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FIRE PROTECTION HISTORY-PART 90: 1914 (THE REPORT OF COMMITTEE ON SAFETY TO LIFE)

By Richard Schulte

The eighteenth Annual Meeting of the National Fire Protection Association was held in Chicago in May 1914. Presentations at this meeting included presentation of the first report of the Committee on Safety to Life. The following is the Report of the Committee on Safety to Life presented at this meeting:

"***REPORT OF COMMITTEE ON SAFETY TO LIFE.***
H. W. Forster, Chairman.

David S. Beyer, Lewis T. Bryant, F. E. Cabot, R. W. Campbell, W. J. Canada, Henry B. Cross, R. O. Dawson, Carl M. Hansen, L. H. Kunhardt, R. H. Newbern, William Newell, Robert Palm, E. B. Tolsted, James White.

The National Fire Protection Association was organized "To promote the science and improve the methods of fire protection and fire prevention, to obtain and circulate information on these subjects, and to secure the co-operation of its members in establishing proper safeguards against loss of life and property by fire."

Our Constitution, therefore, for a period of almost twenty years has placed the safety of life ahead of that of property. Our Executive Committee, however, recognizing the particular importance which the subject of safety to life now occupies in the public mind, and believing that our Association could improve its efficiency by devoting particular attention to certain phases of this subject, voted on June 28, 1913, to create a Committee on Safety to Life, and unanimously passed the following resolutions: –

"It is voted to appoint a Committee on Safety to Life empowered

1. *To consider advisable modifications of our existing standards in order to provide for safety to life.*
2. *To consider additional standards on safety to life with particular reference to exit facilities and housekeeping methods.*

3. *To consider co-operation, respecting accidents through fire, with existing bodies organized to study industrial or other accident prevention.*

4. *To recommend for adoption by the Executive Committee a definite statement of the field of the Committee's investigation and activities."*

It will be apparent that the Executive Committee has given your new Committee much leeway as to its operations, and by that act placed serious responsibilities upon it.

Our Association has been fortunate in securing for service upon this Committee the following men :-

Mr. David S. Beyer, Manager, Accident Prevention Department, Massachusetts Employees Insurance Association.

Col. Lewis T. Bryant, Commissioner of Labor of New Jersey.

Mr. F. E. Cabot, Secretary, Boston Board of Fire Underwriters.

Mr. R. W. Campbell, President of the National Council for Industrial Safety.

Mr. W. J. Canada, Associate Physicist, Bureau of Standards, United States.

Mr. Henry B. Cross, Secretary, General Fire Extinguisher Company.

Mr. R. O. Dawson, Superintendent of Fire Records, National Fire Protection Association.

Mr. Carl N. Hansen, Secretary, Department of Accident Prevention Inspection and Merit Classification of the Workmen's Compensation Service Bureau.

Mr. L. H. Kunhardt, Vice President and Engineer, Boston Manufacturers Mutual Fire Insurance Company.

Mr. R. H. Newbern, Superintendent of Insurance, Pennsylvania Railroad Company.

Mr. William Newell, Mechanical Engineer, Bureau of Factory Inspection, State of New York.

Mr. Robert Palm, Fire Protection Engineer, American Sugar Refining Company.

Mr. E. B. Tolsted, Department Engineer, in charge of Accident Prevention, Independence Inspection Bureau, Philadelphia.

Mr. James White, Assistant Chairman and Deputy Head, Canadian Conservation Commission.

Practically every known phase of interest in accident prevention is represented by this Committee.

Acting on item No. 4 of the above authorization from our Executive Committee, this Committee at its first meeting on November 6, 1913, decided that for some time to come its activities had best be restricted to those phases of the safety to life problem which are identified with fire prevention and fire protection, and that it would take up for immediate work the following items :--

1. *Reviewing existing N. F. P. A. Standards, and pointing out possible improvements from the standpoint of safety.*

2. *Provision of standards covering various methods of egress, taking up first the engineering features connected with such standards.*

3. *Presentation of the advantages of automatic sprinkler protection from the standpoint of safety to life.*

During the winter and spring your Committee has been actively at work, has held a second well attended meeting, carried on extensive correspondence, and numerous conferences between groups of members of the Committee have also been held. The following report is submitted :-

Mr. Forster: I might say in this connection that the first thing we really did was to make a report on the Binghamton Clothing Company fire, which report was printed by the Association and circulated widely over the country. It is rather strange to think that of all the reports of that disaster it seems to be the only one that laid emphasis on the fact that the sprinkler had proved valuable as a life saver.

(Reads.)

REVIEW OF STANDARDS.

Up to the present time your Committee has reviewed and agreed upon suggestions as to possible methods of improving our existing rules devoted to the following subjects: –

National Electrical Code.
Fire Pumps.
Gravity Tanks.
Railway Car Houses.
Rubber Lined Hose.
Signaling Systems.

A number of other rules have been reviewed; but report has not yet been made to the Chairman of the various committees in charge.

Upon some of our rules, it is not believed that any specific suggestions can be made.

Attention is called to the fact that your Committee has no authority with regard to changes in standards already in existence, its function being purely to advise, and to assist in putting forward the important cause of safety to life.

EGRESS.

A little later, in the body of this report, will be found a detailed discussion of various forms of egress, together with a preliminary specification for outside types of fire escapes. In presenting this section of the report, your Committee has felt that it might be well to have on record, in concentrated form, information which is scattered through our records.

Your Committee has been particularly impressed, upon studying State and City Ordinances, to find that, with a very few exceptions, existing laws are exceedingly deficient in this very important matter of egress. A number of states report frankly that they have no real legislation upon the subject, many City Ordinances are of the most indefinite character, and in some the matter is simply left to the discretion of fire department or other officials.

Your Committee feels that this particular section of its report should be printed and distributed widely throughout the country, to act as a source of information and for the purpose of bringing forth comments and criticism.

SPRINKLERS AS LIFE SAVERS.

Following the detailed egress report will be read the conclusions which your Committee has reached after carefully considering this important subject.

In view of the unquestioned value of sprinklers as safeguards of life, and because this is not generally recognized especially by those who most need to be convinced of it, your Committee feels that this section of the report should, providing it receives the approval of this Association, be given the widest publicity. A statement, such as this, going forth with the stamp of the approval of the National Fire Protection Association, will undoubtedly have a beneficial effect, and be recognized as unprejudiced evidence.

COMBUSTIBLE GUARDS.

[TEXT OMITTED]

STATISTICS REGARDING INJURIES AND DEATH.

In the past our Association report blanks have not called for information upon loss of life or injuries resulting from fires, and it is hoped that the members hereafter will furnish liberally information of this character. Fairly accurate reports are generally obtainable of the serious disasters in which many lives have been lost, but the total number of deaths and injuries in this country is raised to considerable figures, not by these disasters of which everybody knows, but through numerous fires, in each of which comparatively few people are injured or killed.

Members of this Association are requested to report losses of life and injuries by fire even when report is not made to the Association upon other aspects of such fires.

CO-OPERATION WITH OTHER INTERESTS.

Your Committee feels that a very important part of its duty is to keep in close touch with other interests at work upon safety to life problems, in order that there may be harmony in the conclusions reached, and in order that duplication of effort may be avoided.

It was with this thought in mind that the National Fire Protection Association invited the representatives of the National Council for Industrial Safety, the Workmen's Compensation Service Bureau and the Bureau of Standards, U. S., to accept membership upon this committee. These organizations all have national influence upon this movement, and various other members representing state and insurance organizations wield great influence within more restricted zone.

Mr. Forster: We have attempted to get all the different lines of activity having a bearing upon safety to life represented upon this one committee of a dozen or fifteen members, and we have been fortunate in the fact that the men who were most desired and whose interests were most affected have gladly accepted.

Now, Mr. President, the committee has here a rather voluminous report, a dozen pages of typewritten matter covering the section on Egress, and I somewhat hesitate to inflict this upon this meeting. Perhaps if I read first the introductory portion we may agree to read the report itself by title and print it in the proceedings, it being a preliminary report only.

(Reads.)

SECTION ON EGRESS.

All of the work which the National Fire Protection Association has done for controlling fire hazards, influencing building construction, increasing the degree of fire protection, and improving alarm apparatus has a direct effect on safeguarding life against fire. The best constructed and protected building, however, requires adequate exits in case of fire, and the average structure, hardly excepting even dwellings, is distinctly deficient in this regard. The Iroquois, Collinwood, Newark, Asche Building, Binghamton, Arcadia Lodging House and Missouri Athletic Club disasters, in which over 1,000 lives were lost, all demonstrated that with fireproof, plank and timber, or joisted construction, the exits were inadequate.

Your Committee in studying this Egress problem came to the conclusion that it logically divided itself into two portions, the one dealing with the determination of what constituted safe means of egress, and the other apportioning the exits to the number of persons in the structure. As a case in point, a smokeproof tower is admittedly excellent, but a single tower could not answer for 2,000 persons.

A review of the N.F.P.A. records having bearing upon this particular problem indicated the following: –

1. *The April, 1911 Quarterly carried a brief and forceful statement regarding the inadequacy of the ordinary outside fire escape, and pictured the various types of smoke-proof towers advocated by New York City.*

2. *The Committee on Theatre Construction and Equipment reported in 1911 in considerable detail, and discussed types and capacity of exits for such structures.*

3. *The Committee on Fire-resistive Construction at the 1913 meeting presented a splendid set of specifications for the construction of a standard building. Egress received detailed attention,—specifications for smoke-proof towers, for stairs, for horizontal exits, and for the capacity of vertical and horizontal exits were included.*

4. *Very valuable material regarding fire drills appears in our proceedings.*

Your Committee presents herein a preliminary report for your consideration, in which it refers briefly to the various types of exits of which it knows, and in which it presents in some detail specifications for outside fire escapes or outside stairs, as they are occasionally called.

The various means of egress designed especially for use in case of fire, more or less used, and approximately in the order of their excellence are as follows:

Horizontal exits.
Smoke-proof towers.
Cut-off stair shafts.
Interior stairs.
Elevators.
Exterior fire escapes or stairways.
Individual fire escapes.
Spiral chutes.
Poles.

In presenting this list it is not the intention to convey the impression that all buildings require special exit facilities in order to insure the safety of the occupants.

The following comments are suggestions are offered:--

Horizontal Exits.

Obviously, the most rapid method of moving people out of a given area is by means of horizontal exits, such as openings in fire walls or in fire-resistive partitions, or by means of balconies or bridges to other buildings.

The Committee on Fire-resistive Construction specifies the following: –

a. *Openings in fire walls not to exceed 48 square feet.*

Mr. Forster: I believe that size is to be increased.

b. *Self-closing door to be substituted for one of the automatic doors generally specified on both sides of fire wall openings.*

Mr. Forster: This means, for example, one swinging door with check or counter weight and one gravity closing sliding door.

(Reads.)

c. *At least 22 inches of width to be provided for every 50 persons who can use horizontal exits.*

Mr. Forster: The average man being estimated to be 22 inches wide.

(Reads.)

d. *Either of the two connecting areas to contain the joint capacity of both sections upon a basis of at least 5 square feet floor space provided per person.*

e. *Each area to have at least one stair exit of the smoke-proof tower or enclosed staircase type.*

These provisions are good and reasonable in connection with the construction of new buildings, obviously advisable in the case of many existing structures, but, unfortunately, this form of protection is not yet being provided to any appreciable extent throughout the country.

Your Committee calls attention to the somewhat fallacious view held rather commonly to the effect that a horizontal exit is a panacea for all ills. There must be adequate facilities for moving persons downward as soon as they have passed through a horizontal exit, both because fire may spread to floors below them, and because of panic possibilities. In a building with a division wall but with unprotected floor openings, a single fire door not closed or failing to close automatically, could jeopardize life almost as seriously as if no horizontal exit existed.

Smoke-proof Towers.

This form of exit offers the safest medium for moving people downward in a building, but it is only an enclosed stair with a definite capacity if the time factor enters. In a fire-resistive building with floors effectively cut off, a single stair tower, with well-drilled persons using it, can accommodate a large number of people, but if persons pour into it from several floors at a time, its capacity is much reduced as regard any one floor.

In planning adequate exits for a strictly fire-proof building, it may be safe to arrange for a reasonable period of time in which the building can be emptied, but with a poorly constructed building, this would be dangerous.

The Committee on Fire-resistive Construction has prepared specifications for smoke-proof towers and also for stairways, which specifications can properly apply to stairs no matter where located.

The 1913 laws of the New York State Department of Labor, which as regards fundamentals appear to agree entirely with the requirements of our Committee, base the required exits upon the number of occupants of the building, or, as it usually works out in existing buildings, limit the occupants to the existing exits. This obviously is the only properly way to attack the problem.

Mr. Forster: I do not believe that is the only way in which to attack such a problem. It would be quite a while before fire statues could widely be put into effect in this country.

(Reads.)

The following material is extracted from the State Law.

a. *For buildings erected in the future, a minimum of 22 inches of stair width shall be required for not to exceed 14 persons on any one floor.*

b. *On buildings already erected this figure is reduced to 18 inches as a minimum.*

c. *A 44-inch stair in new buildings permits 28 persons to be housed on each floor above the first one.*

d. *In arriving at this decision the idea has been that all of the persons on all floors shall be able to remain in the stair tower without any movement, a person requiring about 22 inches in width and one person to stand on every other stair. With ordinary story heights, and making use of landings, about 14 can be accommodated between floors. For each 16 inches of added floor height, one additional person is allowed. Winders reduce the capacity 10 percent, which for some types of winders is undoubtedly too small a reduction.*

e. *Where fire-resistive enclosures are provided for stairs, landings and hallways, increased capacity is allowed at the rate of one person for each 5 square feet of enclosed hallway space.*

f. *Where there are horizontal exits, the 5 square feet per person rule applies to the area into which person might move.*

g. *Automatic sprinkler protection raises the number of persons allowed 50 per cent.*

Commenting upon the principle of permitting a certain number of persons for each of the various exits, attention is called to the fact that if a single stair, for example, should be impassable owing to smoke or flame, more person than the other exits can accommodate, in accordance with the above reasoning, will have to use them. Your Committee does not feel that this is a serious weakness, assuming that stairs and other floor openings are so enclosed or so located as to avoid being cut off by fire or smoke and thereby give people a reasonable opportunity to use those means of egress which are available.

Stairs at least 44 inches wide are specified for new buildings, this width being reported sufficient to prevent three persons from forming an arch and blocking traffic.

The N.F.P.A. specifications for stairs are excellent, except that no limits for the rise and tread are given. The New York State ones are minimum tread 10 inches, exclusive of nosings, and maximum rise of 7-3/4 inches. These are good.

In the N.F.P.A. rules no stress is placed on the importance of carrying stairs to roof. This is a matter of real moment, as was proved in the Asche Building fire, where persons from the top floor escaped to roof, and many lives undoubtedly were saved as a result.

Cut-off Stair Shafts.

By this designation your Committee refers to brick, stone or concrete shafts of the type used in mill constructed buildings, and cut off at each floor with fire doors.

The form of enclosure for stairs, elevators and other shafts recommended by the Committee on Fire-resistive Construction is adequate.

Doors swinging with travel are specified for smoke-proof towers, but these are not always necessarily best for stair shafts connecting with various floors, unless doors are kept normally closed. This is frequently possible in high buildings where there is little use of stairs. Swinging doors are not easily made self-closing, and may interfere with travel down the stairs unless landings are wide. Your Committee, therefore, feels that a sliding, gravity closing, automatic door is also acceptable in many locations, and probably the Committee on Fire-resistive Construction had this in mind when it specified "approved self-closing doors."

Details of stair construction, lighting and ventilation specified for smokeproof shafts will apply here also

Interior Stairs.

The features covered in the preceding section will apply to a considerable extent also to this means of exit.

Particular attention is called to the inefficiency from the standpoint of safe egress of the type of stair enclosure pictured in the Uniform Requirement rules, where an enclosure with door is built around each stair section, and persons descending must actually enter each story. There should be a continuous shaft from the level of the lowest floor to, and preferably through, the roof, even if this shaft is not a good fire cut-off. An enclosure that will resist fire for from 10 to 15 minutes will undoubtedly enable all persons to escape."

Your Committee recommends against the use of combustible material for enclosures of this character, although recognizing that splined plank or double matched boards have considerable fire-resisting power.

Mr. Forster: There has been a good deal of discussion during the year on standards for buildings. Two planks or matched boards equal to a double floor have good fire-stopping possibilities, as we know. But there is a real question whether we should go on record recommending a better enclosure for stairs. The records of stair injury loss are probably the best arguments.

(Reads.)

Elevators.

The speed with which fire and smoke will spread up unenclosed elevator shafts is well known, and an elevator shaft of this character cannot be relied upon to afford means of egress.

On the other hand, elevator shafts properly enclosed and with openings adequately protected have decided value from an escape standpoint, and are absolutely necessary in high buildings. It may not be out of order to call attention for a moment to the loss of life possibilities in many modern so-called fireproof buildings. Literally, thousands of persons are in the structures above the ground floor, stair capacities are distinctly limited, stairs and elevators are unenclosed, and a fire in lower stories spreading with unexpected speed could result in loss of life which would stagger the civilized world. It is to be fervently hoped that such a disaster will never occur, but if it comes it will make the Iroquois Theatre fire look like a very trivial performance. There are very few people that would think it possible that 600 persons could lose their lives right here in this city in a fireproof theatre where no person was no more than 50 feet from the ground. You take a three or four hundred foot office building with five or six thousand people in it, and you see in a moment potentiality of disaster.

Your Committee emphatically recommends the enclosure of elevator shafts, both from the standpoint of making it possible to operate cars, and from that of protecting against upward spread of fire and smoke.

Attention is called to the fact that the fire-resisting powers of many of the elevator doors and the wired glass panels insecurely held in them are decidedly limited, and it only takes the failure of a single door to make an elevator fill with smoke.

Particular attention needs to be paid to insuring the integrity of the electric current or other powers applied to elevators, against any small fires in the neighborhood which might cripple the elevator service.

There is need of drilling elevator operators as to method of procedure in case of fire, the fundamental principle unquestionably being that persons in the upper stories of the building shall first be taken to the ground, and that no persons below the fire shall be carried on elevators as long as any above remain in the building.

Outside Fire Escapes.

Mr. Forster: I think Secretary Wentworth will admit that I feel strongly upon the question of the efficiency of the outside fire escape. This subject has been considered fully on account of these disasters which are fresh in the minds of the members who are interested in this movement. Now, your Committee raises this broad question, namely, whether we should go on record as recognizing the outside fire escape as a means of egress, or whether we should attack it and absolutely condemn it. It is my opinion, and it is that of many of our members with whom I have discussed this thing with earnestness, that the question of the value of the outside fire escape is one of the most important connected with the subject of egress. We should prepare a set of specifications which will cover a design useful for fire escapes, to be used in the future, provided that there are no more desirable means of egress.

The committee, while of the opinion that specifications for fire escapes of this sort are desirable, feels that a comparatively low limit should be fixed as to the number of stories of height.

Another idea in the minds of your Committee was that the escapes are to be shielded against fire where there is access of fire to the escapes, calling particular attention to the fact that in office buildings, hotels, clubs, dwelling houses and dormitories it is very difficult to get people to go into the halls, which are the first sections of the building to be filled with fire and smoke. Another thing is covered, namely, broad stairs and solid balconies, so that they may act as a shield against fire and smoke that may come up from below. When you get down to the last level you do not want to be confronted with one of those dangers in the form of a ladder to slide down and be injured possibly by people behind you. You want to have things planned so that it swings down without interference from above, and if you can have a permanent section for the ground, by all means get it. In other words, you want a proper fire escape, properly designed, and your buildings protected so as to afford the easiest and safest means to escape from them.

Your Committee has taken up these things item by item and specification by specification, and this report will go into the proceedings. The Committee recommends that these specifications be given a wide publicity, with opportunity for discussion, and that criticism and comment be fired back at the Committee in order that we may next year present a set of specifications which will be reasonably plain, and which we are willing to see incorporated into the laws of the country.

Reference is made in our specifications also to the individual type of fire escape as a means of exit from office buildings, hotels, lodging houses, dormitories, apartment houses, etc., where it is impossible, from the nature of the structure, to have every room opening upon a fire escape, and your Committee has outlined some suggestions covering that phase of the subject.

(Reads.)

On page 471 of the April, 1911, Quarterly appears the following:--

> *"It has long been recognized that the common outside form of iron ladder-like stairway anchored to the side of the building is a pitiful delusion. This device for a quarter of a century has contributed the principal element of tragedy to all fires where panic resulted. Passing successively the window openings of each floor, tongues of flame issuing from the window of any one floor cut off the descent of all on floors above it. Iron is quickly heated and is a good conductor of heat, and expansion of the bolts, stays and fastenings soon pulls the framework loose, so that the weight of a single body may precipitate it into the street or alley. Many a human being has grasped the hot rail of such a ' fire escape,' only to release it with a scream and leap from it in agony. Its platforms are usually pitifully small, and a rush to them from several floors at once jams and chokes them hopelessly. It is a makeshift creation of the cupidity of landlords, frequently rendered still more useless by the ignorance of tenants, covered up with milk bottles, ice boxes and other obstructions."*

This powerful arraignment unquestionably is deserved by a very large percentage of the outside fire escapes in use to-day. The following common defects exist on many: –

a. *Inaccessible to many portions of buildings, except by going into the halls, which may be impassable owing to flames and smoke.*

b. *Unshielded against fire in lower stories.*

c. *Poor design, especially as regards steepness and lack of width.*

d. *Poor supports. Expansion bolts and even lag screws in wooden plugs have been used to support fire escapes.*

e. *Absence of any form of ladder or stair from the second floor to the ground, or complicated and inefficient arrangement of vertical drop ladders.*

f. *Poor condition. Fire escapes are generally regarded as a necessary evil, and receive very little attention.*

g. *Ice and snow covering.*

h. *Used for storage.*

Admitting that all these defects have existed and do to-day, and that a fire escape on a building is usually an admission that life is not safe in it, the fact remains that the outside fire escape is the commonest special provision for escape, that it is written into the Statute books of the states, will long remain with us, that this Association should determine upon proper specifications for such escapes, and use its influence to have them adopted and enforced. With this in mind, your Committee has gathered data regarding the regulations of many states and most of the important cities in the United States, studied many of these in detail, tabulated the essential facts, and concluded that escapes built and located as hereinafter specified will greatly further the safety to life in our, on the whole, poorly constructed and poorly protected buildings.

Your Committee submits this data for your consideration, and the suggestion that this preliminary specification be sent broadcast for review and for criticism. At the 1915 meeting a revised specification can probably be submitted for formal approval of the Association.

Types of Escapes.

These specifications cover outside escapes, either attached to buildings or erected independently of the building, but connected with it by bridges. The forms in common use are:--

a. *Stairs in vertical tiers, or in some other superimposed form.*

b. *Straight run stairs.*

c. *Vertical ladders.*

d. *Bridges around fire walls.*

Easy slope runways are occasionally used in hospitals and similar institutions, and are good if the pitch is moderate. A limit of 2[-]½ inches in 12 inches is advised.

Vertical or practically vertical ladders are deemed inadvisable for use in practically all cases.

Type "A" is probably most commonly used, and generally is believed to be the best. Straight run stairs are not feasible where the exits must be approximately in a vertical line, and some objection has also been made to excessive speed which might be developed in running down such stairs.

The following detailed specifications shall apply in so far as possible to all of the above types of escapes or any other forms which may be erected.

Location of Escapes.

Stairs shall be entirely shielded by blank walls, and access from wall openings to escape stairs shall be by horizontal balconies.

Or stairs shall, in all stories, be shielded by approved stationary metal frame windows glazed with wired glass, and balconies should extend in one or both directions to openings protected with approved fire doors or wired glass windows.

Or, where windows cannot be stationary on account of ventilation requirements or for other reasons, stairs shall, if possible, be shielded by metal frame wired glass windows, the upper halves of which shall be pivoted and automatic closing, the balance of the protection to be the same as in previous paragraphs.

Or, stairs shall be built at least 20 feet away from building, and reached by horizontal bridges.

Extent of protected zone on both sides of stairs shall be not less than 12 feet in any case, shall be one third of the height of the building from the first floor line to the roof, and need not exceed 25 feet.

Wing walls projecting 2 feet beyond outside line of balcony and stairs shall be the equivalent of protection specified above.

Access to Escapes.

Insufficient attention has been given the fact that fire escapes on office buildings, hotels, clubs, dormitories, apartments and similar structures are often difficult to reach, especially if halls are filled with fire or smoke. On an open factory floor, all persons can usually reach the exits to a fire escape, but in laying out any system of escapes, due cognizance of this principle should be taken.

Among the methods of securing improvement are : –

a. *Enclosing elevators, stairs and other floor openings.*

b. *Extending balconies to additional wall openings.*

c. *Connecting escapes to halls independent of the main ones.*

Escapes shall reach all floors above the first, shall be continuous to the ground, or terminate in a swinging stair section, and shall continue to the roof.

Unobstructed aisles, at least 6 inches wider than opening or openings to escape, shall be provided. Space in front of windows or doors to escapes shall be kept clear. No grating, bars nor other obstructions shall be placed at or over any openings to escapes.

Minimum size of wall openings to escapes, whether in form of doors or windows, shall be 30 inches wide and 78 inches high.

Doors are preferred to windows, and doors shall swing with travel and not interfere with persons using escape.

Windows, if used, shall preferably be of the casement type, or be double-hung, operating readily, and counterbalanced.

Doors shall have openings approximately flush with floor of building, sill to be not over 2 inches high. If door sill is over 12 inches from floor of building, steps 50 per cent wider than wall opening shall be provided, and shall have risers approximately 8 inches high and treads not less than 10 inches wide, exclusive of nosings.

Fire escape balcony floor shall preferably be flush with wall opening, and shall not be more than 8 inches below wall opening, and never above it.

Material and Strength.

Wrought iron or steel or concrete only shall be used, no cast metal nor wood to be employed.

No dimension of any structural member used in the construction in the escape (except of pipe used for railings) shall be less than 1/4 inch.

Balconies and stairs shall be designed to carry a load of 100 lbs. per square foot with a factor of safety of 4.

Balcony stairs shall be designed to support a concentrated load of 200 lbs. at the center with factor of safety of 4.

All supporting members for fire escape which are in tension shall pass through the wall, and be secured on opposite sides with wall plates and lock nuts, or be bent over at least three inches, or they shall be securely fastened to the steel framework of the building.

Balcony rails shall be designed to withstand a horizontal pressure of 100 lbs. per running foot of railing, and support at walls for railings shall be in manner above specified for tension members.

Balconies.

Size. Where stairs are in tiers, the length of the balcony shall equal the horizontal length of the stair runs plus at least 4 feet. On straight run stairs the balcony shall be at least 4 feet long.

The width of balcony where stairs are in tiers shall be at least 50 inches between inside of railings, and in straight run stairs shall be at least 3 feet inside of railings.

The minimum clear unobstructed width of any fire escape passageway, whether parallel to the building or at right angles to it, shall be 24 inches.

Floors shall preferably be solid, arranged to prevent slipping, and if solid shall be pitched to secure drainage. If of slatted metal construction, the distance between vertical slats shall not exceed 1 inch. Metal plates not less than 20 gauge, firmly secured underneath balconies and also under stairs, have value as a shield against heat and flame, but should be provided only as protection to existing escapes.

Railings shall be not less than 42 inches high, shall preferably be solid sheets of metal, or if of slatted or grilled construction, no space shall have a horizontal width of more than 4 inches.

Railings shall be provided for floor openings for stairs, except at head of stairs, and such railings shall be capable of resisting the same horizontal pressure specified above for outside railings.

Passage space shall be smooth and free of any projections or other obstructions.

Floor openings for stairs shall be not less than 24 inches wide, and of sufficient length to provide for at least 7 feet head room, as measured vertically from the stair perpendicularly below the edge of the opening.

Landings at the head and foot of stairs shall be at least 24 inches deep.

Stairs.

Note. – For theatres and other places of public assembly, and for schools, hospitals and similar buildings, wider stairs and balconies than specified herein will frequently be necessary. Attention is called to the 1913 specifications of the N. F. P. A . Committee on Theatres.

The pitch of stairways shall not exceed 45 degrees when stationary, and shall not exceed this pitch when swung down if of the swinging stair type.

Rise shall not exceed 9 inches.

Treads shall not be less than 9 inches exclusive of nosings.

Treads shall be solid, and there shall be no winders.

Risers shall preferably be provided on stationary stairs, and shall be required on swinging ones.

The maximum vertical distance between platforms or landings shall not exceed 12 feet.

Minimum width of stairs between rails shall not be less than 24 inches.

Rails shall be provided on both sides of stairs, and have height not less than 42 inches, as measured vertically from the centre of stair treads.

Stairway with proper railing protection shall be extended to roof.

Where possible, stairways shall be built permanently to the ground, and this shall be required in such buildings as schools and hospitals, where escapes do not terminate over streets, alleys or private driveways. At all other points fire escapes shall terminate in a swinging stairway, to which the following specifications shall apply :--

a. *Width of stairs and character of railing protection to be same as specified above.*

b. *If distance from lowest platform to ground exceeds 12 feet, an intermediate balcony, not more than 12 feet from ground, shall be provided and shall have size not less than 3 feet in width and not less than 4 feet in length.*

c. *Counterweight shall be provided for swinging stair, and this shall be of the type balancing about a pivot, no cables being used. Counterweights shall be securely bolted in place, except sliding ball weights or their equivalent be used to hold stairs up and to help lower them. Counter balancing should be such that a weight of 150 lbs. six feet from the pivot shall start stair downward.*

d. *Railings shall be designed to prevent any possibility of injuring persons on stairs or balconies at its head when stairs swing downward.*

Protection Under Fire Escapes.

Reference has been made above to solid floors and to sheet metal protection under balconies and stairs. This has value not only as a shield against heat and fire, but also to give persons using escape a greater sense of security.

Protection Over Escapes.

Roof or canopy over escape has value as protection against rain, snow, accumulation of ice, falling of icicles, and also to prevent dizziness on the part of persons who may be using escape.

Lights and Signs.

Red indicating lights shall be provided at all escapes in buildings which are used during the night, and shall be kept burning during the night time if building is occupied. Two independent sources of light shall preferably be provided.

Adequate signs indicating location of escapes shall be provided not only on or near windows or doors leading to escapes, but at other points of the building wherever deemed necessary.

If access to escape is through any room, doors shall preferably be arranged so that they cannot lock. If not so arranged they shall have thin glass panel and sign on this, reading, "To Fire Escape, Break Glass and Open Door," or some equivalent wording.

Care.

After being erected escapes shall be given a coat of paint.

Escapes shall be painted at least once a year thereafter.

Escapes shall be kept clear of encumbrances.

Escapes shall be promptly cleaned after snow or ice has accumulated upon them.

No obstructions such as lighting or telephone wires shall be permitted on or near escapes.

Particular attention shall be paid to possible interference by awnings or other structures over sidewalks.

Individual Escapes.

For many buildings, such as hotels, dormitories, apartment houses and dwellings, individual types of fire escapes are frequently needed, so that persons can escape from rooms without having to pass into halls leading to usual means of exit or to fire escapes. It is recognized that flames issuing from wall openings below may prevent the use of such escapes.

A rope is the simplest and least expensive form of such an escape. It has, however, questionable value. It takes strength and experience to lower one's self several stories, and ropes are practically valueless for women and, children unless they are tied around the body and some one else lowers the person in question.

A rope if used should have a diameter of about 1 inch and be firmly and permanently secured.

Rolled steel cable ladders with rigid rungs have had some use. They are better than ropes, because there is less danger of falling, but it take skill to climb such a ladder, which generally swings considerably when used. Only substantial ladders, and those which are designed to keep the rungs reasonable distance from the building wall, are advisable.

Unquestionably the best type of individual escape is one which will lower a person or persons at a uniform and moderate rate of speed without any action on the part of the occupant of the broad belt which is usually placed under the arms. Speed controlled by adjusting friction on a rope sliding through the hands is objectionable, because not easily understood, and also because bad falls may result from overspeed. Automatic speed regulation is, necessary.

As fire occasionally breaks out under the windows which would ordinarily be used by such a portable escape, it is good policy to arrange the escapes so that they can be moved to any one of several windows.

Spiral Chutes.

These have had a very limited use, being employed chiefly in connection with public schools in certain cities. It takes courage to enter such an escape and there is a real question as to whether or not the way is clear and smooth to the point of exit. For school children the use of such an escape is a lark, but for general use they are hardly advisable.

Poles.

In some plants in which an exceedingly rapid spread of fire is feared and where few men are employed, a sliding pole such as those used in fire department houses has been employed as a means of exit. Adequate platforms leading to poles are necessary, and poles must be kept in good condition. Obviously, men must be drilled in their use. A landing pad should be provided at the foot of such poles.

Mr. Forster: That completes the egress section of the subject. There only remains the portion on the automatic sprinkler as a life saver.

(Reads.)

SECTION ON THE AUTOMATIC SPRINKLER.

It is to-day an almost unquestioned fact that the automatic sprinkler affords the largest degree of protection of life against fire in practically all cases where there is combustible construction or material, the rapid burning of which is liable to be a menace to the lives of the occupants of buildings. The immense number of fires which have either been promptly extinguished or held in check by the quick operation of the automatic sprinkler definitely demonstrates this when the record is compared with similar fires starting in buildings which had no sprinkler protection and in which large loss of life has resulted, such as in the factory fires in New York City, Newark and Binghamton, the apartment house in Boston, the clubhouse in St. Louis and the Collinwood School in Cleveland.

A study of the record of 14,714 fires in the files of the National Fire Protection Association covering all kinds of properties equipped with automatic sprinklers shows us that in 63 per cent of such fires the sprinklers extinguished the fire, and in 32 per cent held it in check; so that in 95 per cent of all fires in buildings, having automatic sprinklers the action of these sprinklers prevented the fire from ever becoming serious, and consequently it did not become a menace to the people at that time in the building. Furthermore, these statistics show that of the remaining 5 per cent of fires in sprinklered buildings, which by some are classed as unsatisfactory, very few resulted in serious damage, and in these particular cases there was nearly always some lack of efficiency of the sprinklers which could have been remedied by proper supervision and by following out competent engineering advice. As a matter of fact, the records actually show that there is almost no case known where a properly put-in sprinkler system, maintained with adequate water supplies, does not do its work, provided other reasonable requirements of building construction and similar details are carried out under engineering supervision in connection with the installation of the sprinkler equipment itself.

When it is considered that in general, sprinklers have been first installed in hazardous factory buildings and that these records therefore cover largely this class of property, only one interpretation can be placed on the results, viz., that a great many lives have been saved by these fires being controlled in their incipiency before they became of sufficient size to endanger the occupants. As a matter of fact, it may be stated that thirty per cent of all fires open only one sprinkler and eighty-one per cent of all fires under sprinklers do not open more than ten heads. This shows how quickly the fires are extinguished.

Each sprinkler covers a maximum area of from 80 square feet to 100 square feet, according to conditions; therefore it will be observed that 81 per cent of the fires above noted did not spread their heat over a space greater than 1,000 square feet in area, and necessarily the actual fire is much more closely confined.

Mr. Forster: A thousand square feet is not a very large space. It is only about 32 feet square. That is, the heat spread in 81 per cent of the fires over an area less than that. In a big factory building with many lives jeopardized by fire this means that the people on other floors than that where the fire broke out, would not know anything had happened. That is a common experience in sprinkler fires.

(Reads.)

The principal condition necessary for safety to employees in case of fire is time for exit in connection with prompt notification. This is adequately provided for when exits are ample, by the slowness of a fire under sprinkler protection, and under ordinary conditions, its quick extinguishment. In view of the fact that sprinkler equipments may be provided with an alarm to indicate flow of water in the system, there can be an early warning which does not depend on discovery by an employee. It is a fact that in sprinklered factories so secure are the able bodied employees when working under sprinkler protection that they soon become accustomed readily to fighting fires, and have confidence in being able to overcome them with the auxiliary appliances provided with an average sprinkler equipment. Even where a larger number of heads have operated, so successful has been the operation of the sprinklers that the most conservative person would admit that they were instrumental in saving lives.

Two examples of a quick burning" fire here will serve to illustrate this fact: –

S-15205. "This fire started in the third floor of a five-story and basement brick building of ordinary construction. On this floor were manufactured buttons which were covered with celluloid, of which it is said a considerable quantity was stored on the premises. The entire contents of the loft were destroyed. Sixty-eight sprinkler heads operated and held the fire in check until the arrival of fire department, which extinguished the fire with hose streams. The fire department did not reach the scene of fire until fifteen minutes after discovery, owing to delay in sending in alarm, as the woman who discovered the fire (living across the street) did not understand how to operate the fire alarm box and was compelled to get the assistance of an employee on the first floor of building in which fire occurred. As far as could be learned there were about thirty-five people employed in the loft, and it was due to the operation of the sprinkler heads that no lives were lost. Several of the employees were almost overcome, but they revived by the flow of water from the sprinkler system. No one was injured."

S-15030. "This fire took place in a pyroxylin plastic (commonly called celluloid) pin factory, on the second floor of a three-story wooden building. At the time of fire three rounding machines were being operated, and the person at the middle machine 'noticed fire' at his machine. He got up to obtain a pail of water when an explosion occurred in the blower pipe, shattering connections to rounding machines on the second floor, blowing down a large section of main line and ceiling of first floor, and filling the room almost instantly with smoke and flame. Seven sprinklers opened over rounding machines in the main building; eighteen sprinklers opened over burring machines in ell [all] *on second floor; and fifty-two sprinklers opened on the main floor. Altogether eighty-one sprinklers opened on the first and second floors, and it was said they opened practically simultaneously. Fire was said to have been extinguished very quickly by the sprinklers."*

The Boston Manufacturers Mutual Fire Insurance Company reports that during a period of forty years (1874-1913) only twelve lives have been lost in buildings insured by it. Three of these people were killed by going back needlessly into the burning building, evidently to save personal effects at a cotton mill fire in 1907, and four were men in the public fire department who were killed in the performance of their duties at the various mills, thus, only five employees were not able to save themselves in this period. This record may be better appreciated when it is considered that it covers factories one and a half million people.

The Factory Insurance Association report that during the twenty-four years it has been in operation there have been over 2,000 fires in which automatic sprinklers operated, which fires varied in size from a small one to the entire destruction of mill property. However, only one employee lost his life, and that was due to an effort to go back into the room to obtain some of his clothing.

Mr. Forster: Over 2,000 fires and not a life lost except one, that of a main who foolishly went back to get some clothing!

A complete study of the conditions attendant upon the few individual deaths which have occurred in fires in sprinklered buildings shows that in practically every instance they come within one of the three following classes: –

1. *Persons killed by an explosion or burned to death by a slight fire which usually set fire to their clothing.*
2. *Persons entering a building to rescue some article.*
3. *Firemen killed in performing of their regular duties. Other than in such cases as these, the action of automatic sprinklers so retards firs as to permit the safe exit of all the occupants of the building.*

The second and third classes above do not need further explanation, but to bring out more clearly what is included in the first class the following illustration will serve:--

S-14638. "A mechanic was at work under an automobile, supposed to be fitting a patented device to the carburetor. He had an incandescent portable electric light with wire protected cage with him. No one knows just what happened or how the fire started, but from what could be learned, the mechanic for some reason emptied the gasolene tank (about fifteen gallons) and then in some way broke the electric light. There was a quick fire which so badly burned the mechanic that he died soon after in the hospital. Observers reported that there was dense smoke and considerable heat, and apparently all the sprinklers were in operation. When the fire department arrived the fire was practically extinguished, due to the prompt action of sprinklers."

Although a conservative estimate of the number of employees in buildings under sprinkler protection is over two and three-fourths millions, the committee has been unable to learn of a single instance of a person being killed in a burning building having an automatic sprinkler system in proper condition, from which the person was not able to escape and which did not come within one of the three classes noted above.

Letters requesting information relative to fires in which there had been loss of life or where lives had apparently been saved in buildings equipped with automatic sprinklers, were sent to the various inspection bureaus, sprinkler manufacturers, public officials, and others who might be in possession of this information. Replies to these requests invariably set forth for the opinion of the writers of the same that the automatic sprinklers were a very effective means of preventing loss of life in fire in buildings but that it was almost impossible to cite a concrete case where it could be definitely stated that lives were saved by the sprinklers.

Mr. Forster: One of our valuable members wrote to the Committee on this subject, asking the Committee to speak about the effect of the sprinkler in saving lives. It reminded me of the small boy's essay in which he stated that pins had saved a great many lives. When his teacher said, "Johnny, why do you make that remarkable statement?" he said, "By not swallowing them." The point being that if the lives are not jeopardized you cannot prove that they were not saved.

In no instance was the Committee able to learn of a panic ever having taken place in a building equipped with a properly maintained system of automatic sprinklers.

In view of the fact that there are innumerable instances of lives being lost in similar properties without sprinkler protection, there is only one conclusion to be drawn from a study of these replies, namely, that the sprinklers have prevented the fire from making sufficient headway to even become a menace to the lives of those people in the building, and thus, by their action, may be said to have saved a tremendous number of lives.

Mr. Forster: This report being probably more clearly in my mind than in the minds of the gentlemen who have listened to it, I will state that it makes two definite recommendations; first, that the preliminary specifications on fire escapes be promulgated widely over the country for the information of members, stating that they are preliminary; and as a result of the comments which we hope to get, we will be able to make a final set of specifications for the next meeting. That is the first suggestion which the Committee presents, and which the Association Would probably like to take action upon.

The President: First I will entertain a motion that the report be accepted.

(It was moved that the report be accepted, and the motion was carried.)

The President: The first main suggestion made by this report is the one to which Mr. Forster has referred, namely, that the egress specifications be promulgated with a view of securing criticisms from qualified persons throughout the country, to enable the Committee to present a more detailed and definite report at the next meeting.

Mr. Forster: That is correct.

The President: That motion is now presented. Is there a second?

(The motion was seconded by Mr. Humphrey.)

Mr. Humphrey: Just a moment on the question of iron fire escapes. As I understand it, the Committee practically endorsed not the present fire escape, but a fire escape under the specifications which they are proposing to write. During the year I have given the most serious consideration to that subject. I think it is a vital matter, and I think the remarks of the Editor of the Quarterly, quoted in the report, clear and strong as they are, and admirably written, are not strong enough to meet the real needs of that situation. There are many laws on the statute books of this country that are very good legally, but that is no reason why this Association, that is doing pioneer work, should be satisfied with them. I think the fundamental thing about an iron fire escape is this: How many tenants do you suppose the owner of a building could retain if the tenant knew the inefficient character of the contrivances that are now provided and which we call fire escapes? They would move out of the building! And I think the fundamental principle in connection with fire escapes is that the means provided shall be at least as safe as those ordinarily used in getting from one floor to another. I personally do not believe in fire escapes such as are attached to this Chicago building near here, the Continental and Commercial National Bank Building. I do not know how many stories it is to the ground, but I would not walk down them. I ask the Committee on Safety to Life, before they promulgate any recommendations on iron fire escapes, to walk down some of these outside fire escapes and see what they think about them. (Applause.)

I want to say that there is another hazard. I heard authoritatively last week of a man who worked in a woolen mill which had no fire escape, and who got a rope ladder which he put on the window sill in his room, with the expectation that some day there would be a fire and he would have a means of getting out in safety. A fire did come, and the man got on the window sill and jumped out and was killed. He entirely lost his head. Now, the fact is that the fire escape is an available means for a person near it, but where you have a large building all the people hurry to get to the fire escape, and so render it useless. If the committee is going to recommend anything, I suggest that it recommend the down and-out chute as far preferable to an iron contrivance.

The President: Is there any further discussion on the proposition as to whether the Committee on Safety to Life shall find out about these fire escapes? I understand the motion to be that these specifications are to be sent out for comment. Your president will take occasion to comment on them during the year. Mr. Forster, I am sure, expects considerable criticism. Is there any discussion on the recommendation that the report be printed in detail and that criticisms be made upon it, with the idea of the report coming up at the next meeting of the Association?

(The motion was carried.)

The President: Dr. Stratton is prevented from coming and will not read a paper and Commissioner Adamson's and Mr. Merrill's papers will go over until to-morrow morning, therefore, I am going to call on Mr. R. W. Campbell, President of the National Council for Industrial Safety, to say a word about the connection of his work with our work for safety.

Mr. Campbell: Mr. President and gentlemen of the Association, I feel really proud to be in the class that I am in to-day. I feel it has been a privilege to listen to the reports and the papers I have heard read, and think that my appreciation is sound in this matter, because I represent a sister organization of yours. The relationship of our two organizations has been very apparent to me as the program has proceeded, and it is as a representative of that sister that I come to give you its greetings, and wish you good luck in your next year's work.

I say we are sister organizations because we have a common aim. We both have a great waste to contend with. You have the fire waste which involves loss of life and property. We have the accident waste, which likewise involves a loss of life and property. You have a membership of organizations in operation; we have the same. You have increased efficiency; we have the same. You have increased humanitarianism in view, and we have the same. We are both, your organization and our organization, pulling toward the great end of bettering human conditions and more perfectly conserving human life and limb.

Our similarity goes even further than that. Our problem is the same. The same causes are behind us all. You have safeguarded; so have we. You have educational work to do; so have we. You have publicity work to do; so have we. You have organization work to do; so have we.

And so I do feel to-day, in coming before, you for a minute, that I am rather competent to pass upon the work that you are doing, because I have the same kind of work to look over myself in our organization. And I want to say this, that I come to you sympathetically and commiseratingly, because I appreciate the difficulties of your problem. But I come to you also with commendation and congratulations because of the study that I have made of your work.

I do not believe that anywhere in this country has there been such particular effort expended with better results accomplished than those accomplished by your Association. It is pleasant to say this, because I want to say for my organization and myself that one of the lessons that we all have learned is that co-operation, is an essential element to success in this work. You realize that you desire more members, so do we. You are having some lethargy and indifference to contend with; so are we. And so we both appreciate the necessity for wise co-operation and if I might be permitted I would urge upon every one of your members, myself included--for I claim the privilege of being an associate member, that each one of you bring in another member; that each one of you get behind the shoulders of your executive officers to increase the membership and increase the capacity and power of your able secretary.

I want to say this, that our organization hopes to be able to stand shoulder to shoulder with your organization on our common ground; that of conservation of life. I tender our services in any capacity that you may be able to use them, and I hope likewise that in the work that we have which bears upon fire protection we may have the same co-operation from you. Gentlemen, I thank you very much for this privilege! (Applause.)

The President: I am sure that this Association echoes the cordial wishes for co-operation which Mr. Campbell has expressed. The next on the program, the report on Forest, Brush and Grass Fires, will be presented.

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