Techniques for Aesthetic Design of Freeway Noise Barriers

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Guidelines and suggestions for the improved design of freeway noise barriers in urban areas are provided. The guidelines have been developed to encourage an attractive and efficient system of noise control and to achieve design continuity throughout the area. How inventories of the technical, cultural and natural landscape can be used in design is illustrated. A variety of techniques of wall shape and texture and landscaping application that can be adapted to specific environments is provided. The desired approach views the wall and landscape as an integrated system that should be designed to reflect and enhance the surrounding community. Diversity in design of both the wall and landscaping should be sought and systems should be designed to reflect the historic and ethnic heritage of the neighborhoods. A broad range of options should be provided that can creatively enhance the environment that is seen as well as heard along freeways. The concepts developed are illustrated through several prototype designs.

Noise barriers are increasingly used to solve problems of noise pollution from freeways in urban areas. Concern for the negative impacts of noise on the environmental quality of adjacent properties prompted many highway agencies to set maximum allowable noise levels for areas adjacent to freeways. These noise levels are often exceeded in nearly all segments of urban freeway with normal levels of freeway traffic. Consequently noise barriers could be warranted for large portions of the freeway network and there could be a need to build extensive systems of noise barriers over the next decade. As a result of these concerns, many cities and states are in the process of retrofitting their urban freeways with noise barriers. These projects are often implemented with relatively little attention given to their aesthetic impact on the environment.

Noise barriers can have a substantial effect on the visual environment of a highway and its surrounding environment. They are long continuous structures, often more than 10 ft high, made of various materials. They can significantly change the view from the road by blocking the view of the roadside and creating a monolithic uniformity of walls instead of changing urban scenery. They also can change the view towards the road for the surrounding community. There can be an increased sense of the noise barrier as a community barrier that separates an area from other places. Nonetheless, noise barriers may be highly sought after by neighborhoods as a means for reducing noise levels related to freeways. What is needed is a way to provide the benefits of the sound reduction while at the same time creating a positive visual image for road users and the surrounding communities. Ways in which this can be done are suggested.

A larger report (*1*) was prepared in response to a legislative mandate of the State of Wisconsin to examine aesthetic issues related to noise barriers. The report was prepared in cooperation with the Wisconsin Department of Transportation, the city of Milwaukee, and the Southeastern Wisconsin Regional Planning Commission. In addition, previous work in the U.S. (*2–5*) and overseas (*6*) provided a basis for this work.

GOALS AND OBJECTIVES

The goal of this project was to develop a process for planning of noise barriers that enhance and improve the aesthetic quality of the freeway environment. This goal has two primary objectives:

1. To analyze the system-wide area to identify prominent physical and cultural patterns that describe and express the character of urban areas. This objective is based on the fact that barrier locations are not always continuous but must fit into a continuous freeway environment. It is intended that analysis of the system-wide environment will serve as the basis for integrating barriers into the overall urban context.
2. To explore alternative design solutions for barriers in site-specific contexts. Specifically, these designs should accomplish the following:
   a. Integrating the design of new barriers and landscape,
   b. Integrating the new barriers and landscape with existing barriers and landscape.
   c. Designing the new walls as attractively as possible to minimize the need for screening them with landscaping, and
   d. Designing the barrier and landscape to reflect and enhance the specific cultural and physical characteristics of the neighborhoods.

BASIC DESIGN PRINCIPLES

Issues that should be addressed in barrier and landscape design include distance, motion, line, form, scale, balance, rhythm, sequence, and orientation. Each of these factors must be carefully considered to create a design that is compatible with its surroundings.

Distance and motion affect what motorists see when driving through the freeway corridor. Speed alters the peripheral cone of vision and the distance to the motorist's point of focus. In

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general, as speed increases (Figure 1), the cone of vision narrows and the focal distance increases. Likewise, at slower speeds, peripheral vision is expanded and the focal distance is closer to the observer. Vision cones delineate the area within which objects are generally in focus. Objects outside these cones become blurred.

Lines are created by joining two points. Lines are fundamental to three-dimensional forms. Smooth, flowing, horizontal lines may suggest calm and serenity, while bold, vertical, angular lines may suggest strength and tension. The most prominent line created by a noise barrier is the top profile (Figure 2). Lines can be created on the surface of the barrier wall using various materials and texture patterns. Lines may also be implied. For example, a row of street trees may appear to form a solid line.

Form depicts volume in three dimensions—length, width, and depth. A barrier wall itself is a three-dimensional form. This is commonly referred to as positive form. The horizontal wall configuration can be designed to create spaces that are commonly referred to as negative spaces or forms (Figure 2).

Scale establishes a frame of reference. It is a relative measurement. People commonly relate to their environment using the human body or other elements of familiar dimension as the reference measurement. Noise barrier walls can be 15 ft tall or more. Such a wall would appear massive and overpowering located adjacent to a back lot line because residental fences are more commonly 4 to 8 ft tall (Figure 2). The perceived scale of barrier walls can be reduced through the use of landscaping and in the design of the wall itself (e.g., in materials and configuration).

Balance creates order and unity by suggesting a sense of equilibrium. Two basic types of balance are symmetry and asymmetry. Symmetry results when elements are arranged equally around a central axis, for example, creating a mirror-image effect. Symmetry is considered to be a formal type of balance. Asymmetry is more informal, lacking a central axis. Elements are juxtaposed in such a way that they counterbalance each other without creating a mirror image.

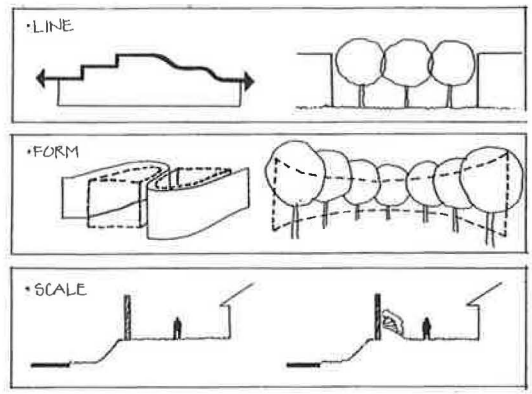

FIGURE 2 Fundamental elements of design.

Rhythm and sequence establish consistent, recognizable patterns. Repeated patterns create a sense of familiarity and comfort. They also provide a sense of progression, unless continued indefinitely. Rhythm and sequence can be created using either the barrier wall or landscaping, or both.

Orientation refers to the dominant visual direction established through design (Figure 3). Horizontal orientation is associated with relatively flat and expansive landforms. This type of orientation tends to direct the eye forward, reducing the apparent height of a barrier wall by emphasizing its re-

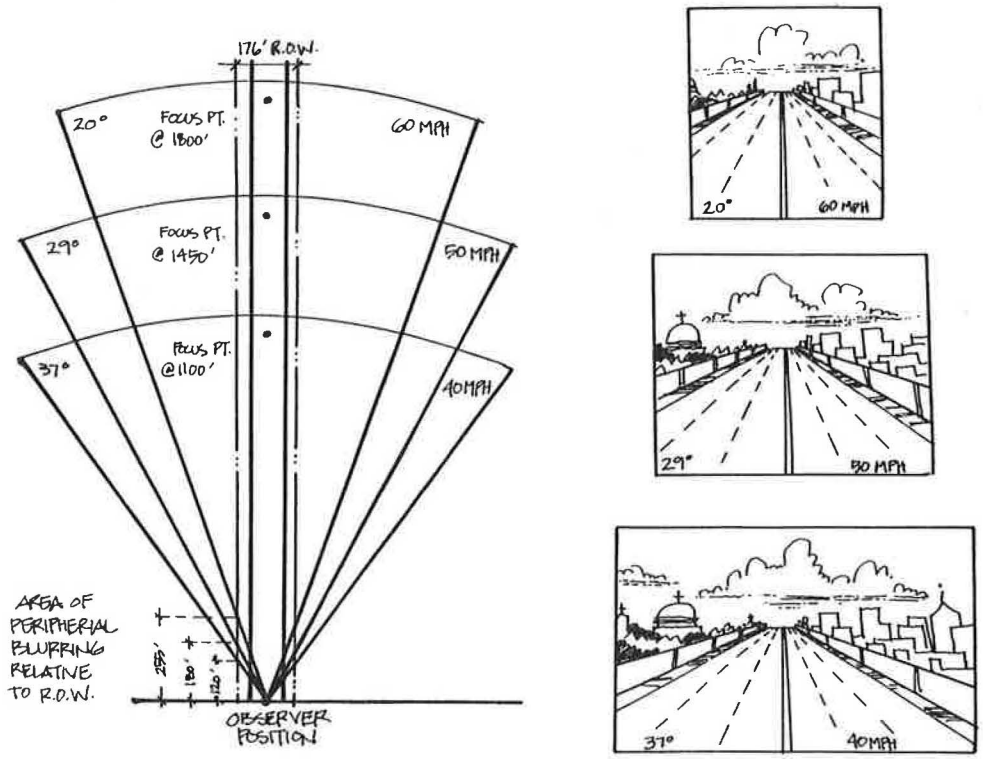

FIGURE 1 Distance and motion.

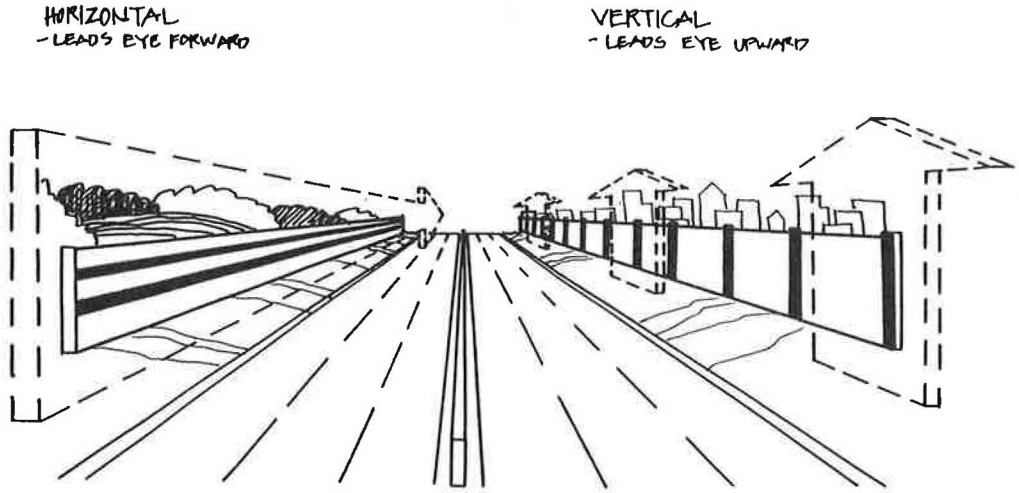

FIGURE 3 Visual orientation.

lationship to the horizon. Vertical orientation is associated with upward reaching forms such as skyscrapers. This type of orientation tends to direct the eye upward, increasing the apparent height of a barrier wall.

INTEGRATION OF WALL, LANDFORM, AND PLANTS

A primary goal in designing noise barriers is to integrate them into the landscape. Problems develop when barrier walls are placed on the landscape with little attempt to integrate them with the surrounding landforms or existing built elements such as bridge abutments, endwalls, and guardrails. As a result, barrier walls can appear as obtrusive objects in the environment. Barrier walls can be integrated with the landscape in two basic ways. The structure itself can be designed to appear to grow out of the landscape, or the landscape (plants and earth) can become part of the barrier structure.

Plants and wall structures can be integrated in a variety of ways. The wall itself can be designed using earth and plants as the primary construction materials. Living barriers, which are used in Western Europe (7), are an example (Figure 4). These essentially vertical earth walls function as the growth medium for willow plants. The earth is contained in a frame constructed of white willow posts interwoven with basket willow twigs. Living barriers provide an attractive alternative to the common barrier constructed of hard materials, both in terms of appearance and maintenance. A similar approach would be to design planter troughs into the wall structure (Figure 5). Irrigation systems could be incorporated into the troughs. The level of planters could be varied to produce a cascading effect. Annuals are commonly used in planters in urban areas and would be appropriate and attractive in wall planters. However, they must be planted annually and are therefore too maintenance intensive for extensive use. Plants can also be integrated with walls by attaching them to the surface or by providing holes in the wall through which they can grow. These approaches are especially appropriate in situations where planting space is limited. Vines planted on the residential side of the noise barrier will eventually cascade over the top. In addition, small holes can be drilled through the wall surface to allow the vines to grow through and spread on the freeway side.

DESIGN IN RELATION TO LOCAL CONDITIONS

These basic principles were used along with additional information on plant materials and barrier wall texture to develop a series of prototype designs for sample locations along the freeways of Milwaukee County. The first step in the devel-

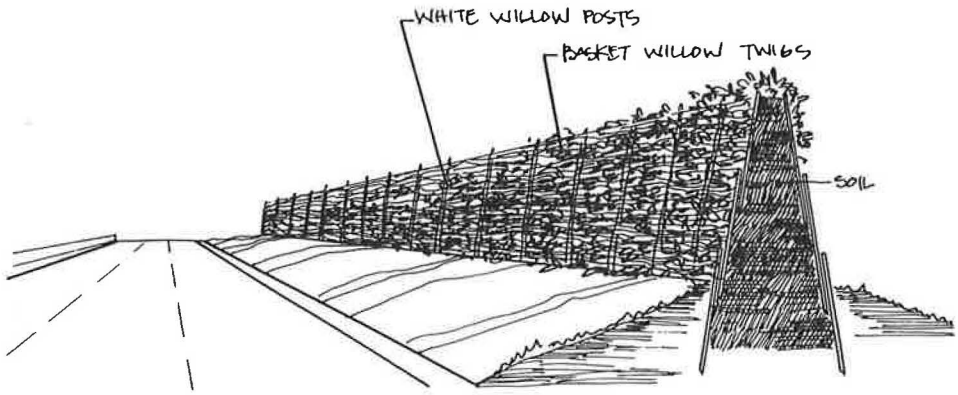

FIGURE 4 Living barrier.

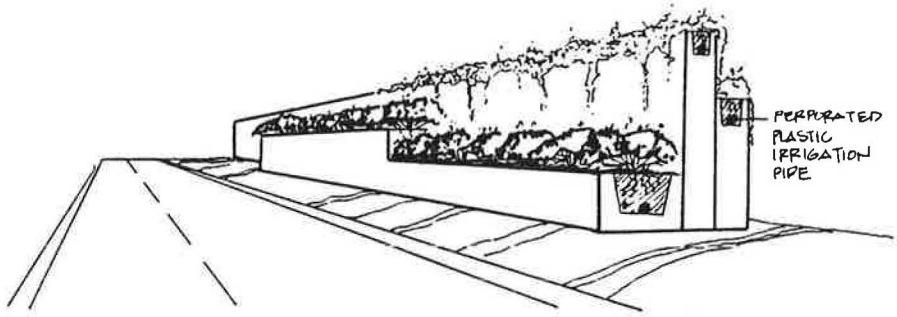

FIGURE 5 Planting troughs nested in the wall.

opment of prototype designs was to identify the opportunities and constraints presented in the community by physical and cultural features. The purpose of the inventory and analysis was to (a) identify regional patterns and features that could potentially impact the visual quality of noise barriers and the freeway corridor; (b) to identify unique cultural, historical, or natural features that could be used to set a theme for the design of a noise barrier–landscaping system, and (c) to identify prototypical situations relative to the location and function of noise barriers.

Both research and a windshield visual analysis were conducted to gather information on the following patterns and features on a county-wide scale:

1. Physical, e.g., topography, vegetation, unique features, and views;
2. Cultural, e.g., ethnic enclaves, landmarks, former uses (historical "ghosts"); and
3. Land use, e.g., urban, suburban, and rural.

Physical Patterns

Analysis was limited to those locations with existing noise barriers and those proposed as candidates for barriers. The most prominent physical features were the existence of mature vegetation in some locations and the visually dominant presence of power lines. Specific locations along the freeway system were identified where existing vegetation provides a significant asset. In many of those areas the vegetation is within the existing right-of-way or near the fence line. A decision must be made as to where (residential or freeway side) a line should be cleared for construction access. Although the most appropriate approach varies by location, a high priority should be given to preserving and using as much of the existing mature vegetation as possible (*8*).

Significant Views

Three locations were identified at which future noise barriers could provide visual obstruction of desirable views:

1. The Milwaukee River crossing. Although the current elevation of the freeway bridge spanning the river precludes expansive views, further minimization of this view opportunity should be avoided.
2. The gate to the city from the south created by the twin spires of a historic church on the west side of the freeway and an industrial clock tower on the east side. Both of these structures are visual landmarks. Driving north, they provide a gateway to the downtown. Driving south, they mark the transition between the industrial heart of Milwaukee and its traditional neighborhoods.
3. The visually prominent dome of St. Josaphat Basilica. The scale and elegant design of this structure signify its importance as a cultural symbol and landmark.
4. The Milwaukee downtown area is a prominent feature when approached from all directions. The view is especially dramatic from the south on the high-rise bridge over the Menomonee Valley.

Cultural Patterns

Cultural patterns and features refer to the location of traditional ethnic neighborhoods along the freeway corridor. This information can be used to extract location-specific design characteristics that could be incorporated into the barrier design. One of the objectives of this study is to provide ideas on how to design noise barriers that better reflect the character of the neighborhoods in which they are located. Substantial effort was made to identify the historic neighborhoods located along the freeway system. Descriptions of the cultural and historic background of neighborhoods were developed (*9*) to provide insight into significant design qualities that could be incorporated into noise barrier design.

Land Use Patterns

The analysis also revealed patterns of land use of adjacent development. The density and age of development contribute significantly to the character of specific locations. The freeway system was separated into zones on the basis of the dominance of particular types of residential development as viewed from the roadway. Three distinct types of development were identified.

- Urban character refers to older residential areas of the city. The freeway cuts through these established neighborhoods, with dense residential development immediately adjacent to the corridor. The design character of these areas is associated with man-made geometric forms, hard edges, hard surfaces, vertical lines, and contrast in forms. An appropriate barrier could be constructed of hard materials, using geometric configurations, with a varied top profile and vertical orientation.

• Suburban character refers to areas of lower density and newer housing. The design character is associated with a mixture of geometric, man-made forms, horizontal lines, and amorphic, naturalistic forms. An appropriate barrier could be constructed of a mix of materials from concrete to wood, using a mix of geometric and curvilinear configurations with a varied top profile. Plants are used primarily to blend, soften, and reduce the scale of the wall.

• Rural character refers to areas that appear to be undeveloped open space or low densities when viewed from the highway. It is unlikely that areas exhibiting actual rural character will be potential candidates for noise barriers. However, some suburban areas have maintained pockets of areas that appear to be rural when viewed from the freeway. The design character is associated with soft, flowing forms. An appropriate barrier could be constructed of natural materials (wood, stone), using curvilinear configurations and a definite horizontal emphasis. Naturalistic planting designs using informal layouts, indigenous plants, and muted color schemes would be most appropriate. Table 1 presents the relationship between the land use type and design considerations.

ECONOMIC CONSIDERATIONS

Retrofitting urban freeway corridors with noise barriers can be an expensive endeavor. For example, costs can be over $2 million per mile for a single side of a freeway. Several factors affect the cost of barriers and landscaping. Materials are probably the most fundamental cost factor. Type of material used affects cost as does the quantity of material used. To provide an estimate of the order of magnitude of landscaping costs as compared to other barrier costs, some typical values were developed as presented in Table 2. Experience in Wisconsin thus far has indicated that metal barriers have been the least expensive. Wood barrier use has had a unit cost about 50 percent higher than metal, while concrete has had a cost 65 percent higher than metal. Landscaping will add cost to a barrier system, but is not as critical as the selection of a material. A limited landscaping may add 5 percent to the cost, an average landscaping 8 to 10 percent, while an elaborate system could add 15 to 20 percent. Actual costs depend on the extent of work, site conditions, and maintenance considerations.

Design trade-offs are inevitable. Decisions must be made as to how much should be spent on the barrier versus the landscape treatment. An elaborate landscaping scheme coupled with a lower-cost barrier material may be cheaper overall than using simple landscaping with more expensive material. Such trade-offs should be made clear to local citizens and elected officials so they can select the option that best fits with their community. In some contexts, dense landscaping may be required to blend the barrier with its environment. In such a situation, a simple barrier could be used, retaining more of the funding allotment for landscaping. In other, especially more urban, locations, the form of the wall may be the most important design feature, with a simpler landscape scheme used to accentuate the wall form.

DESIGN PROTOTYPES

Prototypical designs were generated to illustrate the application of the design guidelines and ideas presented in previous sections. Five sites along the stretch of I-94 were selected to represent prototypical situations. In addition, a short segment of I-43 was selected to represent an example of a "historical ghost." A map of the location of these sites is shown in Figure 6.

Before selecting the specific sites, a windshield analysis was completed to determine unique characteristics of this corridor section. The southern end of the corridor appears to be rural in character when viewed from the freeway. It gives way to newer suburban development as movement proceeds north toward the airport interchange. North of the interchange, houses are close to the freeway and development becomes urban in character. North of these areas, the freeway cuts through older, established urban neighborhoods. Local landmarks, particularly church spires, are prominent on the skyline. At the intersection of I-94 and Mitchell Street, a gateway is formed by the twin spires of St. Stanislaus Church and the Allen-Bradley clock tower. The visual image of a gateway to downtown should be reinforced because just beyond this location, the freeway crosses the Menomonee Valley, which opens an expansive view to downtown Milwaukee.

A series of before and after sketches were made of several sites along this corridor to demonstrate how noise barriers and landscaping can be used to accentuate the characteristics of specific areas to create a more aesthetically pleasing and coherent freeway corridor environment. The intent of each design solution is briefly described in the following paragraphs. They are presented in a sequence from the south to represent views a motorist would have while traveling north to the city center.

Site 1—Rural Character

This site, located just south of the Rawson Avenue interchange, is currently relatively undeveloped. The area is characterized by patches of development interspersed with farm fields, meadows, and woodlands. Historically, this area sup-

TABLE 1 RELATIONSHIP OF LAND USE TYPE TO DESIGN CONSIDERATIONS

Design Component	Urban Land Use	Suburban Land	Rural Land Use
Orientation	vertical	horizontal	horizontal
Lines	angular	mixed	curvilinear
Balance	symmetry	mixed	asymmetrical
Rhythm	regular	mixed	irregular

TABLE 2 RELATIVE COST COMPARISON FOR LANDSCAPE TREATMENT COMBINED WITH BARRIER MATERIAL

Landscape Treatment**	Barrier Material*					
	Metal		Wood		Concrete	
Limited (1)	Barrier	1.00	Barrier	1.50	Barrier	1.66
	Landscape	0.05	Landscape	0.05	Landscape	0.05
	Total	1.05	Total	1.55	Total	1.71
Average (2)	Barrier	1.00	Barrier	1.50	Barrier	1.66
	Landscape	0.08	Landscape	0.08	Landscape	0.08
	Total	1.08	Total	1.58	Total	1.74
Extensive (3)	Barrier	1.00	Barrier	1.50	Barrier	1.66
	Landscape	0.22	Landscape	0.22	Landscape	0.22
	Total	1.22	Total	1.72	Total	1.88

Notes:

Multipliers are given using least expensive noise abatement, metal wall alone, as base. Base = 1.0. These estimates are approximate. Actual costs will depend upon the exact nature of the design, site conditions and maintenance concerns.

* Costs for barrier materials based on average unit cost ($/linear foot).

** Landscape treatment cost based on landscaping along 100 linear feet of barrier and extending 15' into R.O.W. from barrier.

(1) Limited landscaping includes a continuous, single row hedge planted along barrier wall with remainder of landscape area (15' x 100') seeded with wild flower/grass mixture.

(2) Average landscaping includes a multi-row/mass planting of shrubs of various heights and occasional overstory trees (i.e. 3 per 100 linear feet). Remainder of landscape area (10' x 100') seeded with wild flower/grass mixture.

(3) Extensive landscaping includes 3' retaining wall extending partial length of barrier segment (i.e. 40'-50'); multi-row/mass planting of shrubs of various heights and occasional ornamental trees (i.e. 3 per 100 linear feet). Remainder of landscape area (10' x 100') seeded with wild flower/grass mixture.

ported several truck farming and greenhouse operations. Much of its original rural farm character remains intact.

Noise barriers in this area should be designed to reflect its rural character (Figures 7 and 8). Design characteristics of rustic, residential, and utilitarian fences could be adapted to the barrier wall design. The barrier wall could be constructed of rough sawn wood, placed in a somewhat loose pattern to resemble grape stakes. Landscaping should consist of naturalistic drifts of native grasses and wild flowers. Piles of field stones placed at irregular intervals at the base of the wall would add contrast and visual interest.

Site 2—Suburban

This site is located near the airport. The area is characterized by low- to medium-density residential development. This stretch of the freeway is in a slight cut, with gently undulating side slopes along its edge. A significant amount of vegetation has been retained along the top of the side slopes, possibly in the backyards of abutting residences. In this situation, a primary objective would be to design the barrier to resemble a residential fence (Figures 9 and 10). A strong horizontal texture or pattern on the surface of the panels would help to visually reduce the height of the wall by reinforcing the horizontal line of the landform. A wood barrier would blend nicely into the landscape; however, concrete, brick, and even metal could also be used to create the same basic result. Landscaping should consist of informal mass plantings of trees and shrubs on both sides of the barrier. The barrier should appear to meander in and out of the woods. Consideration should also be given to adding berms so that the height of the wall could be reduced.

Site 3—Urban Focal Point

This site is located along the east side of the freeway at a curve just south of Howard Avenue. The sharp curve presents a situation where motorists' views are naturally focussed straight ahead to a potential barrier location. The opportunity exists to capitalize on this situation and create focal points (Figures 11 and 12). This site is located in the Bayview neighborhood, which began as an iron and steel company town. Barriers in this area could be constructed of metal to acknowledge the local historical roots. The design solution proposed suggests attaching decorative metal tracery screens to smooth metal wall panels. Some space should be left between the tracery screen and the wall panel to create depth and shadow patterns. In addition, the wall panel should be light in color to ensure that shadow patterns are visible. To retain their focal impact and contextual uniqueness, decorative panels of this type should be used sparingly. Adjacent wall sections should be rather simple to avoid visual distraction and confusion. No landscaping is required along the decorative panels, because the barrier itself is visually attractive. Landscaping along the ad-

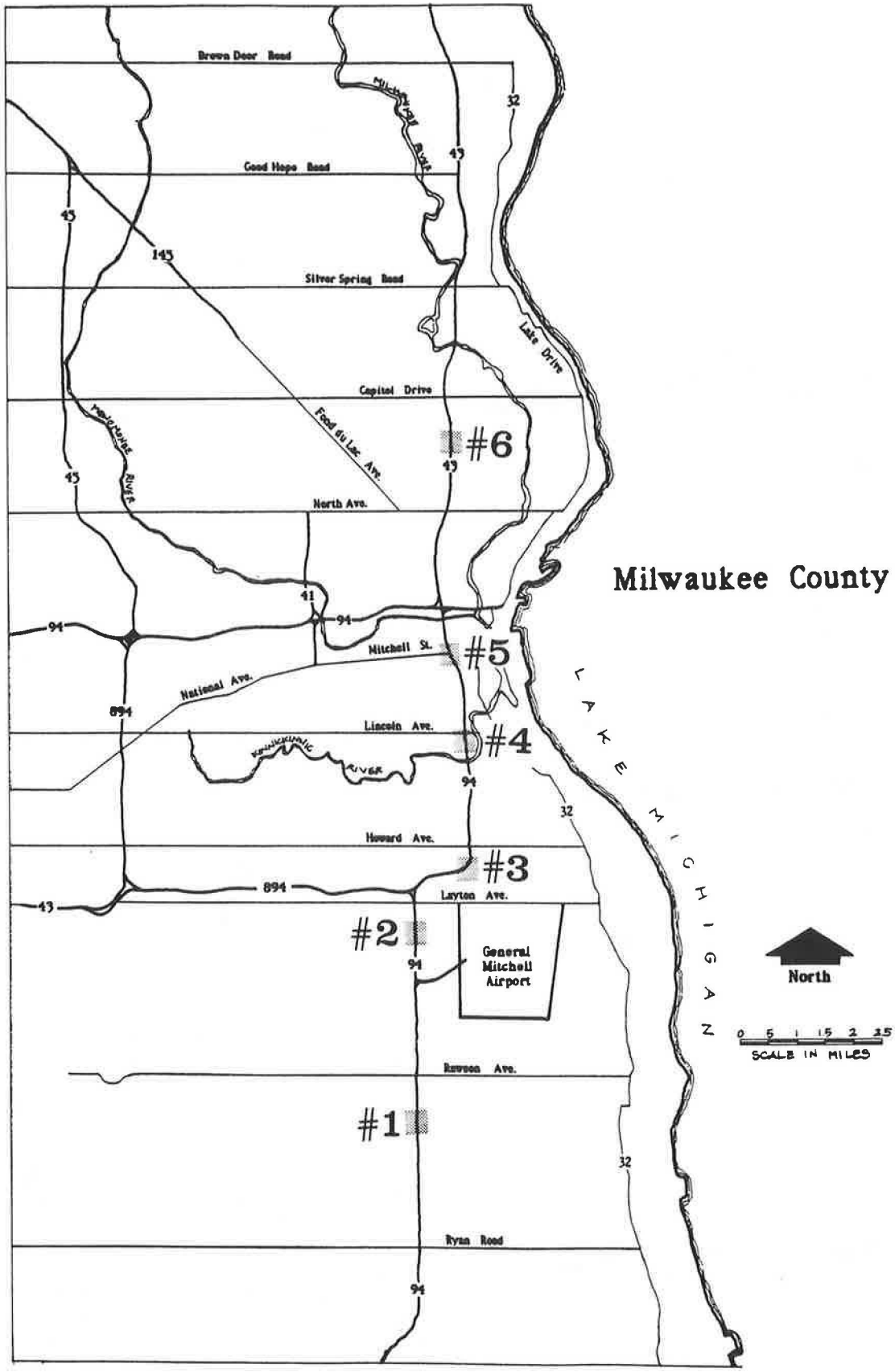

FIGURE 6 Location of sites for prototype designs.

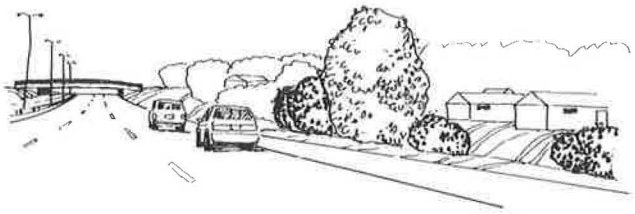

FIGURE 7 Site 1, rural character, before.

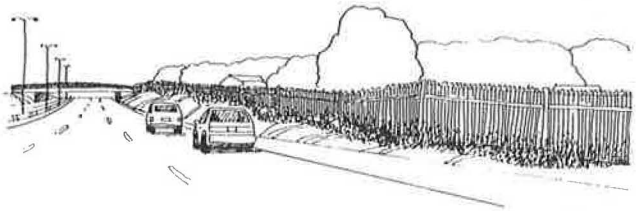

FIGURE 8 Site 1, rural character, after.

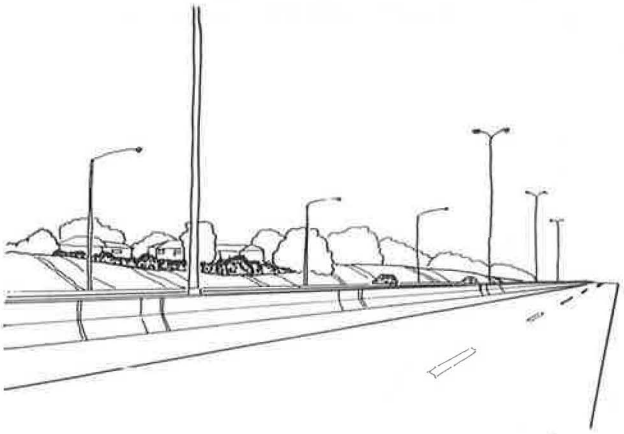

FIGURE 9 Site 2, suburban character, before.

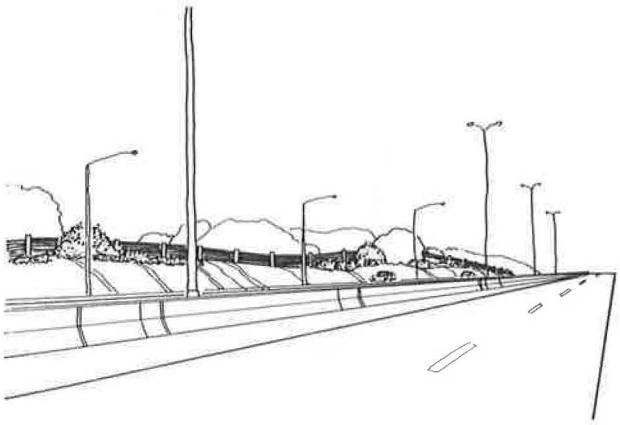

FIGURE 10 Site 2, suburban character, after.

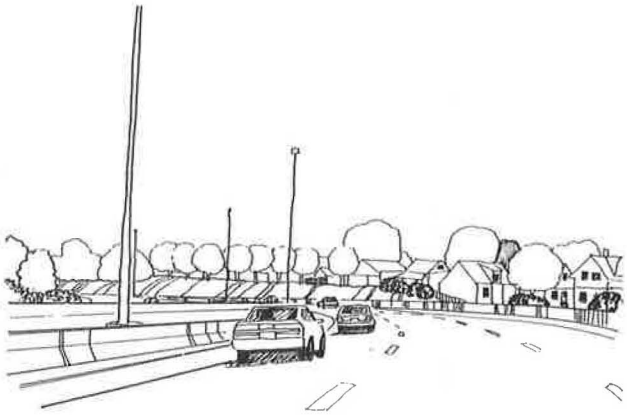

FIGURE 11 Site 3, urban focal point, before.

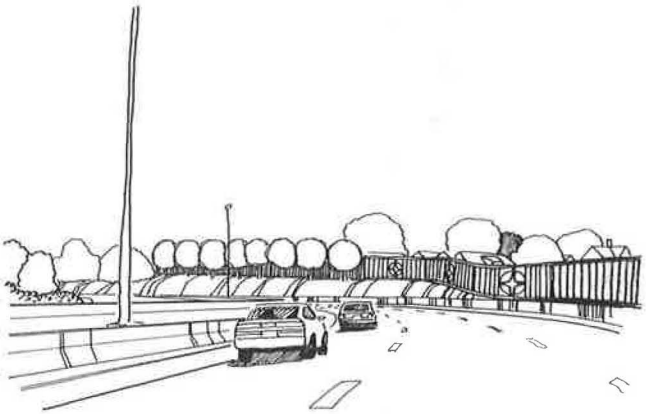

FIGURE 12 Site 3, urban focal point, after.

jacent wall sections should also be simple. In this example, an existing row of trees was retained on the freeway side of the barrier to resemble a residential streetscape.

Site 4—Urban Neighborhood

This site is located in a densely developed, old urban neighborhood. The site contains two significant attributes: a dense row of healthy, mature vegetation, and a prominent local landmark, the dome of St. Josaphat Basilica, a historic church, as a backdrop. The barrier should be designed to accommodate both of these assets. The solution proposed is relatively simple in design (Figures 13 and 14). The wall should be designed to have a finished, more refined, urban character. Pillars could be placed at regular intervals between spans of wall panels. The wall panels should be relatively dark in color, so they visually recede into the landscape plantings. A contrasting (light-colored) cap provides a finishing touch to the top of the wall. Special care should be used when siting and constructing the barrier to save and use as much of the existing vegetation as possible. Some additional landscaping might be necessary to blend the overall design into the existing landscape.

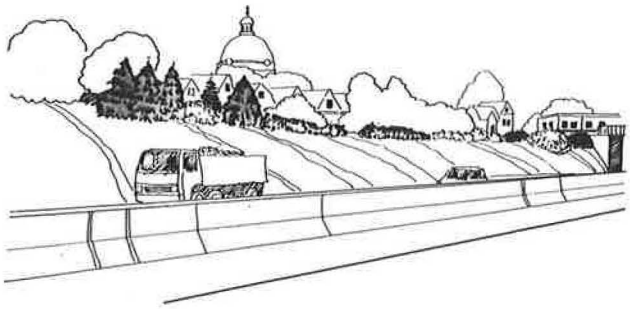

FIGURE 13 Site 4, urban neighborhood, before.

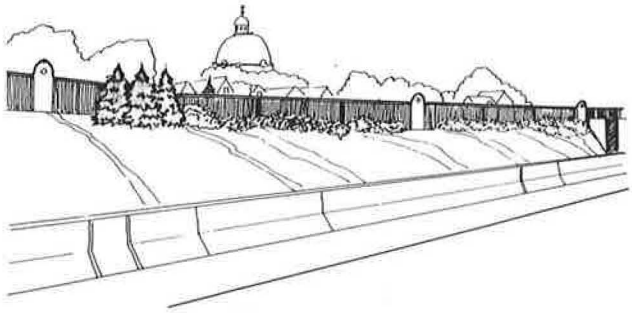

FIGURE 14 Site 4, urban neighborhood, after.

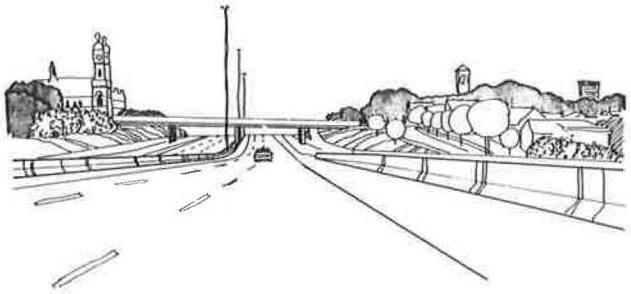

FIGURE 15 Site 5, urban gateway, before.

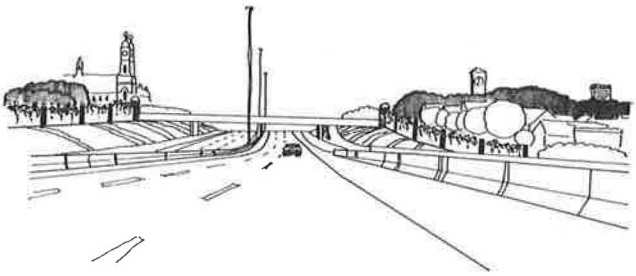

FIGURE 16 Site 5, urban gateway, after.

Site 5—Urban Gateway

This site is located near the downtown along the Mitchell Street interchange. A sense of gateway is created by two visually prominent vertical structures located on either side of the roadway. The twin spires of St. Stanislaus Church and the Allen-Bradley clock tower are prominent Milwaukee landmarks located along the seam where the industrial heart of the city meets its oldest residential neighborhoods. Because of their visual prominence and juxtaposition to each other and to downtown, they create a gateway signaling either the entrance to or exit from the heart of the city (downtown).

A noise barrier on this site could be designed to reinforce the gateway image (Figures 15 and 16). As proposed, the top profile of the walls are stepped to emphasize an upward movement. The walls are tied to the existing bridge structure by vertical pillars. These pillars create a more literal gateway, making reference to the implied gateway created by the two prominent buildings in the background. Vertical posts between wall panels accentuate the upward movement toward the pillars and the surrounding architecture. The vertical elements, end pillars and panel posts, should be darker in color than the wall panels to make them visually dominant.

Site 6—Historical Ghost

This site is located where I-94 crosses Chambers Street. It is the former site of Borchert Field, which served as the major athletic field for Milwaukee baseball teams during the first half of the century until the opening of Milwaukee County Stadium in 1953. In the same year, Borchert Field was demolished to make way for construction of I-43. To reflect this cultural relic, the barrier walls could be designed using a baseball theme.

To avoid being distractive, the design should be simple and uncluttered (Figures 17 and 18). The solution proposed involves the integration of a backstop into the barrier on the west side of the freeway. Home base would be constructed of an appropriately shaped slab of white concrete or marble. The dimensions of the base would have to be exaggerated somewhat to increase its visibility. The base would be placed within a bed of reddish colored gravel to provide heightened contrast. The existing slope of the cut bank could be used to make the base more visible by tilting it toward the roadway.

Borchert Field stadium was a wooden structure. Similarly, the barrier walls should be constructed of wood boards, preferably with a weathered finish, placed vertically, side by side, alluding to the baseball stadium. Numbers stenciled on the east side barrier signify field length. Vertical poles symbolize foul line markers. A change of materials would clearly signal that this area is distinct. Concrete would be an appropriate choice of material for the adjacent barrier because it would provide color contrast and could be given a vertical surface texture to complement the wood barrier design.

Landscaping on the freeway side would be minimal. Vines could be planted to grow on or over the wall. Conceptually, the cut slope should be planted with turf grass. At the point where the barrier material changes, the landscape treatment should also change. The area immediately adjacent to the turf should be planted with a taller ground cover to clearly delineate the edge of the historic ball field.

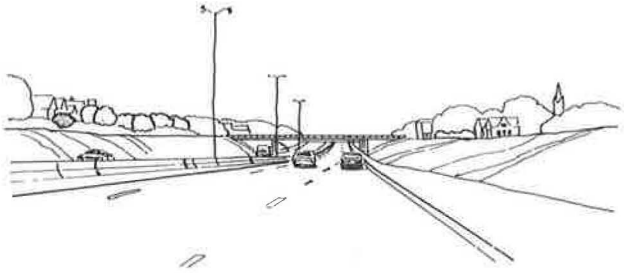

FIGURE 17 Site 6, historical ghost, before.

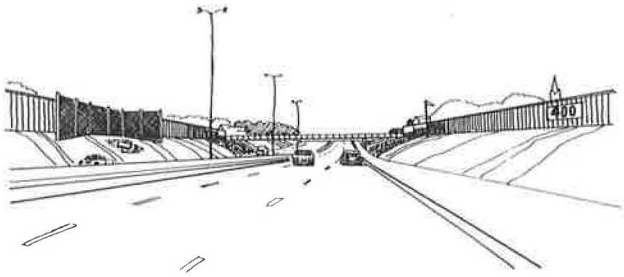

FIGURE 18 Site 6, historical ghost, after.

CONCLUSIONS

Information and tools that can be used to enhance the visual and aesthetic quality of freeway noise barriers have been provided. Noise barriers can be effective in reducing unwanted sound from highway sources in residential neighborhoods. However, they also can have a substantial effect on the visual environment of a highway and surrounding neighborhoods. They can significantly change the view from the road creating monolithic tunnels of walls and by blocking views of changing urban scenery. They can also change the view towards the road for the surrounding community by creating barriers to other areas and developing a sense of isolation. What is needed is a way to provide the benefits of sound reduction from noise barriers while at the same time creating a positive visual image for road users and the surrounding communities.

An attractive and efficient system for freeway noise control can be developed if the following principles are followed.

Diversity

There should be variety in the placement, materials, texture, and landscaping to enhance the aesthetic characteristics of noise barriers. Urban landscapes are diverse mixtures of buildings, plants, streets, and sidewalks; there should be no hesitancy to incorporate this diversity into noise barriers.

Integrate Barriers and Landscaping

Noise barriers and landscaping should be viewed as an integrated, complementary system. Choices of materials, textures, profile, and location should be done in such a way that the various elements fit together into an integrated whole. A balance should be struck between wall decoration and landscaping so that they do not conflict or compete with each other.

Reflect Neighborhood Characteristics

The physical, cultural, and historical characteristics of urban neighborhoods should be incorporated into the design of noise barrier and landscaping systems. Noise barriers should reflect the basic land uses and the heritage of the areas through which the highways pass. Noise barrier design should include efforts to understand urban areas through careful inventories of physical, visual, cultural, ethnic, historical, and land use characteristics of different neighborhoods. These factors should be used to shape design themes as well as details. Specific views should be reinforced and enhanced. Gateways should be identified and accentuated.

Options

Decisions about barriers and landscaping should be made in consultation with neighborhood groups, elected officials, and others. A broad range of options should be provided including materials, profile, and configuration of barriers, and type, location, and configuration of landscaping. Trade-offs should be provided between wall materials and landscaping so that an acceptable balance can be reached.

Creative Process

Finally, a process should be used that maximizes the opportunity for creative design of noise barrier and landscaping systems. This process would include careful inventories of neighborhood characteristics, selection of design themes, preparation of alternative designs, community involvement, and selection of designs that balance the various trade-offs of cost, aesthetics, and noise reduction. Through such a process, systems can be developed that enhance the quality of the environment that is seen as well as heard along freeways.

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