



Arizona Department of Transportation

ROADWAY ENGINEERING GROUP

MEMORANDUM

To: All Design Personnel
ADOT and Consultants

Date: July 9, 2009

From: Mary Viparina
Assistant State Engineer
Roadway Engineering Group

Subject: Crash Cushion Selection
Procedure

The attached procedure for selection of crash cushions supersedes the two previous design memorandums issued on this subject dated 10/31/02 and 11/6/06. The procedure outlines a two-step process for selecting crash cushions on Federal-aid and state funded projects.

Project Managers should insure that the updated procedure is followed.

Please distribute this memorandum to all design and development personnel, including consultants, within your District, Group, or Section.

Thank you for your attention to the updated procedure.

Attachment

C: Roadway Engineering Group
Valley Project Management Group
Statewide Project Management Group
Districts (10)
Bridge Group
Traffic Engineering Group
Contracts and Specifications Section
Local Government Section
Construction Group
Regional Traffic Engineers (4)
Engineering Consultants Section

Central Maintenance Group
Materials Group
Engineering Technical Group
FHWA
Sam Maroufkhani
Dallas Hammit

**CRASH CUSHION SELECTION PROCEDURE
ROADWAY ENGINEERING GROUP
July 9, 2009**

(Supersedes All Previous Design Memorandums)

The following guidance is to be followed for design and selection of crash cushion devices for permanent use on federal-aid and state funded projects. This guidance does not apply to guard rail end terminals or to temporary crash cushion devices during construction.

Devices for Crash Cushion design can be found on the Approved Products List (APL). Subcategory V-1 lists the crash cushions that have been approved through the PRIDE process. The APL can be viewed at the following ADOT website:

<http://www.azdot.gov/TPD/ATRC/PRIDE/apl.asp>

Selection of possible crash cushions requires that they be NCHRP 350 approved devices. The normal usage for high speed applications requires a TL3 design. Designs for lower speeds (45mph and less) are normally available from the manufacturer and can be considered for urban and low speed applications.

The designer is to select devices from the APL for use that will meet the design requirements of the specific application. The manufacturers and their representatives can be contacted for design manuals, consultation on installation details and other specific requirements. Site preparation details and special provisions as needed should be included in the plans with the specific applications selected.

There are a substantial number of devices that can be considered from the list and it is also evident that one device will not always substitute for another. It is desirable that more than one device be considered for a specific location in order to promote competition in bidding. It is also recognized that with consideration of cost, construction and maintenance requirements, one device may be preferable for a specific location.

ADOT has adopted criteria for usage of crash cushion devices for APL Category V-1 that require the concurrence of the District Maintenance Engineer to maintain a crash cushion device that is constructed on a project. This is to ensure that the District is comfortable and willing to maintain a device and that an undue burden for maintenance of proprietary crash cushions is not imposed on a District. This procedure recognizes that ease of maintenance of a device is an important factor in addition to performance of the device. It is in the public interest not to impose devices on the Districts which are not within their resources to maintain.

Documentation and requests for approvals must be made early in the design process to avoid delay of bid.

The following procedure outlines the steps for documenting and finalizing the crash cushions to be shown on the plans:

STEP ONE: Evaluate the usage of the Smart Cushion as a Sole Source Finding in the Public Interest:

On August 25, 2006 the Arizona Division of the Federal Highway Administration approved a Finding In the Public Interest (FIPI) allowing designers to specify the SMART CUSHION impact attenuator, (model SCI 100 GM), a NCHRP Report 350, Test Level 3 device for high-speed, high-crash frequency locations on federal-aid highways.

Typical potential locations include, but are not limited to the following:

- Freeway to freeway system interchanges
- Freeway off-ramps in the Phoenix and Tucson metropolitan areas

At locations not meeting the following high speed, high-crash frequency criteria designers should proceed to **Step Two: Evaluate all Crash Cushions Listed on the APL.**

Procedure for Smart Cushion FIPI:

1. Evaluate and document the site for compliance with the following criteria for a high-speed, high-crash frequency location:

For Existing Location:

- A. Speed: posted or 85th percentile speeds greater than 45 mph; and
- B. Crash Frequency: three or more documented vehicle/impact attenuator collisions within any 36-month period. **Documented means Department of Public Safety or police reports, not maintenance repair records.**

OR

For New Location (where there is no crash history to base a decision): similar site geometry or conditions as for existing locations above. Obtain FHWA concurrence on Federal-aid projects.

2. Review Manufacturer's website for design requirements and contact them as needed.
3. Review site conditions for conformance with manufacturer's requirements.
4. Consult with the District Maintenance Engineer and get concurrence to use the SMART CUSHION.
5. Provide plan details and special provisions as needed.
6. The engineer preparing the roadway design plans will prepare documentation of the FIPI for the Project Reference and design files.
7. Copies are to be provided to Contracts and Specifications.

STEP TWO: Consider All Crash Cushions Listed on the APL

Procedure:

1. Review all crash cushions on APL Subcategories V-1 and V-3 to determine which crash cushions will fully satisfy the requirements of the design for each site being evaluated. Special conditions at each site may eliminate some alternates. Contact manufacturer's for assistance with design requirements.
2. Discuss the alternatives with the District Maintenance Engineer to obtain concurrence on maintenance of all devices selected. Provide alternates where practicable.
3. In the event it is determined that only one alternative is recommended, the design engineer will prepare a letter request for approval to the ADOT Project Manager providing justification for use in the public interest.
 - a) On projects having ADOT approval authority, the ADOT Project Manager, acting on behalf of the Assistant State Engineer, Roadway Engineering Group will review and approve the request if acceptable and in accordance with these guidelines. The Project Manager may wish to confer with the Assistant State Engineer, Roadway prior to approval.
 - b) On Federal-aid projects where the FHWA has direct approval authority, the ADOT Project Manager will submit the request to the FHWA for approval.
4. Provide plan details and special provisions as needed. Consider specifications requiring the same crash cushion alternative be used for multiple similar locations so the alternates are not mixed within a project.
5. The Engineer preparing the roadway design plans will prepare documentation of the selection for future reference in the design file.
6. Copies of Sole Source approvals will be sent to Contracts and Specifications and will be placed in the project file.

SAND BARREL CRASH CUSHIONS:

APL Category V-3 provides alternative manufacturer designs for Sand Barrel Crash Cushions. All of the manufacturer designs shown are equal alternatives and are interchangeable. Any of the alternatives can be provided by a contractor. Standard Specification 702 covers Sand Barrel Crash Cushions. When it is determined that Sand Barrels are the preferred crash cushion, Step 2 of the above procedure is where they are normally selected due to cost considerations. If sand barrels are the sole selection, a FIPI request letter to the ADOT Project Manager providing justification in the public interest is not required due to multiple suppliers of the device on the APL.

Please contact Roadway Design for any information or assistance required in respect to this procedure.