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AN END TREATMENT FOR CONCRETE BARRIERS USED IN WORK ZONES

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An End Treatment for Concrete Barriers Used in Work Zones

by

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The concrete safety shaped barrier (CSSB) has gained widespread implementation during the past several years. Initially it was installed in the median of divided roadways to prevent crossover head-on accidents, where it came to be known as the concrete median barrier (CMB). Early installations were cast in place, but precast units have since been developed and are now used at many sites to reduce costs and expedite installation. With the development of portable precast units, the barrier has also gained wide acceptance as a temporary positive barrier for work zones. More recently the barrier has been used on certain high-volume facilities as a permanent roadside barrier to shield hazards such as rigid objects or embankments. In this capacity it is replacing the standard W-beam roadside barrier.

In all of the above-mentioned applications, the concrete safety shape barrier has proven to be both a cost-effective and a crashworthy barrier. However, when the barrier must be terminated within the "clear zone", the exposed end poses a serious hazard to the motorist. Four acceptable end treatments are now available: (1) Flare the barrier end out of the clear zone (at an acceptable flare angle) or bury the end in a cut slope. This option is available for roadside barrier application only. (2) Use the guardrail energy absorbing terminal (GREAT),[1] which is a proprietary system. (3) Use the median barrier breakaway cable terminal. (4) Use an approved crash cushion.

In many cases the barrier end cannot be flared out of the clear zone or buried due to roadway geometrics or other contraints. Although the GREAT system has proven to be a crashworthy end treatment, its use has been limited by its relatively high cost. Similarly, alternate 3 has not been widely used due to its relatively high cost, marginal impact performance for the small car, and lack of portability. Approved crash cushions are also costly and require more space than is often available.

[1]GREAT, licensed and sold by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, Ill. 60601.

In view of the wide use of the concrete safety shape barrier and its increasing use in construction zones where space is often very limited, Texas Transportation Institute (TTI) engineers and Texas highway engineers have been seeking a relatively inexpensive end treatment that can be used in construction zones. Recent tests by TTI indicate that a safe and relatively inexpensive weakened beam/barrel crash cushion has been designed.

The purpose of the research reported herein was to develop an alternate end treatment for the CSSB for use in work zones. The State Department of Highways and Public Transportation (SDHPT) (Texas) desired that the alternate treatment be reasonable portable, relatively inexpensive, that it be constructed from readily available materials, and that it be relatively narrow.

An end treatment was developed and crash tested to shield the ends of the concrete safety shape barrier (CSSB) and other narrow rigid objects. It was designed as a temporary treatment for use primarily in construction zones. Steel barrels, some empty and some containing sand ballast, were used in conjunction with collapsing W-beam (guardrail) in the design. Factors considered in its development were cost, portability, ease of installation, and the use of readily available components.

Four full-scale vehicular crash test were conducted to evaluate the impact behavior of the design. Since the treatment was intended for temporary use, it was decided that test conditions (vehicle weight, impact speed, and impact angle) recommended for permanent roadside appurtenances were not appropriate. The basic difference between the selected conditions and those recommended for permanent installations involved the impact speed. A 50 mph (80.5 km/h) impact speed was used in lieu of the 60 mph (96.5 km/h) speed used for permanent appurtenances. As a result of the crash tests it was concluded that the design was acceptable in terms of impact performance.

Due to relatively large lateral displacements that may occur from side hits near the nose, caution is advised in its use in narrow medians or other areas where such displacements may create an undue hazard to motorists. These exceptions notwithstanding, there are numerous applications, including most roadside locations, where lateral movement would pose no problem.

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