Development, Application and Effect of Schedule Rating in Liability and Compensation Insurance.

BY

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That all risks within a given classification do not present identically the same hazards has been recognized by underwriters of liability insurance for years and the need of a more refined or detailed system for measuring the hazards in the individual plants has been apparent. Special rating based solely on the individual experience of a risk was too susceptible of misuse to attain universal adoption and was in many respects contrary to the accepted practices of underwriting based on the law of average. It was a serious question also whether past financial results of risk especially in a manufacturing establishment subject to changes was dependable as an indication of probable risks in the future. There was at least an honest difference of opinion among underwriters on that score, one school arguing solely for the retrospective, or experience basis for rate determination; the other for the introspective basis, or an attempt to measure the hazard of the plant under consideration by a detailed physical examination, thereby establishing the probable or anticipatory financial result of risk before underwriting, gauged on an analysis of the presence or absence of known causes of accidents and on the presence or absence of other than pure or inherent hazards of the industry in the plant under consideration, and as is usual when extremes meet, a compromise was the final result.

As in the case of all fundamental changes in procedure in a given line of endeavor, the problem was attacked simultaneously from several different angles and quarters. Experiments were conducted at the same time by the Aetna Life Insurance Company of Hartford, Connecticut, and by Professor Albert W. Whitney, at that time consulting expert to the Industrial Commission of California, in conjunction with the author. As the result of our labor, a plan for applying schedule rating to workmen's compensation insurance, with a tentative draft of a schedule for rating machine shops, was

published by the California Commission and sent broadcast for criticism. This plan, whereas theoretically sound, proved impractical in application. It was based on the assumption that the exposure to any given hazard or accident cause would be a definite known quantity. A standard rating was given each defect in relation to total hazard presented in the plant based on an assumed exposure to each. It was found, however, that no statistics were in existence which would form a basis for the measuring of the exposure; in other words, the actual number of men or payroll in the average plant exposed to each individual hazard, such as belts, gears, lathes, planers, etc., were not available.

The Workmen's Compensation Service Bureau at the same time became actively interested in the question. A department for the purpose was established and instructions were given to proceed with development of a system which would meet the requirements presented, namely, that it be thoroughly practical, that it be easily applicable by the underwriter at the desk, that it appeal and do justice to the plant owner whose establishment was to be rated in accordance with it, that it produce a rate commensurate with the hazard in the individual plant, and that at the same time it would not disturb the present basic or average manual but that it could be applied to that manual. These were the essentials necessary to have schedule rating universally adopted and an effort was made from the beginning to meet them all.

No easy task to be sure, because of the acknowledged lack of data on the subject.

As already stated, no statistics were available from which could be deduced any facts in relation to exposure to different hazards. The next question naturally was "Can we establish the relative accident frequency and severity from known causes?" An investigation was undertaken of all the official accident statistics of the various states. It was found, however, that their classification of causes was not uniform, that the statistics were lamentably incomplete and they were therefore discarded as a basis. The next source of information were the records of the liability companies. As far as could be determined, only one liability company had kept statistics on causes of accidents in such a manner that they were readily available for study and comparison. This company submitted for our investigation some 60,000 compensatory accidents; that is, accidents for which money had been paid under liability. They were

carefully classified by industries, by cause and extent or severity of injury.

Next, we turned to European accident statistics, primarily Germany and Austria. We obtained records of approximately 125,000 accidents from these sources. They were studied in relation to the statistics submitted by the one liability company here and the similarity, both of causes of accidents and severity of accidents from identical causes, were striking. In fact, a review of the data from the two sources established this thesis as fundamental: That the effect on the human body of an accident from a given cause under similar conditions is the same whether it occurs in Europe or in the United States, a fact which should dispel in the minds of some gentlemen the idea that European statistics applied to American conditions are necessarily dangerous. If properly used, these foreign records which are known to be authentic and scientifically compiled would undoubtedly prove of great value in the solution of our problems as to accident frequency by causes, were it not for our apparent hesitancy in availing ourselves of them.

The next step was that of determining the comparative importance of the established causes of accidents in order to determine their relative rate value. That was the hardest problem to solve with any degree of accuracy for the reason, again, that no statistics were available giving exposure to causes. It was comparatively easy, however, to establish the relative importance of each to the total from a frequency and severity standpoint and underwriting judgment combined with engineering knowledge and the facts before us were used in assigning respective values. For instance, it was found from the records before us that the accident frequency from protruding set screws was comparatively low in relation to other causes but that the accidents were unusually severe resulting most often either fatally, in total permanent disability, or partial permanent disability. A rate value in comparison to these facts was assigned. A similar analysis was made of all the other causes taken into account and their comparative values established on the same basis.

We now came to the actual construction of the schedule and the basis upon which the rate values were to be applied.

There are three distinct methods through which schedule rating can be successfully used.

First, we may construct a hypothetical perfect plant, establish

standards for safety and sanitation in that plant and charge in the insurance rate a certain fixed amount for any deviation from these prescribed standards, such amount to be either on a flat dollar and cent basis added to the rate or on a percentage of manual rate basis.

Second, we may, on the other hand, establish a hypothetically very poor plant with no guards at all, use the same standards of safety promulgated for the hypothetical perfect plant and credit for each item of the standards complied with on the same basis as outlined above.

Thirdly, we may take what we term an average plant, establish sub and super standards and charge or credit for each item respectively as to whether it be below or above the average adopted.

The ultimate result of the three methods must of necessity be the same if correctly applied and provided the necessary data to establish true basis rates for each method is available. If the first method is adopted, the basis manual must be minimum rates; that is, rates predicated on conditions in the classification which permit of no hazards outside of the pure or inherent hazards actually necessary and incident to the operation of the industry. If the second method is used, on the other hand, the basis manual must be maximum rates predicated on the presence of or on the hazards often found in an industry but not necessary for the successful conduct of that industry. Whereas, if the third plan is adopted, the basis manual must be compiled on average experience per unit of rating adopted, to reflect the total value of the total hazard in a given district in a given classification.

As one of the prerequisites for the adoption of schedule rating was that the present system of compiling manuals be disturbed as little as possible and as such manuals are determined on average experience and therefore are average rates, the third method as here outlined was the one decided upon. It was a case of expediency, however, rather than scientific determination. The first plan mentioned is, in the author's opinion at least, the most nearly scientifically correct one, provided competition in rates is entirely eliminated and provided further that the data available for the construction of a minimum basis manual is available and he has no hesitancy in stating at this time that sooner or later that plan must be adopted.

Having established the relative values of the accident causes

which were to enter into the schedule and having also determined upon the plan of application, the deciding of how the different values were to be used, how they were to apply to the manual rate was the next question. In the plan proposed under the auspices of the Industrial Commission of California, a percentage basis was used entirely predicated however on the assumption that the relative importance of causes of accidents by actual exposure was a definite known quantity which later was found to be an erroneous assumption. In the plan used by the Aetna Life Insurance Company, an opposite procedure was adopted, namely, that of a flat charge or credit on the rate.

A careful analysis was again made of all causes of accidents as to their relative effect on the employees in a given establishment and it was determined that there are in the average manufacturing establishment three distinct classes of hazards or accident causes, namely:

First, catastrophe hazards, such as those due to the burning of buildings, collapse of buildings, boiler and other explosions. The charges and credits applicable under this head affect necessarily the entire payroll in the building and therefore were to be applied on a basis which would affect the rate on the entire exposure, it must be borne in mind here that compensation is based on earnings of injured or killed employees and has no relation whatsoever to rate for insurance and as the wages on an average are as high in low rated classifications as they are in high rated classifications, a charge or credit for the presence or absence of such catastrophe hazards if on a percentage basis would necessarily establish discrimination as between the low rated and high rated classifications, a discrimination not at all justified because in case of a catastrophe the actual amount in compensation to be paid the low rated classification would be as high as it would be in the high rated classification, assuming the same number of employees killed in either. Still if the charges were made on a percentage basis, we would have received a much higher premium for identically the same hazard in the high rated classification than we would in the other. The rate charge or credit imposed for these hazards, therefore, had to be the same for both classifications and applied by adding or deducting the same amount to or from the base rate for all classifications.

Second, we have the hazards incident to or inherent in the particular industry and affecting all employees. This hazard, some-

times referred to as pure hazard, is constant as long as the present methods of conducting a certain industry are used. Any increase or decrease in that hazard, however introduced, by new methods of operation of the industry or otherwise, must have a corresponding effect upon the basis rate computed to cover the hazard in the classification. Therefore, charges and credits under that heading were made on the percentage of manual rate basis. The hazards to which this applies are, particularly, the working machine hazards, some of the power transmission equipment hazards and such conditions as affect the plant as a whole in relation to management, nature of employees and general moral conditions. In this category comes, naturally, also the amount of the machine payroll in relation to total payroll exposure, it having been definitely established under liability conditions that the accident frequency in a given establishment bears a close relation to machine payroll. For instance, a furniture factory with an 80 per cent. machine payroll exposure as against one with a 20 per cent. machine payroll exposure present quite a different underwriting risk and as that machine hazard is part of the inherent hazard in the classification, the difference is reflected in increase or decrease of manual on a percentage basis.

Third, we have the hazards incident to, but not necessarily inherent in or necessary for the successful conduct of the industry, hazards, however, to which only a limited number of employees are ever exposed at any one time. It would manifestly be unjust to charge the entire payroll for these hazards because in a large plant it would be a physical impossibility to expose all employees to either one of them simultaneously. Let us take for instance, a stairway. After careful investigation of several thousand manufacturing plants, this fact was established: that due to the location of the stairway only a limited number of employees could ever, in the daily routine of their work, use that stair; and that the limit on the average was approximately fifty men. The same was true with numerous other hazards of a similar character. Therefore, fifty men, or $25,000 payroll, was assumed as the average exposure to any one of the so-called adjusted to payroll charges and credits.

It may not be amiss to submit a few explanatory comments in relation to these charges and credits, in view especially of certain criticisms having been presented from various quarters on the correctness of the principle involved. It is held that in applying the schedule this part imposes disproportionate charges on small pay-

rolls—such is not the case—whereas the percentage in relation to basis rate is greater in the small plant; in other words, the rate charge is greater in a small puant than it is in a large plant, the premium charge is the same in both, the reason being that the cost of improvement or removal of the hazard must be taken into consideration as well as the accident probabilities and it obviously costs as much to remove a protruding set screw or cover a set of gears or a belt in a plant with ten employees as it would cost to remove the same hazards in a plant with one thousand employees. Therefore, from an economic standpoint, the principle is correct. From an exposure standpoint it is equally sound because, whereas in a plant of one thousand, fifty men are assumedly exposed to that hazard some time or other during the working hours, in the plant of ten men with a greater proximity of these men to the hazard, the exposure per man becomes greater in the same proportion.

It will undoubtedly be argued on this point that an insurance company as an underwriting medium is not concerned fundamentally with improvement of risk; in fact, some have already argued that if the companies do concern themselves on that point, it is certain to result in financial disaster. By what line of reasoning this thesis can be sustained is admitted to be beyond the author's comprehension. He holds it fundamental to the correct establishing of the rate values in a schedule that the cost of removing the hazards must be considered. He further holds that the very position the insurer of industrial accidents holds, automatically compels him to pursue a line of endeavor which an organization established solely for the purpose of accident prevention would follow.

As the schedule now stood it constituted a combination of the ideas brought out under the auspices of the California Industrial Commission and the ideas brought out in the experiments of the Aetna Life Insurance Company.

Certain phases of the schedule as a whole met with strenuous objections from prominent underwriters, particularly the so called discretionary credits. It was realized in the study of the subject that there were numerous hazards incident to industrial establishments upon which it would be impossible to affix specific values unless other conditions having bearing on the hazard were studied conjointly. For instance, a faulty foundation of a building, a tank on top of the building, the elusive term of "general order, light and sanitation," maintenance, etc., nature of employees, and so forth.

To successfully value, say for instance, a defective foundation, the extent of the defect had to be known and it was impossible to establish degrees of defects of that nature. That had to be brought out on inspection; it had to be studied in relation to the exposure as well. A faulty foundation in a building containing only one man would naturally not present the same horror to an underwriter from a catastrophe standpoint as it would if, say a hundred employees were present. The same is equally true of overhead tank exposures. The objecting underwriters were convinced on that point, that it was necessary these values remain discretionary, but when it came to nature of employees, the effectiveness of management, general order, light and sanitation, etc., it was held that facts in relation to these so-called moral conditions could be established only after an intimate knowledge of the risk based on past experience. Instead of these items being discretionary as respects the underwriting, therefore, they were put on the basis of experience. In other words, individual experience was added to the schedule as part of it, dividing it into two distinct parts with a limit of reduction permissible under physical improvements and a limit of reduction allowable under individual experience. After eighteen months, therefore, the two extreme views, that of the introspective school and that of the retrospective school had resulted, as stated, in a compromise. It has been argued that this compromise is equivalent to an attempt to mix oil and water; that the thesis that both can be successfully applied to the same risk is fundamentally wrong. Results so far obtained have not demonstrated the verity of this contention, but it is too early yet to speak of any definite result in this respect. Time only will bring it out.

Successful application of schedule rating is dependent upon two fundamental operations. First, a detailed analysis of the hazards in the risk under consideration by personal investigation. Second, a correct application by the underwriter and rater of the facts thereby brought out. The facts to be brought out on inspection, however, must be determined on a common basis; that is, the hazards in the different plants within the same classification must be measured by the same standard. As no uniform standards of safety were in existence, it became necessary before the schedule could be applied to establish such uniformity to enable the different inspectors, irrespective of the human equation, to arrive at practic-

ally the same result in the same plant. Necessity, again, was the compelling factor and a series of standards, known as "Universal Safety Standards" were adopted covering all the accident causes considered under the schedule.

In conclusion as to the effect of schedule rating objections are frequent that it has shown a tendency to reduce manual rates. The author will say to these objections that if it did not reduce manual rates on the average, it would not be worth the time or money spent in its development. Reduction of average rate must be a natural sequence of all forms of schedule rating.

Assuming a given classification with a basis rate on average experience on the entire classification say of 100, the hazards within the industry of that classification are analyzed and valued as to frequency and severity by causes. Upon inspection of all the risks, it is found that 50 per cent. of them carried an increase in manual due to sub-standard conditions, the other 50 per cent. carried a decrease due to super-standard conditions; that is, in both instances conditions, varying from the average, produced as a whole the net gross premium which would have been obtained if manual rate was applied to the whole.

Is it to be assumed that the employers paying the higher premium are not going to find out why they are paying more than their competitors for insurance of the same line of operation? And is it to be assumed that competition among insurance carriers is not going to result in their being made conversant with how they may reduce their rates? Surely not! And that is exactly the condition or the result schedule rating should bring about. The insurance carriers are sending their experts through the plants to locate and advise the establishment owner of where and how by actual improvements he can reduce his rate, and by these improvements the hazard of the classification as a whole is naturally reduced in direct proportion. And if the average rate originally computed was a correct one, that rate must necessarily, with the plants bettered through the removal of these hazards, be reduced in direct ratio.

The president of the society requested the author not to make the paper a defensive one as respects the "Universal Analytic Schedule." An effort has been exercised in the preparation to comply with his wishes. However, as no other schedule but this one is in universal application and as the author has professional and personal interest in it, it has been hard entirely to comply with the

request. Let it be noted, however, that it has been frankly admitted that many factors in the compilation of the schedule were assumed without any definite data to substantiate same. This, however, is not to be charged against the author of the schedule, but rather is an indictment of the lack of foresight displayed by the actuarial and statistical departments of the federal and different state bureaus as well as by these departments of the liability insurance companies. Referring especially to the latter, and in the words of Mr. C. E. Scattergood, "it should not be counted enough for the statistical departments to simply compile figures as to how much the insurance companies have been paying out for accidents; they should be able to show with equal conclusiveness why it had been paid out and why and how accidents happen." Until such data are available any proposed changes in the schedule as now applied will be but a pitting of expert opinion against other expert opinion and any radical changes in the present system, until authoritative data is available would be to say the least ill advised.