APPENDIX P

PAVEMENT STRUCTURE QUANTITIES

This Appendix discusses the concepts and methodology associated with the pavement structure quantities process.

PAVEMENT STRUCTURE QUANTITIES PROCESS

The pavement structure quantities process is a two-part process. The first enables the user to specify the location by roadway (station-to-station), material limits, and configurations for pavement structures whose quantities need to be summarized. The second part summarizes the materials input, produces a report of the summaries, and produces an ASCII summary data file for use by other processes.

PAVEMENT STRUCTURE LIMITS

The limits for pavement structures materials are defined by the user entering pavement structure quantities input data which defines, for all desired design roadways, the specific pavement structure quantities materials associated with each roadway and the location and configuration of each material. Beginning and ending stations define the location along the roadway for a specific material. Ridgeline points in conjunction with +/- offset distances from these points are used to define the left and right limits for pavement structures. The ridgeline points that may be specified are left subgrade shoulder point (LSSP), finish grade template points 1 through n (from left to right with a maximum n of 99), and right subgrade shoulder point (RSSP). Figure P-1 graphically depicts these ridgeline points.

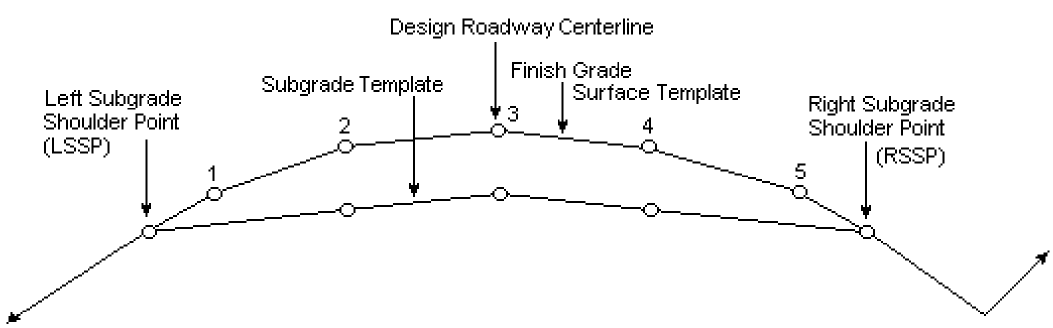
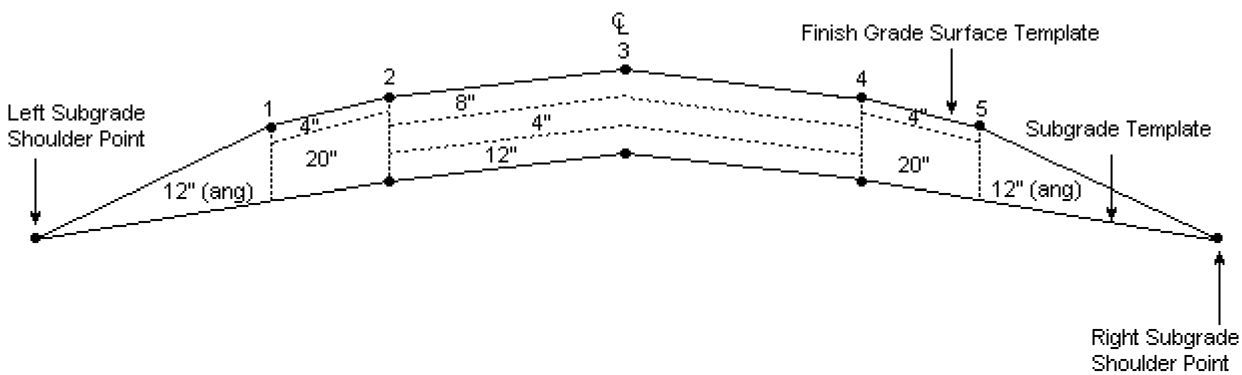


Figure P-1 - Ridgeline Points

There are three types of pavement structures: linear, area, and volume. The linear type (e.g., curbs, screens, etc.) requires only one ridgeline (and optional offset) to be defined. The linear pavement structure quantity value will be computed along the given ridgeline from the beginning station to the ending station. The area type (e.g., surface treatments, etc.) requires two ridgelines (and optional offsets) to be defined for the left/right limits of the area. The area values will be computed between these limits from beginning station to ending station. Volume types (concrete, pavement, etc.) require the same left/right limits as for areas, but also require that a depth of material be given. This should be a constant depth from left to right and from beginning to end. Figure P-2 below shows how various types might be defined:



Ridge Lines 1 & 5 - AC Mountable Curb (Linear)
Ridge Lines 2 to 4 - Surface Treatment I (Area)
Ridge Lines 1 to 2 - Surface Treatment II (Area)
Ridge Lines 4 to 5 - Surface Treatment II (Area)
Ridge Lines 1 to 2 - AC Type I (4” Depth) (Volume)
Ridge Lines 4 to 5 - AC Type I (4” Depth) (Volume)
Ridge Lines 2 to 4 - 8” Reinforced Concrete (Volume)
Ridge Lines 2 to 4 - AC Type II (4” Depth) (Volume)
Ridge Lines LSSP to 1 - Earth Back Fill (12” Depth) (Volume)
Ridge Lines 1 to 2 - Aggregate Base Type I (20” Depth) (Volume)
Ridge Lines 2 to 4 - Aggregate Base Type II (12” Depth) (Volume)
Ridge Lines 4 to 5 - Aggregate Base Type I (20” Depth) (Volume)
Ridge Lines 5 to RSSP - Earth Back Fill (12” Depth) (Volume)

Figure P-2 - Various Types of Pavement Structures

PROCESS REQUIREMENTS AND METHODOLOGY

The pavement structure quantities process requires that finished grade cross section data be defined for the design roadways that are to be summarized. The pavement structure quantities process may be performed anytime after the horizontal position calculation and earthwork design processes have been performed. The process is triggered by the pavement structure quantities flag on the earthwork design and volumes computation menu, and there must be at least one entry in the pavement structure quantities input data structure for the design roadways selected. The process is performed for the same baseline station range and the same design roadway as defined for earthwork volume computations. The following subsections discuss the pavement structure quantities process in more detail.

Baseline Station Processing

For each baseline station in the station range defined above, the associated stations on each of the design roadways are computed in left to right order. Each computed design roadway station is compared with the entries in the pavement structure quantities input data structure for that particular roadway to determine whether the roadway should be processed. If the roadway has parameter data stored at this station, the data is retrieved from the structure; otherwise, the next roadway station to the right is checked.

Pavement Structure Sections

For each instance where a pavement structure has been defined to exist on a design roadway, the X,Y coordinates for each defined ridgeline are computed normal to the design roadway using the offset data given on the baseline station cross section for the ridgeline points for a given design roadway. The Figure P-3 below outlines how this is computed.

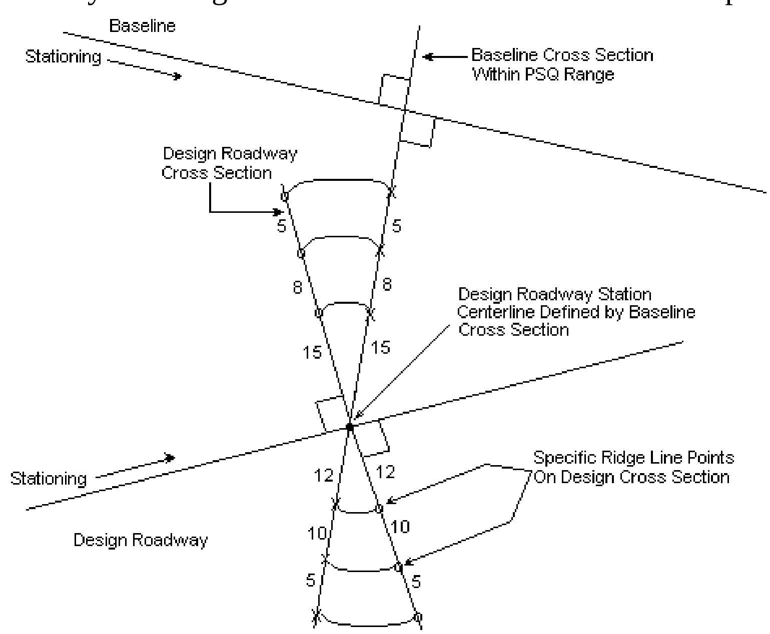


Figure P-3 - Pavement Structure Sections Computation

Pavement Structure Quantities Computation

The pavement structure quantities process basically computes quantities between pairs of design cross sections for each design roadway which has pavement structure quantities data that is applicable within the cross section pairs. Pavement structure quantities computations account for materials that begin or end at design stations that fall between the pair of sections, as well as materials that span the entire distance between the pair of sections.

Linear Material Computations

Pavement structure quantities computations for each linear material item involve computing the straight line distance between the point on each section that defines a given ridge line and then, for ridge lines that are not straight, applying an appropriate curvature correction factor to obtain a sufficiently accurate length. The computed lengths are plan view lengths.

Area Material Computations

Pavement structure quantities computations for each area material item involve utilizing the coordinates of the four ridge line points that have been defined as boundary points for a given pavement structure quantities area. Areas are computed using formulas for four-sided polygonal areas, and applying a curvature correction factor as necessary to maintain appropriate accuracy. The computed areas are plan view areas.

Volume Material Computations

Pavement structure quantities computations for volume materials are basically done exactly the same as for area items, except that the computed area is additionally multiplied by the user-defined depth for each pavement structure quantities material to obtain the appropriate plan view volume.

Alternative Units

Alternative units can be specified for linear, area, and volume-type materials. The standard units for these types of materials are listed below:

- linear - feet or meters
- area - square feet or meters^2
- volume - cubic feet or meters^3

For materials that require units other than the standard units, the user may, in the quantity summary feature table, specify units other than the standard for quantifying a given material. This may be accomplished by specifying in the quantity summary table for a given material the following two values:

° The alternative units (e.g., SQYDS, ACRES, YDS, ha, CUYDS, TONS, GALS, etc.)

° A multiplier factor that will properly convert a given material from standard to alternative units.

Examples of these types of materials might be:

° A linear material that is paid for by the yard (the multiplier would be .333333 and the units would be YDS).

° An area-type surface treatment that is paid for by the gallons (the multiplier could be .1 assuming the treatment was to be applied at .1 gallons per square foot; the units would be GALS).

° A volume-type base material that is paid for by the cubic yard (the multiplier would be .037037 and the units would be CUYDS).

Output

The output from the pavement structure quantities process is in the form of a report in the .lis file which summarizes each user-specified material between sections by roadway, and totals for the entire station range. An ASCII file (.pav) is also produced which contains material totals that can be exported to external processes like BAMS, etc.

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