



# Safety EdgeSM - Design and Construction

An Online Continuing Education Course for Engineers

**Course Number: T-1003**

**Credit: 1 Hour / 1 PDH / 1 CPD**

# Safety Edge: Design and Construction

## SECTION 1: INTRODUCTION

### 1.1 Introduction

The Safety Edge<sub>SM</sub> is a relatively simple but effective solution that can help save lives by allowing drivers who drift off highways to return to the road safely.

During conventional paving processes, the pavement is constructed with vertical or near vertical edges. Instead of a vertical drop-off, the finished Safety Edge<sub>SM</sub> forms the edge of the pavement with a slope of approximately 30 degrees. Research has shown this “transition from on-roadway surface to shoulder and back is so smooth it defies assignment of any degree of severity.” The Safety Edge<sub>SM</sub> provides a strong, durable transition for all vehicles and helps prevent pavement edge raveling.

The recommended practice of bringing the adjacent soil or aggregate material (unpaved shoulder or modified soil) flush with the top of the pavement often requires frequent maintenance. When the vertical edge is exposed due to wear/erosion, it can contribute to drivers losing control of the vehicle when attempting to recover from a roadway departure. The Safety Edge<sub>SM</sub> concept is when drop-offs along the pavement edge occur, the edge will not be vertical, but has a shape that will not induce tire scrubbing. By including the Safety Edge<sub>SM</sub> detail while paving, this safety countermeasure can be implemented system-wide at little or no cost.

## SECTION 2: SAFETY EDGE<sub>SM</sub> – GENERAL DESIGN AND CONSTRUCTION CONSIDERATIONS

In terms of paving operations, there is little difference between the placement and construction of AC and PCC materials (refer to Figure 1) with and without the inclusion of the Safety Edge<sub>SM</sub>. However, there are important considerations that should be accounted for when incorporating the Safety Edge<sub>SM</sub> into a paving operation. This section of the Course highlights the general design and construction details when constructing a Safety Edge<sub>SM</sub> in conjunction with AC or PCC pavements.

### 2.1 Safety Edge<sub>SM</sub> Use

The Safety Edge<sub>SM</sub> provides two important safety related functions. It serves as a mitigating measure to help with pavement edge drop off that occurs after an AC layer is placed, but before shoulders can be reconstructed flush with the paved surface. The Safety Edge<sub>SM</sub> also serves as a long-term safety feature for areas susceptible to material displacement and/or erosion adjacent to the paved surface.

An additional benefit of the Safety Edge<sub>SM</sub> is that the density of the AC mat adjacent to the pavement edge was found to be higher in most areas with the Safety Edge<sub>SM</sub> in comparison to areas without the Safety Edge<sub>SM</sub>. The Safety Edge<sub>SM</sub> is believed to serve as a restriction to the lateral movement of the AC mat along an unconfined edge. This observation was found from multiple demonstration projects. Visual assessment of many Safety Edge<sub>SM</sub> treatments have shown that trucks loaded with asphalt do not deform/damage the finished edge.



(a) AC Project.

(b) PCC Project.

**Figure 1. Safety Edge<sub>SM</sub> placed on an AC and PCC project.**

### **Where the Safety Edge<sub>SM</sub> Can Be Placed**

The Safety Edge<sub>SM</sub> can be used in almost every situation to provide a condition towards preventing near vertical lane-shoulder drop offs during construction and over time. It also provides added insurance until such time that maintenance personnel are able to repair eroded areas of the shoulder adjacent to the paved surface.

### **Where the Safety Edge<sub>SM</sub> Should Not Be Placed**

A site condition where the Safety Edge<sub>SM</sub> should not be used is where the foreslope/embankment or ground surface has a steeper slope than the slope of the Safety Edge<sub>SM</sub>. This condition may exist for a portion of the road being paved, thus the Safety Edge<sub>SM</sub> should be considered for use on the remainder of the road. Figure 2 depicts this condition.



**Figure 2. Example of where a foreslope/embankment is too steep for the Safety Edge<sub>SM</sub>.**

The Safety Edge<sub>SM</sub> should be excluded in areas where curb and gutter have been or will be placed as the Safety Edge<sub>SM</sub> is appropriate for the interface of a paved material and an unpaved/unbound material. In areas where there is a restriction for vehicles leaving the paved surface (for example; guardrails and other safety features) whether or not to use the Safety Edge<sub>SM</sub> must be assessed on a case-by-case situation. The agency may see value in using the Safety Edge<sub>SM</sub> for its pavement quality benefit, and thus may want to use it in these applications.

## 2.2 Pre-Construction and Discontinuous Paving Operations

The pre-construction activities for Safety Edge<sub>SM</sub> projects are to review the paving plan and make sure the Safety Edge<sub>SM</sub> can be placed in suitable areas along the project. If there are areas with restrictions along the edge of the pavement (for example, guardrails, intersections, and bridges), the width of the roadway and width of paving should be considered so that there is sufficient room for the Safety Edge<sub>SM</sub> device for resurfacing projects. As an example, narrow bridges along some low volume roadways can result in conditions where the AC paver screed extensions cannot be moved-in sufficiently when using Safety Edge<sub>SM</sub> devices that are bolted to the paver screed, so the paver operator must steer the paver more towards the center of the roadway during paving operations (center line crown or other cross slope changes need to be considered in these conditions). Other areas where the foreslope is steeper than the Safety Edge<sub>SM</sub> slope should be noted. These conditions should be discussed in the contractors quality control plan and/or pre-paving meeting and how the condition will be resolved.

Paving across intersections and driveways with the Safety Edge<sub>SM</sub> device in place is generally no different than when paving without the Safety Edge<sub>SM</sub>. The differences for both AC and PCC paving are noted below. All of these conditions or paving anomalies should be identified and addressed prior to beginning paving operations.

- For AC paving, extra attention from the paver and screed operators may be necessary to accommodate the Safety Edge<sub>SM</sub> at transitions for intersections, driveways, and changes in longitudinal elevations or profile. The reason for this extra attention is discussed in Section 3 of the Course. Specifically, Section 3.2 discusses the different Safety Edge<sub>SM</sub> devices and their attachment to the paver. For devices attached to the

screed, the screed operator can keep the Safety Edge<sub>SM</sub> device lowered or can raise the device above the bottom of the screed so that the Safety Edge<sub>SM</sub> is not placed through some intersections (refer to Figure 3). The capability for lowering and raising the device allows the paving operation to continue without disruption when discontinuous features or adjacent features are encountered. For devices attached to the end plate, the screed operator needs to monitor the height of the end plate ski to ensure the desired shape is placed.

- For PCC slip-form paving, the PCC material at the intersection or driveway will need to be sawcut to remove the Safety Edge<sub>SM</sub> (refer to Figure 4) or build up the Safety Edge<sub>SM</sub> by hand in order to tie into pavement intersections.



Screed operator raised the Safety Edge<sub>SM</sub> device in paving across this intersection. The Safety Edge<sub>SM</sub> device can be kept lowered when paving across driveways. Agreement on how to treat this condition should be established before paving starts.

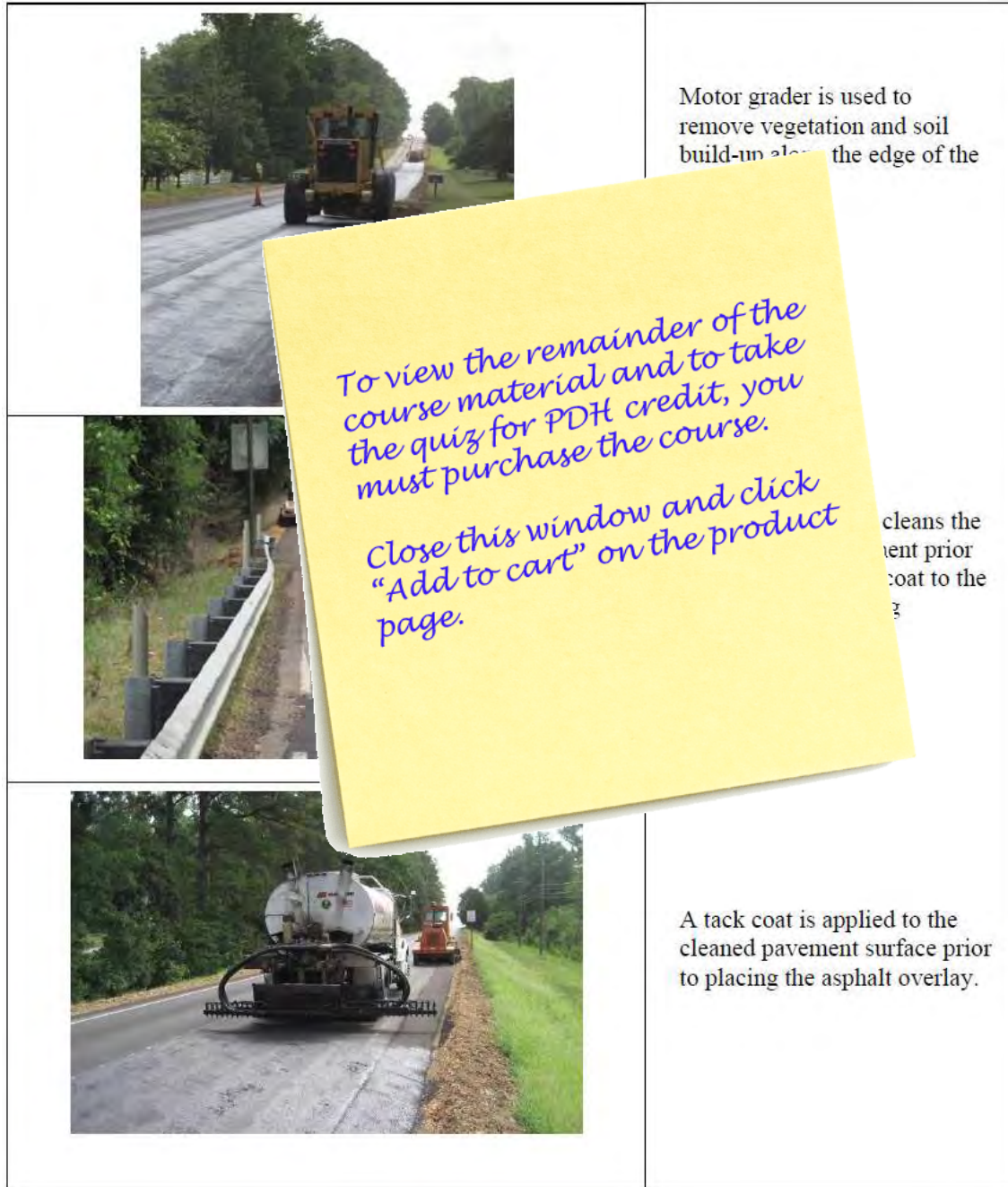
**Figure 3. Placing an AC overlay at an intersection of a Safety Edge<sub>SM</sub> project.**



**Figure 4. Sawcut on a PCC project at an intersection to remove the Safety Edge<sub>SM</sub>.**

### 2.3 Pavement Edge/Shoulder Preparation

The pavement edge should be prepared in accordance with standard agency paving operations for both AC and PCC surfaces (refer to Figure 5).



**Figure 5. Surface preparation activities performed prior to placing an AC overlay.**