Design Standards Letter

Letter Number: **G-1986-09**

Letter Date: **12/15/1986**

Effective Date: **12/15/1986**

Section/Plan No.: **None**

Subject: **Clear Zone Concept for Roadway Design**

Body

As you know, for many years we have incorporated a "safety zone" in the design of certain projects. This safety zone consists of a 20-foot width of 6:1 maximum slopes outside the normal shoulder width. This concept will no longer be used.

In its stead, a "clear zone" concept has been adopted. The concept is discussed in Section III-A-2 Roadside Obstacles in the AASHTO Guide for Selecting, Locating, and Designing Traffic Barriers and the supplement to the guide dated March 9, 1980. Copies of these publications are being furnished to the Districts concurrently with this letter.

A computer program for computing the required clear zone width is also being furnished to the Districts. This program is to be used to the exclusion of the barrier guide to determine the clear zone width. This is because certain modifications have been made to reduce the necessary widths on the outside of curves. The computer diskette also contains a cost-effectiveness selection procedure to be used when obstacles are encountered within the clear zone width. Background for this procedure is contained in Chapter VII on Page 156 of the barrier guide and on Page 25 of the supplement.

The clear zone is defined as the roadside boarder area measured from the edge of the pavement that is available for the safe use by errant vehicles. Clear zones are provided where the design speed of the roadway is 50 mph or more. For less than 50 mph, clear zones should be considered if economically feasible. Non-traversable slopes or fixed objects should be removed, relocated, or shielded by a barrier if they are within the indicated minimum clear zone width and if it is cost effective to do so. Higher speeds will result in vehicles traveling further before recovery. Horizontal curvature will increase the likelihood of a vehicle leaving the travel way and will increase the distance it will travel. Steeper fill slopes will also increase

the distance the vehicle travels off the travel way.

Guard rail will not normally be warranted because of the embankment height provided a 3:1 or flatter fill slope is used and the required minimum clear zone width is attained. However, as a guide, slope protection may be warranted as shown on Figure III-A-1 of the barrier guide. Combinations of embankment height and slope plotting above the curve indicate a need for guard rail. Combinations plotting below the curve indicate conditions are less severe without guard rail. However, other factors contributing to accident severity such as hazards located either on or at the toe of the slope should be taken into consideration.

If guard rail protection of fixed objects is necessary, the protection is determined from the near lane on one direction roadways and from both lanes on a two direction roadway.

Guard rail is warranted in advance of any fixed object located within the clear zone provided the object is potentially more damaging than the guard rail if struck by a vehicle and the object can not economically be removed or relocated. The fixed object is termed the area of concern and the required guard rail depends upon the size of the object, the distance from the travel way, the ADT, and the design speed.

The length of need of the guard rail is the length of the obstacle plus the length of the approach Barrier on the upstream traffic side (and downstream traffic side if needed). The length of need and the flare rate of the guard rail is determined in accordance with the procedures contained in Section III-E-4 of the barrier guide. The general geometrics governing the length of need are illustrated on Figure III-E-4 and Figure III-E-5 and Table III-E-1 of the barrier guide. The length of need does not include the 25 feet of twisted, turndown terminal section.

It is important in the implementation of the clear zone concept that the clear zone distances should not be used as boundaries for introducing roadside hazards such as the bridge piers or trees. These should be as far from the travel way as is practical. The clear zone width should be applied with good judgment. If an obstacle lies just beyond the clear zone, it should be removed or shielded if costs are reasonable. Conversely the clear zone should not be obtained at all costs. Limited right-of-way or high construction costs may lead to the installation of a barrier or possibly no protection at all.

As may be noted, roadside slopes play an important part in the clear zone width determination. For example, changing from a 3:1 to a 4:1 slope will reduce the required clear zone width by up to 50% in most cases. If feasible, the flattening of slopes is preferable to installation of guard rail.

In cut sections, the ditch configuration must be considered if clear zones are provided. Figures III - A7, 8, & 9 of the Guide should be checked for preferred ditch cross sections. Ditch sections must be within the shaded portions of the guides for use with clear zones.

On any given project, the plans are carefully reviewed and a statement is included in the letter of transmittal with the P.S. & E. documents that the project meets the clear zone requirements or that all exceptions to the clear zone are noted and explained.

We are sure that because of the complexity of this concept and the many variables involved, numerous questions may arise. It is intended that the clear zone concept be incorporated into plans as rapidly as possible, but plans in stages of substantial completion should not be revised.

New SP Forms without the safety zones are furnished herewith. SP-51E has been revised to require a six foot shoulder on the right side. Full size reproducibles for use in plans should be requested as needed.