Highway Traffic Noise Barrier Construction Trends - Introduction

The Federal-aid highway program has always been based on a strong State-Federal partnership. At the core of that partnership is a philosophy of trust and flexibility, and a belief that the States are in the best position to make investment decisions that are based on the needs and priorities of their citizens. The FHWA noise regulations give each State department of transportation (SDOT) flexibility in determining the reasonableness and feasibility of noise abatement and, thus, in balancing the benefits of noise abatement against the overall adverse social, economic, and environmental effects and costs of the noise abatement measures. The SDOT must base its determination on the interest of the overall public good, keeping in mind all the elements of the highway program (need, funding, environmental impacts, public involvement, etc.).

The flexibility in noise abatement decision-making is reflected by data indicating that some States have built many noise barriers and some have built none. Through the end of 2001, 44 SDOTs and the Commonwealth of Puerto Rico have constructed over 1,831 linear miles of barriers at a cost of over $1.9 billion ($2.5 billion in 2001 dollars). Six States and the District of Columbia have not constructed noise barriers to date. A detailed listing of noise barrier data may be found in "Summary of Noise Barriers Constructed by December 31, 2001." The paper that follows presents a brief analysis of the data contained in the detailed barrier listing.

It should be noted that the cost data in the listing are approximate due to differing State practices for estimating costs and due to the fact that for some barriers (28 miles), the cost could not be estimated at all. The data represent best estimates of SDOTs for barrier construction. There may be non-uniformity and/or anomalies in the data due to differences in individual SDOT definitions of barrier information.

It should also be noted that California and Arizona did not provide data for the years 1999, 2000, and 2001. This fact greatly affects data for these years, since California constructs many noise barriers annually (119 miles costing 134 million in 2001 dollars for 1994-1998) and California has constructed twenty-three percent (23%) by area of all noise barriers to date.

NOISE BARRIER CONSTRUCTION

Tables 1-9 provide data on barrier construction, height, materials, and unit costs (all cost information is in 2001 dollars). The following points may be made concerning noise barriers:

1. Approximately twenty-six percent (26%) of total expenditures have occurred in the last five years [fifty-four (54%) in the last 10 years; eighty (80%) in the last 15 years].
2. Through the end of 2001, the overall average unit cost, combining all materials, is $19 per square foot. The average unit cost, combining all materials, for the last 10 years is $20 per square foot.
3. Approximately 108 miles of barriers have been built with highway program monies other than Federal-aid. Approximately 45 miles of barriers have been built with Toll facility funds.
4. Overall by length, approximately seventy-five percent (75%) of Federal-aid barriers have been Type I (a barrier built on a highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes).
5. Forty-four States and the Commonwealth of Puerto Rico have constructed more than 1,293 linear miles of Type I barriers, at a total cost of more than $1.6 billion.
6. Twenty-three States have constructed at least one Type II noise barrier (a barrier built along an existing highway, i.e., a retrofit noise barrier), at a total cost of more than $743 million.
7. Six States have not constructed any noise barriers to date: Alabama, Mississippi, Montana, North Dakota, Rhode Island, and South Dakota.
8. Ninety-four percent (94%) of barriers that have been constructed range in height from 6-20 feet. One percent (1%) of barriers are less than 6 feet tall and five percent (5%) are more than 20 feet tall. The overall average barrier height is 14 feet.
9. Barriers have been made from materials that include concrete, block, wood, metal, earth berms, brick, and combinations of all these materials. Concrete and block, for single material barriers, represent just under four-fifths of total material usage [fifty-three point six percent (53.6%) and twenty-six percent (26%), respectively] and wood ten percent (10%). Metal, berm, and brick together account for approximately seven percent (7%) of the total. Six percent (6%) of all barriers have been constructed with a combination of an earth berm and a wall. Almost two percent (2%) have been constructed with absorptive materials. One percent (1%) has been constructed with other materials, such as recycled materials, plastics, composite polymers, etc
10. Average unit costs for all years for all barrier materials range between $16-26 per square foot, except for earth

berms, which average only $5 per square foot. Concrete has been the most popular material; however, its cost, $21 per square foot, is only slightly less than that of brick, $23 per square foot. Overall average costs for wood, metal, and combination barriers are approximately the same ($17, $16, and $17 per square foot, respectively). Absorptive barriers average $26 per square foot in cost.

11. There are no brick barriers over 20 feet tall or absorptive or metal barriers over 26 feet tall. A berm has been constructed to a height of 36 feet, a combination berm and wall to 39 feet, a wood/post and plank barrier to 58 feet, a block barrier to 49 feet, and a concrete barrier to 36 feet.
12. Unit costs for barriers do not always appear to increase as the barrier height increases (Note: This may be due to non-uniformity and/or anomalies in the data reported by SDOTs).
13. Barrier height averages from 17-20 feet in four States. Barrier height averages 10-16 feet in 35 States, and 7-9 feet in five States.
14. Barrier average unit costs are from $5-10 dollars per square foot for three States, $11-15 per square foot for 16 States, $16-20 per square foot for 13 States, $21-25 per square foot for six States, and $26-30 per square foot for the remaining six States.

SUMMARY

Forty-four States and the Commonwealth of Puerto Rico have constructed highway traffic noise barriers; six States and the District of Columbia have not. The most notable trend in highway traffic noise barrier construction is that SDOTs spend more than $100 million of highway program funds annually for this form of noise abatement. Starting in 1992, SDOTs have averaged spending more than $139 million per year. Since the first highway traffic noise barrier was constructed, sixty-five percent (65%) of all spending has been for Type I projects, and twenty-nine percent (29%) for Type II projects.

Most barriers have been made from concrete or masonry block, range from 9-17 feet in height, and average $16-21 per square foot in cost.