The bulk specific gravity ($G_{sb}$) of aggregates is a critical parameter in the design of asphalt mixes. In the Superpave volumetric mix design, $G_{sb}$ is used to determine the amount of asphalt binder absorbed by aggregates and the percentage of voids in the mineral aggregate (VMA). Previous studies indicate that a small unit change (0.01) in $G_{sb}$ leads to a much larger unit change (0.32) in VMA. Therefore, it is important to measure the $G_{sb}$ of fine aggregates accurately. Current test methods (AASHTO T84 or ASTM C128) use a cone method to establish the saturated surface-dry (SSD) condition of the sample. This method does not work satisfactorily for rough and angular fine aggregates (passing No. 4 sieve and retained on No. 200 sieve), because they do not slump readily under the SSD condition. It has also been experienced that this method does not produce repeatable results when the percent of mineral filler (passing No. 200 sieve) is high. With the advent of Stone Matrix Asphalt (SMA), which requires a high percentage of mineral filler (about 8% to 12%), accurate measurement of $G_{sb}$ has become more important.

This study examined the addition of two selected mineral fillers, namely Cement Kiln Dust (CKD) and Rock Dust on the overall $G_{sb}$ by employing the AASHTO T84 and the CoreLok-Aggplus test procedures. When using the AASHTO T84 test method, the overall $G_{sb}$ values reduce for both the additives. When using a newly developed CoreLok method, the $G_{sb}$ values increased for Rock Dust up to 6%, beyond which a reduction is observed. With CKD, the $G_{sb}$ values show an increase for the entire range. The data suggest that the AASHTO T84 test method may not be applicable in the presence of CKD and Rock Dust, due to the possibility of chemical reactions in the presence of water and formation of cementitious products. Thus, use of the CoreLok method appears more appropriate with such reactive materials. To further analyze the problem, specific surface area of fine aggregates and the mineral fillers are measured using the water-based Universal Sorption device and the Nitrogen-based Monosorb device. Since the shape, angularity and texture of aggregate particles play important roles throughout the process of testing and in mix design, these are also measured. This study reveals that angular fine aggregates with rough surface texture pose significant difficulty during the $G_{sb}$ test.