COMMERCIAL FIRE INSURANCE RATEMAKING PROCEDURES

BY

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FOREWORD

It is difficult to imagine that anyone with a just appreciation for historical facts is likely to be much influenced by those who would summarily dismiss all that has gone before in the fire insurance field as the workings of an industry, hide-bound in its conservatism, devoted to the past, and inflicted with a never-ending infancy. Hopefully, we can help to dispel any such notion in the few introductory sections of this paper which, with a due regard for historical precedence, will attempt to explain the actuarial procedures currently used to evaluate commercial fire insurance rate levels and to determine classification adjustments needed to implement such requirements. And, maybe, it will not be taken amiss that one who has never hidden his partialities (well founded, we believe) for the fire insurance ways, must warn of the changes even now upon us. Things which seemed impossible just a short time ago are now taking place with the dynamic changes in industry thinking and responses. But this is a story for another occasion, and, possibly, a more adventuresome pen.

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1. Some Background in the Development of Fire Insurance Rates

Although the history of the fire insurance industry in the United States reaches back to, and is even intimately connected with, the lives of some of our founding fathers, fire insurance rates did not quickly, or easily, win the acceptance and authority with which they began to be regarded shortly after the turn of the century. The early days, the archives suggest, were marked with frequent mistakes and many failures.

It must be remembered that, at the start of the 19th century, the Alleghenies were the nation's frontier, and as the pioneers began to push west, the insurance companies, mainly located on the Atlantic Coast, found it necessary to appoint special agents to travel the new territories and investigate the type of risks being written for them by the local business community. It, undoubtedly, must be difficult today to appreciate the initial frustrations of these companies attempting to introduce some order and stability into the many burgeoning local communities wherein, it seemed, periodic catastrophes would hardly interrupt the almost incessant rate wars. It might not be wrong to picture the temper of those times as an environment of mutual recriminations by outraged insurance practioners; each expostulating with the rate-shaving practices of his confreres, unmindful of his own failings on the same score.

It has been said that chaos seldom happens by mere chance. On the contrary, it is often the result of developments which, in retrospect, can usually be isolated and, with some study, evaluated reasonably well. In this particular instance, the initial calamities were understandable, and correctable. The hamlets, villages and towns were new-built with little regard to planning for safety. These first fire insurance men, for most part, were novices with little or no knowledge of construction and fire protection techniques. There was no standardized fire insurance policy, no real financial or accounting requirements, and no statistics.

It was a situation in which things just had to get better.

Many of the difficulties of those early days have been corrected. For example, we have had for many years a standard fire policy. There is no longer any lack of financial and accounting requirements imposed on the industry. But some of the other problems have not afforded ready solutions, and it is interesting to read that Horace Binney, in April 1852, singled out the festive occasion of the Centennial Anniversary of his Philadelphia Contributionship to complain of: "the defective state of our knowledge in

regard to the facts that ought to govern us in our estimating the risk of loss by fire, and the proper rates of premiums of fire insurance".

It took almost another half century before any significant advancements were made in fire insurance rating practices. The subsequent landmarks would certainly embrace the introduction, in 1893, of F.C. Moore's Universal Mercantile Schedule which, one authority notes: "No system was set up for maintaining the schedule as originally conceived—and it has tended to be adapted and modified—to fit the particular needs of each state—however, variations of this schedule are the basis of schedules in use today in almost half the states".

Probably no other single work has shared the prestige accorded A.F. Dean's Analytic System for the Measurement of Relative Fire Hazard which, from early pamphlets in the 1880's, Dean successively expanded and modified until the October 1904 publication, as titled above. The "Analytic System" has been copyrighted, maintained and periodically revised. It has been noted that the Dean Schedule was based on the fundamental concept of "relativities of hazards", whereby the hazard relativities, once established, could be adapted to differences in loss costs, or burning rates, between one territory and another, or between one period of time, and another. As E.R. Hardy notes in his book, *The Making of the Fire Insurance Rate*[1], "There are few men who have contributed more to the solution of the rating problem than A.F. Dean".

It is hoped that these brief preliminary paragraphs may indicate well enough that the early fire insurance instrumentalities and practices did not, like the legendary Athene, spring full-grown from the forehead of Zeus, but rather evolved gradually, and at times falteringly, from modest beginnings. Moreover, with recognition that our present knowledge of the fire insurance business is, in itself, not absolute and immutable, but that it too must be periodically reassessed in terms of the emerging challenges. Let us proceed along with our investigation into the developments within modern times.

2. *The Changing Nature and Function of the Fire Insurance Rate in Modern Times*

The desideratum for the "Making of Rates" under item 3(a)2 of the January 24, 1947 All Industry Fire, Marine, Inland Marine Model Rate

[1]E.R. Hardy, *The Making of the Fire Insurance Rate* (The Spectator Co., Philadelphia, 1926).

Regulatory Bill was succinctly proclaimed as: "Rates shall not be excessive, inadequate, or unfairly discriminatory". Maybe with some apprehension that such a ringing phrase might appear to indict the authors of a greater concern for "sound" than "substance", an article 3(a)3 was added, enumerating various factors to which consideration might properly be afforded in the implementation of the ratemaking responsibility. It is interesting to note, for possible future reference, that this particular article 3 carries the specific provision that: "in the case of fire insurance rates, consideration shall be given to the experence of the fire insurance business during a period of not less than the most recent five years".

It would not be difficult, but obviously unfair and a misreading of the intent and of the times, to accuse the proponents of the model rate regulatory bills of a purely legalistic approach, with little or no concern for the philosophical and economical realities underlying fire rate level determinations. It must be remembered that these particular men were charged with the responsibility of suggesting some model language that would be acceptable and would unite the leaders of the industry (who represented different and, on some items, widely divergent points-of-view) in support of legislation that was of vital concern to the industry in one of the most trying periods of its history. It was not a time, nor proper occasion, for a philosophical and economic treatise on fire insurance ratemaking.

Somewhat later, in the early 1950's, Professor Clarence Kulp[2], in a contribution to the Duke University's symposium on Regulation of Insurance, addressed himself, in the course of his remarks on ratemaking, to the underlying problem of the nature and the function of the insurance rate. While admitting freely, at the outset, the importance both of the "non-excessive" and "non-discriminatory" aspects of the insurance rate, Professor Kulp strongly advocated that these criteria, desirable as they may be, would be significantly less important than the need for "rate adequacy".

He cautioned his listeners that the insurance rate should produce total funds to cover the insurer's obligations. If the rate is insufficient over the years, there can be no insurance business, since the accumulation of reserve funds for future contingencies requires capital, and capital costs money as every city and state, and even the Federal Government, finds out each time it competes for funds in the capital markets against the securities issued by

[2]*Law and Contemporary Problems, Regulation of Insurance*, School of Law, Duke University Vol. 15, No. 4, Autumn 1950

all other borrowers. Of course, at the end position, a Government might requisition all the funds it needs without turning to the capital markets; but the U.S. Government has not been founded on this principle.

In his analysis of the standards of "equitable" and "not unfairly discriminatory" rates, Professor Kulp noted that these criteria were a much later technical development. Making a "fair" rate is, technically, a far more complicated process than making one that is simply "adequate". It should be patently clear that procedure wherein the losses for a single year or multiple years are divided by the corresponding exposures and then loaded for expenses cannot be expected to produce, necessarily, "equitable" and "not unfairly discriminatory" rates. There are the inherently technical problems of classification of risks by coverage, territory, composite characteristics, the adjustment of the premiums and losses to current levels, and the, always overriding, tests of the credibility of the experience.

3. Maintenance of Fire Insurance Rates in The Transition Period

There is probably little need to trace, in detail, the development of the fire rating bureaus; created in response to the early rate regulatory laws, and functioning, almost, as an adjunct to the state regulatory authority. As one author noted, "The state was the watchdog against excessive rates, and the rating system (i.e. operated by the bureaus) was the device by which property owners were treated uniformly and without unfair discrimination".[3]

Within its operational capabilities, the bureau system of fire ratemaking guaranteed, as surely as any human institution can, "equitable" and "not unfairly discriminatory" rates. The rate was developed for each individual risk based on an analysis of its own particular fire hazards by an engineer trained in the profession and completely impartial as to which insurance company might be writing the risk. There was, however, some feeling that if the rigid bureau system had any significant limitation it was, most likely, in the area of delayed rate level adequacy and an inherent reluctance to visualize risks from other than the aspect of the physical fire hazards presented. The industry's response, in recent years, to this challenge will be highlighted in some detail in subsequent sections.

While the bureau's tariff, or minimum, rates may have, at one time, set the rate for fire coverage on dwelling property, there is no comparable

[3]Kent H. Parker, *Property & Liability Insurance Handbook* (Long & Gregg, Richard D. Irwin, Illinois, 1965), Chapter 13.

limitation in the case of the fire schedule rate used on practically all non-dwelling properties. The individual fire schedule rate is used to compute blanket rates for fire policies covering more than one piece of property. It is the basis of the Multiple Location (Fire, ECE, & Allied Lines) Rating Plans. It has also been used to figure rates for Installation Risk, Garment Contractor, Jewelers Block, Dies and Patents, and other Inland Marine and floater type policies. And as is well known, the fire schedule rate on the individual commercial risk serves as the starting point of the SMP policy and of many of the independently filed package policies.

However, the schedule fire rate has not often maintained its original identity. Normally, it is adjusted (usually downward) as it is fed into its various subsidiary applications. Progressively, it has become more and more difficult to determine what portion of the final policy rate is attributable to the fire hazard, and many believe that such a disclosure, were it possible, would be futile. Nonetheless, the pervasiveness of the fire schedule rate, even if incognito throughout the somewhat amorphous package policy development, would seem to be of some potential significance.

With all that has happened since the "SEUA Decision", it is difficult to imagine that one might be tempted to maintain that there need not be any connection between fire rates and the evolving loss experience. But, maybe, he would be guilty of no less a temerity were he to insist that the fire rates be tied to a prescribed body of statistical experience without a critical investigation into the appropriateness of the particular statistics. Those of a scholarly persuation would, likely, hope that there might be some middle ground, albeit a little breathing space, for discussion between these two extreme positions.

Insurance rates are established, as is generally recognized, on a prospective, not a retrospective, basis. Consequently the subsequent experience, whether it happens to be favorable, unfavorable, or just what was expected, is not necessary proof that the rate levels were either "right" or "wrong". The progressively evolving experience is used successively only to gauge, once again, what the next year's prospective average overall rate level should be. Sometimes the subsequent loss ratios will be higher, sometimes lower, but seldom ever exactly the same as the balance point loss ratio. We can suspect that our rating system has an inherent defect of some serious consequence, only if the experience is persistently, over the years, either almost always above—or conversely, almost always below—the balance point loss ratio.

Students of the business are aware that for fire insurance (except for dwellings) the chance of other than "bagatelle" losses is of a relatively low order of probability. For example, it has been estimated that, on commercial and industrial properties, 92% of the losses, by number, account for only some 15% of the total payments. The following abstract from the National Board of Fire Underwriters' 1964 tabulation of adjusters' reports is indicative. Since the adjusters' reports did not commonly include losses under $250, these have been provided from research associated with, and subsequent to, an earlier paper.

Fire Classes—Other Than Dwelling

Loss Size	Frequency		Severity	
	No. Losses	%	Pd. Loss	%
Under $5,000	191,035	92.1	$ 81,328,000	16.6
$5,000 + Over	16,429	7.9	410,001,000	83.4
Total	207,464	100.0	$491,329,000	100.0

4. Introduction Of The Actuarial Discipline Into Fire Insurance Rating

Maybe, 1958 should be singled out as the transition year. Prior to the date, the industry's fortunes had been pledged to the many local rating bureaus whose response to a nationwide commitment would naturally have been conditioned by the necessary concern for purely parochial interests. The creation of the Inter-Regional Insurance Conference (IRIC) was inspired, it might be viewed in retrospect, as some sort of an early ecumenical movement in the commercial field of insurance to encourage a business community understanding of the industry's substantive and nonsubstantive needs and responsibilities.

The challenge was great. The response, even with some understandable but regretable disaffections, may have been more than should have been expected. Certainly, the general willingness to share set the sights for what had to be done.

In 1958, IRIC came out with its first Recommended Procedure for Fire Rate Level Adjustments, subsequently revised in later years. In hindsight, it was not a very ambitious undertaking. To suggest to the local fire rating bureaus that they should use "earned" rather than "written" experience, that they should adjust prior collected earned premiums to current

rate levels, that they should give more weight to the most recent year's experience, may now seem needless and even somewhat trivial. But, believe it or not, the selling job was not always easy.

No useful purpose would now be served to retrace the anxieties, the misunderstandings, the disappointments that eventually lead to the IRIC demise. It would be much better to record that the IRIC established the first actuarial committee which was composed, almost exclusively, of professionals with membership in the Casualty Actuarial Society and which was charged with the continuing responsibility for introducing sound rating principles into the property insurance field. The honor roll of this particular membership would include so many actuaries, who have also contributed to the affairs of the CAS, that one, instinctively, hesitates to attempt the list lest he, inadvertently, might fail to record even one, among so many, who served with such little concern for personal aggrandizement.

The subsequent, and final, section of this paper will detail the present procedures used in establishing commercial fire statewide rate levels and classification relativities as they have been developed from the continuing research of the industry's actuarial committees which succeeded IRIC. It is believed, however, that any account purporting to record, even if only "en passant", the IRIC actuarial contributions would, most surely, have to cite two of its responses to, perhaps, subsidiary, but certainly somewhat related, challenges.

The first of these was the rating plan to provide for the recognition of of windstorm hazard in the Extended Coverage Endorsement, as requested of the industry by the National Association of Insurance Commissioners (NAIC).

The NAIC, due to the severe catastrophe along the Atlantic Seaboard and the Gulf States during the 1950's, was concerned with the effect of such occurrences on rate level gyrations and/or market availability of windstorm coverage. Consequently, it appointed a committee, representative of the various segments of the industry, to study the problem and, if possible, recommend a feasible solution thereto. This Special Windstorm Catastrophe Rating Subcommittee's findings were reported by the NAIC at its June 1962 convention in Montreal.

Subsequently, based on this principle, the IRIC Actuarial Committee recommended to the local fire rating bureaus an Extended Coverage Rate Level Review Procedure incorporating these criteria. This prototype

EC rating plan, encompassing the windstorm catastrophe element, went through a number of editions and was subsequently adapted to the needs of the present monoline commercial EC requirements and the Homeowners rating procedures. A number of the actuaries who developed this original IRIC Catastrophe Windstorm Rating Plan (while possibly no longer so active in primarily technical responses to such challenges) are, for most part, still in the forefront of industry developments.

While this windstorm catastrophe element has been prescribed reading for CAS examination candidates for a number of years, the property insurance industry's joint report to the 1962 NAIC convention has not generally been readily available, and for this reason it is included as Memorabilia A to this paper for future students of the industry.

The second IRIC actuarial study of possible interest to future students of the commercial fire insurance business would, conceivably, be the 1961-1962 deductible investigations. Previously, it had not been possible for the industry to make actuarially credible determinations of the probable savings under various deductible contracts because of the almost universal practice of fire insurance companies to share large commercial lines and the limited significance that could be accorded, even to any one large company's full-line writings, because of the underlying credibility requirements.

With the cooperation of the General Adjustment Bureau and the Factory Insurance Association, data on some 80,000 losses totaling some $190 million in loss payments were analyzed, and deductible rating plans were recommended by the IRIC and Fire Insurance Research and Actuarial Association, FIRAA (i.e. a successor to IRIC), to the local fire rating bureaus as supporting materials for rate filings to be made on behalf of their member and subscriber companies. Again, to record this IRIC initial property actuarial research for present and future scholars of the business, there is enclosed as Memorabilia B the deductible rating plans, and supporting materials thereto, recommended to the local fire rating bureaus. Experience has indicated that the materials contained therein are self-contained and fully comprehensible, even to knowledgeable persons with no special training in actuarial theory

5. *Present Actuarial Procedures For Evaluating Commercial Monoline Fire Statewide Rate Levels And Classification Relativities Thereon*

The concluding section will treat separately in some, but hopefully not

exhausting, detail present rating practices. A few prefatory reminders may be in order. The fire insurance business is now much different than when Horace Binney issued his 1852 clarion call for rating reforms. Frederick Moore and Alfred Dean, important as their contributions at the "turn of the century" were, would hardly be equipped to cope with the industry's present rating problems.

Even those industry leaders who successfully steered the troubled ship "Insurance" through the uncertain waters of Public Law 15 and the All-Industry Rating Laws might well discover it difficult to relate to the social, economic, and moral changes that have dominated our post World War II era. The Insurance Industry has had to re-examine its position, reassess its capabilities, and reallocate certain of its resources.

Consequently, there is described in the following paragraphs solely the present rating practices, without any implication that further changes therein may not shortly be required. An understanding, however, of the current procedures is a requisite to determine what changes may be needed to adapt our rating methods to the future challenges.

A. Evaluation of Statewide Rate Levels

Exhibit I presents, on a single page, an actual rate level workout for a filing with an effective date of June 30, 1973. The top section shows the calendar year collected earned premiums and incurred losses of the companies whose experience is used to evaluate rate levels in the particular state. No actuarial adjustments are made directly on these actual dollar premium and loss figures, which are no longer needed once the "Unadjusted Loss Ratios" in Column (1) of the section "Rate Level Calculation" have been computed. In this particular exhibit, the 1971 Unadjusted Loss Ratio of 55.3% is obtained, by dividing incurred losses of $23,835,327 by earned premiums of $43,132,303.

I. Adjustment of Losses

In Columns (2) and (3) of the section "Rate Level Calculation", the loss ratios for each of the calendar years are brought up to the current cost levels using the latest available Current Cost Factors (CCF). The loss ratios are then adjusted to the prospective cost levels 12 months beyond the anticipated effective date of filing, using the Trended Cost Factor (TCF) in Column (4).

The CCF is calculated from a weighted average of the U.S. Bureau of Labor Statistics Consumer Price Index and the U.S. Department of Commerce Composite Construction Cost Index, as shown in Exhibit I(a). The weights used give recognition to the relative volume of contents and building expected losses, respectively.

The Trended Cost Factor is calculated from the projection of the fitted (i.e. linear least-squares) Composite Current Cost Index (CCCI) to the point 12 months beyond the anticipated effective date of the rate filing, as shown in Exhibit I(b).

The sequence of the computations may be summarized as follows:

Adjustment to current cost levels

The loss ratio for each calendar year is multiplied by its appropriate Current Cost Factor (CCF), which is developed by dividing the latest available average quarterly CCCI reading by the average CCCI reading for the particular calendar year, and is shown in Column (2) of Exhibit I.

Determination of trend

The trend in the CCCI is computed from the linear "least-squares" line fitted to the twelve (12) latest available average quarterly CCCI readings (i.e. quarters ended March 31, June 30, September 30, and December 31). The statistical calculations are shown in Exhibit I(b).

Development of Trended Cost Factor (TCF) will then involve the following mathematical computations:

a. Count the number of months between the latest CCCI readings used above (midpoint of quarter) and the date 12 months beyond the anticipated effective date of the filing and divide by 12.

b. Multiply by the latest available annual rate of change in the fitted value of the CCCI as determined in Exhibit I(b).

c. Add unity, the resulting sum is the TCF which appears in the heading of Column (4) of Exhibit I.

In Column (5) of the section "Rate Level Calculations", the calendar year loss ratios are adjusted for changes in coverage. In this particular example, a small deductible was introduced in the early years of the experience review period and, consequently, the losses prior to 1969 had to be reduced

slightly for the LER (Loss Elimination Ratio), which is the complement of the savings in losses under the new deductible coverage.

II. Adjustment of Premiums

In Columns (6) and (7), the calendar year loss ratios are adjusted to current rate levels by reflecting the effect of prior rate changes through the "Premium Conversion Factors" (PCF). These PCF's are computed, for this particular example, in Exhibit I(c).

This Exhibit I(c) is divided into three sections of which the top gives both a history of prior average rate changes for all commercial classifications, in the particular year, and a series of index numbers of these rate changes.

The middle section of Exhibit I(c) presents, in parallel columns for each year, the average index and the rate modification factor. For example, the May 8, 1968 rate increase of 3.8% produces an average calendar year index of 1.391 for the calendar year 1968 since the prior rate level of 1.358 was in effect through May 15 or 9/24ths of the year and the then new rate level of 1.410 became effective for 15/24ths of 1968, calculated as follows:

$$[\tfrac{9}{24} \times 1.358] + [\tfrac{15}{24} \times 1.410] = 1.391$$

In the same section, the second column, "Rate Modification Factors" (RMF), gives the factors to be applied to the segments of each year's earned premium contributed from the policy premiums written in prior years. These RMF's are all expressed in terms of current rate level index by dividing each year's index into the current index. For example, the RMF for 1968 of 1.088 is obtained with the division of the 1968 average calendar year index of 1.391 into the index which is in effect as of the date when the rate level evaluation is being calculated (i.e. 1.513).

In the bottom section of Exhibit I(c), the PCF's are finally computed. It will be noted that, of the calendar year 1971 earned premiums 47.5% came from policy premiums written in 1971, 41.5% came from premiums written in 1970, 7.0% from 1969 writings, etc. Consequently, the PCF for calendar year 1971 is obtained by taking: 47.5% of the RMF for 1971 (i.e. 1.000), plus 41.5% of the RMF for the year 1970 (i.e. 1.035), plus 7.0% of the RMF for the year 1969 (i.e. 1.073), and 3.8% of the RMF for 1968 (i.e. 1.088), and similarly for 1967 and 1966. The sum of these products gives 1.024, the PCF for calendar year 1971.

Returning to Exhibit I, we are now ready to determine the rate level indication by extending the rate level loss ratios in Column (7) by the series of weights, which attach greater significance to the more recent experience. The sum of these weighted loss ratio factors, in Column (9) of 64.0%, is multiplied by 1.065 to include the loss adjustment expense. The series of calendar year weights have been established on an underwriting judgment basis. The 1.065 loss adjustment expense factor is developed by an analysis of the ratio of the loss adjustment expense to incurred losses for the three latest calendar years.

Normally, this rate level loss ratio of 68.2% (including loss adjustment expense) would be divided by the "Balance Point" loss ratio to determine the overall commercial fire rate level indication for the particular state. The "Balance Point" loss ratio equals unity less the sum of the profit provision, tax elements, and all expenses except loss adjustment expense, or 56.5% as detailed in the following. Since this example is based on the actuarial calculations underlying an actual rate filing, it was subject to the, then operative, Phase II Federal Price Guidelines which provided that the Company General Expense (i.e. 9.5%), the Other Acquisition Expense (i.e. 3.5%) and the Profit Provision (i.e. 5.0%) be limited to a 2.5% increase, while the budgetary provision of 21.5% for Production Cost (excluding Other Acquisition), Taxes (3.0%) and the Loss Contingency or Catastrophe Allowance of 1.0% might be treated as a direct function of premium.

It is believed important to observe that it is intended that the Federal Economic Stabilization Program would be continued solely for the emergency period and that the industry would return thereafter to the normal Balance Point loss ratio procedures.

The resulting rate level change of (+) 16.3% is finally modified to reflect the Civil Disorder (C-D) Element (1.3% in this particular instance). The C-D factor has been computed from an analysis of each state's distribution of population between metropolitan and rural areas and subsequently adjusted for the developing experience.

B. Determination of Classification Rate Level Relativities

Before attempting to outline the general guidelines for classification rate adjustments, we believe it may be helpful to retrace certain fundamentals.

Basically, fire insurance rates must be geared to expected losses. It is not improbable that from its earliest beginnings, the fire insurance rate has been visualized, at least implicitly, in such terms. In the days when a rate of, say, $1.00 was charged for a relatively broad spectrum of risks, there must have been the expectation that the resulting funds would be adequate for the losses and expenses that would ensue. With the subsequent advances in fire protection engineering, schedules were developed to measure, with progressively more detailed treatment, the hazards presented by individual risks.

However, over the years, supervisory authorities have been increasingly interested in correlating proposed fire rate changes to the classification loss ratios. This trend, it is believed, does some violence to basic concepts in that it weakens the original visualization of the rate, as a measure of "expected losses", by attempting to "true-up" rates with the vagaries of class loss experience. And, on occasions, it introduces certain elements of rigidity, which work against the realization of a proper overall rate level. The situation wherein the rate level inadequacy can be traced to a limited number of classes, and the needed rate increase cannot, practically, be realized just from these few occupancy—protection—contruction groupings is an example of this.

Consequently, once the statewide rate level has been determined, the procedure described hereinafter rests on the cardinal principle that each subsidiary classification adjustment should depart from this statewide norm only to the extent that there are actuarial indications for such a differential.

Throughout the earlier years, fire classification rate level adjustments had generally been made on an informal, semi-statistical basis, with the result, sometimes, being that the sum of the individual revisions did not equal the indicated overall statewide rate level need. The objective of the present procedure, therefore, is to provide a systematic means of determining classification rate level adjustments with a greater degree of actuarial precision than possible heretofore, and at the same time to facilitate the achievement of overall statewide rate level indications.

State individual classification experience often does not, in itself, provide a sufficiently credible basis for determining classification rate level indications. The presence, or absence, of large losses during the review period, plus the low order of fire frequencies, can produce intolerable

fluctuations in the classification experience and, therefore, normally requires that consideration be given to a broader base of experience. This procedure contemplates review of classification experience in conjunction with statewide major industry results and with regional classification data—all on the basis of incurred losses and earned premiums adjusted to current rate levels.

The underlying credibility tables recognize premium volume and a broad judgment of inherent classification hazard. Each of the major classifications and industry groupings was reviewed, both from its underwriting and engineering aspects (i.e. inherent physical hazards) and from its actuarial aspects (i.e. the average annual loss ratio variation). Each classification was then assigned to one of three credibility tables. Credibility Table A was established for use on classes with low hazard risks and with expectation of extremely stable loss ratios. Table B is to apply to medium hazard risks with expectation of average loss ratio stability. Table C is to apply to high hazard risks with the expectation of poor loss ratio stability. Each credibility table was graded by premium volume utilizing a curve, $Z = P/(P + K)$, where Z is credibility and P is the premium volume for the latest 6 years. As indicated in the footnote to Exhibit II, Page 1, the K values are respectively \$500,000 for Table A, \$2,500,000 for Table B and \$10,000,000 for Table C.

Exhibit II presents the procedure used in developing the indicated classification rate level adjustments:

1. The statewide overall commercial fire rate level indication is calculated as outlined in the previous section.
2. The indicated rate level change for each major industry group is then determined:
   a. The state major group loss ratio (${}_sL_g$) is given the credibility value (${}_sZ_g$) corresponding to its earned premium at present rates and the credibility table to which it has been assigned. In the summary portion of Exhibit II these credibility values are shown in column (4).

      The complement of this credibility ($1-{}_sZ_g$) is assigned to the regional loss ratio (${}_rL_g$) for the same major group. In the summary section, these complements are not shown because

column (8) is used in the other sections to show the actual regional credibility values as discussed below.

b. A credibility weighted state and regional major industry group loss ratio (M_g) is calculated by multiplying the state group loss ratio ($_sL_g$) by its credibility factor ($_sZ_g$) and adding to this result the product of the regional group loss ratio ($_rL_g$) and the complement of the state group loss ratio credibility ($1-_sZ_g$). The result of this calculation is shown in column (9) of the summary section.

Example: Major Industry Group II, Mercantile

State major group loss ratio ($_sL_g$) = 71.9%

State major group credibility ($_sZ_g$) = .97

Regional major group loss ratio ($_rL_g$) = 64.9%

Regional major group credibility ($1-_sZ_g$) = .03

$$M_g = [{}_sL_g \cdot {}_sZ_g] + [{}_rL_g(1-{}_sZ_g)]$$

$$M_g = [(71.9)(0.97) + (64.9)(0.03)] = 71.7\%$$

The total commercial weighted mean loss ratio of 62.6% is obtained by summing the weighted means for each major group by its state relative earned premiums as given in column (1).

The relativity index in column (10) for each major classification group results from dividing its own weighted mean loss ratio in column (9) by the total commercial weighted mean loss ratio in the same column. Specifically, the relativity for Group 02 "Mercantile" of 1.145 comes from dividing 71.7% by 62.6%.

The final column (11), the indicated rate adjustment for Group 02 "Mercantile" of +34.9%, results from extending the overall rate level requirement of 1.178 by its appropriate relativity of 1.145 given in the previous paragraph.

3. The individual class rate level adjustments are then determined as follows:

a. The state class loss ratio is assigned its appropriate credibility value ($_sZ_c$) and the regional class loss ratio its appropriate credibility ($_rZ_c$). If the sum of these two credibilities

$({}_sZ_c + {}_rZ_c)$ equals or exceeds 100% (i.e., 1.00), then the regional class credibility is assigned the complement of the state class credibility.

For instance: if the state class credibility is 40% and the regional class credibility is 90% the sum is 130%. Thus, the regional class loss ratio is assigned 60% (rather than 90%) credibility, which is the complement of the state class credibility (i.e., 100% less 40% equals 60%). However, if the sum of the state class credibility $({}_sZ_c)$ and the regional class credibility $({}_rZ_c)$ is less than 100%, then the regional major industry group experience is used to make up the balance of the needed 100% credibility.

b. A credibility weighted classification loss ratio (M_c) in column (9) is then calculated.

Example: Rating group 37 Laundries in Manufacturing major group.

State class loss ratio $({}_sL_c) = 45.2\%$

State class credibility $({}_sZ_c) = 0.16$

Regional class loss ratio $({}_rL_c) = 52.7\%$

Regional class credibility $({}_rZ_c) = 0.41$

Regional major industry group loss ratio $({}_rL_g) = 68.4\%$

$$M_c = ({}_sL_c \cdot {}_sZ_c) + ({}_rL_c \cdot {}_rZ_c) + {}_rL_g(1 - [{}_sZ_c + {}_rZ_c])$$

$$M_c = (45.2 \times 0.16) + (52.7 \times 0.41) + (68.4\,[1.00 - (0.16 + 0.41)])$$

$$M_c = 58.3\%$$

c. The rate level relativity .988 in column (10) is determined by dividing the particular class weighted mean loss ratio (i.e. 037 Laundries at 58.3%) by the 62.6% weighted mean loss ratio for all groups. However, the class loss ratio of 58.3% is first adjusted to the Manufacturing rate level loss ratio by the factor (69.8 ÷ 65.8), therefore:

$$\left\{\left[58.3 \times \left(\frac{69.8}{65.8}\right)\right] \div 62.6\right\} = .988$$

d. Finally, the relativity for the specific class (i.e. Laundries) of .988 is multiplied by the overall rate level indicated change of 1.178 to give a +16.4% increase (i.e., $1.178 \times .988 = 1.164$).

It will be noted that the overall commercial fire rate adjustment indicated for the state is distributed to each of the Major Classification Groupings. And then each of these Major Classification Grouping rate adjustments is distributed to each of the individual classes which make up the Major Classification Group. Consequently, the indicated adjustment for each of the individual classifications is keyed back into particular states overall commercial fire rate level requirements.

SOME AFTER-THOUGHTS

Certain aspects of the rate level procedures may seem to have been treated too cursorily herein. Others, the reader may feel, were barely mentioned, or even totally neglected. The subject of the loss trending techniques may serve as an example of the former and the extended coverage, which parallels fire at many points, an instance of the latter. Our sole defense, but no plea for exculpation, may lie in the consideration that no single paper could reasonably cover all aspects of the subject exhaustively and that emphasis is often a matter of personal preference.

As a partial amends for any failure on this score, we should like to conclude with a catalogue of CAS papers concerned with commercial fire insurance which, it is believed, may be read with profit by all and possibly with special delight by the studiously inclined:

1. Some Random thoughts concerning Fire Insurance—Is a Statistical Basis for Rating Possible?

   E. R. Hardy, *PCAS* Volume X

2. A Casualty Man Looks at Fire Insurance Rate Making

   M. H. McConnell, *PCAS* Volume XXXVIII

3. Problems of Fire Insurance Rate Making

   L. H. Longley-Cook, *PCAS* Volume XXXVIII

4. A Statistical Study of Large Fire Losses

   L. H. Longley-Cook, *PCAS* Volume XXXIX

5. The Uniform Statistical Plans for Fire and Allied Lines

C. H. Graves, *PCAS* Volume XL

6. Statistics of the National Board of Fire Underwriters

J. H. Finnegan, *PCAS* Volume XLIII

7. Ratemaking for Fire Insurance

J. J. Magrath, *PCAS* Volume XLV

8. Notes on Some Actuarial Problems of Property Insurance

L. H. Longley-Cook, *PCAS* Volume XLVI

9. Mathematical Limits to the Judgement Factor in Fire Schedule Rating

K. L. McIntosh, *PCAS* Volume XLVIII

10. An Introduction to Credibility Theory

L. H. Longley-Cook, *PCAS* Volume XLIX

11. Commercial Package Policies—Rating and Statistics

R. A. Bailey, E. J. Hobbs, F. J. Hunt, R. E. Salzmann, *PCAS* Volume L

12. A Mathematical Approach to Fire Classification Rates

K. L. McIntosh, *PCAS* Volume LII

13. Implications of Sampling Theory for Package Policy Ratemaking

J. T. Lange, *PCAS* Volume LIII

14. Underwriting Profit in Fire Bureau Rates

L. H. Longley-Cook, *PCAS* Volume LIII

15. Is Probable Maximum Loss (PML) a Useful Concept?

J. S. McGuinness, *PCAS* Volume LVI

INSURANCE SERVICES OFFICE Exhibit I

INDICATED COMMERCIAL FIRE RATE LEVEL CHANGE

YEAR	EARNED PREMIUMS	INCURRED LOSSES	LOSS RATIO
1966	24,840,666	13,811,578	0.556
1967	25,115,097	13,412,369	0.534
1968	25,122,692	15,655,167	0.623
1969	27,075,311	10,831,257	0.400
1970	32,883,716	20,520,943	0.624
1971	43,132,303	23,835,327	0.553

RATE LEVEL CALCULATION

YEAR	(1) UNADJ. LOSS RATIOS	(2) CURRENT COST FACTORS THROUGH 6/72 (See Exhibit Ia)	(3) L/R AT CURR. COSTS (1) × (2)	(4) L/R AT 6/74 COSTS (3) × 1.070 (See Exhibit Ib)
1966	.556	1.367	.760	.813
1967	.534	1.319	.704	.754
1968	.623	1.253	.781	.835
1969	.400	1.175	.470	.503
1970	.624	1.102	.688	.736
1971	.553	1.038	.574	.614

YEAR	(4) L/R AT 6/74 COSTS (3) × 1.070	(5) LER ADJ. FACT.	(6) RATE LEVEL ADJ. FACT. PCF (See Exhibit Ic)	(7) RATE LEVEL LOSS RATIO (4) × (5) / (6)	(8) WGTS.	(9) LOSS RATIO FACTOR (7) × (8)
1966	.813	.997	1.262	.642	.10	.064
1967	.754	.998	1.201	.627	.10	.063
1968	.835	.999	1.131	.738	.10	.074
1969	.503	1.000	1.061	.474	.15	.071
1970	.736	1.000	1.019	.722	.25	.181
1971	.614	1.000	0.986	.623	.30	.187
					SUM =	.640

Loss Ratio (Including Loss Adjustment Expense):

As Filed Under Phase II = (.640 × 1.065) = 0.682
Under Standard Procedure = 0.682 (1.111 ÷ 1.070) = 0.708

Balance Point Loss Ratio = 0.565

Indicated Rate Level Change (Ex. Civil Disorder)

$$\text{As Filed Under Phase II} = \frac{0.682 + 1.025\,(.035 + .095 + .050)}{1.000 - (.215 + .010 + .030)} = 1.163$$

Under Standard Procedure = (0.708 ÷ 0.565) = 1.253
Filed Rate Level Change (Incl. Civil Disorder) = (1.163 × 1.013) = 1.178

DEVELOPMENT OF CURRENT COST FACTORS (CCF) AND TRENDED COST FACTOR (TCF)

Quarter Ending June 30, 1972

Part A: Establishment of Monthly Composite Current Cost Index (CCCI), With:
40% Weight to Consumer Price Index (CPI) U. S. Dept. of Labor (BLS), And
60% Weight to Composite Construction Cost Index—U. S. Dept. of Commerce (DC)
(BLS Base: 1967 = 100 DC Base: 1967 = 100)

	1969				1970				1971			
MO	BLS	DC	CCCI	3 MOS AVE	BLS	DC	CCCI	3 MOS AVE	BLS	DC	CCCI	3 MOS AVE
7	110.2	115	113.1	112.3	116.7	122	119.9	119.5	121.8	132	127.9	127.1
8	110.7	116	113.9	113.1	116.9	123	120.6	120.1	122.1	133	128.6	127.9
9	111.2	116	114.1	113.7	117.5	123	120.8	120.4	122.2	133	128.7	128.4
10	111.6	117	114.8	114.3	118.1	124	121.6	121.0	122.4	133	128.8	128.7
11	112.2	118	115.7	114.9	118.5	125	122.4	121.6	122.6	133	128.8	128.8
12	112.9	118	116.0	115.5	119.1	125	122.6	122.2	123.1	134	129.6	129.1

	1970				1971				1972			
MO	BLS	DC	CCCI	3 MOS AVE	BLS	DC	CCCI	3 MOS AVE	BLS	DC	CCCI	3 MOS AVE
1	113.3	118	116.1	115.9	119.2	125	122.7	122.6	123.2	135	130.3	129.6
2	113.9	118	116.4	116.2	119.4	125	122.8	122.7	123.8	135	130.5	130.1
3	114.5	118	116.6	116.4	119.8	127	124.1	123.2	124.0	136	131.2	130.7
4	115.2	120	118.1	117.0	120.2	129	125.5	124.1	124.3	136	131.3	131.0
5	115.7	121	118.9	117.9	120.8	130	126.3	125.3	124.7	137	132.1	131.5
6	116.3	122	119.7	118.9	121.5	131	127.2	126.3	125.0	137	132.2	131.9

Part B: Use of Average Annual CCCI To Calculate Current Cost Factors (CCF)

CALENDAR YEAR AVERAGE CCCI				CURRENT COST FACTORS BASED ON AVERAGE CCCI VALUE FOR QUARTER ENDING JUNE 30, 1972 = 131.9
YEAR	BLS	DC	CCCI	
1965	94.5	93	93.6	131.9 / 93.6 = 1.409 *
1966	97.2	96	96.5	131.9 / 96.5 = 1.367
1967	100.0	100	100.0	131.9 / 100.0 = 1.319
1968	104.2	106	105.3	131.9 / 105.3 = 1.253
1969	109.8	114	112.3	131.9 / 112.3 = 1.175
1970	116.3	122	119.7	131.9 / 119.7 = 1.102
1971	121.3	131	127.1	131.9 / 127.1 = 1.038

* To Be Used For First 4 Years of EC 10 Year Non-Catastrophe Period, If Using Data Through 1970.

11/21/72 Exhibit I(b)

DEVELOPMENT OF CURRENT COST FACTORS (CCF) AND TRENDED COST FACTOR (TCF)

Part C: Computation of Trended Cost Factor (TCF)

CAL. YR.	QUARTER ENDING	TIME (2X)	AVERAGE CCCI (Y)	(2XY)	($4X^2$)
1969	SEP 30	−11	113.7	−1250.7	121
1969	DEC 31	−9	115.5	−1039.5	81
1970	MAR 31	−7	116.4	−814.8	49
1970	JUN 30	−5	118.9	−594.5	25
1970	SEP 30	−3	120.4	−361.2	9
1970	DEC 31	−1	122.2	−122.2	1
1971	MAR 31	1	123.2	123.2	1
1971	JUN 30	3	126.3	378.9	9
1971	SEP 30	5	128.4	642.0	25
1971	DEC 31	7	129.1	903.7	49
1972	MAR 31	9	130.7	1176.3	81
1972	JUN 30	11	131.9	1450.9	121
		0	1476.7	492.1	572

Equations: $Y = A + BX$

$SY = NA + BSX$

$SXY = ASX + BSX^2$

Where A = Mean of fitted line

B = Average quarterly increment

S = Summation

N = Number of observations

$S2XY = 492.1$ or $SXY = 246.05$ $\quad S4X^2 = 572$ or $SX^2 = 143$

A (mean of fitted line) = 1476.7/12 = 123.06

B (ave. quarterly increment) = 246.05/143 = 1.721

Ave. annual increment = 4 × 1.721 = 6.88

Fitted CCCI trend at midpoint of qtr. ending Jun 30, 1972 =
123.06 + (5.5 × 1.721) = 132.53

Latest Annual Rate of Change = 6.88/132.53 = 5.2%

Trended Cost Factor* = 1.000 + (.052 × 25.5**/12) = 1.111

*Phase II Price Limitation (5/8s of indicated TCF) = 1.07 (See Column 4 of Exhibit I)

**For a filing with an anticipated effective date of June 30, 1973, i.e., the time interval would be 25.5 months between the midpoint of the latest quarter (May 15, 1972) and June 30, 1974.

INSURANCE SERVICES OFFICE Exhibit I (c)
MASSACHUSETTS 2/14/73
STATISTICAL IMPLEMENTATION—PART A
COMPUTATION OF PREMIUM CONVERSION FACTORS
(COMMERCIAL FIRE)

I. Record of Rate Changes and Rate Level Indices:

EFFECTIVE DATE	ADJ. EFF. DATE	RATE CHANGE (%)	RATE LEVEL INDEX
4/ 1/62	4/15/62	2.3	1.023
9/ 5/62	9/15/62	7.3	1.098
1/20/64	1/31/64	2.5	1.125
5/14/65	5/15/65	3.3	1.162
5/27/66	5/31/66	8.0	1.255
11/ 6/67	11/15/67	8.2	1.358
5/ 8/68	5/15/68	3.8	1.410
6/22/70	6/30/70	7.3	1.513

II. Calculation of Rate Modification Factors:

YEAR	AVERAGE CALENDAR YEAR INDEX	RATE MODIFICATION FACTORS
1961	1.000	1.513
1962	1.038	1.458
1963	1.098	1.378
1964	1.123	1.347
1965	1.148	1.318
1966	1.216	1.244
1967	1.268	1.193
1968	1.391	1.088
1969	1.410	1.073
1970	1.462	1.035
1971	1.513	1.000

III. Development of Premium Conversion Factors:
Distribution of Calendar Year Earned Premium by Year Written

YR. WRITT	1966	1967	1968	1969	1970	1971
N-5	.026	.022	.022	.016	.005	.001
N-4	.043	.036	.036	.010	.003	.003
N-3	.071	.069	.069	.048	.038	.038
N-2	.103	.102	.102	.096	.091	.070
N-1	.394	.366	.366	.434	.411	.415
N	.363	.405	.405	.416	.468	.475
PCF	1.310	1.247	1.174	1.102	1.058	1.024
CORRECTED FOR C-D *	1.262	1.201	1.131	1.061	1.019	0.986

* On state's population distribution, the Civil Disorder change averaged 3.8% which produced a 0.963 PCF correction factor: [1.000 ÷ (1.000 + .038)] = 0.963.

2/16/73

INSURANCE SERVICES OFFICE
COMMERCIAL FIRE-CLASS RATE LEVEL INDICATIONS
MASSACHUSETTS EAST COAST REGION

OVERALL INDICATION = 17.8%

SUMMARY—MAJOR INDUSTRY GROUPINGS—KEYED TO STATE OVERALL RATE LEVEL INDICATION

			STATE EXPERIENCE				REGIONAL EXPERIENCE						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Rtg. Grp.	Description	Cred. Table	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Wtd. Mean	Relativity	Ind. Adj. (%)
01	I Residential (Ex. Dwg.)	A	20,436,230	12,710,208	62.2	.98	93,482,243	64,549,521	69.1	.99	62.3	.995	+17.2
02	II Mercantile	B	70,207,996	50,448,197	71.9	.97	390,337,072	253,356,892	64.9	.99	71.7	1.145	+34.9
03	III Non-Mfg. (Ex. Whses.)	B	40,006,359	24,562,073	61.4	.94	220,995,097	140,834,395	63.7	.99	61.5	.982	+15.7
04	IV Manufacturing	C	19,331.406	13,631,852	70.5	.66	159,815,749	109,322,286	68.4	.94	69.8	1.115	+31.3
05	V Sprinklered Risks	B	35,665,108	14,719,104	41.3	.93	119,905,724	61,672,554	51.4	.98	42.0	.671	−21.0
06	Total Commercial		185,647,099	116,071,434	62.5		984,535,885	629,735,648	64.0		62.6	1.000	+17.8

Experience is at Current Rate Level.

Credibility Computations used (P = Adjusted Earned Premium):

A: Credibility = P/ (P + 500,000)
B: Credibility = P/ (P + 2,500,000)
C: Credibility = P/ (P + 10,000,000)

* Indicates Rating Group Excluding those subgroups shown separately.

***** Indicates loss ratio exceeding 999.9.

Exhibit II

Page 2

2/16/73

INSURANCE SERVICES OFFICE
COMMERCIAL FIRE-CLASS RATE LEVEL INDICATIONS
MASSACHUSETTS — EAST COAST REGION

OVERALL INDICATION = 17.8%

Rtg. Grp.	Description	Cred. Table	STATE EXPERIENCE (1) Earned Premiums	(2) Incurred Losses	(3) Loss Ratio (%)	(4) Credibility	REGIONAL EXPERIENCE (5) Earned Premiums	(6) Incurred Losses	(7) Loss Ratio (%)	(8) Credibility	(9) Wtd. Mean	(10) Relativity	(11) Ind. Adj. (%)
	I RESIDENTIAL (EX. DWG)												
07	Bdg. & Rmg. Ho. Etc.	B	1,878,366	1,219,973	64.9	.43	6,459,122	4,415,017	68.4	.72	66.9	1.037	+22.2
08	Motels, Camps, Etc.	B	2,032,289	920,504	45.3	.45	12,265,583	6,070,572	49.5	.83	47.6	.738	−13.1
09	Farm Property	A	3,221,272	2,320,323	72.0	.87	33,349,312	21,459,892	64.3	.99	71.0	1.100	+29.6
10	Apartment Buildings	B	13,304,303	8,249,408	62.0	.84	41,408,226	32,604,040	78.7	.94	64.7	1.003	+18.2
01	Total	A	20,436,230	12,710,208	62.2		93,482,243	64,549,521	69.1		64.2	.995	+17.2
	II MERCANTILE												
11A	Stores and Dwellings	A	7,523,592	5,370,088	71.4	.94	45,201,516	29,878,727	66.1	.99	71.1	1.158	+36.4
11B	Merc. Bldgs.—Class Rated	A	0	−11,037	0.0	.00	6,476,506	5,151,618	79.5	.93	78.5	1.279	+50.7
11C	Merc. Bldgs.—Sched. Rated	A	28,259,612	22,221,496	78.6	.98	126,626,500	90,090,902	71.1	1.00	78.4	1.277	+50.4
11D	HHG. in Merc. Bldgs.	A	671,276	293,907	43.8	.57	3,873,120	1,824,349	47.1	.89	45.2	.736	−13.3
11E	Heavy Stocks Incl. Mach.	B	795,601	654,577	82.3	.24	5,361,667	3,189,681	59.5	.68	65.4	1.065	+25.5
11F	Wearing Apparel, Textiles	B	2,600,604	1,617,564	62.2	.51	17,723,485	9,347,462	52.7	.88	57.5	.937	+10.4
11G	Food Prod. & Beverages	B	4,297,561	2,955,634	68.8	.63	23,562,357	15,492,234	65.7	.90	67.7	1.103	+29.9
11H	Restaurants and Bars	B	8,037,091	5,337,599	66.4	.76	40,780,242	21,413,928	52.5	.94	63.1	1.028	+21.1
11I	Light Merchandise	B	9,493,001	5,943,405	62.6	.79	63,220,835	40,302,214	63.7	.96	62.8	1.023	+20.5
11J	Extra Hazardous Stocks	B	1,043,739	450,108	43.1	.29	6,274,060	3,641,929	58.0	.72	53.7	.875	+ 3.1
12	Whses.—misc.—Mercantile	C	5,252,376	3,960,502	75.4	.34	40,312,715	26,469,767	65.7	.80	69.0	1.124	+32.4
13	Lumber, Coal & Wood Yds.	C	2,233,543	1,654,354	74.1	.18	10,924,069	6,554,081	60.0	.52	64.0	1.042	+22.7
02	Total	B	70,207,996	50,448,197	71.9		390,337,072	253,356,892	64.9		70.3	1.145	+34.9

2/16/73

INSURANCE SERVICES OFFICE
COMMERCIAL FIRE-CLASS RATE LEVEL INDICATIONS
MASSACHUSETTS EAST COAST REGION

OVERALL INDICATION = 17.8%

			STATE EXPERIENCE				REGIONAL EXPERIENCE						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Rtg. Grp.	Description	Cred. Table	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Wtd. Mean	Relativity	Ind. Adj. (%)
	III NON-MFG. (EX. WHSES.)												
14	Offices & Banks, Etc.	A	7,360,350	3,905,096	53.1	.94	36,843,358	21,837,298	59.3	.99	53.5	.847	− .2
15	Hotels, Comm. Bdg. Ho. Clubs	B	4,977,908	2,784,648	55.9	.67	31,422,001	19,331,173	61.5	.93	57.7	.914	+ 7.7
16	Theatres & Auditoriums	B	2,647,369	2,038,787	77.0	.51	10,106,921	7,105,525	70.3	.80	73.7	1.167	+37.5
17	Amusement Properties	B	3,778,393	1,514,904	40.1	.60	23,948,791	11,049,900	46.1	.91	42.5	.673	−20.7
18	Hospitals, Etc.	B	1,367,086	1,529,757	111.9	.35	6,614,112	3,500,061	52.9	.73	73.5	1.164	+37.1
19	Churches, Etc.	B	1,823,127	1,157,654	63.5	.42	14,524,584	13,883,889	95.6	.85	82.1	1.300	+53.1
20	Auto Garages, Filling Sta.	A	5,058,336	3,126,010	61.8	.91	38,702,391	22,528,587	58.2	.99	61.5	.974	+14.7
21	Airplane Hangars	C	121,732	65,936	54.2	.01	1,172,350	669,407	57.1	.10	62.9	.996	+17.3
22	Penal Institutions	C	147,873	340,537	230.3	.01	1,818,683	2,342,499	128.8	.15	75.1	1.189	+40.1
23	Educational Institutions	C	8,482,075	5,328,579	62.8	.46	35,070,334	24,856,188	70.9	.78	67.2	1.064	+25.3
24	Bridges, Piers, Wharves	C	322,787	242,871	75.2	.03	2,199,521	2,160,056	98.2	.18	70.3	1.113	+31.1
25	Builders' Risks	B	3,361,015	2,480,652	73.8	.57	14,899,787	10,409,423	69.9	.86	72.1	1.142	+34.5
26	Police, Fire, Waterworks	C	558,308	46,642	8.4	.05	3,672,264	1,160,389	31.6	.27	52.3	.828	− 2.5
03	Total	B	40,006,359	24,562,073	61.4		220,995,097	140,834,395	63.7		62.0	.982	+15.7

Exhibit II

2/16/73

Page 3

INSURANCE SERVICES OFFICE
COMMERCIAL FIRE-CLASS RATE LEVEL INDICATIONS
MASSACHUSETTS EAST COAST REGION

OVERALL INDICATION = 17.8%

			STATE EXPERIENCE				REGIONAL EXPERIENCE						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Rtg. Grp.	Description	Cred. Table	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Wtd. Mean	Relativity	Ind. Adj. (%)
	IV MANUFACTURING												
27	Whses.—Misc.—Manufacturing	C	444,825	438,671	98.6	.04	4,026,538	3,515,868	87.3	.29	75.1	1.273	+50.0
28	Grain Elev.-Term. & Ctry.	C	69,016	44,503	64.5	.01	491,726	940,032	191.2	.05	74.5	1.262	+48.7
29	Food & Kindred Products	C	2,162,881	2,690,626	124.4	.18	15,000,002	11,896,457	79.3	.60	85.0	1.440	+69.6
30	Textiles, Furs, Leather	C	1,836,858	1,047,460	57.0	.16	17,150,138	12,579,306	73.3	.63	69.7	1.181	+39.1
31	Wood Products	C	1,870,064	1,011,969	54.1	.16	14,137,581	8,251,580	58.4	.59	60.2	1.020	+20.2
32	Paper & Pulp Products	C	351,879	1,444,838	410.6	.03	3,151,732	4,467,249	141.7	.24	96.3	1.632	+92.2
33	Printing & Lithographing	C	601,427	308,541	51.3	.06	4,873,875	3,497,880	71.8	.33	68.5	1.161	+36.8
34	Chemicals, Plastic, Rubber	C	2,003,651	1,895,848	94.6	.17	27,027,750	16,699,203	61.8	.73	68.0	1.152	+35.7
35	Stone, Clay, Glass Plts.	C	744,514	495,671	66.6	.07	11,358,974	7,322,282	64.5	.53	66.2	1.122	+32.2
36	Metalworkers	C	6,457,781	3,059,264	47.4	.39	48,830,961	32,652,063	66.9	.83	59.3	1.005	+18.4
37	Laundries & Dry Cleaning	C	1,975,912	892,561	45.2	.16	7,084,210	3,731,309	52.7	.41	58.3	.988	+16.4
38	Oil Distributing Sta.	C	812,598	301,900	37.2	.08	6,682,262	3,769,057	56.4	.40	61.1	1.035	+21.9
04	Total	C	19,331,406	13,631,852	70.5		159,815,749	109,322,286	68.4		65.8	1.115	+31.3

Exhibit II

2/16/73

INSURANCE SERVICES OFFICE
COMMERCIAL FIRE-CLASS RATE LEVEL INDICATIONS

Page 4

MASSACHUSETTS — EAST COAST REGION

OVERALL INDICATION = 17.8%

			STATE EXPERIENCE				REGIONAL EXPERIENCE						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Rtg. Grp.	Description	Cred. Table	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Earned Premiums	Incurred Losses	Loss Ratio (%)	Credibility	Wtd. Mean	Relativity	Ind. Adj. (%)
	V SPRINKLERED RISKS												
39	Sprinklered-Non Mfg.—Total	C	16,605,640	9,611,998	57.9	.62	52.780,798	33,409,969	63.3	.84	60.0	.932	+ 9.8
40	Sprinklered-Mfg.—Total	B	19,059,468	5,107,106	26.8	.88	67,124,926	28,262,585	42.1	.96	28.6	.444	−47.7
05	Total	B	35,665,108	14,719,104	41.3		119,905,724	61,672,554	51.4		43.2	.671	−21.0

MEMORIBILIA A

REPORT OF INDUSTRY COMMITTEE TO NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS' SUBCOMMITTEE—TO STUDY THE CATASTROPHE FACTOR AND ITS USE IN EXTENDED COVERAGE FORMULA OF RATES AND RATING ORGANIZATIONS COMMITTEE

In response to the invitation of the Honorable Rufus D. Hayes, Chairman of the NAIC Subcommittee to Study the Catastrophe Factor and its use in Extended Coverage Formula, the following report is addressed seriatim to the Subcommittee's June 5, 1961 comprehensive outline of the problems.

Careful reflection on the complexities with which the Subcommittee is confronted has imposed an obligation of reassessing the fundamentals of present EC rate level adjustment methods. It was deemed advisable to recommend the continuance of those precedures which have worked successfully. At the same time there has been no reluctance to recommend changes in those methods which are not consonant with the facts indicated by developing catastrophe experience.

The EC rating problem and its solution are of great practical consequence to the property insurance business as well as to the supervisory authorities. Admittedly the EC coverage has not been a satisfactory underwriting venture in its 20-year history. Our approach to EC underwriting experience evaluation methods must be consistent with the underlying catastrophe loss expectancies. Neither the policyholder, nor the supervisory authorities, nor the companies really benefits from an inadequate, a redundant or a wildly gyrating rate structure.

It is thought that answers to the Subcommittee's June 5, 1961 questions will indicate the general principles on which the EC rate level adjustment procedure should be based.

The first problem—the definition of an EC catastrophe.

As a result of our studies, it is recommended that a catastrophe be

defined as any occurrence under any one of the EC perils which results in aggregate losses in excess of whichever of the following amounts is the greater:

(a) $1,000,000 or

(b) 50% of the earned EC premium of the State at the current rate level as applied to the year of occurrence of the loss.

Our tests have suggested that on such a definition, even a major storm should not typically result in a subsequent rate adjustment of more than reasonable proportions. Moreover, under this conservative definition of a catastrophe, the thousands of ordinary losses each year can be accommodated according to the established rating procedures which have been employed in the property insurance field.

The second problem—the territorial basis for application of Catastrophe definition.

On the basis of our studies it is recommended that the catastrophe definition be applied to each State individually.

It should be noted that the State can serve as a reasonable basis for application of an EC rate level review formula if the following three interrelated conditions are fulfilled:

(a) an appropriate definition of a catastrophe,

(b) the selection of a compatible catastrophe experience review period of a sufficient span of years, and

(c) a provision for a minimum catastrophe factor in all States whether or not the particular State has suffered a catastrophe loss.

Moreover, the State constitutes a practical geographical basis for rates in that it is consistent with the pattern of rate regulation in the United States which delegates to each of the several States individually the direct responsibility for the supervision of the insurance business, including the review of rates. This is so even though it is recognized the major perils under EC, i.e. Wind and Hail, transcend State lines.

The third problem—the period of time over which the Catastrophe experience should be related to rates.

As a result of our studies it is recommended that the non-catastrophe losses be reviewed over the latest available six calendar year experience

period. It is proposed that the catastrophe factor (except the minimum factor for which provision is otherwise made) be reviewed over not less than the latest available fifteen calendar year experience period with the additional suggestion that consideration should be given to a longer period as the developing experience may indicate.

The fourth problem—the conversion of the Catastrophe experience into a percentage factor or element to be added to the normal EC rate.

As a result of our studies it is recommended that the overall EC rate level by State reflect both the non-catastrophe portion and the long-term catastrophe factor or element. The non-catastrophe portion and the catastrophe element would each be computed individually. However, it is proposed that, while the non-catastrophe portion be reviewed annually, the catastrophe factor would be subject to further modification, upward or downward, only at long-term intervals as the developing catastrophe experience may warrant.

However, there should be a minimum catastrophe factor (i.e. 1%) for any State regardless of whether or not the particular State had suffered an EC Catastrophe.

The following general principles, based on the answers to the above questions, are proposed as a guide in the determination of overall Extended Coverage rate level adjustments, and are supplementary to the general principles established for property insurance overall rate level adjustments:

General Principles—Extended Coverage Rate Level Adjustments

1. Extended Coverage rates shall contain a separate element (1% minimum) for catastrophe losses. This element shall be determined from all available pertinent data including, if possible, the loss experience of not less than the most recent 15 years. It is contemplated that this separate catastrophe element shall be subject to revision, upward or downward, only at long-term intervals as the developing catastrophe experience may warrant.

2. A catastrophe is defined as any occurrence (under any one of the ECE perils) which results in an aggregate loss in excess of whichever of the following amounts is the greater: (a) $1,000,000 or (b) 50% of the State ECE earned premiums in the year of occurrence.

3. Non-Catastrophe ECE experience shall be defined as experience excluding the catastrophe element of the premiums and the portion of losses of

any catastrophe within the State which is in excess of the aggregate loss amount used to define catastrophe. Non-Catastrophe ECE experience shall be reviewed for the latest six-year period including that of the immediate past year, with earned premiums adjusted to reflect current tariff rate levels.

Clyde H. Graves, Assistant Manager,
Mutual Insurance Advisory Association

Walter L. Hays, President,
American Fire and Casualty Company

Ambrose B. Kelly, General Counsel,
Associated Factory Mutual Fire Insurance Companies

Kent H. Parker, General Manager,
Inter-Regional Insurance Conference

April 18, 1962

MEMORIBILIA B

INTER-REGIONAL INSURANCE CONFERENCE
125 MAIDEN LANE, NEW YORK 38, N. Y.

July 15, 1963

To Members of
Inter-Regional Insurance Conference

Gentlemen:

Disappearing Deductible Clause ($5,000 Maximum)
Memorandum on Rating Plan for Deductible Insurance
Fire and Allied Line Perils

Following a long period of study under the direction of our Committee on Rate Level Adjustments, the Executive Committee has approved for country-wide recommendation the attached Rating Plan for Disappearing Deductible Insurance contemplating various disappearing deductibles with a $5,000 maximum. The Executive Committee deferred taking action at this time with respect to a recommendation as to larger deductibles involving straight deductibles of $10,000 or more.

The basic study and the method of development of deductible credits is outlined in the attached memorandum which, likewise, has been furnished to the rating organizations and which is believed sufficiently explanatory to permit development of needed information in support of the Plan and a full understanding of the methods followed. While the present recommendation to the rating organizations is confined to the disappearing deductible involving amounts not exceeding $5,000, the memorandum covers the study in condensed form as to both straight and disappearing deductibles.

This information is sent to member companies to fully acquaint you with the current status of studies and recommendations of the Conference.

Yours very truly,

K. H. Parker
General Manager

Enclosure

July, 1963.

INTER-REGIONAL INSURANCE CONFERENCE
NEW YORK, N. Y.

MEMORANDUM ON RATING PLAN FOR DEDUCTIBLE INSURANCE FIRE AND ALLIED LINE PERILS

1. *Introduction*

It is thought that the attached research findings and analysis will be helpful as a reference frame within which to review the recommended plan of credits from tariff rates for deductible insurance on fire and allied perils.

At the outset, a few words ought to be said on both the source and the scope of the data. With the approval of its Executive Committee, the Inter-Regional Insurance Conference inaugurated in 1962 a research study on fire and allied peril deductible insurance. While the study was in response to the expressed interest of its membership, it was generally recognized that the entire industry would benefit from a detailed research into a volume of data substantially greater than the statistical sources used in early studies in this field.

The IRIC was most fortunate in, and is appreciative of, the co-operation of the General Adjustment Bureau, Inc., and the Factory Insurance Association in the development of the basic loss statistics. These organizations conducted a nine month (January-September, 1962) survey of countrywide case losses. Detailed information as indicated in the Loss Report Form (c.f. Exhibit I) was collected on 80,150 individual losses, encompassing all classifications of fire and allied peril business—excluding only dwellings and farms. These 80,150 losses represented total loss payments to policyholders of $189,182,341.

Traditionally, fire insurance rates have been developed to provide funds whereby the general public may be indemnified for the whole loss. For other than residential properties, the fire rates reflect an analysis of

each individual risk according to an engineering schedule of the hazards presented. They were not developed to fraction off the rate for the probabilities of various loss sizes for the individual risk locations.

There are good reasons to believe that the evaluation of such probabilities cannot be arranged on a risk by risk engineering evaluation. Actually they can at best only be approximated. And maybe the easiest approach is through an analysis of the totality of available statistics. Consequently, the 80,000 losses totaling almost $190 million in payments were used as a basis for the deductible rate credits developed herein.

2. *Fundamental Principles Used in Study*

In order to determine the appropriate discount in tariff rates for deductible coverage, it is necessary and sufficient:

a. to establish what portion of the tariff premium dollar must be reserved for losses and what portion is available for expenses, taxes and profit.

b. to develop a schedule of the savings in losses (hereinafter referred to as LER or Loss Elimination Ratios) for the various deductible classification groupings.

c. to determine the extent to which the expense, tax and profit provisions represented in the initial tariff rate should be reduced by reason of the expected loss savings.

a. *Allocation of Tariff Rate to various Functional Components*

It is well known that there are no such standard allocations recognized countrywide for the type of business which is eligible for deductible coverage. In the absence of such criteria, it was deemed advisable to use the Stock Company countrywide actual experience indications with solely those modifications which would be appropriate for the classes of business eligible for deductible coverage.

A fairly close reading of loss and expense distributions with a due regard to the most currently available data suggested that the tariff premium rate for eligible deductible business could be broken down into the following functional components:

Normal Losses & Loss Adjustment Expense	$ 0.54
Expenses Varying with Written Premiums	
Taxes and Bureau	0.04
Production Costs	0.20
Other Company Expense	0.16
Allowance for Underwriting Profit & Contingencies	0.06
Total Tariff Premium Dollar	$ 1.00

b. *Savings in Loss Cost or Loss Elimination Ratios (LER)*

The Loss Elimination Ratios are the ratios to total losses of all loss payments excluded by the deductible provisions. For example, if the total losses were a $1,000,000. and $100,000. were avoided by the Company (in other words, paid by the policyholders because of the deductible provision) the LER (Loss Elimination Ratio) in this instance would be 10%.

From "a priori" considerations the LER's must be a joint function of the insurable value and the amount to be deducted from each loss. Restating this principle in more specific terms, we would observe that one should normally expect to eliminate a larger proportion of the losses occurring on a $100,000. insurable value with a $25,000. deductible than with a $1,000. deductible. Likewise, one should normally expect to eliminate with a $1,000. deductible a larger percentage of the losses on a $10,000. than on a $1,000,000. insurable value.

Consequently, we would expect that the LER's should increase directly with the size of the deductible and inversely with the size of the insurable value involved. As the deductible amount approaches close to the insurable value, the LER's approach unity or 100%. Conversely, for a specific deductible amount, the LER's approach zero as the insurable value approaches an infinitely large number.

However, the LER's do not vary in direct proportion with the amount of the deductible. Nor do they decrease step by step with the increase in the insurable value involved. In mathematical terms, the functional relationships are not linear. They do not vary in a straight line.

To obtain from the statistics the best possible estimates of the Loss Elimination Ratios (LER's) the some 80,000 losses involving almost $190 million in payments were tabulated by line size and loss size. The LER's

were computed separately for Fire and ECE initially on a straight deductible basis as shown in Exhibit 2. Subsidiary analyses were made of possible variations in the LER's by construction, protection and occupancy classification groupings, but these details are still under review and are not included in this recommended filing.

The Loss Elimination Ratios (LER's) were plotted on graph as shown in Exhibit 3. These points on the graph are observed to adhere to a pattern. It will be noted that the family of curves conforms to this pattern and is consistent with the "a priori" considerations outlined above; namely that the LER's should decrease with the increase in the insurable value and approach gradually to the value zero as the insurable value increases towards infinity.

The Disappearing Deductible which is confined to the smaller deductible amounts (i.e., 5,000. or less) was afforded a slightly different treatment at certain points in the analysis and some specific comment is required. At the risk of belaboring the obvious, the $1,000. Deductible disappearing at a $10,000. loss means that the policyholder:

a) pays himself for all losses under $1,000.

b) receives full payment on all losses of $10,000. or more.

c) receives 111% of the difference between the actual loss and $1,000. on all losses within the range of $1,000. to $10,000.

   1) the 111% is the vehicle for making the deductible disappear and comes from dividing $10,000. by ($10,000. less $1,000. or $9,000.).

Consequently the same loss data used for the Straight Deductibles is again reworked for the Disappearing Deductible. Rather than applying the arithmetic in steps "a", "b" and "c" just above to each and every loss, it is possible to come up with the identical answer by applying the following algebraic formula to the summary data available from the tabulations:

$$S = (1 + x)\, n\, d - x\, L$$

Where

S = the dollar loss payments eliminated in the "Disappearing Deductible" range.

n = the number of losses in the "Disappearing Deductible" range.

d = the deductible amount.

L = the total loss incurred in the "Disappearing Deductible" range before the application of the deductible.

(1 + x) = the multiplicative loss factor (i.e., the 111% as given above).

x = the multiplicative factor less unity (i.e., 111% less 100% or 11%).

The derivation of this formula and a test of it against an arithmetical example is presented in Exhibit 4.

c. *Relation of LER's (Loss Elimination Ratios) to the Credits in Tariff Rates*

Even if all the losses were eliminated through the application of the deductible feature, the insurance company would still incur certain underwriting, servicing, engineering, etc. expenses for which a charge must logically be made to the assured.

On the other hand, there are loss adjustment expenses which are intimately connected with losses and for which no charge need be made on losses escaped by the deductible. Still other items of outgo such as taxes, bureau assessments, production costs and profit margins are a function of the finally adjusted premium . . . although they are usually a constant percentage of the indicated premium.

Therefore, the final premium rate must provide for the sum of the residual normal losses after the application of the deductible clause plus the loss adjustment expenses on these losses, plus the Company expense, all loaded for the items of functional outgo. The formula for the appropriate discount in tariff rates is as follows:

$$C = 1 - \left[\frac{L(1-d) + F}{1 - (S+T+P)}\right] \text{ where:}$$

Symbols

C = credit in tariff premium rates

L = provision for losses and loss adjustment expense in tariff premium rates

d = loss elimination ratios

F = provision in tariff rates for Company expense (not otherwise provided for)

S = percent of final adjusted premium for production cost

T = percent of final adjusted premium for taxes and bureau assessments

P = percent of final adjusted premiums for underwriting profit and contingency allowance.

3. *Development of the Indicated Credits from Tariff Rates*

From the previous section of this memorandum, it was indicated that the final credits from tariff rates must be some percentage, not exceeding 100%, of the expected LER's (loss elimination ratios or relative savings in losses under the deductible coverage selected).

Given the allocations of the tariff rate to its various functional components as set forth in Section 2 (a) and the formula relationship as in Section 2 (c), the appropriate credit in tariff rates will equal 77.1% of the indicated LER's in the previously identified notation:

$$C = 1 - \left[\frac{L(1-d) + F}{1 - (S + T + P)}\right] \text{ or}$$

$$C = 1.00 - \left[\frac{.54(1-d) + .16}{1.00 - (.20 + .04 + .06)}\right]$$

$$C = 1.00 - \left[\frac{.70 - .54d}{.70}\right]$$

$$C = \frac{(.70 - .70 + .54d)}{.70}$$

$C = 0.771d$ or 77.1% of the LER's.

With the development of the formula to convert LER's to indicated rate credits, it remains only to select the best estimates of the LER's for the various deductible provisions contemplated under the respective plans.

The study findings indicate a definite pattern in the relationship between the LER's and the corresponding insurable values over the entire scale for which readings are available. However, it was decided to confine the Deductible Plan to those ranges within which such coverage might be responsive to the ordinary requirements of the policyholder.

For example, it was difficult to imagine that there would be an appre-

ciable demand for as high as a $1,000. deductible on a $5,000. insurable value, or for a $10,000. deductible on, say, a $25,000. insurable value. Consequently, it was decided to develop a schedule of indicated credits from tariff rates for selected ranges of percent deductible to insurable value—up to 10% of the insurable value.

In the development of the plan of credits, as previously noted, the LER's (Loss Elimination Ratios) were computed directly from statistics for the various observation points. Then these averages were plotted on a graph, fitted to a curve, and the corresponding LER's taken from the equation of the curve.

After applying the expense adjustment factor of 77.1% (as derived above) to the LER's, the indicated rate credits both for the unmodified arithmetical indications and the comparable readings from the mathematical curve were reviewed from the point of view of reasonableness and consistency. Wherever possible, the unmodified arithmetical reading was used for the rate credit. However, in some instances, the unmodified arithmetical indication was obviously out of line with the general pattern of the indicated rate credits for neighboring values.

On such an occasion, either the reading from the mathematical curve was used or some adjoining point on the basis of underwriting judgment. However, the departures were seldom of any magnitude. Actually the modifications that were made must be evaluated for significance in terms of the knowledge that:

1. *As far as the averages from the pure arithmetic are concerned,* while the overall sample was very large, the specific values for certain of the detailed line sizes by coverage could be vulnerable to the play of chance fluctuations, and

2. *As far as the readings from the mathematical curves are concerned,* while the mathematical curves observe the pattern suggested by the "a priori" considerations and generally fit the actual observations reasonably well according to established statistical tests, their merit is more likely one of utility and economy than it is the possession of some guarantee of "super-precision."

Exhibit 5 presents the basic data and the computation work sheets which underlie the credits from tariff rates for the recommended Disappearing Deductible Plan.

4. *Conclusions*

The presentations herein have involved the full scope of the Inter-Regional study of deductible insurance for Fire and ECE. It would have been possible to restrict the material solely to the statistics required in support of the specific recommended filing—namely, a Disappearing Deductible Plan with a maximum $5,000. deductible per loss. However, the knowledge of the basic relationships involved over the entire range of deductible coverage on fire and allied lines insurance should be of additional interest and help in evaluating the plan as presently recommended.

In recapitulation, this memorandum has set forth:

1. An explanation of the source, nature and significance of the statistics,
2. The approach used to determine appropriate credits from tariff rates for deductible coverage—both the straight and the disappearing type,
3. A detailed account of basic relationships existing between:
   a) Loss Elimination Ratios (LER's) and the distribution of losses by size and the insurable value involved, and
   b) The LER's and the credits from tariff rates,
4. The basic data and the computations of LER's for straight deductible coverage,
5. The basic data and the computation work sheets showing both the LER's and the indicated credits from tariff rates underlying the recommended Disappearing Deductible Plan.

GENERAL ADJUSTMENT BUREAU, INC.—DIRECT PROPERTY DAMAGE LOSS SURVEY FOR INTER-REGIONAL INSURANCE CONFERENCE

FIRE POLICIES WITH OR WITHOUT EXTENDED COVERAGE (INCLUDING VANDALISM & MALICIOUS MISCHIEF), OTHER THAN DWELLING (MAXIMUM FOUR FAMILIES) AND FARM PROPERTY

No.	Principal Occupancy of Premises Involved in Loss		Loss To		Public Fire Protection		Predominant Construction			Peril—Cause of Loss				Actual Cash Value of Property Involved In Loss	Whole Loss or Damage
	Code	Type of Business (Use Only for Code 5 Explanation)	Building	Contents	Yes	No	Fire Resistant	Non-Comb. All Steel	All Other	Fire or Lightning	Wind or Hail	Explosion	All Other ECE Perils		
1														$	$
2															
3															
4															
5															
6															
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Code	
1	Apartment (5 or More—Family)
2	*Mercantile*
3	Non-Mfg. Whse. & Service
4	Institutional
5	Manufacturing (Explained Above)

Branch _____ State _____ Date _____ Sheet No. _____

No.	Remarks

Exhibit 1

LOSS ELIMINATION RATIOS—STRAIGHT DEDUCTIBLE

Exhibit 2
Page 1

Insurable Value	Paid ($1000) Less than Deductible			No. Losses Above Deduct.			Savings in Loss ($1000)			Total Loss ($1000)			Loss Elimination Ratios		
	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total
$250 DEDUCTIBLE															
0 — 9,999	$ 461	$ 737	$ 1,198	3,885	1,739	5,624	$ 1,432	$ 1,172	$ 2,604	$ 8,439	$ 2,072	$10,511	17.0%	56.6%	24.8%
10,000— 24,999	369	777	1,146	4,146	2,507	6,653	1,406	1,404	2,810	19,068	3,066	22,134	7.4	45.8	12.7
25,000— 49,999	229	457	686	3,187	2,046	5,233	1,026	969	1,995	25,083	2,756	27,839	4.1	35.2	7.2
50,000— 99,999	170	300	470	2,544	1,709	4,253	806	727	1,533	29,180	2,839	32,019	2.8	25.6	4.8
100,000—249,999	137	211	348	2,166	1,552	3,718	678	599	1,277	30,466	3,601	34,067	2.2	16.6	3.7
250,000—499,999	52	89	141	958	713	1,671	292	267	559	17,664	1,439	19,103	1.7	18.6	2.9
500,000 & Over	109	136	245	2,130	1,416	3,546	641	490	1,131	33,519	5,687	39,206	1.9	8.6	2.9
Total	1,527	2,707	4,234	19.016	11,682	30,698	6,281	5,628	11,909	163,419	21,460	184,879	—	—	—
Average													3.8	26.2	6.4
$500 DEDUCTIBLE															
0 — 9,999	792	1,098	1,890	2,953	681	3,634	2.267	1,438	3,705	8,439	2.072	10,511	26.9	69.4	35.2
10,000— 24,999	698	1,311	2,009	3,209	960	4,169	2,302	1,791	4,093	19,068	3,066	22,134	12.1	58.4	18.5
25,000— 49,999	479	830	1,309	2,483	978	3,461	1,721	1,319	3,040	25,083	2,756	27,839	6.9	47.9	10.9
50,000— 99,999	371	579	950	1,978	914	2,892	1,360	1,036	2,396	29,180	2,839	32,015	4.7	36.5	7.5
100,000—249,999	324	436	760	1,647	904	2,551	1,148	888	2,036	30,466	3,601	34,067	3.8	24.7	6.0
250,000—499,999	132	186	318	735	445	1,180	500	409	909	17,664	1,439	19,103	2.8	28.4	4.8
500,000 & Over	289	310	599	1,639	923	2,562	1,109	772	1,881	33,519	5,687	39,206	3.3	13.6	4.8
Total	3,085	4.750	7,835	14,644	5,085	20,499	10,407	7,653	18,060	163,419	21,460	184,379	—	—	—
Average													6.4	35.7	9.8

LOSS ELIMINATION RATIOS—STRAIGHT DEDUCTIBLE

Exhibit 2
Page 2

Insurable Value	Paid ($1000) Less than Deductible			No. Losses Above Deduct.			Savings in Loss ($1000)			Total Loss ($1000)			Loss Elimination Ratios		
	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total
$1,000 DEDUCTIBLE															
0 — 9,999	$ 1,323	$ 1,360	$ 2,683	2,200	291	2,491	$3,523	$1,651	$ 5,174	$ 8,439	$ 2.072	$10,511	41.7 %	79.7 %	49.2 %
10,000— 24,999	1,140	1,710	2,850	2,578	375	2,953	3,718	2,085	5,803	19,068	3,066	22,134	19.5	68.0	26.2
25,000— 49,999	834	1,216	2,050	1,985	411	2,396	2,819	1,627	4,446	25,083	2,756	27,839	11.2	59.0	16.0
50,000— 99,999	696	919	1,615	1,517	429	1,946	2,213	1,348	3,561	29,180	2,839	32,019	7.6	47.5	11.1
100,000—249,999	617	736	1,353	1,232	475	1,707	1,849	1,211	3,060	30,466	3,601	34,067	6.1	33.6	9.0
250,000—499,999	297	313	610	508	264	772	805	577	1,382	17,664	1,439	19,103	4.6	40.1	7.2
500,000 & Over	633	546	1,179	1,160	584	1,744	1,793	1,130	2,923	33,519	5,687	39,206	5.4	19.9	7.5
Total	5,540	6,800	12,340	11,180	2,829	14,009	16,720	9,629	26,349	163,419	21,460	184,879	—	—	—
Average													10.2	44.9	14.3
$5,000 DEDUCTIBLE															
0 — 9,999	5,557	1,884	7,441	437	29	466	7,742	2,029	9,771	8,439	2,072	$10,511	91.8	97.9	93.0
10,000— 24,999	4,240	2,261	6,501	1,362	73	1,440	11,050	2,651	13,701	19,068	3,066	22,134	58.0	86.5	61.9
25,000— 49,999	2,774	1,877	4,651	1,203	73	1,276	8,789	2,242	11,031	25,083	2,756	27,839	35.0	81.3	39.6
50,000— 99,999	2,226	1,596	3,822	884	80	964	6,646	1,996	8,642	29,180	2,839	32,019	22.8	70.3	27.0
100,000—249,999	1,956	1,522	3,478	656	104	760	5,236	2,042	7.278	30,466	3,601	34,067	17.2	56.7	21.4
250,000—499,999	873	747	1,620	241	47	288	2,078	982	3,060	17,664	1,439	19,103	11.8	68.3	16.0
500,000 & Over	2,164	1,476	3,640	465	159	624	4,489	2,271	6,760	33,519	5,687	39,206	13.4	39.9	17.2
Total	19,790	11,363	31,153	5,248	570	5,818	46,030	14,213	60,243	163,419	21,460	184,879	—	—	—
Average													28.2	66.2	32.6

* excludes Losses not assigned an insurable value.

LOSS ELIMINATION RATIOS—STRAIGHT DEDUCTIBLE

Exhibit 2
Page 3

Insurable Value	Paid ($1000) Less than Deductible			No. Losses Above Deduct.			Savings in Loss ($1000)			Total Loss ($1000)			Loss Elmination Ratios		
	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total	Fire	ECE	Total
							$10,000 DEDUCTIBLE								
10,000— 24,999	$ 8,871	$ 2,567	$11,438	719	34	753	$16,061	$ 2,907	$18,968	$19,068	$ 3,066	$22,134	84.3 %	94.8%	85.7%
25,000— 49,999	5,498	2,165	7,663	826	33	859	13,758	2,495	16,253	25,083	2,756	27,839	54.8	90.5	58.4
50,000— 99,999	3,872	1,932	5,804	656	33	689	10,432	2,262	12,694	29,180	2,839	32,019	35.7	79.7	39.6
100,000—249,999	3,151	1,908	5,059	487	48	535	8,021	2,388	10,409	30,466	3,601	34,067	26.3	66.3	30.6
250,000—499,999	1,280	938	2,218	184	20	204	3,120	1,138	4,258	17,664	1,439	19,103	17.7	79.1	22.3
500,000 & Over	3,347	2,049	5,396	293	74	367	6,277	2,789	9,066	33,519	5,687	39,206	18.7	49.0	23.1
Subtotal**	26,019	11,559	37,578	3,165	242	3,407	57,669	13,979	71,648	154,980	19,388	174,368	—	—	—
							$25,000 DEDUCTIBLE								
25,000— 49,999	13,618	2,626	16,244	346	4	350	22,268	2,726	24,994	25,083	2,756	27,839	88.8	98.9	89.8
50,000— 99,999	7,779	2,269	10,048	421	12	433	18,304	2,569	20,873	29,180	2,839	32,019	62.7	90.5	65.2
100,000—249,999	5,668	2,320	7,988	328	21	349	13,868	2,845	16,713	30,466	3,601	34,067	45.5	79.0	49.1
250,000—499,999	2,307	1,184	3,491	121	5	126	5,332	1,309	6,641	17,664	1,439	19,103	30.2	91.0	34.8
500,000 & Over	5,430	2,690	8,120	161	29	190	9,455	3,415	12,870	33,519	5,687	39,206	28.2	60.0	32.8
Subtotal**	34,802	11,089	45,891	1,377	71	1,448	69,227	12,864	82,091	135,912	16,322	152,234	—	—	—

** For checking purposes only . . . does not include losses on Insurable Values less than the Deductible.

EXHIBIT #3

IRIC DEDUCTIBLE STUDY – STRAIGHT DEDUCTIBLE
FIRE LOSS ELIMINATION RATIOS – ALL CLASSES

NOTE: MARKS (● × O □) ARE THE OBSERVATION POINTS ON WHICH THE GRADUATION CURVES ARE COMPUTED

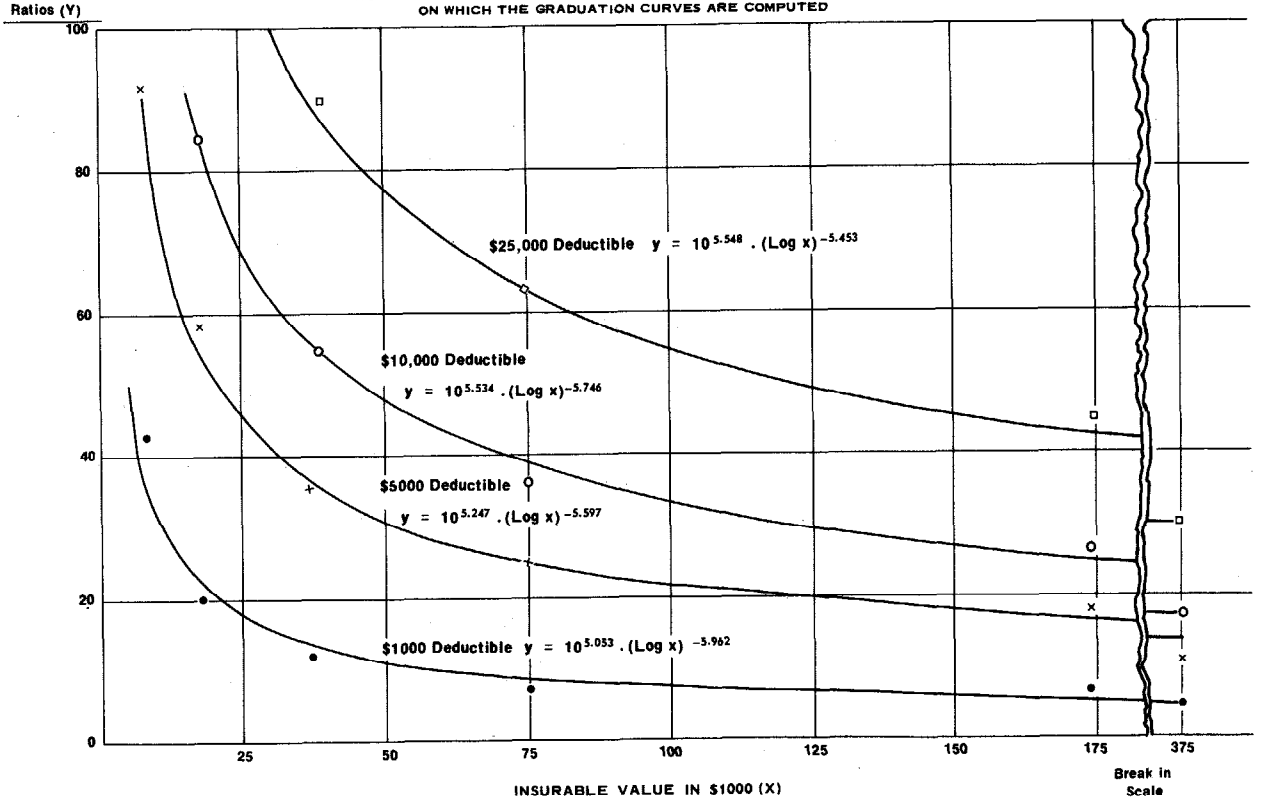

Exhibit 4

DISAPPEARING DEDUCTIBLE FORMULA

The formula used in the calculation of the loss savings within the disappearing deductible range is.

$$S = (1 + x)\,nd - xL$$

Where:

- S = Savings in loss payments by the Insurance Company
- $(1 + x)$ = the multiplication factor applied to the loss net of the deductible
- n = the number of losses in the Disappearing Deductible range
- d = the amount of the initial deductible
- x = the multiplication factor less unity
- L = the sum of the losses in the disappearing deductible range

This formula is developed, in effect, from the following typical example involving three losses (A − B and C) all within the disappearing deductible range: (1000-5000)

Loss	Total Amount of Loss	Deductible Disappearing @ $5000	Net Loss	Paid to * Policyholder	Savings to Insurance Co.
A	2000	1000	1000	1250	750
B	3000	1000	2000	2500	500
C	4000	1000	3000	3750	250
Total	9000	3000	6000	7500	1500

Now by the Formula given above, the Savings (S) equals:

$$S = (1 + x)\,nd - xL$$
$$S = (1.25)(3)(1000) - (0.25)(9000)$$
$$S = 3750 - 2250$$
$$S = 1500$$

It will be noted that this $1500 produced by the formula is the same figure obtained by applying the arithmetical approach to each of the three losses individually.

* With a $1000 deductible disappearing at $5000 the loss multiplication factor becomes $\dfrac{5000}{5000 - 1000} = 1.25$

NOTE

In addition to these savings resulting from the losses in the disappearing deductible range (i.e., in this example $1000 to $5000), we must add the total dollars involved in all losses for less than the deductible (i.e., in this example less than $1000)—in order to develop the total dollar loss savings.

IRIC DEDUCTIBLE STUDY—LOSS ELIMINATION RATIOS & RATE CREDITS

$500 DEDUCTIBLE DISAPPEARING AT $5,000

Insurable Value	Losses Less than Deductible Amt. Pd ($1000)	Losses in Disappearing Range: No.	Losses in Disappearing Range: Amt. ($1000)	Savings* in $1000	Total Eliminated Loss ($1000)	Total Loss in $1000 Under Review	LER's	Indicated Credit in Tarrif Rates
				FIRE				
$ 0— 9,999	793	2516	4765	870	1663	8439	19.7	15.2
10— 24,999	698	1847	3541	636	1334	19068	7.0	5.4
25— 49,999	479	1280	2296	456	935	25083	3.7	2.9
50— 99,999	371	1094	1855	401	772	29180	2.6	2.0
100—249,999	324	991	1633	369	693	30466	2.3	1.8
250—499,999	132	494	741	192	324	17664	1.8	1.4
500,000 & over	289	1174	1873	446	734	33519	2.2	1.7
Total Fire	3086	9396	16704	3370	6455	163419	3.9	3.0
				ECE				
$ 0— 9,999	1099	652	786	274	1373	2072	66.3	51.1
10— 24,999	1311	882	951	384	1695	3066	55.3	42.6
25— 49,999	830	905	1047	386	1216	2756	44.1	34.0
50— 99,999	579	834	1017	350	929	2839	32.7	25.2
100— 249,999	436	800	1085	324	760	3601	21.1	16.3
250—499,999	185	398	562	159	344	1439	24.0	18.5
500,000 & over	310	764	1167	295	605	5687	10.6	8.2
Total ECE	4750	5235	6615	2172	6922	21460	32.3	24.9

* $S = [(1 + x)nd - xL]$ where: S = Savings in losses; n = number of losses; d = deductible amount
$(1 + x)$ = multiplication factor, and x = multiplication factor less unity.

IRIC DEDUCTIBLE STUDY—LOSS ELIMINATION RATIOS & RATE CREDITS

$1000 DEDUCTIBLE DISAPPEARING AT $10,000

Insurable Value	Losses Less than Deductible Amt. Pd ($1000)	Losses in Disappearing Range		Savings* in $1000	Total Eliminated Loss ($1000)	Total Loss in $1000 Under Review	LER's	Indicated Credit in Tarrif Rates
		No.	Amt. ($1000)					
				FIRE				
$ 0— 9,999	1323	2200	7116	1654	2977	8439	35.3	27.2
10— 24,999	1140	1859	7734	1207	2347	19068	12.3	9.5
25— 49,999	834	1159	4663	770	1604	25083	6.4	4.9
50— 99,999	696	861	3176	604	1300	29180	4.5	3.5
100—249,999	617	745	2534	547	1164	30466	3.8	2.9
250—499,999	297	324	983	251	548	17664	3.1	2.4
500,000 & over	633	867	2713	662	1295	33519	3.9	3.0
Total Fire	5540	8015	28919	5695	11235	163419	6.9	5.3
				ECE				
$ 0— 9,999	1360	291	712	244	1604	2072	77.4	59.7
10— 24,999	1710	341	857	284	1994	3066	65.0	50.1
25— 49,999	1214	378	948	315	1529	2756	55.5	42.8
50— 99,999	919	396	1013	328	1247	2839	43.9	33.8
100—249,999	736	427	1171	344	1080	3601	30.0	23.1
250—499,999	313	244	626	202	515	1439	35.8	27.6
500,000 & over	548	510	1504	400	948	5687	16.7	12.9
Total ECE	6800	2587	6831	2117	8917	21460	41.6	32.1

* $S = [(1 + x)nd - xL]$ where: S = Savings in losses; n = number of losses; d = deductible amount
$(1 + x)$ = multiplication factor, and x = multiplication factor less unity.

IRIC DEDUCTIBLE STUDY—LOSS ELIMINATION RATIOS & RATE CREDITS

$5000 DEDUCTIBLE DISAPPEARING AT $25,000

Insurable Value	Losses Less than Deductible Amt. Pd ($1000)	Losses in Disappearing Range No.	Amt. ($1000)	Savings* in $1000	Total Eliminated Loss ($1000)	Total Loss in $1000 Under Review	LER's	Indicated Credit in Tarrif Rates
				FIRE				
$ 0— 9,999	5559	437	2880	2010	7569	8439	89.7	69.2
10— 24,999	4240	1362	14828	4805	9045	19068	47.4	36.5
25— 49,999	2774	857	10843	2645	5419	25083	21.6	16.7
50— 99,999	2226	463	5554	1505	3731	29180	12.8	9.9
100—249,999	1956	328	3712	1122	3078	30466	10.1	7.8
250—499,999	873	120	1435	391	1264	17664	7.2	5.6
500,000 & over	2162	304	3266	1087	3249	33519	9.7	7.5
Total Fire	19790	3871	42518	13565	33355	163419	20.4	15.7
				ECE				
$ 0— 9,999	1884	29	188	134	2018	2072	97.5	75.2
10— 24,999	2261	78	805	287	2548	3066	83.1	64.1
25— 49,999	1877	69	748	245	2122	2756	77.0	59.4
50— 99,999	1596	68	673	257	1853	2839	65.3	50.3
100—249,999	1522	83	798	319	1841	3601	51.1	39.4
250—499,999	747	42	437	154	901	1439	62.6	48.3
500,000 & over	1478	130	1214	507	1985	5687	34.9	26.9
Total ECE	11365	499	4863	1903	13268	21460	61.8	47.6

* $S = [(1 + x)nd - xL]$ where: S = Savings in losses; n = number of losses; d = deductible amount
$(1 + x)$ = multiplication factor, and x = multiplication factor less unity.