State of Nevada
Department of Transportation
Materials Division

METHOD OF TEST TO DETERMINE VOIDS IN MINERAL AGGREGATE OF COMPACTED BITUMINOUS MIXTURES

SCOPE

This method covers the calculations to determine the voids in mineral aggregates of compacted bituminous mixtures.

CALCULATION

The voids in a mineral aggregate, VMA, are defined as the intergranular void space between the aggregate particles in a compacted paving mixture that includes the air voids and the effective asphalt content, expressed as a percent of the total volume. The VMA is calculated on the basis of the bulk specific gravity of the aggregate and is expressed as a percentage of the bulk volume of the compacted paving mixture. Therefore, the VMA can be calculated by subtracting the volume of the aggregate determined by its bulk specific gravity from the bulk volume of the compacted paving mixture. The method of calculation is as follows:

$$VMA = 100 - \frac{G_{mb}}{G_{sb}} \times \frac{100}{100 + P_b} \times 100$$

where:
- VMA = Voids in mineral aggregate (percent of bulk volume)
- G_{sb} = Bulk specific gravity of aggregate (see below)
- G_{mb} = Bulk specific gravity of compacted mixture (Nev. T333)
- P_b = Asphalt, percent by weight of aggregate

G_{sb}: is obtained by combining the bulk specific gravity of the coarse aggregate (AASHTO T85) and the apparent specific gravity of the fine aggregate (Nev T224) by the proper percentages of + No. 4 and – No. 4 of the combined gradation (see Nev T303).

$$G_{sb} = 100 / ((A/C) + (B/D))$$

where:
- A = % Coarse (% retained on #4 sieve)
- B = % Fine (% passing #4 sieve)
- C = Sp. Gr. Coarse
- D = Sp. Gr. Fine