Masonry is one of the oldest construction materials, which was used for all kind of building applications especially for sufficient compressive strength in combination with good acoustic and thermal properties with low construction costs and solving some durability problems. The production of lightweight masonry block is generally performed by using a highly mechanised industry based on great automation and accuracy which is different from the other concrete types. This production has to match strict standards that describe properties specified for the products. Volcanic slag lightweight blocks (VSLB) are made of volcanic slag, cement and water, which are used in construction of non-load bearing infill walls and slabs. One of the most effective ways to reduce the dead load in a multi storey building is to lighten the weight of the structure. Therefore, natural lightweight aggregates, especially produced from the volcanic slag can be considered as a lightweight concrete aggregate in construction of buildings.

In this research, control lightweight concrete (CLC) mixtures containing volcanic slag aggregates (VSA) with only normal portland cement (NPC) and finally with fly ash lightweight concrete (FALC) mixture containing 20% of FA as a replacement of the cement by volume were prepared and tested. In addition, no-fines aggregate was prepared from which the fine aggregate component of the matrix under 1 mm was entirely omitted and no-fines aggregate mixtures with NPC and FALC were compared with CLC and the effect of FA on the strength and unit volume weight was analysed.

VSA samples were obtained from the quarries near Manisa City, Aegean Region of Turkey and after some crushing processes; samples were classified into specialized size fractions (0–4 mm as fine aggregates (FVSA), 4–8 mm as coarse aggregates (CVSA) and 1–4 mm no fines aggregates). From those aggregates, several cubic samples were prepared by using different ratios of size fractions (60% fine and 40% coarse) including 5%, 8%, 10% cement by volume. FALC mixture containing 20% of FA as a replacement of the cement was prepared for analysing the unit weight and compressive strength results with demanding criterions of current standards. The research showed that, masonry units having desired properties can be produced by using fine and coarse VSA lightweight aggregate in the mixture with 10% cement by volume.