

DESIGN BULLETIN #8/2002 (Revised March 2007)

Roadside Design Practices for Alberta - An Update on Barriers, Guardrail, Clear Zone, etc.

Superseded January 2008 by Roadside Design Guide, November 2007

<http://www.infratrans.gov.ab.ca/3451.htm>

January 2006 Update to Design Bulletin #8/2002:

Item 2.1.1 of this Bulletin has been revised to include Deerfoot Trail, Stony Trail, East Freeway (Calgary) and all other Edmonton and Calgary Ring Roads Projects.

June 2006 Update to Design Bulletin #8/2002:

Item 1.4 Shy Line Offset has been revised.

August 2006 Update to Design Bulletin #8/2002:

Item 1.4 Shy Line Offset has been revised.

March 2007 Update to Design Bulletin #8/2002:

Item 2.1.2 Recycle Plastic Post has been revised.

Summary: The department has recently completed a Review of Practices and Guidelines for Clear Zones, Barriers and other subjects related to Roadside Design. This technical bulletin is issued to notify designers of recommendations that have been approved as a result of this study.

Designers should note that the recently completed review is considered to be Phase 1 in the overall review of this subject. As a first phase, the objective of this study was to address many of the issues at a conceptual design level and to take a position regarding the future direction the department should take in these matters. A set of recommendations has been approved, however, a second phase of this engineering study is required before a full implementation can begin. At this time, there are some recommendations that can be implemented immediately, others that can be partially implemented and some that will be deferred pending additional investigation and/or engineering work.

The department intends to transition from using current traffic barriers to using only systems that have been crash tested successfully under NCHRP 350 testing protocols. The chosen systems must be able to perform at a level suitable for the proposed installation. A transition period is required to allow new products to be installed on a trial basis and evaluated in Alberta highway conditions. This period will also allow suppliers and contractors time to adjust to the new requirements.

The “standard” post to be used on strong post systems is the 1.83 m post. For installations that require the Weak Post System, the department will evaluate the performance of a 1.83 m post versus the 1.52 m post that is currently used. If a change in materials or dimensions is required, a transition period will be used to allow suppliers and contractors time to adjust their operations.

This bulletin provides a general update for designers and a list of initiatives that are currently

underway in the general categories of Immediate Implementation, Partial Implementation and Future Work:

IMMEDIATE IMPLEMENTATION:

- 1.1. **RIGID BARRIERS.** Where a new rigid barrier system is required on a roadway, the normal department standard shall be the F-shape concrete barrier. Exceptions may be permitted based on the following criteria:
 - A single slope concrete barrier may be used to tie-in to a single slope concrete bridgerail.
 - A Tall-Wall concrete barrier system may be used where the AADT exceeds 50,000 or where the consequences of large vehicles impacting a smaller concrete barrier are severe or due to a combination of these two factors. Also, where there are fixed objects such as light poles in the “zone of intrusion” of a conventional barrier system, a Tall-Wall system could be used to reduce the probability of impacts with these objects.
 - A New Jersey shape concrete barrier may be used for a limited length where it is needed to replace short segments or tie-in to existing New Jersey installations.
- 1.2. **BRIDGE BARRIER REHABILITATION.** Designers should refer to the “Guidelines for Upgrading of Existing Bridgerails/Approached Rail Transitions in Alberta” in Appendix D of the Bridge Structure Design Criteria. The Guideline can be found at the following web site:
<http://www.trans.gov.ab.ca/Publications/DesignGuides.asp>
- 1.3. For design analysis purposes, designers are to use the department’s benefit/cost analysis guidelines together with the AASHTO Encroachment Based Model (calibrated to local conditions) for prediction of safety effects.
- 1.4. **SHY LINE OFFSET.** It is desirable to provide a uniform clearance between the travel lane and roadside features such as barriers, bridge railings, retaining walls etc. The shy line offset is defined as “A distance beyond which a roadside object will not be perceived by a driver to be a threat, to the extent of changing lane position or speed”. The shy-line offset is the transverse distance measured from the edge of travel lane to the edge of hazard. The hazard may be a protection system such as a roadside barrier or a bridge railing or a natural or man-made hazard. A “suggested minimum” shy line offset is provided here as a guide for designers. Installing barriers at greater offsets is desirable, provided this can be achieved at a reasonable cost and that vehicle trajectory will still allow any barrier systems to operate as designed. Designers should note that the provision of the full shy line offset is considered most critical at the beginning of a hazard. Where there is a long hazard parallel to a roadway for example a bridge railing, the offset is less critical after the hazard has been introduced. Justification should be provided where an offset less than the “suggested minimum shy line offset” is proposed on any project.

For URBAN projects including projects in urban fringe areas such as the Calgary and Edmonton Ring Roads, AIT follows TAC’s “Suggested Shy Line Offset Values” as shown in Table 3.1.6.4 of the 1999 Geometric Design Guide for Canadian Roads. The offsets are to be measured from the edge of lane using the actual lane width provided on the subject road. In some cases this lane width may exceed 3.7m where it has been developed to allow for bicyclists as well as motor vehicles.

For RURAL projects the “Suggested Minimum Shy Line Offset Values” used by Alberta Infrastructure and Transportation are shown in the bullets below. These values are sometimes less than those recommended by TAC for the same speed. This is due to the use of high design speeds over a large component of a rural low-traffic-volume network in Alberta. Due to economic considerations some of these roadways may have a shoulder width of 1m or 0.5m even with a design speed of 110 km/h. It is difficult to justify a large shy line offset when the shoulder is narrow and the traffic volume is low.

Suggested Minimum Shy Line Offset Values for New Construction on RURAL Projects

When selecting a shy line offset all five of the following bullets should be followed:

- On all new structures, barrier installations etc., i.e. all longitudinal hazards, the shy line offset should not be less than 1 m. For example, new bridges on two lane roads should not be less than 9m (clear roadway width).
- The suggested minimum shy line offset should match or exceed the desirable shoulder width on the roadway for the service life of the infrastructure element being designed. For example, for a new bridge the projected traffic volume for the next fifty years is of interest. It is normal practice on new bridge design to provide sufficient width such that widening would not be required in the 25 to 30 year range. In the case of roadside guardrails mounted on wooden posts where the service life is normally 20 years or less, the width of the roadway during the shorter term is normally used.
- For lower volume divided highways (less than 20,000 AADT*) the suggested minimum shy line offset on the left hand side of the travel lanes is the standard left hand shoulder width for the design designation i.e. 2 m for four lanes, 2.5 m for six lanes and 3m for eight lanes.
- For higher traffic volumes (i.e. greater than 9000 AADT on an undivided highway or greater than 20,000 AADT on a divided highway) with design speed greater than 100km/h, consideration should be given to increasing the shy line offset above the desirable roadway shoulder. The suggested minimum is 3.0m for bridges (associated cost increase to be considered) and 3.5m for roadside barriers in isolation from bridges.
- Roadside barriers should normally be located no further than 4m from the edge of travel lane, since the chance of an errant vehicle hitting the barrier at a more obtuse angle increases with the offset. An exception to this rule is in the area of flaring (typically at the barrier ends) where the offset may be increased to more than 4m.

* AADT is defined as 2 Way Average Annual Daily Traffic.

PARTIAL IMPLEMENTATION:

- 2.1 During the transition period to the exclusive use of systems that have successfully passed NCHRP 350 testing protocols and the expected adoption of 1.83 m (6') posts, the following changes to normal practices will be followed:
 - 2.1.1 On the Deerfoot Trail, Deerfoot Trail Extension, Anthony Henday Drive, Stony Trail, East Freeway (Calgary), and all other Edmonton and Calgary Ring Roads projects, the standard barrier system shall be the Modified Thrie Beam on steel posts. However, it may be necessary to use concrete barriers (instead of the Thrie Beam) due to the need to: provide a greater level of protection, tie-in to a rigid system on a bridge, or because

deflection cannot be accommodated. The design deflection for the Modified Thrie Beam system is 0.6m.

- 2.1.2 On undivided highways and all divided highways (excluding those mentioned above) where the AADT > 2500, the Strong Post blocked out system shall be used. The Strong Post system uses 1.83 m wood, plastic or steel posts. ~~An exception is Highway 2 between Calgary and Edmonton where recycled plastic posts are not yet permitted due to the department's limited experience with this product and the high exposure rate on this highway.~~ Design Bulletin #2 and #24 provides additional information on the use of recycled plastic posts in barrier systems. The design deflection for the Strong Post system is 1.5 m for plastic posts and 0.9 m for wood or steel posts.
- 2.1.3 On all other highways, the Weak Post W beam may still be used as per current practice i.e. using the 1.52 m posts. However, the department will identify a number of installations where the use of the 1.83 m post will be specified for evaluation purposes. The design deflection for the Weak Post system is 2.5 m.

FUTURE WORK:

- 3.1 Department will be doing additional investigation into crash testing data and material testing that has been published elsewhere.
- 3.2 Department will monitor the performance of trial installations.
- 3.3 Department will expand the use of alternate hardware and will phase in the introduction of crash tested systems so that eventually all traffic barriers on Alberta highways will be of the crash tested type. End treatments will also be evaluated.
- 3.4 A new Roadside Design Guide will be prepared for Alberta providing comprehensive guidelines, design tools and policy information related to this subject.

For additional information on this subject a document entitled ROADSIDE DESIGN – A review of practices and guidelines for Clear Zones, Barriers, etc. Final Report prepared for Alberta Transportation by Stantec Consulting Ltd, dated September 2001 is available for purchase from Technical Standards Branch.

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Update 1: January 13, 2006

Update 2: June 26, 2006

Update 3: August 31, 2006.

Update 4: March 1, 2007

Contact: Bill Kenny, Technical Standards Branch, Alberta Infrastructure and Transportation.