

MEDIAN DESIGN as it AFFECTS CONSERVATION of VEGETATION and PLANTING for SCREENING HEADLIGHT GLARE and TRAFFIC GUIDANCE

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Design and construction of medians or traffic separators are generally used on all multilane highways to separate opposing lanes of traffic as a safety measure. Medians on urban expressways many times are designed only 4 ft wide, because of limited and expensive right-of-way costs. However, use of such narrow medians preferably should be kept to the minimum wherever possible. It would be much safer if sufficient right-of-way was acquired to permit the design and construction of an 8- to 10-ft wide median curbed with a 10-in. barrier concrete curb. Such a median would provide space for planting for screening headlight glare and for traffic guidance. The height of the planting ($4\frac{1}{2}$ to 5 ft) would make the separator more easily visible to the night driver. In addition to these safety advantages of the planted median as compared with the narrow paved type of median would be its contribution of beauty to the highway, with its flowers and green foliage during the spring and summer months as well as attractive colored bark and fruit effects during the fall and winter months. Beneath the taller-growing plant material, ground-cover plants such as English ivy, periwinkle, and winter creeper may be used to eliminate the need of maintaining grass (Fig. 1).

The width of the separator between the service or marginal roads in urban areas to provide an effective buffer area for planting to reduce highway-traffic noise should measure 20 to 25 ft as a minimum. The minimum buffer-planting space along the main roadways of the expressway from edge of pavement to right-of-way line should measure 60 ft. This border area must provide adequate space for shoulder, gutter, and buffer planting. Sometimes it is possible to preserve existing tree growth along the new highway in this buffer area. The more space provided, the more effective noise-abatement planting may be installed between the heavily traveled highway and any residential development. Many times narrowing the border space will create problems from colored lights in adjacent business sections that may prove very hazardous to motor traffic.

In the rural sections wider rights-of-way should be acquired in order to utilize the varying-width median. If a 40-ft median is selected, very little conservation of existing growth is possible when roadway profiles vary more than 2 ft above or below existing ground level.

When a 60-ft median is selected as the minimum median it is possible to preserve a 12-ft area of existing growth between opposing roadways in cuts or fills at 6 ft. Less than 6 ft, conservation of existing growth would be greater. Cuts and fills above these dimensions will cause the destruction of all vegetation during the construction operations (Fig. 2).

A median measuring 80 ft provides more opportunity to adjust the opposing-roadway horizontal alignment and profiles so it is possible to save between roadways more acres of valuable existing native vegetation that would require years of growing time as well as \$20,000 to \$40,000 per mile to replace (Fig. 3).



Figure 1. View east along Route 29 Freeway, Trenton, N. J. Relatively narrow median of 16 ft provides space for effective headlight glare screen planting as well as contributing to the attractiveness of the Freeway. The 28-ft separator between main roadway and service or marginal road produces an effective buffer planting area against traffic-noise nuisance. (Courtesy of New Jersey State Highway Dept.)

The cost of the additional right-of-way for the wider median is in many instances offset by the savings made possible by reduction in cost of construction items such as acres of clearing of site, stripping 6 in. deep, 4-in. topsoiling, fertilizing and seeding, mulching, and replanting for headlight-glare reduction.

Using the 60-ft median increases (Table 1) the number of acres to be acquired only 2.4 acres per mile as compared with selecting the 40-ft median. If the 80-ft separator is used in the cross-section design, the acreage necessary to acquire would be increased 4.78 acres per mile as compared with the 40-ft median.

The average cost of right-of-way in the northern rural section of New Jersey is approximately \$1,500 per acre. The additional cost for the right-of-way required in the 60-ft median would be \$3,600 per mile and \$7,170 per mile for the 80-ft median. Much of this additional cost would be offset by the reduction in cost of the above-mentioned construction items. In addition to these savings, another advantage would be a safer highway to travel, because the roadway would be designed as two separate roads on separate profiles with a wide wooded median where vegetation exists. Areas left in their natural vegetative cover require less maintenance. Newly constructed grass areas could be kept to a minimum, which would result in reduced maintenance cost for mowing.

TABLE 1
 MEDIAN WIDTH - ACRES PER MILE

Median width, ft	Sq ft per mile	Acres per mile
5	26,400	0.60
10	52,800	1.212
15	79,200	1.812
20	105,600	2.412
25	132,000	3.012
30	158,400	3.612
35	184,800	4.212
40 ^a	211,200	4.812
45	237,600	5.412
50	264,000	6.012
55	290,000	6.612
60 ^a	316,800	7.212
65	343,200	7.812
70	369,600	8.412
75	396,000	9.00
80 ^a	422,400	9.60
85	448,800	10.20
90	475,200	10.60
95	501,600	11.20
100	528,000	11.60
105	554,400	12.20
110	580,800	12.60
115	607,200	13.20
120	633,600	13.80

^a Width of median used in discussion.

If the geometric design standards used for the design of the median strip of the new Interstate Highway System are 60 to 80 ft in width in rural country the headlighting glare problem would be relatively simple because one could ignore the conditions created by meeting other vehicles. According to Val J. Roper, Illuminating Engineer, Lamp Department, General Electric Co., it is easy to design headlamps with a single beam which would provide adequate seeing distances on the clear road. With a moderate increase in the high-intensity zone and a considerable increase in beam candlepower 1 degree above the horizontal, the sealed-beam upper beam would provide adequate illumination for safe driving at reasonable speeds when no approaching cars may be seen.

Adoption of the use of the wider median in rural country has many intangible advantages that should be carefully considered by the highway design engineer, such as the improved appearance of the roadside landscape made possible by conservation of existing vegetation in the wide median and the reduction in monotony due to the varying cross-section treatment of the median that is possible because of added space. Grading cross-sections may easily change from depressed to raised, according to topography encountered. Erosion problems could be kept to the minimum by retaining the native vegetative cover which will help slow down the rate of surface storm-water runoff.



Figure 2. View of Garden State Parkway north of N.J. 4 in Paramus where median is only 29 ft wide. Use of this narrow width at this location made it necessary to remove all existing native growth through this wooded area during construction. (Courtesy of New Jersey State Highway Dept.)



Figure 3. Garden State Parkway. Wide varying median 125 to 130 ft permits adjustment of profiles to fit existing terrain as well as preserving acres of fine wooded areas between roadway that would require years of growing time to replace. (Courtesy of New Jersey State Highway Dept.)

TABLE 2
 LOWER MEDIAN COST DUE TO REDUCED CONSTRUCTION QUANTITIES
 (60-FT MEDIAN AS COMPARED WITH 40-FT SEPARATOR)

Item	Unit price	Total cost per mile
1. Clearing of site ^a 2.4 acres	\$ 400.00/acre	\$ 960.00
2. Stripping 6 in. deep 2.4 acres	300.00/acre	720.00
3. 4-in. topsoiling (includes liming, fertilizing, and seeding)	1,936.00/acre	4,646.00
4. Minimum planting of median for screening headlight glare (double row of rosa multiflora on 3-ft centers)	1.00/lin ft	5,280.00
Total reduced cost per mile		\$11,606.00
Cost of 2.4 acres of additional right-of-way in 60-ft median		<u>3,600.00</u>
Grand total: reduced cost per mile by using 60-ft median		\$ 8,006.00

^a The 2.4 acres per mile of area not disturbed by construction operations would vary somewhat with roadway profiles. The items of embankment and drainage were not included because they are variable. In many locations these items were less when the wide median was used.

Note: Similar construction savings would result from the use of the 80-ft median as compared with the use of the 40-ft median. In fact, the 80-ft median would be much more effective because of the increased space. The added space in the median is a safeguard against the demands for future roadway needs.

When all these factors are carefully considered in the design and construction of the new Interstate Highway, the creation of the complete highway with safety, utility, beauty, and economy built in will be the final result long desired by the motoring public.

ACKNOWLEDGMENT

Grateful acknowledgment is made to T. J. Deane, Engineering Laboratory, Guide Lamp Division, General Motors Corp., Anderson, Ind., for the valuable information furnished concerning automotive headlighting.

REFERENCES

1. Simonson, Wilbur H., "Planning and Planting for Sound Abatement." Paper presented at the Golden Anniversary Meeting, June 25, 1957, American Society of Agricultural Engineers, East Lansing, Michigan State University.
2. Roper, Val J., "The General Electric Co. Tests on Polarized Headlighting." General Electric Company.
3. Deakin, Oliver A., "Progress Report on Planting for Screening Headlight Glare and for Traffic Guidance." Highway Research Board, Roadside Development 1957.

DISCUSSION

MRS. HOOD: Has there been any evidence of damaging effects of gasoline fumes on the vegetation along the parkway?

DEAKIN: In New Jersey along the parkways no damaging effects from gasoline fumes have been observed on the existing or newly planted vegetation.

WELLS: Smoke fumes are recognized as injurious to vegetation. The factory smoke from New Jersey, southwest of New York City, shows its effect in line with the prevailing winds across southern Manhattan and western Brooklyn as being more serious than in northern Manhattan.

DEAKIN: Along some of the older state highways white pine and Norway spruce have suffered from the effects of industrial smoke fumes in the vicinity of Newark Airport and along the Trenton Freeway - Route 26 Extension.

WALKER: What is the lateral clearance or offset planting distance from the edge of pavement used on the Garden State Parkway?

DEAKIN: On the Garden State Parkway the planting design standards required that all vegetation be kept 25 ft from the edge of pavement (10-ft shoulder plus 15 ft). Exceptions were made in the case of unusual existing tree growth encountered. Here a 10-ft clearance plus guardrail was the standard.

WALKER: The Garden State Parkway has certainly taken advantage of the desirable physical features of the route in providing variable median width and profiles at different levels. B. D. Tallamy, in his memorandum of June 18, 1957, to Bureau of Public Roads Regional and Division Engineers, emphasized the need for the best possible location and design elements in constructing the Interstate System. He cautioned the Regional and Division Engineers to review carefully Interstate System projects, particularly those on new location, during the reconnaissance stage and the preliminary stage of engineering design, in order to be sure that all possibilities of providing a safer, more interesting, and less fatiguing highway to drive over would be incorporated into the final design.

BRANT: Several people mentioned an objection to multiflora rose because of a tendency to spread and become a "weed" on adjacent property, and because of difficulty in keeping its thorny growth free from paper or other debris. What has been your experience on these points?

DEAKIN: We have had very little difficulty to date with Rosa multiflora spreading from the roadside plantings to adjacent farm land. Where land is not cultivated frequently or pastures are not maintained, one would probably experience Rosa multiflora self-seeding and gradually taking over. Of course, here other volunteer growth would eventually establish itself also.

The matter of maintenance in regard to paper and debris collecting in Rosa multiflora plantings has not created any unusual problems to date in New Jersey. All median-zone plantings have been made only during the past five years. More will be known about this matter after the plants are more fully developed.

HOTTENSTEIN: Rosa multiflora was used in southeastern Pennsylvania some time ago. In time it can become a pest and, like Hall's honeysuckle, it is hard to get rid of.

DEAKIN: With the use of some of the new herbicides Hall's honeysuckle may be controlled and kept from spreading into adjacent farm land. In New Jersey no great problem has been experienced to date in regard to Rosa multiflora. Farmers have planted more of this shrub than we have in the form of fences. Where the climate is milder, it probably would spread more rapidly and become a nuisance.