



## **1.0 Introduction**

Paved Shoulders are located beyond any through lane of traffic, beyond the edgeline and are paved with either concrete or an asphalt material. Crushed aggregate shoulders treated with emulsion or millings are not considered paved shoulders. The slope of a paved shoulder is either the same slope as the adjacent lane (typically 2%) or sloped at 4% (unless on the super-elevation of a curve). Paved shoulder widths vary from 1-foot to 12-foot. Many two-lane roadways have a 3-foot paved shoulder with a 3-foot crushed aggregate shoulder beyond the pavement. The paved portion of the shoulder on four lane roadways varies according to the roadway type and project type, but generally the right shoulder is paved 10-feet and the left (median) shoulder is paved 3-feet. The Facilities Development Manual (FDM) Chapter 11-15-1 describes shoulder widths and design of shoulders.

## **2.0 Materials**

Concrete paved shoulders are only placed adjacent to concrete pavements. Asphalt paved shoulders may be placed adjacent to concrete or asphalt pavements. All Paved Shoulders must have adequate strength and stability to support occasional vehicle tire loads under all weather conditions without rutting or other surface variations. (FDM 11-15-1) If full-depth repairs are being made, original design materials and thickness or depth of the paved shoulder should be considered.

## **3.0 Edge Drop / Drop-off**

Edge drop in this case is where the paved shoulder has settled or deteriorated next to the adjacent lane's pavement edge creating a lip. This lip can make it difficult for vehicles that have drifted from the lane to return to the pavement, and often cause a potentially dangerous over-correction maneuver. An average drop-off from the pavement in the lane to the paved shoulder exceeding 1 ½ inches on a segment at least 100-feet long should be addressed. Because this type of drop-off is the closest to the travelled way, this maintenance activity should be given the highest priority to repair despite the fact that it may be very costly. Because the cost is higher than crushed aggregate and the repair method can be more complex, the time from the decision to repair a paved shoulder to when the actual work is completed may be longer than a year.

## **3.1 Repair Methods**

Maintenance to correct drop off may include the following operations:

- Wedging – a varying depth of asphalt pavement is placed over the existing paved shoulder adjacent to the traveled lane. Often the crushed aggregate shoulder would need to be repaired as well with this operation.
- Partial depth patching – loose materials are removed and all voids in the shoulder surface are replaced with material (usually an asphalt product.)
- Full depth replacement – the existing paved shoulder is removed completely. The base material is prepared and new shoulder pavement is placed. Often the crushed aggregate shoulder would need repair as well with this operation.

## **4.0 Cracking of the Paved Shoulder**

As with pavements, the paved shoulders will also crack. Maintenance and treatment of cracked paved shoulders is the same as roadway pavements and includes these operations:

- Crack / joint sealing – cracks are routed, cleaned and proper sealant material is placed in the crack / void left by the router.
- Crack / joint filling – cracks are cleaned usually with pressurized air and proper sealant material is placed in the crack.
- A partial depth patching – deteriorated and loose material from the paved shoulder is replaced with material (usually an asphalt product or quick setting concrete.)

- Chip / Fog Seal – often when the adjacent lanes receive a “chip seal”, the paved shoulders are sealed as well. In some instances, especially if the pavement is concrete and the paved shoulder is asphalt, a “chip seal” or “fog seal” may be applied to the paved shoulder only – in an effort to restore the shoulder.

## **5.0 Rumble Strips**

Rumble strips are an engineering treatment designed to alert drivers of a lane departure through vibration and noise created when a vehicle’s tires contact the rumble strip. Rumble strips may be placed on the shoulders, between opposing travel lanes (centerline), or in the travel lanes (transverse).

Rumble strips on paved shoulders should not be on roadways with a speed limit of less than 50 mph or where the paved shoulder is less than 5-feet. Some rumble strips cause accelerated pavement deterioration. If the paved shoulder with rumble strips has advanced deterioration as compared to the paved lanes, shoulder treatments such as chip seals, fog seals, micro-surfacing and ultra-thin hot mix overlays could be considered as proper maintenance of this type of shoulder. Additional rumble strip location, design and treatment guidance is referenced in the Facilities Development Manual chapter 11-15-1 and the FHWA Technical Memorandum - T 5040.39 (11-16-2011).