

Pavement Drainage and Strength Layers

Design Manual

Chapter 3

Cross Sections

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The cross section of a roadway is made up of many parts. One of the key parts is the overall pavement section. This is most often made up of three layers: the driving surface, commonly called the pavement, the drainage layer, and the strength layer. The drainage layer serves as a path to get water out from under the driving surface. The strength layer transfers the load from the pavement to the road base. Sometimes the drainage and strength layers are combined into one layer, referred to as a common or combined layer, which serves both functions. Designers should check with the Pavement Design Section and the Soils Design Section to find out what layers are to be used on their project.

Drainage Layer

The drainage layer includes a permeable granular layer and a subdrain. It provides a path for water to drain out from under the driving surface. The granular material allows water to pass through to the subdrain where it collects and outlets into the ditch, storm sewer, or similar feature. The drainage layer is located immediately below the pavement. The two possible granular materials are Granular Subbase and Modified Subbase. Granular Subbase is typically used under PCC and Modified Subbase is used under HMA or when the base needs to be driven on during staging and/or paving.

Strength Layer

The strength layer is a layer of material that transfers traffic loads from the driving surface to the base. It is located under the drainage layer. Selected Backfill (good quality glacial clay and clean sand from on site sources) is the most common material for the strength layer. When Selected Backfill is not available, Special Backfill or Modified Subbase has to be purchased for use on the project. The location of the strength layer depends on the material being used for that layer. Selected Backfill is used below the top of subgrade while Special Backfill and Modified Subbase are used above the subgrade. When Modified Subbase is used as the strength layer, drainage needs to be provided, typically by including longitudinal subdrain.

Occasionally geogrid is used for additional strength. When used, geogrid is located immediately above the soil subgrade. Coordinate with Soils Design and Pavement Design for details of geogrid placement.

Common or Combined Layer

A common or combined layer is a layer of material that serves dual purposes of a drainage layer and a strength layer. It provides a path for water to drain to the subdrain, and transfers the traffic loads to the base. It may be used primarily when Selected Backfill is not available and always consists of Modified Subbase. The common or combined layer is located above the subgrade.

Quick Tips:

Granular Subbase -
Drainable material that provides no strength.

Special Backfill -
Provides strength but no drainage.

Selected Backfill-
Provides strength but no drainage.

Modified Subbase-
Provides both strength and drainage.

Driving is prohibited on Granular Subbase but is allowed on Modified Subbase and Special Backfill.

Drainage, typically with longitudinal subdrains, is mandatory with Granular Subbase and Modified Subbase, but not with Special Backfill.

Modifying Typical Cross Sections

Typical cross sections show the most common case for each roadway type. For ramp, two-lane, four-lane, and six-lane-rural typical cross sections, a drainage layer is shown and Selected Backfill is assumed to be used as the strength layer. For the six-lane-urban typical cross section, a drainage layer and a strength layer are shown above the subgrade. Any cases other than those listed will require the typical cross sections to be modified.

Modifications for Drainage and Strength Layer Above the Subgrade

Backbone:

1. Copy the top of subgrade line down 36 feet.
2. Move labels down and add or copy a label for the strength layer.
3. Pattern the strength layer with the appropriate pattern found in dsnMethods.cel.

The end result should look similar to Figure 2.

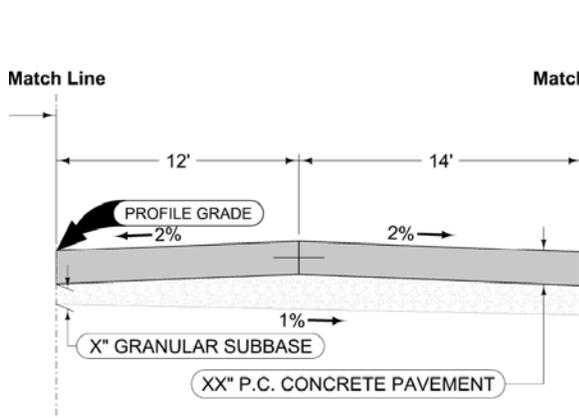


Figure 1: Original Backbone

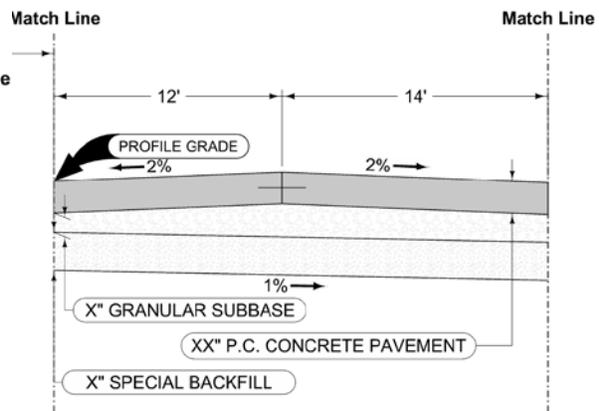


Figure 2: Modified Backbone

Shoulder:

1. Copy the top of subgrade line down the same distance as the backbone.
2. Extend the top of subgrade and foreslope lines to meet.
3. Extend top line of the strength layer to two feet beyond the edge of shoulder.
4. Dimension the two feet by copying one of the other dimensions and using the modify element tool to attach it to the correct points.
5. Adjust labels so they are not covering part of the drawing.

The end result should look similar to Figure 4.

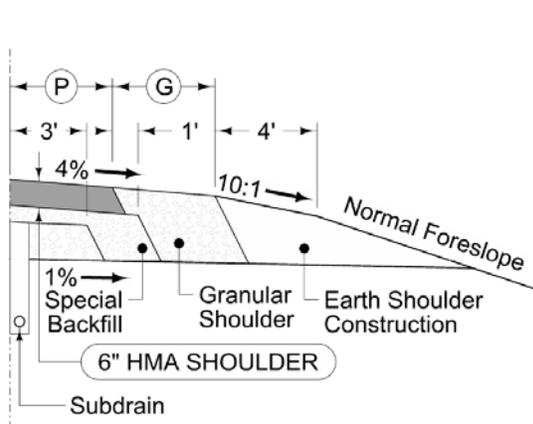


Figure 3: Original Shoulder

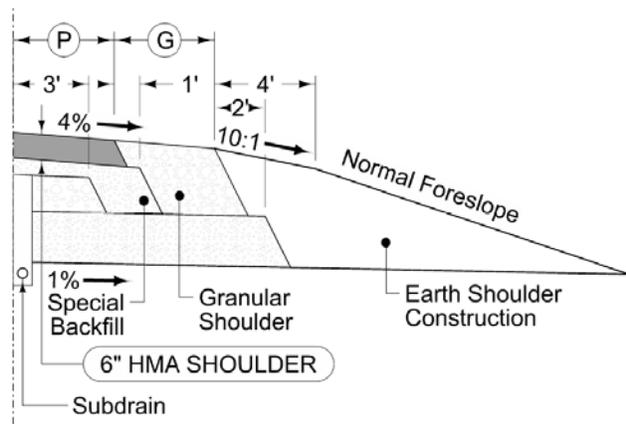


Figure 4: Modified Shoulder

Modifications for a Common or Combined Layer

Backbone:

1. Change the subbase label to read 'X" MODIFIED SUBBASE'

The end result should look similar to Figure 6.

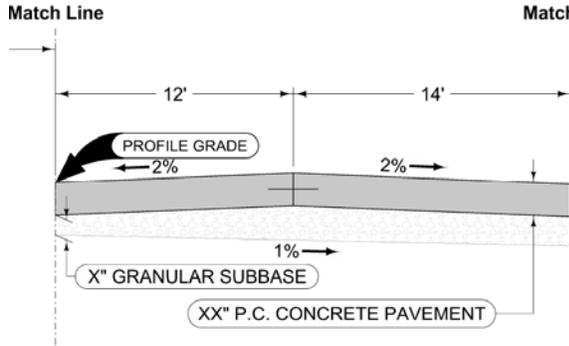


Figure 5: Original Backbone

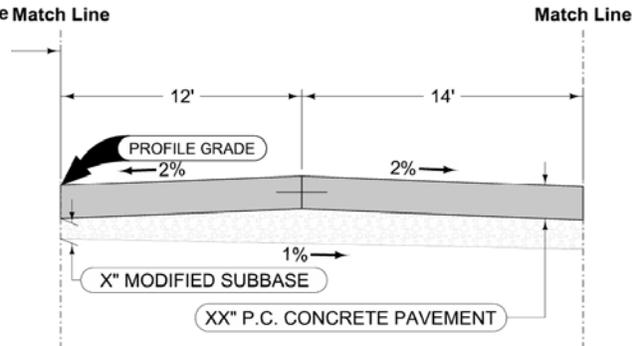


Figure 6: Modified Backbone

Shoulder:

1. Extend top line of the combined layer to one foot beyond the edge of shoulder.
2. Change the Special Backfill to Modified Subbase.
3. Adjust labels to point to the correct locations.
4. Dimension the one foot by copying one of the other dimensions and using the modify element tool to attach the leaders to the correct points.

The end result should look similar to Figure 8.

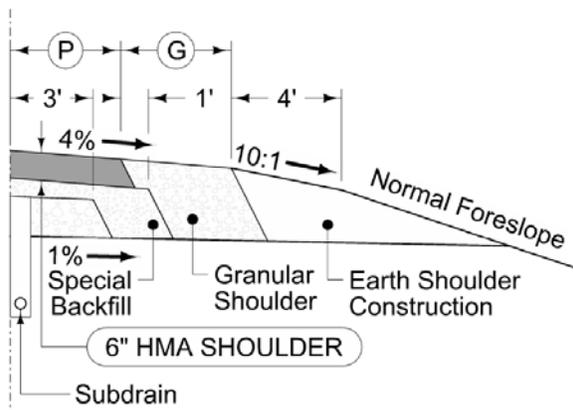


Figure 7: Original Shoulder

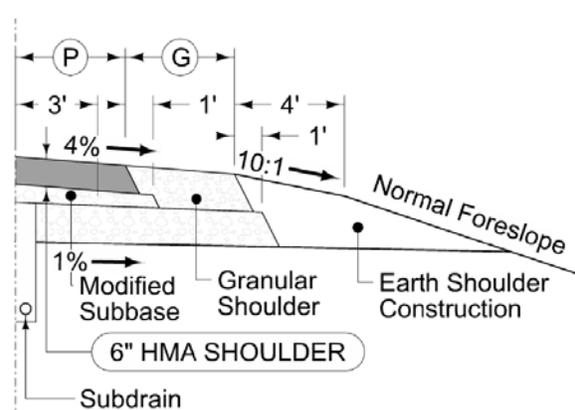


Figure 8: Modified Shoulder

Chronology of Changes to Design Manual Section:

003D-003 **Pavement Drainage and Strength Layers**

1/31/2011 NEW

Explains use of base materials.