

# RIVERBANK ACOUSTICAL LABORATORIES

GENEVA, ILLINOIS

FOUNDED 1918 BY WALLACE CLEMENT SABINE

## REPORT

FOR: Zonolite  
Division W. R. Grace & Company  
ON: Zonolite Insulating Concrete on 26 Ga Tufcor  
CONDUCTED: September 2, 1965

Sound Transmission  
Loss Test TL 66-2

### INTRODUCTION

The method used in making these measurements meets explicitly both the American Society for Testing and Materials Designation: E 90-61 T and the American Standard Recommended Practice: Z 24.19-1957 for the laboratory measurement of airborne sound transmission loss.

### DESCRIPTION OF THE SPECIMEN

The roof deck, 68-3/4 inches wide by 83-3/4 inches high was constructed within a frame made of full 2 by 8 inch lumber. Granco 26 ga Tufcor corrugated metal decks were laid side by side and overlapped 1-1/2 inches to form a continuous section. Zonolite Insulating Concrete was poured over the deck to a thickness of 2 inches at the highest point of the deck corrugation. Built up roofing and gravel were applied to the concrete to complete the structure. The concrete was allowed to cure for 39 days before application of built up roofing. Details of the construction were supplied by the client and are in the laboratory file. The specimen was constructed by the client and shipped to the laboratory for the measurement. The specimen, less frame, weighed 534 pounds, an average of 13.4 pounds per sq ft and was approximately 3-3/16 inches thick. The transmission area, S, used in the computations was 40.0 sq ft. The specimen was installed in the test opening of the receiving room in the usual manner.

### RESULTS OF MEASUREMENTS

Sound transmission loss values are tabulated below at the eleven standard frequencies. An explanation of the single figure ratings, a graphic presentation of the data, and additional information appear on accompanying pages.

FREQUENCY, cps	<u>125</u>	<u>175</u>	<u>250</u>	<u>350</u>	<u>500</u>	<u>700</u>	<u>1000</u>	<u>1400</u>	<u>2000</u>	<u>2800</u>	<u>4000</u>
TRANSMISSION LOSS, decibels	33	34	36	39	39	39	40	(44)	48	(52)	52

NINE-FREQUENCY AVERAGE 40 dB

SOUND TRANSMISSION CLASS 41

Approved F. G. Tyzzer  
F. G. Tyzzer  
Senior Physicist

Submitted by D. A. Zedonis  
D. A. Zedonis  
Experimental Engineer

The sound transmission loss of a specimen (TL) is the ratio, expressed in decibels, of the incident sound power on the source side of the specimen to the transmitted sound power on the receiving side when the sound fields on both sides are diffuse.

These measurements were made using a one-third octave pink noise source, swept in 9 minutes from 100 to 5000 cycles per second. Four runs were made, two before and two after a system interchange, and the ratio of sound pressure levels in each room recorded. The results are obtained by averaging all four runs. Both source and receiving rooms contained stationary and moving diffusing elements.

The nine-frequency arithmetic average, which excludes the values at 1400 and 2800 cycles per second, is given for comparison with previous data and for dealing with specifications still based on this index. A preferred criterion, based on actual partition requirements in typical architectural applications, is the sound transmission class. These two single number ratings provide only a preliminary estimate of the acoustical properties of the specimen. Final decisions should be based on the entire transmission loss curve or the values at all the eleven test frequencies.

If a filler wall was used in mounting the specimen, the sound power transmitted through this wall has been calculated and, if necessary, appropriate changes made in the measured results.

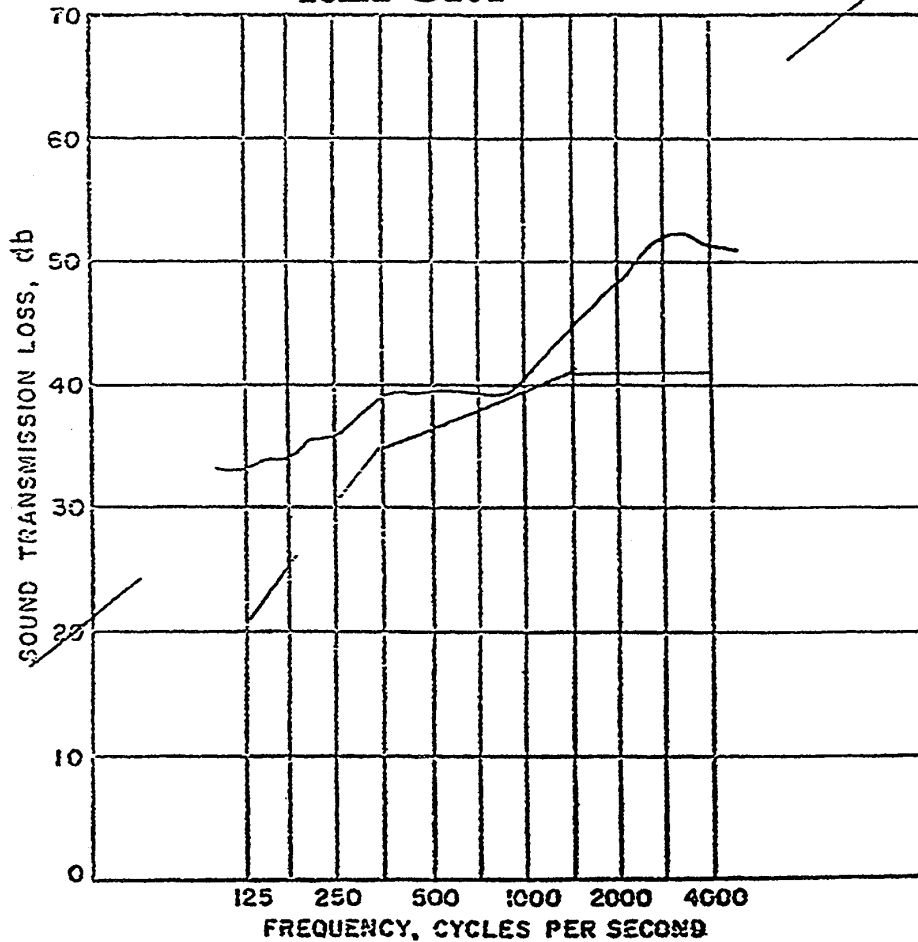
R I V E R B A N K    A C O U S T I C A L    L A B O R A T O R I E S

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GENEVA, ILLINOIS

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## REPORT



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THIS PAGE ALONE IS NOT A COMPLETE REPORT

The curved line above is the sound transmission loss of the tested specimen as derived from the measurements. The broken line is the limiting sound transmission class contour. The graph is prepared on Codex paper No. 31,463.

A straight line drawn between the two slash marks on the edges of the grid will locate the theoretical transmission loss of a limp mass with the same weight per square foot as the specimen. This is also given by the equation  $TL = 20 \log W + 20 \log f - 33$ , where  $W$  is the weight in pounds per square foot and  $f$  is the frequency in cycles per second.

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GENEVA, ILLINOIS

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## REPORT

FOR: Zonolite  
Division W. R. Grace & Company  
ON: "DY-ZO-COR"  
CONDUCTED: September 2, 1965

Sound Transmission  
Loss Test TL 66-3

### INTRODUCTION

The method used in making these measurements meets explicitly both the American Society for Testing and Materials Designation: E 90-61 T and the American Standard Recommended Practice: Z 24.19-1957 for the laboratory measurement of airborne sound transmission loss.

### DESCRIPTION OF THE SPECIMEN

The roof deck, 68-3/4 inches wide by 83-3/4 inches high was constructed within a frame made of full 2 by 8 inch lumber. Granco 26 ga Tufcor corrugated metal decks were laid side by side and overlapped 1-1/2 inches to form a continuous section. Zonolite Insulating Concrete was poured over the deck and screeded to just fill the corrugations. Zonolite Dyfoam Superboard, 1 inch thick, 1.15 pounds per cu ft density, was laid over the concrete base layer. Zonolite Insulating Concrete was poured over the Dyfoam to a thickness of 2 inches. Built up roofing and gravel were applied to the concrete to complete the structure. The concrete was allowed to cure for 39 days before application of built up roofing. Details of the construction were supplied by the client and are in the laboratory file. The specimen was constructed by the client and shipped to the laboratory for the measurement. The specimen, less frame, weighed 586 pounds, an average of 14.7 pounds per sq ft and was approximately 5 inches thick. The transmission area, S, used in the computations was 40.0 sq ft. The specimen was installed in the test opening of the receiving room in the usual manner.

### RESULTS OF MEASUREMENTS

Sound transmission loss values are tabulated below at the eleven standard frequencies. An explanation of the single figure ratings, a graphic presentation of the data, and additional information appear on accompanying pages.

FREQUENCY, cps    125   175   250   350   500   700   1000   1400   2000   2800   4000

TRANSMISSION  
LOSS, decibels    34    34    35    35    33    46    49    (52)    54    (56)    55

NINE-FREQUENCY AVERAGE 42 dB            SOUND TRANSMISSION CLASS 36

Approved F. G. Tyzzer  
F. G. Tyzzer  
Senior Physicist

Submitted by D. A. Zedonis  
D. A. Zedonis  
Experimental Engineer

The sound transmission loss of a specimen (TL) is the ratio, expressed in decibels, of the incident sound power on the source side of the specimen to the transmitted sound power on the receiving side when the sound fields on both sides are diffuse.

These measurements were made using a one-third octave pink noise source, swept in 9 minutes from 100 to 5000 cycles per second. Four runs were made, two before and two after a system interchange, and the ratio of sound pressure levels in each room recorded. The results are obtained by averaging all four runs. Both source and receiving rooms contained stationary and moving diffusing elements.

The nine-frequency arithmetic average, which excludes the values at 1400 and 2800 cycles per second, is given for comparison with previous data and for dealing with specifications still based on this index. A preferred criterion, based on actual partition requirements in typical architectural applications, is the sound transmission class. These two single number ratings provide only a preliminary estimate of the acoustical properties of the specimen. Final decisions should be based on the entire transmission loss curve or the values at all the eleven test frequencies.

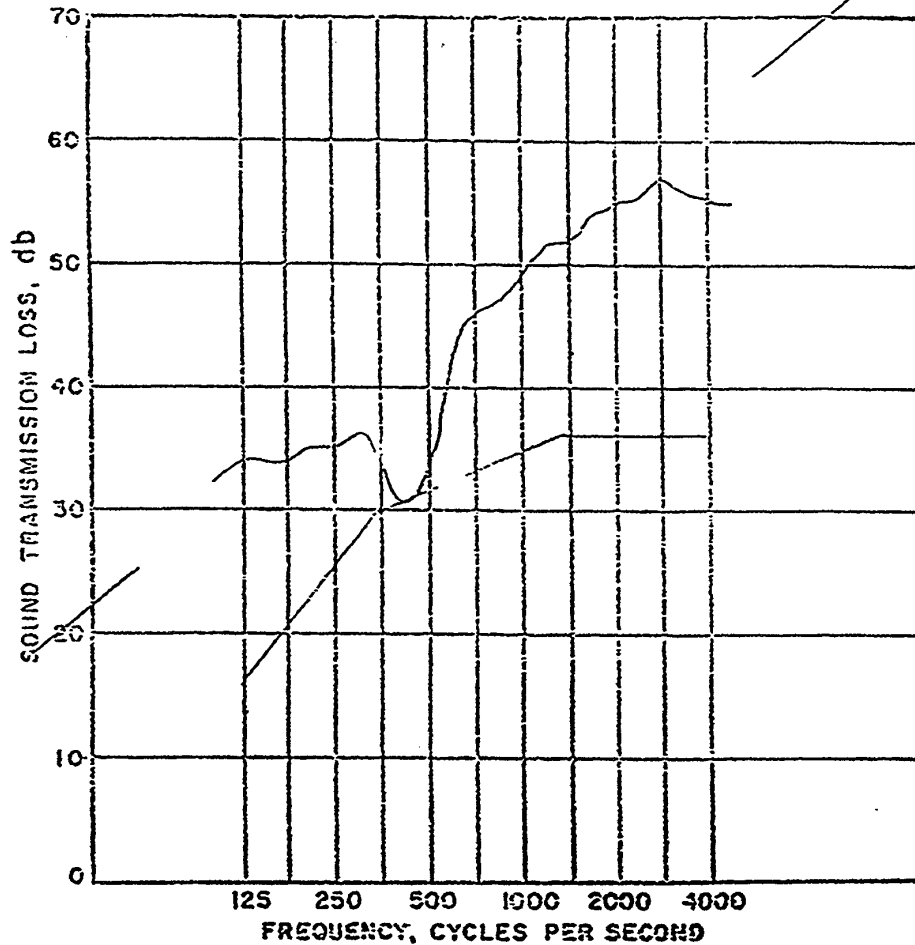
If a filler wall was used in mounting the specimen, the sound power transmitted through this wall has been calculated and, if necessary, appropriate changes made in the measured results.

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## REPORT



Page 3 of 3, TL 66-3 THIS PAGE ALONE IS NOT A COMPLETE REPORT

The curved line above is the sound transmission loss of the tested specimen as derived from the measurements. The broken line is the limiting sound transmission class contour. The graph is prepared on Codex paper No. 31,463.

A straight line drawn between the two slash marks on the edges of the grid will locate the theoretical transmission loss of a limp mass with the same weight per square foot as the specimen. This is also given by the equation  $TL = 20 \log W + 20 \log f - 33$ , where  $W$  is the weight in pounds per square foot and  $f$  is the frequency in cycles per second.



# REPORT

## ETL TESTING LABORATORIES, INC.

INDUSTRIAL PARK

CORTLAND, NEW YORK 13045

Order No. 40107K

Date: November 7, 1986

REPORT NO. 475874-A

SOUND TRANSMISSION LOSS TEST  
AND CLASSIFICATION OF  
NVS/GRM GRACE ROOFING SYSTEM

RENDERED TO

W. R. GRACE & CO.  
CONSTRUCTION PRODUCTS DIVISION

### INTRODUCTION

This report gives the results of a Sound Transmission Loss test and the determination of the Sound Transmission Class on a NVS/GRM Grace Roofing System. The system was installed in our test opening during September and October 1986.

### AUTHORIZATION

Purchase Order Number 1110IG960 dated October 6, 1986 from W. R. Grace & Company signed by Nada Veskovic.

### TEST METHOD

The specimen was tested in accordance with the American Society for Testing and Materials designation ASTM E90-85, "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions", and classified in accordance with the American Society for Testing and Materials designation ASTM E413-73 (Reapproved 1980), "Determination of Sound Transmission Class".

### GENERAL

The sound-insulating property of a partition element is expressed in terms of the sound transmission loss. The procedure for determining this quantity is to mount (and perimeter seal) the test specimen as a partition between two reverberation rooms. Sound is introduced in one of the rooms (the source room) and measurements are made of the noise reduction between source room and receiving room. The rooms are so arranged and constructed that the only significant sound transmission between them is through the test specimen.

An independent, employee-owned organization testing for safety and performance.

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THIS REPORT IS SUBMITTED FOR EXCLUSIVE USE OF THE CLIENT TO WHOM IT IS ADDRESSED. ITS SIGNIFICANCE IS SUBJECT TO THE ADEQUACY AND REPRESENTATIVE CHARACTER OF THE SAMPLES AND TO THE COMPREHENSIVENESS OF THE TESTS, EXAMINATIONS OR SURVEYS MADE. NO QUOTATIONS FROM THIS REPORT OR USE OF ETL'S NAME IS PERMITTED EXCEPT AS EXPRESSLY AUTHORIZED BY ETL IN WRITING.

GENERAL (cont'd)

The purpose of the Sound Transmission Class (STC) is to provide a single figure rating that can be used for comparing the sound-insulating properties of partition elements used for general building design purposes. The higher the rating (STC) the greater the sound-insulating properties of the partition.

DESCRIPTION OF TEST SPECIMEN

The NVS/GRM Roofing System consisted of Superbond 20 deck panels (20 gauge steel with 2" deep by 6" wide flutes spaced 12" on center) covered with 4 inches of hard rock concrete above the flutes. A 1/8" thick NVS Slurry Coat was spread over the concrete with 3" thick Insulperm insulation board laid on top. A 1-1/2" thick NVS concrete (cement to aggregate ratio of 1-3.5) topping was poured over the Insulperm board. A GRM separator sheet covered the NVS concrete and self-adhering GRM-230 was applied over the separator sheet. The exterior roof surface consisted of 3/8" gravel embedded in a gravel adhesive.

RESULTS OF TEST

<u>Band No.</u>	<u>1/3 Octave Band Center Frequency Hz</u>	<u>Sound Transmission Loss in dB</u>
(1)	125	37
(2)	160	42
(3)	200	40
(4)	250	41
(5)	315	44
(6)	400	48
(7)	500	54
(8)	630	58
(9)	800	62
(10)	1000	65
(11)	1250	67
(12)	1600	68
(13)	2000	73
(14)	2500	78
(15)	3150	78
(16)	4000	79
	Sound Transmission Class	<u>55</u>



Report No. 475874-A

3.

REMARKS

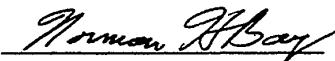
1. Aging Period      40 Days
2. Ambient Temperature      72°F
3. Relative Humidity      40%

CONCLUSION

The test method employed for this test has no pass-fail criteria, therefore, the evaluation of the test results is left to the discretion of the client.

Date of Test - November 4, 1986

Report Approved by:

  
Norman H. Bay, Manager  
Acoustical Division

QTXT