A DISCUSSION OF PRE-CAST CONCRETE TRAFFIC DIVIDERS - OHIO

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Of all the frictions that tend to reduce the traffic carrying efficiency of a highway, one of the most important and most deadly is medial friction. The mechanical devices used for reduction of this friction have been subdivided into three progressive types:[1] (1) those providing *visible definition* of medial area. (2) those providing *sensory warning* to vehicles encroaching on medial area. (3) those providing *deflection* and *redirection* of impinging vehicles.

The precast concrete traffic dividers used in Ohio today were developed to supply these three requirements. While providing these qualities the precast traffic divider uses a minimum width of road surface. This feature alone makes this divider most appropriate in many urban and other developed areas. Not only does the divider occupy a minimum of actual roadway width (2 ft.) but it is believed by many traffic engineers that a minimum reduction of effective travel widths on adjacent lanes is caused by use of precast dividers as compared with other raised medial dividers.

In highly developed areas with driveways on both sides of the roadway, the provision of a medial divider, without restriction on mid-block access to the drives, presents a problem. Flush medial strips can be used but these provide little more separation of opposing traffic flows than paint lines. Continuous raised dividers must be broken so often to provide drive openings that they become unsightly and ineffective. The precast concrete divider units, however, serve the dual function required. They provide physical separation of opposing traffic lanes yet their spacing permits the turning cross-movements required for access to drives and the regularity of their spacing throughout the block contributes to the uniform continuity of the medial strip.

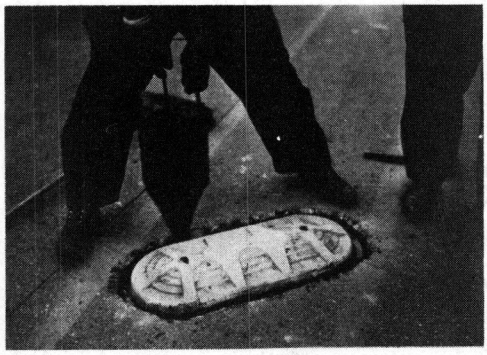
In addition to the effect of precast dividers on traffic flow, they have several physical characteristics pertaining to design and construction which merit consideration. Foremost perhaps is the simplicity of installation on both existing pavements and as a part of new construction projects. Installation consists of merely forming or cutting a 2 in. deep opening in the pavement and setting the unit in place with mortar or bitumious filler (see Figs. 1, 2). Economy is an important facet of highway operation and the $4.00 cost per unit in Ohio is an added inducement to their use. For placement at 12-ft. spacings the delivered price of the medial dividers would be less than 33 cents per lin. ft. of pavement. The units also have a high salvage value in that they are easily removed and reset where resurfacing is necessary.

The simplicity of installation and the inherent economy of this type of divider led to numerous early designs. Of these, Mr. R.N. Ricketts Planning Engineer of Division 6, Ohio Department of Highways, developed the standard design now used in Ohio.

[1] "Mechanical Traffic Deflectors" M. McClintock, Highway Research Board, Proceedings, 1938

Cutting an opening in existing pavement

Placing divider



Sealing with bituminous material

Figure 1. Installation of Precast Concrete Traffic Dividers on Bituminous Concrete

It was first believed that these dividers could be produced by the state personnel, providing an excellent slack-season activity. However, the lack of uniform mix control and the difficulty of compaction in the molds led to such a poor quality product that the production was turned over to commercial concrete manufacturers. Even then, early installations of precast dividers gave very unsatisfactory results since numerous divider units disintegrated rapidly under normal use, creating a traffic hazard and additional expense in replacement. Engineers theorized on numerous explanations concerning impact of heavy vehicles, extensive range of temperature fluctuation, and imperfect seating of units.

Figure 2. Close-up of Precast Concrete Divider Installed Longitudinally in Concrete Pavement

However, rigid specification control of the quality of concrete used and the method of casting brought about satisfactory improvement in the units produced.

They are now made of white cement with an air-entraining agent added to the mixture, and the concrete vibrated in a standard mold. No steel fastening pin or reinforcing steel is used with the concrete. The small size of the individual unit makes reinforcing steel largely unnecessary if the divider is properly bedded. The danger of having steel exposed to the path and contact of vehicle tires in the event that the concrete is chipped or disintegrated, almost prohibits the use of steel pins.

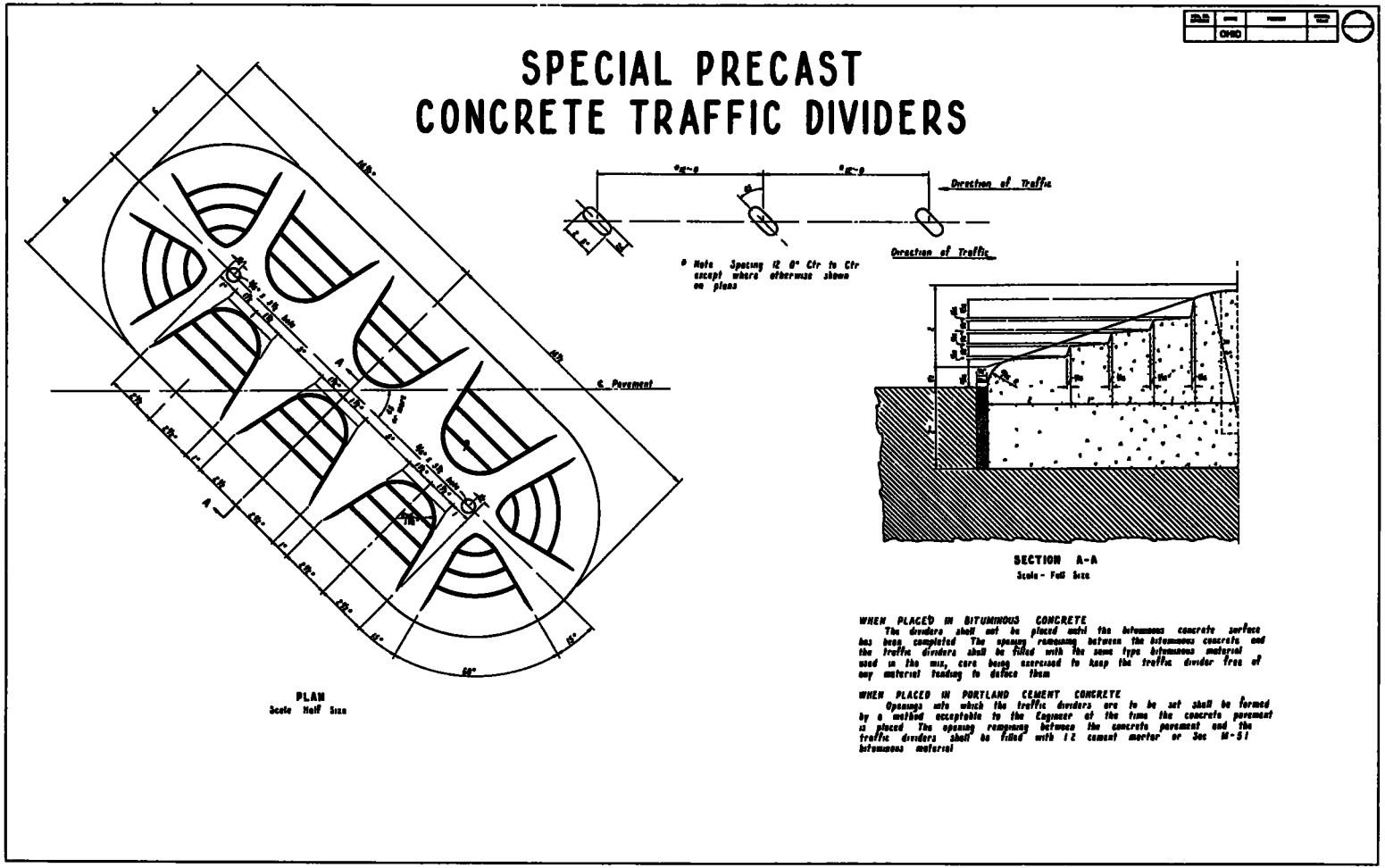

SPECIAL PRECAST
CONCRETE TRAFFIC DIVIDERS
Direction of Traffic
Direction of Traffic
℄ Pavement
PLAN
Scale Half Size
SECTION A-A
Scale - Full Size
WHEN PLACED IN BITUMINOUS CONCRETE
The dividers shall not be placed until the bituminous concrete surface has been completed The spaces remaining between the bituminous concrete and the traffic dividers shall be filled with the same type bituminous material used in the mix, care being exercised to keep the traffic divider free of any material tending to deface them
WHEN PLACED IN PORTLAND CEMENT CONCRETE
Openings into which the traffic dividers are to be set shall be formed by a method acceptable to the Engineer at the time the concrete pavement is placed The spaces remaining between the concrete pavement and the traffic dividers shall be filled with 1:2 cement mortar or Spec M-51 bituminous material

Figure 3.

The physical description of the divider is shown in Figure 3. Note the two ¾ by 3½ in. holes in the top of the unit. These are positioned to enable handling of the unit with a pair of specially devised tongs. The holes are then filled and sealed to prevent infiltration of moisture with resultant freezing and cracking of the concrete after installation. As shown in the plan view of Figure 3 the units are usually placed along the centerline of the roadway with their longitudinal axes set at 45 deg. to the centerline in the direction of traffic. This gives them an additional deflective tendency.

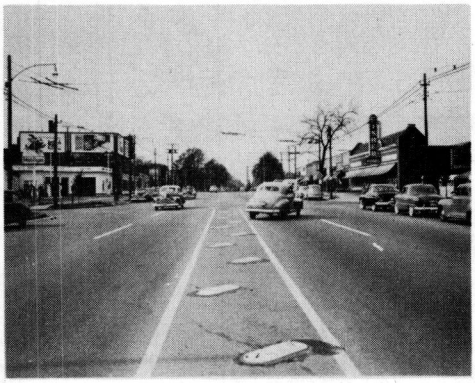


Figure 4. Double Rows of Precast Concrete Traffic Dividers in Urban Sections

The standard position of the units is at 12-ft. center to center on the centerline of the roadway. Their use, however, is actually almost as versatile as that of paint striping. The units can be staggered in two lines to give a wider effective medial area (see Fig. 4). They can diverge from a single line to two separate lines to form a transitional area approaching a wider median, an underpass center pier, safety island or such. They are effectively used to define bus turn-outs (see Fig. 5) and turning movement lanes (see Fig. 6). Obviously the longitudinal spacing along the roadway may be varied according to the character of the section and the degree and type of control desired. In Figure 6 you will note that vehicles are using the bus stop lane for right turning movements. This intersection was designed to provide a bus stop at the terminal of the off ramp. However, driver misuseage of this lane indicates the desirability of having bus stops entirely separate from the natural travel lanes of all through or turning traffic.

Divider units are not recommended on high speed facilities where the velocity of the vehicles is so great as to overcome their deflective

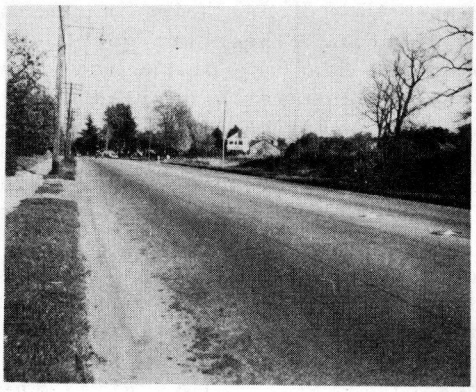
Figure 5. Dividers Mounted Longitudinally to Separate Bus Turn-out From Through Traffic Lanes

value, and the striking of the units might cause the driver to lose control of the vehicle.

Ohio has seen an increasing use of precast dividers in the last few years. There are several projects under construction this year that include installation of these dividers. At the present time there are 3.62 mi. of rural state highways divided by precast concrete units and 17.93 mi. of urban (within corporation limits) state routes. Of the rural routes using precast dividers 0.12 mi. or 3.3 percent of these are in developed areas classified as "urban in character". Thus 83.8

percent of the total mileage using precast dividers is in areas of urban development. This bears out the desirability of these units in sections of restricted right-of-way with many mid-block drives.

Another basis for consideration on the use of precast dividers is safety. It was hoped that a "before and after" comparison could be made of accident statistics on a typical section containing precast dividers but such a comparison was inadvisable for several reasons. The continuous sections containing precast dividers were so short that no significant volume of traffic accidents has occured since the installation of the dividers. Ohio, being one of the two states in the Union not having a compulsory accident reporting law, does not have a complete record of the accidents that have occurred, particularly of the minor accidents. No accident record is maintained by the state for highway sections within a municipality. The predominant trend in available accident records however, indicates a definite reduction in head-on and sideswipe collisions with the introduction of these units.



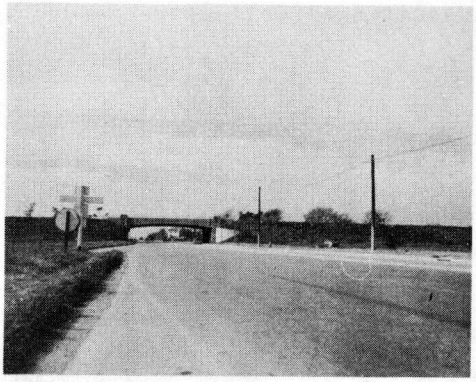


Figure 7. Top: Precast Dividers Used In Residential Section (S.R. 10, Fairview, Ohio)
Bottom: Precast Dividers Used on Approach To Rural Grade Separation (S.R. 237 and S.R. 17, Brookpark, O.)

Figure 6. Precast Concrete Traffic Dividers Used to Define Bus Stops on Ramps (Eddy Road Interchange, Cleveland, Ohio)

Figure 8. Dividers Used on Approach to A Rural Intersection

To summarize on the use of precast dividers we might consider three points:

First, the versatility of the precast dividers almost approaches that of paint-striping, while providing visual and sensory warning, and restraint and redirection of impinging vehicles.

Second, the economy of installation and functional utility in developed areas far exceeds that of any type of continuous divider.

Third, the efficiency of traffic flow and the resultant safety of operation on divided or channelized sections justifies the installation of medial dividers, even in sections of limited width.

Thus it would seem that precast dividers meet a need perhaps not with an ideal solution, but with an economical and efficient design for sections with a definite need and limited opportunity for improvement.