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FIRE PROTECTION HISTORY-PART 130: 1905 (THE DEBATE ON SPACING BETWEEN SPRINKLERS)

By Richard Schulte

The ninth Annual Meeting of the National Fire Protection Association was held in New York City in late May 1905. One of the technical committees reporting at this Meeting was the Committee on the Installation of Automatic Sprinkler Equipments. The chairman of the Committee, W. C. Robinson, presented the Committee Report.

The following are excerpts from the Committee Report at the Meeting in 1905:

"***INSTALLATION OF AUTOMATIC SPRINKLER EQUIPMENTS***

[TEXT OMITTED]

SECTION A-GENERAL INFORMATION.

[TEXT OMITTED]

5. Clear Space Below Ceilings.– Full effective action of sprinklers requires about 24 inches wholly clear space below roofs or ceilings; this loss of storage capacity should be realized in advance of equipment.

[TEXT OMITTED]

9. Curtain Boards.–Where two or move floors of a building communicate by openings not provided with approved "stops", acceptable curtain boards or cornices, wide enough to bank up the heated air at least six inches below the fusible device of the sprinklers, must be fitted around the openings at each floor.

[TEXT OMITTED]

SECTION B–LOCATION OF AUTOMATIC SPRINKLERS.

1. Position of Sprinkler.–To be located in an upright position.

[TEXT OMITTED]

4. Detailed Locations.–Sprinklers to be placed throughout premises, including basements and lofts, under stairs, inside elevator wells, in belt, cable, pipe, gear and pulley boxes, inside small enclosures such as drying and heating boxes, tenter and dry room enclosures, chutes, conveyor trunks and all cupboards and closets unless they have tops entirely open and so located that sprinklers can properly spray therein. Sprinklers not to be omitted in any room merely because it is damp, wet, or of Fire Proof Construction.

Special instructions to be obtained relative to placing sprinklers inside show windows, boxed machines, metal air ducts, ventilators and concealed spaces, and under large shelves, benches, tables, overhead storage racks, over dynamos and switch boards, platforms and similar water sheds.

Mr. Anderson. Under large shelves, benches and tables, would it not be well to specify a dimension in excess of 4 feet? I think that was before the Committee at one time, and I should like to know how that was disposed of.

Mr. Robinson. That was in connection with the idea that in a great many places we might have a shelf which was only 8 foot, where the nature of the contents of the building would clearly indicate that sprinklers ought to be installed. For instance, I have in mind a case where a row of oil barrels was underneath stock shelves, less than 8 feet in width, where we had successful operation of sprinklers. If we limited it to 4 feet in width we might find it difficult to obtain sprinklers under many obstructions where they are desirable.

Mr. Anderson. I think there should be some kind of a limitation. After a man has put in an equipment satisfactory to the underwriters having jurisdiction, others come along and want him to put in sprinklers under a table 2 x 4. He ought to have some latitude. I was sorry not to be at the meeting of the Committee when this was taken up.

Mr. Crosby. That was discussed at some length in the meeting of the Committee, and it was decided it was so dependent upon local conditions, what the shelf was built of and what was upon it and beneath it, that it had better be left out of the rules.

Mr. Sullivan. I presume that part of the 2d paragraph of No. 4 "over dynamos and switchboards," is not to conflict with the first four or five words of the last line of the first paragraph "or of Fire Proof Construction." It is getting to be quite the practice, where new plants are being built, and where electric power is used as the main source of power, or the only source of power, to have the generator rooms entirely fire-proof and have no sprinklers in them.

Mr. Robinson. I think the rule would cover that, under "Special Instruction to be Obtained."

Mr. Sullivan. You don't think one would conflict with the other?

Mr. Robinson. No, I should say not, if you require that special instructions be obtained.

Mr. Sullivan. That is the way I should [would] *interpret it myself, but I wanted to bring it before the meeting so it would be understood.*

(At the suggestion of Mr. Goddard the word "are" was inserted after the word "and" in the third line from the bottom of the first paragraph, and the rule was adopted.)

[TEXT OMITTED]

SECTION C–SPACING OF AUTOMATIC SPRINKLERS.

[TEXT OMITTED]

8. Mill Construction.–Under mill ceiling (smooth solid plank and timber construction, 6 to 12 feet bays) one line of sprinklers should be placed in center of each bay and distance between the sprinklers on each line not to exceed the following:

8 feet in 12 feet bays.
9 feet in 11 feet bays,
10 feet in 10 feet bays.
11 feet in 9 feet bays.
12 feet In 6 to 8 feet bays.

Measurements to be taken from center to center of timbers. (Also see Rule 9.)

[TEXT OMITTED]

Mr. Robinson. The next change is in the sprinkler spacing under mill construction giving additional specifications for such spacing. We at present allow 8 feet in 12 feet bays and 9 feet in 11 feet bays. We add 10 feet in 10 feet bays, 11 feet in 9 feet bays, and 12 feet in 6 to 8 feet bays.

Mr. Phillips. As the spacing of automatic sprinklers is one of the most important details in a proper sprinkler installation, and as quite a change is suggested by the Committee, I would like to ask for a little enlightenment upon the subject as to the reason for making the proposed change?

Mr. Robinson. Your Committee simply completed the table so as to follow all possible arrangements under mill construction. That is, as I understand this, it would make practically no difference, so far as the protection is concerned, whether the sprinklers were 12 feet apart in bays, or whether they were 12 feet apart from bay to bay, providing you had the dimension in the other direction equivalent to what it would be as formerly ruled.

Mr. Phillips. Mr. President, I have always looked upon the spacing of sprinklers in a 12-foot bay, that is allowing one line to cover a 12-foot bay, as meeting an emergency; that we could not consistently call for more; that the risk was built with a 12-foot bay, and the best way to meet the situation for all concerned was by calling for only one line of sprinklers. Then I think there are fewer mill buildings constructed with 12 feet bays than with 8 feet bays, and I think we are extending that arrangement over a great many risks. I dislike to see sprinklers spread further apart in a mill with 8 feet bays, and I should dislike to see the change made in the rules. I think what we are working for is the best protection obtainable. We have been successful in the past in getting sprinklers spaced 10 feet apart in 8 feet bays, and I would like very much to see the practice continued.

Mr. Dana. I wish to agree with Mr. Phillips in what he has said, and to add that the matter of partitions, I think, affects 8 feet bays much more than 12 feet bays. That is, if you get a partition half way between two sprinklers allowed 12 feet apart in an 8 feet bay, you get the sprinklers 6 feet from that partition. You are liable to have partitions put up across bays, but you are not liable to have them put up parallel with bays without additional sprinkler protection being put in. It seems to me that in changing the sprinkler rules in the past we have always been making them more stringent, and I myself do not like to see the standards let down. I believe that 10 feet is none too far apart in 8 feet bays, but I do believe that a provision should be made for narrow bays where the spacing can be staggered. That is, in 6 feet bays I think 12 feet might be allowed, provided they were staggered in alternate bays.

The President. This is a very important subject, gentlemen.

Mr. Grier. If this change we have just been discussing goes through as printed here, it would seem that rule 5 under Section C should be changed to correspond with it.

The President. There is no change recommended in rule 5 as printed.

Mr. Grier. No, sir; but I would like to know if it would not be feasible to make a change so as to make it uniform?

Mr. Robinson. Mr. Grier wrote to me about that point, but the thought of uniformly escaped the attention of the Committee, I think; at least it did mine. However, I should not hesitate to say that rule 5 as printed is a better rule than it would be if it were changed to be in conformity with something which covers a very much superior class of construction, that is, mill construction. I had rather penalize the ordinary construction with the closer spacing, if you want to put it that way, than I would mill construction where everything is open. Rule 5 refers to smooth sheathed or plastered ceilings, usually in buildings of ordinary construction. I do not think it would be inconsistent to leave rule 5 as it is if we do make the change in rule 3.

Mr. Grier. It is a smooth surface there, and it is the character of the construction as to distribution, not the actual construction of the ceiling.

Mr. Robinson. I should prefer very much to have more sprinklers under such a ceiling than under mill construction, because you have hollow spaces back of it and your ceiling, no matter how much you may inspect it or watch it, is liable to get into bad repair, and in the event of a fire the sprinklers would not be able to control it as well, even in the case of a fire of some duration, they would not be able to extinguish it as well or prevent it getting into the concealed spaces. I have no very strong feeling about the matter, but that seemed to me the best way out of it.

Mr.Grier. It seems to me to be more a question of uniformity than anything else, and that if we change one we should change the other. If a fire gets back in the sheathing it is going to run through, sprinklers or no sprinklers.

Mr. Robinson. It is not a question of uniformity, it seems to me, because we are not dealing with uniform construction.

Mr. Phillips. I do not want to prolong the discussion, but I would like to repeat again that I think we all are in favor of meeting conditions to any reasonable extent. I think we are all without an exception in favor of getting as large pipe sizes as we can, in fact of increasing the pipe sizes, as the Committee have suggested in the next section. But as there seems to be some difference of opinion about this section, I would make a motion that the rules be not changed, but that rule 3 under Section C in the old rules–I have here the edition of 1902–be allowed to remain.

Mr. Robinson. That reads 8 feet in 12 feet bays, 9 feet in 11 feet bays, 10 feet in 6 to 10 feet bays.

Mr. Kunhardt. On this matter of the spacing of sprinklers there is one point which I think ought to be brought out and that is that in enlarging the spacing to 12 feet you are not weakening your rules. Those of us who are doing sprinkler work all the time realize the many different types of construction which we have to deal with. In narrow bays the heads necessarily come so close together, if you confine your spacing to 10 feet spacing, that the number of heads will be very much larger than may be advisable, from the standpoint of your water supply. Every sprinkler you have in a system requires just so much water. If your sprinklers are very close together you require more water, and if your water supply is limited it is sooner exhausted. It is better to have a sprinkler 12 feet from another one under a perfectly smooth ceiling, and have each of those sprinklers fully supplied with water, than to have more sprinklers and to have each of them weakened correspondingly by a lack of supply.

Just one more point. You all recognize that on a smooth ceiling the sprinklers, when they are placed from 3 to 6 inches, we will say, below the ceiling, will not cover the entire ceiling when they are placed 10 feet on centers. A sprinkler generally wets the ceiling thoroughly about 6 feet, a radius of 3 feet around the head. If the pressure is high it will wet a little more, but it wets thoroughly 3 to 4 feet, we will say. Now, under these conditions, with a 10 feet spacing, there are spots on the ceiling which are not protected. The floor is thoroughly protected, more than protected, for the spray from one sprinkler will cross that from another. The way a fire is controlled is simply by surrounding the little spot on the ceiling which is not wet so the fire cannot go any further. There is nothing on the ceiling which is combustible, we will say, but wood; there is no storage there, as there is on the floor. The fire then is controlled by being surrounded, just as an army is surrounded and is finally captured. When sprinklers are spaced 12 feet in 6 feet bays, you simply enlarge a little the area between the sprinklers one way, but you keep your water supply; there is the same number of square feet of floor area, each sprinkler gets a good supply of water; is spraying well, and it is absolutely impossible for a fire to go through that 6 feet bay longitudinally and pass by one sprinkler to the next, and it is therefore confined right at that one spot. I think I have now covered the whole story on why we wish to include a 12 feet spacing in a 6 feet and an 8 feet bay. The protection is fully ample. It has been justified by years of experience with sprinkler protection. I wish this fact to be brought out clearly, in view of the statement made that we should be weakening our schedule if we give up the old standard. And, furthermore, 12 feet spacing is practicable.

I want to say one more word, and I am through. We have a great deal of 4 feet bay construction. Under mill ceilings, in order to get floor loads of 200 pounds and over, properly carried, the bays are often made only 4 feet in width. Under that type of construction it is fully practicable under certain conditions, where you want to get the sprinkler pipes out of the head room, to put them up in the bays, run them longitudinally, or to run the pipes close up under the timbers at right angles to the bays and put the sprinklers up with a nipple two or three inches long or screw them into the line of pipe. The sprinklers are then put up in the bays between the timbers, and that is reasonable and it will give you protection in these narrow bays. If you extended the distance for 14 feet you would get the fire surrounded so that it could not get away. Whereas, if you put the sprinklers closer together it would take 150 sprinklers for a building which wouldn't require more than 100. You simply enlarge the number of heads without getting any increase in the water supply and without getting any more water to protect the building. The whole problem is to so distribute the water that you have that you will surround the fire and control it.

Mr. Breed. If the sprinklers are 12 feet apart and goods are allowed to be piled within 12 inches under the pipe the water from the sprinklers will not cover a portion of them, in my experience, and there is great danger in such a wide spacing of the sprinklers, particularly if the goods are light and inflammable.

Mr. Moore. Without reference to the desirability of changing this section, it seems to me that the argument in relation to the water supply is more or less fallacious in the light of practical experience shown in the tables which Mr. Fiske has presented, from which it appears that 90 per cent of the fires have been controlled with 30 sprinklers. If that is so, it shows we have with the present spacing met the situation pretty well, without any question as to the reliability of water supplies. I thoroughly sympathize with the remarks made as to the matter of protecting floors which are built to maintain heavy loads, and consequently have timbers placed closer together than has in the past been the custom in ordinary mill work, but I do not think the water supply question has developed weakness enough to warrant the criticism which has been made.

Mr. Kunhardt. I will state that a great many of those fires which have been reported have been extinguished by sprinklers with a spacing of 12 feet.

Mr. Dana. I would like to offer an amendment to Mr. Phillips' motion as follows: In bays less than 8 feet 12 feet spacing will be allowed if the heads are staggered in alternate bays.

The President. Does Mr. Phillips accept that amendment?

Mr. Phillips. I will accept it.

The President. The motion then is that the spacing as provided for in the rules of 1902 be re-adopted, with the amendment offered by Mr. Dana that in spacing bays less than 8 feet 12 feet if staggered will be accepted.

Mr. Goddard. Just to make it plain, shouldn't you say, 11 feet in 9 feet bays or less, and then as sort of an exception to that, that if staggered they may be 12 feet if the bays are 8 feet or less, otherwise, if they are not staggered a man will say, how many am I to put in them? If they are not staggered you go back to 11 feet.

Mr. Sullivan. As I take it, this is practically what you might say is a limit to the distance we may have between the sprinklers, and I think it rests largely with the inspectors having jurisdiction to determine whether that limit shall be allowed or not, when work is going to be installed. I think it would rest entirely with them anyway, and this is to be used simply as a guide.

Mr. Moore. As I understand Mr. Dana's motion the staggering of sprinklers when they are placed 12 feet apart applies to less than 8 feet, that is 4 and 6.

Mr. Dana. Yes.

Mr. Moore. Then I want to bring out the fact that there will still be a comparatively large number of sprinklers needed under one form of construction with that spacing of the beams, and that is where the two girders do not carry the beams set on top of them, but where they frame into them with straps or otherwise. That will practically involve as many sprinklers as the present form of spacing.

Mr. Kunhart. Up to 12 feet in width for those bays, that is, between the girders, if the joist were placed the other way, we will say, 6 feet, you will put one sprinkler in the middle of each parallel 6 x 12. That would be the 12 feet space.

Mr. Moore. Then you couldn't stagger them, could you?

Mr. Kunhardt. You could not stagger them, no. I agree with Mr. Dana, that in a great many places staggering is needed. I think it can well be left to the judgment of the engineer laying out the work, but I want to call your attention to the fact that in 5 and 6 feet bays where it is sometimes necessary to carry the pipes at right angles to the beams, if you required staggered spacing you would have a network of pipes on the ceiling which wouldn't look well and wouldn't be convenient for the man occupying the building.

I would also call attention to the last paragraph of the note under rule 7: "Special instruction shall be obtained in each case as to whether staggered spacing shall be required under joist construction, where the channel spaces between joists are positively blocked off within the territory of any two adjacent sprinklers." This is not joisted, but the narrow bay construction approaches joisted construction as the bays grow narrower; and I think in good straight mill construction, where an equipment is put in thoroughly in accordance with our standard, we do not need to stagger the sprinklers unless there are obstructions on the floor, for instance, which require it. If the goods or cases, etc. are to be piled right up to the sprinklers we then put in more sprinklers than we do otherwise; and if Mr. Dana could change his amendment to read to the effect that staggered spacing may be required, just simply to indicate to the engineer that it is desirable in some cases, I think he will find it will fit every condition.

Mr. Fiske. *Mr. President, I think we have got a little bit off the track here in our discussion because of not realizing that mill construction is specified under this rule as being "smooth, solid plank and timber construction, 6 to 12 feet bays." We have argued these questions of 4 and 5 feet bays in the Committee and outside at length, and it seems somewhat difficult to determine just exactly what is the best practice; and the construction differs so in various cases that this rule 8 was made just to cover that feature. And I think in talking on this "mill construction" rule we should clearly bear in mind that we are discussing 6 feet bays and over, and I question whether Mr. Dana perhaps feels that staggered spacing is necessary for bays over 6 feet. It certainly is very desirable in many cases for bays under 6 feet.*

Mr. Dana. *I didn't have that in mind, I am free to admit, and I am willing to accept Mr. Kunhardt's amendment, that it be put in the form of a recommendation as to bays under 8 feet.*

Mr. Goddard. *May I suggest to Mr. Kunhardt, in regard to his suggested amendment, that we repeat the note that special instruction shall be obtained in each case where over 10 feet space is allowed, as to whether staggered spacing shall be required–something of that sort.*

Mr. Kunhardt. *I think that will be all right.*

Mr. Goddard. *When you get over 10 feet you should obtain instruction whether the inspector having jurisdiction wants them staggered.*

Mr. Crosby. It seems to me under Mr. Dana's amendment we are taking up but one feature of special construction, which subject is covered very broadly under Rule 8, "Unusual Construction." I think it is very unwise to take up but one feature and not the numerous other conditions of ceiling construction which involve different types of sprinkler application, and that it would be very much wiser to adhere to our present suggested rule No. 3. The only points at all in dispute are the last two specifications, "11 feet in 9 feet bays," and "12 feet in 6 to 8 feet bays," and it seems to me the matter can be very happily adjusted by adopting this rule as printed with a note following what I have just read stating that special instruction shall be received from the underwriters having jurisdiction in relation to the spacing of sprinklers in bays 6 to 8 feet in width, and that in no event shall the heads be placed further apart than 11 feet in 9 [feet] *bays and 12 feet in 6 to 8 feet bays. That will leave the matter to the determination of the underwriters having jurisdiction, and I can see how conditions might vary. In a modern mill the wider space may be amply justified, while in a mercantile establishment, such as Mr. Breed has to deal with, where there are numerous partitions and shelving and stock, not over 10 feet might be very properly insisted on.*

Mr. Fiske. Eight feet bay construction is to-day the common mill construction, and it seems to me the Association is in a position to make a definite rule for this form of construction. If there is any one thing we want to have a definite rule on it seems to me it is that. And I think that rule No. 8, which covers all unusual construction, gives a chance to cover these various things that we seem to have got sidetracked onto during our discussion. I certainly hope we will put through this rule on "Mill Construction" either just as it is printed here or just as it was before.

Mr. Goddard. I certainly fail to understand either Mr. Crosby's or Mr. Fiske's reference to No. 8, stating that the 8 feet bay is the usual construction and then talking about "Unusual construction " taking care of what we are talking about here. It does not. There is no question that 6 to 8 feet bays are usual construction, because by your definition you make them usual – "smooth, solid plank and timber construction, 6 to 12 feet bays." That tells you what is usual construction, and that would justify any contractor in saying that No. 8 had nothing to do with construction of 6 to 12 feet bays. Now you simply run up against a state of affairs that is not new. You will never find anybody in a room filled as this room is, agreeing on all details, and so both sides here may be right. Mr. Breed brings up a certain case because he is dealing with a certain class of risks that Mr. Kunhardt is not familiar with. And take a large department store, even with mill constructed ceiling, it is a question whether you want 12 feet spacing in a 6 feet bay with a large amount of inflammable material. It seems to me that Mr. Kunhardt's suggestion that the note which is under "Staggered spacing" should be repeated for the present under No. 3, is a good one, and it will enable us to come to some compromise in the matter. We will not state absolutely that anybody is right and the rest are all wrong, but it will give the departments having jurisdiction an opportunity to use a little leeway, until this new spacing

has either established itself or proved itself wrong. That can be done by inserting that note that special instruction shall be asked for as to staggered spacing in these last two classes of bays from 6 to 9 feet. The contractors in any department will soon find out whether that department is willing to accept the regular spacing not staggered in that class of work, and they will soon find out, perhaps, that some department for the present will require staggering in all cases where they accept that spacing. It is not going to create any hardship, and I think this is going to place Mr. Phillips and Mr. Dana and others in a situation where they can go home satisfied with the rule, and it isn't going to hurt it a bit for Mr. Kunhardt or those who are in favor of the rule as it stands printed.

Mr. Miller. I understand that the first two provisions in this paragraph are perfectly satisfactory to the members,–"8 feet in 12 feet bays, 9 feet in 11 feet bays." That covers a ceiling area of 99 square feet. Now, inasmuch as the ceiling is absolutely smooth, I cannot see that it makes a particle of difference whether the bays are 8 feet with heads 12 feet apart on the line, or whether the bays are 12 feet apart with the heads 6 or 8 feet apart; you get the same ceiling surface. If you amend the last two you, in order to be consistent, will have to amend the first two. There is nothing in the mill construction which will interfere with the distribution of the heads, no matter which way the lines run.

Mr. Kunhardt. I think a sentence I have written will meet the approval of everybody, Mr. President, for I think it covers everything. I will read it. "Where there is special hazard due to the occupancy of the building, or other conditions justify it, special instruction must be obtained regarding the proper spacing and staggering of heads of adjacent lines." That leaves a chance in a 10 feet bay, if it is necessary on account of occupancy or construction, to put staggered spacing even there.

The President. Now, Mr. Crosby.

Mr. Crosby. When I rose, Mr. President, I was going to express discouragement in getting Mr. Goddard to listen attentively to discussion. (Laughter.) The unusual type of bay construction referred to by Mr. Dana was not the 6 to 8 feet bay, but was the 4 feet bay in which they were talking of placing the sprinklers 14 feet apart on the line. Now, it seems to me we must all be of the opinion that this rule as framed is fairly fitted for adoption, with a reservation allowing the underwriters having jurisdiction, when considering the special occupancy of a building, to require closer spacing in bays 6 to 10 feet wide than the maximum allowed in this rule. And I sincerely hope that rule 3 will be adopted just as it is without any reference to staggered spacing in mill construction, without any reference to an unusual type of construction, such as 4 feet bays, and with simply a note to the effect that underwriters having jurisdiction must be consulted as to the spacing of sprinklers in bays 6 to 10 feet wide, and in no event shall they exceed the figures stated in this rule.

Now, so far as the rule for spacing sprinklers in mill construction is concerned, I think those of us who have argued against wider spacing in mill bays do not wish to have bays over 10 feet wide. That was the maximum distance apart at which we wished sprinklers placed. We were confronted, however, with conditions where bays were 11 and 12 feet wide, and we said that within reason we could not ask for two lines of sprinklers in such bays. But, on the other hand, when we come to the distance apart of the sprinklers in the bay it is our purpose to keep them within 10 feet. So the inconsistency in the old rule was created and that is the reason it existed.

Mr. Phillips. I want to repeat what I said at first, supporting what Mr. Crosby has said, with reference to putting sprinklers 8 feet apart in 12 feet bays. It is a condition which we have to meet. We do not favor 12 feet bays. I do not believe that there is hardly an insurance engineer who, if his opinion was asked as to what type of mill construction he would recommend, would not say not over a 10 feet bay. And I fail to see wherein the point made by the gentleman in the rear (Mr. Miller) applies.

Mr. Steward. It seems to me this question of occupancy is one that is of considerable importance, not only in this type of construction but in others, and if there is no provision in the rule now in regard to it, it might be put in, in a more general way, and not so as to apply necessarily to this one particular feature. I think the rule as presented to us by the Committee will give us reasonably satisfactory service and I should like to see it adopted.

The President. The motion the Chair now has before it is Mr. Phillips' motion to reinstate the 1902 spacing, and an amendment by Mr. Dana. As far as the Chair can recollect that is what is now before the meeting. Will Mr. Dana kindly state his amendment again?

Mr. Dana. In bays less than 8 feet 12 feet spacing may be allowed if the heads are "staggered in alternate bays.

Mr. Goddard. Personally I shall be perfectly satisfied if this rule is adopted as it stands. I do not worry very much about the result, but I want to see a rule adopted which everybody will be satisfied with. I think Mr. Dana has jumped clear over onto the other side of the fence. I think Mr. Kunhardt's amendment was a fair compromise. Mr. Dana stops at 10 feet spacing and absolutely requires staggering if it goes any further. Now, those who are in favor of the rule as presented by the Committee do not wish to always require staggering, if there is 12 feet spacing, but, so far as indicated by Mr. Kunhardt's remarks, they are willing, or he is, to leave that question of staggering to the department having jurisdiction. There, then, is a fair basis of compromise, but the position taken by Mr. Crosby and the position taken by Mr. Dana are far apart. I should much prefer to see Mr. Kunhardt's suggestion adopted, if there is going to be any change in the Committee's report.

Mr. Dana. I intended to adopt Mr. Kunhardt's suggestion in my motion, but apparently I did not get it into proper shape. Perhaps the amendment should read as follows: In bays less than 8 feet 12 feet spacing may be allowed by special permission of the underwriters having jurisdiction.

Mr. Kunhardt. As I understand it, that is an amendment to Mr. Phillips's motion, which was to return to the 10 feet spacing, but you can allow 12 for bays less than 8 feet. It makes 10 feet spacing necessary in an 8 feet bay. Now, that is wrong. You want a 12 feet spacing in an 8 feet bay, and you don't want any more for good protection. I believe the Sprinkler Committee was unanimous on that, and we discussed the thing generally, and every man whose opinion was recorded agreed that a 12 feet spacing was reasonable under those conditions. I think if we leave it as Mr. Goddard has said, and adopt the report of the Committee– think that is the best thing to do, just as it stands, myself, and I would so vote–but I do think we might adopt an amendment along the line Mr. Goddard suggests, if it is necessary to do so.

The President. The Chair still has before it the original motion made by Mr. Phillips. I will state it again, and I will have to call on Mr. Dana to read his amendment to it. Mr. Phillips's motion is that the 1902 spacing be reaffirmed, with Dr. Dana's amendment, which he will now state.

Mr. Dana. In bays less than 8 feet 12 feet spacing may be allowed by special permission of the underwriters having jurisdiction.

The President. That being an addition to the 1902 spacing, that in bays less than 8 feet 12 feet spacing may be allowed by the underwriters having jurisdiction.

Mr. Robinson. Does that require the 10 feet spacing in 8 feet bays?

Mr. Kunhardt. Yes, sir.

Mr. Robinson. Then it is not consistent with the first part of the rule, "8 feet in 12 feet bays."

The President. It goes back to 1902.

Mr. Fiske. Mr. President, it is very evident that there are, you might say, two very different views on this subject. There are certain ones who feel that in 8 feet bays we should always require 10 feet spacing; there are certain others who feel that this rule as presented by the committee is all right. Now, I think this is something, therefore, that we ought to be rather careful about. There are certain members here of important organizations who feel very decidedly that the spacing should not be over 10 feet, and we must be very careful to get some rule, if possible, which will meet their views. I should be sorry to have this matter put to a vote as between 10 and 12 feet spacing and carried through by a majority, without some arrangement being made by which Mr. Phillips and Mr. Dana and any others who feel as they do about a 10 feet spacing being correct, could have the rules framed to agree with their opinion as well as with those on the other side, for there is a direct difference of opinion here.

Mr. Crosby. May I inquire whether this proposition does not meet the desires of all?

The President. Which proposition do you mean?

Mr. Crosby. I mean the proposition for the adoption of the 1902 No. 3 rule, which Mr. Phillips has made, with the addition of the following: If conditions of occupancy and hazard warrant, upon determination of the underwriters having jurisdiction wider spacing may be allowed in 6 to 10 feet bays as follows: 11 feet in 9 feet bays; 12 feet in 6 to 8 feet bays.

The President. Does Mr. Phillips agree to that proposition?

Mr. Phillips. I was just going to suggest another compromise. (Laughter.) I would really like to see some rule put forward that we can all agree to without exception, and I was going to suggest this –I make no motion about it, but just present it to see how it appeals to the other gentlemen–that the rule read like this: Sprinklers on each line not to exceed the following: 8 feet in 12 feet bays, 9 feet in 11 feet bays, 10 feet in 10 feet bays, 11 feet in 6 to 9 feet bays.

Mr. Cabot. I should like to ask Mr. Phillips why, if he is perfectly satisfied with an 8 feet spacing in a 12 feet bay, he is not willing to turn the spacing around a quarter turn and take 12 feet in an 8 feet bay?

Mr. Phillips. I think I have answered that several times, and I will now try to explain it once more. A 12 feet bay is a condition which we are obliged to meet, but which we do not favor. An 8 feet bay is an altogether different proposition. We have a great many more mills constructed with 8 feet bays than we do with 12 feet bays, and I really feel that we ought not to permit the spreading apart of the sprinklers. I appreciate that there is an apparent inconsistency, but I do not feel that it is a real inconsistency, for we have a condition to meet in one case and we are making a condition in the other case.

Mr. Dana. I will withdraw my motion in favor of Mr. Crosby's amendment.

Mr. Phillips. May I ask what Mr. Crosby's amendment is?

Mr. Dana. It was the substitution of the present 1902 rule, which is 8 feet in 12 feet bays, 9 feet in 11 feet bays, and 10 feet in 6 to 10 feet bays, with the following added: If upon determination of the underwriters having jurisdiction conditions of occupancy and hazard warrant, wider spacing may be allowed in 6 to 10 feet bays as follows: 11 feet in 9 feet bays, 12 feet in 6 to 8 feet bays.

The President. The Chair understands that is accepted as a substitute motion. Are there any remarks upon Mr. Crosby's motion?

Mr. Kunhardt. All I can say, gentlemen, is that I think if you adopt this you will make a mistake, and I believe you will come around to my way of thinking after you have tried it a while. You might adopt the report of the committee with a note stating that where special conditions require it, special instruction must be obtained regarding the spacing and staggering of heads. That will cover the whole thing. The schedule as reported by the committee is a good one and it will meet 90 per cent of all the cases. There are a few cases it will not meet, perhaps, and those will require special instructions anyway. We are dealing all the time with special construction; the engineers and architects of this country are all the time designing special forms of construction to bother the sprinkler people, and it is hard work to meet them; but standard mill construction is a type which that spacing of sprinklers will protect every time.

Mr. French. Mr. President, this report was very thoroughly gone over in the committee, and I think that a reversal of carefully considered committee reports in the open meeting usually ends in trouble. Now, I should like to ask if Mr. Crosby would not be willing to adopt the suggestion that Mr. Kunhardt has made, and just reverse things– that is, accept the report of the committee, but make the rule so that when conditions are not favorable, or when the inspection department having jurisdiction prefers or thinks it necessary, they can require the 1902 spacing? That would carry everything right out along the lines which everybody agreed to when they had the chance to think the thing over very carefully.

Mr. Crosby. That would be agreeable to me if Mr. French can suggest some manner in which it could be made practicable. The rule would then allow the maximum conditions and leave it to I don't know who to bring up the question of exceptions. So far as I am personally concerned, I am prepared to vote for the rule as proposed by the Automatic Sprinkler Committee just as it stands, but I can see no possible objection to this amendment, which I think would meet the local conditions over perhaps a little wider range than the proposition of the committee.

Mr. Goddard. If I may come to Mr. French's help, how would it do to have a note something to this effect: "Special instructions should be asked where rule allows sprinkler spacing to be over 10 feet, because special conditions may require the underwriters having jurisdiction to modify the rule."

Mr. Crosby. That is fine.

Mr. Phillips. I think the safest thing to do in these cases, Mr. President, is to make your rule as strong as you can, and then give the privilege of waiving it, and not give the privilege of waiving it at the start and then try to tighten up and get something more.

Mr. Goddard. I think Mr. Phillips ought to recognize something which has received the unanimous approval, as I understand it, of the Sprinkler Committee, and which receives the support, apparently, of a number of the members of the Association outside of the Sprinkler Committee, and has, as far as I know, been opposed by only two members, or three with a possible convert of one of the Sprinkler Committee members, and I think he ought to be glad to take what he can get, especially when it allows him to do in his work just what he wants to do, even if he has to do it under an exception rather than under a rule. While I agree with him and think he is right on general principles, that the rules should be restrictive and exceptions should be favorable, yet I think in this case the compromise proposed will give him abundant foundation upon which to work and may save the rule just as the committee has reported it without any exception.

The President. The motion before you now is the adoption of No. 3 of section C as amended by Mr. Goddard's note.

Mr. Cabot. How amended?

The President. As per Mr. Goddard's addition to the rule recommended by the committee. Adopted.

Mr. Robinson. The reference to Rule 9 under Rule 6 should be to Rule 8, as the rule on curtain boards is transferred to Section A. The next change is in Rule 7, "Staggered Spacing," the change being in the last line."

Although the discussion over the spacing of sprinklers 11 or 12 feet apart may seem trivial today, apparently this issue was not so trivial in 1905. Clearly, sprinkler protection a century ago was more or less developed through a trial-and-error approach and the approach to providing sprinkler protection was on the conservative side. The record of success of sprinkler protection had been established and that record needed to be protected. Hence, even minor changes to the rules for sprinkler protection installations were questioned.

While this conservative approach to the rules preserved the success record of sprinkler protection, it also served to maintain the relatively high cost of providing sprinkler protection. It would be roughly another 20 years before rules for Class B (light hazard) sprinkler equipments were developed and roughly another 50 years before a method of hydraulically calculating a supply piping system was conceived. Interestingly enough, the method of hydraulically calculating a supply pipe system was developed at about the same time as the concept of the spray sprinkler was developed.

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Source: "*Proceedings of the Ninth Annual* [NFPA] *Meeting*", New York, New York, 1905.