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FREEWAY TRAFFIC NOISE OUTSIDE AND INSIDE

SELECTED LOS ANGELES CITY SCHOOLS

70-34

January 14, 1970

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State of California 4441 Highway Transportation Agency

Memorandum

To : Mr. Haig Ayanian
District Engineer
District 07

Attention: Mr. A. D. Mayfield
Asst. District Engineer

Date: January 14, 1970

File : 19103-762550-31190
Your: 07-LA-118 R9.0/R10.0
07205-022821

From : **Department of Public Works—Division of Highways**
Materials and Research Department

Subject: Freeway Traffic Noise Outside and Inside Selected Los Angeles City Schools.

INTRODUCTION

Pursuant to prior arrangements made through the District Office, a meeting was held on December 4, 1969, at the County Board of Education Office, 1425 South San Pedro Street, regarding freeway noise problems at certain schools in the Los Angeles area. Attending this meeting were:

Mr. Harry B. Saunders - Director, School Building Planning City of Los Angeles

Mr. A. D. Mayfield - Division of Highways, Design C

Mr. R. W. Sassaman - Division of Highways, Design C

Mr. Louis Bourget - Division of Highways, Materials and Research Department, Sacramento

Mr. Saunders presented a report of noise measurements taken by Mr. M. Rettinger, Acoustical Consultant, at six schools within the Los Angeles City Unified School District.

It was agreed that the Division of Highways should make a survey of the probable future noise penetration at Haskell School from the activation of Route 118, now under construction, and consider the merit of noise barriers and other means for noise control. It was also agreed that the Division of Highways would make exterior and interior noise tests at the schools mentioned in Mr. Rettinger's report and evaluate means for reducing external noise penetration to a desirable 45 to 50 dBA region within exposed classrooms, exclusive of internally generated noise from school activity.

SUMMARY OF FINDINGS

The benefits of employing noise barriers along highways are recognized but are very expensive for the amount of noise reduction that may be obtained. Division of Highways cost estimates

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vary from $185,000 to $250,000 per mile for one side of a highway. In addition, favorable geometry must exist so that a wall or earth mound of practical dimensions can shield most (or all) of the noise source from view[1,2,3]. Trucks that are only half hidden are reduced about 4 to 6 dBA. Fully hidden trucks may be reduced about 10 to 12 dBA. If the truck noise reduction needed is greater than 10 or 12 dBA, or if aircraft noise is also a problem, it is usually essential to reduce the noise penetration at the windows and doors and to employ air conditioning for the interior. Exterior noise reductions of 25 to 35 dBA are possible by this method, depending upon the employment of sealed single or double windows[4,5].

None of the exposed classrooms examined gave evidence that noise barriers alone could free them from the need for either sealed single or double windows which will require that they be air conditioned. The survey does indicate that adequate window treatment, air conditioning, and weather stripping of exterior classroom doors can accomplish a reduction of external traffic noise to acceptable levels without the employment of noise barriers.

ORDER OF PRESENTATION

The noise test findings are presented in the following order:

1. Haskell School
   15850 Tulsa Street
   Granada Hills
   (north side of Rte. 118 under construction)

2. Riggin School
   4865 E. First Street
   Los Angeles
   (north side of Route 60)

3. Second Street School
   1942 E. Second Street
   (west side of Route 5/10)

4. Sixty-First Street School
   6020 S. Figueroa St.
   Los Angeles
   (west side of Route 11)

5. Reed Jr. High School
   4525 Irvine Avenue
   North Hollywood
   (south side of Route 101)

6. Hesby Street School
   15530 Hesby Street
   Encino
   (south side of Route 101)

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7. Ninety-Seventh Street School
419 W. 98th Street
Los Angeles
(west side of Route 11)

NOISE TEST FINDINGS

1. Haskell Avenue School

Nearest classroom exposure to Route 118	310 feet
Playground exterior noise peaks during recess near Room 6, as shown in recording 1-A. Not a problem, as most classes recess simultaneously	80-90 dBA
Interior noise, Room 6, during recess with closed windows, recording 1-B	54-63 dBA
Noise reduction with closed windows	26-27 dBA
Future exterior noise from freeway, similar to recording 1-C at 310 feet from Route 11	66-76 dBA
Future interior noise in nearest classrooms with air conditioning and closed windows, see Chart 1-D. This is based on an exterior noise reduction of 25 dBA. (Note the resemblance to recording 4-B where a similar reduction has been achieved.)	45-51 dBA
Future exterior noise with a 10 foot barrier. (This may be optimistic as the super elevation is unfavorable.)	60-66 dBA
Future interior noise with open windows and no air conditioning (with barrier)	50-56 dBA

Considerations:

Air conditioning with closed windows permits two distinct advantages over the use of a noise barrier; one is a better reduction of all exterior noise sources including aircraft and two is a superior classroom learning environment through the control of ventilation and temperature.

A noise barrier would resemble a wall at least 10 feet high and would have to extend beyond each end of the school property for an additional distance of 300 feet. The total length required would be about 1200 feet. The structure would be monstrous in both size and cost, and could lead to serious objections about its appearance. Other complaints could arise from noise enhancement in directions opposite to the school. It is suggested that air conditioning of the affected school classrooms, with weather stripping of the doors and sealing of the windows, offers the more practical solution to the noise problem.

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2. Riggin School

Approximate distance to nearest lane of Route 60 (south classrooms)	140-160 feet
Exterior noise peaks from trucks; see recording 2-A outside of Room 40	79-87 dBA
Interior noise, Room 40, with closed windows; see recording 2-B	57-62 dBA
Noise reduction required for a desirable 45 to 50 dBA range inside empty classrooms	12 dBA

Noise barrier considerations:

Noise barriers are not a feasible method for achieving the desired 12 dBA of noise reduction because the first and second story windows rise higher than 15 feet above the grade line and would still be exposed to direct noise paths from trucks over the top of any barrier of practical dimensions.

Preferable solutions:

Noise penetration can be reduced to acceptable levels by filling the window apertures at the front and sides of the building with glass block mortared in place or by installing double glazing with as much spacing as possible between the inner and outer panes. This method will also require air conditioning of the treated rooms to provide ventilation and temperature control.

3. Second Street School

Approximate distance to Route 5/10 (east classrooms)	100 feet
Exterior noise peaks from trucks; see recording 3-A outside 2nd floor windows	77-84 dBA
Interior noise with closed windows; see recording 3-B	58-64 dBA
Noise reduction required for a 45 to 50 dBA range inside empty classrooms	14 dBA

Noise barrier considerations:

A noise reduction of 14 dBA may not be feasible with noise barriers because of the ramp aperture which offers both direct and indirect flanking paths for noise escapement to the school property.

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Preferable solution:

Similar to the suggestions for Riggin School. Seal the exposed window apertures with either glass block or widely spaced double glazing and air condition the rooms requiring this treatment. The exposed rooms are along the east face of the building and may include some side rooms near the east end of the building. Exterior classroom doors on the east side may require weather stripping.

4. Sixty-First Street School

Approximate distance to Route 11 (east classrooms)	150 feet
Exterior noise from aircraft and trucks; see recording 4-A	70-79 dBA
Noise inside Room 33 with air conditioning and closed windows; recording 4-B	45-51 dBA (acceptable)
External noises are reduced by	25 to 28 dBA

This is a realistic example of the noise reduction that can be accomplished by the two step approach of air conditioning and reducing noise penetration at the windows. In this case the job was made somewhat easier by the fact that the existing windows face away from the highway noise source rather than toward it. These bungalow classrooms are now probably more vulnerable to noise from the connecting classrooms than from the penetration of external traffic noise.

5. Reed Jr. High School

Approximate distance to Route 101 (north classrooms)	160-200 feet
Exterior noise peaks from trucks, as shown on recording 5-A	74-83 dBA
Noise inside Rooms 215/216 with closed windows; recording 5-B	53-63 dBA
Noise reduction required for a 45 to 50 dBA range inside empty classrooms	13 dBA

Considerations:

The need for closed windows and air conditioning will exist whether or not a noise barrier is employed. The extra 13 dBA of noise reduction that will be required is economically more practical through the use of glass block or wide spaced double glazing of the exposed window apertures than by means of a noise barrier. A noise

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barrier wall would have to be about 10 feet high and extend past the school and beyond the classrooms at both ends for an additional distance of at least 300 feet. The total length required would be around 850 to 900 feet and would be monstrous in both size and cost. Serious objections are anticipated from the appearance of such a structure and the possibility of noise enhancement in directions opposite to the school.

6. Hesby Street School

Approximate distance to Route 101 (north classrooms)	250 feet
Exterior noise peaks from trucks, recording 6-A	70-79 dBA
Interior noise Room 23 during recess with closed windows and air conditioning, recording 6-B	48-54 dBA
These conditions are regarded as acceptable and should be compared to the noise generated by one student entering and leaving the room during the recess period	60-69 dBA

Suggestion:

An additional 3 to 5 dBA reduction of exterior noise penetration may be possible by caulking the windows. The windows of this classroom face toward the playground and the Ventura Freeway.

7. Ninety-Seventh Street School

Approximate distance to Route 11		280 feet
Exterior noise peaks from traffic, recording 7-A		70-78 dBA
Sporadic peaks from aircraft (measured but not encountered during chart run)		75-85 dBA
Interior Room 10 with closed windows, recording 7-B	Aircraft	58-66 dBA
	Trucks	50-58 dBA

Noise barrier considerations:

Noise barriers would be futile because aircraft are the highest level noise sources and are responsible for the greatest noise penetration.

Preferable solution:

The reduction of external noise may best be accomplished by the installation of air conditioning and either glass block or double glazing of the window apertures. The demands of the environment offer no other alternatives of equal merit for noise reduction.

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EQUIPMENT EMPLOYED

General Radio 1551-C Sound Level Meters #1287, 2285

General Radio 1521-A Graphic Level Recorders

General Radio 1562-A Sound Level Calibrator #887

The measuring equipment meets the requirements of the United States of America Standards Institute S1.4-1961.

All of the measurements are expressed in dBA (decibels on the A scale of a sound level meter). This is a current standard practice for evaluating interior noise or external noise from motor vehicle sources[6,7]. Acoustical calibration was performed prior to each outdoor and indoor test.

REFERENCES

1. Harris, C. M. (ed), "Handbook of Noise Control", Chap. 3. McGraw-Hill, 1957.

2. Rettinger, M., "Noise Level Reduction of Barriers", Noise Control, Sept. 1957.

3. Goodfriend, L. S., "Control of Highway Noise", Sound and Vibration. June 1967 (U. S. per.).

4. Bolt, Beranek and Newman, Inc., "A Study, Insulating Houses from Aircraft Noise", Dept. of Housing and Urban Developments. Federal Housing Administration, Nov. 1966.

5. Sabine, H. J., Morgenroth, D. E., "Solutions to Noise Control Problems in the Construction of Houses, Apartments and Hotels". Owens-Corning Fibreglas Corp., Toledo, Ohio. (2nd Printing 1965).

6. Hillquist, R. K., "Objective and Subjective Measurement of Truck Noise", Sound and Vibration, U. S. Per. April 1967.

7. Young, R. W., "Single Number Criteria for Room Noise", Jour. Acous. Soc. of America, February 1964.

John L. Beaton

JOHN L. BEATON
Materials and Research Engineer

LB:mw
Attach.

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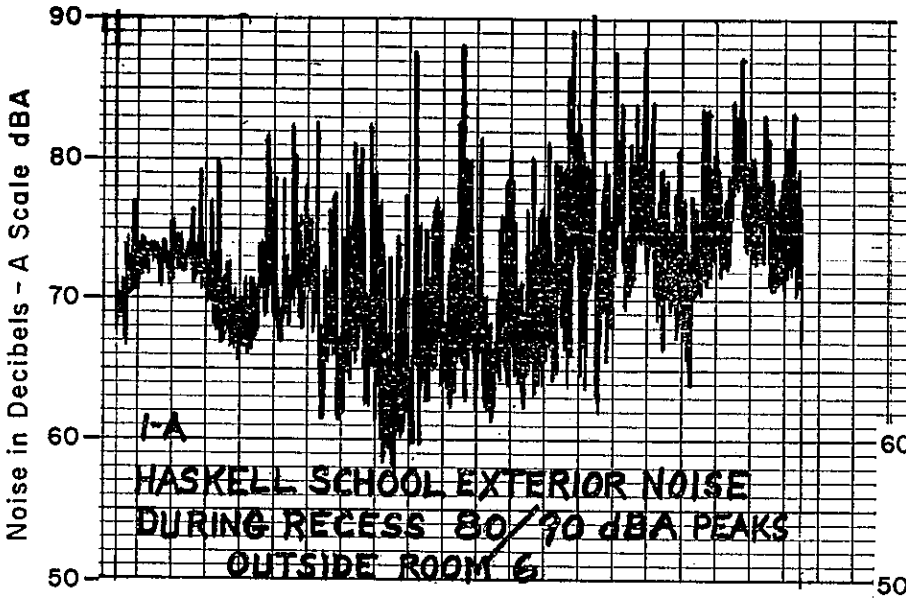

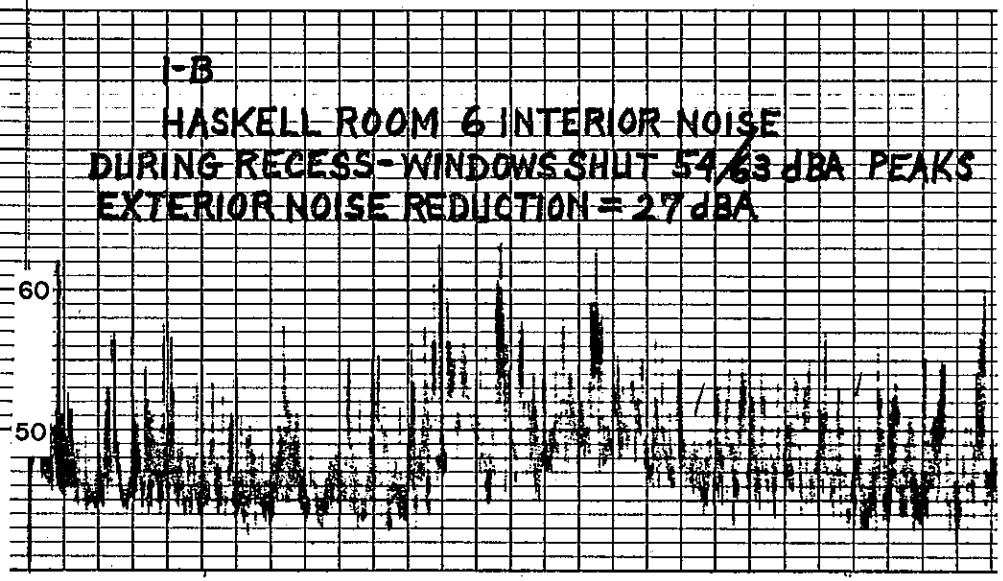

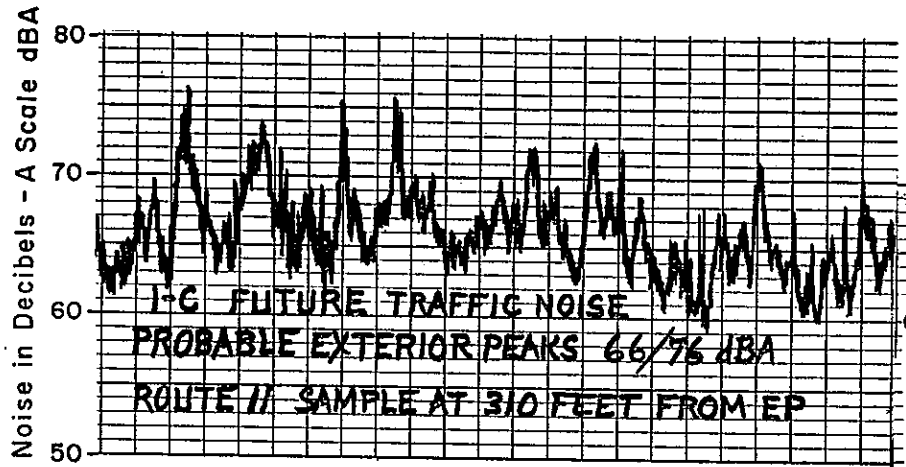

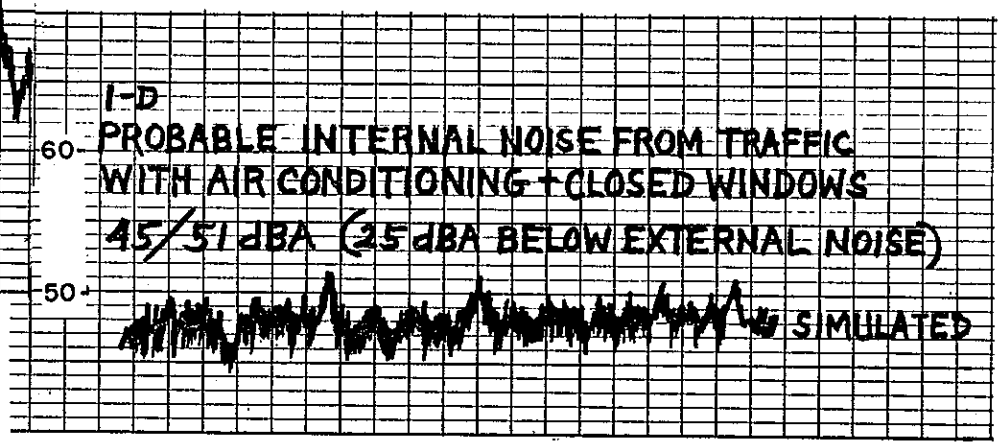

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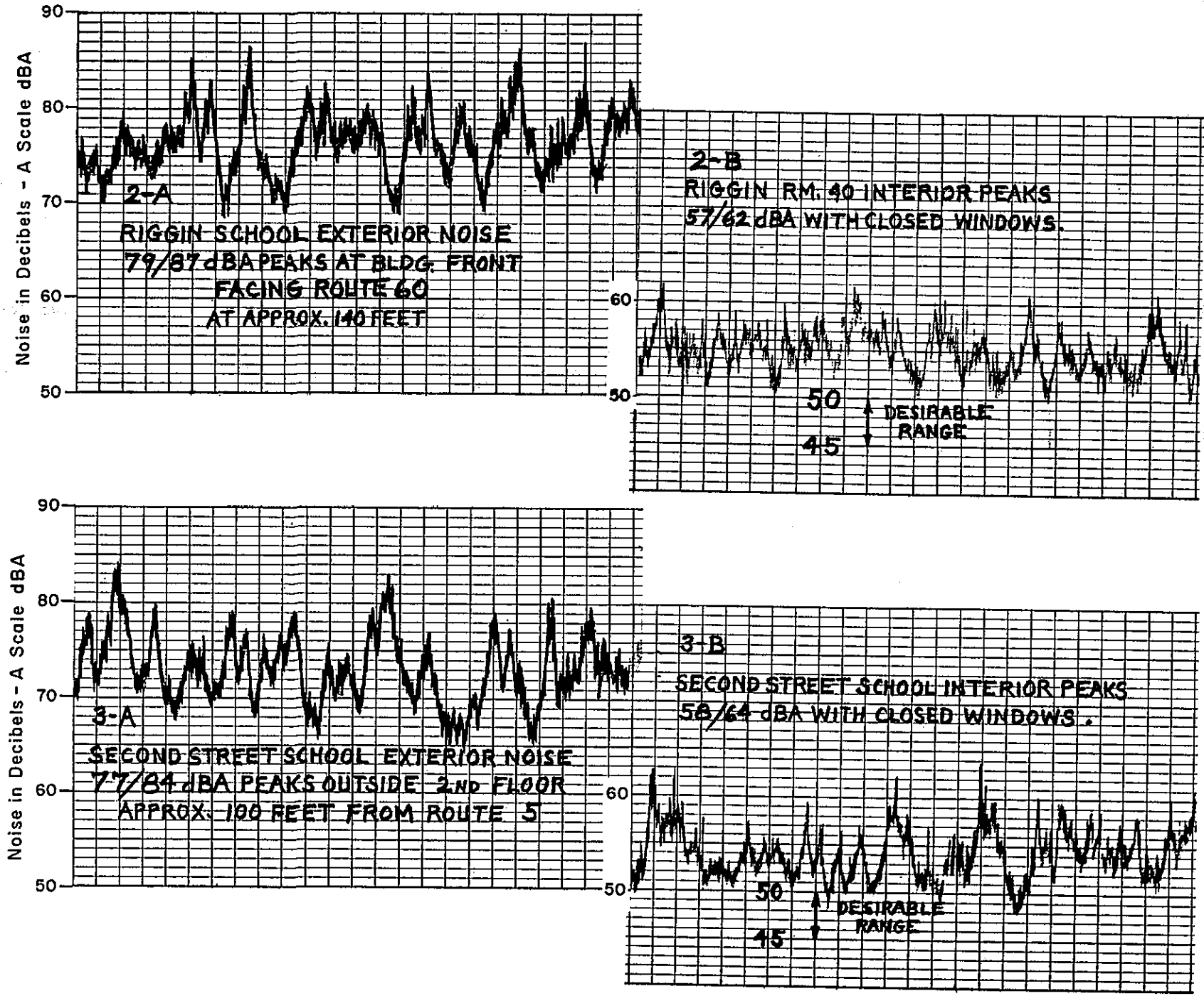

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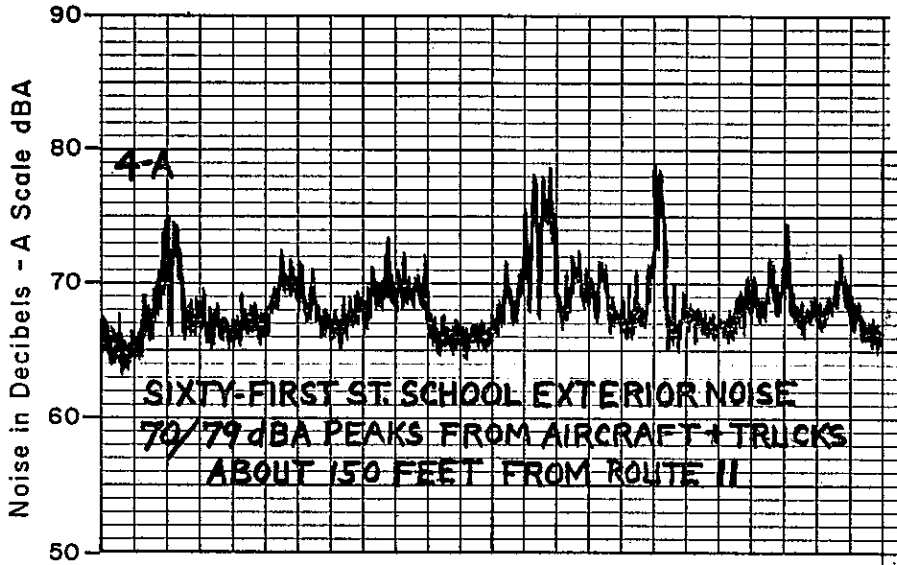

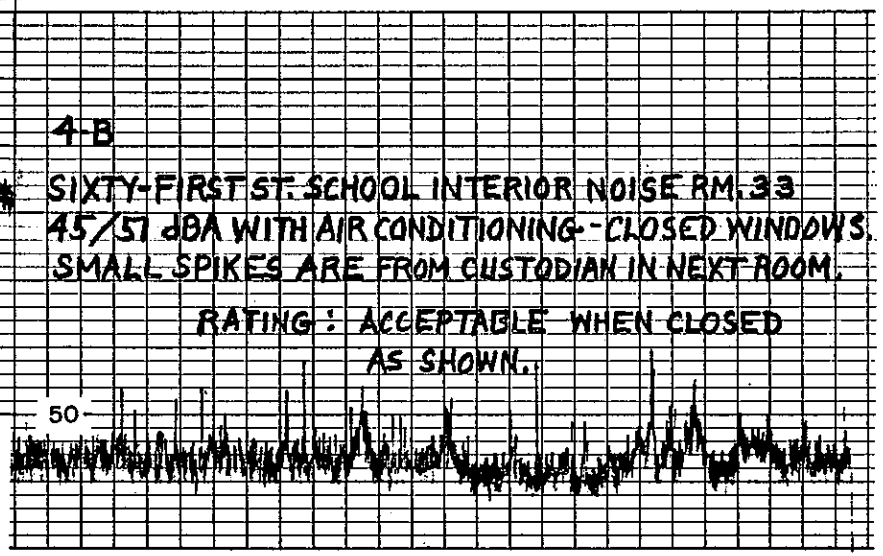

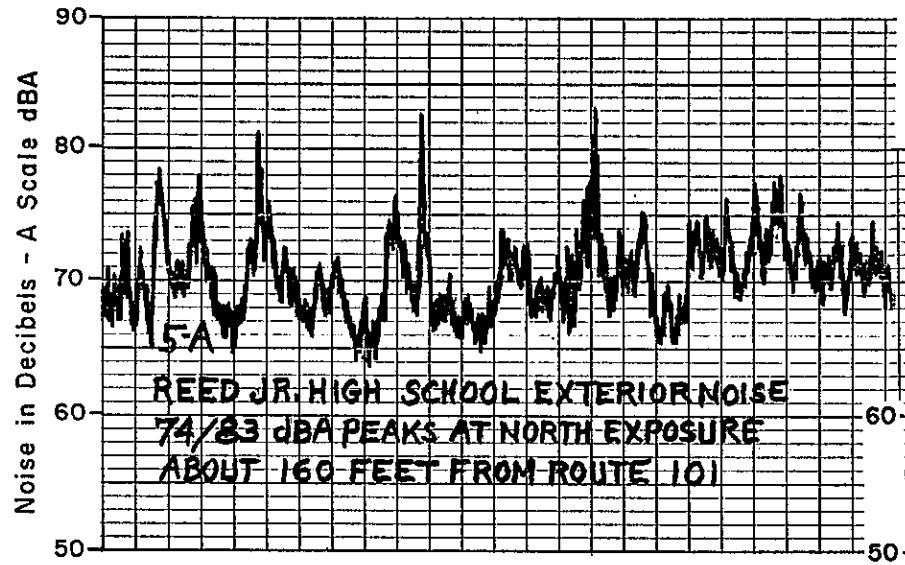

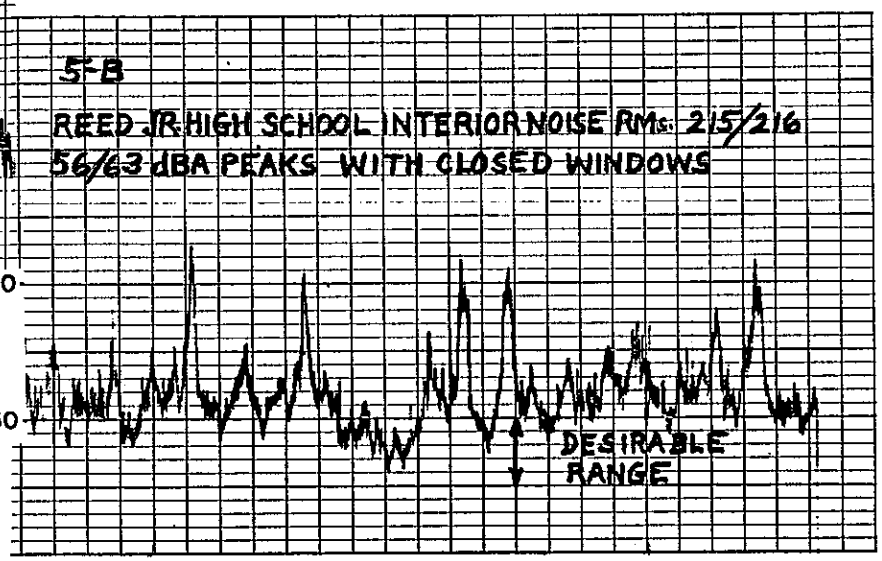

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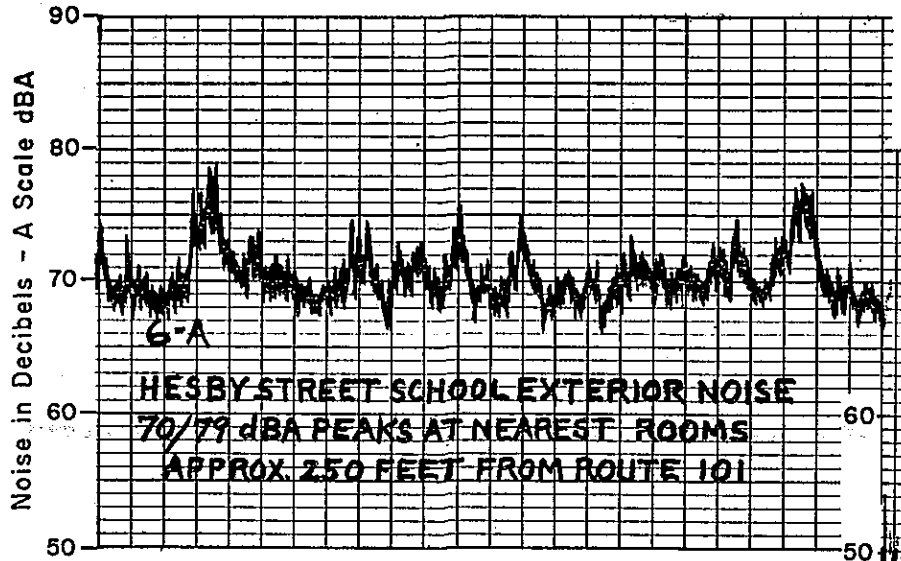

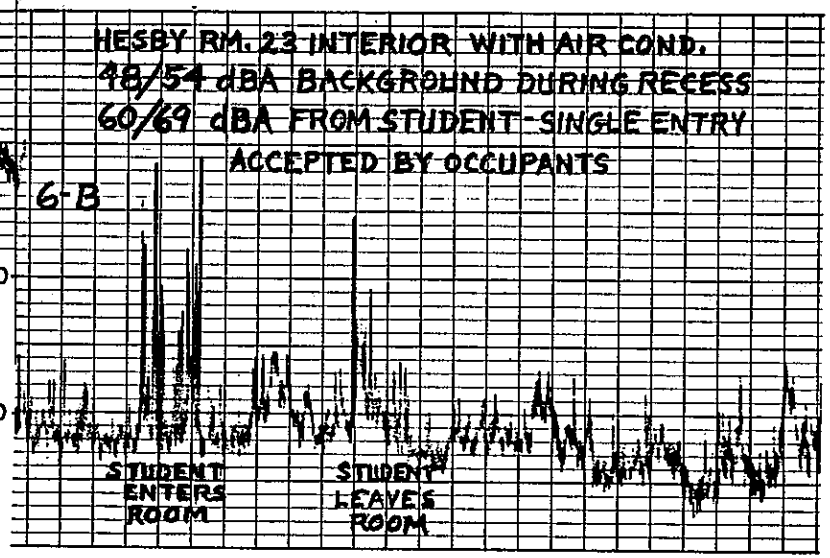

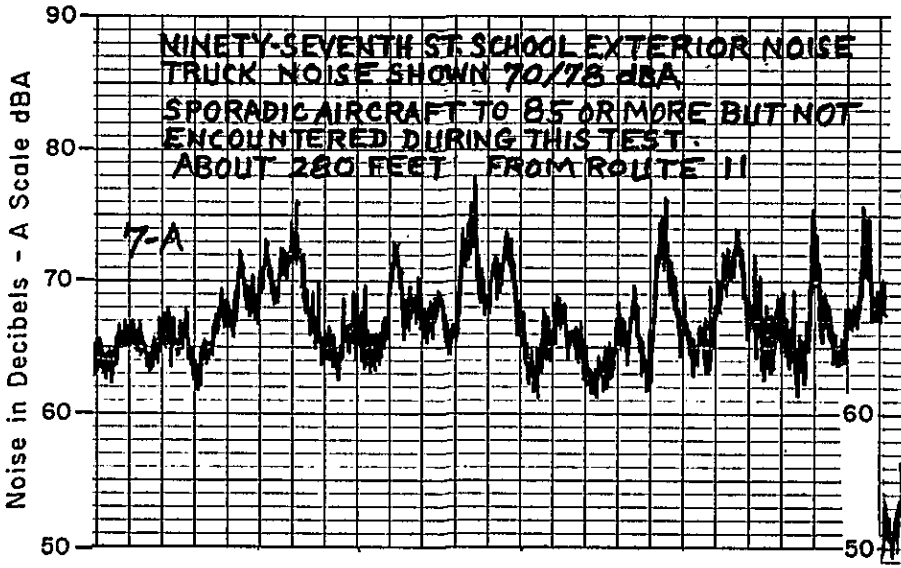

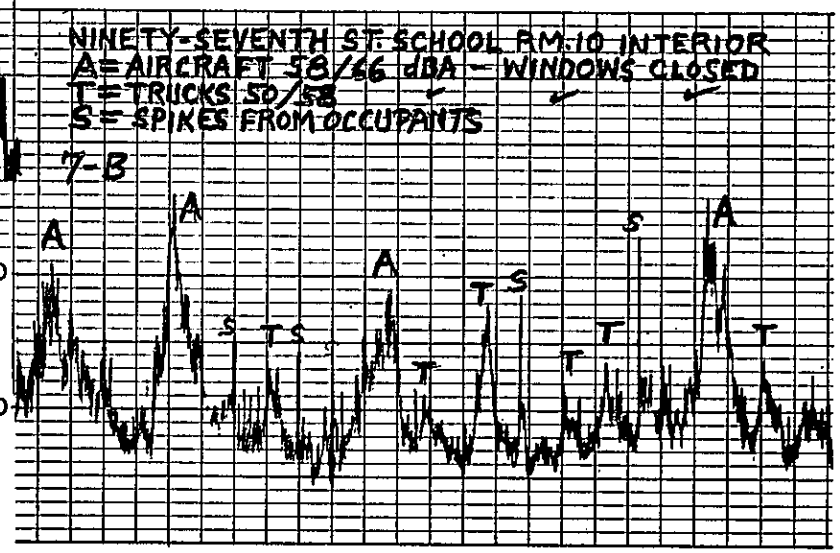

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