PROTECTION of RECORDS

Consolidated Reports
of the
Committee on Protection of Records

1947

One Dollar

NATIONAL FIRE PROTECTION ASSOCIATION
INTERNATIONAL
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NOTE

This pamphlet is a consolidation of the officially adopted reports of the Committee on Protection of Records presented at the annual meetings of the National Fire Protection Association 1942-1946. The present edition supersedes the similar publication originally printed in 1936, revised in 1939, and reprinted (without change) in 1945. Previous editions were consolidations of extracts from committee reports from 1923 to 1936 inclusive. The 1947 edition contains the latest technical information for those interested in this subject, and is completely revised in arrangement as follows:

I. INTRODUCTION. Adopted in 1946. *Advance Reports,* pages 109-111, *Proceedings,* page 54.

II. SURVEY AND CLASSIFICATION OF RECORDS. Adopted in 1942, *Advance Reports,* pages 61-66, *Proceedings,* page 201.

III. RECORD-KEEPING PROCEDURES. Adopted in 1942, *Advance Reports,* pages 66-67, *Proceedings,* page 201. Duplication of Records. Adopted in 1944, *Advance Reports,* pages 148-150, *Proceedings,* page 34. Protection of Microfilm. Adopted in 1944, *Advance Reports,* page 60, *Proceedings,* page 200.

IV. INTENSITY, DURATION AND CONTROL OF EXPOSURE. Adopted in 1944, *Advance Reports,* pages 134-150, *Proceedings,* pages 143-145.

V. SPECIFICATIONS FOR FIRE-RESISTIVE RECORD VAULTS. Adopted in 1945, *Advance Reports,* pages 87-96, *Proceedings,* page 34.

VI. SPECIFICATIONS FOR FIRE-RESISTIVE FILE ROOMS. Adopted in 1946, *Advance Reports,* pages 111-119, *Proceedings,* page 54.

VII. EQUIPMENT FOR THE PROTECTION OF RECORDS. Adopted in 1946, *Advance Reports,* pages 119-122, *Proceedings,* page 54.

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NATIONAL FIRE PROTECTION ASSOCIATION
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60 BATTERYMARCH STREET, BOSTON 10, MASSACHUSETTS

PROTECTION OF RECORDS.

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Part VI. Specifications for Fire-Resistive File Rooms

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FOREWORD.

The destructive fire in the general offices of the Chicago, Burlington and Quincy Railway Company, Chicago, on March 15, 1922, was definite proof that valuable and often irreplaceable business records, unless properly protected, can be destroyed even in so-called "fireproof" buildings.

It was from this fire, in which this company's most important records were destroyed, that the Committee on Protection to Records had its inception. Shortly after this date H. P. Weaver of Philadelphia, original chairman of the committee and active in its present-day membership, was asked to look over building plans for an electric light and power company. Remembering the Burlington fire and its disastrous results, Mr. Weaver suggested that the power company's records were well worth protecting. His proposal brought forth a challenge from the company officials to prove the value of their records.

His subsequent research brought forth some startling facts. In the power department, 40,000 manhole records could only be replaced at a cost of $10 per card or $400,000. Replacement value of the 100,000 pole cards in this same department was set at $100,000. Records in this one department alone were valued at $1,660,000. Customers' records in the accounting department were estimated at $1,000,000. The total mounted as the survey progressed. Mr. Weaver finally ended up with a list of $3,780,000 worth of records—adequate proof of a certain need for record protection, not only for this company but for any business.

Thus was the Committee on Record Protection formed. Its work in the beginning was largely "educated guess work," to quote Mr. Weaver. In 1936, when the first "Consolidated Report" of the Committee was published, knowledge of the subject was still necessarily limited. Conclusions were based on judgment rather than factual test data. Each year, however, has brought a clearer understanding of how records should be classified, the important separated from the unimportant, the seriousness of exposure evaluated, and the exposure protected.

This report will help decide how to do these things and do them accurately and wisely.

NATIONAL FIRE PROTECTION ASSOCIATION

June 1, 1947.

Protection of Records

PART I.

INTRODUCTION.

How valuable are business and public records? What should be done to protect these records against fire or other loss? Unfortunately these questions become acute in all too many cases only after a fire or flood has destroyed them.

The estimated ten-year average loss of valuable property in this country through fire damage amounts to $397 million annually. When we read these rather startling totals of fire losses, the thought immediately comes to mind "What a lot of houses must burn each year." However, when we analyze the figures further, we find that 1⅛ per cent of the total number of fires resulted in 66 per cent of the total amount of dollar losses. This means that fires in manufacturing plants, wholesale and distributing warehouses, department stores and large business buildings account for about two-thirds of the annual fire loss registered in this nation.

Innumerable businesses have been discontinued because of the insurmountable task of replacing all organizational and operational records. While accurate nation-wide statistics are sorely needed, we know from a survey of several hundred fire loss cases that the losses sustained in fires by these business concerns had the adverse effect of lowering their credit ratings and that some 40 per cent of the concerns having complete fire losses were obliged to go out of business because of the destruction of their records.

We have only to turn back to that destructive fire in the general offices of the Chicago, Burlington and Quincy Railway Company, Chicago, to be reminded that valuable business records, unless properly protected, can be destroyed even in so-called fireproof buildings.

The National Fire Protection Association in 1923 appointed a committee to study the subject of proper protection of records. The information presented herewith is the result of a searching inquiry as to the proper answers to the very important question of how to protect records.

Few Appreciate Real Danger.

Every thinking person is more or less conscious in a general way of the value of records and of the desirability of protecting them from destruction. Only a very small number of persons, however, have adequate knowledge of how to protect records, especially from fire. This does not mean that there are not ways whereby records may be lost other than because of fire, such as by water, vermin and neglect. But consideration of these agencies of destruction is only incidental to the work of a committee of an Association dedicated to the furtherance of protection from fire. As a matter of fact, if records are adequately protected from fire, they will in a large measure be protected from the other destructive influences mentioned, except flood waters.

The greatest handicap of the movement to protect records from fire is lack of appreciation by the average owner or custodian of records of the serious consequences that can follow as a result of their destruction. While records are probably destroyed by fire every day, no one individual experiences or perhaps even realizes the serious effects of such losses more than a few times at the most. Some persons may never have first-hand information

of such disaster. This breeds an unwarranted sense of security and, in some cases, of indifference. The individual who has lost valuable records realizes the importance of the subject of protection too late. No one knows whether or not he will be the next victim. It is, therefore, only elementary prudence to provide adequate protection for one's records even though it is hoped and expected that fire will never occur.

The consequences of destruction of records are many and for a business enterprise may even mean the necessity of discontinuance with attendant loss of property and sometimes means of livelihood. The high mortality among firms suffering disastrous fires is due in no small measure to loss of records that formed the basis of the concern's tangible and intangible assets.

Public Records Also Important.

Business enterprises, however, are not the only sufferers because of loss of records by fire. Scattered throughout the length and breadth of the land and indifferently protected are the public records of birth, marriage and death, deeds of conveyance and trust, testaments, court decrees and the multitude of written evidence on which proof of citizenship, legal status, rights and ownership depends. Their loss may mean expensive litigation and deprivation of rights and property that has required a lifetime of effort and sacrifice. Any public officer can cite numerous examples of records that are missing because of fire, water, vermin and neglect.

While protection of records and of tangible property from fire have some things in common, the consequences following therefrom are by no means the same. A burned building can be replaced, even though there has been a real loss of wealth. But, if a record of which there is no copy extant is burned, it is gone forever. Nothing can tell us when a person was born or give us the details of a property transaction if the only records of such events are destroyed. Therefore, records call for absolute preservation.

Record Protection Is a Scientific Study.

Since the turn of the century, the volume of records, especially of business records, has increased rapidly as has also the means of making them. These records naturally have to be housed, and this need stimulated in no small measure, through competition among manufacturers, the development of better record containers, especially of containers of lower weight and greater capacity and fire resistance. The heavy old-line safes of uncertain fire resistance can no longer meet the needs of business and have been largely replaced by modern fire-resistive containers.

The science of protecting records from the effects of fire may be said to have begun about 1910 when Underwriters' Laboratories, Inc., conducted the first test in which the temperatures of the furnace and of the air inside the record container under test, were recorded. While the container first tested was woefully lacking in fire-resistive properties and the test was a crude one as compared with present-day tests of a safe, still the method followed set a precedent that was destined to exert an influence not only upon the testing of record containers but upon fire testing in general. Up to that time, the testing of a fire protection appliance or material consisted of exposing it to fire for a fixed period of time and then judging more or less arbitrarily whether or not the specimen had passed the test. The same procedure could have been followed in the testing of record containers but it was not. In the case of all devices that had been tested previously, doors, windows, walls, it was possible to see the exposed and the unexposed sides of the test specimens. As it is not possible to see what happens in the interior of a safe surrounded by fire, remote-reading electrical thermometers were used to measure the inside temperature.

Protection in Terms of Length of Fire.

Measuring temperatures inside record containers, *i.e.,* safes, naturally called for the fixing of a maximum permissible interior temperature because of the fire-resistive rating of the container. In view of the fact that the rate of temperature rise inside a safe was influenced by the temperature of the furnace fire, the new method called for closer furnace control and following a definite schedule of furnace fire temperatures. There was no Standard Time-Temperature Curve for fire testing in those days, each tester being pretty much a law unto himself with respect to what the furnace temperatures should be in the particular tests he was conducting. Gradually, as fire testing increased, practices tended toward uniformity and eventually to the Standard Curve now in use.

The maximum permissible interior temperature was set at 350°F. in order to provide a safety factor since the ignition temperature of most paper is somewhat higher. This limit was set before the Standard Time-Temperature Curve was adopted and helped to emphasize the desirability of a uniform rule for regulation of testing furnace temperatures. Adoption of a temperature rise limit served to place the rating of record containers upon a quantitative basis and suggested the temperature rise method of rating walls and partitions. The terms Class A, Class B, and Class C were suggested by experience in the testing of fire-resistive safes.

While it is hardly probable that the last word has been said concerning record containers, considered from the standpoint of improvement in fire resistance, there is no crying need for further technical improvement at this time. The manufacturers of record protection equipment have done their part. More important now is better understanding on the part of record owners and custodians of how to estimate the protection needed and how to provide the protection which the situation demands. It is the hope of the committee that this revision of Protection of Records will make providing that protection easier.

PART II.

SURVEY AND CLASSIFICATION OF RECORDS.

Introduction.

Before a comprehensive plan for protecting records can be formulated, it is necessary to know the kind of records involved, their volume by class, their use, and present protection.

The survey should be under the general charge of a senior executive having a perspective of the entire business, department, and public office or other unit involved. The actual survey can be made by a capable junior executive who should familiarize himself with the entire contents of this publication and other pertinent literature on the subject.

The survey should include:

(1) Actually viewing the records.

(2) Determining their physical volume by class.

(3) Determining the rate at which they are being produced, their subsequent history and their relation to other records.

(4) Recording the rate at which they may be transferred or discarded and their use and value after transfer.

(5) Ascertaining how records are then housed.

(6) Estimating carefully the effects of the loss of each class upon the enterprise, office or department.

An intelligent approach to the problem of record protection involves a recognition of the value of records, the hazards to which they are exposed, and the relative merits of the protective methods available.

Before these general principles can be wisely applied in a practical way, it is necessary to examine all records searchingly, and to separate them into groups based upon the importance of providing protection. This makes possible a protection program within reasonable financial limitations by indicating the minimum number of records demanding the highest degree of safety. At the same time, such a grouping, carefully made, guards against the probability of important links in the chain of records being overlooked, a condition almost certain to occur if decision is on the basis of generalities and not on a detailed analysis (from the point of view of possible fire loss of each type of records and its relation to all others and to the carrying on of affairs of the establishment).

Procedure.

It is important that the records be classified by actual physical survey of the records in detail. Misleading results are almost certain to follow any attempt to work from an assumed knowledge of the various record systems, and the factors that make them up. Detailed examination almost always discloses important points. With business methods as complex as they are today, the department head, though familiar with broad principles, cannot maintain an intimate knowledge of the detailed applications in the minute points of daily routine, which, however, constitute vital parts of the record system. The most practical procedure is to go over all records methodically, taking them as found at each location and examining each type of record to ascertain its relation to others, its importance, and hence its classification, making note meanwhile of the degree of protection existing for that particular unit, and of the protection probably warranted.

Department heads and those actually handling records should be freely consulted in establishing the classifications, but it will be found wise to have one person make the classification for all departments in order that there may be uniformity of viewpoint, and in order that there may be developed in the mind of one individual, a picture of the entire record situation which will prevent the distorted judgment otherwise likely to arise. The individual making the classification should have a sufficiently broad knowledge of business in general, and of the affairs of the establishment in particular, so that he will be competent to draw out the facts from the department heads and others in charge of records to temper their opinions where necessary, and finally to evaluate the records wisely, so that his conclusions may contribute accurately to proper decisions as to the protection justified in each case.

Suggested Classification.

It is evident that any workable system of classification must be simple, and that it cannot be based on hard and fast definitions, for it will be found in the actual application, that nearly every case will be decided by a variety of factors, the values of which must be appraised as a matter of judgment rather than on the basis of sharply drawn definitions.

A method that has been found satisfactory assumes four broad classes which may be designated as

Class 1—Vital

Class 2—Important

Class 3—Useful

Class 4—Non-essential

"After-a-Fire" Value.

The "after-a-fire" value of various business records is measured by the question, "How seriously would our business be affected if this particular record were suddenly destroyed?" The answer to this question involves a number of factors including:—

A. The extent to which the unavailability of the particular records *the day after a fire* would delay recovery of monies with which to replace buildings and equipment.

B. The extent to which the unavailability of the particular record *the day after a fire* would delay restoration of production, sales and service.

C. The relative difficulty with which the particular record could be replaced if destroyed in a fire, which is disclosed by answers to the following questions:—
(a) "Is it irreplaceable?", (b) "Would reproduction be prohibitive in cost?", (c) "Could it be reproduced quickly?", (d) "Will a reproduction of it *serve in lieu of the original?*"

D. The difficulty which would be encountered if the particular record is not *available at a moment's notice* in compliance with *legal or other requirements.*

Business Records.

The following four broad classes have been adopted to illustrate, by means of examples, the relative "after-a-fire" value of various business records. (The lists obviously include only a few common examples—they are not all-inclusive):—

Class 1 (Vital) records. This class includes records which are irreplaceable; records a reproduction of which does not have the same value as an original; records needed to promptly recover monies with which to replace buildings and equipment, raw materials, finished goods and work in process; and records needed to avoid delay in restoration of production, sales and service. Included in this class are:—property plans, costs and appraisals; inventories of factory and office equipment; inventories of finished goods and goods in process; all original books of account and supporting papers; independent audit reports; tax returns, accounts receivable; accounts payable; engineering records (such as drawings and tracings); stock transfer and bond records; records required by law (such as social security records, wage and hour records, government-contact-cost records); charters; franchises; deeds; minutes of directors' meetings; major contracts; etc.

Class 2 (Important) records. This class includes records a reproduction of which could be obtained only at considerable expense and labor or only after considerable delay. Most operating and statistical records belong in this class, such as those whose purpose it is to maintain a check on efficiencies, operating costs, etc. It includes minor contracts, customers' credit files, sales records, designs in process of development, records of experiments in progress, etc.

Class 3 (Useful) records. This class includes those records whose loss might occasion much inconvenience but which could quite readily be replaced and which would not in the meantime present an insurmountable obstacle to the prompt restoration of the business.

Class 4 (Non-essential) records. This class includes principally the material which upon examination in accordance with prearranged

plans (see Schedule for Retention of Records, page 13) is deemed eligible for destruction. Their disposal should be accomplished as promptly as possible so as to reduce the fire hazard. Until disposed of, they should be segregated from more important records.

Public Records.

The care of public records is influenced by the laws and regulations of federal governments, state or political subdivisions. Public records have been defined to mean any written or printed book or paper or map which is the property of the government, state, or any county, city, town or village or part thereof, and in or on which any entry has been made or is required to be made by law for which any officer or employee of the government, state or political subdivision has received or is required to receive for filing.

Laws are sometimes so strictly drawn that seemingly unimportant records may not be destroyed without formal permission from the proper officer. This often results in an accumulation of records which constitutes a fire hazard.

The four classes suggested for business records can be used as a guide for public records if the laws of the government or state authorities do not conflict.

Factors Influencing Classification.

Some of the more common factors which influence classification may be readily stated, but it will be found in each individual case that there are many others which must be considered. All factors should be duly weighed before assigning a classification.

CONTINGENT VALUE.

Some types of records have what might be called a contingent value. For instance, minutes of meetings might in many cases be lost without serious consequences, provided the business proceeds smoothly and without difficulty. Such minutes, however, might be of the utmost value in event of legal complications or internal difficulties.

LEGAL VALUE.

Many records will be of value from a legal standpoint. It should be remembered that there are important differences to be observed in records in this regard. From a legal standpoint a duplicate copy of any sort is not as useful as the signed original, and hence for such purposes, the maintenance of duplicates at another point may not be an adequate safeguard. For this reason the originals would be placed in a higher classification than the duplicates.

INTERFERENCE WITH OPERATIONS.

As business is handled to-day, particularly in the larger organizations, records are an important implement in carrying on productive operations. Without them production might be seriously interfered with, deliveries to customers might be delayed, and collection of outstanding bills might be seriously interrupted. All these consequences of possible loss should be considered in assigning a classification to any given record.

RELATIONS WITH PUBLIC OR CUSTOMERS.

To almost any enterprise, records are an essential factor in rendering satisfactory service to the customer. In the case of a public service corporation, this is of particular importance, although it applies with evident force to the concern having customers in any form. Loss of records means that service to customers cannot be continued on the accustomed orderly basis, and dissatisfaction, if not resentment, is very likely to follow.

RELATIONS WITH GOVERNMENT AUTHORITIES.

Public service corporations are faced with the problem of maintaining satisfactory relations (to which suitable records contribute) with public service commissions, and on account of relations with various taxing bodies and other governmental authorities, practically all business organizations could be thrown into very serious confusion by the destruction of the records pertaining to these contacts.

DIFFICULTY OF REPLACEMENT.

Some records will be recognized at once as non-replaceable. This includes not only historical records, such as those in the possession of governmental authorities, museums, libraries, and not a few business organizations, but also certain very common records, which, if lost, could not be reconstructed in the original form, but, at the most, could only be replaced by substitutes. To replace an old set of general books would be almost an impossibility. Minutes of directors' meetings cannot be replaced in the strictest sense because the meeting covered by the minutes can never be held again. Many other such instances could be cited.

Other records are replaceable but only at a cost almost prohibitive. Consider, for instance, the cost of replacing the records covering an underground gas or electric distribution system for a large city. Or, consider the difficulties in the way of reconstructing, if completely destroyed, the stock transfer records of a large corporation.

These possibilities should be squarely faced and should be given due weight in determining the classification of records to which they apply.

EXPENSE OF REPLACEMENT.

The clerical or engineering labor necessary to replace records, even when it is possible to replace them, may be astonishingly large. This will be recognized when thought is given to the current expenses of departments constantly at work on the making of records. To reconstruct, under emergency conditions, the work of many departments for many years clearly would involve a very substantial sum.

Thought must be given also to the additional expense attendant upon the absence of records. Instances are known, for example, where it is necessary to maintain additional engineering staffs, costing hundreds of thousands of dollars annually, by reason of the fact that data, previously available from records which were destroyed, must now be secured by physical survey in the field.

RECOMMENDED DEGREE OF PROTECTION FOR EACH CLASS OF RECORD.

It is recommended that protection be provided for each class of record on the following basis:—

Class 1 (Vital) records should have protection which will assure that the records will be preserved even if there is a complete burning-out of the section of the building in which the records are located, this for the reason that records classed as "vital" cannot be assigned a monetary value and either are not insurable, or are not usually insured, or if insured can be replaced only after considerable delay or not at all, whereas, prompt restoration of the business requires that such records be available *immediately after a fire*—especially if the fire results in a complete burning-out of the building. This degree of protection may be achieved by housing them in a "standard"

fire-resistive vault, or in safes, or record protection equipment having a fire rating comparable with the maximum fire hazard to which they are exposed.

Where the volume of vital records exceeds that which can be stored in a vault, they may be protected as follows:—

If the building is fire-resistive, the records may be segregated in a fire-resistive section designed, equipped and maintained in all essential respects the same as a standard vault; or the records may be segregated in an isolated fire-resistive document building.

Class 2 (Important) records should be given the protection recommended for Class 1 records to the greatest possible extent. If conditions are such that it is physically impossible to so protect all of them, and if the building is fire-resistive, such of them as cannot be protected as recommended for Class 1 records should as a minimum be segregated in a fire-resistive file storage room equipped and maintained as recommended for such areas, but this segregation should not be considered as protecting those particular records against an all-out fire.

Class 3 (Useful) records are not usually of sufficient importance to demand special forms of protection. If not protected as recommended for Class 2 records, the more essential of Class 3 records should as a minimum be housed in closed steel containers located where they will be least exposed by combustibles, but this should not be regarded as full protection against fire.

Class 4 (Non-essential) records manifestly demand no special protection so far as their value is concerned. Any undue accumulation of such records should be disposed of so as to reduce the fire hazard, and those which are retained should be segregated from more valuable records.

Obviously, Class 2, 3, and 4 records should not be allowed to occupy space in vaults, safes, etc. to the exclusion of Class 1 records. Similarly, Class 3 and 4 records should not be allowed to occupy space in file-storage rooms or document buildings to the exclusion of Class 2 records.

PART III.

RECORD-KEEPING PROCEDURES.

CODE FOR PRESERVATION OF RECORDS.

Introduction.

Herein is presented a suggested schedule for periods of retention of important business records of a general nature which is believed to be applicable to various kinds of business.

The real benefits of the adoption of such a program can be derived only when the subjects of destruction, preservation, and protection of records are considered at one time. In other words, the setting aside of certain records as necessary for preservation presupposes the periodical elimination of the unnecessary ones in a thorough and orderly manner under competent authority. Having established that certain documents are worthy of preservation they should receive the best physical protection possible.

When records are destroyed, a permanent list of the items disposed of showing periods covered should always be made and should be signed by

the person or persons authorizing the work, together with those performing the actual destruction.

The code which follows states that correspondence should be retained for the same period as prescribed for the records to which it relates. In some lines of business, this may not be found to be a definite and practical requirement. For example, a large bank has established a system whereby copies of all letters are, before filing, stamped with the date on which destruction is permissible. As much of this bank's correspondence may be so destroyed within one year from date of origin, this system permits the elimination of a large volume which would otherwise have to be moved to "transfer" files annually.

It is appreciated that varying opinions exist as to the value of different records and, consequently, as to the relative importance of their retention and protection. It is felt, however, that the schedule which follows may safely be adopted by business houses interested in an orderly method of dealing with this much neglected subject. From experience, it is believed that the majority of employees whose duties are directly concerned with accounting will cooperate in such work, provided they have a definite schedule giving them a sound basis on which to rely.

This is a skeleton schedule; every business will have records peculiar to itself which are not listed, but with this schedule as a guide, it should not be difficult to arrive at proper conclusions as to such records.

NOTE: Regulatory bodies such as Federal Power Commission, Interstate Commerce Commission, Federal Security Agency (Social Security), etc., have prescribed routines for the preservation and destruction of records.

SCHEDULE FOR RETENTION OF RECORDS
for
LARGE ESTABLISHMENTS.

(For Mercantile, Industrial and Other Establishments of Moderate Size see separate Schedule on this subject.)

Description of Accounts	*Period to be Retained*
General and Financial.	
a. CAPITAL STOCK RECORDS	
Capital Stock Ledgers	Permanently
Records (or stubs) of Capital Stock Certificates	Permanently
Stock Transfer Registers	Permanently
Cancelled Stock Certificates	Optional, but clear record should be made. See note at end of schedule.
b. BOND RECORDS	
Registered Bond Ledgers	Permanently
Record (or stubs) of Bonds	Permanently
Record of Interest Coupons, Paid and Unpaid	7 years
Cancelled Bonds and Paid Interest Coupons	Optional but clear record should be made. See note at end of schedule.

Description of Accounts	*Period to be Retained*
c. PROXIES AND VOTING LISTS	
Proxies of Holders of Voting Securities	2 years
Lists of Holders of Voting Securities presented at Meetings	7 years
Minute Books of Stockholders, Directors, and Executive Committee and other meetings	Permanently
d. CODES	
General Codes and Cipher Books (Official Copies)	Permanently
e. TITLES AND MORTGAGES	
Deeds and other Title Papers and Mortgages	Permanently
f. CONTRACTS AND AGREEMENTS	
In general	7 years
With employees for purchase of securities and memorandums, etc., pertinent thereto	7 years after expiration or cancellation
Records of Contracts, Leases, and Agreements made, etc.	7 years after expiration or cancellation
g. RETIRED SECURITIES	
Cancelled Stock Certificates, Bonds, Notes, Int. Coupons, Receiver's Certificates and Temporary Certificates	Optional, but clear record should be made. See Note at end of schedule
h. LEDGERS	
General Ledgers and those auxiliary and indexes thereto	Permanently
Balance Sheets of General Ledgers	Permanently
Trial Balances of General and Auxiliary Ledgers	Permanently
Accounts Receivable Ledgers, including Branch Office	7 years
Trial Balances of Accounts Receivable Ledgers	3 years
i. RECORDS OF SECURITIES OWNED IN TREASURY, OR WITH CUSTODIANS	Permanently
j. JOURNALS—GENERAL AND AUXILIARY	Permanently
k. CASH BOOKS	
Treasurer's and Auditors' General Cash Books and Auxiliary Cash Books subsidiary to General Cash Books	Permanently
Other Auxiliary Cash Books and Cash Books at Branch Offices	Permanently
l. JOURNAL ENTRIES	
Journal Entries and Interdepartmental bills and supporting papers	Permanently

Description of Accounts	*Period to be Retained*
m. ACCOUNTS RECEIVABLE RECORDS	
Record or Register of Accounts Receivable (except Ledgers previously mentioned) and indexes thereto, and summaries of distribution of credits through bills for entries in General Books	Permanently
Accounting Dept. copies of bills issued and supporting papers which do not accompany original bills, if the details have been summarized in Registers, etc. so as to preserve a complete record of transactions	7 years
n. FIDELITY BONDS	
Records and Files of Fidelity Bonds of employees	3 years after expiration
o. INSURANCE RECORDS	
Schedules of fire and other insurance; also records relating to premiums and amounts recovered and papers substantiating claims	7 years
Fire, liability, automobile, and other policies	Optional
Record of policies in force and notices of changes in and cancellation of such policies	3 years after expiration
Inspectors' reports and records of condition of property	
p. TAX RECORDS	
Copies of Schedule and Returns to authorities for tax purposes and records of appeals	Permanently
q. RECORDS OF PLANT, FIXTURES AND EQUIPMENT	
Records of cost and inventory value of plant. fixtures and equipment; records of retirement and replacement, contracts and agreements relating to construction, purchase or sale, and all papers actually supporting charges and credits to plant, fixtures and equipment accounts	Permanently
Reports and papers pertaining to detail of charges and credits to plant, fixtures and equipment, which have been completely summarized in records previously mentioned herein	3 years
r. ENGINEERING RECORDS	
Maps, plans, and specifications, etc., of work executed in whole or in part	Permanently
Maps, plans, and specifications. etc., of work abandoned	7 years
s. ACCOUNTANTS' AND AUDITORS' REPORTS	Permanently

Description of Accounts	*Period to be Retained*
Treasury.	
a. STATEMENTS OF FUNDS AND DEPOSITS	
Statements and Summaries of Balances with Depositaries	Permanently
Authorities for and statements of transfers from one depositary to another, and periodical statements of working balances; statements of Managers' and Agents' deposits, grouped by depositaries	1 year
Requisitions and receipts for funds furnished by Managers, Agents, etc.	Optional after funds are accounted for
Estimates of working funds required	Optional
b. RECORDS OF DEPOSITS WITH BANKS AND OTHERS	
Statements from depositaries, refunds received, disbursed and transferred; bank reconcilement papers; statements of interest due on daily balances and copies of bank deposit slips	1 year
Deposit books and stubs, records of checks	7 years
Advice of deposits made when information is shown on retained records	Optional
Correspondence and memoranda relating to stop-payment orders and issue of duplicate checks	Permanently
c. RECORDS OF RECEIPTS AND DISBURSEMENTS	
Records of outstanding checks, drafts, etc. issued and not presented	7 years
Periodical statements of receipts and disbursements; remittance slips or report of Managers and Agents and summaries thereof	3 years
d. MANAGERS' AND AGENTS' BALANCES	
Records of Managers' and Agents' accounts showing working fund debits and credits	3 years
e. FIELD CASHIERS' BALANCES	
Reports of working fund balances in hands of field cashiers	3 years
f. RECORDS PERTAINING TO VERIFICATIONS OF TREASURER'S CASH OR SECURITIES	3 years
Expenditures.	
a. VOUCHERS	
Register of audited vouchers and indexes thereto and summaries of distribution of charges through vouchers for entry in General Books	Permanently
Paid and cancelled vouchers, analysis sheets showing detailed distribution of charges on individual vouchers, etc.	Permanently
Paid drafts, checks and receipts for cash paid out	Permanently

Description of Accounts	*Period to be Retained*
Authorities for payment of specific vouchers	3 years
Index of vouchers, lists of unaudited bills, of vouchers transmitted, etc.	Optional
b. PAY ROLL RECORDS	
Pay Rolls and Summaries, authorities for Pay Roll changes, etc.	Permanently
Receipted pay checks, receipted time tickets, discharge tickets, and other evidence of payments for service.	Permanently
Comparative or analytical statements of pay rolls	3 years
Applications for Pay Roll changes not authorized; records pertaining to pay roll deductions, etc.	Optional
c. DISTRIBUTION OF EXPENDITURES FOR MATERIALS	
Journals, ledgers and other records showing detailed distribution	Permanently
Material disbursement tickets and other papers if transcribed in detail to above	7 years
d. ASSIGNMENTS, ATTACHMENTS AND GARNISHMENTS	
Record of and files of assignments, garnishments, etc. of employees' salaries, notices of suits and releases and related correspondence	3 years
Minors' salary releases	Optional
e. AUTHORIZED EXPENSES	
Records, statements, etc. of authorized expenses by divisions, districts, departments, etc. which form basis of charges to accounts	Permanently
Requests and authorities for expenditures for incidental expenses, etc., not used in charging accounts	Optional
f. CLAIMS	
Registers and other records relating to damage, injury and overcharges (except as provided under "Adjustments with Customers")	Permanently
All papers substantiating claims, (except those necessary for completion of vouchers)	7 years after settlement or rejection
g. RECORDS OF ACCIDENTS, DAMAGES AND INJURIES	
Reports and statements regarding accidents, damage to property of Company or others, statements of witnesses, and reports and statements of personal injuries, when not necessary to support vouchers	Optional
Purchases and Stores.	
a. MATERIAL LEDGERS	
Records of Materials and Supplies on hand	Permanently
Balance sheets of material and supplies received, issued and on hand at branch supply department	3 years

Description of Accounts	*Period to be Retained*
b. PURCHASING, ETC.	
Copies of purchase orders and authorities for sale of scrap	3 years
Bids and offers for sale or purchase of materials and supplies	7 years
Invoices for material purchased, records of such invoices, and freight bills covering charges on materials	Permanently
Price records of purchase (file copy)	Permanently
Contracts for purchase or sale of materials	Permanently
Advices or requisitions from storekeeper and others for purchase of materials	3 years
Summaries and distribution sheets and credit memoranda of materials sold or returned to supply house for credit	Permanently
Advices acknowledging receipt of orders for material, shipment notices, packing lists, copies of bills of lading	Optional
Records of invoices transmitted to or from storekeeper, copies of shipping instructions, records and reports used for checking and tracing materials, etc.	Optional
c. MERCHANDISE, MATERIALS AND SUPPLIES RECEIVED AND ISSUED	
Records of materials received and issued	Permanently
Price records of material issued (file copy)	Optional
Records of materials transferred from one storeroom, department or division to another	3 years
Records of materials recovered and returned to stock if detailed on retained records and records of inspection and test of materials	3 years
Minor records pertaining to materials and supplies not involving cost or disposition	Optional
d. INVENTORIES OF MERCHANDISE, MATERIALS AND SUPPLIES	
General inventories, with record of adjustments	7 years
e. CORRESPONDENCE	
Correspondence and records thereof relating to subjects listed therein	For period prescribed for item to which it relates
Stenographers' notebooks and mechanical device records; extra copies of letters if original is retained	Optional
Sales.	
a. SUMMARIES OF SALES	
Records of Sales (by classes) for entry in General Books	7 years
Reports from Managers, Agents, etc., showing debits and credits to accounts, and summaries of such reports	7 years

Description of Accounts	*Period to be Retained*
b. COLLECTIONS, RATINGS, ETC.	
Itemized lists and summaries of agents' collections, Branch Offices, etc.	7 years
Ratings, credit classifications and investigation of customers	3 years
Reports regarding status of customers' accounts	Optional
c. ADJUSTMENTS OF ACCOUNTS WITH AGENTS, MANAGERS, CUSTOMERS, ETC.	
Results of which appear in sales summaries	3 years
Records pertaining to settlement of sales, etc. with allied and subsidiary companies or firms	7 years
d. UNCOLLECTIBLE ACCOUNTS	
Records and reports regarding uncollectible accounts, including authorizations for writing off	7 years
e. CONTRACTS WITH CUSTOMERS	
Contracts and records thereof	7 years after expiration

NOTE: The record of destruction referred to under Capital Stock Records, Bond Records, and Retired Securities, should be a complete Certificate of Destruction, giving full descriptive reference to the documents destroyed, and should be made by the persons authorized to destroy such bonds and stock certificates. When the documents to be destroyed represent debt secured by mortgage, the Certificates of Destruction should also be authenticated by representatives of the Trustees acting in conjunction with those destroying the papers, or it should have the Trustees' acceptance thereon.

DESTRUCTION OF RECORDS NO LONGER USEFUL.

Obsolete and useless records take up valuable floor space, occupy costly filing equipment, entail constant labor costs in filing them, transferring them to make room for current records, or searching through them for old data casually called for. Perhaps the most serious objection to retaining old and useless records is that they frequently occupy space in vaults, safes and other protective containers, to the exclusion of much more important current material. Often accumulations of old records are objectionable merely by reason of their presence in vaults, because they add to the combustible contents and constitute an exposure to important records.

The path of least resistance is to let records accumulate whether they have value or not. Without an authorized procedure for their destruction, usually no one cares to take the responsibility of disposing of them even though they may have outlived their usefulness.

There is a feeling among some companies and individuals that the less said about the destruction of records, the better, and there is perhaps a

fancied security in the retention of old records, which in reality does not exist. Nevertheless, the steady accumulation of old books and records from year to year presents a situation that must be met, and met in some systematic and definite manner. In organizations where the subject of record protection has not been given attention in the past, it will frequently be found that a responsible employe can profitably be delegated to the work of cleaning up accumulations of former years and that the result will be a net cash gain to the organization. This should be made the occasion for the establishment of an almost automatic procedure for the future. Accordingly, periodic selection and destruction of material that has accumulated over a period of years, and an established procedure for continuous elimination as the records reach the limit of their usefulness, can be taken as the two general methods that must be given consideration.

Determination of Retention Period.

Determining the length of time records are to be retained is the most important feature of any system for the elimination of useless records. It should be given careful consideration by those in the most responsible positions in an organization, as well as by those that handle the larger bulk of correspondence and other records. While assistance can be obtained from schedules of retention such as the one recommended by this committee, the findings must necessarily be based on the experience of the individual organization, aided by that of other concerns in the same or related lines of activity. The retention period may also depend on details of office procedure, such as methods of handling correspondence. Where incoming and outgoing correspondence and other records are indexed on cards or in books, the retention period might be made briefer than without this record. Such a record would also overcome the objection to destroying any papers on the ground that it is desired to maintain a record of all business contacts. The index, comprising only a relatively small volume, could be retained, if not permanently, at least for a longer period than the original papers. For many types of activities and records, the applicable statutes of limitation and requirements of federal, state, and municipal regulatory bodies have an important bearing on the determination of retention period.

It is generally recommended that the retention period of correspondence of essential character be made the same as that of the subject to which it relates. Less important correspondence might be given shorter retention periods. For example, a large bank found that much of its correspondence could be destroyed within one year from the date of origin. Another organization with a large volume of correspondence varied to a high degree, found that approximately 30 per cent of it is destructible at once or within one month from the time it originates.

The final conclusions relative to retention period should be reduced to writing and copies given to all concerned with the originating, receiving, and handling of records. The schedule should give classifications best suited for the records of the individual concern, retention periods, and convenient symbols for designating time of retention. In addition, a symbol is needed to indicate that the record must be returned at a later date to receive its retention symbol. Records not marked through oversight are also subject to return for this purpose.

It may be found desirable to add additional designations indicating the degree of protection to be given the records while they are in current files. Usually only two symbols would be necessary, one for protection in vaults or insulated safes and the other for storage in the available general filing equipment. Often the general type of document or its retention

period can be used to designate automatically the degree of protection. It has also been recommended that a symbol be used to indicate that the filing drawers in which designated records are to be placed shall be locked.

With a well-outlined procedure thus established, it is believed that the determination of retention period for individual records should be made and the symbol affixed by those that originate or receive them for attention in the usual course of the office routine. Some officer of mature judgment, and preferably having a long experience within the organization, should be designated to have general charge of the disposition of records, to whom all matters of doubt should be referred. Before a lot of records is destroyed, a list of the records involved should be submitted to him for approval of the recommendation, the final approval to be given by an officer in general administrative position within the organization. It is suggested that the authority for the disposition of records be conferred by title only rather than by name and title, and thus obviate the necessity for a new appointment each time there is a change of incumbents.

Clearing up Accumulations.

While methods based on periodic selection and destruction cannot be considered as the best permanent forms of procedure, the results achieved are comparable to what is obtained with other methods, although generally at greater expense and inconvenience. Also, where records have been permitted to accumulate promiscuously for a considerable period, it offers the only initial means whereby an orderly program can be initiated. The first operation may be tedious and difficult since it usually means the clearing up of accumulations from a period of years. Subsequent work will be found more simple and satisfactory to all concerned, once the precedent is established.

After the records to be destroyed have been selected in accordance with a prepared schedule of retention as outlined above, a complete list should be prepared and submitted for approval. Particular care should be taken that the requirements of the prescribed retention periods have been met. The form on page 23 may be suggestive.

The method of disposition, whether by fire, sale, or shredding prior to sale, would depend on the class of records concerned. Where disposition through the waste paper trade is not considered advisable, direct shipment to paper mills might be made. For the larger concerns, the installation of a small paper shredder of the type used in paper manufacture might be feasible. Waste paper to be reused in paper manufacture should be free from rubber bands, paper clips, and similar foreign material, since their presence greatly reduces its value for the purpose.

Procedure for Continuous Elimination of Useless Records.

It is believed that very large economies are possible by the coordination of four functions of office management which are usually not treated as related subjects, namely, (1) the purchase of books, forms, and paper with a view to the importance and permanence of the records to be established thereon; (2) the delegation of the filing, mailing, etc., to specially trained employees, thus relieving other departments of details which should not occupy their time; (3) the proper and efficient use of space and equipment by the systematic disposal of records not needed in the conduct of the business; (4) protection against fire.

History of Records Permanently Retained or Destroyed

Location of Current Files.....Location of Storage..... ..Sheet No. *301*

Filing schedule No.	Form No.	Description of records	Prescribed retention period	Date of Records		Transferred to Storage		Approved for destruction		Records destroyed	
				From	To	Date	Shelf No.	Signature	Date	Signature	Date
6	*305-A*	*Purchase orders*	*3 years*	*8–1–27*	*9–3–28*	*6–5–29*	*R-26*	*John Doe*	*10–5–39*	*James Doe*	*10–10–40*
10		*Contract set, plans of bldg. "H"*	*Permanent*	*6–9–27*	*11–3–27*	*6–6–29*	*A–46*				
30		*Misc. Correspondence, Class C*	*6 mos.*	*9–1–28*	*11–31–28*			*John Doe*	*6–7–40*	*James Doe*	*7–10–40*

CERTIFICATE OF DESTRUCTION OF RECORDS.

No. *10*

To the (*President*) (*General Manager*) (*Comptroller*) Date *6–30–41*

Approval is requested for the destruction of the following list of records:

Filing schedule number	Form number	Description of records	Prescribed retention period	Date of Records		Minimum age	
				From	To	Yr.	Mo.
65	*TG–367*	*Inspectors reports on condition of property*	*3 years*	*1–4–35*	*4–1–38*	*3*	*3*
54		*Bank statements*	*1 year*	*1–6–39*	*4–10–40*	*1*	*2⅔*

Signed.....Approved.....Date *7–2–41*
(Supervisor of Records) (President) (etc.)

The above listed records were destroyed or disposed of by (*fire*) (*shredding*) (*sale and shipment*) on *7–5–40*

Signed..... Signed.....
(Witness) (Supervisor of Records)

Original to (*President*) Duplicate to be filed in record room

With the retention period for the different classes of records determined as outlined above, a routine for the orderly disposition of records with respect to their value and useful life, is adapted to the pertaining office routine for handling the records. The plan so adapted will not generally require radical changes in any well-considered office procedure, but simply the superposing thereon of a few added details. As previously indicated, the affixing of the symbol indicating the retention period, is believed best left to those originating or otherwise directly concerned with a given record. For records of routine character and considerable volume, it might be assigned to the personnel directly assigned to the files. It should be noted that failure to apply the designation may be due less to inertia or unwillingness, than to hesitancy with regard to the applicable useful period, a condition that can be largely corrected by establishing a well-defined retention schedule. Various methods of marking are in use, including stamping or writing directly on the records, marking the card or book index of the record with its retention period, attaching tags of distinctive colors that project above the edge of the record as filed, or combinations of these. Where the volume is sufficiently large, records marked for permanent retention, retention for a period of years, or destruction within a comparatively short time, may be placed in separate files. This would obviate the necessity for periodic sorting of files to segregate those due to be destroyed.

The form on page 22 has been designed for the purpose of making a permanent record of all records withdrawn from current files and placed in storage or destroyed. Such a record is considered a very essential part of the general plan as it secures the needed consideration and approval before destruction is effected and forms a permanent record thereof. Where records of a given type in considerable volume are involved, the type of record and retention period might be made general headings applicable to the whole sheet.

The pertinent information relative to records in bundles transferred to storage should be entered on a card index, identifying the records, their location in the storage space, and the earliest date for destruction, and an identification mark or tag applied to the bundle. Where no storage period intervenes between current use and permanent safekeeping or destruction, the reference thereto can be omitted. The original sheets as they are completed should be made a part of the permanent protected file and a copy kept in the storage building or record room.

It is believed that the foregoing procedure can be adapted to fill the needs of any type of business. The application of such a plan will result in a lessening of the fire hazard which is ever present where old records have been permitted to accumulate and will assist in providing the needed protection for those that have current or permanent value. Also, the distinction between essentials and non-essentials will have a beneficial effect on the organization as a whole, which, together with the directly accruing material advantages, will more than compensate for the expenditure of time and effort required for its initiation and continued successful operation.

DUPLICATION OF RECORDS

In the case of valuable records, where it is not feasible to provide adequate protection at the place of origin or principal use, and in cases where records are of such importance that more than ordinary protection is desired, duplicate records can be kept on other premises not subject to the same fire, not even under conflagration conditions.

Based on the theory that fires will seldom if ever occur simultaneously in two places remote from each other, some companies have found it expedient (where it is impractical to provide fully adequate protection for records at the main base of operation) to place duplicates of important records in a fire-resistive detached building at a point some reasonable distance from the main base of operations, preferably in a fire-resistive vault, although this latter precaution is not essential to the fundamental principle of the minimizing of loss secured by separation of two or more sets of records. In the case of one important railroad, the point of duplicate storage is in a fire-resistive warehouse, in which space is rented for the purpose. A prominent life insurance company places its duplicate records in a fire-resistive building located in a suburban town, daily messenger service with which is maintained. Under such systems of operation, the original records would preferably be placed at the point having the lesser fire hazard, but of two points, otherwise equally desirable, at the point where least need for consulting them would exist, using the duplicates at the other location for that purpose. By means of duplication, the information carried by the records is safeguarded, and in event of loss of either set, the cost of replacement would be very much materially less than were neither set available and having to carry on without the records during the period of replacement is avoided. It is evident that if one set is destroyed, extraordinary care should be taken of the other set until new

duplicates have been made. It should be remembered, however, that frequently a copy does not have the same value for legal purposes as a signed original document.

Methods of Duplication.

Two important considerations must govern the duplication of records, that is, accuracy of the copies and permanency or durability. Photographic reproductions are usually considered ideal in respect to the former quality, legally and otherwise. The alternate process of photostating eliminates the cost of the ordinary photographic negative, but as often made commercially the fixation and incomplete removal of the unused sensitizing chemicals may render the print subject to rapid deterioration after a few years. Whatever process is used must be thoroughly carried out as to details or the results are bound to be unfortunate. Some form of photographic reproduction is obviously desirable for types of records, the originals of which are made on heavy paper, or on paper printed on both sides, such as deeds, mortgages, insurance records, and similar documents. The photographic processes are limited to reproduction of sheets of only moderate size. For larger sheets and where a considerable number of copies warrant, lithographing or similar processes can be used to advantage.

With typewritten matter it is often very easy to secure an extra copy for filing at remote points simply by making the duplicate when the original sheets are written, a method involving negligible cost.

Another form of record for which duplication may be desirable is that made on tracing cloth or on thin paper through which light rays can easily penetrate, such as the drawings and specifications of engineers and architects. Exact duplication of such records is possible by contact prints on sensitized paper. Unless made with more care than the usual commercial prints these cannot be considered as permanent in character due to improper chemical fixation and subsequent deterioration as well as by reason of the physical properties of the paper used, which may disintegrate. For scale drawings it may be necessary to consider the question of distortion due to shrinkage of the paper. In this respect certain lithograph processes reproduce an ordinary drawing without change of dimensions and are permanent in character. As no special treatment of the surfaces is necessary, and the ink used is carbon black and varnish, the reproductions are not subject to deterioration. Tracings duplicated by this process can be used interchangeably with originals, thus permitting, if desired, originals to be permanently filed, and duplicates to be used for current work and consultation.

Before deciding on any form of duplication, careful consideration should be given to the treatment that the originals may receive in the process. Frequently some form of oil or paraffin treatment, to render original sheets transparent for ease of contact printing, may result in injury to these sheets. Similar consideration should be given to the quality of the material selected for the duplicate copies. Engineers' and architects' drawings and specifications should preferably be duplicated on a good quality of tracing cloth.

Photographic negatives on film are becoming common for record purposes. Where film or sheet plastic is used, it is recommended that it be of the acetate-cellulose type. Adequate protection of nitrocellulose film or sheet plastic is not practicable except by highly specialized forms of construction or by duplicates not subject to the same fire. Acetate-cellulose film may be protected by the same means that would be used for any records on paper, except that lower temperatures are required for their preservation.

In this connection special consideration of the fire hazard must also be given to processes of reproduction involving final coating of collodion to preserve the integrity of the printed matter beneath.

For records that are to be preserved on paper, full consideration should be given to the relative durability of rag stock bond paper as compared to sulphite stock paper which latter may have a very limited life.

It must be remembered that in any system of duplication, there may be two values at stake. The first, and probably most important, is the possession of the information carried by the record. The second value, often found, lies in the actual money cost of reconstructing duplicates from the copies saved. For instance, to retrace several thousand blueprints is a very costly operation.

Finally, if dependence is placed on duplicate records, care must be taken to maintain the duplicates in complete file. If removed for consultation or other use, they should be returned promptly to the storage point. Even if they are only duplicates, they should be protected with the same care as original records and should be checked periodically to insure that the set is complete, and that the records have not begun to deteriorate physically.

Photographing Records.

A method of photographing in miniature, on a roll of film, which subsequently can be enlarged and displayed on a ground glass plate or a screen for reference, or rephotographed for a permanent full size record, has been developed and is being used advantageously by banks to keep a permanent record of checks handled, deposit slips, etc. It would seem equally advantageous for other lines of business where papers recording transactions must be kept for a number of years. The picture on the film is 1/25th of the size of the original paper and one 100-ft. film contains 8,000 photographs, about the size of a package of cigarettes. The original papers may be destroyed and the saving in storage space is about 98 per cent.

Cellulose acetate film should be used on account of greater permanence and lower fire hazard than nitro-cellulose film.

PROTECTION OF MICROFILM AGAINST DAMAGE BY FIRE

While cellulose acetate film does not burn any more readily than paper records, it may be otherwise affected by some of the ordinary storage conditions or fire conditions which would not affect paper records; for example, paper is not affected by the temperatures or humidities encountered under ordinary storage conditions, but high climatic humidity at ordinary room temperature may affect the base or the emulsion of microfilm. These effects are considerably aggravated when humidity is coupled with high temperature as for example, when the temperature is above 200° to 250° F., or when paper is exposed to steam.

When safes or other insulated record containers or record vaults are exposed to fire, the interior does not reach a temperature which is damaging to papers within the period for which the safe or vault is rated, or during the subsequent cooling period. The interior temperature may, however, exceed 200° to 250° F. and the interior may contain steam produced from the heating of the insulation or the vault walls. While these conditions would not be damaging to paper records on the interior of the safe or vault, tests made by Underwriters' Laboratories Inc., by film producers and by safe manufacturers indicate that such conditions can affect the base or the emulsion of microfilm, either due to the high temperature or due to the steam.

Tests show that when microfilm is exposed for a long period of time to a temperature of 225 to 275° F. in the presence of steam, or to a dry temperature at 300° F. for a shorter period of time, the film warps or shrinks so that it cannot readily be run through a projector, although the individual frames of the film are legible and reprints of them can readily be made. The tests have not determined the point at which temperature alone, or temperature coupled with steam will avoid such damage. Experiments are being

made to determine these critical points for film stored in various types of containers.

The tests which have been conducted to date indicate that for maximum protection against steam, microfilm stored in safes or vaults should be in friction-lid tin cans, rather than stored loose, or in cartons, or even in tin containers with telescoping lid.

Obviously in an *uninsulated* record container, microfilm will burn as readily as paper, because when exposed to fire the interior of the uninsulated record container is almost instantly at a temperature which will char either microfilm or paper.

PART IV.

INTENSITY, DURATION AND CONTROL OF EXPOSURE.

INTRODUCTION

The intensity and duration of a fire, even with a given type of building and occupancy, is subject to great variation due to the particular conditions incident to each fire as regards amount, character and concentration of combustible materials, wall and floor openings and wind conditions in relation to the air supply and the extent to which the severity of the fire and its after effect are modified by the fire-fighting methods employed. In considering the conditions for which provision for the protection of records must be made, it is, therefore, generally necessary to neglect conditions giving rise to fires of minor severity and consider only those giving maximum severity in intensity and duration. This necessitates assuming complete destruction of all combustible portions of buildings and contents under conditions favorable for the development of fires of the most destructive intensity and duration probable for the given building and occupancy.

In fire-resistive construction no heavy impacts are probable, as regards objects falling on the record container or the fall of the record container itself. With combustible or nonfire-resistive construction the impacts can have a wide range in severity, depending on the height of the building and the type of construction. Vault construction can also be severely taxed by stresses from failure of adjacent building members. Light vault construction may also be injured by high-pressure hose streams used in fire extinguishment.

Before the degree and nature of the fire protection required for records can be estimated, it is necessary to know to what hazards they are exposed by making a survey of the building and its occupancy in each area where records are kept. The assistance of a capable fire or record protection engineer in making and interpreting such survey is recommended.

CLASSIFICATION OF BUILDINGS

Considered from the record protection viewpoint, two general classes of buildings, namely, nonfire-resistive and fire-resistive, are recognized as defined below:

NONFIRE-RESISTIVE BUILDINGS can be briefly defined as constructions that cannot withstand burning-out of contents without collapse.

Buildings in this group comprise those having wood exterior and wood interior framing; buildings with masonry exterior walls and interior wood

framing, either of the joisted type or of heavy timbers as in "mill construction"; buildings having masonry exterior walls and unprotected or insufficiently protected interior metal framing; and buildings having noncombustible exterior walls and interior framing with structural members, the fire resistance of which is deficient to an extent that general collapse of interior construction could occur. The main difference between nonfire-resistive and fire-resistive buildings is due to such collapse which destroys the value of floors as fire barriers, in effect making the whole space between exterior and fire walls one unrestricted fire area. Before collapse of interior framing, a fire severity equivalent to from 15 minutes to about 1 hour of the furnace test may have obtained within each story, the time depending on the size of beams and columns, thickness of the floor, and the protection afforded by any ceiling, wall or partition finish that may be present. Collapsing roofs or upper floors often carry down with them floors below that may or may not be on fire.

The exterior protection of a nonfire-resistive type building is more difficult to obtain than with fire-resistive construction even where heavy masonry walls are used, since combustible trim and similar details can afford a fire an opportunity to enter. A nonfire-resistive building with combustible interior construction generally affords fire a more ready start and more ready spread than the fire-resistive type. The protection that can be applied to interior vertical and horizontal openings is also generally less effective. Such factors as the stability of walls after the construction of one side has been destroyed by fire makes the prediction of definite degree of protection difficult.

With nonfire-resistive buildings, after collapse of floors the building will burn as a unit and the burning debris from the whole structure may be in one mass that can produce a more severe fire condition for the construction and equipment in contact with it than those obtained within individual stories in fire-resistive buildings housing comparable amounts of combustible contents in each story.

A FIRE-RESISTIVE BUILDING is one in which the structural members (including floors and roof) are of noncombustible material throughout and which can withstand a fire completely consuming combustible contents, trim, and floor surfacing on any floor without collapse. In this type of building the degree of protection can be evaluated to a more or less definite degree.

The building must be protected against fire in neighboring buildings or areas by means of suitable protection for exterior openings (see N.F.P.A. Standards for the Protection of Openings in Walls and Partitions). If located in an area where a conflagration may occur, this matter would need more careful consideration. However, even under such conditions, modern fire-resistive buildings have given a good account of themselves where openings have been protected by metal window frames with wired glass, or protection of higher rating, combined with some fire-fighting equipment within the building.

The interior design involves protection of all vertical and horizontal openings that might communicate fire from floor to floor. The areas between fire division walls should be kept as small as consistent with the requirements of the occupancy. Noncombustible partitions, doors, frames, and trim should be used for subdivision since these constructions have a decided retarding effect on the spread of fire.

Where several occupancies share one building, the problem of securing a desired degree of protection for one of these occupancies is, in a large part, the same as that involved in securing protection where the same occupancy covers the whole building. If the building has sufficient fire resistance to withstand burning-out of contents of any or all portions thereof, without

collapse of main structure members, it is possible to secure for any portion of the building the required degree of protection under conditions of a fire that involves the rest of the building.

TYPICAL BUILDING AND EQUIPMENT CONSTITUTING MINIMUM FIRE HAZARD FOR RECORDS.

In the following is outlined the minimum hazard for records kept with the rest of an occupancy without other protection than that which can be afforded by a well-constructed and equipped building with such general housekeeping conditions as can be maintained. Such conditions occur mainly where protection must be afforded for a large volume of records in current or occasional use and not of the most vital importance. For the really vital records of any business (usually a small proportion of the whole) adequate protective containers (vaults or safes) should be provided.

The building construction should be of the fire-resistive type, in which areas are small, external exposure is amply protected against, and interior combustibles in consequential amounts are entirely eliminated except for the records themselves. Where conditions fall short of these much may still be done to increase record safety, but the limitations of such procedure should not be overlooked and a false sense of security should not be permitted to obscure the necessity for adequate protection for vital records.

In fire-resistive buildings conforming with the requirements outlined above, additional security can be obtained by the use of noncombustible furniture and record containers which totally enclose the records. These give less opportunity for fires to originate and have a decided retarding effect on the spread of fire. This applies particularly to items of equipment such as desks, closed filing cabinets, and cupboards. While heat in a cupboard or enclosed shelf will be communicated to adjacent sections through a sheet-metal wall, the spread will be relatively slow since there is no opportunity for the free sweep of flames or building up of room temperatures above the ignition point of ordinary combustible materials.

A noncombustible floor finish is a material help in preventing spread of fire from one container to the other. In fact, even under moderate exposure conditions from fires in large accumulations of combustibles within the room, no such spread of fire from one closed container to the other is likely to take place on noncombustible floors. On wood finish floors a fire in the flooring, while spreading slowly, can communicate fire to the contents of cabinets, desks and tables in all portions of the room.

The protection afforded by noncombustible shelving is dependent largely on the design. With open back and sides little more protection than with wood shelving is afforded. A fire originating at one point in the shelving can be readily communicated to all portions of the room. For shelving with closed back and sides, the protection given is dependent to a considerable extent upon the size of the openings. The spread of fire is relatively slow for openings as large as those in the ordinary shelving bay, say, 12 by 36 in. As the openings decrease in size, the spread of fire becomes much slower and where the openings are a few inches in width and height, no appreciable spread of fire from one opening to the other should be expected provided the contents do not overhang the front of the opening. (For further information on the general subject, reference can be made to the paper on "Record Protection and Office Equipment" published in the N.F.P.A. *Quarterly*, Vol. 24, No. 4, April 1931, Page 410, also reprinted in pamphlet form.)

Where optimum conditions in point of structural details and equipment conditions are unfavorable from the record protection standpoint, automatic fire detection and/or extinguishing equipment or other equally effective measures afford added protection.

Maintenance of Area Adjacent to Records.

The proper maintenance of buildings from the standpoint of record protection as well as general fire safety requires recognition of the conditions conducive to the origin and spread of fire. It is recognized that even in nonfire-resistive buildings, fires originate most frequently in accumulations of combustibles or in highly flammable materials, the presence of which can be avoided. Proper care in this respect will reduce fires from origins such as discarded cigarettes and matches. All waste materials should be cleaned up at the close of each day or more often and kept in proper containers until removed from the building. Proper containers should be provided for oil mops, oily waste, and materials of similar hazard. The hazard of materials such as pyroxylin plastics, matches, disinfectants, cleaning fluids and other highly flammable materials should be recognized and the needed precautions taken.

Many fires that occur immediately after working hours from discarded matches, cigars and cigarettes can be prevented by systematic inspection of the premises during the first half hour or hour following closing time.

Repair, painting and renovating operations present particular hazards that require precautions while they are in progress. Other special hazards peculiar to each occupancy will generally need attention as well as the general hazards from heating, lighting and power requirements common to most buildings, if a desired degree of fire safety is to be achieved particularly where structural and equipment conditions are unfavorable. Where these are favorable, deficiencies in housekeeping and maintenance are less serious.

Only activity connected with handling of records should be carried on within vaults, file storage rooms, and the file storage portions of document buildings. No flammable cleaning liquids, no nitro-cellulose film, or other highly flammable materials shall be kept in such places.

SELECTION OF RECORD PROTECTION.

Selection of record protection equipment involves not only the character of the building and its occupancy, which determine the probable maximum fire severity, but also consideration of the character, relative importance, volume and frequency of use of the records, and the relative adaptability and the cost of the various methods of protection available at a given rating.

Types of Record Protection.

VAULTS (see Part V) are usually used where the volume of valuable records is large.

A vault is designed to accomplish a specific purpose, that is, the complete protection of its contents in case of fire. It is, accordingly, most important that its construction be such that there will be no doubt as to its ability to fulfill the object for which it is installed. This depends not only upon its heat-insulating qualities, but also upon the maintenance of the integrity of the structure under the strains and impacts to which it may be subjected during a fire. Therefore, the design, the selection of materials, and supervision of the construction should be entrusted only to a competent engineer or architect.

Record vaults should not be located in buildings housing explosives in sufficient quantities to wreck them. Where this cannot be avoided, a measure

of protection can be provided by vault construction that will resist explosion shock. Explosions from smoke produced by ordinary combustible materials sometimes occur and on this account even where there are no explosives present, it is desirable to incorporate in record containers, the maximum structural strength that can consistently be attained.

Vaults and vault doors are available in 6, 4, and 2-hr. classifications.

FILE STORAGE ROOMS (see Part VI) are generally much larger than vaults, and are used in fire-resistive buildings where, because the volume of the records is too great, or their importance not vital, or by reason of other considerations, protection by vaults or safes may be impracticable or disproportionately costly. File storage rooms and file storage room doors are available in 1-hr. and ½-hr. classifications.

SAFES (see Part VII) are used for smaller volumes of records in situations where the cost of vault construction would be prohibitive, or where the building does not lend itself to vault construction. Safes are available in Class A (4-hr.), Class B (2-hr.), and Class C (1-hr.) classifications.

Other insulated record protection equipment designed for the handling of continuously used records at the point of use to provide continuous protection for such records are available in Class C, Class D, and Class E classifications (see Part VII).

DOCUMENT BUILDINGS are used for storage of important records in considerable volume where ground space is available for a detached and unexposed fire-resistive building for transfer of seldom-used records from working areas in offices.

The "document building" is defined as an isolated, strictly fire-resistive building, usually in an outlying district, in which inactive records can be kept. A number of cases have come to the notice of the committee where companies have considered it worthwhile to provide such buildings. Such an arrangement permits the transfer of a large amount of records from working areas in valuable office space, releasing it for other purposes. Such records are thus brought together where they can be kept under proper conditions and supervision, and where they escape the hazards inherent upon storage at locations never really intended for that purpose. Very frequently important records are crowded out of vaults and other reasonably safe storages into out-of-the-way corners where they may not only lack protection but may actually be exposed to grave hazards.

A document building, if large enough, may be put in charge of one or more persons, competent to handle and file the records and to handle inquiries over the telephone, in order to avoid, as far as possible, actually removing the records.

A building of this type should, of course, have the characteristics of a vault as to construction, absence of combustible interior finish, arrangement of lighting, heating, etc. Exterior openings should be protected in suitable manner.

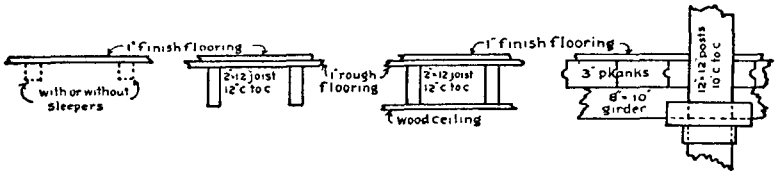
Estimating Combustible in Exposure to Records.

To determine the class of record protection device needed, it is necessary to estimate the combustible to which the device may be exposed.

Estimating the combustible contents of a given area can generally be done with fair accuracy without much difficulty.

The weight of wood in the structure of nonfire-resistive buildings can be conveniently estimated as 2.7 lb. per board foot (board foot is 1 in. nominal, ¾ to ⅞ in. actual thickness and 12 in. square), using actual area of flooring, ceiling and partition spacing and nominal dimensions of joists and other

timbers. The combustible content of outside walls would not be included. Typical examples are:



Wood floor finish on concrete avg. wt. per sq. ft. 4 lb.

Double floor on open joists avg. wt. per sq. ft. 12 lb.

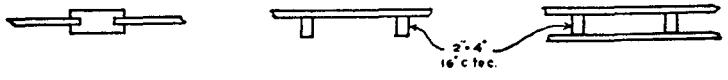
Double floor on closed joists avg. wt. per sq. ft. 15 lb.

Mill construction avg. wt. per sq. ft. 18 lb.

The weight of finish, floors and trim can be computed. Wood used as finish in buildings can be taken as weighing 36 lb. per cu. ft. which gives 3 lb. per sq. ft. for trim of 1 in. actual thickness.

The weight of a single top floor of wood on wooden sleepers will be between 3 and 4 lb. per sq. ft. depending on the species of wood.

The weight of partitions can similarly be computed. Typical partitions are illustrated below.



Single wall on studding avg. wt. per sq. ft. 5 lb.

Single wall avg. wt. per sq. ft. 3 lb.

Double wall on studding avg. wt. per sq. ft. 8 lb.

The weight of shelves can be computed by using the board weight per square foot.

Typical pieces of furniture and furniture contents can be weighed.

The weight of all other wood or paper within the area should be computed. Where contents other than wood or paper are involved, the following allowances for differences in heat value of the materials can be made:

Cotton, wool, straw, grain, sugar, and similar organic materials can be taken at their actual weight; the actual weight of animal and vegetable oils, fats, waxes, petroleum oils, and other petroleum products, asphalt, bitumin, paraffin, pitch, alcohol and naphthalene, should be multiplied by two for the purpose of determining combustible contents approximately equivalent to wood and paper in fuel value. Coal, coke, and charcoal, while having fuel value approximately 50 per cent higher, probably contribute no more if as much to the severity of fire above the debris as an equal weight of wood or paper. As concerns exposure in the debris, they should probably be rated at their full fuel value.

The total weight of combustibles in a given area is then divided by the area to obtain the amount in pounds per square foot, assumed uniformly distributed.

Record Container Requirements.

Having determined the total weight of combustibles involved and having determined the type of protection to be used, the fire resistance rating

necessary to protect records against the worst possible fire condition may be determined by reference to the following tables which summarize the conclusions derived from burning-out tests conducted by the National Bureau of Standards. They refer to recognized classifications for record protection equipment and are derived partly directly from results of tests and otherwise

Record Containers for Nonfire-Resistive Buildings.

Total Weight of Combustibles, Including Contents and Building Members of All Floors Including Roof, but not Exterior Walls, Lb. Per Sq. Ft. of Ground Area	Record Container Rating
Less than 25 lbs.	2-hr. safe or vault; except in one-story and basement buildings (or two-story without basement) 1-hr. safe. Where impacts or blanketing of ruins by collapse of masonry wall of adjoining buildings is possible a safe or vault of 2-hr. or higher rating should be used.
25 to 50 lbs.	2-hr. safe or vault.
50 to 100 lbs.	4-hr. safe; or vault, 4-hr. for basement or ground story, 2-hr. above.
100 to 150 lbs.	Vault; basement or ground (first) story, 6-hr.; first floor, 4-hr.; upper floors, 2-hr.
Over 150 lbs.	Vault: Do not locate in basement or ground story without basement. First floor, 6-hr.; second floor, 4-hr.; upper floors, 2-hr.

Record Containers for Fire-Resistive Buildings.

Total Combustible Contents per Floor (Including any Combustible Flooring, Partitions and Trim), Lb. Per Sq. Ft. of Floor Area	Noncombustible Desks, Filing Cabinets, Lockers, and Other Closed Containers. Not Over 30% of Combustibles Exposed	Noncombustible Open-Front Shelving and Other Open Containers	Combustible Desks, Filing Cabinets, Shelving, Containers, Etc.
5 lbs.	½-hr. container.	½-hr. container.	¾-hr. container.
10 lbs.	½-hr. container.	¾-hr. container.	1-hr. safe.
10 to 15 lbs.	¾-hr. container.	1-hr. safe.	2-hr. safe or vault.
15 to 20 lbs.	1-hr. safe.	2-hr. safe or vault.	2-hr. safe or vault.
20 to 30 lbs.	1-hr. safe.	2-hr. safe or vault.	4-hr. safe or vault.
30 to 35 lbs.	2-hr. safe.	4-hr. safe or vault.	4-hr. safe or vault.
35 to 45 lbs.	2-hr. safe or vault.	4-hr. safe or vault.	6-hr. vault.
45 to 50 lbs.	4-hr. safe or vault.	6-hr. vault.	6-hr. vault.
50 to 60 lbs.	4-hr. safe or vault.	6-hr. vault.	6-hr vault with no combustible near door.

Fig. 1. Office with 6 lbs. per sq. ft. combustible contents. Cement finish floor, metal sash and frames, wood doors, wood furniture.

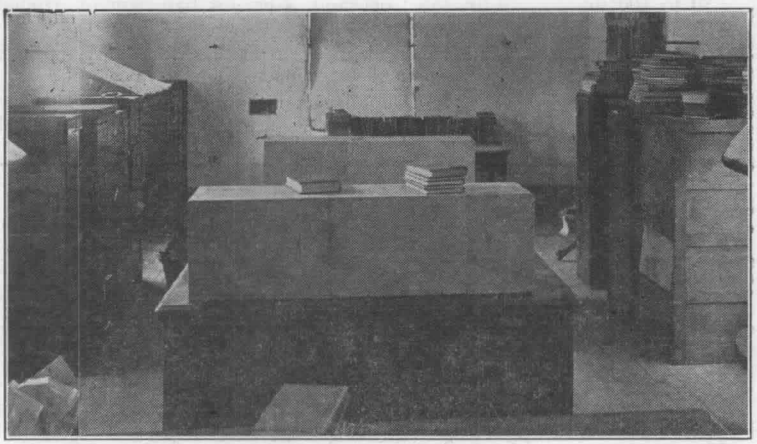


Fig. 2. Test room representing office with 14.2 lbs. per sq. ft. combustible contents. Wood finish floor, wood furniture.

from estimates based thereon. In the latter case, an effort has been made to allow for differences in combustible contents, containers, and pertaining conditions as defined in the table compared with those present in the tests.

The tables assume no cooling by hose streams.

Record Containers for Nonfire-Resistive Buildings.

The degree of exposure to individual record containers in nonfire-resitive buildings varies widely with chance conditions. The recommendations given on page 33 are based on the higher ranges in severity as indicated in tests, although in exceptional cases the severity may be greater for given amounts of combustible contents. Ratings one step higher than those given will give a higher factor of safety.

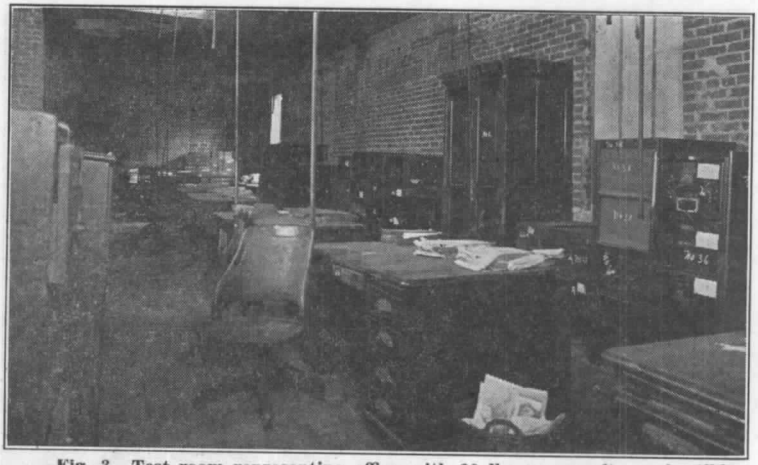


Fig. 3. Test room representing office with 20 lbs. per sq. ft. combustible contents. Wood finish floor, wood furniture.

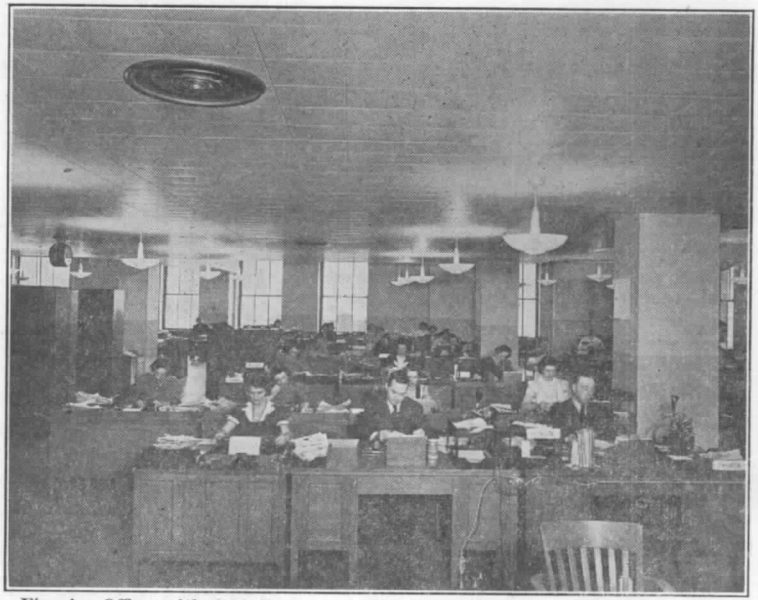


Fig. 4. Office with 2.08 lbs. per sq. ft. combustible contents; maximum weight, 4.16 lbs. per sq. ft. Wood desks and chairs, metal cabinets.

Fig. 5. File storage room with 30 to 50 lbs. per sq. ft. combustible contents, depending on type of material filed. Filing equipment part wood and part metal.

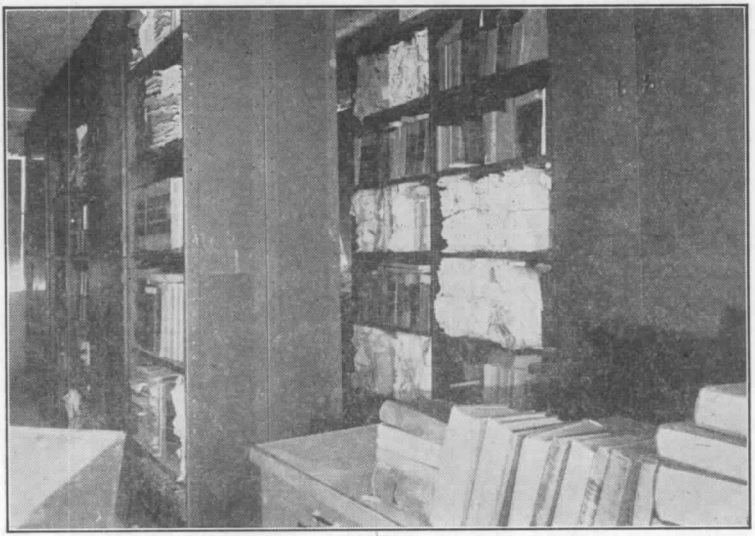


Fig. 6. File storage room with 80 lbs. per sq. ft. combustibles. Cement finish floor, metal shelving.

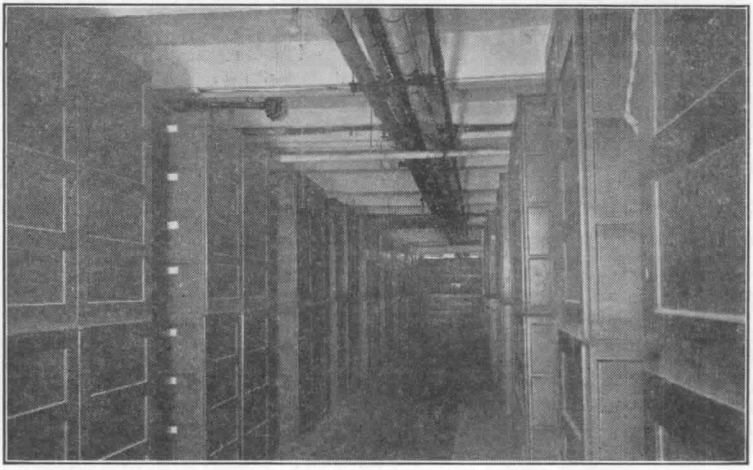


Fig. 7. File storage room with 80 lbs. per sq. ft. combustibles. Cement finish floor, wood files.

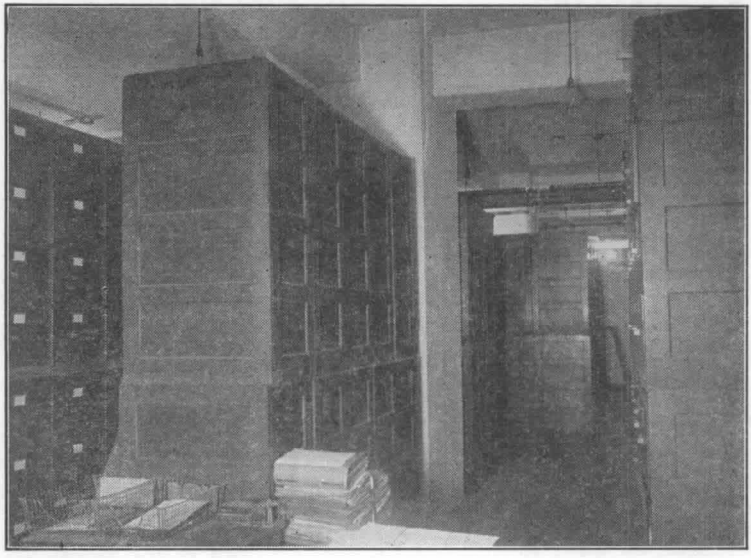


Fig. 8. Another view in same room as above.

The recommendations is the second column of the lists on page 33 are for complete or nearly complete equipment of noncombustible filing cabinets, desks and shelving, no more than 30 per cent of the weight of combustible given in the first column of the table being assumed to be in open shelves, cupboards, or as material in the equipment or building trim. The estimates of severity are based on that obtainable from the exposed combustibles plus an allowance for those contained within closed containers, the heat evolution from the latter being too slow to contribute its full quota to the severity during the period significant from the standpoint of combustibles freely exposed.

Comparisons of the recommendations in the first two columns of the table indicates a little lower severity where open noncombustible shelving or other open containers are used, compared with that for an equal amount contained within or constituting a part of combustible equipment. Also, with the latter, a comparatively greater combustible content will be present for equal weights of contained records.

Office, residential and institutional occupancies in fire-resistive buildings can be named as typical of those giving rise to fires of the light or moderate severity. At the other end of the scale, fires in buildings or parts of buildings normally housing large amounts of combustible materials such as those used for storage of merchandise, are known to have attained intensity and duration fully equal in effect to the standard 4-hr. fire test.

HANDLING OF RECORDS UNDER NORMAL AND FIRE CONDITIONS.

Protective equipment, no matter how complete, is of little value unless it is consistently used, and unless there has been forethought concerning procedure in an emergency. The following suggestions apply:

Records in Normal Use.

No greater number of valuable records than is absolutely necessary for immediate use should be out of their designated protective enclosures at any given time.

All records should be returned to their designated protective enclosures when the office in which they are used is closed.

Records should never be left out overnight. Doors of vaults and safes and other record protection equipment should be locked every night.

Important records properly belonging under protection should not be allowed to accumulate on desks.

Grave oversights in the consistent use of protective equipment and development of procedure in an emergency are more commonly found than not and the importance of drills is emphasized for restoring records to their place of safety, quickly, accurately, and without confusion or oversight. Attention is called to the inconsistencies introduced by permitting records ordinarily protected to be transferred, sometimes for considerable periods, to the custody of others, who do not similarly protect them, by failing to put records away at the close of the working hours, and by allowing them to accumulate outside of protective containers as a matter of convenience or accessibility.

At Time Fire Is Detected.

Employees should be definitely instructed that in case of a day fire, valuable records must be quickly and without oversight returned to their designated protective enclosure, if this is possible without danger to life. In some cases, the best plan is to have the most important records carried out of the building.

Quenching of Fire Ruins.

Where extinguishment of fire takes place, the fire resistance of record containers designed for the full fire severity applicable for the location will be developed only in part and containers having less fire resistance than thus required may preserve their contents. While it may be difficult to decrease greatly the initial severity of a fire that has involved the greater portion of nonfire-resistive buildings, the fire effects on safes and vaults can be greatly decreased by quenching of the hot and glowing ruins. For fires involving only individual buildings or small groups of buildings, the ruins can be easily approached and where there is public fire protection the necessary water and extinguishing equipment will generally be present. Even in the case of fires approaching moderate conflagration proportions, such as that at Fall River, Massachusetts, in 1928, that may require intensive effort for 8 hours or more before being brought under control, much salvage of records in insufficiently protected safes and vaults can be effected by systematic quenching of the ruins with this object in view. To judge from temperature measurements available, the maximum temperature in debris consisting of partly burned paper and wood covered by masonry from fallen walls is not attained before 6 to 36 hours after the start of the fire. Even in exposed burning debris several hours may be required before maximum temperatures are reached. It is the continuance of such temperatures for periods of a day or more that overtaxes the protection obtainable with insulated record containers buried in it and more general knowledge of the hazard thus presented should promote cooperation of fire departments and owners of buildings and their contained records in promptly locating and quenching the adjacent portions of the fire ruins.

After a Fire.

Safes buried in hot debris should be removed as soon as possible and safes and vaults covered with hot debris cooled with hose streams. The prolonged heat exposure from such debris can tax the resistance of the best built containers.

Access should be had as soon as possible to record containers that are suspected to have been subject to fire of sufficient severity to endanger their contents and they should as promptly as possible be cooled with water. To avoid flash ignition of the records, the container should not be opened until it is cooled below the sizzling point. Some means of producing fine water spray should be at hand, or a 15-lb. or larger CO_2 extinguisher, also tubs of water, into which records may be quickly plunged, if they should happen to be hot enough to cause flash ignition when exposed to the air. Under almost all conditions, the sooner the container is opened after it is cooled off the better the opportunity for salvage.

SALVAGE OF FIRE-DAMAGED RECORDS.

In fires involving records, the containers should be left as far as possible in their original location and the contents of each compartment extinguished with the minimum amount of water needed. If this is done, it will often be possible to reconstruct a partly charred file of records where it would be totally lost if taken out of its place or container.

Valuable documents that have been heated to brittleness may in some cases be salvaged by placing them between sheets of glass.

Charred or partly charred records should be left in position in record containers, until systematic inspection and reconstruction work can be undertaken.

Charred records can frequently be read due to the different color of the char under the writing. Otherwise illegible documents may be read by ex-

posing them to invisible ultraviolet light in total darkness. Under these conditions charred papers and inks fluoresce or emit visible light of different color and intensity, thus rendering the writing legible.

Duplication of Charred Records.

Photographic reproductions of records, charred to the extent that they are completely illegible, may be obtained by taking advantage of the fact that charred paper and charred inks absorb infrared light differently. Infrared sensitive film or plates should be used in conjunction with a filter permitting the passage of infrared light only. The usual sources of light for photography may be used, but the exposure should be longer than for the same type of picture using visible light. Since the wave length of infrared rays is longer than that of the components of white or visible light, care must be taken to allow for this factor.

The use of chemicals to restore the legibility of charred records should be attempted only after other means have been found ineffective, since their application may prevent successful restoration by other methods.

Treatment of Water-Soaked Records.

Water damage to valuable records is often a very serious aftermath to fires involving record storage. Water used in fire extinguishment causes very serious damage to records, particularly where vaults or safes are located in basements which may be flooded by hose streams. A similar problem is frequently brought by floods.

It must be recognized that the labor cost of salvage work is high and it is very desirable to store records in such a manner as to minimize the likelihood of water damage.

The preservation of paper records requires the presence in the paper and the air surrounding it of a moderate amount of water (40-65 per cent relative humidity) in order to render the paper fibers sufficiently flexible to withstand ordinary use. If the moisture content of paper is allowed to rise appreciably above that attained by the same paper in equilibrium with air of 70 per cent relative humidity, certain phenomena occur which are fraught with danger to the future life of the records. The methods of treating records suffering from exposure to abnormally high moisture and suggestions for avoiding such exposures are as follows.

Speed is a prime requisite in treating water-soaked records, since the greater prospect of damage comes from the development of molds on the surface of the paper. The spores of these minute plants are widely distributed and require only a favorable environment to germinate rapidly. Under optimum conditions (that is, high humidity and high temperature) less than 24 hours may be required for the development of a serious infestation which if allowed to continue unchecked will transform a valuable body of records into a mass of useless material.

Unbound or loose papers, which are water-soaked, should be removed from containers and spread out on dry blotters or newspapers in a warm (not hot) place. Great care should be exercised to preserve the order in which the papers were filed, but under no circumstances should the individual wet sheets be permitted to remain in contact with each other. As soon as the excess water has been absorbed by the blotters but before the documents are entirely dry, they (the records under treatment) should be ironed sheet by sheet in a mangle. The ordinary electric household ironing machine is eminently suitable for this type of work. If equipment of this type is not available, the damp sheets may be placed between blotters or newspapers and allowed to dry under pressure. The blotters should be changed daily, at which time the pressure should be increased. If newspapers are used instead of blotters, care should be taken to avoid those which will offset ink to the documents. This must be determined by experiment.

Books of any variety, including bound records, should be interleaved with thin waxed paper and allowed to dry under pressure. Interleaving is necessary to prevent the pages sticking to each other. When partially dry, each page may be ironed with a flatiron by placing a thin metal plate beneath the page and a sheet of blank paper on top of it. The iron should be moderately hot and should never come in direct contact with the page under treatment. In severe cases, the cloth or leather covering may pull away from the boards because of the action of water on the glue used in fastening the binding. If the book is properly dried as outlined above, the replacement of the covering material will be a simple task for a book-binder.

While the records are being treated, the vault or record room should be thoroughly dried by the application of heat from a suitable source. When the enclosure is apparently dry, anhydrous calcium chloride in earthernware dishes or crocks should be placed within the vault. The doors should be kept closed during this exposure. Approximately 5 lb. of calcium chloride per 100 cu. ft. of storage space should be used. It should be inspected daily and replaced if much moisture has been absorbed. When the relative humidity of the air within the vault has remained below 65 per cent for two or three days, the drying agent may be removed and the records returned to the vault.

If possible, vaults and record rooms should be constructed above the ground floor of office buildings rather than using the basement space for the storage of records. Shelving should be designed so that no record is less than 6 in. above the floor level and six-sided metal containers are strongly recommended. From time to time, the relative humidity of the air within the record room should be determined by means of a sling psychrometer, and if it is found to be above 65 per cent, remedial measures should be taken immediately.

TYPES OF FIRE PROTECTION EQUIPMENT.

A system of automatic carbon dioxide fire protection installed in accordance with the N.F.P.A. Standards for Carbon Dioxide Fire Extinguishing Systems affords excellent protection and is particularly adaptable where large values are concentrated in a relatively small space. Relief vents opening automatically must be provided, preferably at or near the top of the vault, to prevent building up of pressures by the gas discharge that would rupture the vault construction.

Automatic sprinklers installed in accordance with the N.F.P.A. Standards on Sprinkler Equipments are effective in extinguishing or limiting the spread of fire, but involve the possibility of some water damage. It would be expected, however, that the water damage to vault contents would be greater if, in the absence of needed automatic protection, large hose streams were used. Where sprinklers are installed, sprinkler alarms and shut-off valves, located conveniently outside the vault, should be provided to permit turning water off promptly after fire is extinguished, thus preventing unnecessary water damage.

Automatic fire detecting systems installed in accordance with the recommendations of the N.F.P.A. Standards on Protective Signaling Systems are valuable in giving warning of fire inside vaults. They should be relied upon only when there is assurance that the alarms will bring prompt response at all times.

First aid fire appliances of type suitable for Class A fires (see N.F.P.A. Standards on First Aid Fire Appliances) or standpipe systems with small hose suitable for use by occupants of the building (see N.F.P.A. Standards on Standpipe and Hose Systems) should be provided at a conveniently

accessible location outside the door of the vault. Such protection is recommended in all cases and is particularly indicated where automatic fire extinguishing equipment is not provided inside the vault.

PART V.

SPECIFICATIONS FOR FIRE-RESISTIVE RECORD VAULTS.

Introduction.

These specifications deal primarily with protection of records against fire and do not presume to deal particularly with other hazards. However, it may be stated that all fire-resistive vaults do afford a measure of protection against burglary. Where a greater burglary protection is desired, burglary-resistant safes or chests of the desired classification may be installed within a fire-resistive vault, or relocking device protection may be installed on the vault door. Although fire-resistive vault doors are not designed to be water-tight, modern doors do provide reasonable protection against entrance, at door jambs, of water from fire hose streams. Where specific protection against burglar or flood conditions is desired, the problem should be submitted to a competent engineer.

Definitions.

The term "APPROVED" refers to a material or equipment tested and listed by Underwriters' Laboratories, Inc., or other nationally recognized testing laboratory.

The term "VAULT" as used in these specifications refers to a completely fire-resistive enclosure, to be used exclusively for storage (no work to be carried on in the vault) and to be so equipped, maintained and supervised as to minimize the possibility of origin of fire within and to prevent entrance of fire from without. The construction specified herein is intended to provide not only a factor of safety for structural conditions but also (1) to prevent the passage of flame or the passage of heat above a specified temperature into the vault chamber for a stated period, and (2) to permit withstanding the stresses and strains due to the application of a fire hose stream while the unit is in a highly heated condition without materially reducing its fire resistance. On the basis of the foregoing, vaults are classified as "six-hour," "four-hour" or "two-hour."

The term "NONFIRE-RESISTIVE" building as used in these specifications refers to a building, the structural members of which including floors and roof cannot withstand a fire completely consuming combustible contents, trim and floor surfacing without collapse. This type includes buildings having wood exterior walls and interior wood framing; masonry walls, (exterior, or exterior and interior), and interior wood framing either of the joisted type or of heavy timbers as in "mill construction"; masonry exterior walls and unprotected or insufficiently protected interior metal framing and noncombustible exterior walls, and interior framing with structural members whose fire resistance is deficient to an extent that general collapse of interior construction could occur in event of a fire completely consuming combustible contents, trim and floor surfacing.

The term "FIRE-RESISTIVE" building as used in these specifications refers to a building whose structural members (including floors and roof if used as part of a vault) are of noncombustible material throughout and *can* withstand a fire completely consuming combustible contents, trim and floor surfacing on any floor without collapse, thereby assuring that record containers

on one floor of the building will not be exposed to the burning of additional combustible materials from other floors.

The term "GROUND-SUPPORTED" vault is, as the name implies, one which is supported from the ground up and which is structurally independent of the building in which it is located.

The term "STRUCTURE-SUPPORTED" vault is one which is supported by the framework of a fire-resistive building and may be supported individually on any floor of such a building.

The term "VAULT DOOR" as used in these specifications is defined in the section entitled "Vault Door."

Selection of Type of Vault.

In a fire-resistive building, the vault may be of either the ground-supported or the structure-supported type.

In a nonfire-resistive building, the vaults shall be of the ground-supported type. Walls of building shall not be used as walls of vault because collapse of building may cause damage to the vault and its contents.

Location of Vault.

The vault shall be located in a normally dry place, preferably accessible to the section of the building where the records are used.

Because of the difficulty of providing resistance to severe impact, vaults in nonfire-resistive buildings should be located where they will not be exposed to the fall of a heavy safe, machine or water tank, in the event of collapse of the building as the result of a fire.

Basement vaults are undesirable, not only because under certain conditions burning or smoldering debris may be accumulated in a basement sufficient to produce a "cooking effect" of such duration that it cannot be resisted by construction alone (within practical limitations), but also basement vaults may be damp causing destruction of records by mold, and they are subject to flooding, under either flood or fire conditions, and consequent damage by water to some or all of the records.

Exterior building walls forming part of a vault enclosure are subject to the penetration of moisture, and condensation within the vault may result from differences between the inside and outside temperatures. Remedial treatment is described in the following sections entitled "Waterproofing" and "Dampproofing."

Size of Vault.

Standard record vaults shall not exceed 5,000 cu. ft. in volume and the interior height shall not exceed 12 ft. These limitations are for the purpose of restricting the quantity of vital records exposed to destruction by fire in a single enclosure, and to reduce the possibility of fire originating within the vault. For conditions requiring space in excess of 5,000 cu. ft., see the following section entitled "Working Vault," or "Specifications for Fire-Resistive File Rooms."

Design of Vault and Supervision of Construction.

Vaults require unusually good design and construction to insure that the structure will withstand satisfactorily all of the conditions which may be imposed upon it by fire. Plans and specifications shall be prepared and construction supervised by a competent engineer or architect.

Proper design and construction of a vault include not only its qualities as a flame barrier and as a heat-retardant, but also its ability to avoid settlement and consequent cracking, and its ability to maintain the integrity of the

vault structure under the stresses and impacts to which it may be subjected during a fire, including impact from falling objects and stresses, strains and erosion due to sudden cooling with fire hose streams. Proper design includes: determination of classification, selection of type, choice of materials, independence of walls, floor and roof of vault from nonfire-resistive building, bonding of walls, floor and roof of vault to each other, load capacity, etc. Proper construction involves supervision of details to avoid subsequent settlement and cracking of walls and to insure that all structural considerations related to fire resistance will be observed.

Foundation of Vault or Supporting Structures.

Foundations for vaults of the ground-supported type shall be of reinforced concrete adequate for the entire load of the vault structure and its contents, or tier of vaults and their contents. Structural members supporting vaults of the ground-supported type shall have steel-work protected by at least 4 in. of fireproofing.

The supporting structures for vaults of the structure-supported type shall be of adequate strength to carry the full load including the weight of the vault structure and its contents. There shall be no combustible material in any portion of the supporting members of the structure. All structural members of the building which support the vault shall have steel protected by at least 4 in. of fireproofing. The walls of a structure-supported vault shall follow the panels of the building wherever possible and shall extend from floor to ceiling of the building in each story where a vault is located. If vaults are located on more than one floor of a building, they shall preferably be placed one above the other in the several stories.

Walls of Vault.

Walls shall be of noncombustible construction throughout, consisting of reinforced concrete or brick with vertical as well as horizontal joints filled with mortar; or in a fire-resistive building, a framework of heat-protected steel or reinforced concrete with panels of reinforced concrete or brick; walls of two-hour vaults (not four-hour nor six-hour) may be of approved concrete masonry units. Walls of hollow units shall be plastered on both sides with at least ½ in. of gypsum or portland cement plaster.

Reinforcement for concrete shall consist of steel rods at least ½ in. in diameter spaced 6 in. on center and running at right angles in both directions. Rods shall be securely wired at intersections not over 12 in. apart in both directions, and be installed centrally in the wall or panel.

Where a structural steel frame is used, the steel shall be protected with at least 4 in. of concrete, brick or its equivalent tied with steel tips or wire mesh equivalent to No. 7 A.S.W. gauge (0.177 in. diameter) wire on 8-in. pitch. Brick protection if used shall be filled solidly to the steel with concrete.

Stone and gravel aggregate for concrete shall be selected with regard to their fire-resistive properties. Siliceous gravel shall not be used for the coarse aggregate because it is particularly subject to disintegration under heat.

No combustible material shall be used for trim or partitions.

THICKNESS.—To provide not only the necessary minimum resistance to fire and fire hose streams, but also to provide for structural consideration and variations in quality of materials and workmanship, walls shall not in any event at any point be less than 6 in. thick if of reinforced concrete, nor 8 in. if of brick or hollow concrete units. Walls of these minimum thicknesses are hereinafter referred to as walls for two-hour vaults, which may be expected to be capable of protecting against a complete burning out of

the section of the fire-resistive building adjoining the vault, or of buildings of nonfire-resistive construction having not more than two floors; and then only if the area in the vicinity of the vault, and particularly the vault door, has an occupancy containing a *moderate* amount of combustible material (such as an office occupancy consisting of an ordinary assortment and arrangement of desks, tables, chairs, filing cabinets, cupboards, open containers, etc., and no combustible partitions).

Where the fire area in the vicinity of the vault has an occupancy containing a *large* amount of combustible material (such as an office occupancy with combustible partitions, or an extraordinary amount of combustible furniture or open shelving, or a congested file storage area, or a factory, store or warehouse in which the vault is in the vicinity of combustible merchandise), walls shall be of greater thickness as in four-hour vaults, not less than 8 in. thick, of reinforced concrete or 12 in. if of brick.

Where the combustible merchandise or other contents of the fire area in the vicinity of the vault are of extreme concentration or are highly flammable, walls shall be the thickness required for six-hour vaults, not less than 10 in. thick if of reinforced concrete or 12 in. if of brick.

Walls of ground-supported vaults shall be of greater thickness than those described above where necessary to take care of unusual structural conditions, loads, etc. (See the following table, "Suggested Minimum Thicknesses for Ground-Supported Vaults.")

Expert judgment is required in determining vault classification based on actual weights of combustibles in fire area. (See Part IV entitled "Intensity, Duration and Control of Exposure.")

Suggested Minimum Thickness of Walls for Ground-Supported Vaults.

(The first line of the following table may be considered as the minimum thickness of walls for structure-supported vaults.)

The following is a table of suggested minimum thicknesses of walls for various floors to take care of ordinary structural conditions and ordinary vault loads.

Kind of Material / Class of Wall / Floor - Counting from Top Down	Thickness of Wall, In.						
	Reinforced Concrete			Brick			Hollow Concrete Masonry
	6 Hr.	4 Hr.	2 Hr.	6 Hr.	4 Hr.	2 Hr.	2 Hr.
Top	10	8	6	12	12	8	8
2nd from top	10	8	8	12	12	12	12
3rd from top	10	10	10	12	12	12	12
4th from top	12*	10	10	16†	16†	16†	16†
5th from top	12	12	12	16	16	16	16
6th from top	12	12	12	16	16	16	16
7th from top	12‡	12‡	12‡	16‡	16‡	16‡	16‡
8th from top	12‡	12‡	12‡	16‡	16‡	16‡	16‡
9th from top	12‡	12‡	12‡	16‡	16‡	16‡	16‡
10th from top	14‡	12‡	12‡	16‡	16‡	16‡	16‡

Example: For a four-story building, use thicknesses shown in first four

‡These thicknesses apply to panel construction.
*Thickness in panel construction may be 2 in. less.
†Thickness in panel construction may be 4 in. lesss.

lines of table, the fourth line designating the minimum thickness suggested for walls of the ground floor vault, the first line the minimum thickness for the walls of the top or fourth floor vault, etc.

Example: For an eight-story building, use thicknesses shown in first eight lines of table, the eighth line designating the minimum thickness suggested for walls of the ground floor vault, the first line the minimum thickness of walls (panel construction) for the top or eighth floor vault, etc.

OPENINGS IN WALLS.—Walls of vaults shall have no openings except door openings which shall be protected with approved vault doors. Doors shall not open into elevator, conveyor or other shafts, and there shall be no openings from one vault into another.*

Openings shall not exceed two for any one vault, and shall be limited in area to that necessary for convenient ingress and egress and for ventilation. It is recommended that the following standard sizes of clear door openings be used wherever practical: 78 by 32 in. for single door; 78 by 40 in. for doors in pairs. Stock frames of two-hour doors are usually for 6-in. walls; of four-hour doors for 8-in. walls; of six-hour doors for 10-in. walls.

BONDING TO STRUCTURES OF FIRE-RESISTIVE BUILDINGS.—The walls of vaults, unless ground-supported, shall be laid directly on the rough structural arch or floor slab construction of the fire-resistive building which shall afford a solid and roughened surface free from combustible or loose material, dirt or other foreign matter. Such surfaces shall be swept clean and dampened when the construction of the walls and floors of the vaults is started.

If any wall of a building is of suitable construction to form part of the vault enclosure, the wall or walls of the vault at the intersection with the building wall shall, when practicable, be bonded into it for the full height and width of the vault wall or walls. When such bonding is not practicable, the wall or walls of the vault shall be (a) rabbeted into the building wall for their full height and width, to a depth of not less than 4 in., or (b) the bonding may consist of a series of keys the full width of the vault wall and let into the building wall not less than 4 in., these keys to be not less than three brick courses in height and spaced not to exceed 2 ft. on the centers, with the lower key at the floor and the upper key at the ceiling, and with all joints between the keys and the building wall thoroughly filled with mortar or cement grout.

Where structural steel members of a building come in contact with vault construction, such members and their fire-resistant protection shall in no case reduce the minimum thickness of the vault construction prescribed in these specifications.

Interior columns or pilasters shall not be considered in determining the thickness of vault walls, but the wall of the vault shall be bonded or anchored to each column or pilaster if the two intersect or adjoin.

BONDING OF WALLS, FLOOR, AND ROOF.—Vault walls of masonry units shall be laid with angles and corners well bonded throughout their height.

Where the floor construction of a fire-resistive building forms the roof of the vault, the joint between the top of the vault wall and the underside of the floor arch or slab shall be tightly finished and thoroughly filled with mortar or cement grout. Wedging with slate should be done where required to secure adequate bonding.

INDEPENDENCE FROM BUILDING STRUCTURE.—Vault construction shall not be used as a support or bearing for the structural members of the building.

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*See page 41 for permissible fire protection equipment for vaults.

In buildings of nonfire-resistive construction, the walls of vaults shall be structurally independent of the building.

Floor of Vault.

IN STRUCTURE-SUPPORTED TYPE, the floor of the fire-resistive building may serve for the floor of the vault, provided it is of noncombustible construction throughout and complies with the following paragraphs (b) to (d) inclusive:

IN GROUND-SUPPORTED TYPE, the following paragraphs (a) to (e) inclusive shall apply:

(a) Materials—Floor of vault shall be of noncombustible material; exposed floors, i.e., floors exposed to fire from outside the vault, shall be of reinforced concrete.

(b) Thickness—Floor of vault shall be not less than 6 in. thick and greater if necessary, to support the full load; or, if exposed to fire from outside the vault, equivalent to that required for the walls of the vault.

NOTE.—It is good practice to have the portion of the floor under the record storage space about 4 in. higher than the floor of the building to avoid wetting of records in lowest storage space.

(c) Floor Openings—Floor of vault shall not be pierced for any purpose.

(d) Floor Surfacing—No wood or other combustible material shall be used for floor surfacing.

(e) Independence from Building Structure—In nonfire-resistive buildings, the floor construction of vaults shall be independent of the floor construction of the building.

Roof of Vault.

The term "ROOF OF VAULT" refers to the ceiling or roof of a single vault and to the ceiling or roof of the top vault of a tier, not to the slab between vaults in a tier which is classified as a floor.

IN STRUCTURE-SUPPORTED TYPE, the roof or the floor of the fire-resistive building may serve for the roof of the vault, provided it is of noncombustible construction throughout and complies with the following paragraphs (a) to (e) inclusive:

IN GROUND-SUPPORTED TYPE, the following paragraphs (a) to (f) inclusive shall apply:

(a) Materials—Roof of vault shall be reinforced concrete on reinforced concrete or protected steel supports.

(b) Thickness—Roof of vault shall be at least 6 in. in thickness and greater if subject to unusual impact, or if exposed to fire from outside the vault, thickness of roof shall be equivalent to that required for the walls of the vault.

(c) Interior Supports—All interior structural steel shall be protected with at least 2 in. of fireproofing.

(d) Roof Openings—Roofs of vaults shall not be pierced for any purpose.

(e) Bonding of Vault Roof to Walls of Vault—As required by the materials and type of construction used, the vault roof shall be adequately bonded or anchored to the walls of the vault. For reinforced concrete construction, the reinforcing steel in the vault roof shall be extended into the walls for not less than one-half the thickness of the wall and finished with a right angle or hook anchor. The wall reinforcing steel shall be extended

into the vault roof construction not less than 18 in. and similarly finished. If steel beams are used in the roof construction, they shall be provided with suitable wall anchors or secured to structural members forming part of the wall construction.

(f) INDEPENDENCE OF VAULT ROOF FROM BUILDING STRUCTURE.—In nonfire-resistive buildings, the roof of vaults shall be entirely independent of the wall floor, ceiling or roof construction of the building.

Dampproofing.

When walls, floor or roof of vault is dampproofed, methods and materials used shall be such that the desired fire-resistance of the vault will not be impaired. When temperature changes between the exterior and interior of the vault may be encountered, the resultant condensation (sweating) may be avoided by constructing a continuous air space of preferably 2 in. formed by a noncombustible lining inside the vault.

Waterproofing.

Where conditions require waterproofing, the problem should be referred to a competent engineer or architect.

Vault Door.

The term "VAULT DOOR" as used in these specifications designates a unit consisting of a frame, generally known to the trade as a vestibule, which is designed to be installed in the wall of the vault and into which is hung a single or a pair of fire-insulated doors equipped with suitable hinges and locking mechanism, and is limited to approved vault door units bearing the label of the Underwriters' Laboratories, Inc., or other nationally recognized testing laboratories. Such doors are capable (1) of preventing the passage into the vault chamber of flame or of heat, above a specified temperature, for the period of time indicated on the label, and (2) of withstanding the stresses and strains due to the application of a fire hose stream while the unit is in a highly heated condition without materially reducing its fire resistance. Inner steel doors may be hung in the vestibule if desired; they provide little or no added fire resistance, but have some value in keeping combustible material inside the vault and, if kept closed during the day, they help to reduce the possibility of fire originating inside the vault.

CLASSIFICATION.—Each wall opening in the vault shall be provided with a vault door unit bearing a rating, in hours of fire-resistance, comparable to the classification of the walls of the vault, as follows:

Two-hour vault—Two-hour door.

Four-hour vault—Four-hour door.

Six-hour vault—Six-hour door.

Ordinary fire doors such as hollow metal, tin-clad, sheet metal or metal-clad types, plate steel type and file room doors, are not acceptable as vault doors.

INSTALLATION OF FRAME.—Installation of the vault door unit shall be made in conformity with instructions supplied by the manufacturer and shall be entrusted only to those experienced in such installation work. This will insure that the vault door unit as installed will maintain its integrity not only as a flame barrier but also as a heat retardant under the stresses and impacts to which it may be subjected during a fire, and expansion or distortion of the vault door itself due to sudden cooling with fire hose streams.

The following procedure is recommended: The masonry at the bottom of the opening shall be built up to the bottom of the steel of the frame and

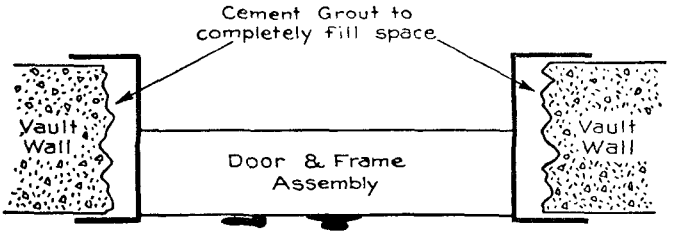

Fig. 9. Installation when Vestibule Laps Both Faces of Wall.

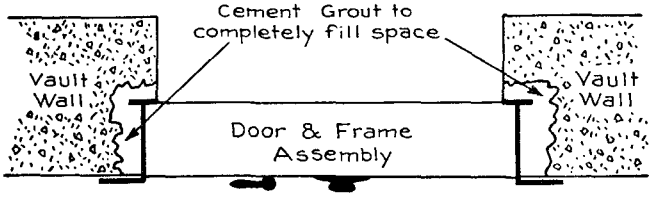

Fig. 10. Installation when Vestibule Does Not Lap Both Faces of Wall.

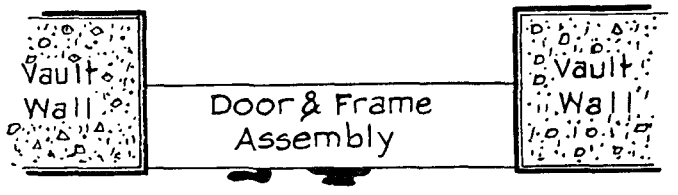

Fig. 11. Installation without Grouting. Frame Fits Fairly Snug into Masonry Opening.

METHODS OF INSTALLATION OF VAULT DOORS.

covered with a thick coat of cement mortar on which the sill of the frame is placed. The frame and door assembly shall be braced in position and the space between the jambs and the head and masonry completely filled with cement grouting. The methods of installation for jambs and head are shown in diagrams. Figures 9, 10 and 11 are typical.

ESCAPE DEVICE.—The door-locking mechanism shall be of a type enabling a person accidentally locked inside the vault to open the door from the inside.

DOOR CLOSERS.—Doors should preferably be equipped with self-closers. When conditions are such that the doors may be fastened in the open position, the self-closers should be equipped with heat-actuated releases to close them in case of fire.

Lighting, Heating and Ventilation.

LIGHTING.—The lighting shall be electric with all interior wiring in conduit and installed in accordance with the National Electrical Code. The conduit, if exposed, should preferably be located on the ceiling and so as to

avoid the possibility of records coming in contact with it; where it is carried through the vault wall, the hole shall be made as small as possible and the space around the conduit shall be completely filled with cement grouting. Floors and roofs of vaults shall not be pierced for conduit.

The wiring shall provide as many fixed lamps as needed for adequate illumination. There shall be no pendant lamp or extension cord used within a vault. Care should be taken to make the fixed lighting adequate for all portions of the vault, as otherwise matches or other hazardous forms of illumination are likely to be used.

Wiring shall be so arranged that both wires of the circuit shall be disconnected when the vault door is closed. Common methods of accomplishing this are given herewith, in order of merit:

(1) Interior wiring controlled by nonsparking door switch.

(2) Interior wiring controlled by outside switch with red pilot light.

HEATING.—No heating other than indirect heating through door opening is permissible. Walls, floor and roof of vault shall not be pierced for piping.

VENTILATION.—Ventilation of interior of vault shall be only through door openings. Floors and roofs of vaults shall not be pierced for ventilation.

Where the natural circulation of air through the door opening does not provide sufficient ventilation, an electric fan may be placed outside the vault close to the door, directed through the door opening. Such fans may be conveniently placed on wall brackets near the top of the door. Fans should be so located that they will not obstruct the closing of the door.

Filing Equipment for Vaults.

Filing equipment shall be noncombustible throughout. All records shall be stored in fully enclosed containers so far as possible. If complete enclosure of certain records is impractical, shelving having only the front open may be used, but loose papers shall not be filed on open shelving. Cubical contents of individual compartments of shelving should have a volume of not more than 10 cu. ft., preferably less.

Arrangement of filing devices within the vault shall be such that they will be in short sections and with ample aisles between for convenient access and to retard the spread of fire. If open-front shelving is used, the sections of shelving should be broken up with fully enclosed containers forming fire stops.

Open-front containers should be located at least 36 in. away from door openings; fully enclosed containers at least 4 in. away from door openings.

If floor of vault, at least the portion under record storage space, is not at least 4 in. higher than the floor of the building, the bottoms of the lowest record storage spaces should be not less than 4 in. above the floor of the vault.

Housekeeping and Supervision.

General cleanliness shall be of the highest type.

The vault shall be under responsible supervision from opening until closing time and inspections shall be made daily, particularly before closing time, to insure that all containers are closed, no records left on top of containers or elsewhere exposed, all waste papers removed, and vault doors closed.

Vaults should not be used as working spaces. Persons other than those authorized to handle the records should not be permitted in the vaults.

All vault door openings should be marked to caution firemen against