property and life safety protection. The committee statement for rejecting this proposal has no technical justification.
Note: This proposal appeared as Comment 130-44 (Log #85) which was held from the Annual 2009 ROC on Proposal 130-61.

Submitter: Gary L. English,

Recommendation:  The proposed language extends the coverage of sprinklers to all areas of the station. This is common in all assembly occupancies throughout NFPA. The lack of this common requirement for sprinklers in all portions of an underground station is not supported by any rationale.

Substantiation:  There appears to be no basis for the sprinkler exception. The most common exception to sprinklers normally provided under ‘impracticality or unnecessary’ are clearly not valid as several underground stations have sprinklers i.e. practical, and, there is a real risk of fire i.e. necessary.

RE: 130-61 Log #136 (5.7.3.1) Additional comments and explanation.
By Gary English, Seattle Fire Department

SPRINKLER IN NFPA 130, UNDERGROUND STATIONS.
I agree with the proposal from Salvatore A. Gilardi, Jr and the comments from Ch Nelsen. The proposal would simply extend the requirement for sprinklers to the entire station as is common in all other assembly type occupancies.

The current language under 130 5.7.3.1 requires an “automatic sprinkler protection system for a limited coverage, i.e. areas used for concessions, in storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible loadings, except trainways.”

The lack of the common requirement for sprinklers in all portions of an underground station is not supported by any rational. In fact, other portions of NFPA as well as International Fire Code specifically call for sprinklers in this type of occupancy.

There appears to be no basis for the sprinkler exception. The most common exception to sprinklers normally provided under ‘impracticality or unnecessary’ are clearly not valid as several underground stations have sprinklers i.e. practical, and, there is a real risk of fire i.e. necessary.

Without specific rationale that provides either impracticality or lack of necessity, the assumption should be that sprinklers are required.

The presence of sprinklers may complicate the design fire calculation, but will dramatically reduce the fire growth rate, smoke propagation, and maximum heat release rate. The significant reductions in these critical factors could have positive impacts on ventilation systems and possibly increase the allowable exit times and distances.

The following comparison of other NFPA standards and relative codes fails to provide support for the ‘conflicting’ position that NFPA 130 takes, i.e. that sprinklers are only required in a few area. NFPA 130 should adopt the requirement for full sprinklers in stations as in other standards, or provide a comprehensive rationale why they should not be required. See summary at bottom.

From NFPA 1 we have the following simple requirements.

“13.3.1.1* Automatic sprinklers shall be installed and maintained in full operating condition in the occupancies specified in this Code or in the codes or standards referenced in Chapter 2.

6.1.2.1* Definition — Assembly Occupancy. An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. [101:6.1.2.1]”

In NFPA 13, Standard for the Installation of Sprinkler Systems, “The purpose of this standard shall be to provide a reasonable degree of protection for life and property from fire through standardization of design, installation, and testing requirements for sprinkler systems, including private fire service mains, based on sound engineering principles, test data, and field experience.”

This goes on to define what level of protection under

“11.2.1.2.3 Occupancies or portions of occupancies shall be classified according to the quantity and combustibility of contents, the expected rates of heat release, the total potential for energy release, the heights of stockpiles, and the presence of flammable and combustible liquids, using the definitions contained in Section 5.2 through Section 5.5.

Classifications are as follows:
(1) Light hazard
(2) Ordinary hazard (Groups 1 and 2)
(3) Extra hazard (Groups 1 and 2)
(4) Special occupancy hazard (see Chapter 21)”

It is most likely that underground station will fall into the ordinary or light hazard classifications given the small level of
combustibles, with the possible exception where flammable liquids are present, i.e. train fuel, or stations shared with other risks such as heavy rail.

There are a few locations which are normally exempt from sprinklers as follows. (Note that there are NO exemptions for assembly occupancies such as underground stations.)

903.3.1.1 Exempt locations. Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an approved automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance rated construction or contains electrical equipment.

1. Any room where the application of water, or flame and water, constitutes a serious life or fire hazard.
2. Any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the fire code official.
3. Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire-resistance rating of not less than 2 hours.
4. In rooms or areas that are of noncombustible construction with wholly noncombustible contents.*

From NFPA 520, Subterranean Spaces

1.1.1 This standard addresses the safeguarding of life and property against fire, explosion, and related hazards associated with developed subterranean spaces.

6.2 Sprinkler Systems.

6.2.1 A sprinkler system shall be provided throughout all developed areas of new and existing subterranean space except in the following areas:

1. Existing freezer storage areas
2. Common space in which roadways, railways, and parking areas are not the sole means of egress from any building of the subterranean space
3. Areas protected by other approved fire suppression systems designed and installed in accordance with the applicable NFPA standard

6.2.2 Required sprinkler systems shall be installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.*

From NFPA 5000, Building Construction and Safety Code

16.3.5.1.2 Buildings containing assembly occupancies with occupant loads greater than 300 shall be protected by an approved, electrically supervised automatic sprinkler system installed in accordance with Section 55.3 as follows:

1. Throughout the story containing the assembly occupancy
2. Throughout all stories below the story containing the assembly occupancy
3. In the case of an assembly occupancy located below the level of exit discharge, throughout all stories intervening between that story and the level of exit discharge, including the level of exit discharge

Beyond the NFPA, the International Fire Code is adopted as law in most states (45) and includes the following.

2006 INTERNATIONAL FIRE CODE

903.2.1.3 Group A-3. An automatic sprinkler system shall be provided for Group A-3 occupancies where one of the following conditions exists:

1. The fire area exceeds 12,000 square feet (1115 m2);
2. The fire area has an occupant load of 300 or more; or
3. The fire area is located on a floor other than the level of exit discharge.*

(NOTE: IBC CHAPTER 3 defines ‘waiting areas in transportation terminals’ as Group A-3 occupancy.)

IFC Commentary
This section allows the omission of sprinkler protection in certain locations if an approved automatic fire detection system is installed.

“Buildings in compliance with one of the four listed conditions. would still be considered fully sprinklered throughout in
compliance with the code and NFPA 13 and thus are eligible for all applicable code trade-offs, exceptions or reductions. Elimination of the sprinkler system in a sensitive area is subject to the approval of the fire code official.

Condition 1 addresses restrictions where the application of water could create a hazardous condition. For example, sprinkler protection should be avoided where it is not compatible with certain stored materials (i.e., some water-reactive hazardous materials). Combustible metals, such as magnesium and aluminum, may burn so intensely that the use of water to attempt fire control will only intensify the reaction.

It is not the intent of Condition 2 to omit sprinklers solely because of a potential for water damage. Also, a desire to not sprinkle a certain area (such as a computer room or operating room) does not fall within the limitations of the exception unless there is something unique about the space that would result in water being incompatible.

Condition 3 recognizes the low fuel load and low occupancy hazards associated with generator and transformer rooms and therefore allows the omission of sprinkler protection, if the rooms are separated from adjacent areas by 2-hour fire-resistance-rated construction. This condition assumes the room is not used for any combustible storage.

Condition 4 requires the construction of the room or area, as well as the contents, to be noncombustible. An example would be an area in an unprotected steel frame building (Type II B construction) used for steel or concrete block storage. Neither involves any significant combustible packaging or sources of ignition, and few combustibles are present (see Figure 903.3.1).

The companion book to the International Fire Code is the International Building Code which has the following commentary relative to underground buildings.

International Building Code Commentary

"An underground building presents a unique hazard to life safety. Due to its isolation and inaccessibility, occupants within the structure and fire fighters attempting to locate and suppress a fire are presented with a unique fire protection challenge.

To egress the structure, occupants must travel in an upward direction. The direction of occupant travel is the same as the direction that the products of combustion travel. As such, the occupants are potentially exposed to the products of combustion along the entire means of egress.

Fire fighters are also confronted by constant exposure to the products of combustion. Beginning their descent above the actual location of the fire source, fire fighters encounter an increasing amount of smoke, heat and flame as they attempt to locate and extinguish the fire source. These extreme conditions could significantly hinder the effectiveness of the fire department if not offset by appropriate fire protection requirements. The requirements for underground buildings are, in some ways, similar to those for high-rise structures.

Both types of structures present an unusual hazard since they are virtually inaccessible to exterior fire department suppression and rescue operations with the increased potential to trap occupants inside. To counteract these hazards, such structures are required by Section 405.2 to be built of noncombustible, fire-resistance-rated construction. Additionally, they are required by Section 405.3 to be equipped with an automatic sprinkler system and a smoke control system in accordance with Section 405.5. Standby and emergency power systems are also required in these structures by Sections 405.9 and 405.10.

Underground buildings that require the occupants of the lowest floor level to travel upwards for more than 30 feet (9144 mm) to reach the level of exit discharge present a significant hazard to the occupants. As such, Section 405 is applicable to buildings with a floor level more than 30 feet (9144 mm) below the lowest level of exit discharge (see Figure 405.1).

Structures regulated by Section 405 are also subject to all other applicable code provisions. Additionally, underground buildings to which this section does not apply are still subject to all other code provisions, including fire suppression (Section 903); standpipe systems (Section 905); fire alarm and detection (Section 907) and emergency escape (Section 1025).

405.3 Automatic sprinkler system. The highest level of exit discharge serving underground portions of the building and all levels below shall be equipped with an automatic sprinkler system installed in accordance with Section 903.3.1.1. Water-flow switches and control valves provisions of this section apply to building spaces having a floor level used for human occupancy more than 30 feet (9144 mm) below the lowest level of exit discharge.

IBC COMMENTARY on sprinklers

One of the most effective preventative measures to fire growth is the installation of an automatic sprinkler system. Because of the unique conditions for occupant egress and fire department access in the underground portion of a building, automatic sprinkler is required. The level of exit discharge and all floor levels below are required to be sprinklered throughout in accordance with Section 903.3.1.1. This section does permit a portion of a building to extend above the level of exit discharge and not be equipped with an automatic sprinkler system. If, however, another code section (Section 403.2 or 903) requires an automatic sprinkler system in the above-ground portion, such a requirement would still be applicable. Note that a smoke control system is required. Automatic sprinkler systems are essential elements of any smoke control system. Without suppression, the size of the fire or the resulting products of combustion..."
will rapidly overwhelm most mechanical smoke control systems.”

Note that from an AHJ perspective, Smoke control systems cannot be considered an alternative provision in lieu of sprinklers, as automatic sprinkler systems are essential elements of any smoke control system.


This technical committee has resolved misunderstandings about sprinklers in road tunnels with the following annex language.

“E.3.2 Listed below are the major concerns expressed in the past by tunnel designers, engineers, and authorities worldwide regarding the use and effectiveness of water-based fixed fire-fighting systems in road tunnels, along with the current assessment of those issues.

(1) Fires in road tunnels usually occur inside vehicles or inside passenger or engine compartments designed to be waterproof from above; therefore, water-based fixed fire-fighting systems would not have an extinguishing effect.

It is now recognized that the purpose of a water-based fixed fire-fighting system is not to extinguish the fire but to prevent fire spread to other vehicles so that the fire does not grow to a size that cannot be attacked by the fire service.

(2) If any delay occurs between ignition and water-based fixed fire-fighting system activation, a thin water spray on a very hot fire could produce large quantities of superheated steam without materially suppressing the fire.

Fire tests have shown this concern not to be valid. A properly designed water-based fixed fire-fighting system suppresses the fire and cools the tunnel environment. Since a heavy goods vehicle fire needs only 10 minutes to exceed 100 MW and 1200°C (2192°F), which are fatal conditions, it is important to operate the fixed fire-fighting system as soon as possible.

(3) Tunnels are long and narrow, often sloped laterally and longitudinally, vigorously ventilated, and never subdivided, so heat normally will not be localized over a fire.

Advances in fire detection technology have made it possible to pinpoint the location of a fire in a tunnel with sufficient accuracy to operate a zoned water-based fixed fire-fighting system.

(4) Because of stratification of the hot gas plume along the tunnel ceiling, a number of the activated fixed fire suppression systems would not, in all probability, be located over the fire. A large number of the activated water-based fixed fire-fighting systems would be located away from the fire scene, producing a cooling effect that would tend to draw the stratified layer of smoke down toward the roadway level, thus impeding rescue and fire-fighting efforts.

Independent laboratories have commented that they do not observe smoke stratification. Any activated water-based fixed fire-fighting system not over the fire would cool the tunnel to help rescue services to intervene. Zoned systems are released by a detection system that is accurate even with forced ventilation.

(5) Water spraying from the ceiling of a subaqueous tunnel could suggest tunnel failure and induce panic in motorists.

This theoretical concern was not borne out in practice. In the event of fire, motorists are likely to recognize water spraying from nozzles as a fire safety measure. Behavioral studies have shown that most people do not panic in a fire, even when they are unable to see.

(6) The use of water-based fixed fire-fighting systems could cause the delamination of the smoke layer and induce turbulence and mixing of the air and smoke, thus further threatening the safety of persons in the tunnel.

This has been shown not to be a valid concern. Fire tests have demonstrated that smoke does not usually form a layer at the top of the tunnel but quickly fills the cross-section. Normal air movement in the tunnel accelerates this process. A water-based fixed fire-fighting system reduces temperatures and the risk of fire spread to other vehicles.

(7) Testing of a water-based fixed fire-fighting system on a periodic basis to determine its state of readiness is impractical and costly.

A full discharge test is normally performed only at system commissioning. During routine testing, the system can be configured to discharge flow to the drainage system.

It should be noted that the Occupant load for Underground stations in NFPA 130 is sorely underestimated i.e. “… the platform and station occupant loads are a function of the train load and the simultaneous entraining load. This concept differs from that of NFPA 101, Life Safety Code, where the occupant load is determined by dividing the floor area by an occupant load factor assigned to that use. Applying the Life Safety Code approach to determine the station platform occupant load is inappropriate.”

The only case where this annex language is true is if there is NO entrance to the station from the exterior, i.e. all the passengers in the station platform will arrive from the trains. In most stations the ability for passengers to arrive at the platform from the ‘street level’ could mean that the platform will fill with passengers without anyone arriving by train. The arriving train will compound the problem by putting more passengers on an already full platform.

In the normal calculations for occupant load the following is used from NFPA 101.

12.1.7.1* General. The occupant load, in number of persons for whom means of egress and other provisions are required, shall be determined on the basis of the occupant load factors of Table 7.3.1.2* that are characteristic of the use...
of the space or shall be determined as the maximum probable population of the space under consideration, whichever is
greater.
12.1.7.1.1 In areas not in excess of 10,000 ft² (930 m²), the occupant load shall not exceed one person in 5 ft² (0.46
m²).
12.1.7.1.2 In areas in excess of 10,000 ft² (930 m²), the occupant load shall not exceed one person in 7 ft² (0.65 m²).
SUMMARY
It is clear that the other applicable standards consider underground assemblies, such as the underground station, a
high enough risk to require sprinklers.
Unless NFPA 130 technical committee can provide a serious argument to the contrary with supportive materials,
sprinklers should be included as a requirement throughout stations.

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Submitter: Philip A. Sherer, AECOM
Recommendation: Revise text as follows:
5.7.3.1 An automatic sprinkler protection system shall be provided in areas of stations used for concessions, in
storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible
loadings, except trainways, and train control equipment rooms.
Substantiation: The issue at hand is the use of sprinklers in a train control equipment rooms that houses safety critical
systems. Many are considering these information technology rooms and hence are applying NFPA 75 to these rooms
especially section 8.1.1 which states "Information technology equipment rooms and information technology equipment
areas located in a sprinklered building shall be provided with an automatic sprinkler system". What I would like to see
happen is the NFPA 130 committee by specific language provide design criteria that allow the use of either water or
non-water based suppression systems in these critical areas. If you review NFPA 13, 75 and 130 while you can make a
case that water based suppression systems are not required based on a safety critical nature of the equipment and
application of this equipment still many are falling back on the NFPA 75 requirements that any facility that is sprinklers
must provide the sprinkler protection in the information technology equipment rooms regardless if other nonwater based
suppression systems are provided. In addition the operation required for water based suppression of a abnormal fire
condition in a information technology equipment rooms would require shutting down of these safety critical electronic
systems and equipment, this operations as you are aware, these systems will go into a safety mode which in the case of
the fixed guide way system could course trains to be stopped in tunnel segments between stations and hence involving
a much more difficult evacuation of passengers from a tunnel instead of allowing the train to proceed with a controlled
safe move into a station area where passengers can disembark in a controlled environment. By providing specific
design criteria involving train control equipment rooms this would eliminate the issue and provide for a much safer
operation of fixed guide way system.

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Submitter: Philip A. Sherer, AECOM
Recommendation: Revise text as follows:
5.7.3.1 An automatic sprinkler protection system shall be provided in areas of stations used for concessions, in
storage areas, in trash rooms, and in the steel wood truss area of all escalators and other similar areas with combustible
loadings, except trainways.
Substantiation: It seems excessive to require automatic sprinklers in steel truss escalators where the fire load from the
equipment, structure (fire fuel) and debris is low. If the standard was to protect against another King's Crossing type fire
then the standard should read as edited. In addition when rehabbing a station the standard would require a complete
retro fit of the escalator to accomplish the addition of the automatic sprinkler system. In most cases there are fire
detection in the pits and trusses of the escalators, this would provide early warning of an abnormal fire condition prior to
the automatic sprinkler providing suppression.
Russell P. Fleming, National Fire Sprinkler Association, Inc.

Revision to Section 5.7.3.1

5.7.3.1 Automatic Sprinkler Systems - An automatic sprinkler protection system shall be provided in all public areas of stations, in areas used for concessions, in storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible loadings covered platforms and trainways.

Substantiation: The current requirement for partial sprinkler protection is based on a concept of limiting combustible loading. However, the new awareness of potential threats in public spaces recognizes that combustible loading can result from deliberate acts of terrorism. Underground assembly areas can contain thousands of people and would be required to be protected with automatic sprinklers by the NFPA 101 Life Safety Code and most modern building codes.

John F. Devlin, Aon Fire Protection Engineering Corporation

Revise text to read as follows:

An automatic sprinkler protection system shall be provided in areas of stations used for concessions, in storage areas, in trash rooms, and in the steel truss area of all escalators and other similar areas with combustible loadings, except trainways.

A.5.7.3.1 Escalators constructed of combustible stairs should be protected with an approved automatic sprinkler or fire suppression system installed in the truss area and designed to control or extinguish a fire.

Substantiation: The steel truss area of a modern escalator is a noncombustible concealed space. Equipment contained within the truss area including steps, motors, drive wheel, and chains are of noncombustible construction, predominately steel and other metals. The electrical and mechanical equipment within the truss area pose an insignificant fire/fuel load. Combustion of trash and other foreign debris accumulated in the truss area including lubrication grease is of relatively limited quantity and pose an inconsequential fire hazard due to the escalator’s noncombustible construction and its enclosure. The escalator enclosure wherein the truss area is located is of substantially thick steel or other comparable material construction. The enclosure creates a fire barrier between the escalator and the station/building space thus containing the fire. NFPA 101 – Life Safety Code, NFPA 5000 – Building Construction and Safety Code, and ICC International Building Code do not consider a modern escalator a fire hazard and, accordingly, do not require automatic sprinklers/fire suppression system in the truss area. Stations / escalators exposed to temperatures below 40F (5C) must be dry-pipe types sprinkler systems per NFPA 13 thus increasing and system installation complexity. Installation of sprinklers in the truss area poses an unnecessary construction / installation and maintenance cost.

Archaic wooden escalators, albeit rare, do exist and do create a potentially unacceptable fire hazard/risk. To address this possibility, Annex language is added.
### 130- Log #180
(5.7.3.1)

**Final Action:**

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.

**Recommendation:** Revise as follows:

5.7.3.1 An automatic sprinkler protection system shall be provided in areas of stations used for concessions, in storage areas, in trash rooms, and **in the steel truss area of all escalators** and other similar areas with combustible loadings, except trainways.

**Substantiation:** There is no evidence to support the provision of sprinkler protection in the truss spaces of modern escalators. The original requirement was for sprinklers in escalator trusses in single entry stations, presumably to compensate for the use of escalators as means of egress. The standard now requires two means of egress from all platforms.

**NOTE:** NFPA 13-2010, Section 21.18 Fixed Guideway Transit Stations currently re-iterates NFPA 130 requirements and will therefore need to be amended if this proposal is adopted.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities

### 130- Log #226
(5.7.3.6 (New))

**Final Action:**

**Submitter:** Scott J. Harrison, Marioff Inc.

**Recommendation:** Add text to read as follows:

5.7.3.6 When Water Mist Systems are installed in lieu of automatic sprinkler systems per 5.7.3.4, they shall comply with NFPA 750 Standard on Water Mist Fire Protection Systems or applicable local codes as required.

**Substantiation:** Paragraph 5.7.3.4 states: “Other fire suppression systems, if approved, shall be permitted to be substituted for automatic sprinkler systems in the areas listed in 5.7.3.1.” The addition of paragraph 5.7.3.6 will provide the design and installation standard for Water Mist fire suppression systems when/if used as a substitute for automatic sprinkler systems.

**NOTE:** If this new paragraph is accepted, a reference to NFPA 750 needs to be added to Chapter 2 Referenced Publications Paragraph 2.2 NFPA Publications.

### 130- Log #192
(5.7.4 and A.5.7.4.1 (New))

**Final Action:**

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.

**Recommendation:** Revise text to read as follows:

5.7.4.1* Class I or **Class III** standpipes shall be installed in enclosed stations in accordance with NFPA 14 except as modified herein.

A.5.7.4.1 The AHJ may additionally require 2 ½ in. (65 mm) hose connections to be equipped with a 2 ½ x 1 ½ in. (65 mm x 40 mm) reducer.

**Substantiation:** The current language causes confusion with regard to intent. Hose stations with hose are not appropriate in stations, but the proposed annex language introduces the possible consideration of reducers at the discretion of the AHJ.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Add to Section 5.7.4 after existing Clause 5.7.4.3:

Standpipes are not required to be interconnected provided that adequate signage is provided at the fire department connections and approved by the Authority Having Jurisdiction.

NFPA 14 states that when two standpipes are installed in the same building or section of building, they be interconnected (aka cross-connected). Due to the time requirements to charge dry systems and the potential danger of interconnecting exposed standpipe systems it may be better to have the station standpipe systems not be interconnected. Providing proper signage at the fire department connection is a reasonable method of ensuring firefighters charge the proper standpipe system.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Insert new clause:

The standpipe design may include a pressure boost from a local fire department pumper to meet minimum pressure requirement at the outlet of the hydraulically most remote hose connection without having to install a permanent fire pump(s).

Renumber existing clauses accordingly.

In most cases pressure boost is provided by a fire department pumper without having to install permanent fire pumps. This proposal identifies that this option is available to a designer with local fire department’s approval.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Add text to read as follows:

Where the most remote portion of a non-sprinklered public area in a station is located in excess of 150 ft (45.7 m) of travel distance from a required exit containing or adjacent to a hose connection, or the most remote portion of a sprinklered area is located in excess of 200 ft (61 m) of travel distance from a required exit containing or adjacent to a hose connection, additional hose connections shall be provided, such that all public spaces are within 130 ft (39.7 m) of a hose connection.

Hose connections are not required on at grade entrance levels where all parts of the area on that level are within the prescribed distances of a main entrance used by the fire department for access.

NFPA 14-2010 typically requires hose valves to be installed in fire separated exits, which may not exist in stations, and does not specify the intervals at which hose valves must be installed except for Class II systems. Therefore, it is prudent to ensure all areas within the station can be reached by firefighters with a reasonable length of hose. The proposed text language is modelled on the requirements of NFPA 14, Clause 7.3.2.2.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Standpipes shall be permitted to be of the dry type with the approval of the authority having jurisdiction provided the following conditions are met:

1. Systems shall be installed in a manner so that the water is delivered to all hose connections on the system in 10 minutes or less.
2. Combination air relief–vacuum valves shall be installed at each high point on the system.

This clause is intended to clarify that dry type systems may be considered in stations regardless of the potential for freezing with the approval of the local fire department.

Calculations, including transit and fill times, should be submitted to the authority having jurisdiction to support this requirement.

The emphasis for dry pipe is necessary to provide the flexibility that is required to address the many variations in size and configuration of stations.

Dry standpipe systems in large station or station complexes are usually very long which can result in significant amount of time required to charge the system. NFPA 502 has a requirement that all hose valves must be capable of being delivered water in 10 minutes. It is recommended that the requirements of NFPA 502 for dry systems be used for stations.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Standpipe systems shall not be required to be enclosed in fire-rated construction provided the following conditions are met:

1. The system is cross-connected or fed from two locations.
2. Isolation valves are installed on each standpipe and not more than 245 m (800 ft) apart.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Dry standpipes may be concealed without the piping integrity being monitored with supervisory air pressure.

NFPA 14-2007 was changed from previous editions to require dry standpipes with concealed piping to be monitored with supervisory air, which is not typical in station standpipes. We recommend that the supervisory air not be required for standpipes in stations due to the maintenance burden.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Standpipe and hose systems shall be tested and designed to be maintained in accordance with NFPA 25.

Thomas G. Middlebrook, McCormick Rankin Corporation

Portable fire extinguishers shall be designed to be maintained in accordance with NFPA 10.

Thomas G. Middlebrook, McCormick Rankin Corporation

5.7.4.4 Standpipe and hose systems shall be tested and designed to be maintained in accordance with NFPA 25.

5.7.5.1 Portable fire extinguishers shall be designed to be maintained in accordance with NFPA 10.
Katherine Fagerlund, Sereca Fire Consulting Ltd.

Amend requirements as follows:

**Aboveground Atmospheric Storage Tanks.** Aboveground atmospheric storage tanks storing, handling, or processing Class I flammable liquid or Class II or Class III combustible liquids and related piping shall be installed in accordance with the requirements of NFPA 30.

6.6.4.1 Such tanks shall not be located directly over an underground subsurface system structure, or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure unless provided with an approved leak-detection system.

6.6.4.2 Where the top of the subsurface trainway or station system structure is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the rate requirement in 6.6.4.1 shall be permitted to be conducted.

**Underground Storage Tanks.** Underground storage tanks for Class I flammable or Class II or Class III combustible liquids and related piping shall be installed in accordance with the requirements of NFPA 30.

6.6.5.1 Such tanks shall not be permitted directly over an underground subsurface system structure, or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure. (See 6.6.7 for tanks in or under existing buildings.)

6.6.5.2 Where the top of the underground subsurface trainway or station system structure is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement in 6.6.5.1 shall be permitted to be conducted.

6.6.5.3 For underground storage tanks and related piping for Class I flammable or Class II or Class III combustible liquids located up to in the area between 6.1 m (20 ft) and 30.5 m (100 ft) (measured horizontally) from the outside wall of the underground subsurface system structure and within that same area, where such tanks and related piping will be located less than within 610 mm (24 in.) (measured vertically) below the lowest point of an underground system subsurface structure excavation, they shall be constructed and installed according to one of the following methods:

(1) For tanks of double-wall construction, the following shall apply:
   
   (a) Tanks shall be equipped with an approved automatic leak detection and monitoring system.
   
   (b) Tanks shall be provided with an approved corrosion protection system.
   
   (c) Installation, maintenance, and inspection shall conform to the requirements specified by the authority having jurisdiction.

(2) For tanks installed in a cast-in-place reinforced concrete vault large enough to hold and retain the entire contents of the tank, the following shall apply:

   (a) The storage tank shall be completely encompassed by not less than 610 mm (24 in.) of well-tamped, noncorrosive inert material within the vault.

   (b) An approved method for the monitoring of or testing for product and enclosure leakage shall be incorporated into the enclosure design.

   (c) The vault lid shall be designed and constructed to withstand anticipated surface loadings and shall be not less than 150 mm (6 in.) of reinforced concrete.

   (d) Vault, tank, and piping shall be protected from corrosion.

6.6.5.4 All tanks, vaults, and appurtenances used to store Class I flammable and Class II and Class III combustible liquids shall be compatible with the materials stored and shall conform to the provisions of NFPA 30.

5.8.1 Aboveground and underground storage tanks above subsurface station structures shall meet the requirements of Section 6.6.4:

**Substantiation:** Proposed revisions are to delete some of the dimensional requirements where technical rationale for such requirements cannot be established. The remaining dimensional requirements (many of which originated in the 1988 edition) should likewise be substantiated or deleted. The American Petroleum Institute has been suggested as a potential source. Other changes are editorial.

This is not original material; its reference source is as follows: Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Katherine Fagerlund, Sereca Fire Consulting Ltd.

**Recommendation:** Delete requirements as follows:

5.6.3 Service stations above subsurface station structures shall meet the requirements of 6.6.6:

6.6.6 Service Stations:

6.6.6.1 Service stations dispensing Class I flammable liquids and Class II and Class III combustible liquids and located in the area within 30.5 m (100 ft) (measured horizontally) from the outside wall of the underground structure shall be required to comply with 6.6.6.2 through 6.6.6.5:

6.6.6.2 The surface around pump islands shall be graded or drained in a manner to divert spills away from the tunnel vent gratings or tunnel entrances or exits:

6.6.6.3 Continuous drains across driveways, ramps, or curbs of at least 150 mm (6 in.) in height shall separate service station properties from adjacent tunnel vent gratings or tunnel entrances or exits:

6.6.6.4 No connection (such as venting or drainage) of any storage tanks and related piping of Class I flammable liquids and Class II and Class III combustible liquids to a subsurface fixed guideway transit structure shall be permitted:

6.6.6.5 Dispensing pumps for Class I flammable liquids and Class II and Class III combustible liquids shall not be located less than 6.1 m (20 ft) from the face of such pump to the nearest side of a tunnel vent grating or subway entrance or exit:

**Substantiation:** Requirements for Service Stations are addressed in NFPA 30A, which includes drainage of spills. Also, there is no technical basis for the dimensional requirement in 6.6.6.1.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Katherine Fagerlund, Sereca Fire Consulting Ltd.

Amend requirements as follows:

5.6.4 Existing storage tanks in or under buildings shall meet the requirements of 6.6.7.

6.6.5 Underground Storage Tanks. Underground storage tanks for Class I flammable or Class II or Class III combustible liquids and related piping shall not be permitted directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure. (See 6.6.7 for tanks in or under existing buildings.)

6.6.7 Existing Storage Tanks in or Under Buildings:

6.6.7.1 Existing storage tanks for Class I flammable liquids and Class II and Class III combustible liquids located in or under buildings and located directly above a subsurface transit structure or within 6.1 m (20 ft) (measured horizontally) from the outside wall of the subsurface transit structure shall be removed and relocated outside the prohibited area.

6.6.7.1.1 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement of 6.6.7.1 shall be permitted to be conducted.

6.6.7.2 Where it is not possible to remove and relocate tanks for Class I flammable and Class II combustible liquids due to limited space, such underground tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.6.7.3 Where it is not possible to remove and relocate tanks for Class III combustible liquids located in buildings, such tanks shall be provided with leak detection and a secondary containment system of adequate capacity to contain the contents of the tank:

6.6.7.4 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.6.7.5 Where it is not possible to remove and relocate tanks for Class III combustible liquids located under a building, such tanks shall be UL-listed double wall or installed in a cast-in-place reinforced concrete vault and shall be provided with an approved leak detection system:

6.6.7.6 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

Substantiation: This proposal is in response to a comment received by the TC. Requirements for Storage Tanks associated with Flammable and Combustible Liquids are addressed in NFPA 30. Except for the requirements addressed in that standard, the requirements of Section 6.6.7 are unenforceable. Changes to 5.8.4 and 6.6.5 are for consistency with these proposed changes.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
5.9 Interior Finish.

5.9.1 Enclosed Stations.

5.9.1.1 General. Interior wall and ceiling finish materials in enclosed stations shall comply with one of the following.

5.9.1.2 Noncombustible. Interior wall and ceiling finish materials shall be noncombustible materials.

5.9.1.3 ASTM E 84. Interior wall and ceiling finish materials shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 450, when tested in accordance with ASTM E 84, unless otherwise provided in 5.9.1.5.

5.9.1.4 NFPA 286. Interior wall and ceiling finish materials shall comply with the following when tested in accordance with NFPA 286:

1. Flames shall not spread to the ceiling during the 40 kW (135 kBTU/hr) exposure.
2. Flames shall not spread to the outer extremity of the sample on any test room wall or ceiling.
3. Flashover, as described in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW (2730 kBTU/hr).
5. The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).

5.9.1.5 Excluded materials. The following materials shall not be used as interior wall or ceiling finish materials when exposed or covered by a textile or vinyl facing unless they comply with the requirements of 5.9.1.4.

1. Foam plastic insulation
2. Textile wall or ceiling coverings
3. Polypropylene
4. High density polyethylene

5.9.1.6 Interior Floor Finish. Interior floor finish materials in enclosed stations shall be noncombustible or shall exhibit a critical radiant flux not less than 0.8 W/cm² when tested in accordance with ASTM E 648.

5.9.1.7 Interior wall and ceiling finish materials in enclosed stations shall comply with one of the following:

1. Interior wall and ceiling finish materials shall be noncombustible materials.
2. Interior wall and ceiling finish materials, other than textile wall coverings or foam plastic insulation, shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 450, when tested by ASTM E 84.

5.9.1.8 Interior floor finish materials, when tested in accordance with NFPA 286, shall comply with the following:

1. Flames shall not spread to the ceiling during the 40 kW (135 kBTU/hr) exposure.
2. During the 100 kW (354 kBTU/hr) exposure, the following criteria shall be met:
   (a) Flame shall not spread to the outer extremities of the sample on the 2.45 m× 3.7 m (8 ft × 12 ft) wall.
   (b) The peak heat release rate shall not exceed 800 kW (2730 kBTU/hr).
   (c) Flashover shall not occur.
3. The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).

5.9.1.9 Interior Floor Finish. Interior floor finish materials in enclosed stations shall be noncombustible or shall exhibit a critical radiant flux not less than 0.8 W/cm² when tested in accordance with ASTM E 648.

Substantiation: This proposal has editorial and technical changes.

The key technical change is the addition of polypropylene and high density polyethylene to the list of materials that are not allowed to be tested by ASTM E 84 (Steiner tunnel) and still used as interior finish. The reason for this change is that it has been demonstrated that these materials melt and drip (with flaming drips) in the tunnel and produce misleading results. In fact it is likely that polypropylene and high density polyethylene will cause flashover in a station when used as interior wall finish but they will give low flame spread index values in the ASTM E 84 test. On the other hand, the room-corner test, NFPA 286, is able to evaluate the materials adequately. This has already been recognized in the 2012 editions of NFPA 101, NFPA 5000, IBC and IFC.

The added technical change is to clarify, just as in NFPA 101, that it is not permitted to cover any of the materials that should not be tested using ASTM E 84 with a textile or vinyl facing and state that they are now something else. A foam plastic with a textile or vinyl facing still performs like a foam plastic and cannot be tested adequately in the ASTM E 84 fire test. The same applies to the other materials.

The editorial change cleans up the sections in ways similar to how they read in NFPA 101.
Interior wall and ceiling finish materials in enclosed stations shall comply with one of the following:

1. Interior wall and ceiling finish materials shall be noncombustible materials.
2. Interior wall and ceiling finish materials, other than textile wall coverings or foam plastic insulation, shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 450, when tested by ASTM E 84.

Substantiation: Foam plastic insulation should not be permitted in enclosed stations.

Rubbish containers shall be manufactured of noncombustible materials or shall be listed containers manufactured of materials that comply with a peak heat release rate not exceeding 300 kW/m² when tested in accordance with ASTM E 1354 at an incident heat flux of 50 kW/m² in the horizontal orientation. Metal wastebaskets and other metal waste containers with a capacity of 20 gallons (75.7 L) or more shall be listed in accordance with UL 1315 and shall be provided with a noncombustible lid.

Substantiation: The Uniform Fire Code and the International Fire Code as well as NFPA 101 have instituted requirements for large rubbish containers that ensure adequate fire safety while permitting some choice of materials. Such listed rubbish containers are very safe.

Where lockers constructed of combustible materials are used, the lockers shall be considered interior finish and shall be listed and comply with the requirements of 5.9.1.4 when tested in accordance with NFPA 286.

Substantiation: The Uniform Fire Code and the International Fire Code as well as NFPA 101 have instituted requirements for non metallic lockers to ensure that no plastic lockers that are unsafe are used. This will ensure adequate fire safety while permitting some choice of materials. Such listed lockers are very safe.
Stephanie H. Markos, US Department of Transportation/Volpe Center

Check new ordering per Committee acceptance for Proposals 147 and 220 in 2007 cycle to identify sections that were inadvertently deleted in 2007 edition during that cycle revision which changed the intent of the standard.

As noted to Committee in April 2008, traction power requirements for surface and elevated trainways were deleted in 2007 edition, as a result of then Proposal 147. Recommend TIA to restore traction power requirements, since I believe that was “unintended” result of “streamlining” objective. In addition, recommend that Committee review the entirety of Chapter 6, Trainways, as well as Chapter 5, Station (see also Proposal 34), to ensure that the logic of both is consistent with the Chapters and between the Chapters.

Salvatore A. Gilardi, Jr., American Ins Services Group Inc

Revise text as follows:

Please see attached re-numbering of Chapter 6.

***Insert Chapter 6 Trainways Include Here***

Substantiation: To be consistent with the format of Chapter 5.
Chapter 6 Trainways

6.1* Applicability. This chapter applies to all portions of the trainway, including pocket storage and tail tracks not intended for occupancy by passengers.

6.2 Construction Materials.

6.2.1 General.

6.2.1.1 Underground (Subways).

6.2.1.1.1 Where trainway sections are to be constructed by the cut-and-cover method, perimeter walls and related construction shall be not less than Type I– or Type II– or combinations of Type I– or Type II– noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.2.1.1.2 Lining.

6.2.1.1.2.1 Where trainway sections are to be constructed by a tunneling method through earth, unprotected steel liners, reinforced concrete, shotcrete, or equivalent shall be used.

6.2.1.1.2.2 Rock tunnels shall be permitted to utilize steel bents with concrete liner if lining is required.

6.2.1.1.3 Walking Surfaces.

6.2.1.1.3.1 Walking surfaces designated for evacuation of passengers shall be constructed of noncombustible materials.

6.2.1.1.3.2 Walking surfaces shall have a slip-resistant design.

6.2.1.1.4 Underwater Tubes. Underwater tubes shall be not less than Type II (000) noncombustible construction as defined in NFPA 220, as applicable.

6.2.1.1.5 Rail Ties.

6.2.1.1.5.1 Rail ties used in underground locations, except as permitted in 6.2.1.1.5.2 or 6.2.1.1.5.3, shall be non-combustible materials, complying with the requirements of ASTM E 136.

6.2.1.1.5.2 Rail ties used at switch or crossover locations shall comply with 6.2.1.1.5.1 or shall be fire retardant treated wood in accordance with NFPA 703.

6.2.1.1.5.3 Rail ties and tie blocks in underground track sections shall be permitted to be wood encased in concrete such that only the top surface is exposed.

6.2.1.1.6 Structures. Remote vertical exit shafts and ventilation structures shall be not less than Type I (332)–noncombustible construction as defined in NFPA 220.

6.2.1.1.7 Ancillary Areas.

6.2.1.1.7.1 Ancillary areas shall be separated from trainway areas within underwater trainway sections by a minimum of 3-hour fire-resistive construction.

6.2.1.1.7.2 Ancillary areas shall be separated from trainway areas within underground trainway sections by a minimum of 2-hour fire-resistive construction.
6.2.1.2 Surface. Construction materials shall be not less than Type II (000) noncombustible material as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.2.1.3 Elevated. All structures necessary for trainway support and all structures and enclosures on or under trainways shall be of not less than Type I or Type II (000) or combinations of Type I– or Type II– noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.2.2. Warning Signs.

6.2.2.1 Warning signs shall be posted on entrances to the trainway (e.g., station platforms and portals), on fences or barriers adjacent to the trainway, and at such other places where nontransit authority employees might trespass.

6.2.2.2 The warning signs shall clearly state the hazard (e.g., DANGER HIGH VOLTAGE — 750 VOLTS) with letter sizes and colors in conformance with NFPA 70 and Occupational Safety and Health Administration (OSHA) requirements.

6.2.3* Combustible Components. Where combustible components not specifically addressed in this standard are installed in a trainway, a fire hazard analysis shall be conducted to determine that the level of occupant fire safety is not adversely affected by the contents.

6.2.3.1 General. Combustible components not covered in 6.2.1 through 6.2.2.2 shall comply with 6.2.3.

6.2.3.2 Engineering Analysis.

6.2.3.2.1 An engineering analysis shall be conducted on nonstructural combustible components that includes, as a minimum, an examination of peak heat release rate for combustible elements, total heat released, ignition temperatures, radiant heating view factors, and behavior of the component during internal or external fire scenarios to determine that, if a fire propagates beyond involving the component of fire origin, a level of fire safety is provided within an enclosed trainway commensurate with this standard.

6.2.3.2.2 Computer modeling, material fire testing, or full-scale fire testing shall be conducted to assess durability performance in potential fire scenarios.

6.2.4 Coverboard or Protective Material.

6.2.4.1 Coverboard or protective material shall have a flame spread rating index of not more than 25 and a smoke developed index not exceeding 450 when tested in accordance with NFPA 255 (ASTM E 84).

6.2.4.2 Materials that comply with the requirements of 6.2.4.3 when tested in accordance with NFPA 286 shall be permitted to be used in all areas where flame spread index and smoke developed index when tested by NFPA 255 or by ASTM E 84 is required.

6.2.4.3 Test Criteria. The following test criteria shall apply:

(1) Flames shall not spread to the ceiling during the 40 kW exposure.

(2) During the 160 kW exposure, the following criteria shall be met:
   (a) Flame shall not spread to the outer extremities of the sample on the 2440 mm × 3660 mm (96 in. × 144 in.) wall.
   (b) Flashover shall not occur.

(3) The peak heat release rate throughout the test shall not exceed 800 kW.
(4) The total smoke released throughout the test shall not exceed 1000 m².

6.3 Wiring Requirements. *(See Section 5.4.)*

6.3.1 General.

6.3.1.1 Traction power shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead wire, the contact rail supports, and special warning and identification devices.

6.3.1.2 Life safety and fire protection criteria for the subsystem installed in the trainway shall conform to the requirements for underground trainways that are listed in 6.7.3.

6.3.1.3 All wiring materials and installations other than those for traction power shall conform to the requirements of NFPA 70.

6.3.2 Underground (Subways).

6.3.2.1 All wiring materials and installations within trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of 6.3.2.2 through 6.3.2.9.

6.3.2.2 Materials manufactured for use as conduits, raceways, ducts, boxes, cabinets, equipment enclosures, and their surface finish materials shall be capable of being subjected to temperatures of up to 500°C (932°F) for 1 hour and shall not support combustion under the same temperature condition.

6.3.2.2.1 Other materials, where encased in concrete or suitably protected, shall be acceptable.

6.3.2.3 All conductors shall be insulated.

6.3.2.3.1 Ground wire installed in a metallic raceway shall be insulated.

6.3.2.3.2 Other ground wires shall be permitted to be bare.

6.3.2.4 All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant types carrying temperature ratings corresponding to either of the following conditions:

- (1) 75°C (167°F) for listed fire-resistive cables
- (2) 90°C (194°F) for all other applications
- (3) All insulated conductors and cables shall be listed for wet locations.

6.3.2.5 All wire and cable intended for use in trainways, other than traction power cables, shall meet the following:

- (1) Wire and cable shall be listed as being resistant to the spread of fire in accordance with ANSI/UL 1685/CSA C22.2 No. 0.3 having a "1202 / FT-4" rating. One conductor cable smaller than 14 AWG or communications, data and other low voltage electronic cables smaller than 18 AWG shall meet the "VW-1" flame test in accordance with ANSI/UL 44.

- (2) Wire and cable shall be listed as having reduced smoke emissions in accordance with ANSI/UL 1685/CSA C22.2 No. 0.3 having a "LS" or "ST1" rating.

- (3) All materials (such as insulation, jacket and fillers) used in the construction of wire
and cable for use in enclosed trainways, other than traction power cables shall be halogen-free meeting the following requirements as listed in Table 7.1-5 in ICEA S-73-532/NEMA WC 57.

(a) Halogen content less than 0.2 percent.
(b) Acid gas content less than 2 percent.
(c) Smoke generation per ASTM E662 in a flaming mode of 50 at 4 minutes and 250 maximum and in a nonflaming mode of 50 at 4 minutes and 350 maximum.

6.3.2.6* All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas.

6.3.2.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but shall not be installed, exposed, or surface-mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10.

6.3.2.7 Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment and that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

6.3.2.8 The emergency lighting and communication circuits shall be protected from physical damage by transit or passenger rail vehicles or other normal operations and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E-119 fire conditions by any one of the following:

(1) Suitable embedment or encasement
(2) Routing—external to the interior underground portions of the system facilities
(3) Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier,) so that a single fire or emergency event—will not lead to a failure of the system
(4) Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 6.3.2.10.

6.3.2.9 Power Supply for Emergency Ventilation. See Chapter 7.

6.3.2.10 Fire-resistive cables used for emergency lighting and communication shall be listed and have a minimum 1-hour fire-resistive rating in accordance with ANSI/UL 2196 and shall be installed per the listing requirements.

6.3.2.11 Emergency Power. Enclosed trainways shall be such that, in the event of failure of the normal supply to, or within, the system, emergency power shall be provided with emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110. The supply system for emergency purposes, in addition to the normal services to the trainway, shall be one or more of the types of systems described in section 700.12(A) through 700.12(E) of NFPA 70.

6.3.2.11.1 The following systems shall be connected to the emergency power system:
(1) Emergency lighting
(2) Protective signaling systems
(3) Emergency communication system
(4) Fire command center

6.4.4 Ventilation. Except as described in Sections 6.4.1 and 6.4.2, emergency ventilation shall be provided in enclosed trainways in accordance with Chapter 7.

6.4.1* Emergency ventilation meeting the tenability criteria for occupied spaces is not required in tail track areas where engineering analysis indicates that a fire on a train in the tail track area will not impact passengers or passenger areas.

6.4.2* Emergency ventilation meeting the tenability criteria for occupied areas is not required in storage track areas where the storage track does not open along its length to passenger track areas and where an engineering analysis indicates that a fire on a train in the storage track area will not impact passengers or passenger areas.

6.5 Egress for Passengers.

6.5.1 General.

6.5.1.1 Identification. Emergency exit facilities shall be identified and maintained to allow for their intended use.

6.5.1.2 Passengers shall enter the trainways only in the event that it becomes necessary to evacuate a train.

6.5.1.3 Evacuation shall take place only under the guidance and control of authorized, trained system employees or other authorized personnel as warranted under an emergency situation.

6.5.1.4* The system shall incorporate a walk surface or other approved means for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety.

6.5.1.5 System egress points shall be illuminated.

6.5.1.6 Where the trainway track bed serves as the emergency egress pathway, it shall be nominally level and free of obstructions.

6.5.1.7 Walking surfaces shall have a uniform, slip-resistant design.

6.5.1.8 In areas where cross-passageways are provided, walkways shall be provided on the cross-passageway side of the trainway for unobstructed access to the cross-passageway.

6.5.1.9 Crosswalks shall be provided at track level to ensure walkway continuity.

6.5.1.10 Crosswalks shall have uniform walking surface at the top of the rail.

6.5.1.11 Walkway continuity shall be maintained at special track sections (e.g., crossovers, pocket tracks).

6.5.1.12* The means of egress within the trainway shall be provided with an
unobstructed clear width graduating from:

1. 610 mm (24 in.) at the walking surface, to
2. 760 mm (30 in.) at 1420 mm (56 in.) above the walking surface, and to
3. 610 mm (24 in.) at 2050 mm (80 in.) above the walking surface

6.5.1.13 Guards

6.5.1.13.1 Raised walkways that are more than 760 mm (30 in.) above the floor or grade below shall be provided with a continuous guard to prevent falls over the open side.

6.5.1.13.2 Guards shall not be required along the trainway side of raised walkways where the bottom of the trainway is closed by a deck or grating.

6.5.1.13.3 Guards shall not be required on raised walkways that are located between two trainways.

6.5.1.14 Handrails

6.5.1.14.1 Raised walkways shall be provided with a continuous handrail along the side opposite the trainway.

6.5.1.14.2 Raised walkways that are greater than 1120 mm (44 in.) wide and located between two trainways shall not be required to have a handrail.

6.5.2 Means of Egress Underground.

6.5.2.1 General. Exit stairs and doors shall comply with Chapter 7 of NFPA 101 except as herein modified.

6.5.2.2* Number and Location of Means of Egress Routes.

6.5.2.2.1 Within underground or enclosed trainways, the maximum distance between exits shall not exceed 762 m (2500 ft).

6.5.2.2.2 For exit stairs serving underground or enclosed trainways, the width of exit stairs is not required to exceed 1120 mm (44 in.).

6.5.2.3 Cross-Passageways.

6.5.2.3.1 Cross-passageways shall be permitted to be used in lieu of emergency exit stairways to the surface where trainways in tunnels are divided by a minimum of 2 hour-rated fire walls or where trainways are in twin bores.

6.5.2.3.2 Where cross-passageways are utilized in lieu of emergency exit stairways, the following shall apply:

1. Cross-passageways shall not be farther than 244 m (800 ft) apart.
2. Cross-passageways shall not be further than 244 m (800 ft) from the station or tunnel portal.
3. Cross-passages shall be a minimum of 1120 mm (44 in.) in clear width and 2100 mm (7 ft) in height.
4. Openings in open passageways shall be protected with fire door assemblies having a fire protection rating of 1½ hours with a self-closing fire door.
5. A tenable environment shall be maintained in that portion of the trainway that is not involved in an emergency and that is being used for evacuation.
(6) A ventilation system for the contaminated tunnel shall be designed to control
smoke in the vicinity of the passengers.

(7) Provisions shall be made for evacuating passengers via the non-incident
trainway to a nearby station or other emergency exit.

(8)* The provisions shall include measures to protect passengers from oncoming
traffic and from other hazards.

(9) An approved method for evacuating the passengers to a nearby station or
other emergency exit shall be provided.

6.5.2.4 Doors.

6.5.2.4.1 Doors in the means of egress, except cross-passageway doors, shall open in the
direction of exit travel.

6.5.2.4.2 Doors in the means of egress shall comply with the following:
(1) Open fully when a force not exceeding 220 N (50 lb) is applied to the latch side
of the door
(2) Be adequate to withstand positive and negative pressures caused by passing
trains and tunnel ventilation system

6.5.2.4.3* Doors in egress routes serving trainways shall have a minimum clear width
of 810 mm (32 in.).

6.5.2.4.4 Horizontal sliding doors shall be permitted in cross-passageways.

6.5.2.5 Exit Hatches.

6.5.2.5.1 Exit hatches shall be permitted in the means of egress provided the following
conditions are met:
(1) Hatches shall be equipped with a manual opening device that can be readily
opened from the egress side.
(2) Hatches shall be operable with not more than one releasing operation.
(3) The force required to open the hatch when applied at the opening device shall
not exceed 130 N (30 lb).
(4) The hatch shall be equipped with a hold-open device that automatically latches
the door in the open position to prevent accidental closure.

6.5.2.5.2 Exit hatches shall be capable of being opened from the discharge side to permit
access by authorized personnel.

6.5.2.5.3* Exit hatches shall be conspicuously marked on the discharge side to prevent
possible blockage.

6.5.3 Surface and Elevated Emergency Access.

6.5.3.1 Surface.

6.5.3.1.1 If security fences are used along the trainway, access gates shall be provided in
security fences, as deemed necessary by the authority having jurisdiction.

6.5.3.1.2 Access gates shall be a minimum of 1120 mm (44 in.) wide and shall be of the
hinged or sliding type.

6.5.3.1.3 Access gates shall be placed as close as practical to the portals to permit easy
access to tunnels.
6.5.3.1.4 Information that clearly identifies the route and location of each gate shall be provided on the gates or adjacent thereto.

6.5.3.2 Elevated.
6.5.3.2.1 Access to the trainway shall be from stations or by mobile ladder equipment from roadways adjacent to the trackway.
6.5.3.2.2 If no adjacent or crossing roadways exist, access roads at a maximum of 762 m (2500 ft) intervals shall be required.
6.5.3.2.3 If security fences are used along the trackway, access gates shall be provided as deemed necessary by the authority having jurisdiction.
6.5.3.2.4 Adjacent to each blue light station, information shall be provided that identifies the route and location of the access.
6.5.3.2.5 The graphics shall be legible from the ground level outside the trackway.

6.5.4 Blue Light Station.
6.5.4.1* Blue light stations shall be provided at the following locations:
   (1) At the ends of station platforms
   (2) At cross-passageways (see 6.2.2.3)
   (3) At emergency access points
   (4) At traction power substations
   (5) In underground trainways as required by the authority having jurisdiction
6.5.4.2 Adjacent to each blue light station, information shall be provided that identifies the location of that station and the distance to an exit in each direction.
6.5.4.3 In systems with overhead traction power, the requirement to disconnect traction power shall be permitted by an approved alternate means.

6.5.5* Directional Signs.
6.5.5.1 Underground or enclosed trainways greater in length than the minimum length of one train shall be provided with directional signs as appropriate for the emergency procedures developed for the fixed guideway transit or passenger rail system in accordance with Chapter 9.
6.5.5.2 Signs indicating station or portal directions shall be installed at maximum 25 m (82 ft) intervals on either side of the underground or enclosed trainways.
6.5.5.3 Signs shall be readily visible by passengers for emergency evacuation.
6.5.5.4 Points of exit from elevated and underground or enclosed trainways shall be marked with internally or externally illuminated signs.

6.6 Illumination.
6.6.1 The requirements of 6.6.2 through 6.6.3.2 shall apply to all underground or enclosed trainways that are greater than 30.5 m (100 ft) in length or 2 car lengths, whichever is greater.
6.6.2 Lighting systems for enclosed trainways described in 6.6.1 shall be installed in accordance with Sections 7.8 and 7.9 of NFPA 101, except as otherwise noted in this
Standard.

6.6.2.1 Exit lights, essential signs, and emergency lights shall be included in the emergency lighting system in accordance with NFPA 70.

6.6.2.2 Emergency fixtures, exit lights, and signs shall be wired separately from emergency distribution panels.

6.6.3* Lighting systems shall be designed so that, during a period of evacuation, average illumination levels of trainway walkways and walking surfaces shall not be less than 2.7 lx (0.25 ft-candles), measured along the path of egress at the walking surface.

6.6.3.1 The emergency lighting system in the trainway shall not exceed a maximum to minimum illumination uniformity ratio of 10:1.

6.6.3.2* Point illumination of means of egress elements shall be permitted to be greater than the 10:1 uniformity ratio.

6.7 Traction Power.

6.7.1 Application.

6.7.1.1* Section 6.7 shall apply to life safety and fire protection criteria for the traction power subsystem installed in the underground trainway.

6.7.1.2 Section 6.7 shall apply to traction power, which shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead contact system (OCS), the contact rail or OCS supports, and special warning and identification devices, as well as electrical appurtenances associated with overhead contact systems.

6.7.2 Traction Power Contact Rail Protection.

6.7.2.1 To provide safety isolation from the contact rail, the requirements of 6.7.2.2 through 6.7.2.5 shall apply.

6.7.2.2 Power rail conductor(s) (dc or ac, which supply power to the vehicle for propulsion and other loads) shall be secured to insulating supports, bonded at joints, and protected to prevent contact with personnel.

6.7.2.3 The design shall include measures to prevent inadvertent contact with the live power rails where such power rails are adjacent to emergency or service walkways and where walkways cross over trainways.

6.7.2.4 Coverboards, where used, shall be capable of supporting a vertical load of 1125 N (250 lb) at any point with no visible permanent deflection.

6.7.2.5 Insulating material for the cable connecting power to the rail shall meet the requirements of IEEE 383, Section 2.5.

6.7.3 Traction Power Overhead Contact System Protection.

6.7.3.1 To provide isolation from the overhead contact system, the requirements of 6.7.3.2 through 6.7.3.3 shall apply.

6.7.3.2 Power conductor(s) (dc or ac, which supply power to the vehicle for propulsion and other loads) shall be secured to insulating supports, bonded at joints, and protected to prevent contact with personnel.

6.7.3.3 Insulating material for the cable connecting power to the overhead contact system
shall meet the requirements of IEEE 383, Section 2.5.

6.8 Protection.

6.8.1 Automatic Fire Detection.

6.8.1.1 Heat and smoke detectors shall be installed at traction power substations and signal bungalows and shall be connected to the operations control center.

6.8.1.2 Signals received from such devices shall be identifiable as to origin of signals.

6.8.2 Standpipe and Hose Systems.

6.8.2.1 An approved fire standpipe system shall be provided in underground fixed guideway transit or passenger rail system trainways where physical factors prevent or impede access to the water supply or fire apparatus, where required by the authority having jurisdiction.

6.8.2.1.1 Class I or Class III standpipe systems shall be installed in trainways in accordance with NFPA 14 except as modified herein.

6.8.2.1.2 Standpipe systems shall not be required to be enclosed in fire-rated construction provided the following conditions are met:

(1) The system is cross-connected or fed from two locations.

(2) Isolation valves are installed not more than 245 m (800 ft) apart.[jg33]

6.8.2.2 Standpipes shall be permitted to be of the dry type with the approval of the authority having jurisdiction.

6.8.2.3 Standpipe systems shall be provided with an approved water supply capable of supplying the system demand for a minimum of 1 hour.

6.8.2.3.1 Acceptable water supplies shall include the following:

(1) Approved municipal or privately owned waterworks systems that have adequate pressure, flow rate, and level of integrity

(2) Automatic or manually controlled fire pumps that are connected to an approved water source

(3) Pressure-type or gravity-type storage tanks that are installed in accordance with NFPA 22.[jg34]

6.8.2.4 Identification numbers and letters conforming to the sectional identification numbers and letters of the fixed guideway transit or passenger trainway system shall be provided at each surface fire department connection and at each hose valve on the standpipe lines.

6.8.2.4.1 Identifying signs shall be affixed to underground or enclosed trainway walls at each hose outlet valve or shall be painted directly on the standpipe in white letters next to each hose outlet valve.

6.8.2.4.2 Exposed tunnel standpipe lines and identification signs shall be painted as required by the authority having jurisdiction.

6.8.2.5 A fire department access road shall extend to within 30 m (100 ft) of the fire department connection.

6.8.3 Standpipe Installations in Tunnels Under Construction.
6.8.3.1 A standpipe system shall be installed in tunnels under construction in accordance with NFPA 241.

6.8.3.1.1 A standpipe system shall be installed in tunnels under construction before the tunnel has exceeded a length of 61 m (200 ft) beyond any access shaft or portal and shall be extended as tunnel work progresses to within 61 m (200 ft) of the most remote portion of the enclosed trainway.

6.8.3.1.2 Standpipes will be sized for approved water flow and pressure at the outlet, based upon the maximum predicted fire load.

6.8.3.2 Reducers or adapters shall be provided and attached for connection of the contractor's hose.

6.8.3.3 Reducers or adapters shall be readily removable through the use of a fire fighter's hose spanner wrench.

6.8.3.4 Risers shall be identified with signs as outlined in 6.8.2.4.

6.8.3.5 Risers shall be readily accessible for fire department use.

6.8.3.6 Risers shall be protected from accidental damage.

6.8.3.7* Illumination levels of enclosed trainway shall not be less than 2.7 lx (0.25 ft-candles) at the walking surface.

6.8.4 Portable Fire Extinguishers. Portable fire extinguishers shall be provided in such numbers, sizes, and types and at such locations in tunnels as determined by the authority having jurisdiction.

6.9 Flammable and Combustible Liquids Intrusion.

6.9.1 General. Prevention of accidental intrusion of flammable and combustible liquids due to spills shall be provided in accordance with 6.9.2 through 6.9.7.

6.9.2 Vehicle Roadway Terminations. Vent or fan shafts utilized for ventilation of tunnels shall not terminate at grade on any vehicle roadway.

6.9.3 Median and Sidewalk Terminations. Vent and fan shafts shall be permitted to terminate in the median strips of divided highways, on sidewalks designed to accept such shafts, or in open space areas provided that the grade level of the median strips, sidewalk, or open space meets the following conditions:

   (1) It is at a higher elevation than the surrounding grade level.

   (2) It is separated from the roadway by a concrete curb at least 150 mm (6 in.) in height.

6.9.4 Aboveground Atmospheric Storage Tanks. Aboveground atmospheric storage tanks storing, handling, or processing Class I flammable liquid or Class II or Class III combustible liquids and related piping shall not be located directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure unless provided with an approved leak detection system.

6.9.4.1 Where the top of the subsurface trainway or station is more than 15 m (49.2 ft) below the surface of the earth, an engineering analysis to determine the need of rate
requirement in 6.9.4 shall be permitted to be conducted.

6.9.5 Underground Storage Tanks. Underground storage tanks for Class I flammable or Class II or Class III combustible liquids and related piping shall not be permitted directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure. *(See 6.6.7 for tanks in or under existing buildings.)*

6.9.5.1 Where the top of the subsurface trainway or station is more than 15 m (49.2 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement in 6.9.5 shall be permitted to be conducted.

6.9.5.2 For underground storage tanks and related piping for Class I flammable or Class II or Class III combustible liquids located in the area between 6.1 m (20 ft) and 30 m (98.4 ft) (measured horizontally) from the outside wall of the subsurface structure and within that same area, such tanks and related piping within 600 mm (24 in.) (measured vertically) below the lowest point of subsurface structure excavation shall be constructed and installed according to one of the following methods:

1. For tanks of double-wall construction, the following shall apply:
   a. Tanks shall be equipped with an approved automatic leak detection and monitoring system.
   b. Tanks shall be provided with an approved corrosion protection system.
   c. Installation, maintenance, and inspection shall conform to the requirements specified by the authority having jurisdiction.

2. For tanks installed in a cast-in-place reinforced concrete vault large enough to hold and retain the entire contents of the tank, the following shall apply:
   a. The storage tank shall be completely encompassed by not less than 600 mm (24 in.) of well-tamped, noncorrosive inert material within the vault.
   b. An approved method for the monitoring of, or testing for, product and enclosure leakage shall be incorporated into the enclosure design.
   c. The vault lid shall be designed and constructed to withstand anticipated surface loadings and shall be not less than 150 mm (6 in.) of reinforced concrete.
   d. Vault, tank, and piping shall be protected from corrosion.

6.9.5.3 All tanks, vaults, and appurtenances used to store Class I flammable and Class II and Class III combustible liquids shall be compatible with the materials stored and shall conform to the provisions of NFPA 30.

6.9.6 Service Stations.

6.9.6.1 Service stations dispensing Class I flammable liquids and Class II and Class III combustible liquids, and located in the area within 30 m (98.4 ft) (measured horizontally) from the outside wall of the underground structure, shall be required to comply with 6.6.6.2 through 6.6.6.5.

6.9.6.2 The surface around pump islands shall be graded or drained in a manner to divert spills away from the tunnel vent gratings or tunnel entrances or exits.

6.9.6.3 Continuous drains across driveways, ramps, or curbs of at least 150 mm (6 in.) in height shall separate service station properties from adjacent tunnel vent gratings or tunnel entrances or exits.

6.9.6.4 No connection (such as venting or drainage) of any storage tanks and related piping of Class I flammable liquids and Class II and Class III combustible liquids to a
subsurface fixed guideway transit structure shall be permitted.

6.9.6.5 Dispensing pumps for Class I flammable liquids and Class II and Class III combustible liquids shall not be located less than 6.1 m (20 ft) from the face of such pump to the nearest side of a tunnel vent grating or subway entrance or exit.

6.9.7 Existing Storage Tanks in or Under Buildings.

6.9.7.1 Existing storage tanks for Class I flammable liquids and Class II and Class III combustible liquids located in or under buildings, and located directly above a subsurface transit structure or within 6.1 m (20 ft) (measured horizontally) from the outside wall of the subsurface transit structure, shall be removed and relocated outside the prohibited area.

6.9.7.1.1 Where the top of the subsurface trainway or station is more than 15 m (49.2 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement of 6.9.7.1 shall be permitted to be conducted. (Note 38)

6.9.7.2 Where it is not possible to remove and relocate tanks for Class I flammable and Class II combustible liquids due to limited space, such underground tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.9.7.3 Where it is not possible to remove and relocate tanks for Class III combustible liquids located in buildings, such tanks shall be provided with leak detection and a secondary containment system of adequate capacity to contain the contents of the tank.

6.9.7.4 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.9.7.5 Where it is not possible to remove and relocate tanks for Class III combustible liquids located under a building, such tanks shall be UL-listed double wall or installed in a cast-in-place reinforced concrete vault and shall be provided with an approved leak detection system.

6.9.7.6 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

A.6.1 The intent of the Standard is to provide a reasonable level of life safety to passengers, transit system personnel, authorized visitors, and emergency responders. Generally, protective features such as complying exiting egress routes in compliance with Chapter 6 are required for these areas, but see 6.3.2.1 applicable to ventilation requirements. (Note 39)

A.6.2.3 The fire hazard analysis should determine that the fire does not propagate beyond the area of fire origin, and that a level of fire safety is provided within the trainway commensurate with this standard. Computer modeling, material fire testing, or full-scale fire testing should be conducted, as appropriate, to assess fire performance in potential fire scenarios.

A.6.3.1 The life safety and fire protection requirements for the traction power substations, tie breaker stations, and power distribution and control cabling are described in other parts of this standard.
A.6.3.2.6 The trainway, although used for ventilation, should not be considered as an air plenum for purposes of mounting electrical appurtenances.

A.6.3.2.6.1 Cables in the air plenum might be exposed to air at elevated temperature accompanying fire emergency conditions.

A.6.4.1 The intent of the Standard is to provide a reasonable level of life safety to passengers, staff, authorized visitors, and responding personnel. However, the risk faced in non-passenger areas where trains are merely stored or cleaned, is significantly different than in passenger areas. (These two sections do not apply to maintenance and yards areas.) This is because there are fewer ignition sources, fewer people, and the occupants will either be familiar with their surroundings (in the case of staff), or trained to react in hazardous locations (in the case of emergency responders). The standard continues to require all other protective features, including compliant exiting from these areas, but, in these sections, eliminates the requirement for the emergency ventilation system to meet the tenability criteria for occupied areas, tenability criteria in these areas can be reduced provided that an engineering analysis shows that a fire in these areas will not impact areas occupied by passengers.

A.6.4.2 See A.6.4.1

A.6.5.1.4 The trainway and vehicle means of egress should be designed to be compatible. See Chapter 8.

A.6.5.1.12 Maintaining a clear space above the walking surface is important to ensure that projections do not encroach into the means of egress. The envelope created by the boundary limits defined by this paragraph is intended to gradually change from point to point.

****Artwork will be inserted here.****

A.6.5.1.13 It is important that guards and handrails be configured so that they do not interfere with either the vehicle dynamic envelope or with egress from the train onto the walkway. For that reason, guards are not required on the trainway side of raised walkways provided that the bottom of the trainway is closed by deck or grating so that persons could not fall through the bottom of the guideway.

A.6.5.1.14 It is important that handrails be configured so that they do not interfere with either the vehicle dynamic envelope or with egress from the train onto the walkway. For that reason, handrails are not required on the trainway side of raised walkways. Likewise raised walkways located between trainways are not required to have handrails provided they are a minimum width of 1120 mm (44 in).

A.6.5.2.2 Previous editions of NFPA 130 addressed this requirement by prescribing the maximum travel distance to an exit. The intent of this requirement was often
misinterpreted. NFPA 101 requires, at a minimum, that two means of egress be provided within a building or structure and prescribes the maximum travel distance to an exit. This same requirement is applied in NFPA 130. Where two means of egress are required, the maximum travel distance to an exit occurs at the midpoint. For example, in a building with two exits, in the event of a fire adjacent to an exit rendering that exit unavailable, NFPA 101 recognizes that an individual in proximity to the affected exit must travel twice the prescribed exit travel distance to the alternate exit. Since two means of egress are required at any one point in a tunnel, the exits cannot be more than twice the travel distance, or 762 m (2500 ft) apart.

A.6.5.2.3.2 (2) The distance from the station should generally be measured to the end of the station platform. However, the distance may also be measured to an area of relative safety that is beyond the end of the platform, such as an exit stair or, where appropriate based on evaluation of emergency ventilation airflow, a ventilation inlet.[jg43]

A.6.5.2.3.2 (8) The hazards to be considered include but are not limited to potential contact with live traction power distribution equipment.[jg44]

A.6.5.2.4.3 The stipulated minimum width applies to all means of egress doorways, including those for crosstages.[jg45]

A.6.5.2.5.3 Where exit hatches are installed in spaces such as walkways or access areas, appropriate design features such as readily visible signs, markings, or bollards should be provided to prevent blockage of the exit hatch. In addition, provisions should be included in the design to protect the exterior side of the hatch, including the outside latch, from accumulation of ice and snow, which could render the hatch inoperable.

A.6.5.4.1 The placement of blue light stations at the ends of station platforms should be governed by actual need. For instance, an at-grade system that has stations in dedicated streets and overhead power supply would not need blue light stations at the ends of platforms.

A.6.5.5 Directional signs are provided to assist emergency evacuation of passengers. The signs should be of reflective or illuminated materials and readily visible by passengers within the trainway. Inclusion of distance to the station or portal is discouraged since that might influence passenger evacuation route, which could contradict the emergency evacuation strategy.

A.6.6.3 This value is a minimum maintained point measured at any location on the walkway, taking into account the total light loss factor (dirt depreciation, lumen depreciation, etc.) that will be experienced by the luminaire.

A.6.6.3.2 Point illumination can be utilized to accentuate critical elements within the trainway such as walkway change of elevation, steps, and access points.[jg46]

A.6.7.1.1 The primary hazards presented by the electrified third rail in the trainway are electrical shock to employees and other personnel in the trainway and the heat and smoke generated by the cable or third rail caused by combustion resulting from
grounding or arcing.
The life safety and fire protection requirements for the traction power substations, tie breaker stations, and power distribution and control cabling are described in other parts of this standard.

[A.6.8.3.7 See A.6.6.3][jg48]
Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.
Recommendation: Amend the order of requirements in Chapter 6 as shown:

****Insert 130_L152_Tbl Chapter 6****

Substantiation: The reorganization is required to correct mistakes made in the re-organization that occurred in the 2007 edition.
This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Submitter: Stephanie H. Markos, US Department of Transportation/Volpe Center
Recommendation: Revise Chapter 6 to re order the sections to clarify the contents.

***Insert Table Here***

Substantiation: Prior to the 2007 edition, Construction, emergency egress-related requirements, etc., were each contained in a separate section heading depending on the type of trainway: underground, surface, or elevated. The 2007 edition combined the majority of those items particularly relating to “Means of Egress” as part of an effort to reduce repetition. However, several issues were identified during the 2010 revision cycle relating to this reorganization, which caused some confusion as to the applicability of certain requirements. Accordingly, this current proposal is based on: 1) the previous order of major sections in the Chapter prior to 2007, 2) a proposal by the submitter provided to the Committee for the 2007 revision in 2008 and 2010, to reorder sections of the Chapter, 3) review of the draft proposal prepared by the Task Group 2 and 5 Chair during this revision cycle, and 4) further review by this submitter of the 2010, 2007, and earlier versions of 130 prior to 2007. Note that the order of certain sections in this proposal does not exactly “track” with that of either the draft or submitted proposal by the Task Group 2 and 5 Chair, due to different logic as to the recommended order of several sections.
This is not original material; its reference/source is as follows:
Prior editions of NFPA 130, Task Group 2 and 5 Chair draft proposal
CHAPTER 6 – TRAINWAYS

6.1 General

6.1.1 6.1* Applicability.

6.1.1.1 * This chapter applies to all portions of the trainway, including pocket storage and tail tracks not intended for occupancy by passengers.

6.1.2 Use and Occupancy

6.1.2.1 6.2.12–Passengers shall enter the trainways only in the event that it becomes necessary to evacuate a train.

6.1.2.2 6.2.13–Evacuation shall take place only under the guidance and control of authorized, trained system employees or other authorized personnel as warranted under an emergency situation.

6.2 Warning Signs

6.2.1 6.5.3–Warning signs in accordance with 6.3.5.1 shall be posted on entrances to the trainway (e.g., station platforms and portals), on fences or barriers adjacent to the trainway, and at such other places where nontransit authority employees might trespass.

6.2.3 6.3Construction Materials

6.2.1 6.5.3–Safeguards During Standpipe Installations in Tunnels Under Construction

6.2.1.1 6.5.3.1–A standpipe system shall be installed in tunnels under construction in accordance with NFPA 241.

6.2.1.2 6.5.3.1.1–The standpipe system shall be installed before the enclosed trainway has exceeded a length of 61 m (200 ft) beyond any access shaft or portal and shall be extended as work progresses to within 61 m (200 ft) of the most remote portion of the enclosed trainway.

6.2.1.3 6.5.3.1.2–Standpipes shall be sized for approved water flow and pressure at the outlet, based upon the maximum predicted fire load.

6.2.1.4 6.5.3.2–Reducers or adapters shall be

(1) provided and attached for connection of the contractor's hose, and,

(2) 6.5.3.3–Reducers or adapters shall be readily removable through the use of a fire fighter's hose spanner wrench.

6.2.1.5 6.5.3.4–Risers shall be

(1) identified with signs as outlined in 6.4.4.76.5.2.4,

(2) 6.5.3.5–Risers shall be readily accessible for fire department use, and,

(3) 6.5.3.6–Risers shall be protected from accidental damage.

6.2.1.6 6.5.3.7* Illumination. Illumination levels of enclosed trainways shall not be less than 2.7 lx (0.25 ft-candles) at the walking surface.
6.2.2 6.3.1 General Construction Type.

6.3.1.1 Underground (Subways).

6.2.2.1 6.3.1.1.1 Cut and Cover. Where trainway sections are to be constructed by the cut-and-cover method, perimeter walls and related construction shall be not less than Type I or Type II or combinations of Type I or Type II noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.3.1.1.2 Lining.

6.2.2.2 6.3.1.1.2.1 Bored Tunnels. Where trainway sections are to be constructed by a tunneling method through earth, unprotected steel liners, reinforced concrete, shotcrete, or equivalent shall be used.

6.2.2.3 6.3.1.1.2.2 Rock Tunnels. Rock tunnels shall be permitted to utilize steel bents with concrete liner if lining is required.

6.2.2.4 6.3.1.1.4 Underwater Tubes. Underwater tubes shall be not less than Type II (000) noncombustible construction as defined in NFPA 220, as applicable.

6.2.2.5 6.3.1.1.6 Exit and Ventilation Structures. Remote vertical exit shafts and ventilation structures shall be not less than Type I (332) noncombustible construction as defined in NFPA 220.

6.2.2.6 6.3.1.2 Surface. Construction materials shall be not less than Type II (000) noncombustible material as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.2.2.7 6.3.1.3 Elevated. All structures necessary for trainway support and all structures and enclosures on or under trainways shall be of not less than Type I or Type II (000) or combinations of Type I or Type II noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.2.3 6.6 Flammable and Combustible Liquids Intrusion.

6.2.3.1 6.6.1 General. This section describes requirements for the prevention of accidental intrusion of flammable and combustible liquids due to spills shall be provided in accordance with 6.6.2 through 6.6.7.

6.2.3.2 6.6.2 Vehicle Roadway Terminations. Vent or fan shafts utilized for ventilation of tunnels shall not terminate at grade on any vehicle roadway.

6.2.3.3 6.6.3 Median and Sidewalk Terminations. Vent and fan shafts shall be permitted to terminate in the median strips of divided highways, on sidewalks designed to accept such shafts, or in open space areas, provided that the grade level of the median strips, sidewalk, or open space meets the following conditions:

(1) It is at a higher elevation than the surrounding grade level.

(2) It is separated from the roadway by a concrete curb at least 150 mm (6 in.) in height.
6.2.3.4 **6.6.4 Aboveground Atmospheric Storage Tanks.** Aboveground atmospheric storage tanks storing, handling, or processing Class I flammable liquid or Class II or Class III combustible liquids and related piping shall not be located directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure unless provided with an approved leak detection system.

6.2.3.5 **6.6.4.1** Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the rate requirement in 6.6.4 shall be permitted to be conducted.

6.2.3.6 **6.6.5 Underground Storage Tanks.** Underground storage tanks for Class I flammable or Class II or Class III combustible liquids and related piping shall not be permitted directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure. *(See 6.6.7 for tanks in or under existing buildings.)*

6.2.3.7 **6.6.5.1** Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement in 6.6.5 shall be permitted to be conducted.

6.2.3.8 **6.6.5.2** For underground storage tanks and related piping for Class I flammable or Class II or Class III combustible liquids located in the area between 6.1 m (20 ft) and 30.5 m (100 ft) (measured horizontally) from the outside wall of the subsurface structure and within that same area, such tanks and related piping within 610 mm (24 in.) (measured vertically) below the lowest point of subsurface structure excavation shall be constructed and installed according to one of the following methods:

1. For tanks of double-wall construction, the following shall apply:
   (a) Tanks shall be equipped with an approved automatic leak detection and monitoring system.
   (b) tanks shall be provided with an approved corrosion protection system.
   (c) Installation, maintenance, and inspection shall conform to the requirements specified by the authority having jurisdiction.

2. For tanks installed in a cast-in-place reinforced concrete vault large enough to hold and retain the entire contents of the tank, the following shall apply:
   (a) The storage tank shall be completely encompassed by not less than 610 mm (24 in.) of well-tamped, noncorrosive inert material within the vault.
   (b) An approved method for the monitoring of or testing for product and enclosure leakage shall be incorporated into the enclosure design.
   (c) The vault lid shall be designed and constructed to withstand anticipated surface loadings and shall be not less than 150 mm (6 in.) of reinforced concrete.
   (d) Vault, tank, and piping shall be protected from corrosion.
6.2.3.9 All tanks, vaults, and appurtenances used to store Class I flammable and Class II and Class III combustible liquids shall be compatible with the materials stored and shall conform to the provisions of NFPA 30.

6.6.6 Service Stations.

6.2.3.10 Service Stations. Service stations dispensing Class I flammable liquids and Class II and Class III combustible liquids and located in the area within 30.5 m (100 ft) (measured horizontally) from the outside wall of the underground structure shall be required to comply with 6.6.6.2 through 6.6.6.5.

6.2.3.11 The surface around pump islands shall be graded or drained in a manner to divert spills away from the tunnel vent gratings or tunnel entrances or exits.

6.2.3.12 Continuous drains across driveways, ramps, or curbs of at least 150 mm (6 in.) in height shall separate service station properties from adjacent tunnel vent gratings or tunnel entrances or exits.

6.2.3.13 No connection (such as venting or drainage) of any storage tanks and related piping of Class I flammable liquids and Class II and Class III combustible liquids to a subsurface fixed guideway transit structure shall be permitted.

6.2.3.14 Dispensing pumps for Class I flammable liquids and Class II and Class III combustible liquids shall not be located less than 6.1 m (20 ft) from the face of such pump to the nearest side of a tunnel vent grating or subway entrance or exit.

6.6.7 Existing Storage Tanks in or Under Buildings.

6.2.3.15 Existing Storage Tanks in or Under Buildings. Existing storage tanks for Class I flammable liquids and Class II and Class III combustible liquids located in or under buildings and located directly above a subsurface transit structure or within 6.1 m (20 ft) (measured horizontally) from the outside wall of the subsurface transit structure shall be removed and relocated outside the prohibited area.

6.2.3.16 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement of 6.6.7.1 shall be permitted to be conducted.

6.2.3.17 Where it is not possible to remove and relocate tanks for Class I flammable and Class II combustible liquids due to limited space, such underground tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.2.3.18 Where it is not possible to remove and relocate tanks for Class III combustible liquids located in buildings, such tanks shall be provided with leak detection and a secondary containment system of adequate capacity to contain the contents of the tank.

6.2.3.19 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.
Where it is not possible to remove and relocate tanks for Class III combustible liquids located under a building, such tanks shall be UL-listed double wall or installed in a cast-in-place reinforced concrete vault and shall be provided with an approved leak detection system.

Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

Ancillary Areas

Ancillary areas shall be separated from trainway areas within underwater trainway sections by a minimum of 3-hour fire-resistive construction.

Ancillary areas shall be separated from trainway areas within underground trainway sections by a minimum of 2-hour fire-resistive construction.

Fire Hazard and Engineering Analysis.

Combustible components not covered in 6.3.1 through 6.3.3.2.8 shall comply with 6.2.4.

An engineering analysis shall be conducted on nonstructural combustible components that includes, as a minimum, an examination of peak heat release rate for combustible elements, total heat released, ignition temperatures, radiant heating view factors, and behavior of the component during internal or external fire scenarios to determine that, if a fire propagates beyond involving the component of fire origin, a level of fire safety is provided within an enclosed trainway commensurate with this standard.

Computer modeling, material fire testing, or full-scale fire testing shall be conducted to assess durability performance in potential fire scenarios.

Walking Surfaces

Walking surfaces designated for evacuation of passengers shall be constructed of noncombustible materials.

Coverboard or Protective Material.

Coverboard or protective material shall have a flame spread index of not more than 25 and a smoke developed index not exceeding 450 when tested in accordance with ASTM E 84.

Materials that comply with the following requirements of 6.4.2.5.3 when tested in accordance with NFPA 286 shall be permitted to be used in all areas where flame spread index and smoke developed index when tested in accordance with ASTM E 84 is required.

The following test criteria shall apply:
(1) Flames shall not spread to the ceiling during the 40 kW (135 kBtu/hr) exposure.

(2) During the 160 kW (545 kBtu/hr) exposure, the following criteria shall be met:

(a) Flame shall not spread to the outer extremities of the sample on the 2.45 m × 3.7 m (8 ft × 12 ft) wall.

(b) Flashover shall not occur.

(3) The peak heat release rate throughout the test shall not exceed 800 kW (2730 kBtu/hr).

(4) The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).

6.4.2.6 Insulating material for the cable connecting power to the rail shall meet the requirements of IEEE 383, Section 2.5.

6.3.1.1.5 Rail Ties.

6.3.1.1.5.1 Rail ties used in underground or enclosed locations, except as permitted in 6.3.1.1.5.2 or 6.3.1.1.5.3, shall be noncombustible materials, which comply with the requirements of ASTM E 136.

6.3.1.1.5.2 Rail ties used at switch or crossover locations shall comply with 6.4.7.16.3.1.1.5.4 or shall be fire–retardant treated wood in accordance with NFPA 703.

6.3.1.1.5.3 Rail ties and tie blocks in underground or enclosed track sections shall be permitted to be of wood encased in concrete such that only the top surface is exposed.

6.2.9* Wiring Requirements - General. (See Section 5.4.)

6.3.3.1* General.

6.3.3.1.1 Traction power shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead wire, the contact rail supports, and special warning and identification devices.

6.3.3.1.2 Life safety and fire protection criteria for the subsystem installed in the trainway shall conform to the requirements for underground trainways that are listed in 6.4.2.

6.2.9.1 All wiring materials and installations other than those for traction power shall conform to the requirements of NFPA 70.

6.4.2.6 Insulating material for the cable connecting power to the rail shall meet the requirements of IEEE 383, Section 2.5.

6.4.3.3 Insulating material for the cable connecting power to the power rail or overhead contact system shall meet the requirements of IEEE 383, Section 2.5.
6.2.10  **6.3.3.2 Wiring Requirements - Underground (Subways).**

6.2.10.1  **6.3.3.2.1** All wiring materials and installations within underground trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition to the requirements of Section 6.2.9, shall satisfy the requirements of 6.3.3.2.2 through 6.3.3.2.9 in this Subsection.

6.2.10.2  **6.3.3.2.2** Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136.

6.2.10.3  **6.3.3.2.3** All conductors shall be insulated.

6.2.10.4  **6.3.3.2.3.1** Ground wire installed in a metallic raceway shall be insulated.

6.2.10.5  **6.3.3.2.3.2** Other ground wires shall be permitted to be bare.

6.2.10.6  **6.3.3.2.4** All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant types carrying temperature ratings corresponding to either of the following conditions:

   (1) 75°C (167°F) for listed fire-resistant cables

   (2) 90°C (194°F) for all other applications

6.2.10.7  **6.3.3.2.4.1** All insulated conductors and cables shall be listed for wet locations.

6.2.10.8  **6.3.3.2.5** All wires and cables used, other than traction power cables, shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 6.2.10.96.3.3.2.5.1 or 6.2.10.106.3.3.2.5.2.

6.2.10.9  **6.3.3.2.5.1** All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685-2007.

6.2.10.10 **6.3.3.2.5.2** Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA 262, shall be permitted for use instead of the wires and cables specified in 6.2.10.96.3.3.2.5.1.

6.2.10.11 **6.3.3.2.6** All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas.

6.2.10.12 **6.3.3.2.6.1** Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but shall not be installed, exposed, or surface-mounted in air plenums unless cables are listed fire-resistant cables in accordance with 5.4.10<Insert Chapter 5 reference>.

6.2.10.13 **6.3.3.2.7** Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment and that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.
6.2.10.14 6.3.3.2.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E119 fire conditions by any of the following:

(1) Suitable embedment or encasement

(2) Routing external to the interior underground portions of the system facilities

(3) Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

(4) Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 6.2.10.16

6.2.10.15 6.3.3.2.9 Power Supply for Emergency Ventilation. See Chapter 7. Wiring supplying power for the emergency ventilation system shall comply with Chapter 7.

6.2.10.16 6.3.3.2.10 Fire-resistive cables used for emergency lighting and communication shall be listed and have a minimum 1-hour fire-resistive rating in accordance with ANSI/UL 2196 and shall be installed per the listing requirements.

6.3 Emergency Egress and Emergency Access.

6.3.1 6.2.1 General Location of Egress Routes.

6.3.1.1 6.2.1.1* The system shall incorporate a walk surface or other approved means for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety.

6.3.1.2 6.2.1.8 Walkway continuity shall be maintained at special track sections (e.g., crossovers, pocket tracks).

6.3.1.3 6.2.1.6 Crosswalks shall be provided at track level to ensure walkway continuity.

6.2.2 Means of Egress Underground.

6.2.2.2* Number and Location of Means of Egress Routes.

6.3.1.4 6.2.2.2.4* Within underground or enclosed trainways, the maximum distance between exits shall not exceed 762 m (2500 ft).

6.2.2.3 Cross-Passageways.

6.3.1.5 6.2.2.3.1 Cross-passageways shall be permitted to be used in lieu of emergency exit stairways to the surface where trainways in tunnels are divided by a minimum of 2 hour–rated fire walls or where trainways are in twin bores.

6.3.1.6 6.2.2.3.2 Where cross-passageways are utilized in lieu of emergency exit stairways, the following shall apply:

(1) Cross-passageways shall not be farther than 244 m (800 ft) apart.
(2)* Cross-passageways shall not be farther than 244 m (800 ft) from the station or tunnel portal.

(3) Cross-passageways shall be a minimum of 1120 mm (44 in.) in clear width and 2100 mm (7 ft) in height.

(4)(3) Openings in open passageways shall be protected with fire door assemblies having a fire protection rating of 1½ hours with a self-closing fire door.

(5)(4) A tenable environment shall be maintained in that portion of the trainway that is not involved in an emergency and that is being used for evacuation.

(6)(5) A ventilation system for the contaminated tunnel shall be designed to control smoke in the vicinity of the passengers.

(7)(6) Provisions shall be made for evacuating passengers via the non-incident trainway to a nearby station or other emergency exit.

(8)(7)* The provisions shall include measures to protect passengers from oncoming traffic and from other hazards.

6.3.1.7 **6.2.1.5**—In areas where cross-passageways are provided, walkways shall be provided on the cross-passageway side of the trainway for unobstructed access to the cross-passageway.

### 6.3.2 Size of Egress Routes

6.3.2.1 **6.2.1.9**—The means of egress within the trainway shall be provided with an unobstructed clear width graduating from the following:

1. 610 mm (24 in.) at the walking surface to
2. 760 mm (30 in.) at 1420 mm (56 in.) above the walking surface and to
3. 610 mm (24 in.) at 2025 mm (80 in.) above the walking surface

6.3.2.2 **6.2.2.2 (3)**—Cross-passageways shall be a minimum of 1120 mm (44 in.) in clear width and 2100 mm (7 ft) in height.

6.3.2.3 For exit stairs serving underground or enclosed trainways, the width of exit stairs shall not be required to exceed 1120 mm (44 in.).

6.3.2.4 **6.2.2.4.3**—Doors in egress routes serving trainways shall have a minimum clear width of 810 mm (32 in.).

### 6.3.3 Egress Components

6.3.3.1 **6.2.1.4**—Walking surfaces serving as egress routes within guideways shall have a uniform, slip-resistant design.

6.3.3.2 **6.2.1.7**—Guideway crosswalks shall have uniform walking surface at the top of the rail.

6.3.3.3 **6.2.1.10**—Guards.
6.3.3.4  6.2.1.10.1* Raised walkways that are more than 760 mm (30 in.) above the floor or grade below shall be provided with a continuous guard to prevent falls over the open side.

6.3.3.5  6.2.1.10.2 Guards shall not be required along the trainway side of raised walkways where the bottom of the trainway is closed by a deck or grating.

6.3.3.6  6.2.1.10.3 Guards shall not be required on raised walkways that are located between two trainways.

6.2.1.11* Handrails.

6.3.3.7  6.2.1.11.1* Raised walkways shall be provided with a continuous handrail along the side opposite the trainway.

6.3.3.8  6.2.1.11.2 Raised walkways that are greater than 1120 mm (44 in.) wide and located between two trainways shall not be required to have a handrail.

6.3.3.9  6.2.2.1 General. Exit stairs and doors shall comply with Chapter 7 of NFPA 101, except as herein modified.

6.2.2.4 Doors.

6.3.3.10  6.2.2.4.1 Doors in the means of egress, except cross-passageway doors, shall open in the direction of exit travel.

6.3.3.11  6.2.2.4.2 Doors in the means of egress serving underground trainways shall comply with the following:

1. Open fully when a force not exceeding 220 N (50 lb) is applied to the latch side of the door

2. Be adequate to withstand positive and negative pressures caused by passing trains and tunnel ventilation system

6.3.3.12  6.2.2.4.4 Horizontal sliding doors shall be permitted in cross-passageways.

6.2.2.5 Exit Hatches.

6.3.3.13  6.2.2.5.1 Exit hatches shall be permitted in the means of egress, provided the following conditions are met:

1. Hatches shall be equipped with a manual opening device that can be readily opened from the egress side.

2. Hatches shall be operable with not more than one releasing operation.

3. The force required to open the hatch when applied at the opening device shall not exceed 130 N (30 lb).

4. The hatch shall be equipped with a hold-open device that automatically latches the door in the open position to prevent accidental closure.

6.3.3.14  6.2.2.5.2 Exit hatches shall be capable of being opened from the discharge side to permit access by authorized personnel.

6.3.3.15  6.2.2.5.3* Exit hatches shall be conspicuously marked on the discharge side to prevent possible blockage.
6.4 Traction Power Protection.

6.4.1 Application.

6.4.1.1* Section 6.4 shall apply to life safety and fire protection criteria for the traction power subsystem installed in all trainways.

6.4.1.2* This Subsection 6.4 shall apply to the traction power subsystem installed in all trainways, which shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead contact system (OCS), the contact rail or OCS supports, and special warning and identification devices, as well as electrical appurtenances associated with overhead contact systems.

6.4.2 Traction Power Contact Rail Protection.

6.4.2.1 To provide safety isolation from the contact rail, the requirements of 6.4.2.2 through 6.4.2.6 shall apply.

(1) 6.4.2.2 Power rail conductor(s) (dc or ac, which supply power to the vehicle for propulsion and other loads) shall be secured to insulating supports, bonded at joints, and protected to prevent contact with personnel.

(2) 6.4.2.3 The design shall include measures to prevent inadvertent contact with the live power rails where such power rails are adjacent to emergency or service walkways and where walkways cross over trainways.

(3) 6.4.2.4 Coverboards, where used, shall be capable of supporting a vertical load of 1125 N (250 lb) at any point with no visible permanent deflection.

6.4.3 Traction Power Overhead Contact System Protection.

6.4.3.1 To provide isolation from the overhead contact system, the requirements of 6.4.3.2 and 6.4.3.3 shall apply.

6.4.3.2 Power conductor(s) (dc or ac, which supply power to the vehicle for propulsion and other loads) shall be secured to insulating supports, bonded at joints, and protected to prevent contact with personnel.

6.3.5 Signage, Illumination and Emergency Lighting.

6.2.6 Warning Signs.

6.2.6.1 Warning signs shall be posted on entrances to the trainway (e.g., station platforms and portals), and on fences or barriers adjacent to the trainway, and at such other places where nontransit authority employees might trespass.

6.2.6.2 The warning signs shall clearly state the hazard (e.g., DANGER HIGH VOLTAGE — 750 VOLTS)—with letter sizes and colors in conformance with NFPA 70 and Occupational Safety and Health Administration (OSHA) requirements.

6.3.5.2 6.2.6.2 System egress points shall be illuminated.

6.3.5.3 6.2.8.4 Points of exit from elevated and underground or enclosed trainways shall be marked with internally or externally illuminated signs.
6.3.5.4  **6.2.9 Identification.** Emergency exit facilities shall be identified and maintained to allow for their intended use.

6.2.8*  **Directional Signs.**

6.3.5.5  **6.2.8.1**—Underground or enclosed trainways greater in length than the minimum length of one train shall be provided with directional signs as appropriate for the emergency procedures developed for the fixed guideway transit or passenger rail system in accordance with Chapter 9.

6.3.5.6  **6.2.8.2**—Directional Signs indicating station or portal directions shall be installed at maximum 25 m (82 ft) intervals on either side of the underground or enclosed trainways.

6.3.5.7  **6.2.8.3**—Directional Signs shall be readily visible by passengers for emergency evacuation.

6.2.5  **Illumination.**

6.5.3.7*—Illumination levels of enclosed trainways shall not be less than 2.7 lx (0.25 ft-candles) at the walking surface.

6.3.5.8  **6.2.5.1**—The requirements of 6.3.5.9 through 6.3.5.14 shall apply to all underground or enclosed trainways that are greater than 30.5 m (100 ft) in length or 2 car lengths, whichever is greater.

6.3.5.9  **6.2.5.3**—Lighting systems shall be designed so that, during a period of evacuation, illumination levels of trainway walkways and walking surfaces shall not be less than 2.7 lx (0.25 ft-candles), measured along the path of egress at the walking surface.

6.3.5.10  **6.2.5.3.1**—The emergency lighting system in the trainway shall produce illumination on the walkway that does not exceed a uniformity ratio of 10:1 for the maximum maintained horizontal illuminance to the minimum maintained horizontal illuminance.

6.3.5.11  **6.2.5.3.2**—Point illumination of means of egress elements shall be permitted to exceed the 10:1 uniformity ratio.

6.3.5.12  **6.2.5.2**—Lighting systems for enclosed trainways described in 6.2.5.1 shall be installed in accordance with Sections 7.8 and 7.9 of NFPA 101, except as otherwise noted in this standard Subsection.

6.3.5.13  **6.2.5.2.1**—Exit lights, essential signs, and emergency lights shall be included in the emergency lighting system in accordance with NFPA 70.

6.3.5.14  **6.2.5.2.2**—Emergency fixtures, exit lights, and signs shall be wired separately from emergency distribution panels.

6.4  **6.5 Fire Protection and Life Safety Systems.**

6.4.1  **6.2.3 Surface and Elevated Emergency Access.**

6.4.1.1  Except as described herein, points of egress and exits from the guideway shall serve as emergency access routes.

6.2.3.1  **Surface.**
6.4.1.2 If security fences are used along the trainway, access gates shall be provided in security fences, as deemed necessary by the authority having jurisdiction.

6.4.1.3 Access gates shall be a minimum of 1120 mm (44 in.) wide and shall be of the hinged or sliding type.

6.4.1.4 Access gates shall be placed as close as practical to the portals to permit easy access to tunnels.

6.4.1.5 Information that clearly identifies the route and location of each gate shall be provided on the gates or adjacent thereto.

6.2.3.2 Elevated.

6.4.1.6 Access to the elevated trainway shall be from stations or by mobile ladder equipment from roadways adjacent to the trackway.

6.4.1.7 If no adjacent or crossing roadways exist for the elevated trainway, access roads at a maximum of 762 m (2500 ft) intervals shall be required.

6.4.2 Blue Light Stations.

6.4.2.1 Blue light stations shall be provided at the following locations:

(1) At the ends of station platforms

(2) At cross-passageways (see 6.2.2.3)

(3) At emergency access points

(4) At traction power substations

(5) In underground trainways as approved

6.4.2.2 Adjacent to each blue light station, information shall be provided that identifies the location of that station and the distance to an exit in each direction.

6.4.3 Automatic Fire Detection.

6.4.3.1 Heat and smoke detectors shall be installed at traction power substations and signal bungalows and shall be connected to the operations control center.

6.4.3.2 Signals received from such devices shall be identifiable as to origin of signals.
6.4.4  **Standpipe and Hose Systems.**

6.4.4.1  A fire standpipe system shall be provided in underground fixed guideway transit or passenger rail system trainways where physical factors prevent or impede access to the water supply or fire apparatus, where required by the authority having jurisdiction.

6.4.4.2  **Class I or Class III standpipe systems shall be installed in trainways in accordance with NFPA 14 except as modified herein.**

6.4.4.3  Standpipe systems shall not be required to be enclosed in fire-rated construction, provided the following conditions are met:

1. The system is cross-connected or fed from two locations.
2. Isolation valves are installed not more than 244 m (800 ft) apart.

6.4.4.4  Standpipes shall be permitted to be of the dry type with the approval of the authority having jurisdiction.

6.4.4.5  Standpipe systems shall be provided with an approved water supply capable of supplying the system demand for a minimum of 1 hour.

6.4.4.6  Acceptable water supplies shall include the following:

1. Approved municipal or approved privately owned waterworks systems that have adequate pressure, flow rate, and level of integrity.
2. Automatic or manually controlled fire pumps that are connected to an approved water source.
3. Pressure-type or gravity-type storage tanks that are installed in accordance with NFPA 22.

6.4.4.7  Identification numbers and letters conforming to the sectional identification numbers and letters of the fixed guideway transit or passenger trainway system shall be provided at each surface fire department connection and at each hose valve on the standpipe lines.

6.4.4.8  Identifying signs shall be affixed to underground or enclosed trainway walls at each hose outlet valve or shall be painted directly on the standpipe in white letters next to each hose outlet valve.

6.4.4.9  Exposed tunnel standpipe lines and identification signs shall be painted as required by the authority having jurisdiction.

6.4.4.10  A fire department access road shall extend to within 30.5 m (100 ft) of the fire department connection.

6.4.5  **Portable Fire Extinguishers.**

6.4.5.1  Portable fire extinguishers shall be provided in such numbers, sizes, and types and at such locations in tunnels as determined by the authority having jurisdiction.

6.4.6  **Ventilation.**
6.4.6.1 \textbf{6.3.2 Ventilation}. Except as described in 6.3.2.1 and 6.3.2.2 this Subsection, emergency ventilation shall be provided in enclosed trainways in accordance with Chapter 7.

6.4.6.2 \textbf{6.3.2.1*} Emergency ventilation meeting the tenability criteria for occupied spaces shall not be required in tail track areas where engineering analysis indicates that a fire on a train in the tail track area will not impact passengers or passenger areas.

6.4.6.3 \textbf{6.3.2.2*} Emergency ventilation meeting the tenability criteria for occupied areas shall not be required in storage track areas where the storage track does not open along its length to passenger track areas and where an engineering analysis indicates that a fire on a train in the storage track area will not impact passengers or passenger areas.

6.4.7 \textbf{Emergency Power}.

6.4.7.1 \textbf{6.3.3.2.11 Emergency Power}. Enclosed trainways shall be such that, in the event of failure of the normal supply to, or within, the system, emergency power shall be provided with emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110. The supply system for emergency purposes, in addition to the normal services to the trainway, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.

6.4.7.2 \textbf{6.3.3.2.11.1} The following systems shall be connected to the emergency power system:

(1) Emergency lighting
(2) Protective signaling systems
(3) Emergency communication system
(4) Fire command center

6.6 \textbf{Flammable and Combustible Liquids Intrusion}.

6.6.1 \textbf{General}. Prevention of accidental intrusion of flammable and combustible liquids due to spills shall be provided in accordance with 6.6.2 through 6.6.7.

6.6.2 \textbf{Vehicle Roadway Terminations}. Vent or fan shafts utilized for ventilation of tunnels shall not terminate at grade on any vehicle roadway.

6.6.3 \textbf{Median and Sidewalk Terminations}. 
6.6.3 Median and Sidewalk Terminations. Vent and fan shafts shall be permitted to terminate in the median strips of divided highways, on sidewalks designed to accept such shafts, or in open space areas, provided that the grade level of the median strips, sidewalk, or open space meets the following conditions:

1. It is at a higher elevation than the surrounding grade level.
2. It is separated from the roadway by a concrete curb at least 150 mm (6 in.) in height.

6.6.4 Aboveground Atmospheric Storage Tanks.

6.6.4 Aboveground Atmospheric Storage Tanks. Aboveground atmospheric storage tanks storing, handling, or processing Class I flammable liquid or Class II or Class III combustible liquids and related piping shall not be located directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure unless provided with an approved leak detection system.

6.6.4.1 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the rate requirement in 6.6.4 shall be permitted to be conducted.

6.6.5 Underground Storage Tanks.

6.6.5 Underground Storage Tanks. Underground storage tanks for Class I flammable or Class II or Class III combustible liquids and related piping shall not be permitted directly over a subsurface structure or within 6.1 m (20 ft) measured horizontally from the outside wall of such subsurface structure. (See 6.6.7 for tanks in or under existing buildings.)

6.6.5.1 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement in 6.6.5 shall be permitted to be conducted.

6.6.5.2 For underground storage tanks and related piping for Class I flammable or Class II or Class III combustible liquids located in the area between 6.1 m (20 ft) and 30.5 m (100 ft) (measured horizontally) from the outside wall of the subsurface structure and within that same area, such tanks and related piping within 610 mm (24 in.) (measured vertically) below the lowest point of subsurface structure excavation shall be constructed and installed according to one of the following methods:

1. For tanks of double-wall construction, the following shall apply:

   (a) Tanks shall be equipped with an approved automatic leak detection and monitoring system.
   (b) Tanks shall be provided with an approved corrosion protection system.
   (c) Installation, maintenance, and inspection shall conform to the requirements specified by the authority having jurisdiction.
(2) For tanks installed in a cast-in-place reinforced concrete vault large enough to hold and retain the entire contents of the tank, the following shall apply:

(a) The storage tank shall be completely encompassed by not less than 610 mm (24 in.) of well-tamped, noncorrosive inert material within the vault.

(b) An approved method for the monitoring of or testing for product and enclosure leakage shall be incorporated into the enclosure design.

(c) The vault lid shall be designed and constructed to withstand anticipated surface loadings and shall be not less than 150 mm (6 in.) of reinforced concrete.

(d) Vault, tank, and piping shall be protected from corrosion.

6.6.6 Service Stations.

6.6.6.1 Service stations dispensing Class I flammable liquids and Class II and Class III combustible liquids and located in the area within 30.5 m (100 ft) (measured horizontally) from the outside wall of the underground structure shall be required to comply with 6.6.6.2 through 6.6.6.5.

6.6.6.2 The surface around pump islands shall be graded or drained in a manner to divert spills away from the tunnel vent gratings or tunnel entrances or exits.

6.6.6.3 Continuous drains across driveways, ramps, or curbs of at least 150 mm (6 in.) in height shall separate service station properties from adjacent tunnel vent gratings or tunnel entrances or exits.

6.6.6.4 No connection (such as venting or drainage) of any storage tanks and related piping of Class I flammable liquids and Class II and Class III combustible liquids to a subsurface fixed guideway transit structure shall be permitted.

6.6.6.5 Dispensing pumps for Class I flammable liquids and Class II and Class III combustible liquids shall not be located less than 6.1 m (20 ft) from the face of such pump to the nearest side of a tunnel vent grating or subway entrance or exit.

6.6.7 Existing Storage Tanks in or Under Buildings.

6.6.7.1 Existing storage tanks for Class I flammable liquids and Class II and Class III combustible liquids located in or under buildings and located directly above a subsurface transit structure or within 6.1 m (20 ft) (measured horizontally) from the outside wall of the subsurface transit structure shall be removed and relocated outside the prohibited area.
6.6.7.1 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the requirement of 6.6.7.1 shall be permitted to be conducted.

6.6.7.2 Where it is not possible to remove and relocate tanks for Class I flammable and Class II combustible liquids due to limited space, such underground tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.6.7.3 Where it is not possible to remove and relocate tanks for Class III combustible liquids located in buildings, such tanks shall be provided with leak detection and a secondary containment system of adequate capacity to contain the contents of the tank.

6.6.7.4 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.

6.6.7.5 Where it is not possible to remove and relocate tanks for Class III combustible liquids located under a building, such tanks shall be UL-listed double wall or installed in a cast-in-place reinforced concrete vault and shall be provided with an approved leak detection system.

6.6.7.6 Tanks shall be abandoned in accordance with the provisions of Annex C of NFPA 30.
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<thead>
<tr>
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<td><strong>General</strong></td>
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<td>6.1</td>
<td>6.1.1</td>
<td><strong>Applicability</strong></td>
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<td></td>
<td>This chapter applies to all portions of the trainway, including pocket storage and tail tracks not intended for occupancy by passengers.</td>
</tr>
<tr>
<td>-</td>
<td>6.1.2</td>
<td><strong>Use and Occupancy</strong></td>
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<tr>
<td>6.2.1.12</td>
<td>6.1.2.1</td>
<td>Passengers shall enter the trainways only in the event that it becomes necessary to evacuate a train.</td>
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<td>6.2.1.13</td>
<td>6.1.2.2</td>
<td>Evacuation shall take place only under the guidance and control of authorized, trained system employees or other authorized personnel as warranted under an emergency situation.</td>
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<td>6.2.6</td>
<td>6.1.3</td>
<td><strong>Warning Signs</strong></td>
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<tr>
<td>6.2.6.1</td>
<td>6.1.3.1</td>
<td>Warning signs shall be posted:</td>
</tr>
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<td></td>
<td>(1)</td>
<td>On entrances to the trainway (i.e., station platforms and portals),</td>
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<td>(2)</td>
<td>On fences or barriers adjacent to the trainway, and</td>
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<td>(3)</td>
<td>At such other locations where non-system transit authority employees might trespass.</td>
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<tr>
<td>6.2.6.2</td>
<td>6.1.3.2</td>
<td>Warning signs shall clearly state:</td>
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<td>(1)</td>
<td>The hazard (e.g., DANGER HIGH VOLTAGE — 750 VOLTS)</td>
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<td></td>
<td>(2)</td>
<td>With letter sizes and colors in conformance with NFPA 70 and Occupational Safety and Health Administration (OSHA) requirements.</td>
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<td>6.2</td>
<td>6.3</td>
<td><strong>Means of Egress</strong></td>
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<td><strong>Standpipe Installation in Tunnels-Safeguards During Under Construction</strong></td>
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<td>6.5.3.1.1</td>
<td>6.2.1.1</td>
<td>A standpipe system shall be installed in tunnels under construction in accordance with NFPA 241.</td>
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<tr>
<td>6.5.3.1.4</td>
<td>6.2.2.2</td>
<td>A standpipe system shall be installed before the enclosed trainway has exceeded a length of 61 m (200 ft) beyond any access shaft or portal and shall be extended as work progresses to within 61 m (200 ft) of the most remote portion of the enclosed trainway.</td>
</tr>
<tr>
<td>6.5.3.1.2</td>
<td>6.2.2.3</td>
<td>Standpipes shall be sized for approved water flow and pressure at the outlet, based upon the maximum predicted fire load.</td>
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<tr>
<td>6.5.3.2</td>
<td>6.2.2.4</td>
<td>Reducers or adapters shall be: provided and attached for connection of the contractor's hose.</td>
</tr>
<tr>
<td>6.5.3.2</td>
<td>(1)</td>
<td>Provided and attached for connection of the contractor's hose.</td>
</tr>
<tr>
<td>6.5.2.3</td>
<td>(2)</td>
<td>Reducers or adapters shall be readily removable through the use of a fire fighter's hose spanner wrench.</td>
</tr>
<tr>
<td>6.5.3.4</td>
<td>6.2.2.5</td>
<td>Risers shall comply with the following: shall be identified with signs as outlined in 6.5.2.4.</td>
</tr>
<tr>
<td>6.5.3.4</td>
<td>(1)</td>
<td>Risers shall be identified with signs as outlined in 6.5.2.4.</td>
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<tr>
<td>6.5.3.5</td>
<td>(2)</td>
<td>Risers shall be readily accessible for fire department use.</td>
</tr>
<tr>
<td>6.5.3.6</td>
<td>(3)</td>
<td>Risers shall be protected from accidental damage.</td>
</tr>
<tr>
<td>6.5.3.7*</td>
<td>6.2.2.6*</td>
<td>Illumination levels of enclosed trainways shall not be less than 2.7 lx (0.25 ft-candles) at the walking surface.</td>
</tr>
</tbody>
</table>

6.3 6.2.3 Construction Materials

6.3.1 6.2.3.1 General Underground and Underwater (Subway)

6.3.1.1 6.2.3.2 Underground (Subways)

6.3.1.1.1 6.2.3.2.1 Where trainway sections are to be constructed by the cut-and-cover method, perimeter walls and related construction shall be not less than Type I or Type II or combinations of Type I or Type II noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.

6.3.1.1.2 6.2.3.1.2 Where trainway sections are to be constructed by a tunneling method through earth, unprotected steel liners, reinforced concrete, shotcrete, or equivalent shall be used.

6.3.1.1.3 6.2.3.1.3 Rock tunnels shall be permitted to utilize steel bents with concrete liner if lining is required.

6.3.1.1.4 6.2.3.1.4 Underwater tubes shall be not less than Type II (000) noncombustible construction as defined in NFPA 220, as applicable.

6.3.1.1.5 6.2.3.1.5 Walking Surfaces. Walking surfaces designated for evacuation of passengers from underground, enclosed, or underwater locations shall be constructed of noncombustible materials.

6.3.1.1.5 6.2.3.1.6 Rail-Ties. Rail ties used in underground, or enclosed, or underwater locations, except as permitted in 6.3.1.1.5.2 or 6.3.1.1.5.3, shall be noncombustible materials, which comply with the requirements of ASTM E 136, except as permitted below.
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<tbody>
<tr>
<td>6.3.1.1.5.1</td>
<td>(1)</td>
<td>Rail ties used at underground, enclosed, or underwater switch or crossover locations shall comply with 6.3.1.5.1 6.2.3.1.6 or shall be fire–retardant treated wood in accordance with NFPA 703.</td>
</tr>
<tr>
<td>6.3.1.1.5.2</td>
<td>(2)</td>
<td>Rail ties and tie blocks in underground, underwater, or enclosed track sections shall be permitted to be of wood encased in concrete such that only the top surface is exposed.</td>
</tr>
<tr>
<td>6.3.1.1.6</td>
<td>6.2.3.1.7</td>
<td>Structures. Remote vertical exit shafts and ventilation structures shall be not less than Type I (332) noncombustible construction as defined in NFPA 220.</td>
</tr>
<tr>
<td>6.3.1.1.7</td>
<td></td>
<td>Ancillary Areas.</td>
</tr>
<tr>
<td>6.3.1.1.7.1</td>
<td>6.2.3.1.8</td>
<td>Ancillary areas shall be separated from trainway areas within: Underground and enclosed underwater trainway sections by a minimum of 3 1/2-hour fire-resistant construction.</td>
</tr>
<tr>
<td>6.3.1.1.7.2</td>
<td>(2)</td>
<td>Ancillary areas shall be separated from trainway areas within: Underwater trainway sections by a minimum of 2 3/4-hour fire-resistant construction.</td>
</tr>
<tr>
<td>6.3.1.3</td>
<td>6.2.4</td>
<td>Surface. Construction materials shall be not less than Type II (000) noncombustible material as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.</td>
</tr>
<tr>
<td>6.3.1.2</td>
<td>6.2.5</td>
<td>Elevated. All structures necessary for trainway support and all structures and enclosures on or under elevated trainways shall be of not less than Type I or Type II (000) or combinations of Type I or Type II noncombustible construction as defined in NFPA 220, as determined by an engineering analysis of potential fire exposure hazards to the structure.</td>
</tr>
<tr>
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<td>6.3.3.1</td>
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<td>Wiring Requirements (See section 5.4).</td>
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<tr>
<td>6.3.3.1.1</td>
<td>6.2.6.1</td>
<td>General* All wiring materials and installations other than those for traction power (see 6.6) shall conform to the requirements of NFPA 70.</td>
</tr>
<tr>
<td>6.3.3.1.1</td>
<td>-</td>
<td>Traction power shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead wire, the contact rail supports, and special warning and identification.</td>
</tr>
<tr>
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<tr>
<td>6.3.3.1.2</td>
<td>-</td>
<td>Life safety and fire protection criteria for the subsystem installed in the trainway shall conform to the requirements for underground trainways that are listed in 6.4.2.</td>
</tr>
<tr>
<td>6.3.3.1.3</td>
<td>6.2.6.1</td>
<td>All wiring materials and installations other than those for traction power shall conform to the requirements of NFPA 70</td>
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<td>6.3.3.3</td>
<td>6.2.6.2</td>
<td>Underground, Underwater, and Enclosed (Subways).</td>
</tr>
<tr>
<td>6.3.3.2.1</td>
<td>6.2.6.2.1</td>
<td>All wiring materials and installations within trainways, other than for traction power (see Section x.x.x), shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of 6.3.3.2.2 through 6.3.3.2.9 and 6.2.6.2.2 through 6.2.2.1.10.</td>
</tr>
<tr>
<td>6.3.3.2.2</td>
<td>6.2.6.2.2</td>
<td>Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136.</td>
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<tr>
<td>6.3.3.2.3</td>
<td>6.2.6.2.3</td>
<td>All conductors shall be insulated</td>
</tr>
<tr>
<td>6.3.3.2.3.1</td>
<td>(1)</td>
<td>Ground wires installed in a metallic raceway shall be insulated</td>
</tr>
<tr>
<td>6.3.3.2.3.2</td>
<td>(2)</td>
<td>Other ground wires shall be permitted to be bare</td>
</tr>
<tr>
<td>6.3.3.2.4</td>
<td>6.2.6.2.4</td>
<td>All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant types carrying temperature ratings corresponding to either of the following conditions</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>75°C (167°F) for listed fire-resistive cables</td>
</tr>
<tr>
<td>(2)</td>
<td>(2)</td>
<td>90°C (194°F) for all other applications</td>
</tr>
<tr>
<td>6.3.3.2.4.1</td>
<td>6.2.6.2.5</td>
<td>All insulated conductors and cables shall be listed for wet locations</td>
</tr>
<tr>
<td>6.3.3.2.5</td>
<td>6.2.6.2.6</td>
<td>All wires and cables used, other than traction power cables (see section 6.6) shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 6.3.3.2.5.1 or 6.3.3.2.5.2 one of the following:</td>
</tr>
<tr>
<td>6.3.3.2.5.1</td>
<td>(1)</td>
<td>All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685 or</td>
</tr>
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<tr>
<td>6.3.3.2.5.2</td>
<td>(2)</td>
<td>Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA 262, shall be permitted for use instead of the wires and cables specified in 6.3.3.2.5.1.</td>
</tr>
<tr>
<td>6.3.3.2.6</td>
<td>6.2.6.2.7</td>
<td>All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas.</td>
</tr>
<tr>
<td>6.3.3.2.6.1</td>
<td>6.2.6.2.8</td>
<td>Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but shall not be installed, exposed, or surface-mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10.</td>
</tr>
<tr>
<td>6.3.3.2.7</td>
<td>6.2.6.2.9</td>
<td>Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment and that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.</td>
</tr>
<tr>
<td>6.3.3.2.8</td>
<td>6.2.6.6.10</td>
<td>The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E119 fire conditions by any of the following:</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>Suitable embedment or encasement</td>
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<tr>
<td>(2)</td>
<td>(2)</td>
<td>Routing external to the interior underground portions of the system facilities</td>
</tr>
<tr>
<td>(3)</td>
<td>(3)</td>
<td>Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system</td>
</tr>
<tr>
<td>(4)</td>
<td>(4)</td>
<td>Use of a listed fire-resistive cable system with a minimum 1-hour fire resistive rating in accordance with ANSI/UL 2196 6.3.3.2.8.</td>
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<td>6.3.3.2.9</td>
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<td>6.3.3.2.10</td>
<td>6.2.6.2.11</td>
<td>Fire-resistive cables used for emergency lighting and communication shall be listed and have a minimum 1-hour fire-resistant rating in accordance with 6.2.6.2.11(4) ANSI/UL 2196 and shall be installed per the listing requirements</td>
</tr>
<tr>
<td>6.2.4*</td>
<td>6.2.7*</td>
<td><strong>Fire Hazard and Engineering Analysis</strong></td>
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<tr>
<td>6.2.4.1</td>
<td>6.2.7.1.1</td>
<td>Where combustible materials and components not specifically addressed in this standard are installed in a trainway, a fire hazard analysis shall be conducted to determine that the level of occupant fire safety is not adversely affected by the contents.</td>
</tr>
<tr>
<td>6.2.4.2.1</td>
<td>6.2.7.1.2</td>
<td>An engineering analysis shall be conducted on nonstructural combustible materials and components that includes, as a minimum, an examination of peak heat release rate for combustible elements, total heat released, ignition temperatures, radiant heating view factors, and behavior of the material or component during internal or external fire scenarios to determine that, if a fire propagates beyond involving the material or component of fire origin, an equivalent level of fire safety is provided within an enclosed trainway commensurate with this standard.</td>
</tr>
<tr>
<td>6.2.4.3.4</td>
<td>6.2.7.1.3</td>
<td>Computer modeling, material fire testing, or full-scale fire testing shall be conducted to assess durability performance in potential fire scenarios.</td>
</tr>
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<td>6.3</td>
<td><strong>Means of Egress and Emergency Access</strong></td>
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<td>6.3.1</td>
<td>General.</td>
</tr>
<tr>
<td>6.2.1.1*</td>
<td>6.3.1.1*</td>
<td>The system shall incorporate a walk surface, walkway, or other approved means of egress route for passengers to evacuate a train at any point along the trainway so that they can proceed to the nearest station or other point of safety</td>
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<tr>
<td>6.2.1.2</td>
<td>6.2.1</td>
<td>System egress points shall be illuminated</td>
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<td>6.2.2.3.2*</td>
<td>6.3.1.2*</td>
<td>The system shall make provisions for evacuating passengers via the non-incident trainway, or other egress route which shall include measures to protect passengers from oncoming traffic and from other hazards, to a nearby station or...</td>
</tr>
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<td>Route and Exit Components</td>
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<td>6.2.1.3</td>
<td>6.3.2.1</td>
<td>Where the trainway track bed serves as the emergency egress route pathway, it shall be nominally level and free of obstructions.</td>
</tr>
<tr>
<td>6.2.1.4</td>
<td>6.3.2.2</td>
<td>Walking surfaces shall have a nominally level, uniform, and slip-resistant design, and be nominally free of obstructions.</td>
</tr>
<tr>
<td>6.2.1.8</td>
<td>6.3.2.3</td>
<td>Walkway continuity shall be maintained at special track sections (e.g., crossovers, pocket tracks).</td>
</tr>
<tr>
<td>6.2.1.5</td>
<td>6.3.2.4</td>
<td>In areas where cross-passageways (see 6.3.3) are provided, walkways shall be provided on the cross-passageway side of the trainway for unobstructed access to the cross-passageway.</td>
</tr>
<tr>
<td>6.2.1.6</td>
<td>6.3.2.5</td>
<td>Crosswalks shall comply with the following requirements be provided at track level to ensure walkway continuity.</td>
</tr>
<tr>
<td>6.2.1.7</td>
<td>(1)</td>
<td>Be provided at track level to ensure walkway continuity.</td>
</tr>
<tr>
<td>6.2.1.8</td>
<td>(2)</td>
<td>Crosswalks shall have uniform walking surface at the top of the rail.</td>
</tr>
<tr>
<td>6.2.1.9*</td>
<td>6.3.2 6.*</td>
<td>The egress route means of egress within the trainway shall be provided with an unobstructed clear width graduating from the following:</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>610 mm (24 in.) at the walking surface to</td>
</tr>
<tr>
<td>(2)</td>
<td>(2)</td>
<td>760 mm (30 in.) at 1420 mm (56 in.) above the walking surface and to</td>
</tr>
<tr>
<td>(3)</td>
<td>(3)</td>
<td>610 mm (24 in.) at 2025 mm (80 in.) above the walking surface</td>
</tr>
<tr>
<td>6.2.1.10*</td>
<td>See next Guards.</td>
<td></td>
</tr>
<tr>
<td>6.2.1.10.1</td>
<td>6.3.2.7*</td>
<td>A continuous guard for raised walkways that are more than 760 mm (30 in.) above the floor or grade below shall be provided with a continuous guard to prevent falls over the open side.</td>
</tr>
</tbody>
</table>
| 6.2.1.10.2 | 6.3.2.8 | Guards shall not be required for raised walkways along the trainway side of raised walkways where the bottom of the trainway is closed by a deck or grating.
<table>
<thead>
<tr>
<th>Existing 2010 Section Number</th>
<th>New Section Number</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.1.10.3</td>
<td>(2)</td>
<td>Guards shall not be required on raised walkways that are located between two trainways.</td>
</tr>
<tr>
<td>6.2.1.11*</td>
<td></td>
<td>See next Handrails.</td>
</tr>
<tr>
<td>6.2.1.11.1</td>
<td>6.3.2.9*</td>
<td>A continuous handrail shall be provided for Raised walkways shall be provided with a continuous handrail along the side opposite the trainway.</td>
</tr>
<tr>
<td>6.2.1.11.2</td>
<td>6.3.2.10</td>
<td>A continuous handrail Raised walkways shall not be required for walkways that are greater than 1120 mm (44 in.) wide and located between two trainways shall not be required to have a handrail.</td>
</tr>
<tr>
<td>6.2.1.12.</td>
<td>6.12.1</td>
<td>Passengers shall enter the trainways only in the event that it becomes necessary to evacuate a train.</td>
</tr>
<tr>
<td>6.2.1.13</td>
<td>6.1.2.2</td>
<td>Evacuation shall take place only under the guidance and control of authorized, trained system employees or other authorized personnel as warranted under an emergency situation.</td>
</tr>
<tr>
<td>6.3.2</td>
<td>6.3.3</td>
<td>Underground, Underwater, and Enclosed.</td>
</tr>
<tr>
<td>6.2.2.2*</td>
<td>6.3.3.1*</td>
<td>Number and Location of Means of Egress Routes.</td>
</tr>
<tr>
<td>6.2.2.1*</td>
<td>6.3.3.1.1</td>
<td>General—Exit stairs and doors shall comply with Chapter 7 of NFPA 101, except as modified inherein.</td>
</tr>
<tr>
<td>6.2.2.2*</td>
<td>6.3.3.1.2</td>
<td>Within underground, underwater, or enclosed trainways, the maximum distance between exits shall not exceed 762 m (2500 ft).</td>
</tr>
<tr>
<td>6.2.2.3*</td>
<td>6.3.3.1*</td>
<td>Number and Location of Means of Egress Routes.</td>
</tr>
<tr>
<td>6.2.2.4*</td>
<td>6.3.3.1.1</td>
<td>General—Exit stairways and doors shall comply with Chapter 7 of NFPA 101, except as modified in Section 6.3.3.2 herein.</td>
</tr>
<tr>
<td>6.2.2.2.2*</td>
<td>6.3.3.1.2*</td>
<td>Within underground, underwater, or enclosed trainways, the maximum distance between exits shall not exceed 762 m (2500 ft).</td>
</tr>
<tr>
<td>6.2.2.3</td>
<td>6.3.3.1.3*</td>
<td>Cross-passageways shall be permitted to be used in lieu of emergency exit stairways to the surface where trainways in tunnels are divided by a minimum of 2 hour–rated fire walls or where trainways are in twin bores for the following conditions.</td>
</tr>
<tr>
<td>Existing 2010 Section Number</td>
<td>New Section Number</td>
<td>Text</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------</td>
<td>------</td>
</tr>
<tr>
<td>6.2.2.3.2*</td>
<td>-</td>
<td>Where cross-passageways are utilized in lieu of emergency exit stairways, the following shall apply</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>Cross-passageways shall not be farther than 244 m (800 ft) apart.</td>
</tr>
<tr>
<td>(2)*</td>
<td>(2)*</td>
<td>Cross-passageways shall not be farther than 244 m (800 ft) from the station or tunnel portal.</td>
</tr>
<tr>
<td>(3)</td>
<td>(3)</td>
<td>Cross-passageways shall be a minimum of 1120 mm (44 in.) in clear width and 2100 mm (7 ft) in height</td>
</tr>
<tr>
<td>(4)</td>
<td>(4)</td>
<td>Openings in open passageways shall be protected with fire door assemblies having a fire protection rating of 1½ hours with a self-closing fire door</td>
</tr>
<tr>
<td>(5)</td>
<td>(5)</td>
<td>A tenable environment shall be maintained in that portion of the trainway that is not involved in an emergency and that is being used for evacuation</td>
</tr>
<tr>
<td>(6)</td>
<td>(6)</td>
<td>A ventilation system for the contaminated tunnel shall be designed to control smoke in the vicinity of the passengers.</td>
</tr>
<tr>
<td>(7)</td>
<td>(7)</td>
<td>Provisions shall be made for evacuating passengers via the non-incident trainway to a nearby station or other emergency exit</td>
</tr>
<tr>
<td>(8)</td>
<td>(8)</td>
<td>The provisions shall included measure to protect passengers from oncoming traffic and from other hazards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.2.2.4</th>
<th>6.3.3.2</th>
<th>Doors</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.2.4.1</td>
<td>6.3.3.2.1</td>
<td>Doors in the means of egress, except cross-passageway doors, shall open in the direction of exit travel and comply with the following:</td>
</tr>
<tr>
<td>6.2.2.4.2</td>
<td>Se above</td>
<td>Doors in the means of egress shall comply with the following</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>Open fully when a force not exceeding 220 N (50 lb) is applied to the latch side of the door</td>
</tr>
<tr>
<td>(2)</td>
<td>(2)</td>
<td>Be adequate to withstand positive and negative pressures caused by passing trains and tunnel ventilation system.</td>
</tr>
<tr>
<td>6.2.2.4.3*</td>
<td>6.3.3.2.2</td>
<td>Doors in egress routes serving trainways shall have a minimum clear width of 810 mm (32 in.).</td>
</tr>
<tr>
<td>6.2.2.4.4</td>
<td>6.3.3.2.3</td>
<td>Horizontal sliding doors shall be permitted in cross-passageways.</td>
</tr>
<tr>
<td>6.3.2.5</td>
<td>6.3.4.1</td>
<td>Exit Hatches</td>
</tr>
<tr>
<td>6.3.2.5.1</td>
<td>6.3.4.2.1</td>
<td>Exit hatches shall be permitted in the means of egress, provided the following conditions are met</td>
</tr>
<tr>
<td>Existing 2010 Section Number</td>
<td>New Section Number</td>
<td>Text</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------</td>
<td>------</td>
</tr>
<tr>
<td>(1)</td>
<td>(1)</td>
<td>Hatches shall be equipped with a manual opening device that can be readily opened from the egress side</td>
</tr>
<tr>
<td>(2)</td>
<td>(2)</td>
<td>Hatches shall be operable with not more than one releasing operation</td>
</tr>
<tr>
<td>(3)</td>
<td>(3)</td>
<td>The force required to open the hatch when applied at the opening device shall not exceed 130 N (30 lb).</td>
</tr>
<tr>
<td>(4)</td>
<td>(4)</td>
<td>The hatch shall be equipped with a hold-open device that automatically latches the door in the open position to prevent accidental closure</td>
</tr>
</tbody>
</table>

**6.3.2.5.2**  
6.3.4.2.2  
Exit hatches shall be capable of being opened from the discharge side to permit access by authorized personnel

**6.3.2.5.2**  
6.3.4.2.3*  
Exit hatches shall be conspicuously marked on the discharge side to prevent possible blockage.

**6.2.7**  
6.5  
**Blue Light Station**

**6.2.8**  
6.3.5*  
**Exit Identification and Directional Signs**

**6.2.9**  
6.3.5.1  
Identification  
Emergency exit facilities shall be identified and maintained to allow for their intended use.

**6.2.8.3**  
6.3.5.2  
Signs shall be readily visible by passengers for emergency evacuation

**6.2.8.4**  
6.3.5.3  
Points of exit from elevated and underground or enclosed trainways shall be marked with internally or externally illuminated signs.

**6.2.8.1**  
6.3.5.4  
Underground or enclosed trainways greater in length than the minimum length of one train shall be provided with directional signs as appropriate for the emergency procedures developed for the fixed guideway transit or passenger rail system in accordance with Chapter 9.

**6.2.8.2**  
6.3.5.5  
Signs indicating station or portal directions shall be installed at maximum 25 m (82 ft) intervals on either side of the underground or enclosed trainways.
<table>
<thead>
<tr>
<th>Existing 2010 Section Number</th>
<th>New Section Number</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.5</td>
<td>6.3.6</td>
<td><strong>Illumination and Emergency Lighting</strong></td>
</tr>
<tr>
<td>6.2.1.2</td>
<td>6.3.6.1</td>
<td>System egress points shall be illuminated.</td>
</tr>
<tr>
<td>6.2.5.1</td>
<td>6.3.6.2</td>
<td>The requirements of 6.2.5.2 through 6.2.5.3.2, 6.3.6.3 through 6.3.6.6.2 shall apply to all underground or enclosed trainways that are greater than 30.5 m (100 ft) in length or 2 car lengths, whichever is greater.</td>
</tr>
<tr>
<td>6.2.5.2</td>
<td>6.3.6.3</td>
<td>Lighting systems for enclosed trainways described in 6.3.6.2. 6.2.5.1 shall be installed in accordance with Sections 7.8 and 7.9 of NFPA 101, except as otherwise noted in this standard.</td>
</tr>
<tr>
<td>6.2.5.2.1</td>
<td>6.3.6.4</td>
<td>Exit lights, essential signs, and emergency lights shall be included in the emergency lighting system in accordance with NFPA 70.</td>
</tr>
<tr>
<td>6.2.5.2/</td>
<td>6.3.6.5</td>
<td>Emergency fixtures, exit lights, and signs shall be wired separately from emergency distribution panels.</td>
</tr>
<tr>
<td>6.2.5.3*</td>
<td>6.3.6.6*</td>
<td>Lighting systems shall be designed so that, during a period of evacuation, illumination levels of trainway walkways and walking surfaces shall not be less than 2.7 lx (0.25 ft-candles), measured along the path of egress at the walking surface.</td>
</tr>
<tr>
<td>6.2.5.3.1</td>
<td>6.3.6.6.1</td>
<td>The emergency lighting system in the trainway shall produce illumination on the walkway that does not exceed a uniformity ratio of 10:1 for the maximum maintained horizontal illuminance to the minimum maintained horizontal illuminance.</td>
</tr>
<tr>
<td>6.2.5.3.2</td>
<td>6.3.6.6.2</td>
<td>Point illumination of means of egress elements shall be permitted to exceed the 10:1 uniformity ratio.</td>
</tr>
<tr>
<td>6.2.3</td>
<td>6.4</td>
<td><strong>Surface and Elevated Emergency Access</strong></td>
</tr>
<tr>
<td>6.2.3.1</td>
<td>6.4.1</td>
<td>Except as described herein, exits from the trainway shall serve as emergency access routes.</td>
</tr>
<tr>
<td>6.2.3.1.1</td>
<td>6.4.2.1</td>
<td>Renumber subsections.</td>
</tr>
<tr>
<td>6.2.3.1.2</td>
<td>6.4.2.2</td>
<td></td>
</tr>
<tr>
<td>6.2.3.1.3</td>
<td>6.4.2.3</td>
<td></td>
</tr>
<tr>
<td>6.2.3.1.4</td>
<td>6.4.2.4</td>
<td></td>
</tr>
<tr>
<td>Existing 2010 Section Number</td>
<td>New Section Number</td>
<td>Text</td>
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<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>6.2.3.2</td>
<td>6.4.3.</td>
<td>Elevated</td>
</tr>
<tr>
<td>6.2.3.2.1</td>
<td>6.4.3.1</td>
<td>Renumber all subsections</td>
</tr>
<tr>
<td>6.2.3.2.2</td>
<td>6.4.3.2</td>
<td></td>
</tr>
<tr>
<td>6.2.3.2.3</td>
<td>6.4.3.3</td>
<td></td>
</tr>
<tr>
<td>6.2.3.2.4</td>
<td>6.4.3.4</td>
<td></td>
</tr>
<tr>
<td>6.2.3.2.5</td>
<td>6.4.3.5</td>
<td></td>
</tr>
<tr>
<td>6.2.7</td>
<td>6.5</td>
<td>Blue Light Stations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Renumber subsections</td>
</tr>
<tr>
<td>6.4</td>
<td>6.6</td>
<td>Traction Power Protection</td>
</tr>
<tr>
<td>6.4.x,</td>
<td></td>
<td>Renumber subsections</td>
</tr>
<tr>
<td>6.4.1</td>
<td>6.6.1</td>
<td>Application</td>
</tr>
<tr>
<td>6.6.1.1</td>
<td></td>
<td>Section 6.4 6.6 shall apply to life safety and fire protection criteria for the traction power subsystem installed in all trainways.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Renumber all section to higher numbering revision</td>
</tr>
<tr>
<td>6.5</td>
<td>6.7</td>
<td>Protection</td>
</tr>
<tr>
<td>6.3.3.2.1</td>
<td>6.7.xa</td>
<td>Emergency Power  renumber to be before portable fire extinguishers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Renumber subsections</td>
</tr>
<tr>
<td>6.3.2</td>
<td>6.7.x</td>
<td>Ventilation  Renumber to be after Emergency Power but before fire extinguishers</td>
</tr>
<tr>
<td>6.7.x.x</td>
<td></td>
<td>Renumber other sections and subsections</td>
</tr>
<tr>
<td>6.5.3</td>
<td>6.2.1</td>
<td>Standpipe Installations in Tunnels Under Construction</td>
</tr>
<tr>
<td>6.6</td>
<td>6.8</td>
<td>Flammable and Combustible Liquids Intrusion</td>
</tr>
<tr>
<td></td>
<td>6.8.x</td>
<td>Renumber subsections</td>
</tr>
</tbody>
</table>
Stephanie H. Markos, US Department of Transportation/Volpe Center

Review usage of terms underground, enclosed, and underwater as in this Chapter and Chapter 5.

While specific definitions for "enclosed" and "underground" as well as "elevated" stations are contained in the definitions section (3.4.44 AND 3.4.45), these terms are not defined for the guideway or trainway. There are numerous times that it is unclear as to why one or the other term or both is used. Sometimes "enclosed" is included in the requirement, along with "underground," See 6.2.2.2.1 and 6.2.2.2.2; 6.2.5.1, 6.2.8.1 6.2.8.2, 6.8. Enclosed" alone is used in 6.2.4.2.1 and 6.2.5.1. "Underwater" is used in section 6.3.1.1.7.1, but u underwater" is used in 6.3.1.1.7.2. Moreover, 6.3.3.1 has the heading title of Underground (Subways). But "enclosed" is used in several items, along with underground in the same sentence. Also note that "Underwater" is not necessarily "underground" if it is a trainway drilled through rock.

This is not original material; its reference/source is as follows:
Prior editions of NFPA 130, Task Group 2 and 5 Chair draft proposal

William D. Kennedy, Parsons Brinckerhoff

After Section 6.2.1.1 insert:

The egress provided must recognize that for multiple-track tunnels, there exists the possibility of having to simultaneously evacuate the incident train plus a non incident train(s) stranded on the adjacent track(s).

Renumber 6.2.1.2 through 6.2.1.3 to reflect the added text.

The standard needs to recognize the multiple-track tunnels require added egress facilities.

Katherine Fagerlund, Sereca Fire Consulting Ltd.

Revise text to read as follows:

6.2.1.3 Where the trainway track bed serves as the emergency egress pathway, it shall be nominally level and free of obstructions.

6.2.1.4 Except as permitted in 6.2.1.3, walking surfaces shall have a uniform, slip-resistant design.

This is in response to the following comment received by the TC: “Clarify that when a ballast track-bed is used as the walking surface, a requirement for a uniform slip resistant design does not apply, instead, Section 6.2.1.3 applies that calls for it to be nominally level and free of obstructions.”

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
6.2.1.6 Crosswalks shall be provided at track level to ensure walkway continuity.

Substantiation: Revised language to provide clarity.

This is not original material; its reference/source is as follows:

NFPA TC - Task Group 1 - Log 603

6.2.1.9* The means of egress within the trainway shall be provided with an unobstructed clear width graduating from:

1. 610 mm (24 in.) at the walking surface to
2. 760 mm (30 in.) at 1420 mm (56 in.) above the walking surface and to
3. 430 mm (17 in.) at 2025 mm (80 in.) above the walking surface

A.6.2.1.9: Figure A.6.2.1.9 to be modified accordingly, i.e. "610 430 mm (24 17 in.) wide" and "1420 1575 mm (56 62 in.) height.

Substantiation: The current boundary limit of 610 mm (24 in.) at a height of 2025 mm (80 in.) above the walking surface is too wide. NFPA 101 Annex 7.3.4.1.1(a) & (b) provides anthropometric data for adults, which in part, has been used to formulate the minimum boundary limits referred to in 6.2.1.9 and Figure A.6.2.1.9, but the data in these figures makes no mention of head breadth. The proposed reduction to the upper boundary limit is based on the head breadth provided in NASA's Man-System Integration Standards Volume 1, Section 3 - Anthropometry Biomechanics (Anthropometric Dimensional Data tables). The latter indicates for the 95th percentile a head breadth of 168 mm (6.6 in.). Rounding up to 180 mm (7 in.) and adding 250 mm (10 in.) for side to side sway, consistent with Annex 7.3.4.1.1(a) & (b) of NFPA 101, yields a value of 430 mm (17 in.).

The intermediate boundary limit of 760 mm (30 in.) taken from the aforementioned NFPA 101 anthropometric data is consistent with the NASA data; however, the height of 1420 mm (56 in.) is not. This latter value was included in NFPA 130 for the first time in the 2003 edition, and was reportedly based on the 95th percentile male referenced in NFPA 101 anthropometric data. Further review confirms that the height data provided in NFPA 101 is for the 50th percentile. The aforementioned NASA data for acromial (shoulder) height of the 95th percentile indicates a value of 1573 mm (61.9 in.), which is rounded to 1575 mm (62 in.) in the above proposal.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.
Recommendation: Revise to read as follows:

6.2.1.10* Guards.
6.2.1.10.1 Raised walkways that are more than 760 mm (30 in.) above the floor or grade below shall be provided with a continuous guard to prevent falls over the open side.
6.2.1.10.2 Guards shall not be required along the trainway side of raised walkways where the bottom of the trainway is closed by a deck or grating.
6.2.1.10.3 Guards shall not be required on raised walkways that are located between two trainways.

6.2.1.11* Handrails.
6.2.1.11.1 Raised walkways that are more than 760 mm (30 in.) above the floor or grade below shall be provided with a continuous handrail along the side opposite the trainway.
6.2.1.11.2 Raised walkways that are greater than 1120 mm (44 in.) wide and located between two trainways shall not be required to have a handrail.

Substantiation: The existing wording has led to some confusion about the definition of a raised walkway. The proposed changes eliminate the need for a definition by deleting the use of the term and instead defining the condition similar to NFPA 101.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Recommendation: Revise text to read as follows:

6.2.2.1 General. Exit stairs and doors and stairs in the means of egress shall comply with Chapter 7 of NFPA 101, except as herein modified.

William D. Kennedy, Parsons Brinckerhoff

Delete Sections 6.2.2.1 through 6.2.2.3 and replace by:

6.2.2.1 General

6.2.2.1.1 Exit stairs and doors shall comply with Chapter 7 of NFPA 101, except as herein modified.

6.2.2.1.2 Exit stairs and cross passages shall have a minimum width of 1120 mm (44 in.) and a clear height of 2140 mm (7 ft).

6.2.2.1.3 The separation between the tunnel and its points of safety shall have a fire rating of at least two hours as per ASTM E119. The doors between the tunnel and its points of safety shall be self-closing and shall have a fire rating of at least 11/2 hours as per ASTM E119.

6.2.2.1.4 The spacing between exits shall not be affected by the number of tracks in the trainway.

6.2.2.1.5 Provisions shall be made for evacuating passengers via the non-incident trainway, the nearby station, emergency exits or other points of safety.

6.2.2.1.6* The provisions shall include measures to protect passengers from oncoming traffic and from other hazards.

6.2.2.1.7 A tenable environment shall be maintained in that portion of the trainway that is not involved in the emergency and that is being used for evacuation.

6.2.2.1.8 A ventilation system for the contaminated tunnel shall be designed to control the direction of movement of smoke in the vicinity of the passengers.

6.2.2.2 Maximum Spacing Between Exit Points

6.2.2.2.1 The maximum spacing between exits shall be 500 m (1640 ft) for average grades (g) -2 • g • +1 percent.

6.2.2.2.2 For average uphill grades greater than one percent, the maximum spacing between exits shall be 500 m (1640 ft) minus 62.5 m (205 ft) for every percent greater than one percent.

6.2.2.2.3 For average downhill grades less than three percent, the maximum spacing between exits shall be 500 m (1640 ft) minus 25 m (82 ft) for every percent less than three percent.

6.2.2.3 Calculation of Exit Spacing

6.2.2.3.1* The calculated exit spacing shall be less than or equal to the maximum exit spacing developed in 6.2.2.2.

6.2.2.3.2* If no engineering analysis is done, the calculated exit spacing shall be 250 m (820 ft).

6.2.2.3.3* Calculated exit spacings greater than 250 m shall be permitted provided they are supported by an analysis.

The analysis shall, where appropriate, include the following:

(X) The number of exit paths in the tunnel
(X) Exit surface width
(X) Exit surface grade
(X) The number of evacuees
(X) Walking speeds of the evacuees
(X) Tenability of exit paths
(X) Exit path air velocities
(X) Train fire, smoke, and carbon monoxide release rates as a function of time
(X) Origin of the train fire: below floor or interior
(X) The capability of the point of safety to accommodate all evacuees

In Annex A, delete section A.6.2.2.2.
In Annex A change A.6.2.2.3.2 (2) to A.6.2.2.3.1
In Annex A change A.6.2.2.3.2 (8) to A.6.2.2.1
In Annex A, After A.6.2.2.3.2 (8) Insert:


Substantiation: (1) The previous approach is presented in the 2010 Edition of NFPA 130, Section 6.2.2.2. The 244 m (800 ft) devolved from the MARTA (Atlanta) Subway project. It was the calculated distance people could walk downstream of a train fire site before flashover occurred and made the downstream environment untenable. Key input parameters where the fire originating below the car floor, thus immobilizing the train in the tunnel; a car floor fire rating of 30 minutes; and a walkway width of 30 inches. Despite many efforts, the source of the 762 m (2500 ft) is unknown.
No evidence or logic has been found as to why the travel distance to a point of safety should be affected by the number of tracks in the tunnel. That is to say whether the geometry is twin-tunnel with a track in each “bore” or “box” or a multiple tracks in the same tunnel, the travel distance to a point of safety should be the same. However, the egress provided must recognize that for multiple track tunnels, there exists the possibility of having to simultaneously evacuate the incident train plus a non incident train(s) stranded on the adjacent track(s).

Exits are also points of emergency egress, emergency ingress and maintenance access. Therefore, their locations must consider all three uses. Maintenance access is beyond the scope of NFPA 130.

A tunnel-to-tunnel cross passage, an exit stair to the surface, an exit to a place of refuge (such as a “pilot” tunnel or dedicated underground room) can be a point of emergency egress/ingress provided it meets NFPA 130 and is determined to be a point of safety. The point of safety must be able to accommodate all evacuees and must be accessible to emergency personnel without their having to walk unacceptable distances. For example, consider the evacuation of a train with 1500 passengers. If it is assumed they are “stored” on the walkway in the non-incident tunnel, a walkway length on the order of 3000 feet would be needed. Ventilation must maintain this point of safety clear of smoke. Depending on the system configuration, this can be accomplished by the station and tunnel ventilation systems or a stairway “pressurization” system. If the former is selected, all interactions between it and the pressures caused by train movement must be considered in the design analysis. If the latter is selected, all interactions between it, the station and tunnel ventilation systems and the pressures caused by train movement must be considered in the design analysis.

Exit spacing must consider emergency ingress. A fire fighter in uniform may be carrying breathing apparatus, hoses, tools, etc. Informal discussions with fire departments in Seattle and Hong Kong have estimated the maximum flat-grade distance of 500 m (1640 ft) is the greatest distance fire fighters can walk to and fight a fire effectively – when walking in non-contaminated air. Further discussions have estimated this distance is not affected by grades greater than or equal to plus one percent or less than or equal to three percent. For steeper grades, the following is suggested:

a. Uphill. Deduct 62.5 m (205 ft) for every percent the average grade is steeper than one percent. For example, an average grade of 5 percent would decrease the maximum spacing to 250 m (820 ft).

b. Downhill. Deduct 25.0 m (82 ft) for every percent the average grade is steeper than three percent. For example, an average downhill grade of 5 percent would decrease the maximum spacing to 450 m (1476 ft).

It is recognized that there should be a maximum allowable interval between egress/ingress points for single-track and multi-track tunnels if the “traditional” (not performance based) approach is used. As per the MARTA approach, it recommended that NFPA 130 continue to allow 250 m, providing its requirements for the width of the exiting surface, the car floor fire rating, etc are met.

One of the logical weaknesses of the previous approach is that it requires the same exit spacing for an eight-car train carrying 3000 people as it does for a four-car train carrying 300 people. This leads to the conclusion that the exit spacing should be on a performance basis, provided that the maximum spacing allowed for ingress is adhered to.
Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.

Recommendation: Add Annex note:

6.2.2.2.2: Referring to NFPA 101 Table 7.2.2.1.2.2B, requirements (where additional width is required for stairs serving an occupant load of 2000 people or more), exit stairs serving trainways are not required to exceed the minimum width, regardless of the occupant load. This is reasonable considering that evacuation flow from a tunnel would be essentially single file, and stairs do not normally converge with other egress routes.

Substantiation: This proposal is in response to the following comment received by the NFPA130 TC: “The wording of this new requirement <6.2.2.2.2> is baffling. “…shall not be required to exceed…”? What does this mean? When specifying an exit usually a minimum width is in order to provide a minimum capacity. What is the rationale for a standard specifically stating a minimum value is not permitted? This is important in light of the apparent inconsistency in paragraph 6.2.2.3.2 (3) – minimum cross-passage width of 44” and paragraph 6.2.2.4.3 where doors are required to be a minimum of only 32”. Are doors to cross passages not covered by 6.2.2.4.3? Annex A says it does. If the wording in 6.2.2.2.2 is a typo the discrepancy is still there. To be resolved by an Annex note?”

6.2.2.2.2 was added in the 2010 Edition to clarify that the exit stairs are not required to exceed the minimum width regardless of the occupant load. The Annex A note addresses the confusion described in the above comment.


Recommendation: Revise text to read as follows:

Cross-passageways shall be permitted to be used in lieu of emergency exit stairways to the surface where train ways in tunnels are divided by a fire barrier having a minimum fire resistance rating of 2 hours-rated fire walls or where train ways are in twin bores.

Substantiation: Fire walls have specific structural stability requirements as defined in NFPA 221 and NFPA 5000 that may not be intended in this application.

Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.

Recommendation: Add to Section 6.2.2.3 Cross-passageways

6.2.2.3.3 Where cross-passageways are used in lieu of emergency exit stairways, the interior of the cross passage shall not be used for any purpose other than as an area of refuge or for access/egress to the opposite tunnel except:

(1) The use of cross passages for the installation of non-combustible equipment is permitted.

(2) Usable space within the cross passage shall be permitted provided the space is separated with the same fire resistive construction as the cross passage.

(3) Installations shall not intrude into the required clear width of the cross passage.

Substantiation: This proposal is to address the following comment received by the NFPA 130 TC: “Nowhere in this section does it describe what is permitted (equipment, electrical panels, cables, etc) to be in a cross passageway, it only specifies the minimum width. What should be allowed? Whatever is installed should not impact life safety.” This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
6.2.2.4 Doors and Gates
6.2.2.4.4 Platform end gates shall meet the clear width requirements for gate-type fare collection equipment in Chapter 5.

This proposal is in response to the following comment received by the NFPA 130 TC: "Clarify the minimum permitted width for platform end gates."

Although not intended to be part of the means of egress from a trainway, platform end gates nevertheless can potentially serve that purpose during an evacuation from a trainway to a station. For this reason, it is the Task Group's recommendation that requirements for minimum clear width of platform end gates be added to Chapter 6. The minimum clear width requirements should be based on the NFPA criteria for fare gates, which were in turn based on anthropometric data in NFPA 101. This is consistent with single file movement permitted for egress through fare gates in stations.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

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Egress and Emergency Access for Open Cut Trainways

For open cut trainways, an engineering analysis shall be conducted to evaluate the impact of the trainway configuration on safe egress from a train fire to a point of safety.

Where the engineering analysis indicates that the configuration will impact tenability beyond the immediate vicinity of the fire, egress routes shall be provided such that the maximum distance from any point within the open-cut section to a point of egress from the trainway shall not be more than 381 m (1250 ft.).

Where the configuration of an open cut trainway prevents or impedes access for firefighting, provisions shall be made to permit firefighter access to that section of trainway at intervals not exceeding 762 m.

This proposal is in response to the following comment received by the NFPA 130 TC: Exiting from U-sections aka open cut, depressed or 'boat' sections. The requirements for emergency egress from and fire-fighting ingress to open cut or depressed 'boat' sections are not stated. For example, a 1500 m (5000 ft) two-track open cut 10 m (33 ft) deep with 750 mm (30 in.) walkways. Fire departments sometimes cannot "ladder down". The proposed criteria is consistent with requirements for elevated and enclosed trainways.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Exit lights, essential signs, blue lights at blue stations, and emergency lights shall be included in the emergency lighting system in accordance with NFPA 70. The standard does not specify if blue lights at blue stations (6.2.7) are essential signs or emergency lights. In definition 3.3.4, blue light stations are where “emergency service or authorized personnel ... communicate with operations control center and disconnect traction power.” If emergency service personnel use these stations, the lights indicating their location should be on the emergency lighting system.

Where an air-rights structure encloses a trainway, the trainway shall be considered a tunnel for emergency access, egress, fire-protection and ventilation purposes and shall comply with the requirements of Chapter 6.

Where an air-rights structure does not fully enclose the trainway, the decision to consider it as an unenclosed trainway shall be based on an engineering analysis.

All structural elements that support air-rights structures over trainways and all components that provide separation between air-rights structures and trainways shall have a minimum 3-hour fire resistance rating in accordance with ASTM E 119.

Structural members shall be protected from physical damage from vehicle impact.

All other construction and compartmentation/separation requirements shall be in accordance with 6.3.1.1.7 and local codes as approved by the AHJ.

Additional language is needed to address subject matter that is not currently addressed in NFPA 130. This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities

The design of ancillary spaces adjacent to the trainway should be in accordance with the requirements of the local building code except as specifically described in this standard. This would include requirements for egress from within the spaces, and for heating, ventilation and air conditioning.

This proposal is in response to a comment received by the NFPA 130 TC that, except for fire separation requirements, the standard did not state requirements for ancillary spaces adjacent to the trainway.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
<table>
<thead>
<tr>
<th>Log #46</th>
<th>Submitter: George A. Straniero, AFC Cable Systems, Inc.</th>
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<tbody>
<tr>
<td></td>
<td><strong>Recommendation:</strong> Revise 6.3.3.2.5 as follows to delete “wires” from the requirements of 6.3.3.2.5.1 and 6.3.3.2.5.2.</td>
</tr>
<tr>
<td></td>
<td><strong>Substantiation:</strong> Inclusion of “wires” in the text of 6.3.3.2.5 requires that single insulated conductors be listed to the flame and smoke test requirements of 6.3.3.2.5.1 and 6.3.3.2.5.2.</td>
</tr>
<tr>
<td></td>
<td>The National Electrical Code does not permit single insulated conductors to be installed unless they are contained within raceways or cables. Section 6.3.3.2.2 requires non-combustible raceways, and since cables are required to be listed to the flame and smoke test requirements of 6.3.3.2.5.1 and 6.3.3.2.5.2, the requirements of 6.3.3.2.5 do not apply to single insulated conductors and should be deleted.</td>
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<tr>
<th>Log #52</th>
<th>Submitter: Gil Shoshani, RSCC</th>
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<tr>
<td></td>
<td><strong>Recommendation:</strong> Add new Acid gas testing requirements for wire and cable</td>
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<td><strong>Substantiation:</strong> The committee added the requirement for acid gas test per MIL-DTL-24643. Compliance with this requirement will help reduce the presence of acid gas in a fire event. Acid gas acts as both an eye irritant and respiratory inhibitor and degrades tenability. This is consistent with the wire and cable requirements of NFPA 502 for similar enclosed applications.</td>
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<td><strong>Task Group 7.</strong></td>
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<td><strong>Recommendation:</strong> Revised text to read as follows:</td>
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<tr>
<td></td>
<td>6.3.3.2.6 All wires and cables used for enclosed stations and trainways shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643.</td>
</tr>
<tr>
<td></td>
<td><strong>Substantiation:</strong> The trainway, although used for ventilation, should not be considered as an air plenum for purposes of mounting electrical appurtenances.</td>
</tr>
<tr>
<td></td>
<td>A.6.3.3.2.6.1 Cables in the air plenum might be exposed to air at elevated temperature accompanying fire emergency conditions.</td>
</tr>
<tr>
<td></td>
<td><strong>Substantiation:</strong> The requirement that electrical appurtenances are not to be mounted in trainways needs to be specific rather than an annex suggestion.</td>
</tr>
</tbody>
</table>
130- Log #47
(6.3.3.2.6.1) Final Action:

Submitter: George A. Straniero, AFC Cable Systems, Inc.
Recommendation: Revise 6.3.3.2.6.1 by permitting wiring methods in air plenums in accordance with NFPA 90A as follows:

6.3.3.2.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 5.4.10 as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, or shall be installed in metal raceways, metal sheathed cable, or totally enclosed non-ventilated busway.

Substantiation: The NFPA Standards Council has directed to the NEC that NFPA 90A, Standard for the installation of Air Conditioning and Ventilation Systems, has jurisdiction over wiring in air handling plenums. The proposed revised text is taken from the requirements of NFPA 90A, section 4.3.11.2.6.1 and should be a requirement in NFPA 130 where wiring is installed in air plenums. Fire resistive cables were deleted since they can be included in the proposed revised requirements.

130- Log #59
(6.3.3.2.8) Final Action:

Submitter: Gil Shoshani, RSCC
Recommendation: Revise text to read as follows:

6.3.3.2.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portions of the system facilities
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system
4. Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 6.3.3.2.10

6.3.3.2.8 The emergency power circuits and communication circuits shall be designed and located so as to minimize damage from normal system operations and shall remain functional during a fire utilizing one of the following methods:

1. A fire-resistive cable listed for 2-hours in accordance with ANSI/UL 2196 and tested to ASTM E119
2. Circuits embedded in concrete or protected by a 2-hour fire barrier system in accordance with UL 1724. The cables or conductors shall be suitable to maintain functionality at the temperature within the embedded conduit or fire barrier system.
3. Routing external to the interior underground portion of the system facility
4. Diversity in system routing (such as separate redundant or multiple circuits separated by a 2-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

Note to Committee: If this proposal is accepted, section 6.3.3.2.10 should be deleted because it will be addressed in the new 6.3.3.2.8 (1)

Substantiation: Changed from “emergency lighting” to “emergency power” to more globally address the essential emergency circuits that should be connected to the emergency power system. This was necessary to encompass all life safety circuits such as power to the fire alarm panel, protective signaling system etc.

Reworded the opening statement to clarify that the circuit needs to be protected from physical damage and remain functional from fire conditions.

Changed from 1-hour protection from fire to 2-hours to be consistent with the NFPA 70 article 700

Quantified suitable embedded or encasement in concrete with respect to circuit functionality.

This is not original material; its reference/source is as follows:

Task Group 7.
6.3.3.2.11.1* The following systems shall be connected to the emergency power system:

1. Emergency lighting
2. Protective signaling systems
3. Emergency communication system
4. Fire command center

A.6.3.3.2.11.1 While not required, continuity of monitoring through a loss of power serves several useful functions. The incident commander will be more accurately informed as to available system resources and status. The position of ventilation shaft dampers and track isolation dampers will provide key information in the potentially affected areas of the underground network, as would the status of cross passage doors. On this basis, the provision of emergency power to the tunnel ventilation monitoring and control system is recommended, even when the controlled equipment is not provided with emergency power. Emergency power for the monitoring and control system is a logical inclusion when the controlled equipment is provided with emergency power.

**Substantiation:** Requirement for control and monitoring systems for the emergency ventilation system to be on emergency power circuits needs to be clarified. Loss of power should not cause loss of information on system status. This need not be mandatory, but guidance language should be provided in the Annex text.

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The following test criteria shall apply:

1. Flames shall not spread to the ceiling during the 40 kW (135 kBtu/hr) exposure.
2. During the 160 kW (545 kBtu/hr) exposure, the following criteria shall be met:
   a. Flame shall not spread to the outer extremities of the sample on the 2.45 m × 3.7 m (8 ft × 12 ft) wall.
   b. Flashover shall not occur.
3. The peak heat release rate throughout the test shall not exceed 800 kW (2730 kBTU/hr).
4. The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).
5. Flames shall not spread to the outer extremity of the sample on any test room wall or ceiling.
6. Flashover, as described in NFPA 286, shall not occur.
7. The peak heat release rate throughout the test shall not exceed 800 kW (2730 kBTU/hr).
8. The total smoke released throughout the test shall not exceed 1000 m² (10,764 ft²).

**Substantiation:** This proposal has editorial changes only. The editorial changes clean up the sections in ways similar to how they read in NFPA 101.
**Insert new clause:**

The standpipe design may include a pressure boost from a local fire department pumper to meet minimum pressure requirement at the outlet of the hydraulically most remote hose connection without having to install a permanent fire pump(s).

Renumber existing clauses accordingly.

**Substantiation:** In most cases pressure boost is provided by a fire department pumper without having to install permanent fire pumps. This proposal identifies that this option is available to a designer with local fire department’s approval.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities

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**Revise text to read as follows:**

A fire standpipe system shall be provided in underground fixed guideway transit or passenger rail system trainways where physical factors prevent or impede access to the water supply or fire apparatus, where required by the authority having jurisdiction.

System will require approval in any event so requiring an approved system is redundant.

This is not original material; its reference/source is as follows:

NFPA TC - Task Group 1 - Log 628

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**Add text to read as follows:**

Standpipes shall be permitted to be of the dry type with the approval of the authority having jurisdiction provided the following conditions are met:

1. Systems shall be installed in a manner so that the water is delivered to all hose connections on the system in 10 minutes or less.
2. Combination air relief–vacuum valves shall be installed at each high point on the system.

A.6.5.2.2(1) Calculations, including transit and fill times, should be submitted to the authority having jurisdiction to support this requirement.

Dry standpipe systems in tunnels are usually very long which can result in significant amount of time required to charge the system. NFPA 502 has a requirement that all hose valves must be capable of being delivered water in 10 minutes. It is recommended that the requirements of NFPA 502 for dry systems be used for tunnels.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
130- Log #202
(6.5.2.3 and A.6.5.2.3 (New))

Submitter: Katherine Fagerlund, Sereca Fire Consulting Ltd.
Recommendation: Insert new appendix note:

A.6.5.2.3 A piping network serving two adjacent tunnels shall not be considered separate standpipes for purposes of determining required demand. Such a piping network shall be considered single standpipe for this purpose. This is consistent with the single incident of 4.4 Assumption of a Single Event.

Substantiation: The emphasis for single standpipe is necessary to provide consistency with an assumption of a single event of a fire. This proposal clarifies this requirement.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

130- Log #141
(6.5.2.3.1)

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:

6.5.2.3.1 Acceptable water supplies shall include the following:

(1) Approved Municipal or approved privately owned waterworks systems that have adequate pressure, flow rate, and level of integrity

(2) Automatic or manually controlled fire pumps that are connected to an approved water source

(3) Pressure-type or gravity-type storage tanks that are installed in accordance with NFPA 22

Substantiation: The use of “approved” in subclause 6.5.2.3.1 is redundant as 6.5.2.3 requires approved water supplies.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 105

130- Log #227
(6.5.5 (New))

Submitter: Scott J. Harrison, Marioff Inc.
Recommendation: Add text to read as follows:

6.5.5 Water Mist Fire Protection Systems shall be designed and installed in accordance with NFPA 750 Standard on Water Mist Fire Protection Systems.

Substantiation: No fire suppression systems are specified in Chapter 6 Trainways other than standpipes and fire extinguishers. Water Mist Systems have been utilized to protect many areas, equipment and adjoining spaces of station facilities globally. Because NFPA 750 is a performance based standard, the design applications per facility will be engineered to meet the fire protection demands and requirements of the local jurisdiction and this standard (NFPA 130). NFPA 750 should be introduced into this standard to provide a fire suppression option to this portion of the document.

NOTE: If this new paragraph is accepted, a reference to NFPA 750 needs to be added to Chapter 2 Referenced Publications Paragraph 2.2 NFPA Publications.
Signal/communication facilities

Rooms or structures used to house signal or other critical electronic communication equipment shall be protected by an approved automatic extinguishing system.

Alarms, where required, shall be connected to the Operations Control Center.

Substantiation: This proposal is to address the following comment received by the NFPA 130 TC: “Some underground rail & transit systems install their signaling and communications system in pre-packaged metal "bungalows". NFPA 130 should either provide requirements for the fire protection and internal wiring of bungalows or reference another (NEC 70?) that does.”

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Relocate text in Section 6.6 to Chapter 5 and provide a cross-reference in Chapter 6 to the re-located material.

This proposal is in response to a comment received by the TC. The requirements apply equally to stations and trainways, and should therefore they should appear at the earliest mention of the subject in the document.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

Prevention of accidental intrusion of flammable and combustible liquids due to spills shall be provided in accordance with 6.6.2 through 6.6.7.

Vent or fan shafts utilized for ventilation of tunnels underground system structures shall not terminate at grade on any vehicle roadway.

Changes to 6.6.1 and 6.6.2 are editorial. In 6.6.3, the requirement in clause (1) is sufficient. Not all curbs are 150 mm high, such as roll-over curbs which the fire department prefer for vehicle access.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Revise text to read as follows:

6.6.4.1 Where the top of the subsurface trainway or station is more than 15 m (50 ft) below the surface of the earth, an engineering analysis to determine the need for the rate requirement in 6.6.4 shall be permitted to be conducted.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 633

Revise text to read as follows:

6.6.6.3 Continuous drains across driveways, ramps, or curbs of at least 150 mm (6 in.) in height shall separate service station properties from adjacent tunnel vent gratings or tunnel entrances or exits.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 635

Revise text to read as follows:

6.6.7.5 Where it is not possible to remove and relocate tanks for Class III combustible liquids located under a building, such tanks shall be UL-listed double wall or installed in a cast-in-place reinforced concrete vault and shall be provided with an approved leak detection system.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 636

Revise text to read as follows:

7.1.1* This chapter defines the requirements for the environmental conditions and the mechanical and nonmechanical ventilation systems used to meet those requirements for a fire emergency in a system station or trainway as required by Sections 5.3 and 6.3.2.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Log 701
130- Log #130
(7.1.1)

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:

7.1.1* This chapter defines the requirements for the environmental conditions and the mechanical and nonmechanical ventilation systems used to meet those requirements for a fire emergency in a system station and/or trainway as required by Section 5.3 and 6.3.2.

Substantiation: Revised language to provide clarity.

130- Log #105
(7.1.2.2 and A.7.1.2.2 (New))

Submitter: William D. Kennedy, Parsons Brinckerhoff
Recommendation: Revise text to read as follows:

7.1.2.2* A mechanical emergency ventilation system shall be provided in the following locations:

(1) In an enclosed system station
(2) In a system underground or enclosed trainway that is greater in length than 305 m (1000 ft)

Add text to read as follows:

A7.1.2.2 Individual project geometries may impose constraints that make the length requirement of 7.1.2.2(2) onerous to meet. Proposals to the AHJ for relief based on engineering analysis might be made to address this, and guidance in that matter is needed in the Standard.

In the development of the proposal, further points were discovered, needing additional modification - for committee discussion:

- If distance between exits is 2500 feet, is the maximum travel distance really 1250 feet?
- Doesn’t that 2500 foot distance assume that one can pass the incident to reach a nearer exit?
- Further, the origin of the 2500 foot distance appears lost, and should be re-derived in general.
In Section 7.1.3 Line 7, change "velocities" to "airflows".

Add after Section 7.4:

7.5 Fans, dampers and devices used for emergency ventilation shall be factory tested.

7.6 The no-fire (or cold) airflows provided by the installed mechanical ventilation system shall be measured during commissioning to confirm that the airflows meet the requirements determined by the analysis.

Add the following after Section A.7.2.6 in Annex A:

A.7.5 Factory Testing

1. Ventilation equipment should be factory-tested using accepted standards such as those published by the Air Moving and Control Association, the American Society of Heating Refrigerating and Air-Conditioning Engineers, the International Standards Organization, and the Underwriters Laboratories. If an appropriate standard does not exist then a test procedure should be submitted for approval.

2. Factory tests may consist of prototype testing and production testing. Prototype testing should include those tests necessary to assure the design of the equipment is acceptable. Typically one prototype is thoroughly tested. Production testing should include those tests necessary to assure the equipment as produced meets specification. Typically all equipment produced is production tested.

A.7.6 Commissioning Tests

A Test Plan should be prepared and submitted to the owner and the AHJ for review and approval prior to the commissioning tests. The Test Plan should describe the method of testing and identify pass-fail criteria. As a minimum, the Test Plan should identify the following items:

1. The commissioning tests should include individual equipment tests (2 and 3) and system-wide tests (4-13).

2. The commissioning tests should be performed to confirm the functionality. As a minimum, ventilation equipment operation should be initiated at the local primary location for fan operation such as an emergency management panel or fire management panel.

3. The individual fan and ventilation plant airflows should be measured to confirm the intended airflows are being delivered. At least one test should be made to measure the time required for the fan plant airflows to reach steady-state from a zero-flow start and at least one test shall be made to measure the time required for the fan plant airflows to reverse from full-forward to full-reverse operation. Subsequent tests shall be conducted from Operations Central Control to verify remote fan and damper operation.

4. The no-fire (or cold) station and tunnel airflows provided by the as built mechanical ventilation system should be measured to confirm that the airflows meet the requirements determined by the analysis.

5. The Test Plan should include provisions for the witnessing of the system-wide tests by the owner, the AHJ, the designer or the engineer of record, the contractor, and possibly the ventilation equipment suppliers.

6. The system-wide testing should be done by a qualified airflow measurement specialist or contractor having previous experience in measuring airflows.

7. Calibrated instruments providing an air velocity measurement accuracy of ± 2.5% should be used. The number of points to be measured to convert air velocities to airflows should be determined by standards such as those published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, the Air Moving and Control Association or a CFD analysis. The test data should be electronically recorded for future use.

8. The Test Plan should identify the fan(s) that are assumed to be operated and not operated by the analysis for each scenario being tested.

9. The Test Plan should include at least one test to measure the time required for all the fans used in a fire scenario to reach full operating mode.

10. The Test Plan should include the tunnel fire scenarios to be tested. These should include the design cases (i.e., those that determine the ventilation equipment functional capacities) and any other scenarios deemed appropriate. The train(s) should be located in the tunnel as per the scenario. Tunnel airflows upstream of the stopped trains should be measured. It is not necessary to test all scenarios.

11. The Test Plan should include the station fire scenarios to be tested. These should include the design cases (i.e., those that determine the ventilation equipment functional capacities) and any other scenarios deemed appropriate. The station geometry may preclude the necessity of locating trains in the station. Airflows through the station entrances and tunnels connected to the station should be measured. It is not necessary to test all scenarios.

12. The airflows measured should be compared with the "cold flows" predicted by the analysis. If the measured
airflows are less than the predicted airflows then the mechanical ventilation system or its operation should be changed and the test repeated until passing results are achieved. Negative tolerances in the results should not be accepted.

(13) The system-wide testing should be documented by one or more reports. The report should include a description of the scenario tested, the instrumentation used, the names and affiliations of those witnessing the tests, and all test results.

Substantiation: Add testing requirements to assure ventilation system performs as intended.

Add text to read as follows:

7.2 Design.
7.2.1* The emergency ventilation system shall be designed to do the following:
(3) Be capable of achieve the required speed and direction for all related fans and reach the required position for all dampers and related emergency devices, to establish the selected reaching full operational operating mode within 180 seconds.

Add text to read as follows:

A7.2.1 The time frame required for achievement of the selected operating mode applies to the ventilation system equipment, not to the establishment of the resultant air flows in the tunnels and stations.

Substantiation: The intent of 7.2.1(3) was to require the ventilation equipment to attain its operating configuration with 180 seconds. This meant that the fans would be operating at their required RPM and direction and the dampers would be open/closed/last position as required. Some Standard users have interpreted this to mean that the tunnel and station airflows have to reach their design flow rates. That status may require anywhere from 30 to 300 seconds additional time to reach design flows following the achievement of the selected operating mode (the intent of the Standard). The time to establish the design air flows in the system will depend upon the distance from the fire site, the system geometry and dimensions, and other factors. Clarification of the 130 Standard’s intent is required.
7.2.3 (7) A ventilation system hazard reliability analysis that, as a minimum, considers the following subsystems shall be generated in accordance with DOT-FTA-MA-26-5005-00-01 “Hazards Analysis Guidelines for Transit Projects”. The hazard of the inability of the tunnel ventilation system to provide a tenable environment at any time, regardless of the probability of fire, shall be analyzed.

(a) Electrical
(b) Mechanical
(c) Supervisory control

7.2.4 The Acceptance Criteria for hazard the system reliability analysis in 7.2.3(7) shall be established and approved.

7.7.1.1 Alternatively, the design of the power for the emergency ventilation system shall be permitted to be based upon the results of an analysis conducted in accordance with section 7.2.3 (7) electrical reliability analysis as per 7.2.3(6), as approved.

Criteria for the system reliability analysis in 7.2.3(6) shall be established and approved.

Provide correct reference.

The requirements for reliability analysis as specified in 7.2.3 (7) do not provide sufficient framework or criteria. Use of the established DOT-FTA-MA-26-5005-00-01 “Hazards Analysis Guidelines for Transit Projects” provides a methodology and criteria to assess hazards. The specific hazard is the inability of the tunnel ventilation system to provide a tenable environment. This methodology includes the reliability analysis of the tunnel ventilation system components.

This proposal includes a new reference to DOT-FTA-MA-26-5005-00-01 whereas the current version of the Standard includes MIL-STD 882D as a reference. Both MIL-STD 882D and DOT-FTA-MA-26-5005-00-01 address Hazard Analyses. However, there are some differences to note, mainly regarding their conservativeness.

Failure Probability:
The standards have a similar probability level assessment, however presented differently.

MIL-STD allowable event probability (TABLE A-II) is based on equipment life (failure probability from 10% (frequent) to 0.0001% (improbable) in the equipment’s life). DOT allowable event probability (Section 3) is based on time (failure probability from 1/1000 operating hours (frequent) to 1/100,000,000 operating hours (improbable)). These minimum frequency values can be translated to percentages to be compared directly with the MIL-STD (0.1% (frequent) to 0.000001% (improbable)). The DOT standard is more conservative, allowing 100 times less allowable hazards/failures per unit time than the MIL-STD.

Risk Categories/Acceptance Levels:
The main difference between the two standards is that the acceptability level of each category is defined differently between the two standards. The DOT standard categorizes hazards more conservatively. Equivalent hazard conditions (probability and severity) is assigned a more critical category index.

Conclusion/Proposal
The DOT standard provides a more conservative acceptance criteria than the MIL Standard for civilian Fixed Guideway Transit and Passenger Rail Systems.

This is not original material; its reference/source is as follows:
Submitted by W.D. Kennedy on behalf of Rod Falvey on behalf NFPA 130 Task Group 3 - Ventilation
7.2.4 Criteria for the system reliability analysis in 7.2.3(76) shall be established and approved.

7.7.1.1 Alternatively, the design of the power for the emergency ventilation system shall be permitted to be based upon the results of the electrical reliability analysis as per 7.2.3(76), as approved.

Substantiation: There are incorrect references to section 7.2.3(6). The correct reference for the reliability analysis is section 7.2.3(7).

This is not original material; its reference/source is as follows:
Text was originally drafted by Rod Flavey or Lee & Elliott. I am submitting on his behalf.

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A.7.2.6 The time of tenability should consider the possibility of one or more egress paths being blocked by fire or smoke (as may be demonstrated by analysis) and for other considerations that are not accounted for in the egress capacity calculations. Section B.2.3 provides additional information to be considered.

Substantiation: “... time greater than ...” in 7.2.6 is too non specific. The recommended explanation clarifies the intent.

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7.3.1 The ventilation system fans that are designated for use in fire and similar emergencies shall be capable of satisfying the emergency ventilation requirements to move tunnel air in either direction as required to provide the needed ventilation response.

Some Standard users have interpreted the inclusion of the word “fire” in this clause to mean that the tunnel and station ventilation equipment design for emergencies is limited to fire response only. This excludes other fire-life safety situations with emergency ventilation requirements, such as ventilation of tunnels in gassy ground. Conforming the wording of this paragraph to that of 4.2.1 removes that unintentional limitation.
Thermal over-current elements that are designed to protect conductors serving motors for both emergency fans and related emergency devices that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation—shall not be permitted where such over-current elements are subject to false operation due to exposure to elevated temperatures during a fire emergency. All other motor and fan protection devices except motor short-circuit and excessive vibration shall be bypassed during a fire emergency.

7.3.4.1 Thermal overload protective devices in motors or on motor controls of fans used for emergency ventilation shall not be permitted where such over-current elements are subject to false operation due to exposure to elevated temperatures during a fire emergency.

7.4.3 Other devices shall be designed to operate throughout the anticipated temperature range. Thermal overload protective devices in devices or on device controls required to support the emergency ventilation shall not be permitted where such over-current elements are subject to false operation due to exposure to elevated temperatures during a fire emergency.

7.3.2 Emergency ventilation fans, their motors, and all related emergency devices components exposed to elevated temperatures during emergency operation the exhaust airflow shall be designed to operate in an ambient atmosphere of 250°C (482°F) for a minimum of 1 hour but not less than the required time of tenability.

Substantiation: The proposed text changes address the following issues:

1. Log #710:
Section 7.7.8 is always referred to as "run to destruction". The inserted text requires the bypass of certain protection devices to allow emergency fans running to a point of failure during a fire emergency.

2. Log #711:
The inserted text to Section 7.7.8 requires the motor short-circuit and high vibration level will be in effect at all times to prevent a fan/motor fault affecting other emergency fans in the ventilation system.

3. Log #719:
The further changes in Sections 7.3.4.1 and 7.4.3 will use common language and extend the requirements to all related emergency devices, such as dampers. A further companion change to #719 would be to Section 7.3.2.

This is not original material; its reference/source is as follows:
Submitted by Silas Li and David Plotkin on behalf of NFPA 130 Task Group 3 - Ventilation

Recommendation: Revised text to read as follows:

7.4.2 Devices in the emergency ventilation system that are exposed to the exhaust airflow and are critical to its effective functioning in the event of an emergency shall be constructed of noncombustible, fire-resistant materials and shall be designed to operate in an ambient atmosphere of 250°C (482°F) for a minimum of 1 hour but not less than the required time of tenability. Materials that comply with all of the following:

1. they are noncombustible materials
2. they exhibit a fire resistance rating of not less than 1 hour when tested in accordance with ASTM E 119
3. they exhibit a fire resistance rating of not less than the required tenability time when tested in accordance with ASTM E 119, and
4. they are suitable for operation in an ambient atmosphere of 250 °C (482 °F).

Substantiation: This section contains contradictory and unclear requirements. I assume that the intent of this section is that the materials are both noncombustible and exhibit a fire resistance rating of no less than 1 hour or of the minimum required tenability time. The rewording does that. It also specifies the test method for the fire resistance rating.
Operation of the emergency ventilation system shall not be discontinued until directed by the incident commander.

The statement is out of place under the heading 7.6 Emergency Ventilation System Control/Operations and is superfluous under Emergency Procedures, 9.4.9, “Procedures typically implemented by responding jurisdictions for various types of emergencies as appropriate to site configuration.”

Given the critical nature of ventilation to underground operations, the emergency plan will include management of the emergency ventilation system. The Incident Commander will ensure the ventilation system is functioning based upon the strategy and tactics and will not allow the ventilation system to be discontinued without the IC authorization.

This is not original material; its reference/source is as follows:

Submitted by Gary English on Behalf of TG 3 - Ventilation

Alternatively, the design of the power for the emergency ventilation system shall be permitted to be based upon the results of the electrical reliability analysis as per 7.2.3(6), as approved.

Editorial change.

The requirement of Section 7.4.3 is not possible and is not necessary. NFPA 70 does not contain or specify jacket thicknesses NFPA 70 does include and specify insulation thickness. However, given that section 7.7.5 requires that “All insulations shall conform to NFPA 70”, which includes thickness, the requirement in 7.7.4.3 is not needed.
Revise 7.7.6 as follows to delete “wires” from the requirements of 7.7.6.1 and 7.7.6.2.

7.7.6 All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 7.7.6.1 or 7.7.6.2.

Inclusion of “wires” in the text of 7.7.6 requires that single insulated conductors be listed to the flame and smoke test requirements of 7.7.6.1 and 7.7.6.2. The National Electrical Code does not permit single insulated conductors to be installed unless they are contained within raceways or cables. Section 7.7.3 requires non-combustible raceways, and since cables are required to be listed to the flame and smoke test requirements of 7.7.6.1 and 7.7.6.2, the requirements of 7.7.6 do not apply to single insulated conductors and should be deleted.

Add new Acid gas testing requirements for wire and cable

7.7.7 All wires and cables used for enclosed stations and trainways shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643

Renumber subsequent sections

The committee added the requirement for acid gas test per MIL-DTL-24643. Compliance with this requirement will help reduce the presence of acid gas in a fire event. Acid gas acts as both an eye irritant and respiratory inhibitor and degrades tenability.

This is consistent with the wire and cable requirements of NFPA 502 for similar enclosed applications.
7.7.7* The emergency ventilation circuits routed through the station public areas and trainway shall be protected from physical damage by fixed guideway transit or passenger rail vehicles or other normal operations and from fires in the system for a period of not less than 1 hour.

7.7.7.1 The circuits shall be protected from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing of such conductors external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier so that a single fire or emergency event will not lead to a failure of the system)
4. Be a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 7.7.10

7.7.7* The emergency power circuits and communication circuits shall be designed and located so as to minimize damage from normal system operations and shall remain functional during a fire utilizing one of the following methods:

1. A fire-resistive cable listed for 2-hours in accordance with ANSI/UL 2196 and tested to ASTM E 119
2. Circuits embedded in concrete or protected by a 2-hour fire barrier system in accordance with UL 1724. The cables or conductors shall be suitable to maintain functionality at the temperature within the embedded conduit or fire barrier system.
3. Routing external to the interior underground portion of the system facility
4. Diversity in system routing (such as separate redundant or multiple circuits separated by a 2-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

Note to committee: If this proposal is accepted, section 7.7.10 should be deleted because it will be addressed in the new 7.7.7 (1)

Substantiation: Changed from “emergency lighting” to “emergency power” to more globally address the essential emergency circuits that should be connected to the emergency power system. This was necessary to encompass all life safety circuits such as power to the fire alarm panel, protective signaling system etc.

Reworded the opening statement to clarify that the circuit needs to be protected from physical damage and remain functional from fire conditions.

Changed from 1-hour protection from fire to 2-hours to be consistent with the NFPA 70 article 700

Quantified suitable embedded or encasement in concrete with respect to circuit functionality.

This is not original material; its reference/source is as follows:
Task Group 7.
**Report on Proposals – June 2013**

**NFPA 130**

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**130- Log #33**

(7.7.7 and A.7.7.7)

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**Submitter:** Marcelo M. Hirschler, GBH International / Rep. American Chemistry Council  

**Recommendation:** Revised text to read as follows:

7.7.7 The emergency ventilation circuits routed through the station public areas and trainways shall be protected from physical damage by fixed guideway transit or passenger rail vehicles or other normal operations and from fires in the system for a period of not less than 1 hour.

7.7.7.1 The circuits shall be protected from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing of such conductors external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier so that a single fire or emergency event will not lead to a failure of the system
4. Be a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 7.7.10

7.7.7.2 Except in ancillary areas or other nonpublic areas, encased conductors shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceway boxes and cabinets.

7.7.7.3 Conductors in conduits or raceways shall be permitted to be embedded in concrete or to run in concrete electrical duct banks.

7.7.7.4 No electrical appurtenances shall be mounted in trainways.

A.7.7.7 The trainway, although used for ventilation, should not be considered as an air plenum for purposes of mounting electrical appurtenances.

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**Substantiation:** The requirement that electrical appurtenances are not to be mounted in trainways needs to be specific rather than an annex suggestion.

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**130- Log #31**

(7.7.7.1)

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**Submitter:** Marcelo M. Hirschler, GBH International / Rep. American Chemistry Council  

**Recommendation:** Revised text to read as follows:

7.7.7.1 The circuits shall be protected to ensure operation for at least 1 hour when exposed to fire conditions corresponding to the time-temperature curve in the ASTM E 119 fire resistance test, from ASTM E 119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing of such conductors outside the external to the interior underground portion of the system facility
3. Diversity in system routing (such as separate redundant circuits or multiple circuits separated by a fire barrier with a 1-hour fire resistance rating barrier so that a single fire or emergency event will not lead to a failure of the system
4. Be a All circuits consist of listed fire-resistive cable systems system with a minimum 1-hour fire resistance rating in accordance with 7.7.10

**Substantiation:** “Protection from ASTM E 119 fire conditions” is an unclear statement. ASTM E 119 is a fire resistance test intended for use to assess the fire resistance rating of products or assemblies and it produces a number, which represents the time to failure. It appears that the intent of the committee is that the circuits shall be protected from failure for at least one hour if exposed to a fire corresponding to the ASTM E 119 time-temperature curve. The language in NFPA 130 does not explain how long the protection needs to be. The terms “fire barrier” and “embedment” are not sufficiently clear or potentially misleading.

Consistent language is being proposed for 5.4.8, 6.3.3.2.8 and 7.7.7.1, which all have the same concepts.

**Fire Barrier.** A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

**Embedment** is a phenomenon in mechanical engineering in which the surfaces between mechanical members of a loaded joint embed. It can lead to failure by fatigue as described below, and is of particular concern when considering the design of critical fastener joints.

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*Printed on 12/15/2011*
130- Log #32
(7.7.7.2)
Final Action:

Recommendation: Revised text to read as follows:
7.7.7.2 Except in ancillary areas or other nonpublic areas, encased conductors shall be enclosed in their entirety in noncombustible armor sheaths, conduits, or enclosed raceway boxes and cabinets
Substantiation: Sheaths, conduits and raceways can be combustible and that is not the committee’s intent.

130- Log #50
(7.7.7.3)
Final Action:

Submitter: George A. Straniero, AFC Cable Systems, Inc.
Recommendation: Revise 7.7.7.3 to permit conductors enclosed in their entirety in armor sheaths as permitted in 7.7.7.2, with an outer jacket, to be installed embedded in concrete.
7.7.7.3 Conductors in conduits or raceways, or armored sheathed cables listed for the use shall be permitted to be embedded in concrete or to run in concrete electrical duct banks.
Substantiation: Listed Type MC cable with conductors enclosed in their entirety in armor sheaths and with a non-metallic outer covering over the armor is available with a rating that permits its use embedded in concrete. It should be included as a permitted wiring method

130- Log #69
(8.3.1, 8.3.2, and 8.3.3)
Final Action:

Submitter: Robert May, LTK Engineering Services
Recommendation: Revise text to read as follows:
8.3.1 Heat-producing equipment or equipment posing an ignition threat in vehicles, including associated electrical services, shall be isolated from the combustible materials in the passenger and crew compartments.
8.3.2* Equipment other than comfort heating equipment operating on voltage of greater than 300 V shall be located external to or isolated from passenger and crew compartments to prevent electrical failures from extending into these areas.
8.3.3 Where it is not possible to locate high-energy equipment external to the passenger and crew compartments, the equipment shall be isolated from these compartments to prevent a hazard from extending into these areas.
Substantiation: As-written these requirements would appear to prohibit comfort heating equipment (floor heaters, overhead heaters and cab heaters) from operating on voltages greater than 300 volts. The majority of equipment in service today utilizes comfort heating equipment that operates at greater than 300 volts. For example, most subway cars operate comfort heating equipment directly from third-rail voltage nominally in the range of 600 to 750 volts DC; most locomotive hauled commuter rail and intercity rail cars operate comfort heating equipment from the locomotive’s head-end power supply, typically 480 volts AC.
It is not believed that the committee intended to prohibit this historically used comfort heating arrangement when paragraph 8.3 was revised, however the revised language introduces ambiguity regarding the intent.
Paragraph 8.3.3 introduced the term “high-energy equipment” without prior definition. It is assumed that “high-voltage” was intended, and that the lower threshold of “high-voltage” is 300 volts as mentioned in paragraph 8.3.2.
Selection 8.4.1 Category - Elastomers, Other Materials and Wire and Cable:

- Elastomers
- Floor Covering
- Wire and Cable

NFPA 130/2003, 8.4.1.5.2 States "The ASTM E 662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, maximum test limits for smoke emission (specific optical density) shall be measured in either the flaming or non flaming mode, utilizing the mode that generates the most smoke.” This note was applied to all materials except floor covering, elastomers and wire and cable. In NFPA 130/2007 8.4.1.2, same note new number, was revised to state “The ASTM E 662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, maximum test limits for smoke emission (specific optical density) shall be based on both the flaming and non flaming modes”. Currently this note applies to all materials except floor covering, elastomers and wire and cable. To be consistent with the rest of the materials in the table and with standard rail industry practice this note needs to be referenced to elastomers, floor covering and wire and cable (although the section on wires already requires readings in the flaming and non flaming modes).

This is not original material; its reference/source is as follows:
NFPA 130 Task Group 4

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Revise text to read as follows:

8.4.1 (add testing for toxicity and limits to table for all materials): SMC 800-C Toxic Gas Generation. Carbon Monoxide (CO) 3500 ppm, Hydrogen Fluoride (FL) 200 ppm, Nitrogen Dioxide (NO2) 100 ppm, Hydrogen Chloride (HCL) 500 ppm, Hydrogen Cyanide (HCN) 150 ppm and Sulfur Dioxide (SO2) 100 ppm.

The aircraft industry has compiled with voluntary toxicity standards for smoke emissions for many years. Numerous transit agencies have insisted these same standards be applied to the materials used in passenger rail vehicles they purchased for the past decade. In addition, the "Recommended Fire Safety Practices for Rail Transit Materials Selection", submitted by the National Association of State Fire Marshals (November 2008) also recommends the adoption of toxicity requirements. The toxicity of smoke affects the passengers ability to escape from the fire due to disorientation from inhalation (causing difficulty breathing) and gases attacking the mucus membranes such as eyes causing difficulty in seeing a safe exit path.
New Category 8.4.1 Adhesives and Sealants, Test Method: ASTM E 162 Is < 35; ASTM E 662 Ds (1.5) < 100 and Ds (4.0) < 200.

The use of adhesives and sealants in railcar construction has been increasing over the past several years. Consideration should be given to adding them to the table.

Several car builders manufacture light rail and commuter rail vehicles with an exterior cladding of fiberglass reinforced plastic or metal panels adhesively bonded to a steel or aluminum skeleton. The manufacturing methods used by these car builders were adopted from the transit bus industry and as such not anticipated by NFPA, Section 8 vehicle standards. Assembly of a typical LRV with bonded exterior cladding, floor panels and windows requires approximately 1,000 lb of adhesives. None of this adhesive material is currently required to comply with flame spread and smoke emission standards even though their volume and location in the vehicle pose significant fire propagation and smoke hazard.

New Function of Material in "Other Vehicle Components" Category 8.4.1 Adhesives and Sealants, Test Method: ASTM E 162 Is<35; ASTM E 662 Ds (1.5) < 100 and Ds (4.0) < 200

The use of adhesives and sealants in rail vehicle construction has been increasing over the past several years. Test method and criteria requirements should be added to the "Other Vehicle Components" category in Table 8.4.1.

Several vehicle manufacturers build light rail, transit and commuter rail vehicles with an exterior cladding of fiberglass reinforced plastic or metal panels adhesively bonded to a steel or aluminum skeleton. Composite floor panels are also now being bonded to the floor structures of many vehicles. The manufacturing methods used by these manufacturers were adopted from the transit bus industry and not anticipated for application to rail vehicles by this Standard. For example assembly of a typical light rail vehicle with bonded exterior cladding, floor panels and windows requires approximately 1,000 lb of adhesives. None of this adhesive material is currently required to comply with flame spread and smoke emission tests and criteria requirements, although their volume and location in the vehicle may pose significant fire propagation and smoke hazard.

This is not original material; its reference/source is as follows:
NFPA 130 Task Group 4.
Revise Table 8.4.1 to read as follows:

Section 8.4.1 Category - Elastomers, Other Materials and Wire and Cable:
- Elastomers
- Floor Covering

NFPA 130/2003, 8.4.1.5.2 states "The ASTM E 662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, maximum test limits for smoke emission (specific optical density) shall be measured in either the flaming or non flaming mode, utilizing the mode that generates the most smoke." This note was applied to all materials except floor covering and elastomers. In NFPA130/2007 8.4.1.2, same note new number, was revised to state "The ASTM E 662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, maximum test limits for smoke emission (specific optical density) shall be based on both the flaming and non flaming modes". Currently this note applies to all materials except floor covering, and elastomers. To be consistent with the rest of the materials in the table and with standard rail industry practice, this note needs to be referenced to elastomers and floor covering.

This is not original material; its reference/source is as follows:
NFPA 130 Task Group 4.
8.4.1.1 If a material or assembly cannot be tested in accordance with ASTM E 162 or in accordance with ASTM D 3675 because the material or assembly generates invalid test results, the material or assembly shall be tested in accordance with NFPA 271 (ASTM E 1354) as an alternative to the ASTM E 162 or ASTM D 3675 flammability test procedures. Testing shall be at 50 kW/m² (4.4 Btu/sec•ft²) applied heat flux in the horizontal orientation with a retainer frame. Materials tested in accordance with NFPA 271 (ASTM E 1354) shall comply with a 180 second average heat release rate of $q''_{180} < 100$ kW/m² (8.8 Btu/sec•ft²).

New Footnote a to Table 8.4.1: a. See 8.4.1.1.

Renumber all sections starting at the existing 8.4.1.1 through 8.4.1.15. Also renumber all footnotes in Table 8.4.1 and add new footnote a.

Substantiation: It has recently been noted that, for some materials, it is not possible to obtain valid test results with the ASTM E 162 because of one of the four phenomena described in section 11.11 of ASTM E 162 (see text below). The key issue that has been noticed recently is that a significant number of materials exhibit “rapid running or dripping of flaming material due to melting”. Even if such materials are retested the same behavior is often observed. Note that the test specimen in ASTM E 162 (and in ASTM D 3675) is not placed horizontally, allowing melting materials to flow away from the heat source, while the test specimen in NFPA 271 (or ASTM E 1354) is horizontal. At present NFPA 130 already includes the use of NFPA 271 (or ASTM E 1354) in Annex Note A.8.4.1.10, as an optional test for materials in small parts. The present proposal uses the heat release portion of that section for this new section.

This proposal extends the requirement to materials tested in accordance with ASTM D 3675, which is a very similar test to ASTM E 162 and may well encounter similar problems. In fact, revisions are being proposed to revise ASTM D 3675 to incorporate similar language to that in ASTM E 162.

This proposal will not affect in any way the requirement for materials or products that provide valid test results with ASTM E 162 or ASTM D 3675.

A parallel proposal is also being made to deal with the smoke measurements via ASTM E 662, since the test specimen in ASTM E 662 is vertical.

Text of the relevant ASTM E 162 standard test method:

11.11 If during the test of one or more of the test specimens, any of the following behaviors occur: (1) molten material flows out of the specimen holder, (2) one or more portions of a test specimen is forcefully displaced from the zone of controlled irradiance (explosive spalling), (3) the test specimen swells sufficiently prior to ignition to touch the burner during combustion, or (4) materials exhibit rapid running or dripping of flaming material due to melting and the steep inclination of the specimen during test; these occurrences shall be noted within the test report and no radiant panel index shall be reported for that test.
8.4.1.2 If a material or assembly cannot be tested in accordance with ASTM E 662 because the material or assembly generates invalid test results, the material or assembly shall be tested in accordance with NFPA 271 (ASTM E 1354) as an alternative to the ASTM E 662 smoke obscuration test procedure. Testing shall be at 50 kW/m² (4.4 Btu/sec·ft²), applied heat flux in the horizontal orientation with a retainer frame. Materials tested in accordance with NFPA 271 (ASTM E 1354) shall comply with a test average smoke extinction area ($F_t < 500 \text{ m}^2/\text{kg}$ (2441.2 ft²/lb)).

New Footnote b to Table 8.4.1: b. See 8.4.1.2.

Renumber all subsequent sections. Also renumber all footnotes in Table 8.4.1 and add new footnote b.

Substantiation: This is a parallel proposal to that for the new proposed section 8.4.1.1 and footnote (a) to Table 8.4.1. Test specimens in ASTM E 662 are placed vertically and thus some materials may exhibit similar behavior to the one exhibited in ASTM E 162 or ASTM D 3675. If that is the case and the test laboratory determines that the material test results are invalid when tested to ASTM E 662, it is important to offer an alternative. At present NFPA 130 already includes the use of NFPA 271 (or ASTM E 1354) in Annex Note A.8.4.1.10, as an optional test for materials in small parts. The present proposal uses the smoke portion of that section for this new section.

This proposal will not affect in any way the requirement for materials or products that provide valid test results with ASTM E 662.
8.4.1.10 Discontinuous small parts. Discontinuous small parts are items not listed in Table 8.4.1 (such as knobs, rollers, fasteners, clips, grommets, small electrical parts, …) and for which PESA (for a single part) is less than 100 cm². The discontinuous small parts can be either grouped or not grouped.

a) Discontinuous small parts that are grouped
Discontinuous small parts are considered as grouped when:
- The horizontal distance from each other is less than 20 mm and their vertical distance from each other is less than 100 mm;
- The parts are within a cubic space of 100 mm side.
For grouped discontinuous small parts, if the addition of the PESA of the different parts is less than 500 cm² in end use configuration, they are exempt of flammability and smoke production performance requirements, provided that an appropriate fire analysis is conducted that addressed the location and quantity of the materials used and the vulnerability of the materials to ignition and contribution to flame spread.

b) Discontinuous small parts that are not grouped
When their individual PESA is less than 100 cm², they are exempt of flammability and smoke production performance requirements, provided that an appropriate fire analysis is conducted that addressed the location and quantity of the materials used and the vulnerability of the materials to ignition and contribution to flame spread.
A discontinuous small part can include different combustible materials.
For both grouped and not grouped individual parts, any combustible material which represents less than 10% of the total combustible material of a given part is exempt of flammability and smoke production performance requirements. Any other combustible material must meet the flammability and smoke production performance requirements.
PESA: Potentially Exposed Surface Area (small part): addition of all the surface areas of a part, which could be exposed when a fire starts and/or grows within its vicinity. For example for a small electrical part fixed against a wall or the back of a non combustible cabinet (without gap), PESA is the addition of all its surface areas but its back.

Substantiation: As stated, the § 8.4.1.10 can lead to some confusion:
- It is unclear which surface area must be considered with regard to the 100 cm² threshold;
- It is unclear whether any combustible material included in a discontinuous small part must be tested;
- It is unclear how to deal with a group of different parts (which can be touching each other for instance).

Rotary motors shall be rated and tested in accordance with IEEE 11. Linear induction motors shall be rated and tested in accordance with BS EN 62520.
This Section currently references IEEE 11 which applies only to rotary motors. Linear Induction motors are not typically used in traditional rail vehicles. However they would be more applicable to a Mag-Lev vehicle. In order to include LIMs in this Standard then BS EN 62520 (for LIMS) needs to be cited also.
8.6.3.1 Rotary motors shall be rated and tested in accordance with IEEE 11, Linear induction motors shall be rated and tested in accordance with IEC 62520, Railway Applications Electric Traction, Short Primary Type Linear Induction Motors (LIM) Fed by Power Converters.

This Section currently references IEEE 11, which applies only to rotary motors. Linear Induction Motors (LIM) are not typically used in traditional passenger rail or rail transit vehicles. However, LIMs are used in some steel-wheel applications and are applicable to a Mag-Lev vehicle. Accordingly, to LIMs in this Standard, BS EN 62520 (for LIMs) needs to be cited.

8.6.9 (3) The battery installation area shall be provided with a fire alarm system for heat or smoke detection.

The following clause in NFPA 130:2010, 8.6.9 (3) added additional requirements that are non-typical of the state of the art in Passenger Rail Vehicle battery box design and system installation. The clause states:

Typically batteries applied to rail vehicles use a thermal sensor on an inter-pole connector plate set at 150 degrees F. This thermal sensor triggers the shunt trip battery circuit breaker, disconnection the batteries from the load. The battery circuit breaker shunt trip signals the on board vehicle monitoring system of a thermal event in the battery box. This alarm event is displayed to the vehicle operator via the Train Operator Display.

The addition of the smoke detector requirement is not well defined and the availability of a device for an undercar or roof mounted battery box that meets the currently specified environmental requirements for a rail vehicle is not commercially available.

Additionally, typical vehicle specifications require explosion proof battery circuit breakers if mounted within the battery box. This would imply the need for an explosion proof smoke detector. Costs for a rugged smoke detector are in the region of $200. Costs for an explosion proof smoke detector are in the $3000.00 region. If a smoke detector is required, the type should be specifically addressed.

Also, it should be noted that railcars equipped with “on board energy storage systems”, that utilize batteries with high energy densities, typically have a battery management system that monitors individual cells for thermal performance.
Submitter: Steven W. Roman, LTK Engineering Services

Recommendation: Revise text to read as follows:

8.6.5.1* Self-ventilated propulsion and braking resistors shall be mounted with air space between resistor elements and combustible materials sufficient clearance to prevent ignition and dissipate heat away from combustible train materials.

Appendix 8.6.5.1 Resistors dissipate heat at elevated temperatures and are frequently separated by noncombustible shields to avoid ignition of combustible train materials. Direct contact with combustibles is a fire hazard and minimum spacing should be established if combustible materials are required to be used. The required clear spacing will vary depending on location, orientation and fire characteristics of the combustible train materials.

Substantiation: The current language requires an air space between the resistor elements and combustible material but does not quantify the required air space. The brake resistor peak temperatures are between 600-750°F with an average around 300°F. The air space will be dependent on what material's are near the resistors. The revised language and Appendix material provides some guidance as to how to determine the required air space.

Submitter: Steven W. Roman, LTK Engineering Services

Recommendation: Revise text to read as follows:

8.6.5.1* Self-ventilated propulsion and braking resistors shall be mounted with air space between resistor elements and combustible materials sufficient clearance to prevent ignition and dissipate heat away from combustible materials.

Testing or analysis shall be provided to support the chosen clearance condition.

Substantiation: The current language requires an air space between the resistor elements and combustible material but does not quantify the required air space. Brake resistor peak temperatures can be between 600-750°F, with an average around 300°F. The air space required to dissipate heat will depend on what materials are near the resistors. The revised section and new Annex material provides guidance as to how to determine the required air space.

This is not original material; its reference/source is as follows:

NFPA 130 Task Group 4.

Submitter: Steven W. Roman, LTK Engineering Services

Recommendation: Add new text to read as follows:

New Annex Note 8.6.5.1 Resistors dissipate heat at elevated temperatures and are frequently separated by noncombustible material shields to avoid ignition of combustible train materials. Direct contact with combustible materials is a fire hazard and a minimum clear spacing should be established if combustible materials are used near resistors. The sufficient clear spacing will vary depending on location, orientation, and fire characteristics of the combustible materials, as well as the maximum temperatures that can be achieved by the resistors.

Substantiation: The new Annex material provides guidance as to how to determine the required air space between the braking resistors and surrounding combustible materials.

This is not original material; its reference/source is as follows:

NFPA 130 Task Group 4.
8.6.7.4.3 Wires connected to different sources of energy shall not be cabled together or be run in the same conduit, raceway, tubing, junction box, or cable unless all such wires are insulated for the highest rated voltage in such locations or unless physical separation is provided.

8.6.7.4.3 All conductors connected to equipment that has different voltage rating shall be permitted to occupy the same cable, cable tray, enclosure or raceway, provided all conductors are insulated for the maximum voltage of any conductor in the cable, cable tray, enclosure, or raceway or the conductors of different voltage rating are physically separated.

Substantiation: Reworded for clarification.

This is not original material; its reference/source is as follows: Task Group 7.

(3) The battery installation area shall be provided with a heat, smoke or other fire detection system, as appropriate for the environment in which it will operate.

Substantiation: The current Standard language requires that both heat and smoke detection be provided for the battery installation area. However either method may not be appropriate, depending on where the batteries may be located. For example, if the batteries are located undercar, a smoke detection system would not be appropriate due to the potential of dirt infiltrating the detector and the chance that the smoke might be dissipated while the train is moving such that it would not be detected. Further, two different types of detection systems is not warranted. The change in the language allows the appropriate detection method to be chosen depending on where the batteries are located.

This is not original material; its reference/source is as follows: NFPA 130 Task Group 4.
8.8.3.1* Emergency lighting facilities shall be provided such that the level of illumination of the means of egress conforms to the level of illumination determined necessary by the authority having jurisdiction or with the following as follows:

Substantiation: The current Standard language allows different levels of illumination to be imposed by the AHJ in addition to or in place of the performance requirements listed in the Standard. The performance requirements listed in the Standard are consistent with those listed in the rail industry standard for emergency lighting system design for passenger cars. Therefore, to eliminate the potential of having conflicting requirements specified by the AHJ, the Standard should reference only the requirements that already exist in items 1, 2, and 3.

This is not original material; its reference/source is as follows: NFPA 130 Task Group 4.

8.8.3.1* Emergency lighting facilities shall be provided such that the level of illumination of the means of egress conforms to the level of illumination determined necessary by the authority having jurisdiction or with the following as follows:

Substantiation: The current Standard language allows different levels of illumination to be imposed by the AHJ in addition to or in place of the performance requirements listed in the Standard. The performance requirements listed in the Standard are consistent with those listed in the rail industry standard for emergency lighting system design for passenger vehicles. Therefore, to eliminate the potential of having conflicting requirements specified by the AHJ, the Standard should reference only the requirements that already exist in items 1, 2, and 3.

This is not original material; its reference/source is as follows: NFPA 130 Task Group 4.

8.8.4 Means of emergency egress using doors, windows, or roof hatches shall be capable of being operated manually without special tools from the interior and exterior of the vehicle, and while the vehicle is not in the upright position. The method and equipment used to reach a point of emergency access from the interior of the vehicle when the vehicle is not in the upright position shall be determined during design review and shall be approved by the AHJ.

Substantiation: The current 130 Section 8.8.4, it states, "Means of emergency egress using doors, windows, or roof hatches shall be capable of being operated manually without special tools from the interior and exterior of the vehicle, and while the vehicle is not in the upright position." It appears to be a good performance standard although it does not specifically address the vehicle orientation. Since there are various car types and configurations, specific performance requirements for one car type may not work for all. The proposed language brings the vehicle orientation to light and suggests it needs to be taken into consideration during the design phase of the car for means of emergency egress.
8.8.4 Means of emergency egress using doors, windows, or roof hatches shall be capable of being operated manually without special tools from the interior and exterior of the vehicle, \(-\) when the vehicle is in an upright position and when it\(\text{is not in the upright position.}\)

**Substantiation:** The requirement provides a good performance standard but does not specifically address vehicle orientation in a fire or other emergency. Because various vehicle types and configurations currently exist and could be potentially designed, specific performance requirements for one vehicle type and configurations currently exist and could be potentially designed, specific performance requirements for one vehicle type and configuration may not be appropriate for all vehicles. The proposed revised language states that vehicle orientation must be considered to permit the means of emergency egress to be used when the vehicle is not in an upright position.

*This is not original material; its reference/source is as follows: NFPA 130 Task Group 4.*

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A.8.9.3.3 On-board fire suppression systems (i.e. mist systems), while relatively new in the rail transit industry have been successfully used on a number of rail projects outside of the United States. The applications for this type of system can range from protection of diesel engine compartments to the interior of passenger rail vehicles. The use of a fire suppression system can: save lives in the incident car during a fire condition; minimize damage to train and the station to which it has entered; reduce or eliminate possible station sprinklers; reduce or eliminate the need for down-stands; significantly reduce the impact of designing for fire emergencies on station architecture; reduce tunnel ventilation capacities by approximately 40+/-percent; may reduce the number and/or diameter of emergency ventilation fans at each end of each station and within the tunnels, thus reducing structure sizes; decrease shaft airflow cross section areas by approximately 40 percent; decrease tunnel ventilation shaft portal areas that correspond to the required fans sizes/velocities.

When considering the addition of a fire suppression system several design challenges must be met. Among them are: the type of extinguishing medium used, which all must be approved by the AHJ; size and number of medium canisters and where on the car to place them so they can be easily accessed for maintenance; resultant increased energy consumption caused by the increase in weight of the suppression system; maintenance intervals; cost of the system; testing and commissioning the system; cost and difficulties associated with retrofitting vehicle for a suppression system.

**Substantiation:** Existing ventilation capacities in existing sub-surface stations or tunnels may not be sufficient to accommodate the heat release rate of a new modern rail car design. Upgrading or re-designed the ventilation system in a sub-surface application may not be possible or practical. If the heat release rate of the rail car cannot be lowered sufficiently through careful selection of materials then the addition of a fire suppression system to the rail car can prevent the potential peak heat release rate from being realized by extinguishing a fire in its initial stages. The new text introduces the option of a suppression system and in the Annex outlines the advantages and design challenges of such a system.

*This is not original material; its reference/source is as follows: NFPA 130 Task Group 4.*
8.9.3.3 Portable fire extinguishers shall not be required in the vehicle or cab where sufficient wayside extinguishers, standpipe systems, on-board fire suppression system or other fire-fighting equipment is available.

Existing ventilation capacities in existing sub-surface stations or tunnels may not be sufficient to accommodate the peak heat release rate of a new modern vehicle design. Upgrading or re-designing the ventilation system in a sub-surface application may not be possible or practical. If the heat release rate of the vehicle cannot be lowered sufficiently through selection of materials, then the addition of a fire suppression system to the vehicle may prevent the potential peak heat release rate from being reached by extinguishing a fire in its initial stages. The proposed revision to 8.9.3.3 allows the option of a suppression system and the new Annex note describes the advantages and design challenges of such a system.

This is not original material; its reference/source is as follows:
NFPA 130 Task Group 4.

Emergency personnel training shall be kept current through comprehensive periodic drills and formal review courses.

Clarifies that the drills should be comprehensive and the courses should be formal.

Emergency procedure shall be developed to address specifically the various types of emergencies that might be experienced on the system and shall include, but not be limited to, the following:

Revised language to provide clarity.

This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 901 & 902
Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:
(3) Participating agencies and area of responsibility, including governing officials and signatures of executives
signing for from each agency
(6) Command post and auxiliary command post, their purposes, and operational procedures, as applicable
(8) Fire and smoke emergency information and procedures to be provided, including the following:
(8) (j) The preplanned mode of ventilation system preplanned mode of fan operation (exhaust or supply)

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 903-906

Submitter: Jon Nisja, Northcentral Regional Fire Code Development Committee
Recommendation: Add a new 9.4(12) to read:
(12) The Emergency Plan shall address when and how passengers will be advised and informed during an emergency,
to discourage panic or stress during adverse circumstances.

Substantiation: Added a new item requiring the plan address how the passengers will be informed of emergencies.

Submitter: Thomas G. Middlebrook, McCormick Rankin Corporation
Recommendation: Revise text to read as follows:
9.5 Participating Agencies.
Participating agencies to be summoned by operators of a fixed guideway transit or passenger rail system to cooperate
and assist, depending on the nature of the emergency shall include the following:

Substantiation: Revised language to provide clarity.
This is not original material; its reference/source is as follows:
NFPA TC - Task Group 1 - Logs 907-906
Gil Shoshani, RSCC

**Recommendation:** Consolidate wiring requirements from Chapters 5, 6 and 7 to new Chapter 12.

In Chapter 5 the consolidation is from section 5.4 to 5.4.10. Section 5.4.11 renamed “Emergency Power” and the section was renumbered. (See attachment 2 - section 5.4 changes)

In Chapter 6 the consolidation is from section 6.3.3.1.3 to 6.3.3.2.10. Section 6.3.3 renamed “Emergency Power” and the section was renumbered. Deleted section 6.3.3.1.1 and 6.3.3.1.2 since they are already covered in section 6.4 “power traction”. (See attachment 3 - section 6.3.3 changes)

In Chapter 7 the consolidation is from section 7.7.2 to 7.7.8 and 7.7.10. Section 7.7 renamed “Emergency Power” and the section was renumbered. (See attachment 4 - section 7.7 changes)

***INCLUDE 130_I57_R HERE***

**Substantiation:** The new Wire and Cable Chapter 12 combines the wiring requirements from Chapter 5, 6 and 7 into one chapter for ease of use, eliminates redundancy and offers a single point of reference for all wire and cable. The new Wire and Cable chapter excludes vehicle wiring found in Chapter 8. The new chapter is a consolidation of the existing requirements with editorial changes made for clarity. No substantive changes have been made.

*This is not original material; its reference/source is as follows:*

Task Group 7.

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Thomas G. Middlebrook, McCormick Rankin Corporation

**Recommendation:** Add new text to read as follows:

**A.4.4** The standard was created to address the issue of entrapment and injury of large numbers of people who routinely use fixed guideway transit systems, as a result of fire in the system. The document has evolved to now include passenger rail systems. The basis of the document—providing the minimum life safety from fire and fire protection requirements—still stands. It is not intended for the document to provide design basis for non-fire events such as explosions or other random acts of sabotage. Specifically, the consequences of CBRN (Chemical, Biological, Radiation and Nuclear) scenarios are not directly considered by the standard.

**Substantiation:** The term “random acts of sabotage” in the previous sentence may not provide enough guidance as to the other scenarios that an operator may want to consider.

*This is not original material; its reference/source is as follows:*

NFPA TC - Task Group 1 - Log 407
Proposed New Chapter 12

Chapter 12 Wire and Cable Requirements

12.1 Wire and Cable. This applies to all chapters except of vehicle wiring found in chapter 8.

12.1.1 All wiring materials and installations other than for traction power shall conform to the requirements of NFPA 70.

12.1.2 The additional requirements in 12.2 through 12.6 apply to all areas except non underground trainways.

12.2 Wiring Requirements.

12.2.1 Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

12.3 Wire and Cable Requirements.

12.3.1 All conductors shall be insulated.

12.3.1.1 Ground wire installed in a metallic raceway shall be insulated.

12.3.1.2 Other ground wires shall be permitted to be bare.

12.3.2 All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant type carrying temperature ratings corresponding to either of the following conditions:
(1) 75°C (167°F) for listed fire-resistive cables
(2) 90°C (194°F) for all other applications

12.3.2.1 All insulated conductors and cables shall be listed for wet locations.

12.3.3 All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 12.3.3.1 or 12.3.3.2.

12.3.3.1 All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685.

12.3.3.2 Wires and cables listed as having adequate fire resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum
average optical density of smoke of 0.15 when tested in accordance with NFPA 262 shall be permitted for use instead of the wires and cables specified in 5.4.5.1.

12.4 Wiring Installation Methods

12.4.1 Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136. In stations, other materials when encased in concrete shall be acceptable.

12.4.2 All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas

12.4.2.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surface mounted in air plenums unless cables are listed fire-resistive cables in accordance with 12.6

12.4.3 The emergency circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour.

12.4.3.1 The circuits shall be protected from ASTM E119 fire conditions by any of the following:
(1) Suitable embedment or encasement
(2) Routing external to the interior underground portions of the system facilities
(3) Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system
(4) Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 12.6


12.6 Fire-resistive cables shall be listed and have a minimum 1-hour fire-resistive rating in accordance with ANSI/UL2196 and shall be installed per the listing requirements.

Proposed Revisions to Section 5.4

5.4 Emergency Power Wiring Requirements.

5.4.1 All wiring materials and installations within stations other than for traction power shall conform to requirements of NFPA 70 and, in addition, shall satisfy the requirements of 5.4.2 through 5.4.9.
5.4.2 Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136.

5.4.2.1 Other materials when encased in concrete shall be acceptable.

5.4.3 All conductors shall be insulated.

5.4.3.1 Ground wire installed in a metallic raceway shall be insulated.

5.4.3.2 Other ground wires shall be permitted to be bare.

5.4.4 All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant type carrying temperature ratings corresponding to either of the following conditions:

1. 75°C (167°F) for listed fire-resistant cables
2. 90°C (194°F) for all other applications

5.4.4.1 All insulated conductors and cables shall be listed for wet locations.

5.4.5 All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 5.4.5.1 or 5.4.5.2.

5.4.5.1 All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685.

5.4.5.2 Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA 262 shall be permitted for use instead of the wires and cables specified in 5.4.5.1.

5.4.6 All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas or other nonpublic areas.

5.4.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical
duct banks, but they shall not be installed exposed or surfacemounted in air plenums unless cables are listed fire resistive cables in accordance with 5.4.10.

5.4.7 Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

5.4.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be a listed fire resistive cable system with a minimum 1-hour rating, in accordance with 5.4.10, and shall be protected from ASTM E 119 fire conditions by any of the following:
(1) Suitable embedment or encasement
(2) Routing external to the interior underground portion of the system facility
(3) Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system

5.4.9 Power Supply for Emergency Ventilation Fans. See Chapter 7.

5.4.10 Fire resistive cables shall be listed and have a minimum 1-hour fire resistive rating in accordance with ANSI/UL2196 and shall be installed per the listing requirements.

5.4.11 Emergency Power. Emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110 shall be provided for enclosed stations.

5.4.11.1 The supply system for emergency purposes, in addition to the normal services to the station building, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.

5.4.11.2 The emergency power system shall have a capacity and rating sufficient to supply all equipment required to be connected by 5.4.11.4.
5.4.11.3 Selective load pickup and load shedding shall be permitted in accordance with NFPA 70.

5.4.11.4 The following systems shall be connected to the emergency power system:
(1) Emergency lighting
(2) Protective signaling systems
(3) Emergency communication system
(4) Fire command center

5.4.1.5 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fire as described in 12.4.3

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**Proposed revisions to 6.3.3**

6.3.3 *Wiring Requirements.* *(See Section 5.4.)*

6.3.3.1 *General.*

6.3.3.1.1 Traction power shall include the wayside pothead, the cable between the pothead and the contact (third) rail or overhead wire, the contact rail supports, and special warning and identification devices.

6.3.3.1.2 Life safety and fire protection criteria for the subsystem installed in the trainway shall conform to the requirements for underground trainways that are listed in 6.4.2.

6.3.3.1.3 All wiring materials and installations other than those for traction power shall conform to the requirements of NFPA 70.

6.3.3.2 *Underground (Subways).*

6.3.3.2.1 All wiring materials and installations within trainways, other than for traction power, shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of 6.3.3.2.2 through 6.3.3.2.9.
6.3.3.2.2 Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E-136.

6.3.3.2.3 All conductors shall be insulated.

6.3.3.2.3.1 Ground wire installed in a metallic raceway shall be insulated.

6.3.3.2.3.2 Other ground wires shall be permitted to be bare.

6.3.3.2.4 All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant types carrying temperature ratings corresponding to either of the following conditions:
(1) 75°C (167°F) for listed fire-resistive cables
(2) 90°C (194°F) for all other applications

6.3.3.2.4.1 All insulated conductors and cables shall be listed for wet locations.

6.3.3.2.5 All wires and cables used, other than traction-power cables, shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 6.3.3.2.5.1 or 6.3.3.2.5.2.

6.3.3.2.5.1 All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685-2007.

6.3.3.2.5.2 Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA262, shall be permitted for use instead of the wires and cables specified in 6.3.3.2.5.1.

6.3.3.2.6* All conductors, except radio antennas, shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceways, boxes, and cabinets except in ancillary areas.

6.3.3.2.6.1* Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete electrical duct banks, but shall not be installed, exposed, or surfacemounted in air-plenums unless cables are listed fire-resistive.
6.3.3.2.7 Overcurrent elements that are designed to protect conductors serving emergency equipment motors (pumps, etc.), emergency lighting, and communications equipment and that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

6.3.3.2.8 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fires in the system for a period of not less than 1 hour. The circuits shall be protected from ASTM E119 fire conditions by any of the following:

1. Suitable embedment or encasement
2. Routing external to the interior underground portions of the system facilities
3. Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier) so that a single fire or emergency event will not lead to a failure of the system
4. Use of a listed fire-resistive cable system with a minimum 1-hour rating in accordance with 6.3.3.2.10

6.3.3.2.9 Power Supply for Emergency Ventilation. See Chapter 7.

6.3.3.2.10 Fire-resistive cables used for emergency lighting and communication shall be listed and have a minimum 1-hour fire-resistive rating in accordance with ANSI/UL 2196 and shall be installed per the listing requirements.

6.3.3 Emergency Power

6.3.3.14 6.3.3.1 Emergency Power. Enclosed trainways shall be such that, in the event of failure of the normal supply to, or within, the system, emergency power shall be provided with emergency power in accordance with Article 700 of NFPA 70, and Chapter 4 of NFPA 110. The supply system for emergency purposes, in addition to the normal services to the trainway, shall be one or more of the types of systems described in subsections 700.12(A) through 700.12(E) of NFPA 70.

6.3.3.2.11.1 6.3.3.2 The following systems shall be connected to the emergency power system:

1. Emergency lighting
(2) Protective signaling systems
(3) Emergency communication system
(4) Fire command center

6.3.3.3 The emergency lighting and communications circuits shall be protected from physical damage by system vehicles or other normal system operations and from fire as described in 12.4.3

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Proposed revisions to Section 7.7

7.7 Emergency Power and Wiring:

7.7.1 The design of the power for the emergency ventilation system shall comply with the requirements of Article 700 of NFPA 70.

7.7.1.1 Alternatively, the design of the power for the emergency ventilation system shall be permitted to be based upon the results of the electrical reliability analysis as per 7.2.3(6), as approved.

7.7.1.2 The emergency ventilation circuits routed through the station public areas and trainway shall be protected from physical damage by fixed guideway transit or passenger rail vehicles or other normal operations and from fire as described in 12.4.3

7.7.2 All wiring materials and installations shall conform to the requirements of NFPA 70 and, in addition, shall satisfy the requirements of 7.7.3 through 7.7.8.

7.7.3 Conduits, raceways, ducts, boxes, cabinets, and equipment enclosures shall be constructed of noncombustible materials in accordance with the requirements of ASTM E 136.

7.7.4 All conductors shall be insulated.

7.7.4.1 Ground wire installed in a metallic raceway shall be insulated.

7.7.4.2 Other ground wires shall be permitted to be bare.

7.7.4.3 All thicknesses of jackets shall conform to NFPA 70.

7.7.5 All insulations shall conform to NFPA 70 and shall be moisture- and heat-resistant types carrying temperature ratings corresponding to either of the following conditions:
(1) 75°C (167°F) for listed fire resistive cables
(2) 90°C (194°F) for all other applications
7.7.5.1 All insulated conductors and cables shall be listed for wet locations.
7.7.6 All wires and cables used in emergency ventilation circuits shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with 7.7.6.1 or 7.7.6.2.

7.7.6.1 All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL 1685.

7.7.6.2 Wires and cables listed as having adequate fire-resistant and low-smoke-producing characteristics, by having a flame travel distance that does not exceed 1.5 m (5 ft) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical density of smoke of 0.15 when tested in accordance with NFPA262, shall be permitted for use instead of the wires and cables specified in 7.7.6.1.

7.7.7* The emergency ventilation circuits routed through the station public areas and trainway shall be protected from physical damage by fixed guideway transit or passenger rail vehicles or other normal operations and from fires in the system for a period of not less than 1 hour.

7.7.7.1 The circuits shall be protected from ASTM E 119 fire conditions by any of the following:
(1) Suitable embedment or encasement
(2) Routing of such conductors external to the interior underground portion of the system facility
(3) Diversity in system routing (such as separate redundant or multiple circuits separated by a 1-hour fire barrier so that a single fire or emergency event will not lead to a failure of the system
(4) Be a listed fire-resistant cable system with a minimum 1-hour rating in accordance with 7.7.10

7.7.7.2 Except in ancillary areas or other nonpublic areas, encased conductors shall be enclosed in their entirety in armor sheaths, conduits, or enclosed raceway boxes and cabinets.

7.7.7.3 Conductors in conduits or raceways shall be permitted to be embedded in concrete or to run in concrete electrical duct banks.

7.7.8 Overcurrent elements that are designed to protect conductors serving motors for both emergency fans and related emergency devices that are located in spaces other than the main electrical distribution system equipment rooms shall not depend on thermal properties for operation.

7.7.9 For electrical substations and distribution rooms serving emergency ventilation systems where the local environmental conditions require the use of mechanical ventilation or cooling to maintain the space temperature below the electrical
equipment operating limits, such mechanical ventilation or cooling systems shall be
designed so that failure of any single air moving or cooling unit does not result in the
loss of the electrical supply to the tunnel ventilation fans during the specified period of
operation.

7.7.10 Fire-resistive cables shall be listed and have a minimum 1-hour fire-resistive
rating in accordance with ANSI/UL2196 and shall be installed per the listing
requirements.
130- Log #157 Final Action: 

(A.4.4)

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.  

**Recommendation:** Add the following text to A4.4: 

Specifically, the consequences of CBRN (chemical, biological, radiological and nuclear) scenarios are not directly considered by this standard. 

**Substantiation:** This is submitted in response to the following comments received by the Committee: “Section 4.4, assumption of Single Fire – still appropriate? one location or one ignition source?” The term “random acts of sabotage” in the previous paragraph may not provide enough guidance as to the other scenarios that an operator may want to consider. 

This is not original material; its reference/source is as follows:  
Submitted on behalf of NFPA 130 Task Group 5 - Facilities

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130- Log #173 Final Action: 

(A.5.5.2.1(2))

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.  

**Recommendation:** Add text to read as follows: 

A.5.5.2.1(2) The intent is to keep escalators running in the direction of egress in order to provide more efficient evacuation flow. Where escalators are an integral means of egress component in deep stations, the provision of emergency power for the escalators should be considered when supported by risk analysis.

**Substantiation:** This is submitted in response to the question “Section 5.5.6.3.2.5. Should a subsection (4) be added requiring escalators to be on emergency power?” Rather than add language in the main body of the code requiring emergency power for escalators, it is recommended that Annex language be provided to recommend emergency power for escalators when used in deep stations as a means of egress component. After a review of other escalator sections, it has been determined that the Annex language should more appropriately be added to Section 5.5.2.1(2). 

This is not original material; its reference/source is as follows:  
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

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130- Log #166 Final Action: 

(A.5.5.6.1)

**Submitter:** Katherine Fagerlund, Sereca Fire Consulting Ltd.  

**Recommendation:** Revise A.5.5.6.1 as follows: 

The calculation stipulated time is intended as a design tool baseline for determining the minimum required capacity of platform egress routes and maximum travel distances for platform egress routes. It is not intended that this calculation be required to account for delays from due to products of combustion or debris along the egress route, or for delays due to the movement of those who are unable to achieve self-evacuation.

**Substantiation:** The change clarifies that the exiting capacity calculation should not be used as the actual time to evacuate the platform. 

This is not original material; its reference/source is as follows:  
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Add: A.5.5.6.3 – The incremental capacity factors referred to herein are not intended to apply to walkways serving the trainway, which would normally be capable of only single file pedestrian flow.

Add to A.6.2.1.9 – Refer to A.5.5.6.3 regarding measurement of capacity on walkways serving the trainway.

It has been brought to the Committee’s attention that some Individuals are using this section to infer that small increases in walkway widths (e.g. 750 mm [30 in.] to 850 mm [34 in.]) will result in proportionate increases in the rate of people movement along a walkway.

The Annex note is required as clarification that this is not the intent.

Add text to read as follows:

A.5.5.6.3.1 Ramps in stations are permitted in accordance with NFPA 101 (and other applicable standards), which allows use of ramps with up to 1:12 slope (8.33%).

A.5.5.6.3.1.4 For ramps, various studies have reported that there were no statistically significant differences or measurable effect on walking speeds due to grades up to 5 or 6%, but that there is a gradual linear decline in speed for steeper grades.

The proposed annex notes provide additional clarification regarding the use of ramps in stations. Ramps in stations are permitted in accordance with NFPA 101 (and other applicable standards), which allows use of ramps with up to 1:12 slope (8.33%). John J. Fruin, Ph.D., in his seminal Pedestrian Planning and Design, reported that there were no statistically significant differences in walking speeds due to grades up to 6%, according to a survey of walking speeds by age, sex, and grade categories, in the Central Business District of Washington, D.C., and that other studies confirm that there is no measurable effect on walking speeds due to grades up to 5%, but that there is a gradual linear decline in speed for steeper grades.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Relocate the annex note that is currently attached to 5.5.6.3.1.2 to refer to 5.5.6.3.1.1.

A minimum clear width of 1120 mm (44 in.) shall be provided along all platforms, corridors, and ramps serving as means of egress.

In computing the means of egress capacity available on platforms, corridors, and ramps, 300 mm (12 in.) shall be deducted at each sidewall and 450 mm (18 in.) at open platform edges.

The 2003 and previous editions of NFPA 130 required that exit corridors and ramps be a minimum of 1.73 m (5 ft 8 in.) wide. There is/was no technical basis for the previous minimum. The intent of 5.5.6.3.1.1 is to make NFPA 130 consistent with NFPA relative to the minimum 1120 mm (44 in.) corridor width in the means of egress.

NFPA 130 addresses means of egress conditions unique to transit/passenger rail facilities such as open platform edges.

In NFPA, means of egress facilities are based upon a function of the persons served (units of width/person served).

NFPA 130 introduces a unit of time in determining the required egress width. This is necessary to demonstrate compliance with the performance requirements related to platform evacuation time and reaching a point of safety.

Assuming a 1120 m (44 in.) wide side platform per 5.5.6.3.1.2, the effective platform width for egress is:

1120 mm (44 in.) – 455 mm (18 in.) @ platform edge – 305 mm (12 in.) @ sidewall = 355 mm (14 in.).

The capacity afforded by the effective 355 mm (14 in.) wide platform is:

355 mm (14 in.) x 0.819 p/mm·min (2.08 pim) = 29 p/min.

An effective 1120 mm (44 in.) wide corridor yields:

1120 mm (44 in.) x 0.819 p/mm·min (2.08 pim) = 91 p/min.

It must be recognized that while strict interpretation of this section indicates a station could be designed using a 1120 mm (44 in.) wide platform with an open edge and sidewall condition, it is impractical to do so, especially when one considers the other requirements of this standard that will impact the platform width such as the travel distance to the point(s) of egress, maximum 4-minute platform evacuation time, and 6-minute point of safety time.

Substantiation: The TC has received suggestions that platform width requirements should be re-instated. Instead, the TC believes that the discussion on platform width as discussed in the last paragraph of this annex note, should be more appropriately re-located from 5.5.6.3.1.2 (referring to calculation of egress capacity) to 5.5.6.3.1.1 (referring to minimum widths).

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
Katherine Fagerlund, Sereca Fire Consulting Ltd.

To A.5.5.6.3.2.3, add the following:

Refer also to Appendix C for discussion on alternate designs for deep stations.

Revise Appendix C to include a section discussing alternatives for addressing egress from deep stations.

Substantiation: This proposal is in response to the following comment received by the NFPA 130 TC: "The present exiting methodology was developed for systems such as Atlanta and Los Angeles where the stations are 'shallow'; that is, their platforms are less than about 30-45 feet below grade and the use of stairs is to some degree practical. Systems such as Dallas, Minneapolis, Montreal, Portland, Seattle, Washington and a number of overseas projects have had to design deep stations where only the most physically fit can climb the stairs and all normal patron movement is by vertical transport. Some systems have used all elevators and others have used all escalators, providing them in redundant numbers and sometimes with places of safe refuge. The deep station emergency exiting issue should be addressed. Doing so would provide guidance to both the users and the authorities having jurisdiction (AHJ)." The TC introduced provisions related to the use of elevators for evacuation in the 2010 edition. Additional material related to the design alternatives for addressing egress from deep stations is currently being prepared.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Katherine Fagerlund, Sereca Fire Consulting Ltd.

To A.5.5.6.3.2.3, add the following:

Where the vertical rise exceeds xx m (xx ft.), the capacity and travel speed for stairs should be adjusted downward by xx% to account for fatigue. Additionally, the design should provide for enlarged landings to allow pedestrians to rest without impeding egress flow.

Conduct research to confirm the height at which fatigue becomes a factor on stair climbing rates and travel speeds, and the percentage impact of that factor.

Substantiation: This proposal is in response to the following comment received by the NFPA 130 TC: "The vertical travel speed for people walking up escalators and stairs should vary based upon the depth of the station. It does not seem reasonable to use the same vertical travel speed for a deep station as for a shallow station." Previously, the TC has been unable to find technical rationale that would provide a basis for varying stair and escalator travel speeds. Research that is currently underway is expected to provide such rationale.

This is not original material; its reference/source is as follows:

Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting
A.5.5.6.3.5.4 The ‘clear width’ means the clear width between any protrusions with the fare gates open. The stipulated clear widths are appropriate where the length of the equipment console is less than 2500 mm in the egress direction. Where the equipment exceeds 2500 mm in length, increased widths are recommended, which should be based on the anthropometric body sway data from NFPA 101 as follows: Each unit should provide a minimum width of 560 mm (22 in.) clear width at and below a height of 1000 mm (39.5 in.) and 760 mm (30 in.) clear width above that height.

Substantiation: Annex material added for clarification of intent.

For egress through gate-type fare collection equipment with short distances of travel (less than 2500 mm), the anthropometric data related to human body dimensions may be used directly for guidance on the minimum required clear width, without providing additional width for the body sway. This recognizes that pedestrians are able to distort their gate and body position over short distances. However, for egress through gate-type fare collection equipment where longer distances of travel are expected (length exceeds 2500 mm), anthropometric data that accounts for body sway may be used to provide guidance on the minimum required clear width for occupants to navigate through the gate. Anthropometric data indicates that the 97.5th percentile hip breadth is 560 mm with body sway and the 97.5th percentile shoulder width is 760 mm with body sway [Error! Reference source not found.]. The proposed dimensions are based on that data, with no restriction on the maximum console height.


This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting.

A.6.2.2.1 The decision to use exits or cross-passages should be based on system properties, egress scenario, and ingress scenario.

Substantiation: The suggested text gives guidance on how to choose a proper exiting facilities. NFPA 130 does not give any guidance. Some people perceive that the current text in NFPA 130 prefers exits from tunnels instead of cross-passages.
This value is a minimum maintained point measured at any location on the walkway, taking into account the total light loss factor (dirt depreciation, lumen depreciation, etc.) that will be experienced by the luminaire. Required lighting levels should be read in the same manner as they would be in other codes—i.e., without consideration for obscuration by evacuees. The statement “during a period of evacuation” is intended to clarify that continuous illumination is not required during normal operations.

This proposal is in response to the following comment received by the NFPA 130 TC: “If the revision to add the phrase “...during a period of evacuation...” was intended that the minimum light levels must be achieved with a walkway full of evacuees (partially blocking overhead lighting) not only should this have been made clearer (perhaps in the already existent Annex A note) but some ground rules would seem to be in order. Evacuees spaced at X ft apart? Otherwise this requirement could be viewed as requiring walkway level lighting.”

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting

Most tunnels exposed to prolonged fires have been heavily damaged or have collapsed, resulting in service disruptions, significant structural damage and, most important, loss of lives (Both & Breunese 2003, Khoury 2002, and Tatnall 2002). The structural concrete or shotcrete liner can be designed to withstand the fire load up to a certain period of time while accepting some minor repairable damage to the liner. The fire endurance of the tunnel liners can be analyzed.

References:

Designers may not realize the catastrophic impacts large fires on underground infrastructure. Without a proper design, operations cannot quickly restore service after an incident. This text would alert the designer that infrastructure could be designed with more resiliency.

This is not original material; its reference/source is as follows:
If the surface area of any individual small part is less than 100 cm² (16 in.²) in end use configuration, materials used to fabricate such a part should be permitted to be tested in accordance with NFPA 271 (ASTM E 1354) as an alternative to both the ASTM E 162 flammability test procedure or the appropriate flammability test procedure otherwise specified in Table 8.4.1 and the ASTM E 662 smoke generation test procedure. Testing should be at 50 kW/m² (4.4 Btu/sec·ft²) applied heat flux in the horizontal orientation with a retainer frame. Materials tested in accordance with NFPA 271 (ASTM E 1354) should meet the following performance criteria:

Materials tested should meet the performance criteria of a 180 second average heat release rate of $q_{180} < 100$ kW/m² (8.8 Btu/sec·ft²) and test average smoke extinction area ($F_J$ < 500 m²/kg (2441.2 ft²/lb)).

This proposal just introduces a clarification. Most testing to NFPA 271 (or ASTM E 1354) is conducted in the horizontal orientation but some testing is also conducted in the vertical orientation. The appropriate test orientation should be horizontal. This test method is also known as the cone calorimeter.

Add new text to read as follows:

NEW Annex Note A.8.9.3.3 On-board fire suppression systems (e.g., mist systems), while relatively new in the passenger rail and rail transit industry have been successfully used on a number of passenger rail and diesel powered light rail systems outside of the United States. The applications for this type of system can range from protection of diesel engine compartments to the interior of passenger rail vehicles. The use of a fire suppression system may: save lives in the incident vehicle during a fire condition; minimize damage to the train, tunnel and the station which it has entered; reduce or eliminate potential use of station sprinklers; reduce or eliminate the need for down-stands; significantly reduce the impact of designing for fire emergencies on station architecture; reduce tunnel ventilation capacities by approximately 40%; may reduce the number and/or diameter of emergency ventilation fans at each end of each station and within the tunnels, thus reducing structure sizes; decrease shaft airflow cross section areas by approximately 40%; and decrease tunnel ventilation shaft portal areas that correspond to the required fans sizes/velocities.

When considering the addition of a fire suppression system, several design challenges must be met by the rail vehicle manufacturer. These challenges include: the type of extinguishing medium used, which all must be approved by the AHJ; size and number of medium canisters and where on the vehicle to place them for easy access for maintenance; resultant increased energy consumption caused by the increase in weight of the suppression system; maintenance intervals; cost of the system; testing and commissioning the system; and cost and difficulties associated with retrofitting vehicles.

Existing ventilation capacities in existing sub-surface stations or tunnels may not be sufficient to accommodate the peak heat release rate of a new modern rail vehicle design. Upgrading or re-designing the ventilation system in a sub-surface application may not be possible or practical. If the heat release rate of the rail vehicle cannot be lowered sufficiently through selection of materials then the addition of a fire suppression system to the rail vehicle may prevent the potential peak heat release rate from being reached by extinguishing a fire in its initial stages. The new Annex note describes the advantages and design challenges of such a system.

This is not original material; its reference/source is as follows:
NFPA 130 Task Group 4.
Revise text to read as follows:

(B.2.1.1)  
\[ t_{\text{rad}} = 4 \times 106 \ q^{-1.35} \]  
(B.2.1.1a)  

where:

- \( t \) = time in minutes
- \( q \) = radiant heat flux (\( \text{kW/m}^2 \))

**Substantiation:** The wrong units are given for the radiant heat flux in equation B.2.1.1a. The units are indicated as “\( \text{kW/m}^2 \)”. However, as written, the equation has a coefficient of “4.0”. In this form, the units for the radiant heat flux should have the units of “\( \text{Btu/s-ft}^2 \)”. 

This is consistent with the equation presented in John Klete’s smoke management manual (excerpt attached). Note that John’s equation uses a coefficient of “3.2” when the units are in “\( \text{Btu/s-ft}^2 \)”. The text in NFPA 130 indicates that a 25% factor was applied, hence: 3.2 x 1.25 = 4.0. In order to keep the NFPA units in terms of “\( \text{kW/m}^2 \)”, then the coefficient in equation B.2.1.1a would have to be changed from “4.0” to about 85 x 1.25 ~ 106, using Klete’s numbers. 

This is not original material; its reference/source is as follows: 
Submitted by William D. Kennedy on behalf of NFPA 130 Task Group 3 - Ventilation
Air carbon monoxide content (CO) is as follows:

1. Maximum of 2000 ppm for a few seconds
2. Averaging 1150 ppm or less for the first 6 minutes of the exposure
3. Averaging 450 ppm or less for the first 15 minutes of the exposure
4. Averaging 225 ppm or less for the first 30 minutes of the exposure
5. Averaging 50 ppm or less for the remainder of the exposure

These values should be adjusted for altitudes above 1000 m (3000 ft).

An exposed occupant can be considered to accumulate a dose of carbon monoxide over a period of time. This exposure to carbon monoxide can be expressed as a fractional effective dose according to Equation B.2.1.2a (see reference [1], page 6, equation (2))

\[
\text{FED} = \frac{1}{\Delta t} \int_{0}^{\Delta t} (CO) \, dt
\]

where:

- \( \Delta t \) – time increment in minutes
- \( [CO] \) = average concentration of CO (ppm) over the time increment, \( \Delta t \)

It has been estimated that the uncertainty associated with the use of Equation B.2.1.2a is \( \pm 35 \) percent. The time at which the FED accumulated sum exceeds a chosen incapacitating threshold value represents the time available for escape for the chosen carbon monoxide exposure.

As an example, consider the following:

1. Time to FED reduced by 35 percent to allow for the uncertainty in Equation B.2.1.2a
2. Exposure concentration is constant

This gives the values in Table B.2.1.2 for a range of threshold values

A value for the FED threshold limit of 0.5 is typical of healthy adult populations [1], 0.3 is typical in order to provide for escape by the more sensitive populations [1], and the AEGL 2 limits are intended to protect the general population, including susceptible individuals, from irreversible or other serious long-lasting health effects [2].

The selection of the FED threshold limit value should be chosen appropriate for the fire safety design objectives. A value of 0.3 is typical. More conservative criteria may be employed for use by especially susceptible populations. Additional information is available in references [1] and [3].


Substantiation: Since the adoption of the existing text in B.2.1.2, efforts in consensus standards organizations have advanced to the point where CO tenability can be treated in a manner consistent with the previous section on Heat Effects. The revised text provides this consistency, with recommended limits based on traceable consensus standards reference documents.
\[ FED_{CO} = \sum_{t_1}^{t_2} \frac{[CO]}{35000} \Delta t \]
### Table B.2.1.2 Maximum Carbon Monoxide Exposure

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</table>
Smoke obscuration levels should be continuously maintained below the point at which a sign internally illuminated at 80 lx (7.5 ft-candles) is discernible at 30 m (100 ft) and doors and walls are discernible at 10 m (33 ft).

[There is no change proposed to the wording of the Annex note – the submission is made to have on record the originating information]

The visibility of exit signs have been regulated since the first edition (1924) of the Building Exits Code (NFPA 101). The 1924 Building Exits Code (Tentative Edition) regulated that an exit sign needs to be visible, but did not specify where it needs to be visible from. Specifically:

2465. After dark if more than fifty persons are gathered in rooms having an illumination less than one-tenth of a foot candle the exits from rooms and all passages to the exits of the building shall be indicated by adequately illuminated exit signs so as to clearly indicate the path of safe exit from the building in case of emergency.

The 1927 Edition of the Building Exits Code refined this requirement by indicating that exit signs are required to be visible from the exit approach and indicate the way of egress, but did not indicate the distance of the length of approach. Specifically:

1205. Exit doors and passageways shall have signs visible from the exit approach indicating the way of egress.

The visibility requirement for exit signs remained unchanged until the 1934 Edition of the Building Exits Code, which required illumination of the sign by a light source to an intensity of not less than 5 foot-candles (54 Lux) on the illuminated face. Specifically:

The visibility requirement wording changed slightly between the 1934 and 1976 Editions of the Building Exits Code. The 1976 Edition required exit signs where an exit is not readily visible to occupants. In addition, the exit sign is required to be illuminated on the surface by a light source with an intensity not less than 5 foot-candles (54 Lux). Specifically:

5-10.1.2 Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants, and in any case where required by the applicable provisions of Chapters 8 through 16 for individual occupancies.

5-10.3* Illumination of Signs. Every sign shall be suitably illuminated by a reliable light source giving a value of not less than 5 foot-candles on the illuminated surface.

It was not until the 1981 Edition of NFPA 101 that a distance and an intensity level was associated with visibility of exit signs. Specifically:

5-10.1.2 Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants. Sign placement shall be such that no point in the exit access is more than 100 ft (30.48 m) from the nearest visible sign.

5-10.3.3* In an internally illuminated sign with translucent letters and an opaque background the average luminance due to the internal source only of the letters shall be a minimum of 2 footlamberts (6.85 cd/sq m) and a maximum of 3 footlamberts (10.28 cd/sq m). The letters shall be illuminated such that the brightest spot is not more than four times as bright as the darkest spot.

A-5-10.3.3 Two footlamberts (6.85 lx) are required for sign legibility in total darkness from a distance of 100 ft (30.48 m) (65-year-old adult, 20/20 vision). With a maximum of 3 footlamberts (10.28 lx), the letters will remain dark against the white background when viewed with high ambient light.

The basis for the 100 ft (30.48 m) visibility distance is not provided in the 1981 NFPA 101. Requirements for the visible distance and intensity of exit signs has remained relatively unchanged in subsequent editions of NFPA 101 to the current edition (2009 NFPA 101).

The basis for the 30 m (100 ft) visibility of a sign in NFPA 130 could not definitively be established. However, given the development of the requirements relative to exit sign visibility in NFPA 101, it is likely that the requirement in NFPA 130 originated from NFPA 101, and as a result has the same ancestry.

80 Lux Intensity

The originating document of the 80 Lux intensity internal illumination has not been sourced. The intensity of an exit sign in NFPA 101 has consistently been set at not less than 5 foot-candles (54 Lux). However, this intensity is on the illuminated surface of the sign, and not the internal illumination level as specified in B.2.1.3 of NFPA 130.
Neither NFPA 101 or NFPA 130, including the ROC's and ROP's between 1999 and 2010 for NFPA 130, indicate the basis for exit sign intensity. Research available at the time of the adoption of the 80 Lux (7.5 foot candles) requirement into NFPA 130 indicates that:

· Exit signs are more difficult to see with increasing smoke obscuration.
· Ambient illuminance at 75 Lux reduces exit sign visibility.

Several lighting design manuals correlate 80 Lux light intensity with public hallways. Whether the ambient lighting was considered in setting the light intensity level for a light source in B.2.1.3 of NFPA 130 is not known, and would require further confirmation.

This is not original material; its reference/source is as follows:
NFPA 130 Technical Committee, Task Group 3 - Ventilation

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130- Log #101
(B.2.2(1) and B.2.4 (New ))

Final Action:

Date: 
Submitter: Daniel M. McKinney, AECOM Transportation
Recommendation: Revise text to read as follows:
B.2.2 Geometric Considerations. . .
(1) The evacuation path requires a height clear of smoke of at least 2 m (6.6 ft). The current precision of modeling methods is within 25 percent. Therefore, in evaluating the results of modeling methods, a height of at least 2.5 m (8.2 ft) should be maintained above any point along the surface of the evacuation pathway. For low ceiling areas, selection of the modeling method and the criteria to be achieved should address the limitations imposed by ceiling heights below 3 m (9.84 ft). At low ceiling areas in an evacuation path, beyond the immediate vicinity of a fire, smoke should be excluded to the greatest extent practicable.

B2.4 Modeling accuracy. Where modeling is used to determine factors such as temperature, visibility and smoke layer height, suitable allowances should be made for modeling error including reliability of the input data and model uncertainty.

Substantiation: Consideration of modeling precision should be applied to the obscuration levels (visibility distance) as well as the layer height. The visibility distance is more meaningful when mixing occurs and with low ceiling heights.

This is not original material; its reference/source is as follows:
On behalf of TG3

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130- Log #109
(B.2.2(2))

Final Action:

Date: 
Submitter: William D. Kennedy, Parsons Brinckerhoff
Recommendation: Add text to read as follows:
B.2.2 Geometric Considerations. Some factors that should be considered in establishing a tenable environment in stations are as follows:
(2) The application of tenability criteria at the perimeter of a fire is impractical. The zone of tenability should be defined to apply outside a boundary away from the perimeter of the fire. This distance will be dependent on the fire heat release rate, fire smoke release rate, local geometry, and ventilation, and could be as much as 30 m (100 ft). A critical consideration in determining this distance will be how the resultant radiation exposures and smoke layer temperatures affect egress. This consideration should include the specific geometries of each application such as vehicle length, fire location, platform width and configuration, and ventilation system effectiveness, among others, and how these factors interact to support or interfere with access to the means of egress.

Substantiation: Prior inclusion of a distance value, even though not specific, has resulted in inappropriate generic use. Revision changes from providing the value to providing the rationale to establish one. This is necessary to more properly guide the selection of a project specific approach appropriate to each situation.
B.7.1 The inclusion of platform edge screens is a design option that is effective for comfort control installations as well as for smoke control in tunnels. Platform edge screen walls and doors are sometimes incorporated into stations for various reasons, such as climate control, separation between passengers and trainway hazards (especially in driverless systems), and ventilation control in tunnels. When used, the screen walls and doors should meet both fire resistivity and structural strength relative to the train and ventilation system drafts and the operational efficiency requirements.

Substantiation: The current language places a value judgment on the use of platform edge screen walls and doors. The revised language removes the value judgment from the standard.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 5 - Facilities
Where trains might be stopped or delayed in a tunnel for a period of time, the vehicle ventilation system should be capable of maintaining an acceptable level of patron comfort. If not operating in a fire or other emergency scenario, the tunnel ventilation fans can be used to augment the vehicle system capability.

Maintenance activities within station and tunnel areas can include heat, dust or fume producing operations such as grinding, welding, or painting; operation of fuel powered vehicles or equipment; and other operations that affect tunnel air quality or temperature. If not operating in a fire or other emergency scenario, the tunnel ventilation fans can be used to address the safety and comfort of employees working in the affected tunnel and station areas. In such cases, velocities should consider the comfort levels of employees required to be in the tunnels.

Tunnels in gassy ground may be subject to ingress of flammable gases or other hazardous gases. Gases of concern include hydrogen sulfide (H$_2$S) and methane (CH$_4$). Inflow gas concentrations can be up to 100 percent. Typical base criteria (no contingency included) are 10 ppm (continuous exposure) and 15 ppm (15-minute exposure for H$_2$S (sourced from ACGIH), and 5 percent of Lower Explosive Limit (LEL) for CH$_4$.

Different projects have applied different comfort margins to the above base criteria to determine project action levels for the gasses of interest. Action levels developed often include minor and major alarm levels. The former is a “warning” level (begin ventilation operation – system remains in use) and the latter is an “evacuation” level (full ventilation operation and system evacuation).

The ventilation design should be coordinated with the gas detection and alarm system type and the activation levels selected. The design should consider two general conditions: ongoing or periodic ventilation requirements to meet expected average gas ingress rates, and reaction to potential abrupt increases in gas ingress, such as might result from future construction, climate events or seismic activity.

The air velocities and airflows have to satisfy two objectives.

1. The air velocity has to be sufficiently high to avoid pockets of gasses forming. US and UK guidelines are 0.3 m/s (60 fpm) for very smooth-walled tunnels and 0.5 m/s (100 fpm) for rough-walled tunnels providing a geometry where gas pockets might form.

2. The airflows have to achieve dilution of gas inflows through a design crack. Projects have used the flow volume provided by an average cross-section velocity of 0.75 m/sec (150 fpm) since this corresponds with B2.1.4.1. It should be noted that cracks larger than the design assumption can occur, and sufficient flexibility in the ventilation system capacity and response should be included.

New first entry to G.2:


New ??? entry to G.2:

[find and insert reference to US Bureau of Mines report ] (Note: Report note received at NFPA)k

Substantiation: Current language mentions system maintenance activities only in passing, and omits other non-fire ventilation requirements, particularly those related to gassy ground. Changes are required to clarify these other important roles for tunnel and station ventilation systems.

Revise the egress calculations in Annex C to be consistent with the Standard. Although additional corrections may be required based upon further changes to the document, the following items should be addressed:

1. The 48 inch service gates are shown as having a capacity of 100 ppm. However, Paragraph 5.5.6.3.4.2 limits the capacity of single leaf doors and gates to 60 ppm. The drawings indicate a single leaf gate. It should be noted that a separate proposal has been submitted to revise Paragraph 5.5.6.3.4.2.

2. Table C.1.3 shows the capacity of a 48 inch service gate as 100 ppm while Table C.1.4 shows the capacity as 99 ppm. The values should be consistent.

3. Table C.1.4 uses capacity factors and travel speed for stairs and escalators that are different from Table C.1.3 and Paragraph 5.5.6.3.2.3.

4. Although Paragraph 5.5.6.3.1.5 permits the use of an increased travel speed for concourses, the increased value is not used. I admit that this is a permissive provision but since there is a queue associated with getting people to the concourse level it would seem as if the pedestrian density on the concourse level would be less than the platform level.


Revised text to read as follows:

G.1.2.4 ASTM Publications.

American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

This proposal updates ASTM standards to the most recent editions.

Katherine Fagerlund, Sereca Fire Consulting Ltd.

Delete the following reference:


This methodology addressed in this publication is out of date—i.e., it refers to the exit lane concept in the 1997 edition of NFPA 130, whereas that concept was replaced in the 2000 edition by the calculation of exit width based on incremental width.

This is not original material; its reference/source is as follows:
Submitted on behalf of NFPA 130 Task Group 2 - Emergency Exiting