

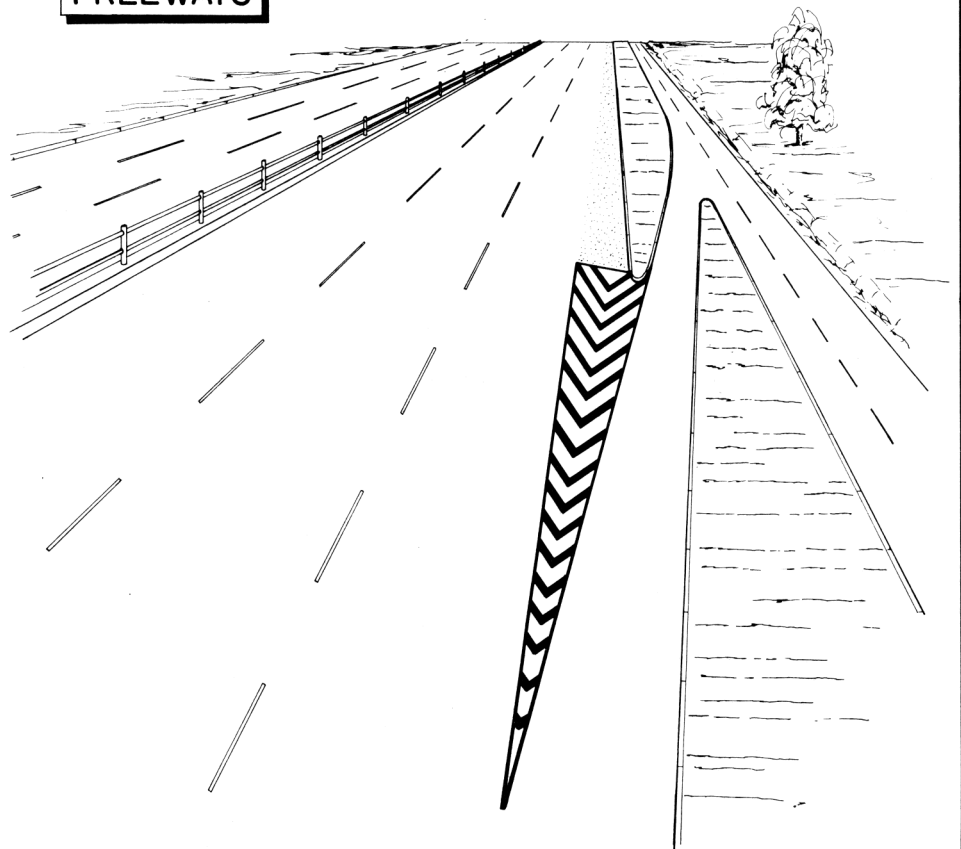
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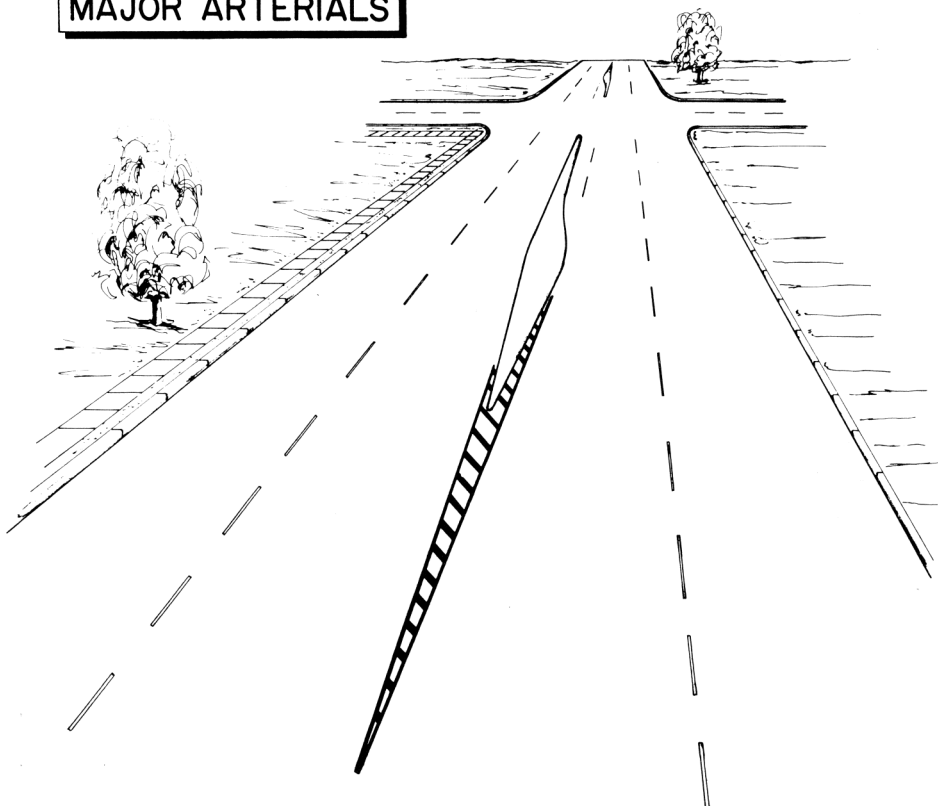
**MARKING THE
APPROACH-ENDS
OF
CHANNELIZATION**

by
Neilon J. Rowan

FREEWAYS



MAJOR ARTERIALS



A Report On
Cooperative Research
of the
**TEXAS TRANSPORTATION
INSTITUTE**
and the
**TEXAS HIGHWAY
DEPARTMENT**
in cooperation with the
**DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS**

BULLETIN NO. 25

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Reading this report will require only ten minutes of your time. In concise form it presents facts that may help you in your work.

The report deals with the problem of effectively warning the driver of islands and other obstructions that are in his path by necessity for direction and safety. It contains the results of a phase of experimentation of the research project, CHANNELIZATION, conducted by the Texas Transportation Institute and the Texas Highway Department in cooperation with the U. S. Bureau of Public Roads. Additional reports of a similar nature will soon be published on the delineation and signing of channelizing islands.

Marking the Approach-ends of Channelization

by

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*This report results from a cooperative research project of the
Texas Highway Department, the Bureau of Public Roads,
and the Texas Transportation Institute*

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TEXAS TRANSPORTATION INSTITUTE

Texas A&M University
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Test Area Showing Layout of Raised Stripe vs. Paint Line.

INTRODUCTION

The highway engineer has succeeded in getting the driver out of the mud only to be faced with a far more complex problem—that of satisfying the ever-increasing demands for fast and efficient vehicular travel on streets and highways.

If efficient operation is to be attained, especially on the high-density, high-speed facilities, a positive guidance system must be provided. The driver must be adequately informed of decision points, then be allowed sufficient time for making the decision, and finally be guided into the proper maneuver without the disruptive effects of confusion and indecision.

The adequacy of a guidance system is dependent upon a number of things. There is considerable importance attached to the proper use and location of signs. Equally important are the other traffic control devices, including channelization which guides traffic into proper paths and segregates turning or waiting vehicles from the through traffic stream. But, regardless of the adequacy of the signing and control phases of the guidance system, efficient operation is not attained unless the action or maneuver point is defined and the path fully delineated ahead of the driver at all times, regardless of weather conditions. In other words, like the chain, the guidance system is only as strong as its weakest link—signing, control or delineation.

The development of an adequate guidance system has been the general objective of recent research conducted by the Texas Transportation Institute and the Texas Highway Department in cooperation with the U. S. Bureau of Public Roads. Although research to date has dealt only with the signing, design and delineation of channelizing islands, it is anticipated that research in future years will treat the entire problem of traffic guidance.

Close-Up View of Raised Stripe.



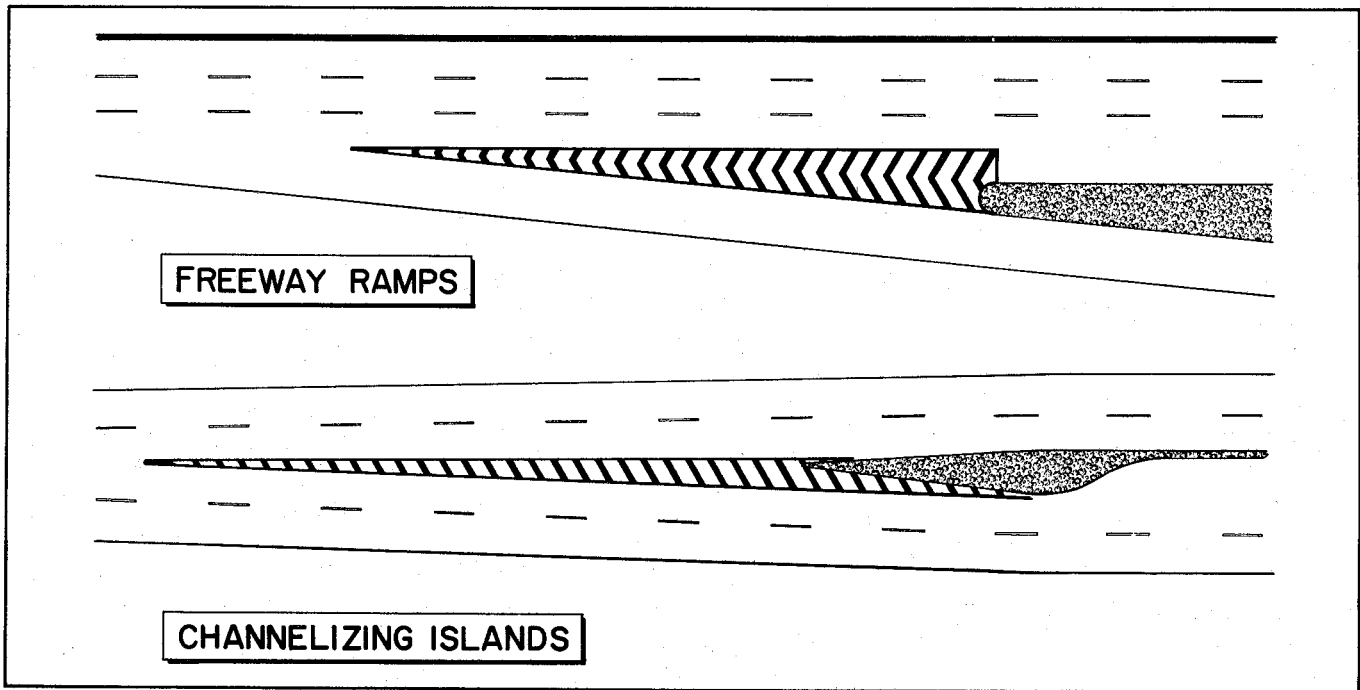


Figure 1—Recommended approach-end treatment of channelizing islands or freeway ramps.

OBJECTIVES

This report deals with a method of approach-end treatment to provide advance warning of physical barriers, such as channelizing islands and ramp terminals. The objectives of this approach-end treatment are "to provide, for approaching traffic, a maximum degree of warning of the presence of the island and a definite indication of the proper vehicle path or paths to be followed." In other words, this approach-end treatment should guide the driver into the proper maneuver without physical restraints well in advance of the actual physical barrier. If the approach-end treatment is to effectively provide this "channelizing effect," it should take advantage of the maximum number of the drivers' senses. The three senses which are normally applicable to traffic control are seeing, hearing and feeling. Also, the approach-end treatment should be designed so that the maneuver into the channelized path is natural to the driver and requires little concentrated effort.

The special approach-end treatment meeting the requirements outlined above is illustrated in Figure 1. It is merely an extension of the channelizing island or ramp nose, whichever the case may be, utilizing a pattern of stripes rather than barrier curbs. These stripes are formed using the "surface treatment" or "inverted penetration" construction technique to produce a raised effect, then painted and reflectorized.

This system or technique is not entirely new to the profession. Pre-treatment to channelizing islands, although of rather conservative design in most cases,

has been effected using conventional paint stripes. The Manual on Uniform Traffic Control Devices specifies that a solid white paint line at least 8 inches in width shall be used to mark the triangular neutral area in advance of the ramp nose.

The approach-end treatment described herein provides numerous advantages over the conventional methods utilizing reflectorized paint lines. These advantages are as follows:

1. *Improved visibility*—The approach-end treatment has certain advantages in both wet and dry weather. In dry weather, the visibility is improved because the raised stripe constitutes more surface area and a higher profile. During the inclement weather, the raised effect enhances the visibility of the approach-end treatment because the reflective surfaces are projected above water that normally inundates paint lines, rendering them ineffective.
2. *Rumble Effect*—The raised stripe can also utilize the drivers' senses of feeling and hearing to warn of encroachment on the approach-end treatment. If the raised stripe is constructed of coarse aggregate, the continuous stripe next to the traffic lane will produce a change in tire noise to warn the driver. Further encroachment onto the approach-end treatment will produce a "rumble" effect due to the bars, and should further increase the sensations experienced by the driver.

Table I
AVERAGE VISIBILITY DISTANCE OF RAISED STRIPE IN
COMPARISON WITH CONVENTIONAL PAINT LINE

	Visibility Distance, Feet	
	Paint Line	Raised Stripe
Observations during a rain storm	110	593
Observations immediately following rain storm	262	693

FIELD STUDIES

Tests were conducted to evaluate the visibility characteristics of the raised stripe method of approach-end treatment in comparison with the conventional paint line method. To facilitate this testing, two test sections were constructed—one for each technique. The raised stripe was constructed in general accordance with a design first described in Texas Highway Department Administrative Circular No. 144-60, and later incorporated into the Texas Design Manual on Controlled Access Highways. The paint stripe configuration was constructed in accordance with the Manual on Uniform Traffic Control Devices, Paragraph 2B-16.¹

The two test sections were placed on the runways at the Texas A&M Research and Development Annex.

They were constructed with the same external dimensions and placed side by side to attain as nearly as possible a true comparison. Test conditions were created to represent the most critical conditions for the general applications of the approach-end treatment.

In planning the visibility tests, consideration was given to the possibility that the factors affecting visibility differ, dependent upon whether the approach-end treatment is to be applied to channelizing islands or ramp terminals. In the case of channelizing islands opposing headlights are a constituent factor and must be considered; however, they are ineffectual in the case of ramp terminals. The effect of rain and the resulting wet pavement prevails in both applications. Because of these factors, the two methods of approach-end treatment were tested under conditions of dry and wet pavement with and without the effect of opposing headlights.

Visibility—During Rain

The first visibility tests comparing the two methods of approach-end treatment were conducted during and immediately following a moderate rain storm. In these tests four observers operated a vehicle

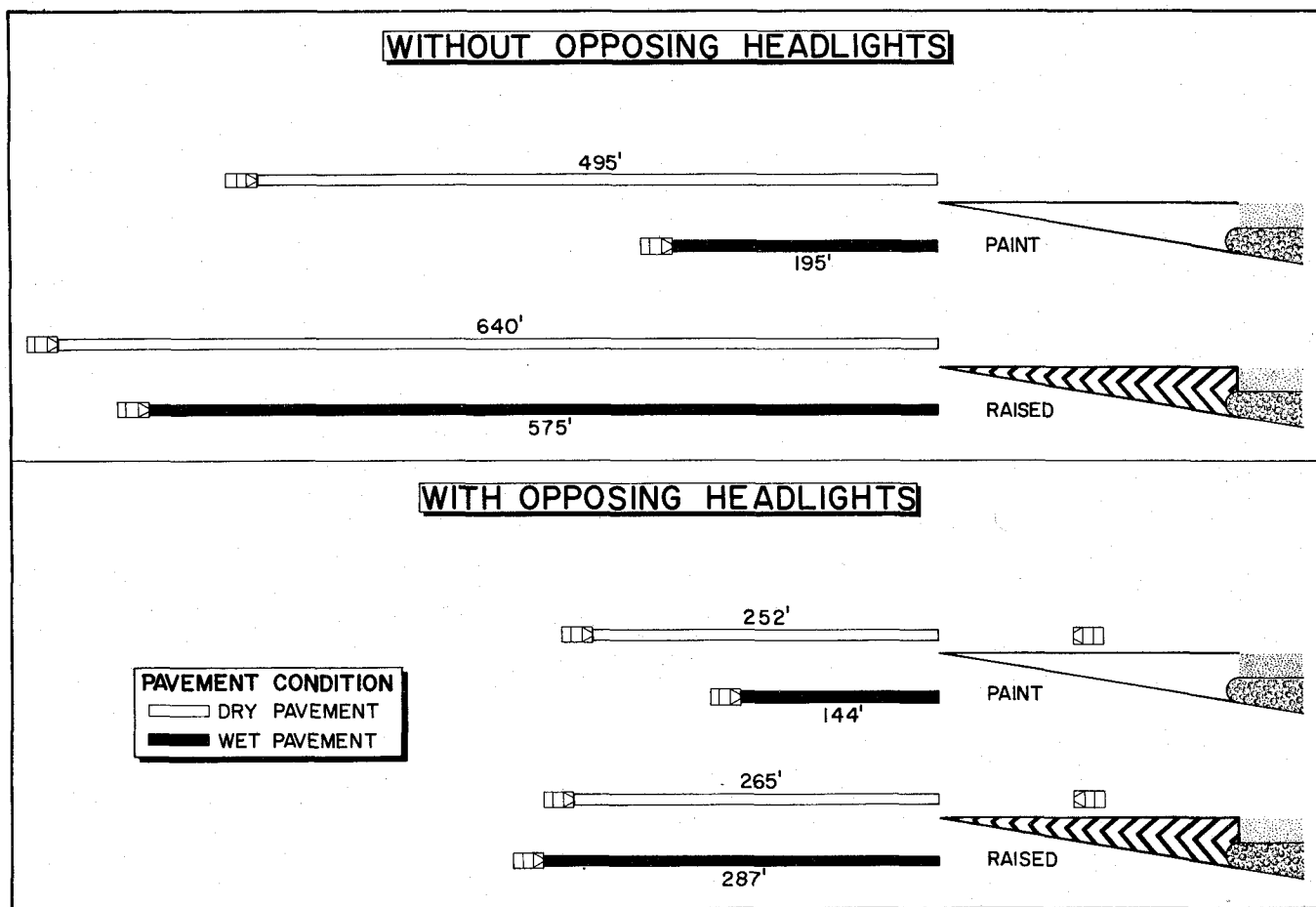
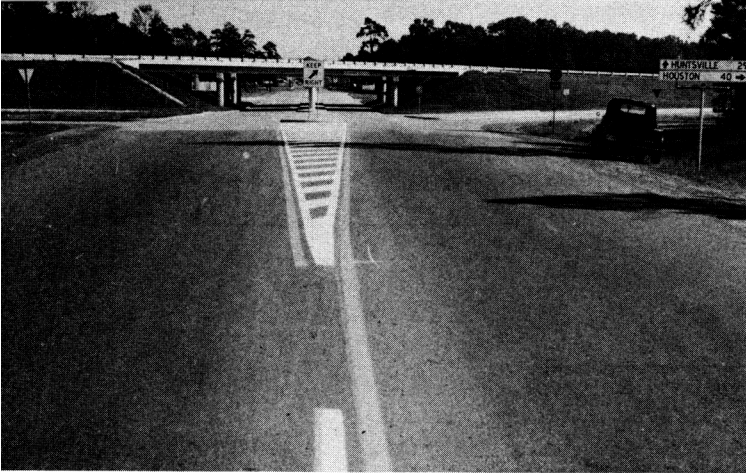


Figure 2—A comparison of average night visibility distances of approach-end treatments using raised stripes vs. conventional paint lines.



Approach-End Treatment as Applied to Channelizing Islands.



Experimental Approach-End Treatment as Applied to a Freeway Ramp.

displaying low-beam headlights on a predetermined path through the test sections. Visibility distances were determined by the observers indicating the point at which they could recognize the general configuration of the approach-end treatment. The visibility distances, measured from the beginning of the approach-end treatment, are listed in Table I.

Visibility Tests—Dry vs. Wet Conditions

On a second occasion, a complete series of tests were conducted, incorporating the variables of wet and dry pavement conditions and the effect of opposing headlights. Again, four observers performed the tests, making two observations for each type of approach-end treatment while the pavement was dry and there were no opposing headlights. Then, these tests were repeated with a vehicle displaying low-beam headlights located as if it were adjacent to the approach-end treatment in the inside opposing-traffic lane. The above tests were then repeated after the pavement in the test area was thoroughly wetted by a water truck. The wetting procedure was repeated before each driver made his observations. This was necessary to maintain a consistent "after-a-rain" effect. The results of these tests are illustrated in Figure 2.

On a third occasion, eight additional drivers were used in only one phase of the testing to further substantiate the results of the previous tests. These tests were conducted under the conditions of wet pavement and without opposing headlights—conditions similar to what would be expected on a freeway ramp at night following a rain. The data from two replications by the eight drivers were combined with the data from the previous four drivers to yield the following mean visibility distances:

Paint line, wet pavement, no opposing headlights — 175 feet.

Raised stripe, wet pavement, no opposing headlights — 465 feet.

SUMMARY OF RESULTS

A painted and reflectorized raised stripe formed by the "surface treatment" or "inverted penetration" method of construction offers a distinct advantage over the conventional reflectorized paint line in providing approach-end treatment to physical barriers, such as islands and freeway ramp terminals.

Night visibility tests showed that the visibility distance of a painted and reflectorized raised stripe was not reduced by wetting the stripe and pavement area, whereas, the visibility of a conventional reflectorized paint line was reduced approximately 60%.

The visibility of both methods of approach-end treatment was reduced approximately 50% for both wet and dry conditions, when opposing headlights were introduced into the tests. However, the raised stripe maintained its relative or proportional superiority over the paint line.

FURTHER RESEARCH

Further research is being conducted on the approach-end treatment of channelization. This research is concerned with an evaluation of materials and methods other than the "surface treatment" or "inverted penetration" technique described in this report. Materials presently under consideration are:

1. Pigmented paving materials.
2. Bituminous mixtures.
3. Portland cement concrete.
4. Epoxys and resins.

Other studies will be concerned with methods and materials of adding greater contrast and reflectivity to the raised stripes used in the approach-end treatment.

¹"Manual on Uniform Traffic Control Devices for Streets and Highways," Bureau of Public Roads, June 1961.