BlueBook

of Sound Control Service

Canadian Gypsum Company, Ltd.

SOUND CONTROL SERVICE

ACOUSTONE

SABINITE ACOUSTICAL PLASTER

SYSTEM OF SOUND INSULATION

SOUND INSULATIVE FLOORS, WALLS, CEILINGS

SOUND INSULATIVE MACHINE BASE

SOUND INSULATIVE DOOR

Dominion Gypsum Company, Ltd.

1221 BAY STREET

Toronto, Ontario

THE BLUE BOOK OF SOUND CONTROL SERVICE

RESEARCH, DEVELOPMENT AND SERVICE

Research and Development

All D.G.C. Sound Control materials and Systems are the esult of directed research in a modern building, especially 'quipped for that work. The research work is carried out under he direction of trained physicists and chemists, architectural ngineers and investigators, comprising a personnel of some ifty individuals. Here new materials and methods are produced and tested and improvements developed.

The fundamental nature of the laboratory's approach to ny problem is well illustrated by the following: Some years igo they were asked to develop an acoustical absorbent of reat efficiency which as well would be incombustible, withstand ll the hazards of building construction and occupancy, equally daptable to new or existing structures, and one which would be decorative and appropriate to any architectural treatment—Acoustone is that product.

The laboratory is unique in possessing the only complete sound chamber, owned and maintained by a manufacturer of acoustical products; a carefully calibrated accoustical measuring stick to use during the development of acoustical products and as a guide to the scientists who are developing them. It is also used for control tests on the company's output, so that the acoustical absorption and sound insulation afforded by the sound control products of the Dominion Gypsum Company, Ltd., is constantly maintained equal or superior to the published determinations of recognized acoustical laboratories.

Service

The Dominion Gypsum Company, Ltd., acoustical engineers, are completely equipped to assist architects on any problem involving sound absorption, acoustical correction or sound insulation. They render this service, without charge and without obligation, in advance of construction or will gladly advise corrective methods for existing buildings in which sound difficulties are experienced.

In auditoria 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 for economically covering the necessary areas with acoustical absorbents.

Because the Dominion Gypsum Company, Ltd., handles all phases of the problem and provides, not only materials for sound absorption, but also a complete system for the insulation of sound, architects are assured that absorption materials will not be recommended where sound insulation is required or vice versa.

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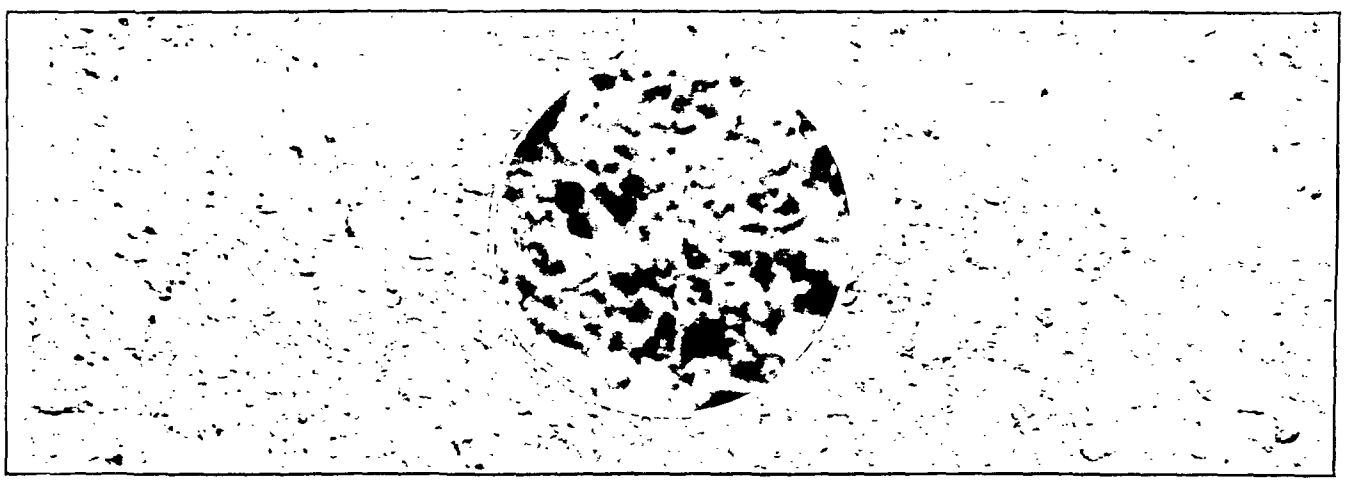
ACOUSTONE—Actual Size Showing Texture and Enlargement Showing Porosity



ACOUSTONE—D.G.C. ACOUSTICAL TILE

Composition

Acoustone is formed from filaments of specially processed stone. Its extremely fine, almost microscopic, porosity provides an unusually high degree of sound absorption.

Absorption

The acoustical efficiency of Acoustone has been confirmed by all the leading laboratories. The values below were obtained from tests by Dr. Paul E. Sabine at Riverbank Laboratories, Geneva, Illinois.

Tile	Pitch C3 (256 d.v.)	Pitch C4 (512 d.v.)	Pitch C5 (1024 d.v.)	Pitch C6 (2048 d.v.)
½" thick	.16	.48	.60	.52
¾" "	.29	.62	.60	.66
1" "	.46	.67	.60	.64

Thickness

Acoustone is made standard in ¾ inch thickness.

Sizes

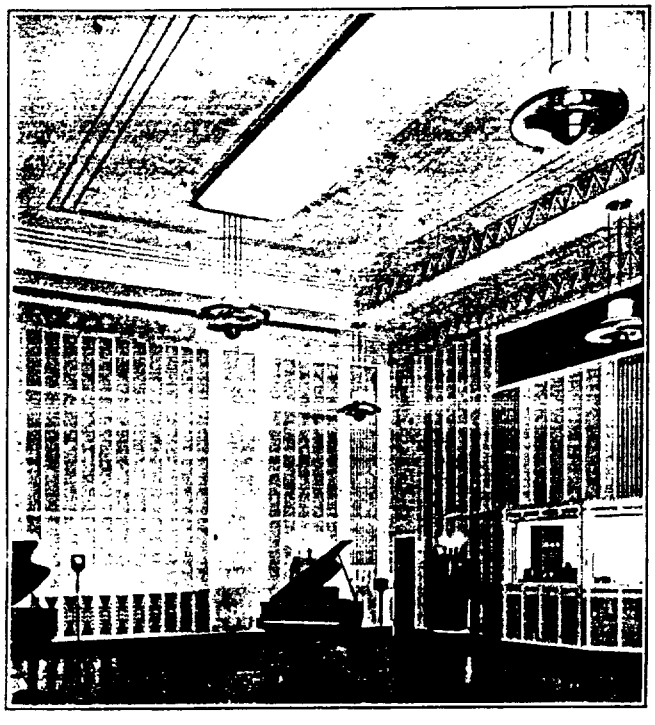
Tiles are made in the following standard rectangular sizes: 6x6 in., 6x12 in., 12x12 in., 9x18 in. Special shapes and sizes may be obtained when required.

Outstanding Decorative Appearance

In addition to its high degree of acoustical efficiency, it is outstanding in its decorative effect. The surface texture is quite similar to travertine stone, surpassing it, however, in the richness and warmth it supplies through a wider range of color tones. From the viewpoint of design, it is adapted to harmonious, unobtrusive inclusion in any decorative scheme. Ashlar masonry walls for interiors can be constructed with Acoustone facings that are as beautiful as natural stone. Interiors in the modern trend may be delightfully handled in tile with a metallic lustre in many shades and colors. The wide variety of shapes likewise adds flexibility—the tile may be laid up in many interesting patterns. There is no disconcerting mechanical effect. Coloured borders, cornices in relief, and modified coffered work are easily obtained. Joints between tile units may be accented with a V profile or suppressed as desired. Struck joints may be used with ashlar patterns.

Colours

Tiles are furnished in light-reflecting white or cream. Special colours will be made to order. If for any reason changes in colour or effect are desired, the tile surfaces may be brush or spray painted with any of the brushing or spraying lacquers. Sprayed lacquers, containing bronze powders in suspension give the tile the appearance of being plated with the metal used. Exhaustive tests have proven that painting with lacquer does not reduce the acoustical efficiency or absorption of the tile. Oil paint, diluted with equal parts of thinner, may be brush applied without significant reduction in absorption.



National Broadcasting Studio
Ceilings and Walls of Acoustone in varying shades. D G C. system of Sound Insulation used throughout for floors, walls and ceilings.

Incombustible

Since it is made solely from specially processed stone filaments, it is incombustible.

Light Weight

Due to its extremely light weight, it is safely and permanently cemented over plaster in both new and old work.

Easily Cleaned

The complete and thorough cleaning of the porous structure of Acoustone with an ordinary vacuum cleaner thoroughly evacuates any foreign matter that may become lodged in the tile. Accumulations of grease and dirt on the surface of the material are easily removed by the same method, or by using ordinary wall paper cleaner, restoring the original color and appearance. The cost of such cleaning is much less than the cost of decorating an equal area of wall or ceiling; and the wear on the tile, incidental to the cleaning, is so negligible that no appreciable difference is made either in its appearance or sound absorbing ability after repeated cleanings over a period of years.

Durable

Because Acoustone is made from especially processed stone, it does not deteriorate with age.

Sanitary

Acoustone offers complete sanitation. It is inorganic, durable, completely cleanable. It provides an aseptic, readily and cheaply cleaned sound absorbent for hospitals, sanitoria and restaurants.

Installation and Guarantee

The manufacture, installation and acoustical design of Acoustone is entirely under the control and is the sole responsibility of the Dominion Gypsum Company, Ltd.

This policy enables the purchaser to buy a result without reference to the manner in which the result is obtained. It definitely fixes the responsibility with the Dominion Gypsum Company, Ltd., as it frees the purchaser or the architect from all details, engineering and installation.

Such a policy, of course, means that the Dominion Gypsum Company, Ltd. will refuse to install Acoustone where satisfactory results will not be obtained.

The company is prepared to make the installation of Acoustone in busy offices, banks, restaurants, brokers' offices, hospitals, etc., at times so that there will be no interruption in the usual routine.

For this work only trained and experienced mechanics are employed, who will carefully protect the walls, floors and furnishings against damage during the installation.

Economical

Acoustone is not expensive to install. It costs more than ordinary wall and ceiling decorating, but by eliminating redecorating costs, over a period of years, the expense is less.

SPECIFICATIONS ACOUSTONE

LONG FORM

Note: *Notes are explanatory or advisory only and should not be included in the specifications.*

(1) Work Included

Note: *List and locate all walls and ceilings to be covered with Acoustone. If more than one thickness of Tile is used, specify the thickness for the various areas.*

(2) Base

Acoustone shall be applied direct to plaster or similar smooth surface.

Note: *On existing work Acoustone is applied over any firm, standard plaster finish.*

(3) Acoustical Treatment Material

(3a) Acoustical treatment material shall be Acoustone ¾ in. thick and of colours selected by the architect.

(3b) Joints between Tiles shall be (*a V formed by accurately beveling the tile edges*) (*as detailed*) (*specify*).

(3c) Tiles on walls and fields of ceilings shall be of size, shape, disposition and colour as shown on the various details and approved shop drawings.

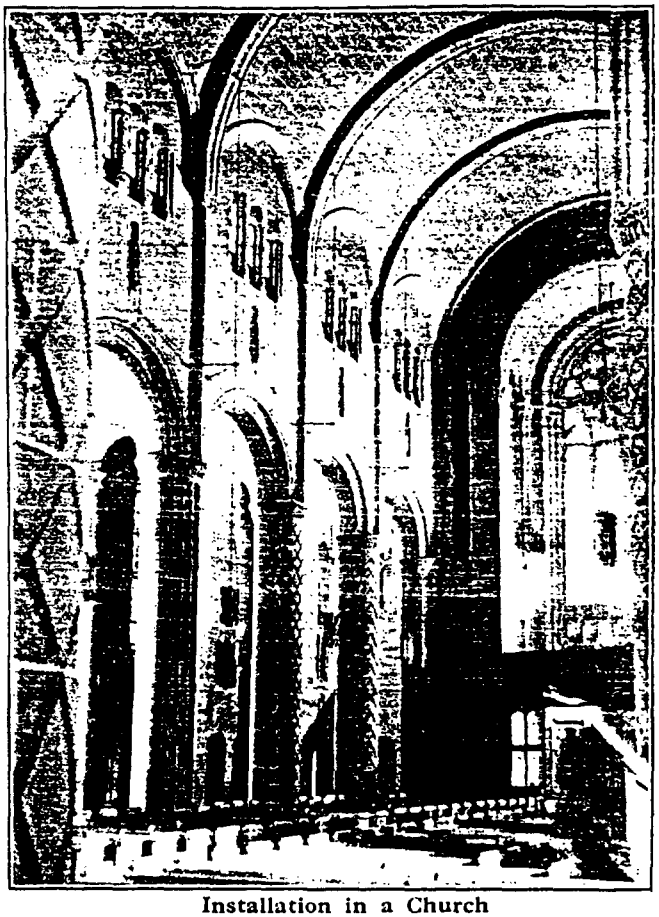
(4) Application of Acoustone

(4a) Acoustone shall be completely erected by the Dominion Gypsum Company, Ltd., of sizes, colours and pattern shown on the drawings and details.

(4b) The Tile shall be laid close, accurately cemented in position in full conformance with the manufacturer's specifications.

SHORT FORM

The contractor shall allow the sum of $..... to cover the cost of acoustical treatment, using Acoustone to be furnished and erected by the Dominion Gypsum Company, Ltd., as directed and approved by the architect.



Installation in a Church

Acoustone laid in Ashlar pattern with struck joints matching in texture and random colour the native stone walls

SABINITE ACOUSTICAL PLASTER

Types

Standard—Standard Sabinite is for use in locations not subject to moisture (high humidity).

Number *38*—Sabinite No. 38 is a special material for use in swimming pools, bath houses, hospitals, etc., specially developed to resist moisture. It has more absorption than the standard Sabinite.

Absorption

Tests expressed in percentages of sound absorbed made in 1930 at Riverbank Laboratories (Dr. Paul E. Sabine), Geneva, Illinois.

Sabinite type	Pitch C3 (256 d.v.)	Pitch C4 (512 d.v.)	Pitch C5 (1024 d.v.)	Pitch C6 (2048 d.v.
Standard	.20	.31	.39	.38
No. 38	.24	.38	.42	.41

Composition

Sabinite Acoustical Plaster is a permanent, reasonably priced, sound-absorbing plaster. Standard Sabinite is substituted, over the standard scratch and brown coats, for the usual hard, sound-repellent plaster finishes. Sabinite No. 38 is applied only over Special Exterior Stucco base coats. Sabinite absorbs sound because of its great multitude of tortuous, minute passages, which have their start in tiny openings at its surface. In these passages, inherent in the material, sound is repeatedly reflected, losing its energy to heat and friction.

Thickness

It is applied ½-in. thick in two successive coats, each ¼-in. thick, with the usual plasterer's tools.

Appearance

It presents the same appearance as a sand floated plaster finish.

Colours

Both Standard and No. 38 Sabinite are furnished in white and four standard colours or tints: ecru, ivory, cream, buff. Special colours will be furnished on orders exceeding 5 tons. On small orders where special colours are required Sabinite may be integrally tinted on the job.

It can be painted or decorated after application without loss of efficiency. (See specifications.)

Incombustible

Composed of inorganic aggregates bonded together with gypsum plaster, long known as a fireproofing material, it is incombustible.

Durable

Sabinite Plaster is as rugged and durable as the ordinary sand float finish.

It is unaffected by dampness and does not shrink or swell with climatic changes.

Sanitary

Because it contains no vegetable or animal matter, Sabinite is sanitary. Like any gypsum plaster it is vermin proof and the pores are too small to admit flies or other insects. It may be disinfected or washed when necessary.

Covering Capacity

One ton of Standard Sabinite applied in two coats, each ¼-in. thick, will cover a surface of from 70 to 75 sq. yds. The average plasterer can apply 100 sq. yds. of Sabinite to full specifications in 11 hrs.

To mix this material, including delivery to the mechanic, requires but 7 hrs.

Sabinite No. 38 covers from 60 to 75 yards a ton, and requires 14 hours of a plasterer's time and 8 hours of mixing labor per 100 sq. yds.

Application

It is applied by the plastering contractor in lieu of the usual finish. Its installation is always supervised by an experienced representative of the seller.

Easy to Apply

Nothing but water is added to make Sabinite ready for application. It spreads with a trowel from the hawk, like ordinary plaster and bonds easily and firmly to the base coat.

Economical

The low cost of the material, ease of application and excellent covering capacity, coupled with its relatively high sound absorption, makes Sabinite a most economical material.

SPECIFICATIONS—SABINITE ACOUSTICAL PLASTER

Note: *Notes are explanatory or advisory only and should not be included in the specifications.*

(1) Work Included

Note: *List and locate all walls and ceilings to be covered with Sabinite Acoustical Plaster. If both Standard and No. 38 Sabinite are used, list and locate separately. If different colours of integrally tinted Sabinite are used, specify the colours for the various areas.*

(2) Grounds

On walls, in addition to the usual grounds set for the scratch and brown coat plaster base, set additional ½-in. thick grounds to assure proper thickness of the Sabinite and form nailing for wood trim, etc. All corner beads shall be set to conform to the increased plaster thickness.

(3) Acoustical Treatment Material

(3a) Acoustical Treatment material shall be (*Standard*) (*and*) (*No. 38*) Sabinite Acoustical Plaster as manufactured by the Dominion Gypsum Company, Ltd.

(3b) Sabinite shall be integrally tinted by the manufacturer at the mill.

(3c) Sabinite shall be tinted as directed on the job by the inclusion of dry colour in amounts not to exceed 25 lbs. per ton of Sabinite. The usual precautions for handling coloured plaster shall be observed.

Note: *Integrally tinted Sabinite should be a shade lighter than the same colour would be in paint because the texture of Sabinite casts a slight darkening shadow.*

(4) Scratch and Brown Coat Base

(4a) **Standard Sabinite**—All walls and ceilings to receive Standard Sabinite shall be given a scratch and brown coat of gypsum plaster containing not more than two parts of sand by weight to one part of plaster.

(4b) **Sabinite No. 38**—Hydraulic Sabinite shall only be applied over Special Exterior Stucco Base Coat

Note: *Special Exterior Stucco Base Coat is a prepared material requiring no sand or other addition except water. It is applied in two coats in place of the regular scratch and brown coats.*

(4c) The scratch coat shall be thoroughly broomed before the second or brown coat is applied. The second or brown coat shall be deeply raked after straightening.

(5) Application of Sabinite

The application of Sabinite shall only be made under the supervision of the Service Department of the Dominion Gypsum Company, Ltd., and after the plasterers have received full individual instructions.

To the dry base coat, first apply one ¼-in. coat of Sabinite mixed in accordance with the manufacturer's direction, adding water only to the material as supplied. The first coat shall be straightened with a darby and thoroughly broomed with a clean broom as soon as the water leaves the surface, the broom to be kept clean of all droppings and aggregate during the operation.

The second coat shall be floated with a clean cork float to an even and porous surface when the water has left the surface.

Restaurant Installation
Ceilings of Sabinite Acoustical Plaster

PAINTING SABINITE

Spray Painting

Sabinite may be spray painted. Depending on the conditions and the effects desired, the Dominion Gypsum Company, Ltd., will make definite recommendations as to the paint or spraying lacquer to be used and the type of spraying equipment best adapted to the conditions.

They will also furnish complete specifications covering the application.

Brush Painting

The only paint for brush application approved for use over Sabinite is one recommended by the Dominion Gypsum Company, Ltd., which may be tinted to any desired shade from the natural white by adding color ground in oil.

The Dominion Gypsum Company, Ltd., will furnish complete specifications covering application adapted to the particular conditions.

WHERE ACOUSTICAL CORRECTION IS NECESSARY

uditoria

The use of sound absorbing materials on the walls or the ilings of auditoria reduces the reverberation time to a proper vel, so that hearing is made perfect at every seat location. nsideration should, of course, be given to designing the om so as to secure an ample and even distribution of sound. ncentration and dead spots, which result from improper flecting walls or ceilings, will not be present if inclined and rved surfaces are properly handled.

Gothic churches invariably will require treatment, and even en will in many cases have dead spots in areas immediately ck of the transepts.

In school auditoria and gymnasia, reverberation times ould be lower than those in churches and theatres. In talking-cture houses reverberation times should be still lower than in eatres if the sound of the projection apparatus is to be natural id without disconcerting barrel-like tones.

Sound, like light, is reflected by the surfaces it strikes. lthough it is possible to design walls and ceilings and prosce-um arches so as to obtain amply even distribution of sound; ufortunately, many architectural forms, particularly domes and liptical curves, are apt to concentrate sound, producing areas greater volume in some parts of the room and consequent eas of low volume in other parts.

No general rule can be given by which these difficulties are be avoided, but acoustical engineers can usually suggest slight anges in the radii of curved surfaces and better angles for at surfaces which will provide a more even distribution of ound. Auditoria should be acoustically treated only after a areful analysis.

usiness Offices

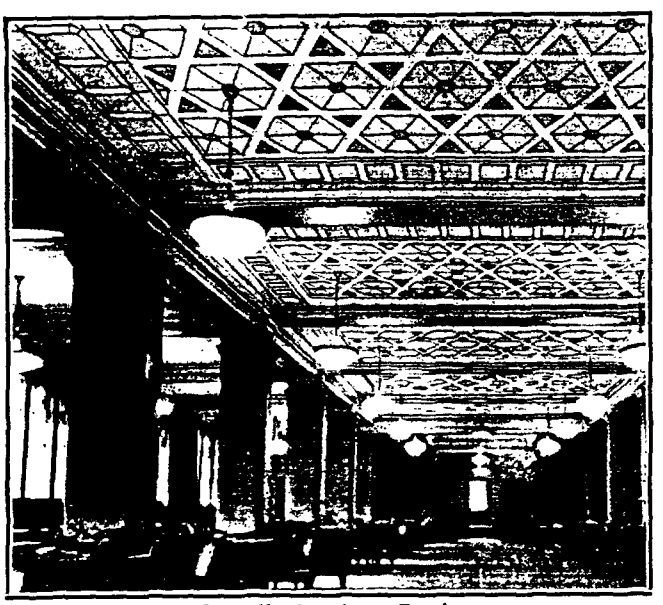
Acoustical treatment will reduce the noise level in an office om one-third to one-tenth. Everyone appreciates a quiet place which to think. In an acoustically treated office the noise roduced by jangling phone bells, strident buzzers, and paper-umping typewriters ceases to be a distraction. Tests have roved also that the quieting of offices makes for greater effi-ency. The acoustical treatment of office buildings and noisy ork-rooms pays for itself through the elimination of mis-nderstandings, the reduction of errors, and the lessening of tigue.

Dr. Donald A. Laird, Director of the Psychological Labora-ory of Colgate University, says, "Many executives think hat noise is inevitable, that nothing can be done to lessen t, and that any way it does not matter. All three ideas are rong. Noise cuts into divi-ends by lessening output and equiring more energy from orkers. There is no evi-ence that workers get used to oise. They may become un-onscious of its presence, but he effect upon their output emains.

"In the Colgate University aboratory, it was determined y the use of special apparatus hat noise of usual office inten-ity cuts into the output of pro-essional typists on the average f 5 per cent. In higher mental ork, such as the executive oes, the cut into output is in he neighbourhood of 30 per ent.

"In a survey of two large lants, it was found that abor turnover, absence from work and requests for transfer to other work were above the plant average in those departments which were noisy.

"In many non-hospital cases the physician could apparently consider the working environment of the patient in cases of obscure neurasthenia and fatigue. The experiments on office conditions seem to indicate that in some instances a move to a quieter work-place may be as good as a rest, there being a difference of 19 per cent. in the energy expenditure increment following working in a noisy as compared with a quieter environment. Men and women seemed to be similarly affected, while the more skilled typists were adversely affected in output to a greater extent than were the mediocre typists."



Installation in a Bank

Paneled ceiling in various shades and sizes of Acoustone

Hotels

In hotels, elevator shafts as well as corridors are noise conveyors. Quiet guest rooms may be secured by treating the corridor ceilings with acoustical treatment. Many of the sounds occurring 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 ceilings in kitchens and sculleries and 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 sound absorbents on the ceiling usually suffices to correct such conditions.

Hospitals

In the treatment of hospitals it is wise to apply acoustical absorbents to the ceiling, and in many cases to the side walls of corridors. It is more necessary to do this than to apply the material 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 acoustical treatment 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 ceilings and side walls of the labor and delivery rooms. It is excellent practice to apply treatment to the ceilings of all sculleries, kitchens and pantries which directly connect with portions of building used by patients.

Restaurants

Restaurants, quick lunches and cafeterias with their din of clattering dishes and silverware are made as quiet as carpeted dining rooms by treating the ceilings with high-efficiency sound absorbents.

Gymnasia and Natatoria

Particularly where gymnasia and natatoria are built as integral parts of the building as is usually the case in schools and similar buildings, the ceilings, at least, should be covered with sound absorbent material. In gymnasia besides the ceiling the upper walls may well be included in the treatment.

Many examples prove that where these rooms are properly treated the noises created within them are so successfully diminished that other departments in the building are unaware of their use.

DEFINITIONS—TECHNICAL DATA

Note: *The nomenclature of the science of acoustics is so relatively new and so possible of misapplication that to assist in clarity and understanding of analysis reports submitted by acoustical engineers, it seems advisable to define the more important terms and explain certain phases of the technical data.*

Data on Sound Control

Those interested in the complete details of the subject should refer to Professor Sabine's Collected Papers on Acoustics published by the Harvard University Press.

The Dominion Gypsum Company, Ltd., will furnish on request a publication containing interesting data on the theory of acoustical control, the formulas used, their application and the criteria of excellence for auditorium acoustics. This booklet also contains an extended discussion of the theory and practice of office quieting through use of acoustical absorbents.

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 ft. per second at 68° F. Its velocity increases about 1.1 ft. 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

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 per cent. in the intensity of a tone produces a barely perceptible increase in loudness.

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 length. 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.

Yorkminster Baptist Church, Toronto, Ont.
George, Moorhouse and King, Architects
Sabinite Acoustical Plaster.

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 focussing 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

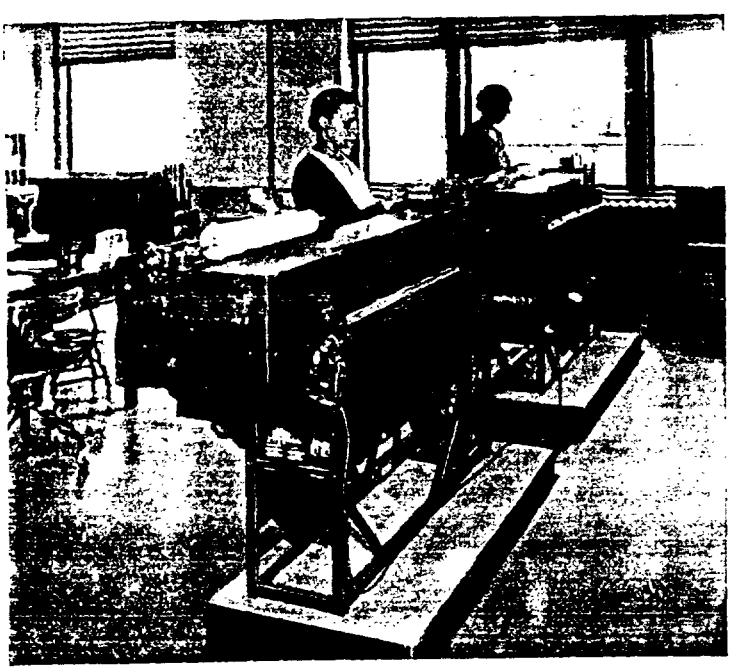
Echo is the distinct repetition of a single short, sharp sound, due to direct reflection of sound from one or more reflecting surfaces. Like interference, echo is a localized defect. It is seldom present as a source of acoustical difficulty except in rooms of large proprotions. Extended, unbroken rear walls frequently produce direct reflections annoying to the speaker, but unheard 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—Overlapping Sounds

Reverberation may be called "the persistence of sound in a room after it has ceased at its source." Professor Wallace C. Sabine said, "Sound beingenergy, 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."

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.

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 compete 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.



London Life Insurance Co., Ltd., London, Ontario
Sound Insulative Machine Bases

Frequency

The frequency of a sound is its number of double vibrations (complete vibrations) per second. The frequency most often used in acoustical calculations is 512, or one octave above middle C (C4). The actual frequency range which is of importance in acoustical work extends from about 128 to 4096 D.V. per second, or about five octaves.

Pitch

Pitch is measured by the frequency of the vibrations. Middle C (C3) on the piano has a period of 256 complete or double vibrations per second. The various octaves above middle C and those customarily considered in acoustical correction have the following periods of vibration: C4—512 d.v.; C5—1024 d.v.; C6—2048 d.v. Some ears are able to hear vibrations as low as 14 or 16 per second and have an upper range limit that varies even more in separate individuals to almost 20,000 vibrations per second. The average ear can hear as shrill a sound as 16,000 vibrations per second.

C4 is that used as the fundamental note in auditorium analysis. Careful investigation has determined that the pitch of office machines varies between C5 and C6.

Facts Concerning Absorption Percentages

Architects should know that laboratories in determining the co-efficients of absorption of materials submitted for analysis do not all use the same yardstick. For example, we find the same sample of material which tested 62 per cent. at C4 at the Riverbank Laboratories, testing 65 per cent. at another widely known laboratory. In order to equitably compare various acoustical products, the archtect should compare figures of the same observer.

It would seem logical that the co-efficients used for comparison be furnished by laboratories using the identical methods that were employed by Professor Wallace C. Sabine in discovering the absorption of various building materials, carpets, drapes, and persons, co-efficients which are recognized as standard and used by all laboratories in determining reverberation times. The Dominion Gypsum Company, Ltd. uses the co-efficients provided by the Riverbank Laboratories, Geneva, Illinois, which were designed by Professor Sabine and had its sound chamber calibrated with his original pipes and by his so-called "four-organ-pipe experiment."

Too much stress should not be laid on the relative co-efficients of absorption, particularly when the problem is that of quieting. In an office 30 x 50 ft., with a 12-foot ceiling, a difference of ten points in the absorption co-efficient of the absorbent used produces less than a decibel (the least audible difference in loudness the human ear can detect) of difference in the noise level.

To illustrate: if the reduction in noise level caused by a 60 per cent. absorbent in this room is 5 decibels, a 70 per cent. absorbent produces a reduction of 5.6 decibels. Such a difference is undistinguishable by the ear, yet the difference in price of the material will frequently be as much as 10 or 15 cents per square foot. In this connection, the architect is reminded that the use of a low co-efficient absorbent over a wider area is generally more desirable than the use of a high co-efficient material on a concentrated area. It is the exception in auditoria where an absorbent of maximum co-efficient is required.

Sound Insulation vs. Sound Absorption

The architect should differentiate between sound insulation and sound absorption. The former has to do with preventing the passage of sound through walls, floors, ceilings, and other structural parts of the building. Sound absorption, on the other hand, has to do with the control of sound within a room, either reducing reverberation so that speech and music are properly heard, or reducing the noise level in the room to a minimum. Although sound-absorbing materials will in some measure reduce the amount of sound transmitted through walls and floors, their value as sound insulators does not warrant their expense.

Another point which often causes confusion of mind is that the intensity of sound as measured by physical standards does not represent the loudness of the sensation that reaches the senses. Loudness—the aural sensation of intensity—is roughly proportional to the logarithm of the physical intensity.

As well, no means are known of separating the amount of sound that passes through a sound absorbent and that which is actually absorbed (killed) by it; but even if 50 per cent. of the sound were completely annihilated, the remaining 50 per cent. would usually be sufficiently intense to permit of ordinary conversation being heard through walls. In order to stop effectively the passage of objectionable sound through walls, floors and ceilings sound insulation must be much more effective than this.

This insulation the qualified acoustical engineer can provide. It can be done in existing buildings, although it is best done during construction. Moreover, for the reason that conveyor flights, vent ducts, piping, etc., carry sound and must be insulated, sound insulation should be the work of one contractor who can be made responsible for the result.

D.G.C. SYSTEM OF SOUND INSULATION

ELEMENTS

(1) D.G.C. System of Sound Insulation for Walls, Floors and Ceilings.
(2) D.G.C. Sound Insulative Machine Bases for isolating vibration and noise in Machine Equipment.
(3) D.G.C. System of Sound Insulation for Floors in Non-fireproof Construction.
(4) Thermofill for Pipe Chases, Shafts, etc.
(5) D.G.C. Sound Insulative Door.

FLOOR, WALL AND CEILING CONSTRUCTION

Purpose

To prevent the passage of sound from one room to another.

Theory and Description

Sound passes through a wall, floor or ceiling by vibrating it as a diaphragm. In the case of a wall, the sound strikes it and sets it into vibration. The vibrating wall sets up new sound waves, reduced in intensity on the opposite side. The D.G.C. System of Sound Insulation is built upon the principle of providing a wall in which one side can vibrate while the other side does not. This is accomplished by constructing a furred surface supported on springs. These springs act as "snubbers" in reducing the amount of vibration of the surface, and because of their resiliency, prevent the remaining vibration from passing through to the opposite side.

Advantages

The D.G.C. System of Sound Insulation possesses the following advantages over other methods of sound insulation.

(1) **Permanence** — The efficiency of this construction, being primarily obtained by steel spring devices, is maintained permanently.

(2) **Fireproofness** — Only incombustible materials, steel and gypsum, are employed.

(3) **Economy** — Because of its simplicity of construction, the D.G.C. System of Sound Insulation offers a maximum of efficiency at a reasonable cost.

Sale and Installation

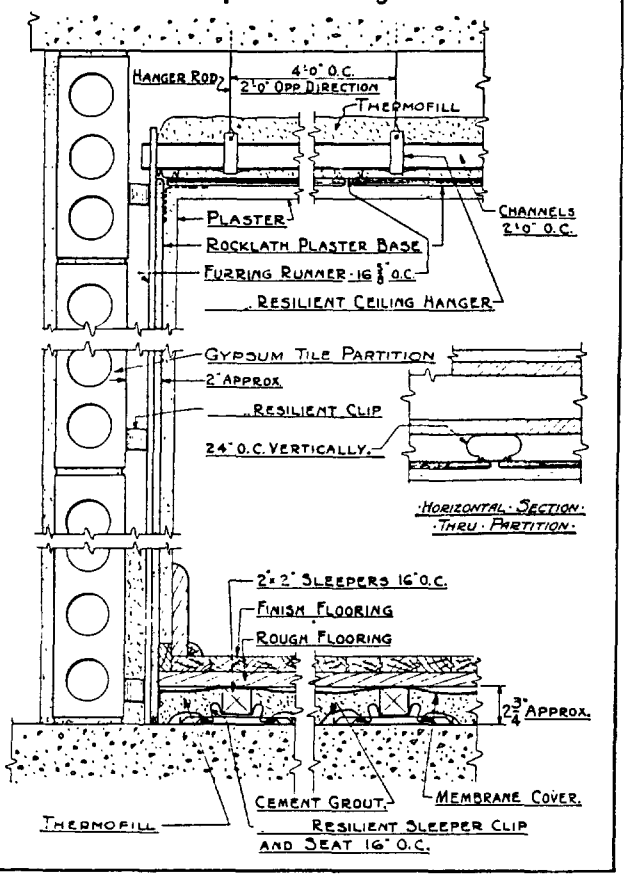
The D.G.C. System of Sound Insulation in Fireproof Construction is sold and installed only by the Dominion Gypsum Company, Ltd., which assures undivided responsibility for the results. All work is installed by trained mechanics under strict supervision.

Uses

It should be used wherever a high degree of sound insulation is required in either new or existing buildings.

Apartments, hotels, hospitals, schools, radio and talking picture studios, music studios, club buildings, theatres, bowling alleys, office buildings, etc., all require sound insulation treatment to a varying extent.

Detail Section of D.G.C. Sound Insulative Floor, Wall and Suspended Ceiling Construction



Items Furnished and Installed in the D.G.C. System of Sound Insulation (See detail, page 9)

Ceilings — Resilient Ceiling Saddles, 1½-in. Channel Runners, Furring Runners, Rocklath, Thermofill.

Note: *We do not include plaster or hanger rods. Hanger rods should be furnished by others, 2 by 4-ft. centers with first hanger 6 in. from all walls.*

Walls — Resilient Wall Clips, Furring Runners, Rocklath, Cornerite.

Note: *We do not include tile walls or plaster.*

Floors—Resilient Sleeper Chairs with tie wire and grout, Wood Sleepers, Thermofill, Paper Membrane.

Space Required by the D.G.C. System of Sound Insulation.

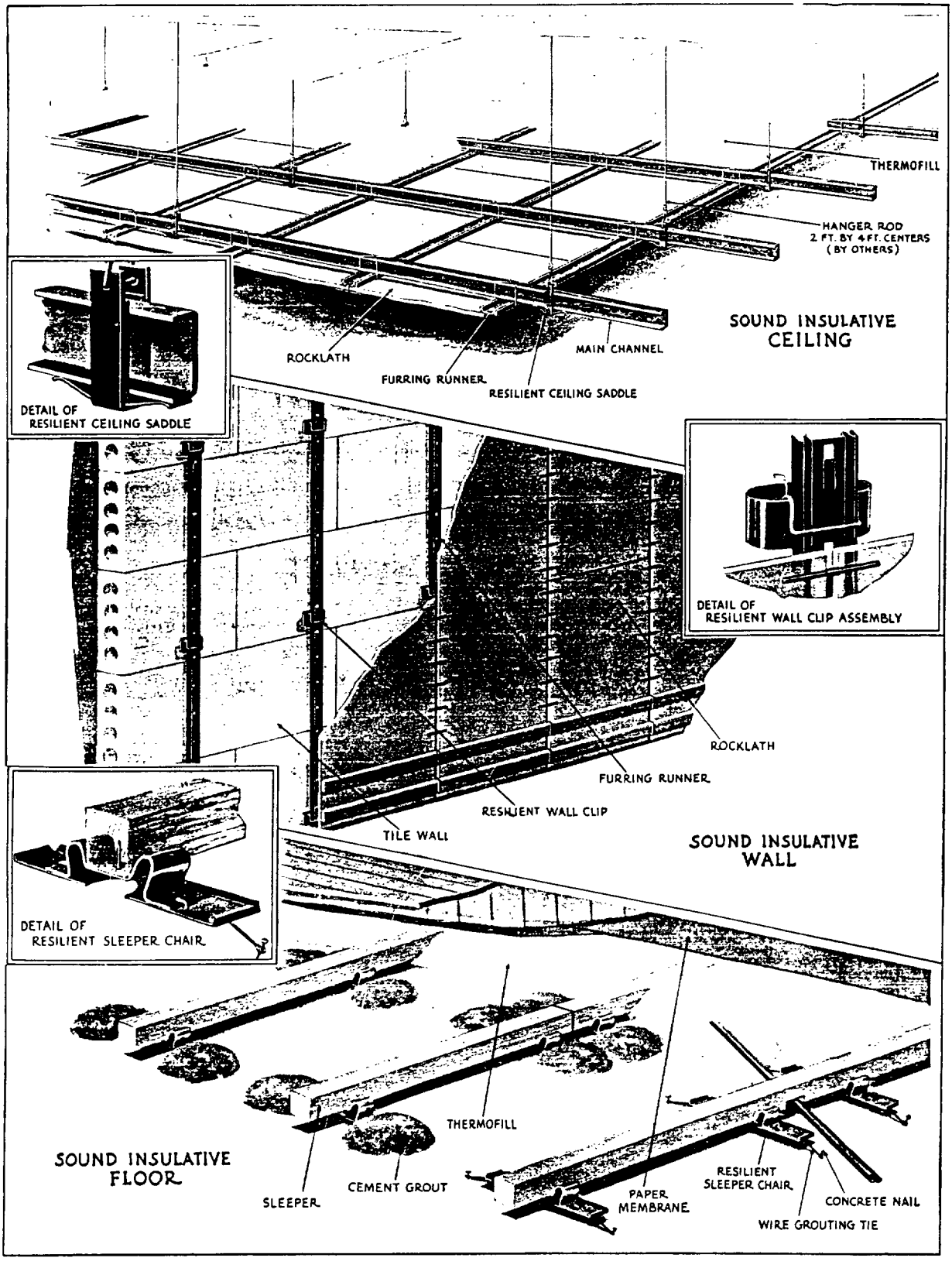
Note: *We do not include the rough and finished flooring.*

Ceiling—Not less than 6 in. to the bottom of Rocklath.

Walls—2⅛ in. from the face of tile wall to outside face of Rocklath.

Floor—2¾ in. from the top of the floor slab to the top of the wood sleepers.

DETAILS OF THE D.G.C. SYSTEM OF SOUND INSULATION



SPECIFICATION (SHORT FORM) D.G.C. SYSTEM OF SOUND INSULATION

FOR FLOORS, WALLS AND CEILINGS

Note: *Notes are explanatory or advisory only and should not be included in the specifications.*

Note: *This specification should be included under a separate heading of "Sound Insulation."*

(1) Work Included

Note: *Here list and locate clearly the walls, floors and ceilings to be treated. Also indicate the ollowing areas clearly on the plans:*

Partitions—*Indicate by heavy black line on the side to be insulated.*

Floors and Ceilings—*Indicate on room schedules and by notations on floor plans and sections.*

(2) Sound Insulation

The sound insulation as above listed and shown on plans shall be the D.G.C. System of Sound Insulation furnished and installed by the Dominion Gypsum Company, Ltd., Toronto, Ont.

D.G.C. SOUND INSULATIVE MACHINE BASES

Purpose

To prevent the transmission of noise and vibration of motors and machines in buildings.

Description

The Dominion Gypsum Company, Ltd., Sound Insulative Machine Base has been especially designed for use under machinery of all kinds to localize vibration and the resultant noise.

Its construction is essentially that of a rigid platform supported on very sensitive steel springs as is shown in the accompanying illustrations. These resilient springs "absorb" the noise and vibration of the machine so that practically none enters the floor upon which the machine rests. The platform has no continuous connection of any kind with the floor except through the resilient springs. The action of the springs in the base might be likened to those in an automobile, where the vibration and shock on the wheels is absorbed instead of being transmitted to the body of the car.

Uses

The bases are for use under fans, motors, pumps, elevator motor generators and control panels, oil burners, printing presses or any piece of equipment that is a source of vibration or noise.

Advantages

The D.G.C. Sound Insulative Machine Base possesses the following advantages:

(1) **Adaptability**—Each base is especially designed and built for the piece of equipment that it is to support. The number of springs is determined by the load and characteristics of the machine. The standard base is of all steel construction with either a concrete or a steel plate top although it may be furnished with a platform of wood planking with maple floor finish. Special bases with cast top can also be furnished.

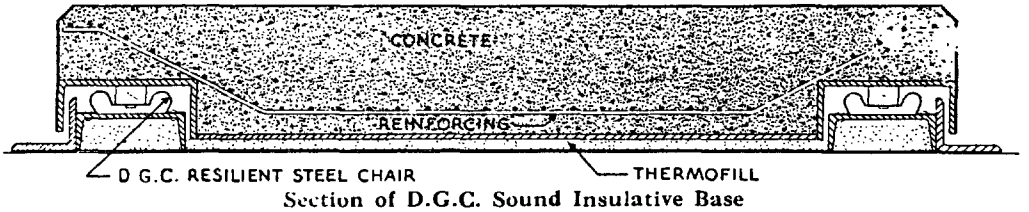
(2) **Economy**—By the use of this base, equipment can be placed in that part of the building most desirable from the standpoint of efficiency and economy, without regard as to possibility of disturbances to adjacent parts of building.

(3) **Installation**—While it will usually be found more economical to pour the concrete top at the time of erection, the base can be shipped complete with the top, and with anchor bolts imbedded therein. The wood top base can be provided with properly placed holes for bolting down the machine. The outline of the machine is clearly indicated, making installation very simple. If desired, we will furnish and install the base. The connecting of pipes, wires, ducts, etc., should be done by the proper trades. Connections should be made with a flexible coupling.

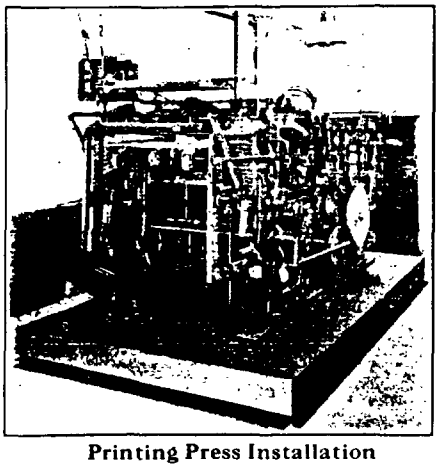
SPECIFICATION (SHORT FORM)

Note: *List under heading of "Sound Insulation."*

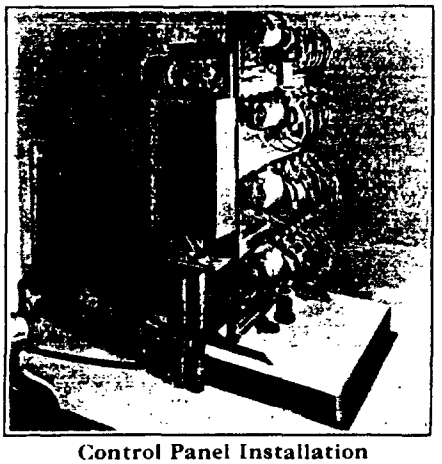
Under all (*name and describe items of equipment to be insulated*) the (*specify which*) contractor shall install D.G.C. Sound Insulative Machine Bases as designed and manufactured by the Dominion Gypsum Company, Ltd.



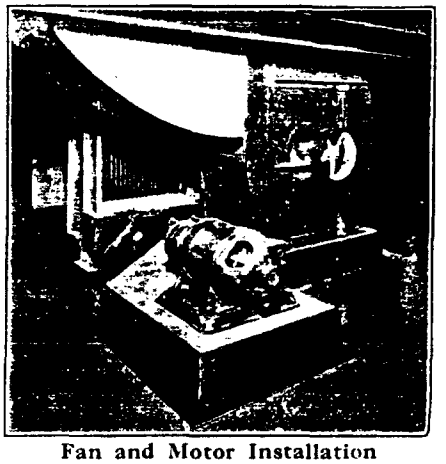
Section of D.G.C. Sound Insulative Base



Printing Press Installation



Control Panel Installation



Fan and Motor Installation

THERMOFILL FOR PIPE CHASES, ETC.

Purpose—To prevent pipes from carrying sound, the hases should be filled with Thermofill and the pipes kept ree from all floor slabs and partitions in so far as possible.

Thermofill is a dry, flocculent material of light weight, which acts as an effective sound deadener. It is easily installed and is low in cost.

D.G.C. SYSTEM OF SOUND INSULATION FOR FLOORS IN NON-FIREPROOF CONSTRUCTION

)escription

The D.G.C. System of Sound Insulation is also adapted to se on floors in wood joist construction. It is designed to urnish a high degree of sound insulation in non-fireproof build-igs at a nominal cost. Its use is particularly desirable in partment buildings of this type of construction, because of he ease with which sounds travel from one apartment to another resulting in considerable annoyance to the tenants.

Items Furnished by the D.G.C. Co.

Resilient Sleeper Chair, Thermofill, Sleepers, Paper Membrane. This construction will require 2¼ in. from the top of the rough floor to the top of the wood sleepers.

Note: *We do not include the sub or finished flooring.*

D.G.C. SOUND INSULATIVE DOOR

)escription

The Dominion Gypsum Company Sound Insulative Door mploys the same principle used in the Dominion Gypsum Company System of Sound Insulation.

The two sides of the door are supported on resilient spring levices, which allow either side of the door to vibrate under he action of sound without the vibrations passing through to he other side.

\dvantages

(1) **Fire Retarding**—Sheets of steel and asbestos on the nside of the door make it resistive to fire.

(2) **Light in Weight**—The door, because of its construc-ion, weighs but slightly more than standard 1¾-in. flush panel doors of the same size.

(3) **Regular Hardware**—No special hardware is required with these doors. The ordinary standard knob and lock set operates with this door the same as with a regular door. The undesirability of special lever handle hardware is generally recognized and a sound insulative door which operates with standard hardware fills a long felt want.

(4) **Effectiveness**—The door is built upon the scientific principle of preventing the diaphragmatic vibrations of one side of the door from being transmitted to the opposite side. Its sound insulative efficiency is, therefore, remarkably high.

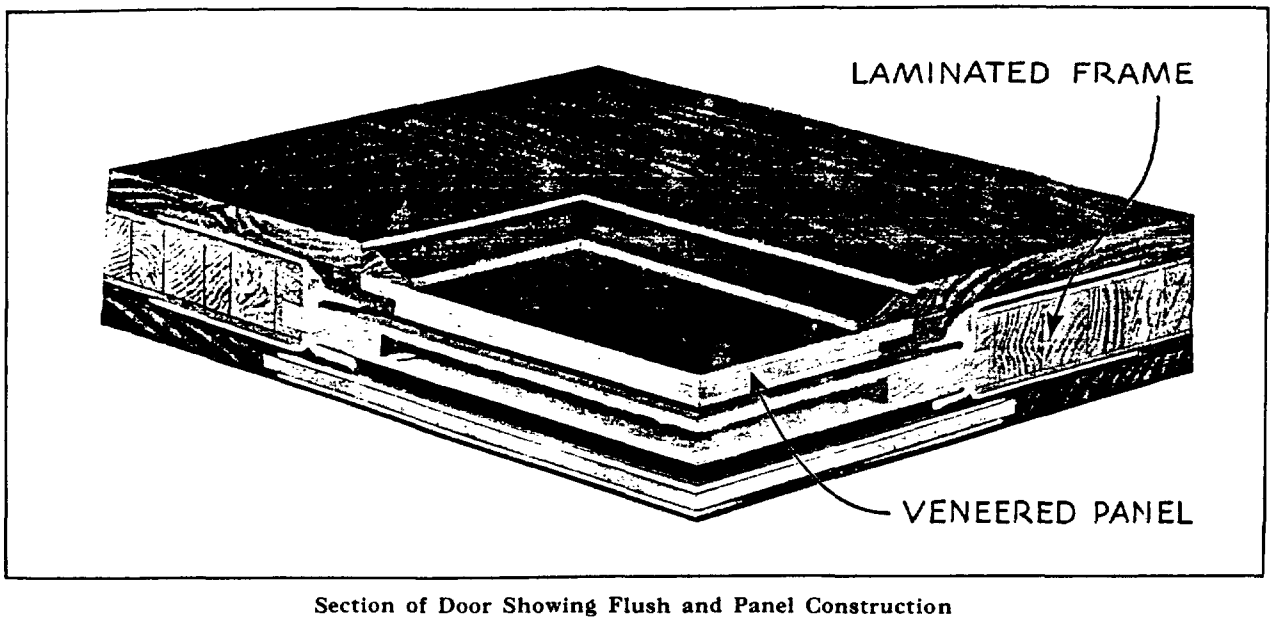
(5) **Economy**—This door, although it possesses unusual advantages in a "soundproof" door, actually costs less than "clumsy" and less efficient doors used in the past. It is priced to permit its widespread use in hotels and apartment houses.

Materials and Design

The doors are furnished standard 2¼-in. thick, in birch, unfinished, in either flush or panelled construction. Other wood veneers or any special design of panels can be furnished at slight additional cost.

Special Items Furnished

Special stops with rubber gaskets and threshold are furnished with the door. Since no special jambs, trim or hardware are required, none are included.



Section of Door Showing Flush and Panel Construction

FIREPROOF GYPSUM ROOF, FLOOR AND PARTITION CONSTRUCTION

The Dominion Gypsum Company also manufactures, sells and installs the following Fireproof Gypsum Products:

Pyrobar Gypsum Roof Tile, both Short Span and Long Span.

Sheetrock—Pyrofill Poured Gypsum Roof Construction.

Marks T System of poured Gypsum Roof Construction

Pyrofill Monolithic Poured Gypsum Roof and Floor Construction.

Pyrobar Gypsum Floor and Ceiling Tile.

Pyrobar Gypsum Partition Tile.

Pyrobar Gypsum Column, Beam and Girder Fireproofing,

Full information will be found in our Red Book of Fireproof Gypsum Roof, Floor and Partition Construction, copy of which is available on request.

DOMINION GYPSUM COMPANY, LIMITED

1221 BAY STREET - TORONTO, ONTARIO