V. DEVELOPMENT OF STANDARD

Basis for Previous Standards

The accepted consensus standard on the subject of emergency egress is the Life Safety Code, National Fire Protection Association Pamphlet No. 101. Its origin dates back to 1913 when the Committee on Safety to Life of the National Fire Protection Association (NFPA) was appointed as is stated on page 101-V. [27] During its early years, the committee devoted its attention to a study of historic fires involving loss of life and analysis of the causes of loss of life. This work led to the preparation of standards for the construction of stairways and fire escapes for fire drills in various occupancies, and for the construction and arrangement of exit facilities for factories, schools, and other buildings. These standards form the basis of the present Life Safety Code.

Early committee work resulted in the development of a series of pamphlets on egress and life safety, which were later consolidated into a comprehensive guide known as the Building Exits Code, first published in 1927. In 1942, the Coconut Grove Night Club fire in Boston focused public attention on the importance of adequate exits and related fire safety features. This interest was further stimulated by a series of hotel fires in 1946. The Building Exits Code was thereafter increasingly used for regulatory purposes. However, because the code contained many advisory provisions, the committee reedited the entire document, limiting the body of the text to requirements suitable for mandatory application.

In 1963, the Safety to Life Committee was reorganized and subsequently prepared the 1966 edition of the code. At that point, the
title of the code was changed to the Code for Life Safety from Fire in Buildings and Structures.

As stated in section 1-2, paragraph 1-2111, of the Code, the purpose of the present Life Safety Code [27] is to specify measures which will provide that degree of public safety from fire which can be reasonably required. The code covers construction, protection, and occupancy features to minimize danger to life from fire, smoke, fumes, or panic before buildings are vacated. It specifies the number, size, and arrangement of exit facilities sufficient to permit prompt escape from buildings or structures in case of fire or other condition dangerous to life as is stated in section 1-3. [27]

The present Life Safety Code was designed to make it adoptable by municipalities to serve as a legal basis for requiring construction of buildings with concern for the life safety of the occupants. It is a comprehensive effort to develop a universal set of regulations. For that reason, and since many lack the capabilities to develop one of their own, or evaluate other municipalities' life safety regulations, many have adopted the code, or portions thereof.

The code outlines the general egress requirements for industrial occupancies. Although the major thrust of these requirements is directed toward egress from occupied buildings, it also outlines egress requirements for open industrial structures. Examples of such structures are those found in oil refining and chemical processing plants where equipment is in the open, and platforms, sometimes with roofs or canopies to provide shelter, but with no walls, are used for necessary access.
It is within this classification of open industrial structures that the emergency high egress hazard is greatest.

The American National Standards Institute (ANSI) has not developed a comprehensive consensus standard dealing with emergency egress from high workplaces. The chairman of the committees producing three ANSI standards which might have been expected to be concerned with worker egress from high places assessed the system by which ANSI develops safety standards. He stated that one weakness in the system is the absence of meaningful statistics to point out the need for standards in highly specialized areas such as worker egress from high places. (R Moore, written communication, November 1973)

However, some ANSI consensus standards have alluded to the problem of egress from high locations under emergency conditions. [28-30] Because the subject is treated in a cursory manner within the standards, the basis for the consideration of the subject has not been discernible.

The State of California Construction Safety Orders contain several standards dealing with the problem of emergency egress. [59,60] They require the use of an approved descent control device in combination with a lifeline and safety belt by employees using boatswains chairs and workers performing scaling and drilling operations on steep slopes. When adopting these requirements, California established a height of 15 feet or one story as the point above which workers must use the devices specified. The decision to specify 15 feet was arrived at through professional judgment on the part of those responsible for drafting the standard. (H Crabtree, oral communication, February 1974) Because the standard was ultimately adopted, it can be inferred there was no substantial public comment against this decision.

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An auxiliary means of escape is required by the California Petroleum Safety Orders [61] covering drilling and production operations on derricks and masts. The hazards involved in these operations, when workmen are in the derrick above the wellhead, are blowouts and fires. The use of slide cables as an auxiliary device was effective in a number of instances. (G Bunker, written communication, January 1974)

The basic OSHA guideline on the subject of worker egress is Subpart E of the General Industry Standards. It is based on NFPA Life Safety Code No. 101. Subpart E established necessary features of building construction, arrangement, and equipment to facilitate safe egress in the event of fire or other emergency.

The subject of worker egress is treated in additional OSHA General Industry Standards. These include a requirement for an emergency electrical operating device on roof powered platforms which will permit lowering of workers stranded on platforms if the normal operation device should fail. Another provides for emergency operation of the main drive machine by manual cranking to permit lowering of the workers. Additionally, emergency communications equipment must be provided for each powered platform to provide communications between persons on the disabled platform and those operating the emergency lowering device. Another requirement, in 29 CFR 1910.261, Subpart R, is for at least one unobstructed exit on each floor at each end of a digester building.
In summary, worker egress from elevated workstations has been subordinated in importance by the standards-producing and standards-adopting agencies. The need for definitive standards on the subject has not been demonstrated by the amassing and analysis of relevant statistics. Specific language relating to the subject has, in some cases, been dropped during the standards-adopting process because of the technical nature of the requirements, their economic impact, or their potential for generating negative reaction on the part of factions within the labor/management arena.

When the subject has been included in consensus standards, it has been treated as an adjunct to the general concern of the standard, i.e., to ensure that the worker is adequately protected against mechanical hazards.

**Basis for Recommended Standard**

The recommended standard is intended to provide all workers whose workstation requires their presence on an occasional, periodic, or daily basis, at a height of 15 feet or more above grade level, with a means of egress that considers three of the following hazard elements included in the Life Safety Code of the National Fire Protection Association [27] section 2-1, paragraph 2-113:

1. Height of the workstation.
2. Hazards associated with the occupancy of the work process.
3. Number of persons exposed.

This recommended standard applies to all elevated workstations 15 feet or more above grade level except in high hazard situations. Lacking any definitive statistics or results of studies, professional judgment
any definitive statistics or results of studies, professional judgment indicates that 15 feet above grade level be established as the lower limit for the standard proposed. In one instance, [62] this height was included in a safety standard concerned with worker occupancy of elevated workstations.

A study conducted for the city of Chicago [63] included the concept of recognizing the different evacuation and rescue procedures associated with emergencies in buildings having occupancies at varying heights. This concept is valuable in recognizing the egress needs of persons working at different levels and ensuring that the additional needs will be met.

Therefore, in the proposed standard, additional requirements are recommended for workstations above 80 feet in height. These are recommended because conventional firefighting ladder equipment cannot reach above 80 feet to provide a means of egress. [63] Furthermore, with high machinery and structures in industry, it is reasonable to assume that fewer means of egress are available as the height of the workstation increases.

Requirements for meeting more stringent medical qualifications have been included in the standard for those who work at heights of 80 feet or more above grade level, because they must rely more heavily on their physical, mental, and sensory attributes when using a means of egress from an elevated workstation under emergency conditions.

In their Life Safety Code, [27] section 4-2, paragraph 4-212, the NFPA recognized that different types of occupancies exhibit varying degrees of potential for fire. Similarly, the need for egress can be related to the hazards associated with the work process or type of facility and equipment. Therefore, the proposed standard includes, as has the Life
Safety Code, [27] paragraph 4-213, more extensive requirements for those workplaces where there may be a greater propensity for emergencies.

In consideration of the comparative speed of egress when using ramps, stairs, horizontal exits, and ladders, it seems reasonable to require the lowest ratio of workers to unit exits for ladders and the highest ratio to horizontal exits. Results from studies to validate the specific ratios selected are not available; these ratios were previously recommended by NFPA [27] and on review, professional judgment indicates that they are reasonable and should be required. The standard recommends provisions for dual egress from elevated workstations 15 or more feet above grade or floor level with a designed occupancy load of 10 or more workers. This is judged sufficient to permit a prompt evacuation of the site during emergency egress.

It is obvious that the need for egress facilities from elevated workstations is affected by the number of persons who must use those facilities in time of emergency. For standard egress facilities, therefore, the proposed standard requires evacuation capacity (expressed in units of exit width) based on the greatest number of people who would necessarily avail themselves of the means of egress during an emergency. The number of persons upon which the evacuation capacities are based were originally established by the NFPA and are the requirements of the Life Safety Code [27] as stated in section 5-1, paragraphs 5-115/5-116 and section 14-2, paragraph 14-213. A unit of exit width is defined as 22 inches as a sufficient representation for emergency egress purposes of the width of a worker. This unit is used by the NFPA in their code and is judged to be a reasonable value despite the fact that it will not be a
comfortable width for some workers.

During the development of the proposed standard no data were found which indicated a definite quantitative relationship between the effects of the lack of emergency egress and the need for it. Therefore, a conservative approach has been taken to provide increased protection for workers who are exposed to the hazard associated with the need for emergency egress from elevated workstations.
VI. REFERENCES


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60. California Construction Safety Orders, California Administrative Code, Title 8, Art 5, Section 1538

61. Petroleum Safety Orders--Drilling and Production, California Division of Industrial Safety, Title 8, Section 6573, 4

62. California Construction Safety Orders, California Administrative Code, Title 8, Section 1670

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VII. TABLE

NUMBER OF WORKERS HAVING POSSIBLE NEED FOR EMERGENCY MEANS OF EGRESS FROM HEIGHTS IN EXCESS OF 15 FEET*

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickmasons and stonemasons</td>
<td>139,967</td>
</tr>
<tr>
<td>Carpenters</td>
<td>631,460</td>
</tr>
<tr>
<td>Carpenters' helpers</td>
<td>34,799</td>
</tr>
<tr>
<td>Cement and concrete finishers</td>
<td>60,856</td>
</tr>
<tr>
<td>Construction laborers</td>
<td>484,199</td>
</tr>
<tr>
<td>Cranemen, derrickmen, and hoistmen</td>
<td>74,958</td>
</tr>
<tr>
<td>Drillers, earth</td>
<td>14,648</td>
</tr>
<tr>
<td>Electricians</td>
<td>233,619</td>
</tr>
<tr>
<td>Heavy equipment mechanics</td>
<td>50,971</td>
</tr>
<tr>
<td>Mixing operatives</td>
<td>3,438</td>
</tr>
<tr>
<td>Oilers and greasers</td>
<td>5,121</td>
</tr>
<tr>
<td>Painters</td>
<td>209,551</td>
</tr>
<tr>
<td>Plumbers and pipefitters</td>
<td>243,293</td>
</tr>
<tr>
<td>Roofers and slaters</td>
<td>58,007</td>
</tr>
<tr>
<td>Structural metal craftsmen</td>
<td>2,966</td>
</tr>
<tr>
<td>Structural metal workers</td>
<td>49,175</td>
</tr>
<tr>
<td>Tile setters</td>
<td>23,943</td>
</tr>
<tr>
<td>Welders and flame cutters</td>
<td>63,438</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,384,409</strong></td>
</tr>
</tbody>
</table>

*Limited to the following SIC major groups:
Crude petroleum and natural gas extraction, construction, chemicals and allied products, petroleum refining, metal industries (includes blast furnaces, steel works, rolling and finishing mills, other primary iron and steel industries, primary aluminum industries, other primary nonferrous industries).

Taken from 1970 Census data [1]