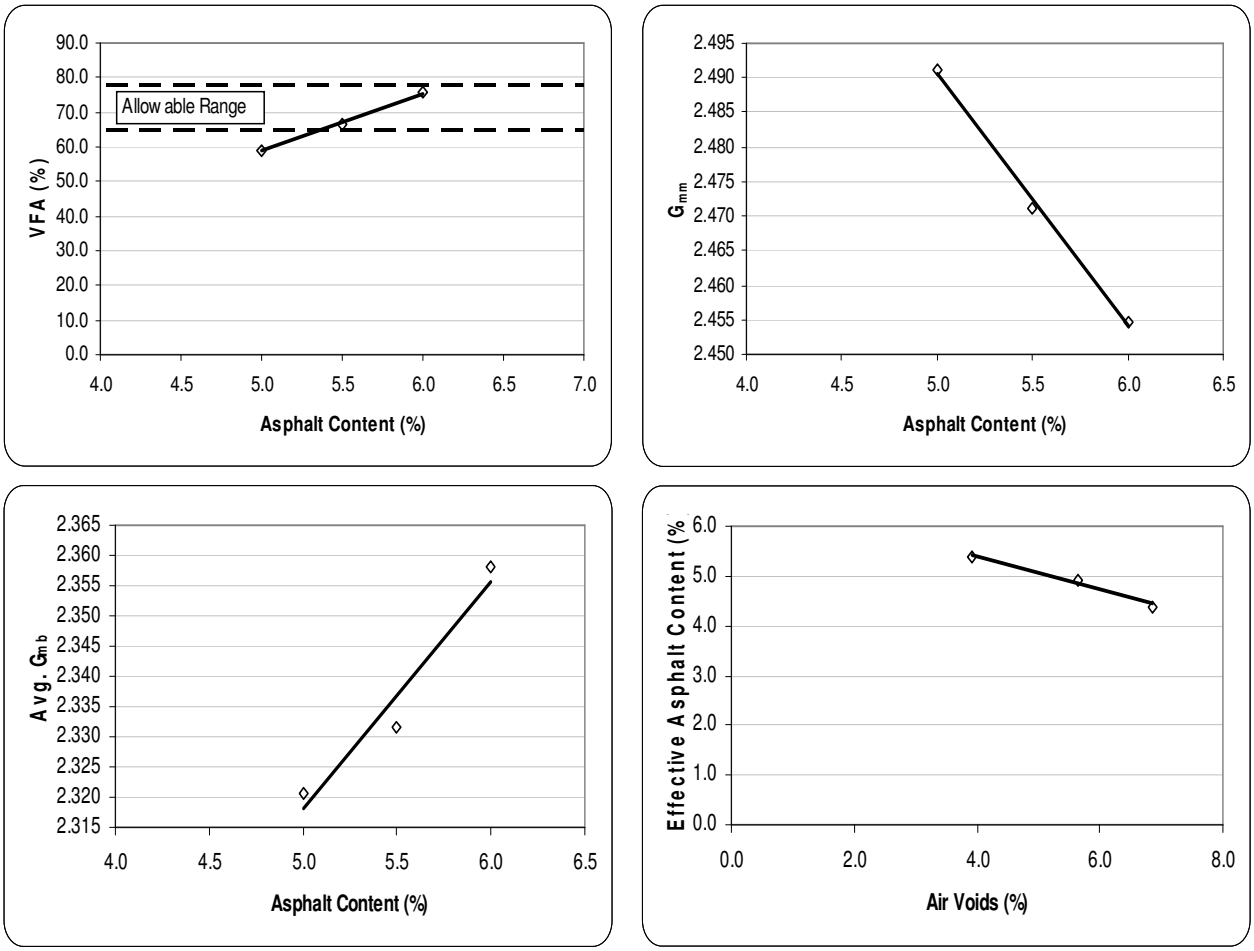
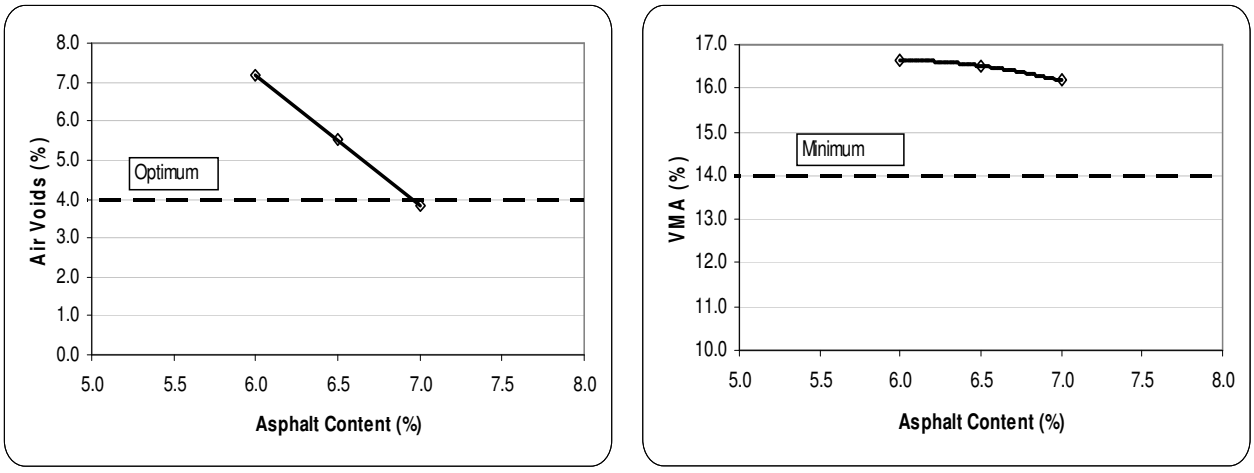


Figure 2. Granite Aggregate Mix Design Volumetric Properties



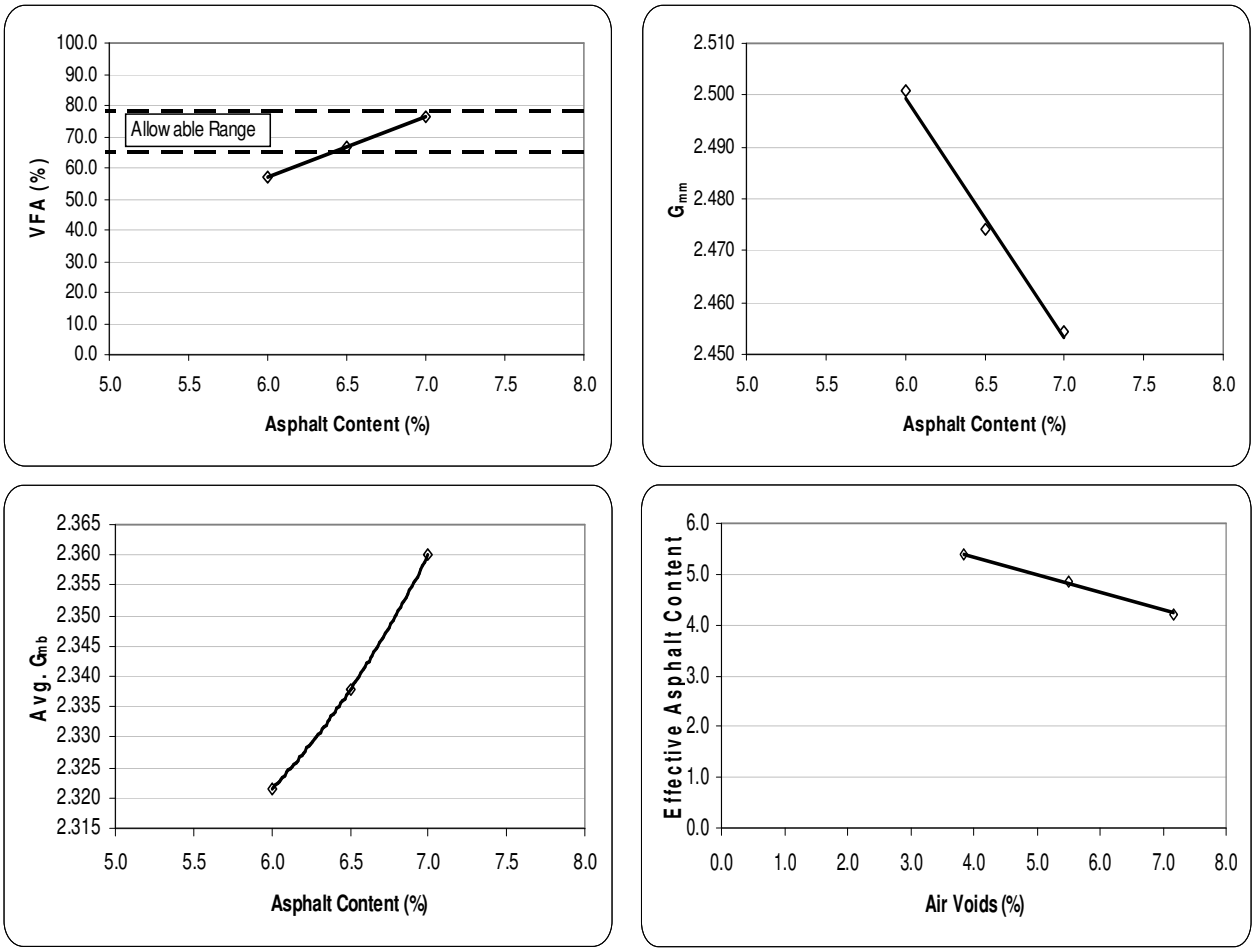


Figure 3. Limestone Aggregate Mix Design Volumetric Properties

Batching of Materials for Slabs

The first step in the sample preparation was to batch out the required amount of aggregate materials for each slab. The slab specimen sample size for the granite source were 17,286g at 4% air voids, 16,737g for 7% air voids for a 380mm x 100mm x 75mm slab; 10,795g at 4% air voids and 10,477g at 7% air voids for a 380mm x 63.5mm x 63.5mm slab. The slab specimens for the limestone source 18,325g at 4% air voids, 17,780g for 7% air voids for a 380mm x 100mm x 75mm slab, 11,475g at 4% air voids and 11,113g at 7% air voids for a 380mm x 63.5mm x 63.5mm slab. A total of 224 slab samples were batched for the 28 different mix designs.

The batching process started with the measurements of the linear kneading compactor taking into consideration the final compaction heights of 100mm and 63.5mm for the two different slab samples. The maximum theoretical specific gravity was used to calculate the bulk specific gravity at a specified air void level. The calculated bulk specific gravity is then multiplied by the volume of the mold and then divided by a correction factor (1.022 for the granite source and 1.013 for the limestone source) to estimate the target mix weight for a particular air void level.

Mixing and Compacting of Hot Mix Asphalt Slab Specimens

First the aggregate and asphalt were brought up to the appropriate mixing temperature. The mixing and compaction temperatures were selected to be 155 and 135°C, respectively. Typically, a viscosity and temperature relationship is developed by testing the asphalt binder in a rotational viscometer. According to SP-2 manual, the mixing temperature should not exceed 165°C and the compaction temperature should not be lower than 115°C. In this research project there was an enormous undertaking with the amount of material being compacted and the broad range of binders, therefore common mixing and compaction temperatures were used for all mixtures instead of using different mixing and compaction temperatures for each of the 11 binders. The temperatures selected of 155 and 135°C were well within the range of the temperature-viscosity relationship developed by Superpave. Then liquid asphalt was added to the aggregate and the sample was thoroughly mixed to ensure uniform coating of the aggregate with the binder. The mixture was then placed back in the oven at the compaction temperature to short-term age for 2 hours. While the samples were aging the appropriate aluminum gauge plates (1" aluminum plate and ½"aluminum plate to achieve 2½" thick slab), 1/8" steel plate, kneading keys and appropriate tools needed for compaction were heated and brought to compaction temperature as well. First, the aluminum plate was placed in the mold box, then the steel plate was placed on top of the aluminum plate as to not damage the aluminum plate. HMA was placed in the mold and spread out with a spatchula with extra HMA placed in the corners. The keys were then placed on top of the HMA to knead/compact the slab. The roller was lowered and the pressure initialized. The HMA was compacted until the keys were flush with the mold surface in order to achieve the height of interest. Figures 4 and 5 show a picture of the slab compactor. Two slabs were able to be compacted simultaneously. The slabs were then compacted and allowed to cool down to room temperature before further testing. The samples' bulk specific gravities were then measured according to ASTM D 2726 (Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures). Finally, each samples' air voids were calculated using the maximum theoretical and bulk specific gravities.

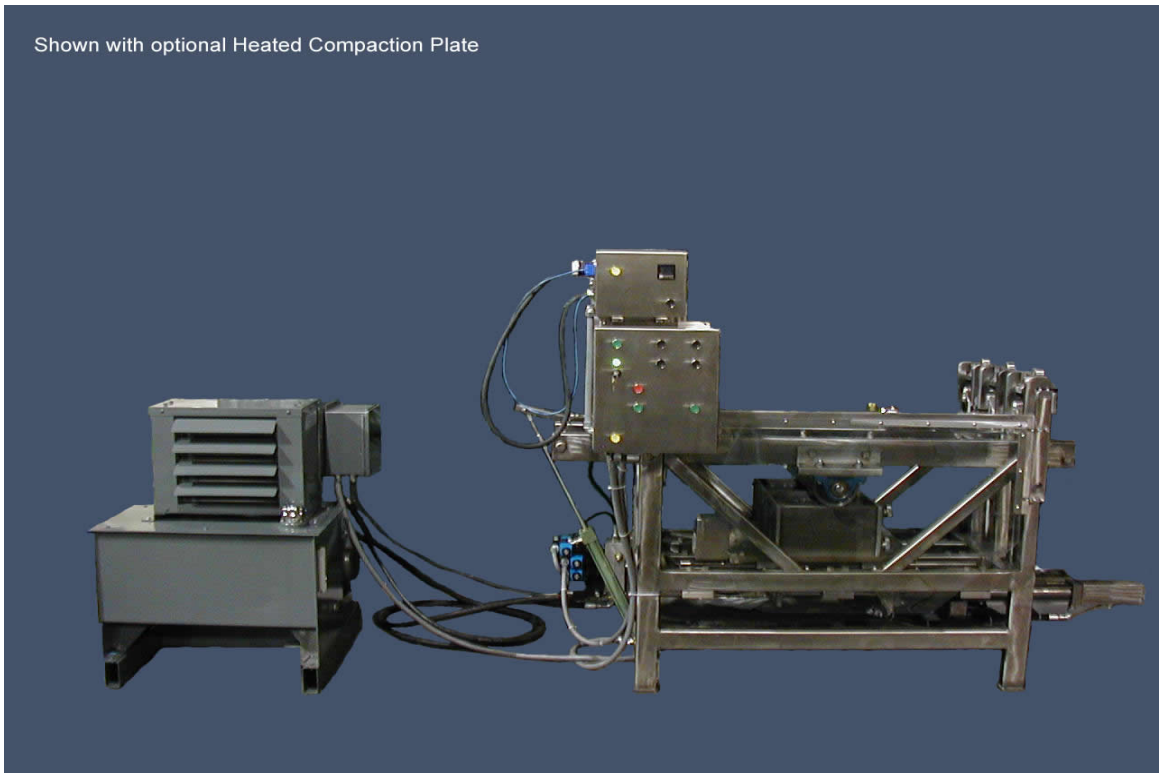


Figure 4 Front View of Slab Compactor

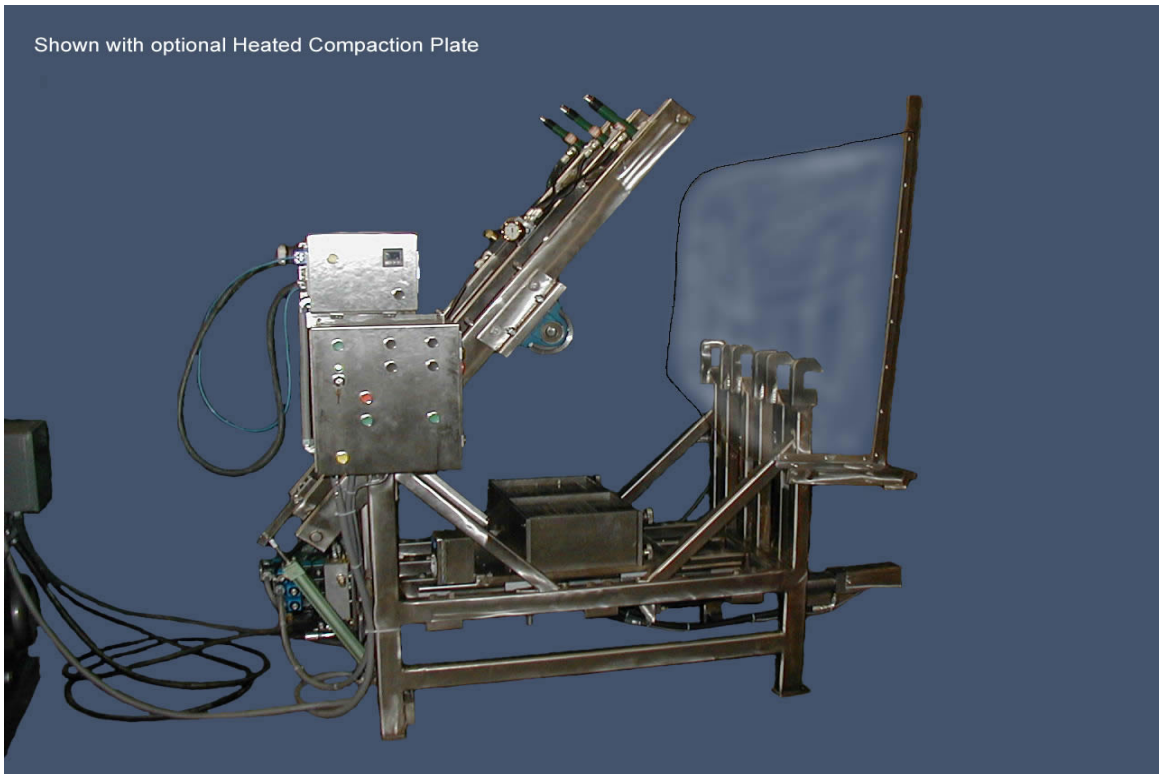


Figure 5 Front View of Slab Compactor with Guard Raised