

STATISTICAL METHODS FOR CASUALTY COMPANIES
BY USE OF THE EIGHTY COLUMN
HOLLERITH SYSTEM

BY

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INTRODUCTION

The basic procedure in a casualty statistical department consists primarily of the recording, tabulation, and analysis of actuarial and company statistics in accordance with ratemaking bureau and company statistical coding plans.

It is the purpose of this paper to describe some of the standard as well as unusual methods of recording and tabulating casualty insurance ratemaking and allied statistics with special reference to the actuarial bureau and insurance department experience calls or requests for primary ratemaking data and with special reference to the use of the eighty column Hollerith card.

Consistent with this expressed purpose the scope has been necessarily confined to an outline of the requirements set forth in bureau calls and their compilation by the use of the eighty column Hollerith system. It is presumed that those to whom this paper may be of interest are familiar with the forty-five column Hollerith system.

EIGHTY COLUMN HOLLERITH SYSTEM

The important change in the eighty column Hollerith system as compared with the forty-five column system is found in the increased capacity of the new system. The economical utilization of this added capacity is emphasized in this paper.

The size of the punch card is the same— $3\frac{1}{4}''$ x $7\frac{3}{8}''$ —the added capacity having been accomplished by providing for a rectangular contact hole instead of a circular hole. The minimum space between two consecutive horizontal holes is the same as on the forty-five column card.

For casualty statistical work the new card system possesses several advantages. The increased capacity, besides eliminating

double punching, can be utilized to great advantage in the primary Hollerith recording of multi-coverage policies by punching two or three coverages on one card. In addition, the eighty column card is very practical for recording combined annual statement accounting and actuarial experience data. A sizeable saving is realized in punching, verifying, and tabulating time and in filing space and equipment. The eighty column card also permits the designing of loss cards which are very complete as to reference data, reserve test data, and combination annual statement and statistical data.

Contrary to a natural first assumption the compactness of the punched holes on the eighty column card results in an increased rather than a decreased degree of accuracy and efficiency in the mechanical functioning of the machine units. The verifying unit readily detects misalignment in the punching operation. A more accurate alignment of the punched holes and the fact that the insulation between the contact holes is the same give the eighty column card a higher degree of mechanical accuracy.

There are two methods of making a complete change-over from the forty-five column system to the eighty column system. Departments with large installations can retain both types of equipment during the transition period. Where this is impracticable, especially in the case of small installations, the change-over can be economically accomplished by tabulating all forty-five column cards necessary for future data before releasing the forty-five column machines, and punching such tabulated data on eighty column master cards.

The fact that the statistical work of casualty companies is increasing both as to bureau requirements and as to the requirements of company executives makes the eighty column card system a convenient adoption to permit of future expansion in statistical programs.

COMPLEMENT SYSTEM

The complement method of recording cancelled premiums and credits to losses involves the punching of the amount fields in complement figures. This method eliminates a large amount of clerical work when net tabulations are desired. The cards illustrated in this paper have all been designed to take care of complement punching.

Certain progress has been made in the development of a tabulating machine which will perform direct subtraction. The perfection of the direct subtraction principle in the tabulating machine will provide a more simple method of securing net tabulated figures as compared with the complement method.

SOURCES OF STATISTICAL DATA

The company records from which the coding and Hollerith punching is done for the recording of premiums (and exposures), losses, allocated loss expenses, and outstanding losses are of various forms.

Premium transactions other than audits are usually reported to the Statistical Department by means of some form of intermediate record rather than the underwriting file copy of the policy. The use of multiple copies of such an intermediate record enables several home office departments to handle a given group of entries simultaneously. Audit transactions are usually recorded from a copy of the audit, or similar record showing earned payrolls and premiums by classifications. Cancellations and corrections are often reported for statistical entry on the same intermediate record used to record the original policy. An alternate plan is to employ separate multiple records for the handling of cancellations and corrections by the several departments.

The recording of paid and unpaid losses on an individual case basis is usually done by one of three methods. Perhaps the most common method is the use of an individual hand written card on which the estimated reserve, subsequent changes, and loss payments are entered and the net reserve calculated after each entry.

A second method is to keep a running reserve on punch cards. Cards are cut for all original estimates, debit or credit changes, and loss payments. Cards of similar design but with an opposite corner clipped are punched as closure notices and sorted in with the other cards periodically. By "needling" out all claim numbers in sequence with a closure card, the punch cards representing closed claims can be withdrawn. The remaining cards which represent the net entries on all open claims can be readily tabulated to give the net case reserve. The disadvantage of a punch card record of individual claims is that it is not a satis-

factory unit record nor is it a convenient reference record, particularly where a single claim is represented by several cards.

The third method is a combination of the other two plans and involves the use of a bookkeeping machine for posting estimates and loss payments. The posted "account sheets," each representing an open claim, serve as convenient media for the daily Hollerith recording of paid losses and allocated loss expenses and a quarterly Hollerith recording of unpaid losses. By means of a control, a daily total of unpaid losses can be maintained. Except at the end of the year or other date as of which experience is filed, it is not necessary to punch the cards representing unpaid losses complete as to all statistical information.

Uniformity, accuracy, and prompt dispatching should be requisites of the sources of the data recorded on punch cards. The punching of cards can be speeded up by providing uniform coding spaces on all sources of data with each item arranged in the order of the corresponding fields on the punch cards.

BUREAU STATISTICAL CODING PLANS

The translation of written data to coded form suitable for Hollerith card recording is accomplished by reference to statistical plans published by the various actuarial bureaus. Such codes are usually confined to purely actuarial or experience statistics. Codes for the other classes of data are usually established in the company Statistical Departments.

Statistical code manuals are based upon the respective underwriting manuals. Since a sufficient spread to be indicative of the inherent hazard is necessary to secure reliable actuarial statistics, the value and importance of uniform statistical plans is apparent for combining the experience of a large number of companies on a common basis.

All casualty companies licensed in the state of New York are required to file their underwriting experience with such statistical agencies as may be designated by the Insurance Department. This Insurance Department ruling gives an official status to the statistical plans of the designated agencies.

The close coordination between the underwriting and statistical classifications gives to the compiled experience a double value—direct cost analysis of past experience, and the basis for future rate promulgation.

CODING

Coding, or the translating of data for Hollerith recording, is one of the most important and often the least supervised activity of a statistical division. When full advantage is taken of the possibilities of the Hollerith system of compiling statistics, the coding remains the only important operation where the human element is a factor up to the point of the editing and analysis.

In the operative statistical routine, all data retains that degree of accuracy which it possessed after the coding operation. Either the independently punched dual card system or the verifying machine method gives an almost exact check on the accuracy of the transcription of codes on the punch cards. From the punched card to the finished tabulation, and to the finished record or report if the master card plan is followed, the Hollerith machines eliminate all clerical routine.

The importance of coding in connection with the efficient operation of a Hollerith system makes it advisable to centralize this operation in the Statistical Department or in any event to place the control thereof under the same head that is responsible for the accuracy of and the filing of bureau experience. In certain lines, particularly workmen's compensation, the underwriting manual reference codes and the statistical codes are identical in which case it is convenient to have the classification coding done in connection with the underwriting.

The use of Rand book units saves a great amount of coding time as contrasted to direct reference to several manuals, code lists of agents, and miscellaneous codes.

BASIC CARDS

Under the Hollerith system the statistical entry unit is the punch card. The card designs in the Exhibits are the basic records for the procedures described in this paper.

In the case of both the premium and the loss cards, many of the fields are common to all cards. A brief explanation of the fields on these cards will serve both to describe their content and to list the more common items of casualty statistical data.

Separate designs are illustrated for each line of insurance so that the experience fields can be seen more clearly. In actual

practice, the cards for similar lines would be combined and two or three composite card designs used.

Combination statistical and accounting cards are illustrated which can be made the basis of casualty actuarial and annual statement data as well as agency statistics and other home office reports.

The fields on these card designs are symmetrical which presents a practical advantage for companies whose statistical operations are centralized.

Date:

The first field contains the calendar month and year of entry on the accounting records. In commercial accounting terminology, it is the business month and year.

Transaction:

The coding in this field describes the entry as to:

1. Written and additional premiums
2. Audits
3. Flat cancellations
4. Partial cancellations and audit refunds
5. Reductions
6. Original premiums cancelled

Since these cards are combination accounting and statistical cards, the above segregation is necessary to give annual statement detail of written and in force premiums.

Source:

Separate reports on new and renewal business can be tabulated by sorting the codes in this field:

1. Renewal business
2. New business

Policy Year:

This field is used to record the last digit of the year in which the policy becomes effective. To record losses on policies over ten years old, this field is left blank and the policy year written in. For example, 1930 policies would be punched 0 and 1920 policies would be indicated by a written code. Three year one payment

policies are recorded on three cards with consecutive policy year coding as though three successive annual policies were issued.

The policy year is the calendar year in which the policy is effective. The policy year statistical method involves the observation of the experience on policies of each calendar year until the accident history is complete.

Policy Number:

This is an identification field and serves the purpose of enabling the punch card entry to be traced to the policy files. This identification field for most agency companies contains a home office number rather than the policy number. Some companies find it advantageous to record register page numbers to facilitate reference to original sources.

Term:

For unearned premium reserve purposes, policies running one year or less, two years, and three years, must be separately tabulated and computed.

Expiry Date:

The expiration month and year serve as the basic sorting field for tabulating premiums in force figures. January expirations would be coded 01 and October, November and December, 10, 11 and 12 respectively. The X and Y positions are not used for expiration months as the Hollerith tabulators do not control on these positions. All cards on one payment three year policies take the expiration year coding of the third year regardless of the policy year punching.

Branch:

Tabulations based upon the coding in this field provide agency or sales departments with very necessary statistics of premiums by branch offices.

Agency:

If all premium transactions are coded for agency, production statistics of individual agents by lines can be compiled. Non-agency companies are likewise interested in new business production by salesman.

State:

This field furnishes state statistics for tax return and experience purposes. The state coding is determined by the location which determined the premium rate.

Territory:

For the majority of lines, casualty experience is filed with rate-making bureaus by territorial divisions within each state. A "statistical city" usually includes the population concentration area rather than the confines of the political boundary. As in the case of state coding, this field contains the coding of the location which determined the premium rate.

Line:

The line of business is designated in this field. A decimal system of line coding similar to the following simplifies the coordination between the three-coverage premium card, the single coverage loss card, and the single coverage master cards.

Class:

For experience purposes, this is the most important field on the card. The experience classifications for each line of business usually correspond directly with the underwriting manual classifications.

Limits:

For the automobile and general liability lines these fields are provided to record the code representing the policy liability limits for the public liability and property damage coverages.

Exposure:

The exposure for any line is the unit of measurement of the extent of the hazard and is the basis for determining the premium. Exposure times the rate equals the premium. The nature of the exposure unit varies with the different lines and with classifications within certain lines. The exposure for workmen's compensation, auto dealers and manufacturers' and contractors' liability lines is \$100 of payroll; for automobile, the number of car years; for owners', landlords' and tenants', the number of square feet of area and linear feet of frontage, or the number of residences, and

Line	PREMIUM CODING			Master Card and Loss Coding
		First Exposure and Premium Field	Second Exposure and Premium Field	
Automobile.....	10 10 10	P. L.	P. D.	Coll. 11 12 13
Automobile Audited Forms.....	20 20 20	P. L.	P. D.	Coll. 21 22 23
Workmen's Compensation.....	30			30
Plate Glass.....	40			40
Owners', Landlords' and Tenants'.....	50 50	P. L.	P. D.	51 52
Products.....	55	P. L.	P. D.	56 57
Manufacturers and Contractors.....	60 60	P. L.	P. D.	61 62
Employers' Liability..	35			35
Elevator.....	70 70 70	P. L.	P. D.	Coll. 71 72 73
Teams.....	75 75	P. L.	P. D.	76 77
Accident and Health..	90 90	Accident	Health	91 92
Bonding:				
Fidelity.....	81			81
Surety.....	82			82
Check Forgery.....	83			83
Burglary.....	85			85
Motor Vehicle Fire Company Coverage	00 00 00	Fire	Theft	Tornado 01 02 03

other bases of premium charge. Great care must be exercised in coding and punching this field as there is no uniform unit of measurement for all lines. For some lines tenths of exposure units must be recorded. For ratemaking statistical purposes the exposure is highly important.

Premium:

This field is self-explanatory.

Dividend:

The necessity for this field would depend upon the type of insurance carrier. Participating carriers which pay dividends at policy expiration require tabulations of dividends paid or applied on account by line and state. Since credit application on renewal policies is the more common form of dividend payment, it is economical to record such applied dividends on the premium cards.

The above fields for policy year, policy number, branch, agency, state, territory, line, and class apply also to the loss and loss expense Hollerith cards. The coding for each of the above fields on the loss cards should always be identical with the premium coding of the policy upon which the loss has been paid.

Following is a description of the fields which are exclusive with loss and loss expense Hollerith cards:

Transaction:

For annual statement purposes the following transaction code is carried in this field:

1. Gross loss or loss expense paid
2. Subrogation credits
3. Miscellaneous credits or refunds
4. Reinsurance recoveries

Reinsurance recovery credits are used in annual statement tabulations only. All experience filings exclude reinsurance accepted or ceded.

Kind of Payment:

Payments under workmen's compensation policies must be segregated as to compensation payments, medical payments, and loss expense. For other lines the payments are segregated as to pure loss and loss expense.

Claim Date:

The claim month and year are used to furnish incurred loss tabulations.

Claim Number:

This reference number is self-explanatory.

Report Date:

The report month and year are used to run tabulations to test the adequacy of loss reserves. Successive quarterly or semi-annual valuations of claims reported in a certain fiscal period are the bases for most reserve adequacy tests.

Number of Claims:

This is a counter field to tabulate the number of claims. For statistical purposes a "claim" is a case upon which a pure loss payment has been made. The recording in this field is made by punching a "1" for the first pure loss payment and an "0" for all other payments and loss expense.

The other fields which are applicable to specific lines are explained under the individual treatment of those lines.

UNEARNED PREMIUM RESERVE

As combination annual statement and statistical punch cards are illustrated in this paper mention should be made concerning the method of securing premiums in force tabulations.

The coding in the transaction column of each premium card describes each premium entry as to gross written or additional, audit additional, flat cancellations, partial cancellations and audit refunds, reductions, or original premiums cancelled.

The following premium transactions affect net premiums written: gross written or additional, audit additional, flat cancellations, partial cancellations, reductions, and audit refunds. Cards representing the following transactions only affect premiums in force: gross written or additional, flat cancellations, reductions, and original premiums cancelled.

In recording pro-rata or short rate partial cancellations one card is punched for the amount of the return premium and a second or original premium cancelled card for the original premium or amount in force prior to the cancellation.

The record of premiums in force is the basis of one of the most important reserves of a casualty company—the unearned premium reserve. On account of the importance of this reserve and the fact that the premiums in force figures are not in themselves subject to bookkeeping control makes it advisable that a reconciliation record between written premiums and in force premiums be maintained.

While line and year of expiration only are necessary for companies setting up the unearned premium reserve on the 50% method, it is advisable to keep the record of premiums in force by month of expiration also. If this is done the more accurate calculation of earned premiums on a pro rata basis for internal statements can be made.

MASTER CARDS

The master or recapitulation card system of compiling and recording statistics is a very flexible and economical method of furnishing extensive periodic data promptly and accurately. Briefly, the master card system consists of the posting of tabulated data to summary punch cards.

The master card method is very satisfactory for compiling casualty experience on a policy year basis where two or more reportings are made as of successive calendar year developments. The premium cards for each line and policy year are tabulated to show the net exposure and net premium by classification for each territorial division in each state. These tabulated codes and corresponding exposure and premium figures are then posted by punching them on classification master cards (Exhibit V). This tabulating and master carding of premiums can be done at the end of each calendar year for each policy year or more frequently for lines comprising a large volume of cards.

The tabulating and master carding of paid losses (including allocated loss expenses for certain lines) is also done by line, policy year, and class for each territory and state. For these code sub-divisions, the amount paid and the number of claims are shown.

Outstanding losses and the number of claims outstanding are recorded on punch cards as of the date of the experience call and summarized on separate master cards similar to the paid loss

procedure. By summarizing outstanding losses on separate experience master cards, they can be replaced at each future reporting of the experience. Also, a direct tabulation of incurred losses can be obtained by cross-adding on the printer-tabulator.

Two types of master cards are illustrated in Exhibit V. The monthly master card is used primarily to record premiums, losses, loss expense, dividends, and outstanding losses by policy year and state for annual statement purposes and for statistical department controls. A brief explanation of the fields on the monthly master card will suffice to describe the data recorded thereon:

Code:

This card design can be used to record several master card accounts such as, business by state, business by policy year, business by state by policy year, premiums in force by expiration month and year, etc. The code in this column is erected to designate the particular master card account.

Date:

This date designates the calendar month and year of the data which is summarized on the particular master card.

Line: Statistical

The statistical line code is recorded in this field. This code is the one shown under the heading, "Loss Coding," in the description of the basic cards.

Line: Accounting

This field is punched on all annual statement master card accounts. A code is provided for each line shown in the income exhibit on page 2 of the annual statement blank. Certain annual statement lines, for example, liability other than auto, are made up of several statistical lines.

Policy Year:

The last two digits of the policy year are recorded in this field for those master card accounts segregated by year of issue.

State:

All state master card accounts contain the standard state coding in this field.

Expiry Date:

The month (the two digit code) and year of expiration are recorded in this field on the premiums in force master card account.

The other fields are amount fields and are self explanatory. The only purpose within the scope of this paper which the monthly master card serves is to record the policy year, line, and state controls to which the experience master cards can be balanced.

The second type of master card illustrated is the experience card. The additional fields not explained above are posting fields for the classes of data indicated by the headings and explained in the description of the basic cards. Certain experience fields which are not common to several lines are not provided for but can be recorded in the blank space on the card.

It is not practical to record too many subdivisions of detail on one master card account as the number of master cards becomes too large to obtain the advantages of summarizing.

Interesting internal exhibits of experience can be economically made up from the master cards after the bureau tabulations have been run. The master cards readily give experience by class regardless of territories, by territories regardless of class, and other exhibits of more analytical value than the bureau report itself. For most territories and classifications the data in the latter are too scattered in the reporting of an individual company.

The situation often arises where different card designs are used in the various calendar years over which a given policy year extends. The additional clerical work involved in combining three or four tabulations is eliminated by recording each year on a common experience master card design.

The master card data should not be recorded on cards exclusively. In fact it is advisable to tabulate each master card account with a printer on ruled forms. Practically all of the permanent monthly accounting data and policy year and calendar year experience can be permanently recorded by the master card method with a consequent elimination of hand-written records.

RATEMAKING EXPERIENCE STATISTICS

The card designs illustrated in the Exhibits and which have been explained in the foregoing sections contain three classes of

“fields” or items of data; namely, reference fields, accounting fields, and statistical fields. The latter fields are the sections of the Hollerith cards from which the experience for bureau calls is compiled. The common statistical or experience fields include the line, policy year, state, territory or city, classification, exposure, premium, losses paid, allocated loss expense paid, losses outstanding, number of claims paid, and number of claims outstanding.

The line is, of course, the subject of the call; while the policy year is the period covered. The state and territory are the bases for location statistics. The classification describes the hazard and usually corresponds to the hazard segregations in each respective underwriting manual, thereby furnishing the necessary statistics for a hazard analysis of past experience and the basis for rate revisions. The statistical fields just described are primarily analytical while the other fields, comprising exposure, premium, losses, and number of claims are quantitative. The premium, loss, loss expense, outstanding loss, and number of claims fields need no further explanation. The different bases of exposure measurement will be explained in a separate discussion of each line of insurance.

The compiling of bureau calls involves three steps or operations. The first step is the tabulation of the primary premium and loss cards. The second step is the master carding of the quantitative data in the detail of the analytical fields. The third is the tabulation of the master cards for the compilation of the bureau call.

All three steps should be carefully audited and any inconsistencies with the statistical plan corrected. On account of the complexities of most casualty statistical plans, supervised coding, verified Hollerith recording, controlled tabulating, and a final careful audit of the reportable experience is imperative. It is readily apparent that the detection and correction of errors at the “end of the line” is a more costly procedure than a supervised system to assure the accuracy of each step from the primary coding operation to the completed experience call.

While the above gives a general outline of the compilation of ratemaking experience statistics, there are sufficient and important exclusive items and exceptions in almost every line to necessitate a brief review of the specific statistical compilation require-

ments for each line of casualty insurance. Such an individualized treatment of each line follows:

AUTOMOBILE CASUALTY EXPERIENCE

The statistical or experience fields on the automobile casualty premium and loss cards illustrated in Exhibits I(A) and III(A), respectively, have been designed to include fields for all data required in the official New York Call with the exception of certain historical supplements on individual claims. Separate experience on each automobile casualty coverage must be filed as the automobile casualty call actually comprises three calls; a public liability call, a property damage call, and a collision call.

On the automobile casualty card the important analytical fields are the policy year, state and territory, and the classification. Exposure, premium, losses, and the number of claims comprise the important quantitative fields.

The geographical coding schedule subdivides all states to reflect the differences in traffic congestion, the important directly contributing factor in accident frequency. These territorial divisions within each state are usually defined by population concentration rather than political boundaries. Separate codes are provided for all cities of 100,000 population and over and for groups of cities with populations under 100,000. Small cities and country districts are classified for underwriting and statistical purposes as a separate territory in each state.

The classification schedule classifies all motor vehicles according to their physical structure and purpose. For private passenger cars there are three main classes designated as W, X, and Y, which are determined by such factors as horsepower, wheelbase, weight, cylinder displacement, and list price. Commercial cars are classified according to purpose and tonnage. Miscellaneous types are for the most part classified as to purpose. Two factors enter into the classification of motor vehicles for collision insurance: replacement cost and age. On the premium card the first class field is used for the public liability and property damage codes and the class field in the collision section of the card for that coverage.

Separate fields are provided for the public liability and property

limits codes. The latter codes are frequently combined with the three digit class codes where separate cards are punched for public liability and property damage.

The common unit of exposure for the automobile casualty coverages is the "car-year." An exposure of one car-year is one car insured for twelve months. The exposure for automobile dealers coverage is the payroll, in dollars, while for the miscellaneous types of cars, the exposure similarly follows the basis of premium charge.

The master card method explained in a foregoing section simplifies the compilation of the bureau report. The calculation of average rates can be made on the master card tabulations and the bureau blanks typed directly therefrom.

Stock casualty companies file their experience with the National Bureau of Casualty and Surety Underwriters and the mutual casualty companies with the National Association of Automotive Mutual Insurance Companies.

The filing of experience on compulsory public liability insurance in Massachusetts is made by reporting each premium and loss transaction on forty-five column punch cards. Premium transactions can be recorded for bureau purposes by routing the source of record to forty-five column key punch operators after the company's eighty column card record has been made. An alternate plan is to list the significant compulsory plan fields from the company's cards, monthly; audit the listing for obvious inconsistencies; and then punch bureau forty-five column cards from this listing. In punching the eighty column cards the compulsory plan codes are used throughout. The coverage (statutory or extra-territorial) can be punched in the first class column and the limits in the field so designated. In the listing the coverage can be printed separately and the limits combined with the class.

Losses are filed on closed claims only, and reported periodically on open claims. The bureau loss cards provide for loss analysis data in addition to the usual policy data. The punching, therefore, must be done from the claim folder, or preferably, from an equivalent intermediate record.

For internal records the compulsory public liability cards should be master carded on the same basis as the regular automobile public liability.

AUTOMOBILE FIRE AND THEFT EXPERIENCE

While the writing of automobile fire, theft, and tornado insurance by casualty companies is not permitted in several states and excluded countrywide to such carriers licensed in New York, it is common practice to issue a dual policy by placing the above coverages in a fire company running mate.

The motor vehicle fire and theft plan requires a fiscal year reporting instead of a policy year reporting as in the casualty plan. This fiscal period runs from September 1 of one year to August 31 of the next year, and its purpose is to provide statistical data for rate revisions earlier in the next calendar year. The cards illustrated in Exhibits I(B) and III(B) contain the necessary fields to comply with the experience requirements of the National Automobile Underwriters Conference, the official filing agent for these lines.

Private passenger car experience is recorded and reported by state, city, and classification. The classification codes are erected to describe each car as to make, type of policy (amount, actual value, or deductible), and age groups. Commercial car experience is recorded and reported by state and classification. The latter classification coding describes a commercial car as to type of policy (full coverage or deductible), age group, and list price. Fire and theft insurance on fleet, public automobile, and dealers policies are reported by states only. The same is true of tornado insurance.

The data called for includes the gross liability or amount of insurance, the net premium, the gross premium in total, and the net losses paid. Fire losses must be analyzed as to self-ignition losses and all others. Theft losses must be separated as to total car and pilferage losses.

It is preferable to compile this call direct from the primary cards rather than by the master card method. The calendar year basis eliminates the policy year cumulative feature of master cards while the degree of refinement of the data is too great to realize the economy of punch card recapitulations.

Although not required on experience reports a field has been provided on both the premium and loss cards for recording policy year. Even though the loss development is rapid, a policy year analysis of the underwriting results on these lines is superior to calendar year exhibits for internal reports.

WORKMEN'S COMPENSATION EXPERIENCE

Two plans are followed in reporting compensation experience: Schedule Z and the Unit Plan. Schedule Z is a policy year reporting by individual states of the experience on each underwriting manual classification. The first and basic part is made up of an individual exhibit of the payroll, premium, and analysis of losses for each classification for each state and policy year. The remainder of the Schedule Z reporting comprises special reports on serious cases. These special reports are historical and therefore are made up from the claim files rather than from punch cards.

The compensation premium card illustrated in Exhibit I(C) and the loss card illustrated in Exhibit III(C) contain experience fields in line with Schedule Z requirements. The territory field is not required for experience purposes. The statistical classifications for compensation insurance represent corresponding underwriting classifications erected to reflect the different industrial hazards. The exposure represents the payroll in dollars.

There are two standard methods of handling daily compensation premium transactions in the Hollerith recording. The first is that of cutting one card for each classification showing the estimated payroll and estimated premium when the policy is written and similarly to record any additions or other changes at the time of the entry of the payroll audit.

The other procedure provides for a classification and payroll analysis at the time of the audit entry only. One card is cut for the deposit premium under some designating punch in the classification field. At the time of the audit entry the deposit premium is cancelled out under the same designating deposit class code and the entire earned premium and earned payroll is punched with class segregation. The net total of these earned premium cards and the cancelled deposit premium card is the net audit additional or refund entered on the accounting records.

The master card plan can be used for compiling the data for the payroll and premium section. Such data consists of state tabulations showing net payroll and net premiums by classification.

The Hollerith loss card illustrated in Exhibit III(C) entails a procedure which differs from that of other casualty lines. In recording payments the "closed claim" fields are skipped, the reason for this being that the Schedule Z loss exhibit analysis

cannot be determined until the claim is closed or placed upon a specific award basis. At the time of closure the same design of card is punched on compensable claims for the loss exhibit of Schedule Z. The Schedule Z field classifies cases as to death, permanent total, major permanent, minor permanent or temporary disability. In the medical field is recorded the compensable medical in dollars, which figures are used to segregate the compensable and non-compensable medical incurred.

The tabulation of the medical by classification is made from the daily paid loss cards. Compensable losses are tabulated from the closed claim punch cards by classification for each class of injury. A tabulation of compensable paid loss cards by claim number makes a good control to which these closure cards can be checked to verify the presence of a closure punch card or outstanding card on each compensable claim. By erecting an additional field on the experience master card to record class of injury the compilation of the loss exhibit is facilitated. The field on the closure punch cards for claim number permits those claims in the death and serious classes of injury groups to be called for and summarized for the supplementary parts of Schedule Z.

The second method of reporting compensation experience is by the Unit Plan. Schedule Z calls for individual reports by classification. The Unit Plan makes the individual risk the reporting unit.

With the exception of the Pennsylvania unit plan, these plans are still in the experimental stage. The more or less developed history card systems in the Risk Experience departments of companies at the time of the inauguration of the Unit Plan will probably result in the history card method becoming the nucleus for the filing of workmen's compensation experience should the Unit Plan displace Schedule Z as the basic workmen's compensation experience reporting.

While the compilation of aggregate classification data on compensation insurance would be a costly and cumbersome task without the aid of the Hollerith system, the latter system does not at present give much clerical relief in compiling data under the Unit Plan. As the possible solution to the clerical problem incidental to administering the unit reporting plan should it be generally adopted, consideration of the use of the eighty column card and the tabulating machine unit known as the interpreter is

recommended. The new card provides sufficient space for assured, policy, and claim numbers, while the interpreter facilitates the reference to the cards by printing the punched information thereon.

Workmen's compensation experience is filed with the National Council on Compensation Insurance or with state rating bureaus.

ACCIDENT AND HEALTH EXPERIENCE

The cards illustrated in Exhibits I(D) and III(D) are not recommended as to content and arrangement for exclusive accident and health companies or accident and health departments of life insurance companies. They are intended primarily to coordinate these lines with the other casualty lines for centralized statistical departments desiring the features of combined accounting and statistical eighty column Hollerith cards.

The experience filing with the Bureau of Accident and Health Underwriters is a punch card filing while the Health and Accident Underwriters Conference merely calls for a monthly report of accident and health premiums, accidental death and dismemberment losses, other accident losses, and health losses.

The card designs contain the statistical fields of the Bureau of Accident and Health Underwriters' punch cards. Some of the fields have not been explained in previous sections of this paper. On the premium card the following fields are self-explanatory: Age, term in months, sex, accident weekly indemnity and sickness weekly indemnity. The policy form coding refers to the coverage (period and amount of indemnity) which is provided under the policy. The term class refers to the accident hazard of the insured's occupation (select, preferred, etc.). A corresponding code is not provided for in the health statistical plan. The occupation code refers to a special and extensive coding schedule from which a classification is assigned to each hazard. The principal sum refers to accident insurance only and is the amount in dollars of the death benefit.

The compilation of accident and health loss statistics involves considerable coding detail. The illustrated card design contains all fields provided for on the reporting loss card. However, unless a company desires such detail for its own internal experience it is advisable to punch the bureau loss card directly from

the claim file or intermediate record and use a more condensed card for internal statistics.

BONDING EXPERIENCE

The bonding lines, comprising surety, fidelity, and check forgery bonds present an unusual actuarial problem. Theoretically, there should be no such problem as suretyship does not presume the payment of losses. But practically, there is a payment of funds of the nature of losses in a ratio to premiums in the same degree of regularity as that possessed by the loss ratio of a regular casualty line.

The card designs illustrated in Exhibits II(A) and IV(A) contain the fields necessary for the accounting and statistical treatment of these lines. The "reinsurance company" and "form" fields require further explanation. In the reinsurance company field is recorded the code number of the carrier from which business is accepted or to which business has been ceded. The form field describes the transaction as to direct business, reinsurance accepted, or reinsurance ceded. Positive entries of reinsurance ceded are recorded in complement figures as regards amounts, premiums, and losses. In this way a single tabulation of all three forms will give the net writings or net losses.

In the classification field is recorded the class code of the Towner Rating Bureau statistical plan. A separate code is provided for each of the general types of bonds, types of corporations named as principals, and types of contracts guaranteed.

The official call for experience is a calendar year call instead of a policy year reporting. The indefiniteness and the extended period of the occurrence of claims on bonding contracts, particularly in the case of fidelity forms, present a difficult problem of policy year allocation of loss payments, not to mention the effect of salvage transactions in deferring the ultimate loss ratio of a given policy (or bond) year.

This official calendar year call requires the filing for New York State and countrywide of the direct premiums and losses by classifications. This data can be readily obtained from the Hollerith cards of the designs illustrated.

For internal experience reports it is advisable to attempt the compilation of policy year reports with slight modifications from

standard casualty policy year procedure. While such procedure presents difficulties in assigning losses to policy years, the resultant reports are not distorted by premium volume changes to the extent that calendar year reports are.

GENERAL LIABILITY EXPERIENCE

The statistical experience on the general liability lines can be compiled from Hollerith cards as illustrated in Exhibits II(B) and IV(B). The statistical processes for these lines correspond very closely to those for the compilation of automobile experience. The essential differences are in the nature of and in the recording of classifications and exposures. The official call requires a policy year reporting on public liability, property damage and collision (if applicable) similar in content and form to the automobile casualty call. The same filing agencies receive this experience.

Separate classification coding schedules are provided in the statistical plan for the different general liability lines. Such coding schedules for each line provide for a segregation of experience by underwriting classifications. The owners, landlords and tenants schedule contains a two digit code determined by type of building or occupancy, combined with a prefix code to designate area or frontage for risks written on that basis. A miscellaneous schedule classifies risks not written on an area and frontage basis. Elevator classification codes segregate the experience by type of elevator, kind of building, and interlocking device. Manufacturers and contractors classification codes are the same as the corresponding compensation codes. The codes for the miscellaneous forms are likewise based upon corresponding underwriting classifications.

Territorial coding is not required for manufacturers and contractors, while the other lines require separate experience for cities over 200,000 and according to zones for apartment and residential risks in New York and Boston, respectively.

The accurate recording and reporting of exposures on the general liability lines require the greatest possible care because of the variance not only as to lines but as to classifications within given lines. In the owners', landlords' and tenants' portion of the statistical plan the exposure for area classes is the number of

square feet, for frontage classes, the number of linear feet, for miscellaneous lines, the number of residences, persons, acres, and other designatures of the basis of premium charge. Other exposure bases are payroll for manufacturers and contractors, number of elevator-years for elevator coverage, team-years for teams coverage, and corresponding units of hazard measurement for other miscellaneous coverages.

PLATE GLASS EXPERIENCE

The Hollerith cards illustrated in Exhibits II(C) and IV(C) contain the necessary fields for compiling plate glass experience. This experience is usually called for by policy year, state and city, and by zones or territorial divisions of cities.

The classification codes are determined by the setting, size, location in building, use and kind of building, depending on the kind of glass. The classification coding for automobile plate glass segregates the experience on open and closed cars for private passenger, commercial, livery and miscellaneous cars. The geographical coding schedule contains the necessary territorial divisions of each state to reflect both the breakage hazard and the cost of replacement. Most of the large cities are subdivided by zones consistent with the varying hazard within the particular city.

The data recorded consists of the table premium or exposure, written premium, losses paid, losses outstanding, total losses incurred, number of claims paid and number outstanding. The table premium is the basic premium shown in the underwriting manual to which differentials are applied to determine the premium charge. The table premium makes a satisfactory exposure in that it is a combined index of relative quantity and replacement cost. For all glass insured on valuation basis where the premium is a definite percentage of the insured value of the glass, the amount of insurance is recorded as the exposure. Automobile plate glass is recorded on the same exposure basis as automobile casualty lines—number of car years insured.

Plate glass experience is compiled by two bureaus. The W. F. Moore bureau is a non-partisan ratemaking office to which the members file calendar year experience annually and on special call. The Plate Glass Department of the National Bureau of

Casualty and Surety Underwriters is membered by stock companies. Similar experience reports with the exception that the period covered is the policy year instead of the calendar year are filed with this bureau.

BURGLARY EXPERIENCE

The burglary experience statistics are filed on forty-five column punch cards in accordance with the statistical plan of the National Bureau of Casualty and Surety Underwriters. Similar procedure to that outlined for filing compulsory automobile liability experience can be followed to comply with this punch card reporting. Company and bureau cards can both be cut from the punching source; or the company cards can be listed monthly, audited, and then punched on bureau cards.

The alarm field on the premium card is provided for recording a special burglary code to designate types of alarm systems used to protect the premises, and the nature and extent of protection by watchmen and guards. A form code to describe the type of policy and kind of coverage is recorded in the form field on the cards. Examples of such forms are bank burglary, bank robbery, messenger robbery, and ten types of residence burglary coverage. On the loss card the cause of loss field has recorded therein a one digit code which describes the nature of the claim (burglary, theft, servant, robbery inside premises, robbery outside premises, etc.). The property field on the loss card designates the property loss (money, silverware, clothings, furs, jewelry, etc.).

The classification coding varies with the policy forms. Residence burglary class codes describe the type of dwelling and size of the policy (amount of insurance). Bank burglary class codes are a combination of safe, vault, and population designations. Robbery and mercantile safe classification codes segregate the experience by the kind of business of the insured. Mercantile open stock classifications describe the merchandise dealt in and the size of the policy.

The territorial code schedule contains separate codes for the most populated cities and counties, and for the balance of the locations in each state. The exposure for all forms is the amount of insurance in dollars.

CONCLUSIONS

In spite of the uniformity in the statistical plans used by all the leading casualty companies and the general application of punch card systems for complying with such plans, there is a lack of uniformity in the statistical methods of various companies. Nor is uniformity to be expected of those statistical processes devised to compile uniform statistics.

The internal organization structure of single line and multiple line companies, of companies decentralized by lines and functions and those decentralized by functions only, of companies operating under the agency plan and those on a direct writing basis, are widely different.

With a recognition of these inherent differences in casualty home office organizations, general principles of statistical methods and Hollerith craftsmanship have been emphasized rather than the presentation of a model statistical procedure capable of solving all casualty statistical experience problems.

EXHIBIT I
 EIGHTY COLUMN HOLLERITH PREMIUM CARDS
 PREMIUM — AUTOMOBILE CASUALTY

DATE	TRANS	SOURCE	POL. YR.	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	LINE	CLASS	LIABILITY		PROP DAMAGE		COLLISION		DIVIDEND	
													EXPOSURE	PREMIUM	EXPOSURE	PREMIUM	CLASS	EXP	PREMIUM	
0000	0000	0000	0000	00000000	00	000000	0000	000000	0000	000000	0000	000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

PREMIUM — AUTOMOBILE FI

DATE	TRANS	SOURCE	POL. YR.	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	LINE	CLASS	AUTO FIRE		AUTO THEFT		AUTO TORNADO		DIVIDEND	
													RISK	PREMIUM	RISK	PREMIUM	RISK	PREMIUM		
0000	0000	0000	0000	00000000	00	000000	0000	000000	0000	000000	0000	000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

PREMIUM — COMPENSATION

DATE	TRANS	SOURCE	POL. YR.	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	LINE	CLASS	COMPENSATION																		DIVIDEND	
													EXPOSURE	PREMIUM																		
0000	0000	0000	0000	00000000	00	000000	0000	000000	0000	000000	0000	000000	00000000	00000000																	00000000	00000000

PREMIUM — ACCIDENT & HEALTH

DATE	TRANS	SOURCE	POL. YR.	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	CITY	POLICY FORM	LINE	CLASS	OCCUPATION	AGE	ACCIDENT		ACC WKLY IND	HEALTH PREMIUM	SICK WKLY IND	DIVIDEND	
																PRINCIPAL SUM	PREMIUM					
0000	0000	0000	0000	00000000	00	000000	0000	000000	0000	000000	0000	000000	000000	000000	0000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

A

B

C

D

EXHIBIT II
EIGHTY COLUMN HOLLERITH PREMIUM CARDS

PREMIUM -- BONDING

DATE	TRANS SOURCE	POL YR	BOND NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	CITY	TERRINS CO	LINE	FORM	CLASS	BONDING		DIVIDEND
														AMOUNT	PREMIUM	
0000	0000	0000	00000000	00	0000	00	000000	00	0000	00	0000	00	0000	00000000	00000000	00000000

A

PREMIUM -- GENERAL LIABILITY

DATE	TRANS SOURCE	POL YR	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	LINE	CLASS	LIABILITY		PROP DAMAGE		COLLISION		DIVIDEND
												EXPOSURE	PREMIUM	EXPOSURE	PREMIUM	EXPOSURE	PREMIUM	
0000	0000	0000	00000000	00	0000	00	000000	00	0000	00	0000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

B

PREMIUM -- PLATE GLASS

DATE	TRANS SOURCE	POL YR	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	ZONE	LINE	CLASS	PLATE GLASS		DIVIDEND
													EXPOSURE	PREMIUM	
0000	0000	0000	00000000	00	0000	00	000000	00	0000	00	0000	0000	00000000	00000000	00000000

C

PREMIUM -- BURGLARY

DATE	TRANS SOURCE	POL YR	POLICY NUMBER	TERM	EXPIRY DATE	BRANCH	AGENCY	STATE	TERRITORY	FORM	LINE	CLASS	ALARM	BURGLARY		DIVIDEND
														AMOUNT	PREMIUM	
0000	0000	0000	00000000	00	0000	00	000000	00	0000	00	0000	0000	00	00000000	00000000	00000000

D

EXHIBIT III EIGHTY COLUMN HOLLERITH LOSS CARDS

LOSS — AUTOMOBILE CASUALTY

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL. YR.	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	LINE	CLASS	CLAIMS	AMOUNT
MO.	DAY														
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A

LOSS — AUTOMOBILE FIRE

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL. YR.	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	LINE	CLASS	CAUSE T. BLZE	CLAIMS	AMOUNT
MO.	DAY															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

B

LOSS — COMPENSATION

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL. YR.	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	LINE	CLASS	COMPENSABLE CLOSED CLAIMS			CLAIMS	AMOUNT
MO.	DAY													WAGE	MEDICAL	OTHER		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

C

LOSS — ACCIDENT & HEALTH

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL. YR.	POLICY NUMBER	BRANCH	AGENCY	STATE	CITY	POLICY FORM	LINE	CLASS.	OCCU- PATION	AGE	SEX	KIND PAYMENT	INDY DAYS	CLAIMS	AMOUNT	CAUSE ACCTO	NAT. LAW	PRIN SUM	ORIG IND	ACCIDENT
MO.	DAY																									
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

D

EXHIBIT IV
EIGHTY COLUMN HOLLERITH LOSS CARDS

LOSS --- BONDING

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL YR	BOND NUMBER	BRANCH	AGENCY	STATE	CITY	REINS CO	LINE	FORM	CLASS	CLAIMS	AMOUNT
MO	DAY																
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A

LOSS --- GENERAL LIABILITY

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL YR	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	LINE	CLASS	CLAIMS	AMOUNT
MO	DAY														
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

B

LOSS --- PLATE GLASS

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL YR	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	ZONE	LINE	CLASS	CLAIMS	AMOUNT
MO	DAY															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

C

LOSS --- BURGLARY

DATE		TRANS KIND	CLAIM DATE	CLAIM NUMBER	REPORT DATE	POL YR	POLICY NUMBER	BRANCH	AGENCY	STATE	TERR- ITORY	FORM	LINE	CLASS	ALARM	CAUSE PROP	CLAIMS	AMOUNT
MO	DAY																	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

D

EXHIBIT V EIGHTY COLUMN HOLLERITH MASTER CARDS MASTER → MONTHLY

CODE	DATE	STATE	LINE	ACCTG	POLICY	YEAR	STATE	EXPIRY	DATE	PREMIUM	LOSS	LOSS EXPENSE	OUTSTANDING LOSS	DIVIDEND	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A

MASTER → EXPERIENCE

CODE	DATE	LINE	POLICY	YEAR	STATE	TERR-	ITORY	CLASS	EXPOSURE	PREMIUM	LOSS	PAID CLAIMS	OUTSTAND- ING	UNS CLAIMS	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

B