



# Project Summary

Texas Department of Transportation

## 0-5527: Development of Transition Element for Low-Profile Traffic Barrier to Standard Concrete Traffic Barrier

### Background

A low-profile barrier system was developed more than a decade ago for use in low-speed urban work zones where it is required to have frequent cross-traffic entrances. The height of the low-profile barrier was set at 20 inches (508 mm) instead of the standard 32 inches (813 mm) used for traditional work zone barriers. The reduced height of the low-profile barrier greatly enhances the ability of drivers who are traversing the work zone to maintain visual contact with the local traffic situation. Since its introduction, the low-profile barrier has demonstrated that it is extremely useful in increasing safety in such situations.



Transition Segment

### What the Researchers Did

The purpose of this research was to develop a crashworthy transition barrier segment that can be used to connect the 20-inch (508 mm) tall low-profile barrier [LPCB(1)-92] to the 32-inch (813 mm) tall F-shape portable concrete barrier [CSB-04]. The low-profile barrier has been accepted as a *National Cooperative Highway Research Program (NCHRP) Report 350 Test Level Two (TL-2)* barrier. Since the transition barrier segment would be attached to the low-profile barrier on one end, it was logical to develop the transition for the same test level used for the low-profile barrier itself. Once the transition to a standard barrier height has been made, then speed limits can be returned to those that are consistent with the higher TL-3 performance levels of the traditional height barrier.

The low-profile barrier system was developed for urban areas with uniformly low speed limits. However, there are a large number of situations where speed limits transition from low speeds to high speeds or vice versa. In such situations, it would be very beneficial to derive the increased visibility benefits of the low-profile barrier in the low-speed areas. However, the low-profile barrier cannot now be used in such situations because there is no approved hardware that can connect the low-profile barrier to the taller traditional concrete median barriers.

### Research Performed by:

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### Research Supervisor:

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### Project Completed:

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The transition barrier segment developed is a reinforced concrete element that has a standard 32-inch (813 mm) tall concrete barrier cross-section at one end and a 20-inch (508 mm) tall low-profile barrier cross-section at the other end. The transformation from one barrier profile to another is accomplished using a series of planar surfaces. The transition barrier segment has an overall length of only 10 ft (3 m), which makes it easy to handle, transport, and set.

## What They Found

Researchers performed two full-scale crash tests to evaluate the performance of the new transition barrier segment. One test was conducted with a 4409-lb (2000 kg) pickup truck impacting at the critical point as the vehicle progressed in the direction of the low-profile barrier to the F-shape barrier; the other test was conducted at the critical impact point with the vehicle traveling in the opposite direction. All results for both tests were within the performance limits as described in *NCHRP Report 350* test for TL-2 conditions.

## What This Means

The full-scale tests verified the performance of the new transition barrier segment for TL-2 impact conditions as defined in *NCHRP Report 350*. This level of performance permits the use of the new transition barrier segment on roadways with speeds up to and including 45 mi/h (72 km/h) or other conditions deemed appropriate for TL-2 barrier systems. Once the transition to a standard barrier height has been made, then speed limits can be increased to those that are consistent with the higher TL-3 performance level of the taller F-shape barrier.

In addition to providing guidance on the redirective capabilities of the new transition barrier segment, recommendations are presented in the full report (Report 0-5527-1) for the minimum length of low-profile barrier that should be used in conjunction with a transition barrier segment. If the full sight distance benefits of the low-profile barrier are to be maintained on level roadways or roadways with an upward slope, it is recommended that a minimum 400 ft (122 m) of low-profile barrier be incorporated before the transition barrier segment is used to connect the low-profile barrier to the taller F-shape barrier. If the longitudinal barrier is installed on a downgrade, one additional 20 ft (6.1 m) of low-profile barrier segment should be added for each 2 percent of downgrade up to a total downgrade of 9 percent.

In addition to preserving the sight-distance benefits of the low-profile barrier, use of the minimum low-profile barrier length should assure that the frictional forces between the top of the concrete barrier and the underside of a vehicle are sufficient to bring an errant vehicle that straddles the end of the low-profile barrier system at a speed of 45 mi/h (72 km/h) to a stop before it encounters the transition barrier segment and taller F-shape barrier.

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