

Midwest States Pooled Fund Program Consulting Quarterly Summary

Midwest Roadside Safety Facility

10-01-2006 to 12-31-2006

F-Shape Temporary Concrete Barrier

Question

State: WI

Date: 10-13-2006

We have a requirement to anchor the temporary concrete barrier if it is closer than a specified distance to a 2-foot or greater dropoff. A question has come up on how to define the maximum steepness of dropoff. What is the maximum steepness of dropoff slope that wouldn't require anchoring?

Could an impacting vehicle penetrate or vault the barrier as a result of a barrier deflecting beyond the edge of a dropoff?

Response

Date: 10-13-2006

The through-bolt tie-down system provided in TRP-03-134-03 was designed, tested, and evaluated for use with barrier placement on rigid concrete pavement adjacent to a vertical drop off. For this 2000P test, part of a barrier was pushed back slightly, thus extending over the drop off edge but without concern. Certainly, this same barrier and tie-down system could be used at similar locations where shallower roadside slopes exist.

Now, if you do not want to use the tie-down system near drop-offs and roadside slopes, it would be necessary to provide level pavement, or nearly level pavement (say 10:1/12:1 or flatter), on the back side of the barrier.

These conditions would allow the impacted barrier to deflect backward without dropping over an edge or slope break point. If a free-standing barrier drops over an edge or modest roadside slope, then there exists an increased propensity for vehicle climb up the barrier, vaulting, and rollover. If a barrier is positioned on soil, then the barrier can sink into the soil. Then, when it is impacted, it may actually dig into the soil and result in increased barrier rotation and vehicle climb, vaulting, and rollover.

In summary, anchoring a TCB to a rigid pavement would not be required as long as you provide adequate space for barrier deflection on a level surface during impact events. For such a situation, a vertical drop-off could be accommodated beyond that distance.

Pier Protection

Question

State: OH

Date: 11-01-2006

I would like your professional opinion about a proposed median bridge pier protection design a local city is asking to use.

This suburb is reconstructing a freeway interchange. The mainline freeway will be on a structure over the 45 mph 4-lane divided arterial underneath, with bridge piers in the center median. This will be a modified diamond interchange, with a low speed roundabout along the arterial on each side of the overhead structure. This concept is shown on the attached sheet 4. The city originally proposed a 16 foot wide 6" high curbed median through the center bridge pier location. We recommended the city provide concrete barrier in lieu of the curbed median island to shield the piers. The city has agreed to this, but they still want the curbed median outside of the bridge pier protection length and in between the roundabouts, as this design is typical for their arterial street system.

On the ODOT network the ends of this concrete barrier would be protected by impact attenuators, but the city wants the median curb to run directly to the concrete barrier, meaning the impact attenuator would have to be installed on a curbed island. This is counter to the attenuator manufacturers recommendations. Since this, and other standard solutions are not attractive to the city, it is asking for a different design.

Thus, the city's engineer, through its consultant, has proposed the attached draft design. In it the concrete barrier (labeled as Type D on the second attachment) is flared to the center of the median and a mounded median is used to cover the barrier end, thus eliminating the need, in the city's opinion, for crash cushions. One can assume all of the barrier taper rates and median slopes used in the design are allowable, so there are no snag points for a motorist to encounter. In similar situations, ODOT would not allow a tapered end section to the concrete, but the city believes this design is safe, because none of the earth slopes violate any geometric standard.

I have my doubts about the design, but the AASHTO RDG does give the designer some leeway in lower speed urban locations. After considerable discussion, I did inform the city and consultant I would run the idea past your group at the Midwest Roadside Safety Facility for your comments on the city's proposed design from a roadside safety point of view.

Response

Date: 11-03-2006

Thanks for the opportunity to review the proposed hazard mitigation design. From my review of the attached discussion and details, I assume that the authors are planning to allow impacting vehicles to travel up and over the sloped berm and onto the top of a single-slope concrete median barrier. This action would result in vehicles rolling off of the top of the barrier or traveling forward and entering the separated median barrier and bridge pier region. Second, angled impacts near the nose of the berm but slightly down the side could result in the vehicle being tripped and launched over the barrier system, potentially rolling over as well. As such, I do not recommend that the Ohio DOT nor any municipality use the sloped berm concept described below to treat the tall, single-slope concrete median barrier. Please feel free to discuss this matter with me at your convenience!

