

Importance of Air Voids and Compaction



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Mix Properties



**Density = 100% - Air Voids
(6% Air Voids = 94% Density)**

Definitions

- Density – the measurement of mass per unit volume
- Compaction – the action of compressing HMA to achieve a higher density

Density

$$\text{DENSITY} = \frac{\text{Mass}}{\text{Volume}} = \frac{\text{lbs}}{\text{cu ft}}$$

Density

- Theoretical Maximum Density (Rice)
 - TMD
 - “Reference Density”
- Bulk Density (Cores or Nuclear Gauge)

Theoretical Maximum Density

What is it?

- Density at 100% compaction
- Rock + Oil....No Air



Measuring Density

Bulk Density : measured by :

- Cores
- Nuclear Gage



Compaction

$$\% \text{Compaction} = \frac{\text{Bulk Density}}{\text{Max. Density(TMD)}} \times 100$$

Most agencies require 92% minimum density (average)

Reasons that Good Compaction is Needed

- To minimize additional densification by traffic
- To minimize permeability
- To limit oxidation of the asphalt pavement
- To provide adequate shear strength



If everything else is unchanged, roadway performance will be a function of construction compaction



One of the Essentials for a Consistent and High Quality Asphalt Pavement is to Provide for a Continuous Operation

Density Behind the Paver

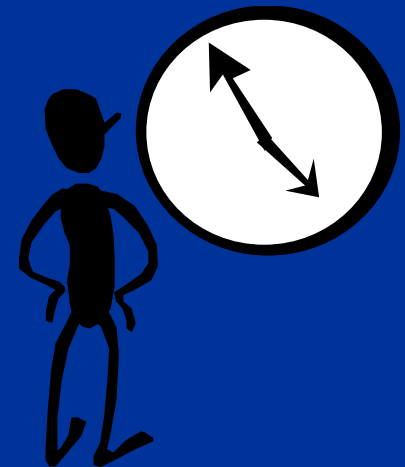


Rule of Thumb: the HMA density behind the screed should be about 85% of Gmm (85% Density)



Time Available for Compaction

(TAC)



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