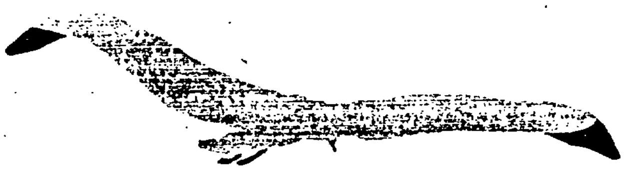
PLAINTIFF'S EXHIBIT

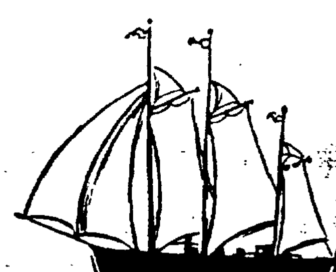
USG-1546

1928

SABINITE

CONTROLLED SOUND





"Pour the full tide of eloquence along
Serenely pure, and yet divinely strong"

POPE

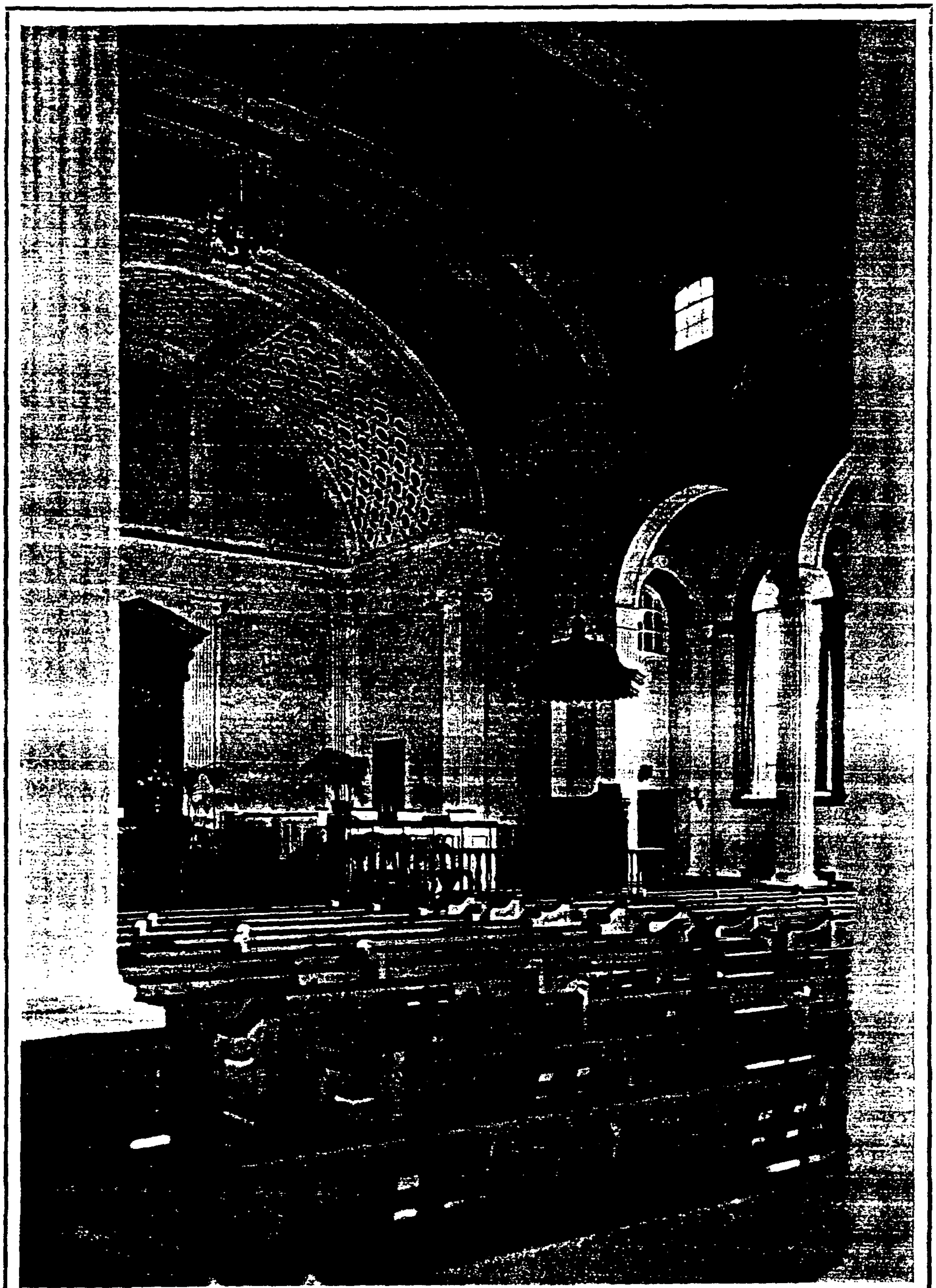
BB006 1049

SABINITE

The practical *fireproof* sound absorbent for the correction of Auditorium acoustics during construction, and for the reduction of noise levels in Office, Hospital and Hotel Buildings.

USG

UNITED STATES GYPSUM COMPANY
CHICAGO



FIRST CONGREGATIONAL CHURCH, EVANSTON, ILL.
TALMADGE & WATSON, ARCHITECTS

FOREWORD

TODAY, architects can plan churches, auditoriums, music halls and similar audience rooms with absolute assurance of proper audition. It is now possible to predict accurately the acoustical results in any room and, further than that, to secure correct acoustics by adherence to certain fundamental principles of design.

This important architectural development is attributable to the late Wallace Clement Sabine, Hollis Professor of Mathematics and Natural Philosophy at Harvard University, and to Dr. Paul E. Sabine of the Riverbank Laboratories at Geneva, Illinois, who has carried on the work since Prof. Sabine's death.

This long known, long puzzling problem of architecture is described and solved in the following pages. A complete service for the analysis of such problems, and the guidance of the architect is offered and described. Data are given for the correct application and use of the sound absorbents manufactured by the United States Gypsum Company.

Why Sabinite?

For many years, the United States Gypsum Company felt that while a fire resistant, hard, decoratable, plastic sound absorbent was badly needed by the architectural profession, it was a material that never could be furnished.

Sound absorbing materials were, generally speaking, fabrics or similar soft stuffs inherently combustible—catch-alls for dirt and vermin. Most of them had conspicuous patterns which distracted the attention of audiences and were impractical to decorate. A material porous enough to absorb an effective amount of sound, and still hard enough to be sold as a real plaster, seemed a paradox.

Sabinite Acoustical Plaster is this paradox.

Why Sabinite Absorbs Sound

Its sound absorption is not due to softness or elasticity. Sabinite Acoustical Plaster absorbs sound because of a great multitude of tortuous, minute passages, which have their start in tiny openings at its surface. In these passages sound is repeatedly reflected, losing energy to heat and friction at each bump. These passages are inherent in the material. No skill or art unknown to the commonest plasterer is needed to secure them.

Being a plaster, Sabinite does not introduce a new trade in the building. There is no delay. The plaster contractor applies the material in lieu of the usual finish. There are no factional labor disputes, and no waiting for sub-contractors.

Appearance

Sabinite walls and ceilings do not cause comment. There is nothing unusual about them. They look like other walls. There is no objectionable pattern. Where wall treatment is needed, Sabinite serves just like any other plaster. It is not soft, and requires no protection. Its surface does not attract curious people as there is nothing unusual about it. Sabinite may be applied on side walls down to the mop-board with full safety in lieu of regular plaster.

Decorating Sabinite

Integral Tinting

Sabinite walls may be integrally tinted on the job by the addition of dry pigments. On large orders, Sabinite will be furnished in colors to suit architectural needs. The natural color of Sabinite is a light gray.

Spray Painting

Sabinite may be painted any color by spraying it with the U. S. Gutta Percha Company's "Flow-On Paste," calcimine, or any spraying lacquer. Where surfaces in the modern trend are desired, Sabinite is sprayed with bronze powder in thin lacquer. White gold bronze powder used as a pigment in thinned lacquer is especially suited to theatre ceilings where special lighting and stereopticon illusions are in vogue. Such decoration is quite inexpensive, as in most cases but one coat is needed.

Brush Painting Where spray painting is not approved, Sabinite may be brush painted with Phon-O-Lite, a special material manufactured by the United States Gypsum Company for application to Sabinite, without appreciably reducing its sound absorption.

General directions for applying various decorative treatments to Sabinite are given on page 26. Specifications for special treatment or unusual decoration problems are supplied on request. Successive painting or application of color by any of these methods may be made without reducing the sound absorption of Sabinite by a measurable amount.

Masonry Effects Where the effect of ashlar masonry is desired, Sabinite may be jointed by the plasterer in the same way in which he joints Keene's Cement or imitation Caenstone. The joints may be left plain or filled with colored mortar.

Frescos and Murals Stencil or fresco designs may be laid on Sabinite with ordinary paint, if the area is restricted to borders. For larger areas, Phon-O-Lite should be used.

Large areas may also be stained or tinted with spray application of aniline dyes in water or alcoholic solution. Mural painting may be done with Phon-O-Lite with complete freedom.

Casting Sabinite For ornamental work, ceiling coffers, Sabinite may be cast and erected like other plaster casts. Special instructions for doing this work will be given on application. Casts so made are easily tinted by including any of the various dry pigments. They produce an effect that is so delightful that their use has been specified by architects for their decorative value alone.

VICTOR TALKING MACHINE COMPANY, CAMDEN, N. J.

Some Outstanding Features of Sabinite

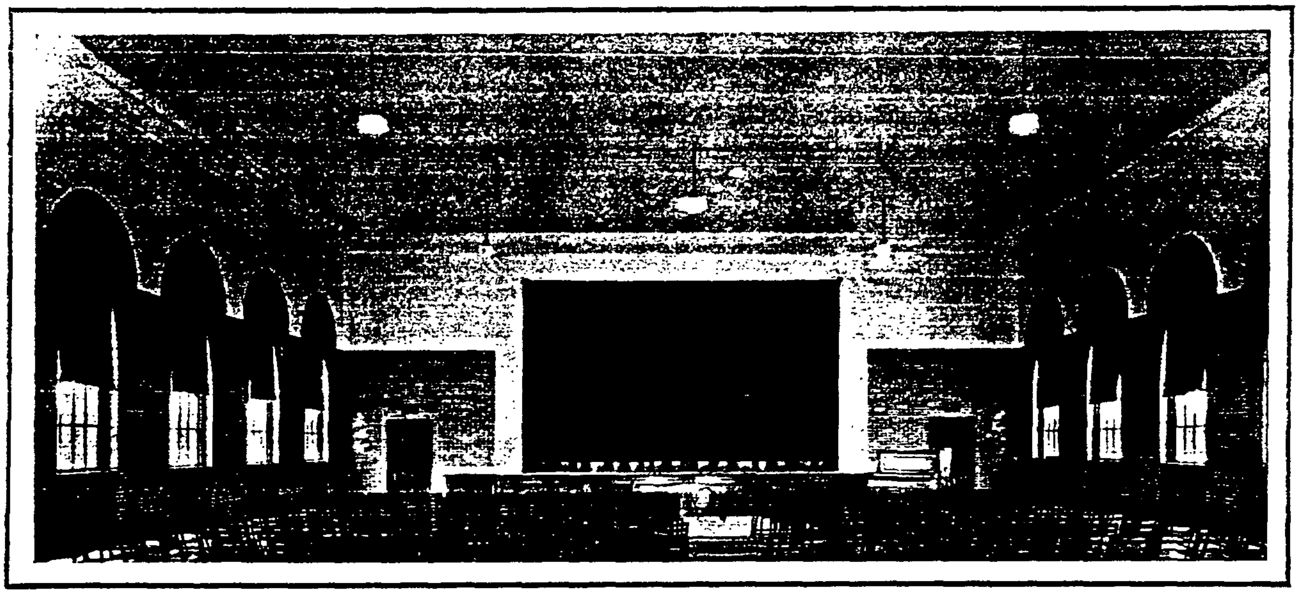
Incombustible There is nothing in Sabinite which will burn. It is composed of incombustible, inorganic aggregates bonded together with gypsum plaster, which has been long known as a fireproofing material.

Durability As Sabinite is composed of rock, it is unaffected by dampness, and does not shrink or swell with climatic changes.

Ease of Application Nothing but water is added to make Sabinite ready for application at the job. It is spread with a trowel from the hawk, just like ordinary plaster. It is as hard as any plaster finish —harder than most of them. It bonds firmly to the base coat. There is nothing in Sabinite to burn, irritate or in any way injure the mechanic applying it.

Covering Capacity One ton of Sabinite, applied in two coats, each ¼" thick, will cover a surface of sixty (60) square yards. Analysis of over 100 jobs, shows that it requires 25 hours of plasterer's labor to apply 100 yards of Sabinite to full specifications. To mix this material, from six to eight hours of mixing labor is necessary. The mixing labor, of course, includes the time necessary to supply the material to the mechanic.

Economical The low cost of the material, easy application and excellent covering capacity, coupled with its relatively high sound absorption, makes Sabinite a most economical material per unit of absorption. On an auditorium in Texas, Sabinite was lower by $3,000.00 than its nearest competitor. The area involved was about 1,200 square yards.



PETWORTH SCHOOL, WASHINGTON, D. C. A. L. HARRIS, SUPERVISING ARCHITECT, DISTRICT OF COLUMBIA

Sanitary Because it contains no vegetable or animal matter, Sabinite is sanitary. There is nothing in it to make nesting material for vermin; nor are the pores large enough to admit flies or other insects. It may be disinfected or washed when necessary. Rats and mice will not gnaw Sabinite.

National Distribution Sabinite is made at the principal mills of the United States Gypsum Company, which are conveniently located for lowest transportation cost. It may be obtained quickly from these centers.

Application Service Every Sabinite job is served without cost by the manufacturer. The service man sees that the base coat has been properly raked, and shows the plasterer how to apply the material. A variety of surfaces may be obtained by variation of the floating. For smooth surfaces, Sabinite may be troweled after the floating process has been completed. The service man is always ready to assist the plasterer in obtaining such results.

Absorption The absorption of Sabinite applied in two coats ¼" thick, is 21% at C-4. This absorption increases with increasing pitches to 39% at C-6. The absorption of Sabinite has been established by tests at the Riverbank Laboratories, Geneva, Illinois. The facilities for such tests at Riverbank are unsurpassed. The tests made there are consistently lower than those made by other laboratories. Checks of reverberation times computed previous to construction, which are made after the building is completed, invariably show an increase of from 15% to 17% in value over the absorption coefficient used in the calculation. It is therefore apparent that Sabinite yields a more absorbent result under job conditions than it does when small test panels are produced.

Architects should not be misled by claims for superior absorption when considering cost. Some of the non-plastic sound absorbents have a greater absorption per square foot, but their cost per unit of absorption is usually greater. It is a simple matter to adjust the area of Sabinite to provide the correct number of units to properly handle any reverberation or quieting problem.

In most buildings a material of greater absorption is a drawback. If an entire ceiling is treated with such material, over-treatment is apt to result, so that the room will be lifeless and unresponsive under full audience conditions. Proper correction in such a room, using a very highly absorbent material means panel treatment in the ceiling. It is difficult to adjust the area of such panels with the architectural scheme for the interior.

Sound Problems as They Affect Architecture

This book on sound problems in architecture confines itself to two of the three major phases of the general problem. The first two are treated here; the third is to be treated separately in a subsequent publication. These three problems are:

1. *Audience Rooms* Treatment of audience rooms in order to provide proper hearing conditions for both speech and music.

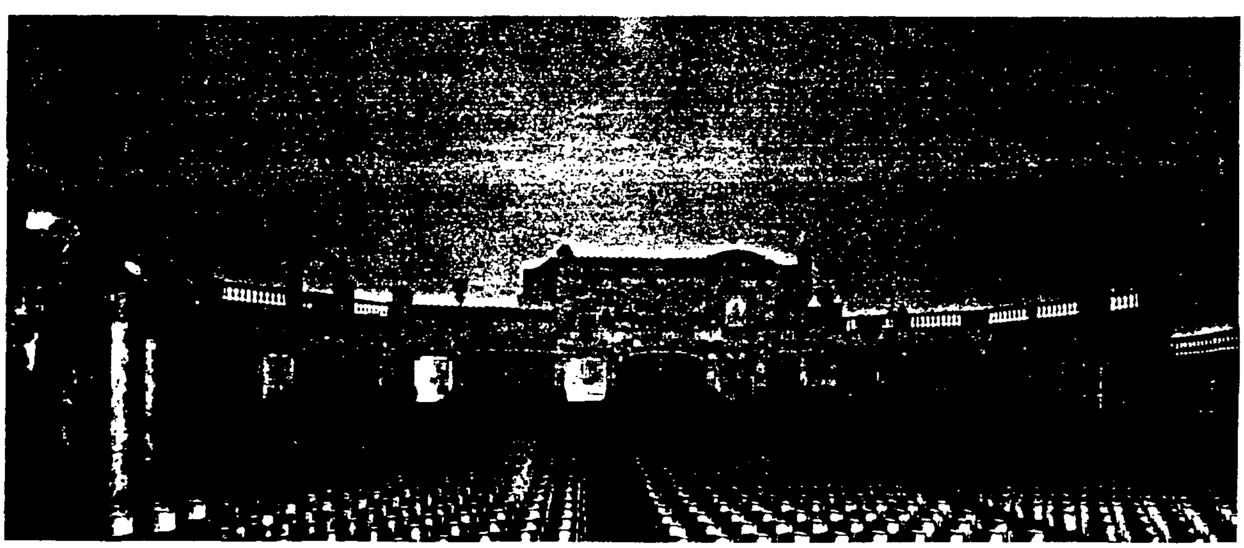
2. *Noise Absorption* The absorption of noise created in and about hotels, office buildings, banks, hospitals, restaurants, railroad stations, etc.; to quiet such structures and make them more generally useful to people occupying them.

3. *Sound Insulation* The treatment of any room, partition or floor to prevent the transmission of noise from that room to abuting rooms—in short, sound insulation, as compared to sound absorption. (See page 30).

While it is true that sound absorbents are useful in preventing transmission of noise, they are not completely efficient in this regard and are, in no sense, offered to the public as sound-insulators. The problems are distinctly different, and consequently are treated separately.

The first two of these problems owe their theoretical solution almost wholly to the work of one man, the late Wallace C. Sabine, Professor of Physics in Harvard University. In 1895 he began twenty-five years of intensive, careful scientific research in a field that had hitherto been the playground of guess work and opinion. This work made Professor Sabine the founder of what is today, an important branch of engineering science, the control of sound within rooms. One who is interested in the mastery of the details of this subject should refer to Professor Sabine's Collected Papers on Acoustics published by the Harvard University Press. Here, it is proposed to present the outstanding results of that work for the architect, builder, or owner, who is faced with the practical problem of acoustics in building design and construction.

SHORE THEATRE, CHICAGO
Z. EROL SMITH, ARCHITECT



Some Definitions

The nomenclature of a science as new as that of acoustics is so possible of misapplication that it seems necessary to assist in clarity and understanding, that we define the more important terms before proceeding with Professor Sabine's theory.

Sound Sound is a wave motion of the air or other elastic medium, capable of producing the sensation of hearing. This wave motion is set up by the vibration of a sounding body, and consists of the successive vibrations of the particles of the medium. This vibration of the individual particles produces alternate rarefactions and condensations of the air or other medium at any point of the wave train.

Speed of Sound Sound in air travels with a speed of about 1129 feet per second at 68° F. Its velocity increases about 1.1 foot per second for every degree rise of temperature.

Intensity of Sound Intensity of sound may be defined as the sound energy per unit volume of the air through which the sound is traveling. Loudness is the degree of sensation produced on the ear corresponding to the intensity of the sound. Loudness increases with intensity, but the difference in loudness between two tones of the same pitch is roughly proportional to the logarithms of their intensities. *Hence an increase of as much as 25% in the intensity of a tone produces a barely perceptible increase in loudness.*

LONDON LIFE INSURANCE CO., LONDON, ONTARIO, CANADA
JOHN MOORE & COMPANY, ARCHITECTS

Resonance Resonance is the enhanced response of the total volume of air included in a room to a musical tone whose pitch coincides with the natural frequency of vibration of that particular volume of air. It is frequently observed in small empty rooms and simply results in an unusual reinforcement of particular low tones in comparison with other tones. It is sometimes a source of annoyance to a speaker upon an enclosed stage, and is undesirable in rooms intended for radio broadcasting or for phonograph recording. Rarely found in large or furnished rooms, it is seldom an important factor in auditorium acoustics.

Interference Interference is a localized phenomenon which may be observed under proper conditions at any point in any room. In the simplest case, it results when sound of definite pitch from a single source reaches a given point by two paths of different lengths. Where this difference of path length is an odd number of half wave lengths of the sound, a condensation arriving by one path coincides with a rarefaction arriving by the other path; the two components of the resultant sound mutually annul each other. Obviously, there will be other points close at hand where the path difference is an even number of half wave lengths, when the two components will mutually reinforce each other. Interference thus results in an uneven space distribution of sound intensity for a given pitch, and a marked variation at any given point in the intensities of sounds of different pitches. It becomes a serious defect when the focusing action of extended concave reflecting surfaces exaggerates the normal inequality that exists in every room. Spherical domes and cylindrical vaulted ceilings with centers or axes of curvature that fall close to the audience or to the speaker are fruitful sources of defects of this type. Such defects can be avoided by proper design. They can be alleviated by the use of sound absorbent materials on the concave surfaces which produce them. Prevention is better than cure, and the designer who proposes to use extended curved forms in an audience room should be competently advised as to the acoustical results to be expected.

Extraneous Noise

Frequently, hearing difficulties resulting from disturbing noise are ascribed to faulty acoustics. Noise of ventilating fans transmitted along air ducts are delivered to audience rooms, air conditioning machinery improperly mounted, thus setting up vibrations which are structurally transmitted, and finally street noises, may seriously lessen the intelligibility of speech in rooms that are otherwise satisfactory.

Echo

Echo is the distinct repetition of a single short, sharp sound, due to direct reflection of sound from one or more reflecting surfaces. Like interference, echo is a localized defect. It is seldom present as a source of acoustical difficulty except in rooms of large proportions. Extended, unbroken rear walls frequently produce direct reflections that are annoying to the speaker, but which are not heard by the audience. Echoes from lofty ceilings, particularly when these are curved so as to produce marked concentration of the reflected sound, frequently result in poorer hearing conditions in seats near the speaker than in seats farther away. Multiple echoes resulting from repeated reflections may be observed under special conditions in very large rooms. Every auditorium design should be carefully investigated for echoes which would cause annoyance.

Reverberation

Reverberation may be called "the persistence of sound in a room after it has ceased at its source." Professor Wallace C. Sabine said, "Sound being energy, once produced in a confined space, will continue until it is either transmitted by the boundary walls, or is transformed into some other kind of energy, generally heat."

Auditorium Acoustics

Good hearing conditions in an audience room are due not so much to the possession of positive acoustical virtues as to freedom from serious acoustical defects.

Professor Sabine classifies difficulties in hearing in audience rooms under two distinct heads:

> *Distortion, which may be due either to the phenomenon of resonance or to that of interference.*
>
> *Confusion, resulting either from echo, extraneous noise, or excessive reverberation.*

Reverberation in Audience Rooms

Architects and scientists, previous to the solution of the acoustics of auditoriums by Professor Wallace C. Sabine, had always thought that the difficulties caused in such rooms were because of echoes, or because of an inability on the part of the speaker or sound-producing source to provide sufficient strength to force the sound to the farthermost listeners. To correct these difficulties, it was common practice to install sounding-boards. Frequent mention in the discussion of acoustics of twenty years ago is made of wires strung across the room to carry the sound. We, of course, now know that neither of these accessories to an auditorium were of much service.

When the interior surfaces of a room are constructed of materials which are highly reflective, sound waves striking them bounce rapidly from surface to surface, making many circuits of the room in every direction. The room is then filled with sound which continues until all of its original energy is dissipated.

Overlapping Sounds

It is easy to appreciate the resultant confusion due to the overlapping of successive syllables or notes in an audience room. The first syllable persists, while the next is uttered. Each syllable and note has to com-

SAVARIN RESTAURANT, NEW YORK CITY
SCHULTZE & WEAVER, ARCHITECTS

pete with preceding sounds for the attention of the audience. This effect is throughout the room. It makes audition uncomfortable, difficult, or impossible, depending solely on the length of time a sound persists. The time a given sound of known intensity and pitch persists is the reverberation time of that particular room.

There is no sorrier picture than that of a beautiful auditorium perfect in architectural magnificence—where the designer has built himself a monument—in which an oration or sermon becomes a jumble, and an organ solo or choral masterpiece a mess of discordant sounds. Regardless of the perfection with which the building is built, it is a total failure if it is useless for audition —in other words, it is not an auditorium, for it can not in any sense be an auditorium if one can not hear clearly and comfortably in it.

In a midwestern city, a group of settlement buildings was recently built which contained a music school and a chapel of considerable proportions. In the music school, the architect wisely treated the ceilings with an efficient sound absorbent. The effect was all that he desired. In the chapel, although analysis indicated an excessive reverberation time he felt nothing was needed. He had built similar structures in which the acoustics were most excellent. And he thought that this building would be equally satisfactory because the structure, general shape, size and contour were the same. He did not consider that different materials were to be used —materials which were highly reflective of sound. The new building was made larger than the one formerly used by the congregation, in order to accommodate the increase in numbers they confidently expected with their finer quarters.

The completed structure is intolerable, acoustically. The congregation can hear but little of the sermon and then only when they concentrate in certain parts of the church. The choir master in the choir loft is apprised of changes in the service by means of notes quickly penciled by the minister. He can not get these orally, although only 7 or 8 feet from the pulpit. The congregation has dwindled. The church can hardly afford to spend the money to bring a contractor into the room with his scaffolds, have them reerected, the old plaster torn off and sound absorbing plaster put on at a cost several times as great as what it would have cost had the auditorium been properly treated during construction.

Almost daily these pictures come to us of buildings useless for their prime purpose. While acoustical correction is not denied their owners, the cost comparatively, is beyond the means of the average church.

These things need not be. There is no mystery about acoustics. Buildings identical in shape and form rarely present the same reverberation time. An analysis should be made of every auditorium. The United States Gypsum Company makes these for any architect without cost and without obligation.

The Reverberation Theory of Professor Wallace C. Sabine How It Is Applied to Planned Structures Before They Are Built

Excessive Reverberation

If a sustained source of sound within a room is suddenly stopped, the sound will be observed to persist for an appreciable period thereafter. The residual sound dies away more or less rapidly to inaudibility. The time required for it to decrease in a given room to 1/1,000,000 of its initial intensity is called the Period of Reverberation. This time is readily computed when the total volume of the room and the sum of the sound absorbing power of all the surfaces exposed to the sound are known.

Professor Sabine showed that T (the time required for sound within a given room to decrease to 1/1,000,000 of its initial intensity) is given by the equation

$$(1) \qquad T = .05\frac{V}{A}$$

where V is the volume of the room in cubic feet and A the total sound absorbing power. The contribution of any exposed surface to the total sound absorbing power is the product of the area of the surface by a certain fraction, called the absorption coefficient for that surface, so that the total absorbing power A in the reverberation equation is the sum of the products obtained by multiplying the area of each exposed surface by its particular absorption coefficient.

An approximate value for A for an empty room without any considerable area of sound absorbing materials such as carpets or draperies, seat cushions and the like may be found from an empirical formula given by Dr. Paul E. Sabine of the Riverbank Laboratories as a result of a study of a large number of auditoriums. This formula is:

$$(2) \qquad A = .29V^{\frac{2}{3}} = .29\sqrt[3]{V^2}$$

That is to say, to find the total absorbing power of any empty audience room with masonry walls and ceiling and seats of wood, take the volume in cubic feet, extract the cubic root, square it and multiply by .29. The result used in the reverberation equation given above will give the reverberation time in the empty room.

It is well known that the presence of an audience materially changes the acoustical properties of an auditorium. This is due to the fact that the total sound absorbing power is very largely increased by the clothing of the auditors. Experiments show that for each person seated in a wooden seat, as assumed above, the total absorbing power of a room is increased by 4.3 units. Thus for the conditions of use, A as given by equation 2 should be increased by 4.3 times the number of persons in the audience.

To illustrate the foregoing by a simple example: Suppose the dimensions of a room intended to seat 1,000 persons are

$$100' \times 60' \times 20'$$

Then V, the volume $= 120{,}000$ cu. ft.
and A, the absorption $= .29\,(120{,}000)^{2/3}$

$$\text{Log } 120{,}000 = 5.0792$$

$$\frac{5.0792 \times 2}{3} = 3.3861$$

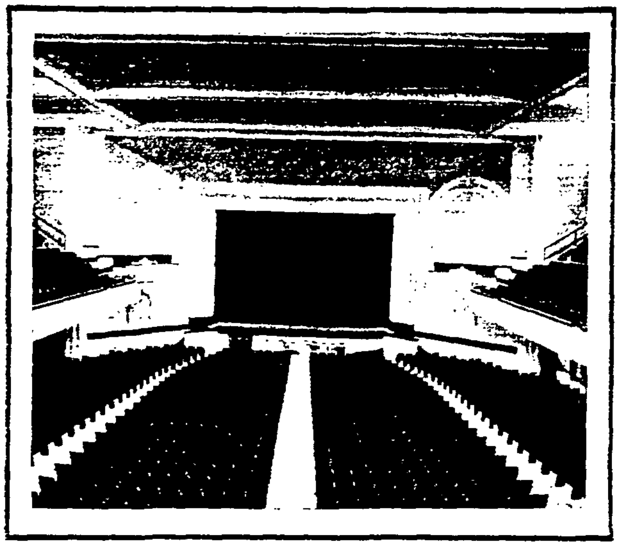
$$\text{Log } .29 = 9.4624 - 10$$

$$\text{Log } A = 2.8485$$

$$A = 706$$

Note: The calculation may be made with ample accuracy on a slide rule.

BRONX COURT HOUSE, NEW YORK CITY
MAX HAUSLE, ARCHITECT



CITY AUDITORIUM, BEAUMONT, TEXAS
F. STEINMAN & SON, ARCHITECTS

If it is desired to compute the reverberation times (a) with an audience, (b) with half audience, and (c) with full audience we have as shown in the following table:

Audience	A Absorption of Empty Room	Absorption of Audience	Reverberation Time $T=.05\frac{V}{A}$
None	706	None	8.5 Secs.
500	706	2150	2.1
1000	706	4300	1.2

Experiments show that a reverberation time greater than 2.0 seconds produces a marked decrease in the intelligibility of speech. In the example, therefore, we have a room that will be satisfactory for large audiences but not so for a small audience. In audience rooms generally, the capacity audience is the exception rather than the rule. In the design of this room, therefore, an increase in absorbing power is desirable, in order to produce conditions that will be acoustically comfortable with small as well as with large audiences.

Suppose the 6,000 sq. ft. of the ceiling be plastered with a material whose absorption coefficient is .21 instead of .025, the absorption coefficient for ordinary plaster. Then each square foot of this new material will add .185 units over the ordinary plaster which it replaces. The 6,000 square feet would add 6,000 x .185 = 1,110, and the absorbing power of the empty room becomes 1,816 instead of 706 units. Under the new conditions then, we have the following values:

Audience	A	T
None	1816	3.3
500	3966	1.5
1000	6106	1.0

We have here a room that will meet the requirements for comfortable hearing conditions with any audience greater than 300 persons.

The Proper Reverberation Time for Audience Rooms

Some authorities on sound seem to feel that the reverberation time most desirable in a room varies with the volume of the room. It is their practice to permit a longer lapping of sound in rooms of large volume than they permit for rooms of small volume. This results in a flexible standard for the reverberation time that is quite confusing, particularly to laymen. It is caused by the fact that the formula in current use does not take into consideration the reduction of the intensity of sound from a given source as the volume and absorbing power of the room increases. In an endeavor to eliminate this difficulty, Dr. Paul E. Sabine has made a considerable studyof the equation of Professor Sabine, ($T=.05\frac{V}{A}$). Dr. Sabine says that the time "*T*"during which a sound remains audible in a room after the source has ceased, theoretically depends upon five factors:

"*V*"—the total volume of the room;
"*A*"—the total absorbing power of the room measured in square units of perfectly absorbing surface;
"*E*"—the acoustic output of the source, expressed in cubic units per second of sound of threshold intensity;
"*T*"—the time during which the source speaks and
"*V*"—the velocity of sound.

These five quantities are related by a somewhat complicated expression, which however, may be reduced to a very practicable form, by assuming that "*T*" is sufficiently long to fill the room with sound, and that "*E*" the acoustic output of the source is approximately equal to that of the organ pipes which Professor Sabine used in his experiments.

Upon these assumptions Dr. Sabine gives the equation

$$(3) \qquad T_1 = .0083 \frac{V}{A} (9.1 - \log_{10} A)$$

Here T_1 is the time required, measured from the instant the source is stopped, for the sound from a source of standard pitch and standard acoustical power to decrease to inaudibility. The bracketed expression is the logarithm of the average intensity of sound throughout the room set up by the standard source and is seen to diminish as A the absorbing power of the room increases. This is what Professor Sabine has called the "initial intensity of the residual sound." Upon the assumption that this is 1,000,000 times the minimum audible intensity (since the logarithm of 1,000,000 is 6), equation (3) reduces to the simpler form

$$T = .05 \frac{V}{A}$$

Equation (3) gives the reverberation time, assuming a standard source of sound, independent of the volume and absorbing power of the room. Equation (1) gives the time required for sound of any given initial intensity to die away to 1/1,000,000 of its initial intensity.

It appears then, that equation 3 is simply equation 1 with a correction term for the change of the initial intensity with a change of absorbing power of the room and the change in volume of the room.

This results in an ability to fix the reverberation time within limits which are proper for any room without regard to its volume.

Using equation 3, "T" was computed by Dr. Sabine for fifteen different rooms which are in actual use and without criticism in the matter of reverberation, and which varied in volume from 3,500 to more than 1,000,000 cubic feet. (See Fig. 1.) The results were compared with those obtained by equation 1.

	Vol. Cubic Feet	Seats	Reverberation Time		Authority
			Equation No. 1	Equation No. 3	
Small Auditorium, Moscow........	4,450	......	1.06	1.15	Lifshitz
Little Theatre, New York...........	6,000	300	1.20	1.14	W. C. Sabine
New England Conservatory Room.	7,400	......	1.10	1.19	W. C. Sabine
Moscow Conservatory, Moscow...	90,000	550	1.30	1.19	Lifshitz
Leipzig Gewandhaus, Leipzig....	406,000	1,600	2.35	1.98	W. C. Sabine
Opera House, Academy or Music, Brooklyn.......	430,000	2,200	1.60	1.31	Tallant
House of Unions Hall, Moscow...	440,000	1,600	1.75	1.44	Lifshitz
Big Theatre, Moscow........	486,000	2,300	1.55	1.25	Lifshitz
Opera House, Boston.........	500,000	2,350	1.51	1.23	P. E. Sabine
Moscow Conservatory Big Hall, Moscow........	600,000	2,150	2.00	1.63	Lifshitz
Symphony Hall, Boston.........	650,000	2,600	2.31	1.92	W. C. Sabine
Masonic Auditorium, Cleveland...	726,000	2,300	2.40	1.95	P. E. Sabine
Eastman Theatre, Rochester.......	790,000	3,340	2.08	1.65	Watson
Hill Memorial, Ann Arbor......	795,000	5,000	1.70	1.33	Tallant
Auditorium Theatre Chicago........	950,000	3,640	1.90	1.48	P. E. Sabine

Fig. 1

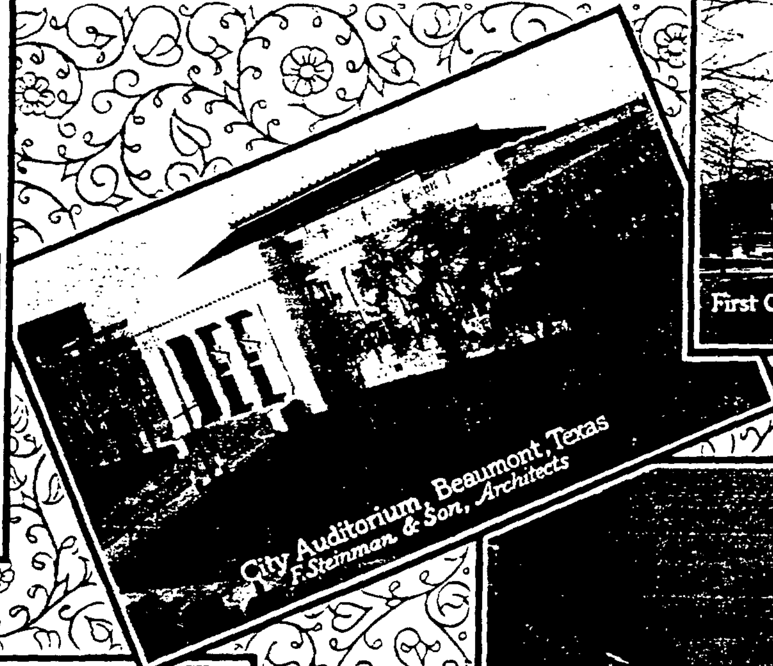
From this comparison is deduced the following working rule: *That the time of reverberation for an auditorium with its average audience as computed by equation 3, should lie between one and two seconds. For speech, and light music, it should fall in the lower half of this range, while for music of the larger sort it may lie near the upper limits.*

Having arrived at a useful criterion of excellence, the designer's problem becomes simply a question of adjusting the absorbing power and the volume to obtain the desired result.

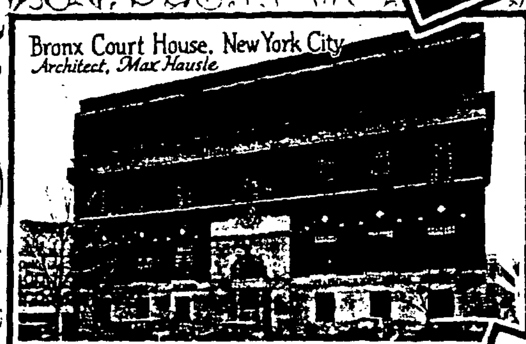
The volume consideration is controlled in great measure by the dictates of the architectural design. It is not always possible to reduce ceiling height without throwing a room completely out of scale. With a useful absorbent at his command, the designer is given much greater liberty in design than the modern high reflective materials of construction will allow, because of the possibility of including specially designed absorbent materials properly tempered in area to the acoustical result desired.

Theatre, Chicago
Smith, Architect

First Church
Faulkner &

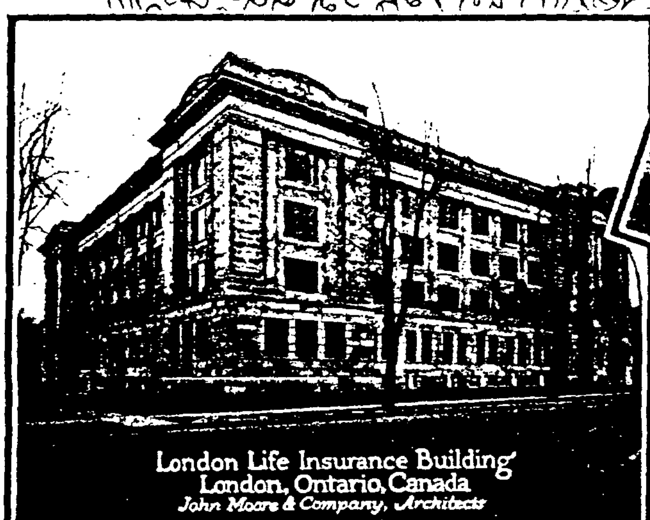


City Auditorium, Beaumont, Texas
F. Steinman & Son, Architects

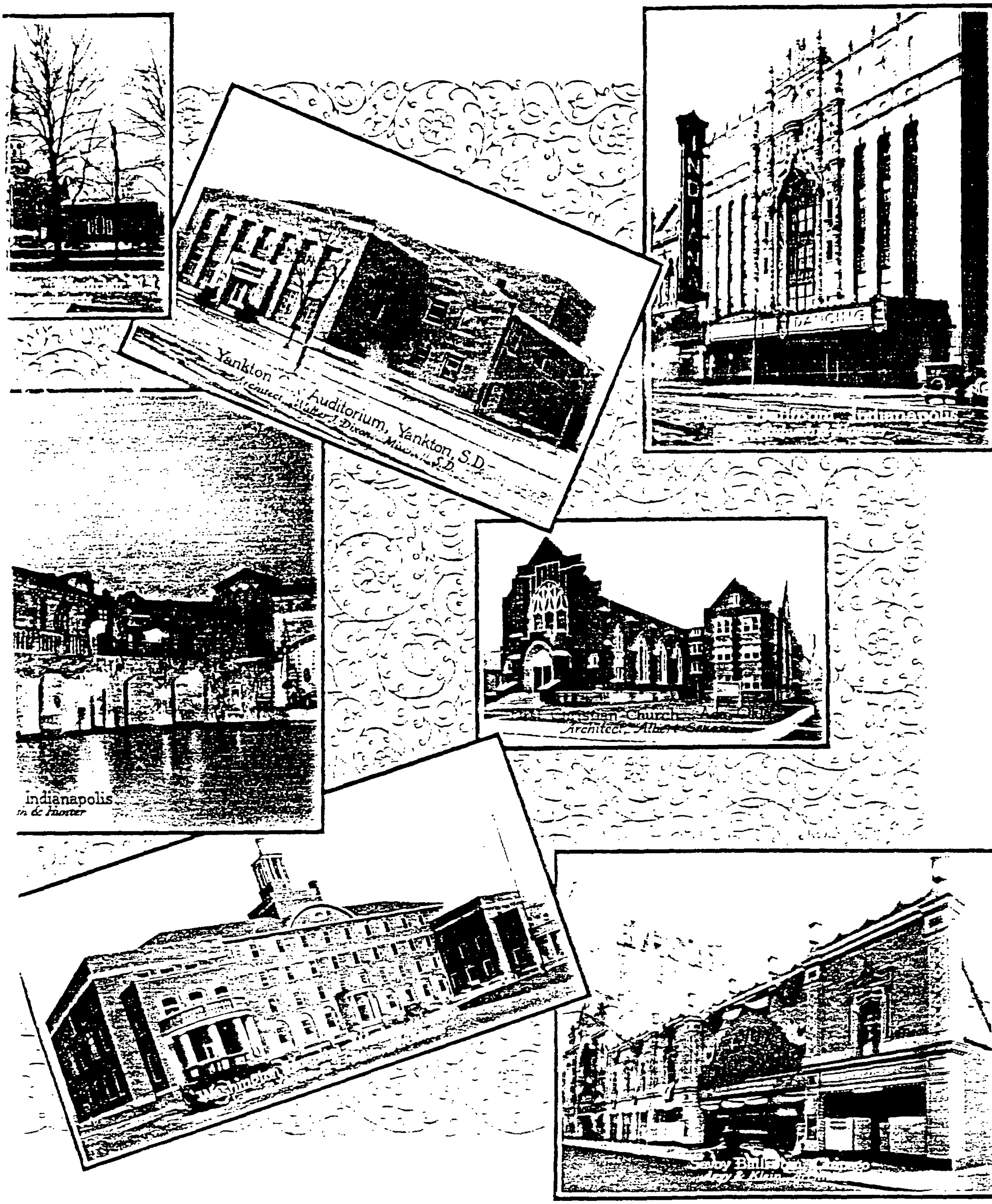


Bronx Court House, New York City
Architect, Max Hausle

Ballr
Architects,



London Life Insurance Building
London, Ontario, Canada
John Moore & Company, Architects


INDIANA
Indianapolis
Yankton Auditorium, Yankton, S.D.
Church
Architect
indianapolis

Securing Quiet with Sabinite in Offices, Hospitals, Hotels, etc.

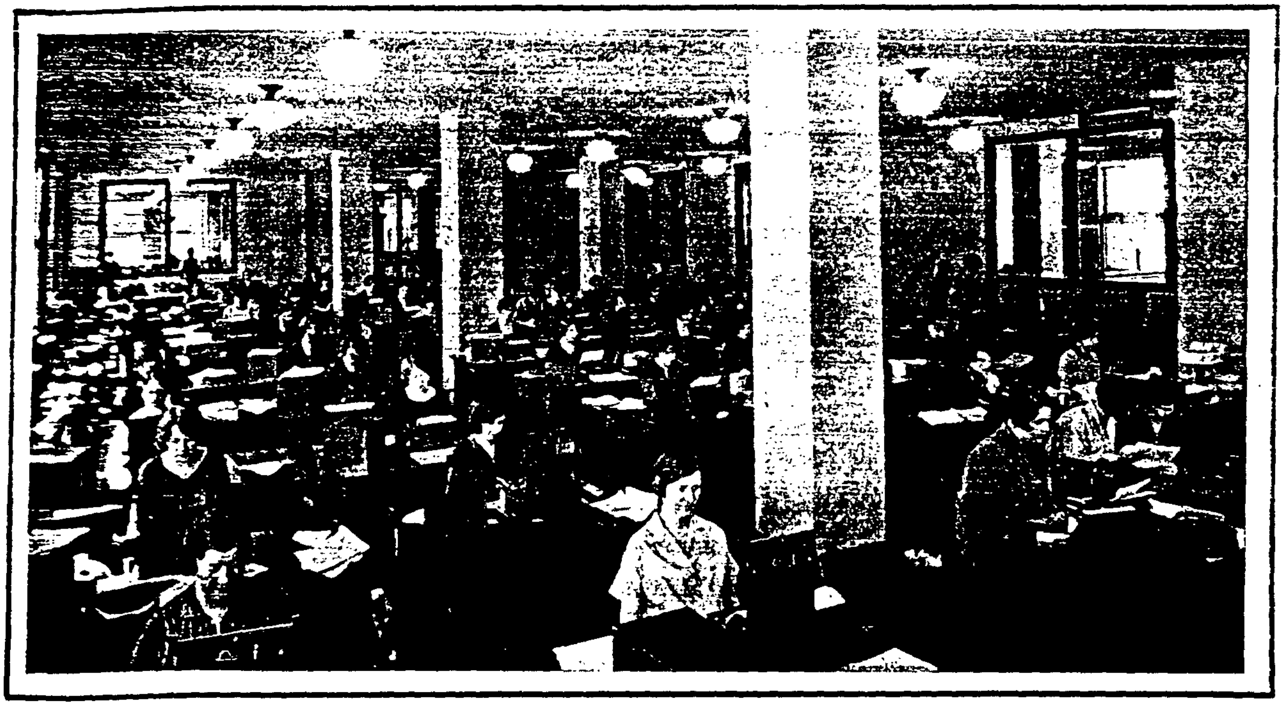
The Cost of Noise Scientists and psuedo-scientists have quite frequently, of late, made attempts to determine the economic worth of quiet, or more particularly, the economic loss caused by noise. In our present knowledge, most of these efforts may be classified as mere guesses, more or less aided by superficial tests, yet anyone will grant great advantage to the thinking individual who is permitted to think in a reasonably quiet room. The more exacting mental tasks, requiring concentration and the exercise of every mental faculty are most disturbed by noise. Those more manual in character are least disturbed by noise, but even manual tasks show a very definite noise effect. In his "Economics of Fatigue and Unrest," Dr. Morris gives interesting figures on this point. He finds that in an American motor factory, the average monthly absence rate for the entire plant was 6.13%. In nine departments where eye-strain was found, the percentage was 6.29%. In thirteen poorly ventilated departments, 6.45%. In the five noisiest departments, the percentage was 6.82%, an increase in the relative absence rate for the noisy rooms of over 11%. Dr. Morris also found a noticeable increase in requests for transfer from noisy departments in comparison with similar requests from other departments.

This problem of noise, as it pertains to business, is being increasingly considered by business men, and consequently it is receiving greater consideration by the architectural profession in the design of business buildings. Even more far-reaching in its effect is the noise produced in and near hospitals. Here, as everyone knows, quiet is essential.

300 WEST ADAMS ST. BUILDING, CHICAGO
J. J. JENSEN, ARCHITECT

Augmentation of Noises It is not usually known that the construction of a building, particularly the plaster and other materials which are highly reflective of noise, increases the audible noise in the room as much as three-fold.

Reverberation, the multiple reflection of sound back and forth in a room, increases the general level of sound intensity. Each sound produced, persists for an appreciable length of time, and during this time contributes to the sum total. The corresponding case in lighting will illustrate this. Consider two rooms identical in every regard, except that the walls and ceilings of one are highly light reflecting (white) while those of the other are highly light absorbing (black). Let lamps of equal candle power be placed at the center of each room. It is easy to see that the general intensity of illumination will be much greater in the white-walled, than in the black-walled room. Similarly, a given amount of light through a window into each of the two rooms will give better general illumination in the white-walled, than in the black-walled room. In exactly the same way, highly sound reflecting walls and ceilings serve to raise the general level of sound intensity from a given source of sound. Ordinary plaster surfaces are almost perfect sound reflectors, absorbing less than 3% of the sound energy and reflecting 97%. Dr. Paul E. Sabine reports that in one case the total measured amount of sound in a room due to the operation of a typewriter was 3.3 times the sound that was produced by each impact of the type.



300 WEST ADAMS ST. BUILDING, CHICAGO—J. J. JENSEN, ARCHITECT

Figure II on this page illustrates this phenomenon very well. In a given room the rate of decay of a single tap from a typewriter was noted. Assuming that such taps succeed each other at intervals of $\frac{1}{5}$ of a second, the figure shows the total contribution that is made by the taps which occurred in the second immediately preceding. In this particular room the residual sound of the preceding second alone raises the total amount of sound in the room at any instant to about three times that of a single tap.

The use of Sabinite Acoustical Plaster for walls and ceilings has proven an extremely effective method of reducing noise, as modern fireproof construction provides almost no absorbent surfaces.

Business offices, with the noise from telephone bells, from typewriters, tabulators, accounting and bookkeeping machines, and the conversation of employes, present a perfect bedlam of sound. Schoolrooms, gymnasia, swimming pools, restaurants and, above all, hospitals, under modern construction, suffer from excessive sound reflection. In such buildings the use of an acoustical absorbent has solved the noise problem.

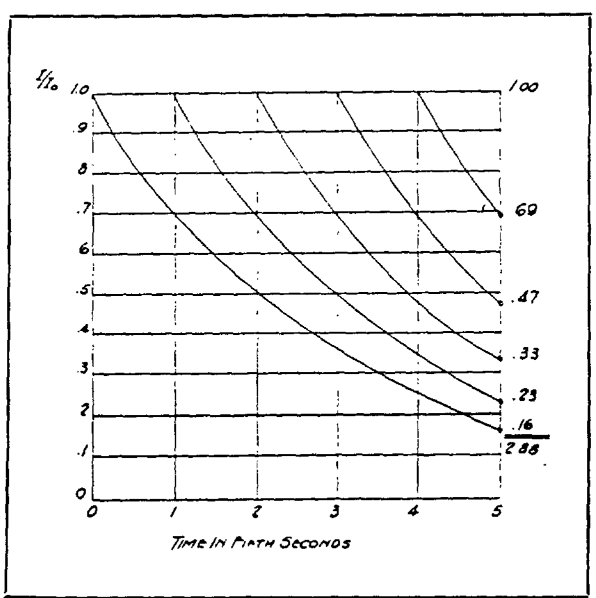


Fig. II

A prominent office building manager has said that within a few years, the office building which has not noise absorption treatment included in the conveniences offered tenants, will be antiquated and suffer accordingly as a revenue producer.

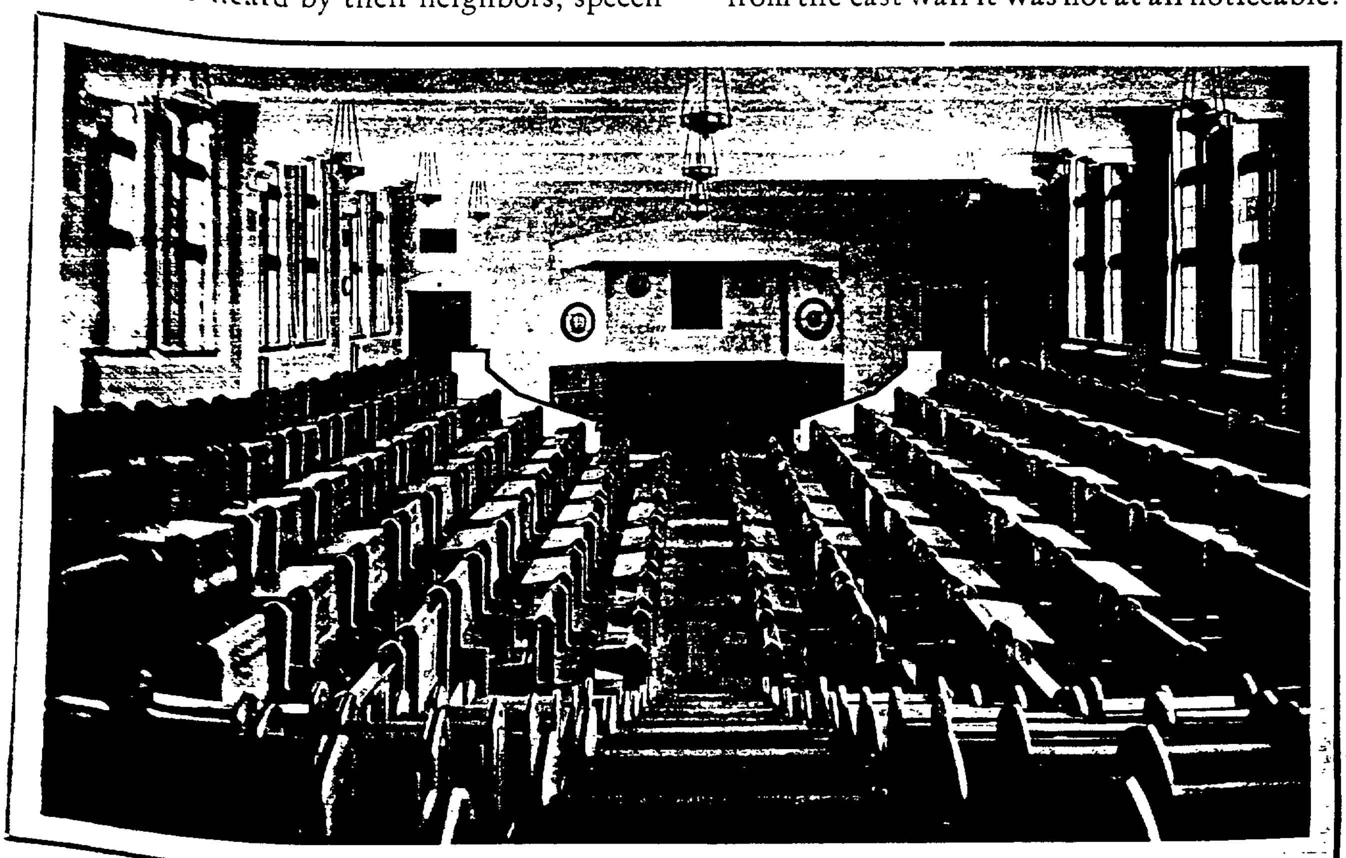
The general manager of a large life insurance company in referring to their recently completed office building said: "This building cost us one million dollars. The complete

Sabinite treatment cost us $20,000.00. This building is worth two million dollars, because of the quiet, comfort, and peace of mind afforded to all of our employees by the Sabinite."

The relatively large amount of acoustical absorbents already in use, particularly in the offices of insurance companies, has given acoustical engineers an excellent opportunity to observe the effects of such installations. In a large Chicago office, which is located on three floors of a recently constructed twelve-story reinforced concrete building, Sabinite Acoustical Plaster was applied to the ceilings of two floors. The contrast is at once apparent upon entering the treated and the untreated offices. The treated rooms do not have the constant murmur which at times reaches such proportions as to be called a roar. The atmosphere is more that of a private drawing-room. When the company moved into this office from their old quarters, the effect on its employes was immediately noticeable. In their previous location they had found through subconscious practice that, to be heard by their neighbors, speech had to be increased in intensity to almost a shout. In the new offices, within three or four days, every employee had so modulated his voice because of the lack of necessity for shouting that the drawing-room atmosphere of the new location elicits spontaneous comment by visitors.

Street noises are, of course, noticeable at the open windows in the summer, but 15 to 20 feet back from these windows the sound is hardly appreciable.

Shortly after this office was opened, construction was started on a building immedidiately west of the one in question. The hissing, thumping noise of a steam piledriver, sharp and very annoying in its effect, was heard with the usual distinctness at the west windows. Moving back into the room one or two bays, the noise, while heard, was not in any sense annoying or noticeable unless attention was called to it. Still, if one went to the windows on the east side of the room, a half block away from the noise, it could be heard there coming around the buildings and entering the windows. Back from the east wall it was not at all noticeable.



LINCOLN HALL, SCHOOL OF LAW, NORTHWESTERN UNIVERSITY, McKINLOCK CAMPUS, CHICAGO
JAMES GAMBLE ROGERS, ARCHITECT. CHILDS & SMITH, ASSOCIATES

The Proper Sound Absorbent for Quieting Buildings

In the consideration of the proper sound absorbent for office, hospital and similar quieting treatment, informed architects and builders give thought to the percentage absorption of the various materials under consideration at pitches above the standard octave above middle C (C4) which is used as the fundamental note in auditorium analysis.

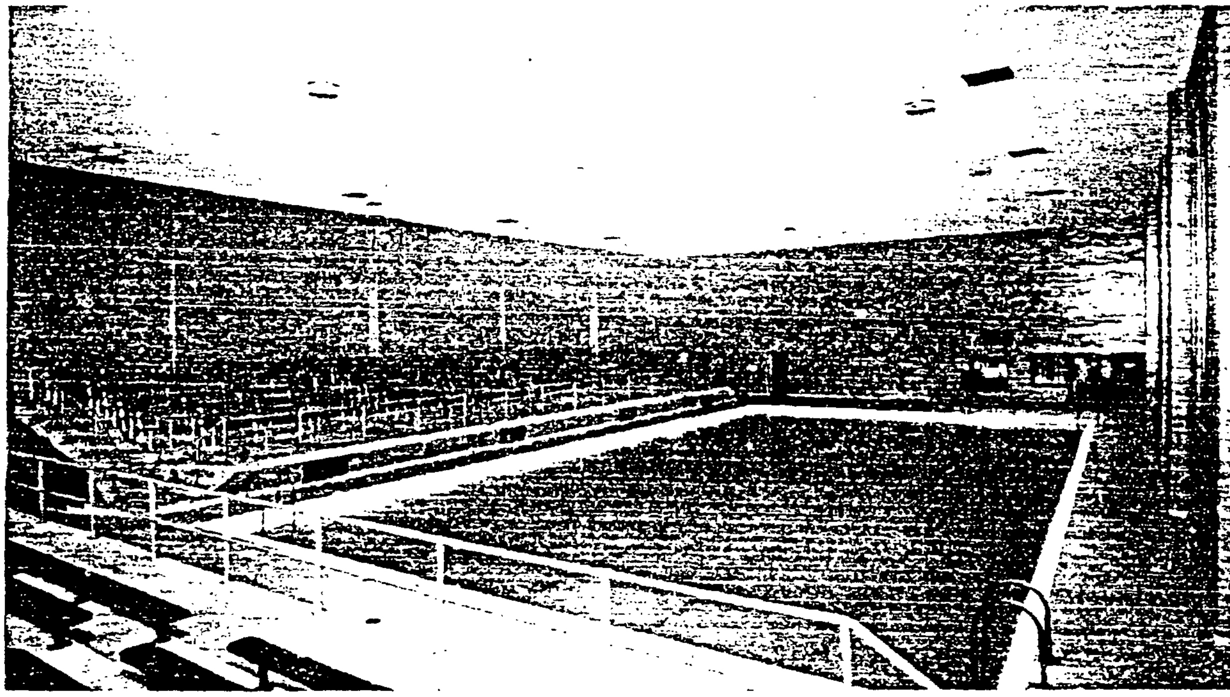
MATERNITY HOSPITAL, BOSTON, MASS.
ANDREWS, JONES, BISCOE & WHITMORE, ARCHITECTS

Careful investigation has determined that the pitch of office machines varies between C5 and C6. Absorbents vary considerably in their abilities to absorb sounds of different pitch. With some of the absorbents offered to the public, there is a comparative reduction of as much as 50% in their absorption efficiency for the higher pitches. This is not so with Sabinite, which has a uniformly increasing absorption for sound as the pitch increases, making it comparable, square foot for square foot in absorption values, with absorbents ordinarily rated higher in that regard at C4. By the same token, Sabinite is noticeably superior when compared at C6 to many absorbents whose absorption is about as great as Sabinite at C4.

The sound absorbent used in a quieting problem should be intensely practical in application. It should be adaptable to any surface or condition. It should lend itself to architectural treatment in keeping with the general design of the room and, above all, it should be a permanent lasting part of the structure. It should not add a combustible element of any sort, or in any way inject additional fire hazard in office, hotel or hospital. Sabinite is a plastic incombustible material which meets all of these requirements.

FIRST CHRISTIAN CHURCH, ADA, OKLA.
ALBERT S. ROSS, ARCHITECT

LONDON LIFE INSURANCE COMPANY, LONDON, CANADA
JOHN MOORE & COMPANY, ARCHITECTS



ROOSEVELT HIGH SCHOOL, CHICAGO—JOHN CHRISTENSEN, ARCHITECT

Light Reflection

It is unusual to find a material which is designed for sound absorption which has any great reflective power for light. Paradoxically, Sabinite in its natural color, reflects 61% of the light which impinges on it, comparing very favorably with ordinary materials. Wall paper, for instance, rarely reflects more than 55% and generally less than 50%.

The light reflection of Sabinite may be enhanced by painting with a light cream or gloss white, and greatly increased by spraying with white gold lacquer.

Sanitation

For installations in hospitals, it is suggested that Sabinite be given two coats of spraying lacquer. A clear lacquer may be used if the natural color of Sabinite is desired to conform with the decorative scheme, or a colored lacquer, if a colored surface is more appropriate. It may then be washed with soap and a brush or treated with disinfectants at regular intervals, providing the hospital with a sanitary, cleanable sound absorbent.

Hospital Corridors

In the treatment of hospitals it is wise to apply Sabinite to the ceiling, and in many cases to the side walls of corridors. It is more necessary to do this than to apply Sabinite in the wards and rooms themselves unless the hospital is located on a noisy street where sound absorbents on the ceilings will reduce the noise which would otherwise cause discomfort to the patients. The noises caused by the wheeling of trays of food, the clatter of dishes, and disturbances in patients' rooms escape into the corridors and are carried into all of the rooms leading from the corridor. The introduction of Sabinite in the corridor will absorb this noise, making all the rooms leading from it quiet and restful. In hospitals it is quite common as well to treat the ceilings and side walls of the labor and delivery rooms. It is excellent practice to apply Sabinite to the ceilings of all sculleries, kitchens and pantries which directly connect with the portions of the building used by patients.

Hotels

In hotels, elevator shafts as well as corridors are noise conveyors. Quiet guest rooms may be secured by treating the corridor ceilings with Sabinite. Many of the sounds occuring in guest rooms, and which seem to be transmitted through partitions, really come over the doors and through the transoms from the halls. One has but to remember his hotel experiences to know how annoying the clanging of elevator gates can be when the hall transoms are open.

Ceiling treatment, particularly in restaurants, lunch rooms and coffee shops, is recommended in hotels, as the clatter of dishes and the rattle of silverware is annoying to guests. It is also advisable to apply a sound absorbent on the ceilings in the kitchens and sculleries and the main dining room for obvious reasons.

The ballrooms and large meeting rooms of hotels used for conventions and other purposes are notoriously bad for speech. The use of Sabinite on the ceiling usually suffices to correct such conditions.

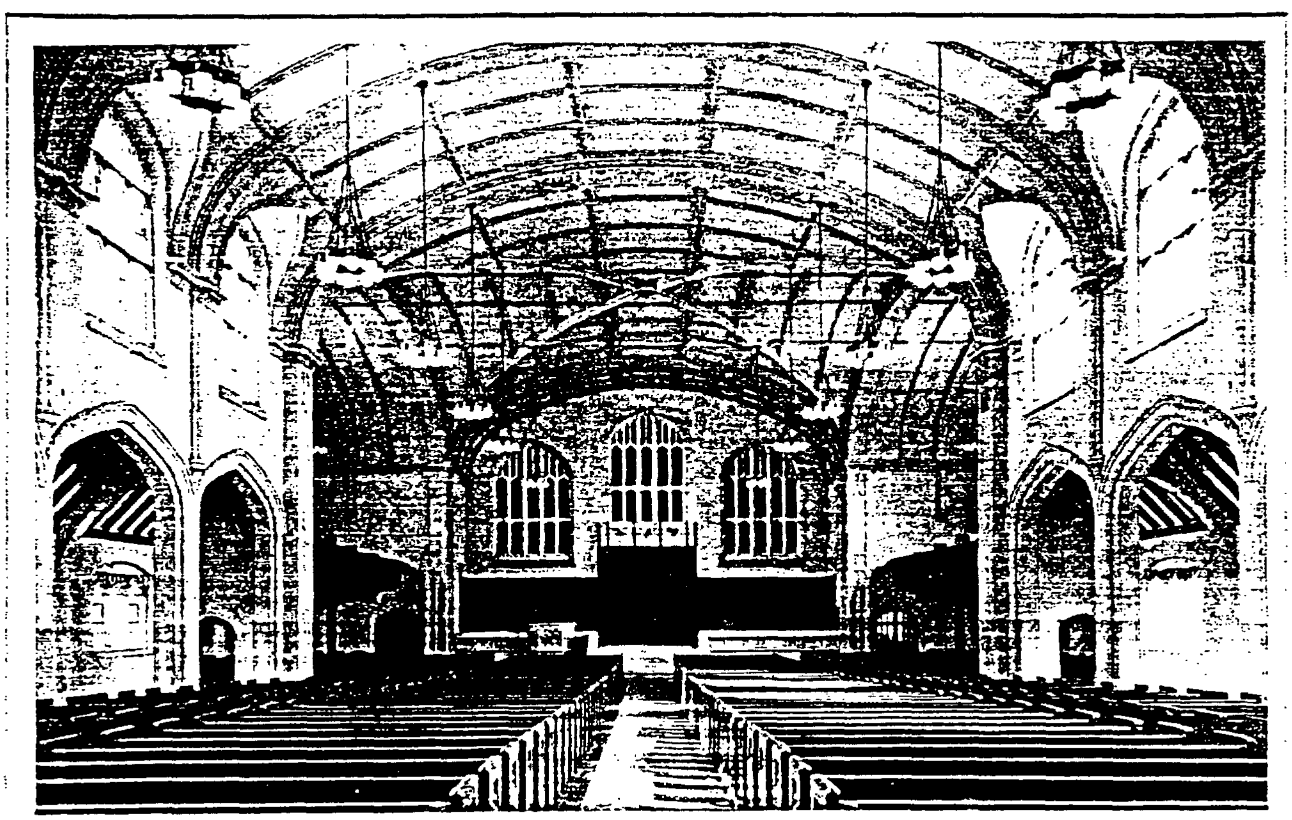
Sabinite provides a complete answer to the sound absorption question in hotel buildings. It is applicable to every point where treatment is required, and is unaffected by varying conditions of moisture or temperature. And, too, it may be readily cleaned and decorated to suit the changing needs in such buildings.

Plan Analysis Service

The United States Gypsum Company provides a complete plan service without charge and without obligation, which will predict the reverberation time in any audience room for the architect.

This service includes analysis of the effect of curved or other sound concentrating surfaces, and investigation for objectionable echoes. In each case it indicates changes in design where they seem advisable. Where the reverberation is too great for comfort, recommendations are made covering the area of Sabinite needed to properly correct the room. These analyses are carefully checked and calculated by acoustical engineers. All plans which are in any way unusual receive the personal criticism of Dr. Sabine.

Because of the facilities afforded at the Wallace Clement Sabine Laboratory at Riverbank, this service keeps pace with the progress in acoustics. The architect can confidentially use it, knowing that his audience rooms will always receive favorable comment from both listeners and performers. He is assured that this service will never suggest treatment where none is needed nor will it ever suggest the inclusion of so much treatment that the resultant room is dead and lifeless, a fairly common occurrence since sound absorbents are being used more generally.



YORKMINSTER BAPTIST CHURCH, TORONTO, ONTARIO, CANADA
GEORGE, MOORHOUSE & KING, ARCHITECTS

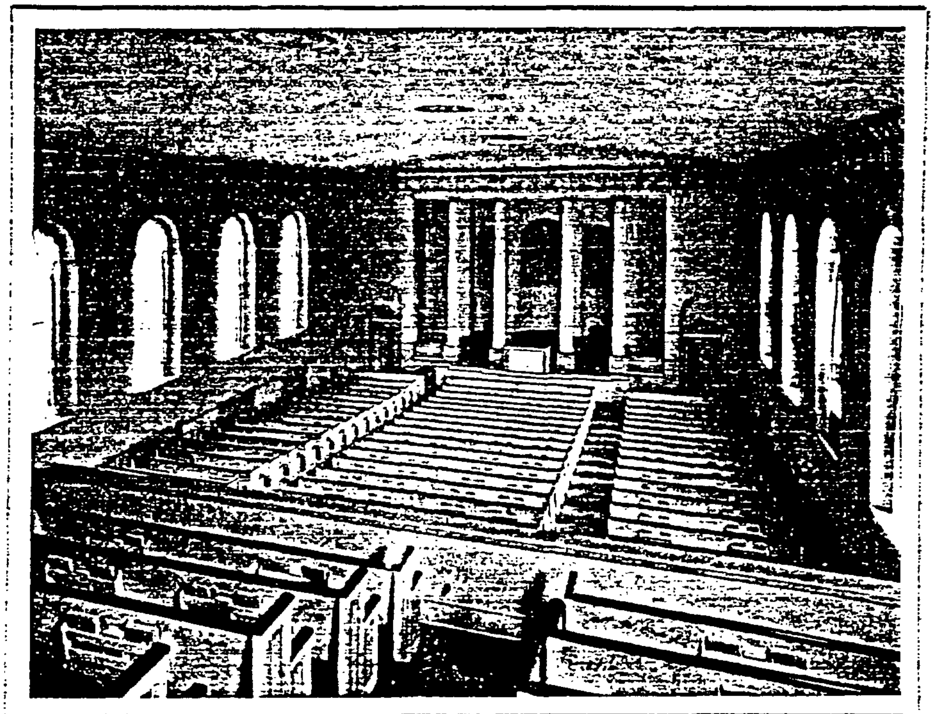
Some Sabinite Installations

Location	Building	Architect
ARIZONA		
Globe	U. S. Postoffice	James A. Wetmore Washington, D. C.
CALIFORNIA		
Compton	Masonic Building	Wright & Gentry Long Beach
Laguna Beach	Presbyterian Church	L. F. Hartley
La Jolla	Presbyterian Church	G. S. Walker
Los Angeles	First National Trust and Savings Bank	Dodd & Richards
San Bernardino	Shaw Funeral Parlor	J. V. Rice
San Bernardino	Junior College Library	Howard E. Jones
San Francisco	Galileo High School	John Reid, Jr.
Whittier	Public Library	Hunt & Chambers
CANADA		
London	Ealing School	L. E. Carrothers
London	London Life Ins. Co.	John Moore & Co.
London	City Hall	Thornton McBride
London	Technical High School	L. E. Carrothers
Toronto	Yorkminster Baptist Church	George, Moorhouse & King
DISTRICT OF COLUMBIA		
Washington	McKinley High School	A. L. Harris
Washington	Petworth School	A. L. Harris
FLORIDA		
Coral Gables	City Hall	Phineas E. Paist
Jacksonville	Riverside Presbyterian Church	Mark & Sheftall
Jacksonville	St. Vincents Hospital	Gerald A. Barry
Marianna	U. S. Postoffice	James A. Wetmore Washington, D. C.
St. Petersburg	St. Joseph Church	Henry L. Taylor
ILLINOIS		
Chicago	Calumet State Bank	John Eberson
Chicago	Chicago Stock Exchange State Bank Building	Graham, Anderson, Probst & White
Chicago	Savoy Ballroom	Levy & Klein
Chicago	Jackson Storage Warehouse	Hall, Bisbee & Rhenisch
Chicago	Northwestern University Law School McKinlock Campus	James Gamble Rogers, Childs & Smith, Associate Architects
Chicago	Olivet Institute	Perkins, Fellows & Hamilton
Chicago	Roosevelt High School	J. C. Christensen
Chicago	Shore Theatre	Z. Erol Smith
Chicago	300 W. Adams St. Bldg.	Jens J. Jensen

Location	Building	Architect
Chicago	Wieboldt Hall University of Chicago	Coolidge & Hodgdon
Chicago	University of Chicago Chapel	Bertram Grosvenor Goodhue Associates New York City
Chicago	Englewood Masonic Temple	Dean & Dean
Chicago	Consumers Warehouse	Robert S. Smith
Chicago	American Spiral Pipe Wks.	Weiss & Niestadt
Evanston	First Congregational Church	Talmadge & Watson Chicago
Evanston	State Bank & Trust Co.	Childs & Smith Chicago
Glencoe	Glencoe High School	Armstrong, Furst & Tilton, Chicago
Glencoe	Synagogue, North Shore Congregation Israel	Alfred S. Alschuler Chicago
Glen Ellyn	Masonic Temple	Betts & Holcomb Chicago
Glen Ellyn	Glenbard High School	Coolidge & Hodgdon Chicago
Hinsdale	Hinsdale State Bank	W. G. Barfield Chicago
Naperville	E. E. Sargent Ins. Co.	Carl J. Horn Logansport, Ind.
Rockford	Rockford Theatre	F. G. Klein
INDIANA		
Fort Wayne	Chamber of Commerce Building	Guy Mahurin
Indianapolis	Indiana Theatre Ballroom	Rubush & Hunter
KENTUCKY		
Louisville	Phoenix Cafeteria	D. X. Murphy & Bros.
LOUISIANA		
LaFayette	Court House	Wm. T. Nolan New Orleans
New Orleans	Sinai Temple	Emile Weil, Weiss, Dreyfous & Seiforth, Moise H. Goldstein
MAINE		
Belfast	City National Bank	Thomas M. James Co.
MASSACHUSETTS		
Boston	Massachusetts Maternity Hospital	Andrews, Jones, Biscoe & Whitmore
Boston	John Hancock Mutual Life Ins. Co.	Parker, Thomas & Rice
Worcester	Worcester Electric Light Company	Frost, Chamberlain & Edwards

Location	Building	Architect
MICHIGAN		
Detroit	M. C. R. R. Fruit Auction Bldg.	A. B. Nies
Grand Rapids	East Grand Rapids High School	Robinson & Campeau
Grand Rapids	Godwin School	J. & G. Daverman
Grand Rapids	Kellogsville School	J. & G. Daverman
Kalamazoo	Vegetable Parchment Paper Co.	Billingham & Cobb
Mt. Pleasant	Normal School	Malcolmson & Higginbotham, Detroit
MINNESOTA		
Fergus Falls	St. Luke's Hospital	J. V. Vanderbilt Minneapolis
Mankato	St. Joseph's Hospital	E. Breilmaier & Sons Co., Milwaukee
Minneapolis	Physics Building University of Minn.	C. H. Johnston & Son St. Paul
St. Paul	Federal Building	James A. Wetmore Washington, D. C.
NEBRASKA		
Omaha	Holy Name Church and School	E. J. Sessinghaus
Steinauer	St. Anthony Parish Church	Lahr & Stangel Omaha
NEW JERSEY		
Camden	Victor Talking Machine Co. Auditorium	Eng. Dept., Victor Talking Mach. Co.
Elizabeth	Union Co. Court House	Oakley & Son
Hackensack	Y. M. C. A.	Louis E. Jallad New York
Montclair	First Church of Christ, Scientist	Charles D. Faulkner Chicago C. Willard Wands, Associate, Caldwell, N. J.
Ogdensburg	Ogdensburg School	Rasmussen & Wayland New York
NEW YORK		
Alfred	Alfred High School	A. W. E. Schoenberg Olean, N. Y.
Brentwood, L. I.	St. Joseph Academy	Robert J. Reiley New York
Bronx	Court House	Max Hausle New York
Buffalo	Gethsemane Lutheran Church	James Walker
New Rochelle	National City Bank	Townsend, Steinle & Haskell, New York
New York City	Fox Film Company	Owners Engineering Dept.
New York City	St. Bartholomews Church	Bertram Grosvenor Goodhue Associates
New York City	Savarin Restaurant	Schultze & Weaver
New York City	No. 2 Park Avenue C. A. Auffmordt & Co. (Importers)	Goodwillie & Moran
Niagara Falls	Mount Saint Mary's Nurses Home	Kirkpatrick & Cannon
Poughkeepsie	Friends Meeting House	Alfred Busselle New York
Saranac Lake	Harrietstown Town Hall	Scopes & Feustmann
Syracuse	St. Paul's Church	Paul Wolter
White Plains	Court House	Theodore Richards
NORTH CAROLINA		
Asheville	Asheville High School	D. D. Ellington
Greensboro	Pilot Life Insurance Co.	Zantzinger, Borie & Medary, Phila.

Location	Building	Architect
NORTH DAKOTA		
Crosby	High School	Ira Rush, Minot
Valley City	Sisters of Mercy Hospital	George P. Stauduhar Rock Island, Ill.
OHIO		
Akron	St. Thomas Hospital	Warner & McCornack Cleveland
Cincinnati	Kahn Packing Co.	Henschien & McLaren Chicago
Cincinnati	Gibson Hotel Roof	Joseph Urban, N. Y., G. W. Drach, Inc., Cincinnati, Assoc.
OKLAHOMA		
Ada	First Christian Church	Albert S. Ross
Buffalo	Court House	Maurice Jayne Oklahoma City
PENNSYLVANIA		
Bradford	Presbyterian Church	Hendryx & Benton
E. Stroudsburg	Normal School	Davis & Lewis Scranton
Ellwood City	Lincoln High School	W. G. Eckles Co. New Castle
Gettysburg	Gettysburg Nat'l. Bank	Simons, Brittain & English, Pittsburgh
Knoxville	St. Canice Church	W. P. Hutchins Pittsburgh
Latrobe	Citizens Bank	Bartholomew & Smith Pittsburgh
New Castle	New Castle Junior High School	Albert S. Thayer
Pittsburgh	Peoples Bank Building	Press C. Dowler
Pottstown	Masonic Temple	A. S. Kepner
Sharon	First Presbyterian Church	Nicklas & Rodrick Cleveland
Washington	Washington Hospital	Schmidt, Garden & Erikson, Chicago
SOUTH CAROLINA		
Florence	Circle Grade School	Wilkins & Hopkins
SOUTH DAKOTA		
Vermilion	Masonic Hall	Walter J. Dixon Mitchell
Yankton	City Auditorium	Walter J. Dixon Mitchell
TEXAS		
Beaumont	City Auditorium	F. Steinman & Son
Dallas	Dallas National Bank	Coburn, Smith & Evans
San Antonio	Bexar County Court House	Phelps & Dewees
VIRGINIA		
Richmond	First Baptist Church	Herbert L. Cain
WISCONSIN		
Green Bay	High School	Foeller & Schober
LaCrosse	Logan Junior High School	Merman & Skogstad
Madison	Medical School University of Wisconsin	Arthur Peabody
Milwaukee	St. Roberts School	Herbst & Kuenzli
Oshkosh	Normal School	Arthur Peabody
Racine	Horlick High School	J. Mandor Matson
Wausau	Y. W. C. A.	Oppenhamer & Obel
Whitewater	High School	E. J. Hancock Eau Claire



FIRST CHURCH OF CHRIST, SCIENTIST, MONTCLAIR, N. J.
CHARLES D. FAULKNER, ARCHITECT. C. WILLARD WANDS, ASSOCIATE

How to Specify Sabinite

Sabinite May Be Specified as Follows:

(Short Form Specifications)

"A"—All walls and ceilings marked "Acoustical Treatment" on the plans shall receive two coats of Sabinite Acoustical Plaster applied according to the full specifications of the United States Gypsum Company and under the supervision of their Service Department.

"B"—The auditorium will be given acoustical treatment in strict accordance with the recommendations and specifications of the United States Gypsum Company who will provide data on which plaster contractor may present his bid.

(Full Form Specifications)

All walls and ceilings shown on the plans to receive acoustical treatment will be given a scratch and brown coat of gypsum mortar containing not more than two parts of sand by weight to one part of plaster. The scratch coat must be thoroughly broomed before the brown coat is applied. The brown coat must be deeply raked after straightening.

Sabinite Acoustical Plaster should then be applied as follows: To the half-green base coat, first apply one ¼″ coat of Sabinite, mixed according to the manufacturer's directions, adding nothing but water to the material as supplied. The first coat should be straightened with a darby and thoroughly broomed with a clean broom as soon as the water has left the surface, the broom to be kept clean of all droppings and aggregate during the operation.

The second coat is to be floated with a clean cork float to an even and porous surface. All applications of Sabinite Plaster are to be made only after the plasterers have received full individual instructions from a representative of the Service Department of the United States Gypsum Company.

Specifications for Tinted Sabinite

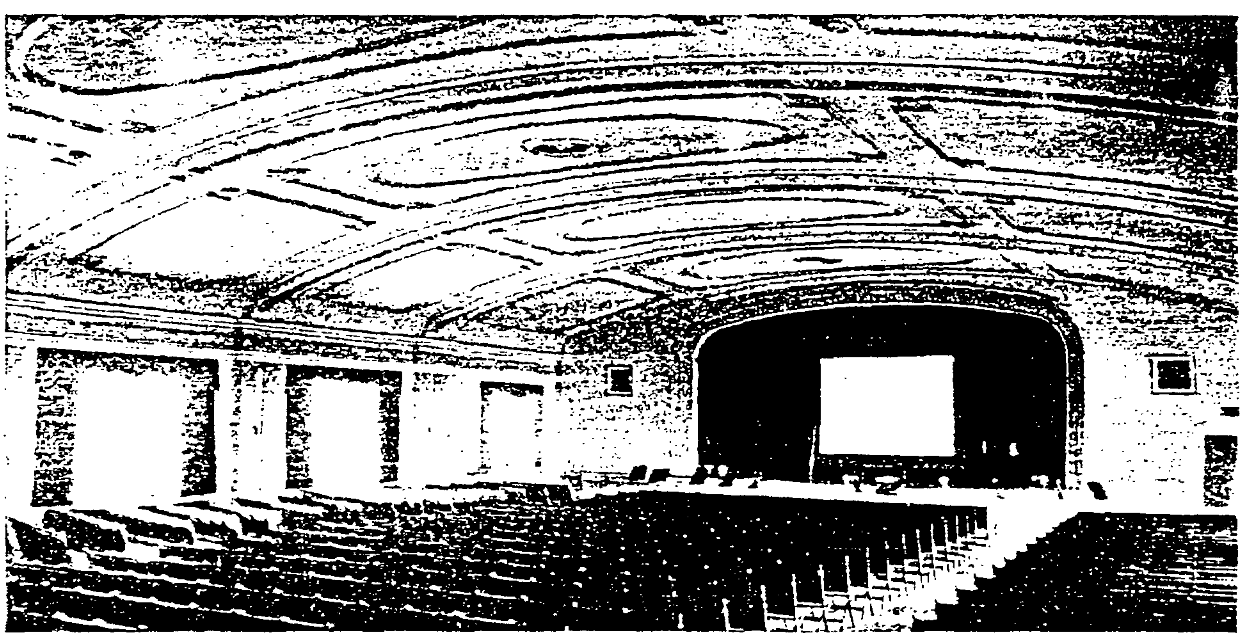
Colored Sabinite may be prepared on the job by the inclusion of dry color in amounts not to exceed 25 lbs. per ton of Sabinite. The usual precautions for handling colored plasters should be observed.

The manufacturer will submit samples of Sabinite in color or match colors submitted by the designer on request. Integrally tinted Sabinite should be a shade lighter than the same color would be in paint because the texture of Sabinite casts a slight shadow.

Painting Sabinite by the Spray Method

Sabinite may be spray painted with a DeVilbis Type A gun with K cap and M.F. nozzle or similar apparatus of equivalent effect, manufactured by other companies, the compressor to be operated at a pressure of 40 to 60 pounds per square inch, the nozzle to be held from 18 to 24 inches from the surface for United States Gutta Percha Company's semi-fluid Flow-on Paste or from 12 to 18 inches from the surface for the various lacquers. The U. S. Gutta Percha Company's semi-fluid Flow-on Paste thinned with Oleum Spirits or Varnolene is the approved oil paint for Sabinite when applied with a spray.

Any good grade of spraying lacquer may be similarly used. In spray painting over Sabinite with either material, go over the surface only once, releasing the trigger of the gun at the end of each stroke. Be sure that the material applied is not sufficiently thinned nor applied sufficiently heavy to "run" on the surface of the work. After the first coat has dried, apply a second coat to even up the surface and to remove any "brush" marks.



LONDON LIFE INSURANCE COMPANY, LONDON, ONTARIO, CANADA—JOHN MOORE & COMPANY, ARCHITECTS

Brush Painting Sabinite

Preparation of Surface

The surface to be painted must be gone over with a small block of wood and lightly rubbed to remove higher projecting particles in the surface. The wall or ceiling is then brushed lightly with a small whisk broom to clean it of loose particles which might adhere to the surface.

The only paint approved for application over Sabinite by brush painting is Phon-O-Lite. It comes mixed to about the right consistency for application, a little thicker than ordinary ready mixed paint. If too thick, say almost jelly-like, it should first be stirred up well and then thinned with a little turpentine, or preferably sub-turpentine. A half pint of sub-turpentine or turpentine per gallon is the maximum thinner permitted.

Phon-O-Lite may be tinted to any desired shade from its natural white by mixing color ground in oil, with turpentine or mineral thinner and then stirring it into the paint to secure the desired shade. Where colored Phon-O-Lite is desired, the tint should be obtained before adding any thinner.

Application is with an ordinary paint brush, used liberally, but not attempting to fill up all the rougher places in the surface. Cover only about one square yard at a time and then double back and stipple the surface vigorously with a large flat, long bristle stipple brush. The stippling carries the paint into the low places, helps distribute it uniformly, and removes any tendency to lap. One coat applied and stippled as described is in all cases sufficient for the job.

The covering capacity of Phon-O-Lite varies with the nature of the surface. Phon-O-Lite should cover from seven to ten square yards per gallon of material.

How to Obtain Sabinite

Sabinite Acoustical Plaster may be obtained from any dealer handling United States Gypsum Company materials. Representatives of the United States Gypsum Company will be glad to secure full and complete analyses of auditoriums for any interested architect without charge or obligation, or plans may be sent direct to any office of the United States Gypsum Company for that purpose. Every installation of Sabinite is serviced regardless of location or size without charge. This service provides a fully competent instructor to show the plasterers how the material is to be applied and to acquaint the architect's superintendent with the method of obtaining correct and efficient application.

KAHN PACKING CO., CINCINNATI, OHIO
HENSCHIEN & McLAREN, CHICAGO,
ARCHITECTS

LIBRARY OF THE SAN BERNARDINO VALLEY UNION JUNIOR COLLEGE, SAN BERNARDINO, CALIF.

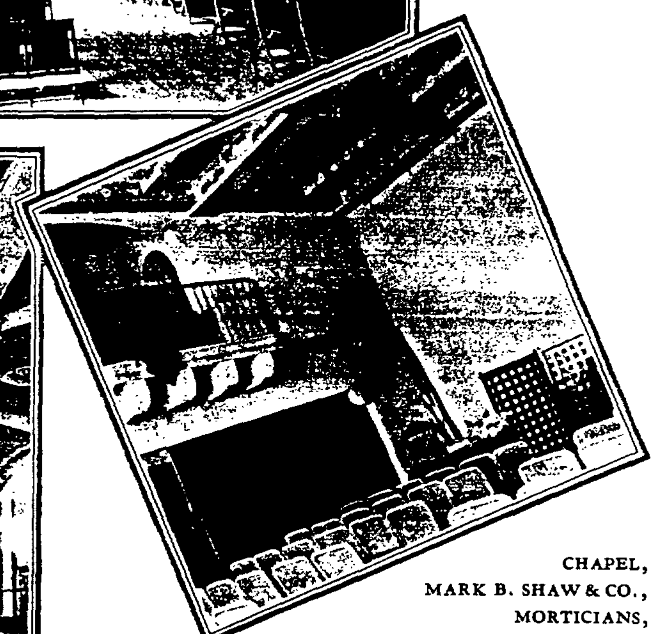
HOWARD JONES, ARCHITECT

ST. BARTHOLOMEWS CHURCH, NEW YORK CITY

BERTRAM GROSVENOR GOODHUE ASSOCIATES, ARCHITECTS

LOS ANGELES FIRST NATIONAL TRUST & SAVINGS BANK

DODD & RICHARDS, ARCHITECTS



CHAPEL,
MARK B. SHAW & CO.,
MORTICIANS,
SAN BERNARDINO, CALIF.,

J. V. RICE, ARCHITECT.

U. S. G. System of Sound Insulation

ANSWERING an insistent demand and a growing need, the United States Gypsum Company after several years of investigation and research has developed the U. S. G. System of Sound Insulation. It provides for the elimination of any objectionable travel of sound from the room or rooms of its source to adjacent rooms as may be required by the nature of the construction, occupancy and mechancial equipment.

The U. S. G. System is *not a material*, but is essentially a method of construction which interposes a "shock-absorbing" construction between the finishing surface of wall, floor or ceiling and the structural floor slab or partition. This "shock-absorbing" construction takes the force of the alternate compressions and rarefactions of the atmosphere which constitute sound and thus prevents their acting upon, vibrating and so transmitting sound through the various items or component parts of a building structure. The construction requires only a minimum of space and is built on any standard type of partition as a furring before plastering; it is similarly provided as a ceiling furring or suspended ceiling construction and as a resilient sub-flooring construction on the structural floor slab. The partition and ceiling treatment includes and provides a base for the application of plaster—and the floor treatment includes and provides sleepers for the application of wood flooring. The system embraces not only the treatment of the above items of a building, but also the mechanical equipment, such as piping, vent ducts, fans, elevators and organs by means of enclosures, resilient platforms, sound baffles, etc., as may be required.

Effective sound insulation is increasingly becoming a necessity in many types of buildings, and particularly so in Music Studios, Theatres, Dance Halls, Schools, Hospitals, Apartments, Club and Fraternal Buildings, Churches and Office Buildings. With the use of the U. S. G. System, Bowling Alleys may be installed even under theatres and in apartment buildings, with assurance of no disturbing noise.

In providing the resiliency, which is one of the pre-requisites of a "shock-absorbing" construction, we do not make use of hair felt or similar fibrous materials, which are not fireproof nor vermin-proof. Such materials tend to harden in time, especially under load, and lose their resiliency and consequent efficiency. The distinctive features of the U. S. G. System are *greater effectiveness*, *economy* and the use of *permanent fireproof materials*.

The Sound Insulation Division of the Company will furnish without obligation recommendations, specifications and cost estimates, based either on preliminary or final plans, or on existing structures.

The furnishing and installation of the U. S. G. System of Sound Insulation of the type and degree recommended is handled in its entirety by the Company, preferably under separate contracts. *Definite Results* and an *Undivided Responsibility* are thus assured.

For this service and further information, address the Sound Insulation Division of the Company.

UNITED STATES GYPSUM COMPANY

GENERAL OFFICES

300 West Adams Street
CHICAGO

SALES OFFICES

New York, N. Y.; Boston, Mass.; Washington, D. C.; Baltimore, Md.; Philadelphia, Pa.; Buffalo, N. Y.; Pittsburgh, Pa.; Cleveland, Ohio; Cincinnati, Ohio; Detroit, Mich.; Milwaukee, Wis.; Minneapolis, Minn.; St. Louis, Mo.; Kansas City, Mo.; Atlanta, Ga.; Omaha, Neb.; Denver, Colo.; Los Angeles, Calif.; San Francisco, California.

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Oakfield, N. Y.; New Brighton, S. I., N. Y.; Hillsboro, New Brunswick; Windsor, Nova Scotia; Wentworth, Nova Scotia; Plasterco, Va.; Cleveland, Ohio; Gypsum, Ohio; Genoa, Ohio; Lancaster, Ohio; Detroit, Mich.; Alabaster, Mich.; Grand Rapids, Mich.; Cordova, Ill.; Milwaukee, Wis.; Fort Dodge, Iowa; Blue Rapids, Kan.; Southard, Okla.; Eldorado, Okla.; Sweetwater, Texas; Piedmont, S. D.; Loveland, Colo.; Denver, Colo.; Arden, Nev.; Amboy, Calif.; Kansas City, Mo.; Heath, Mont.; Laramie, Wyoming.