

Investigation of the effect of freeze-thaw cycles on the mechanical properties of hardened self-compacting concrete

This study investigated the effects of freeze-thaw cycles on the mechanical properties of hardened self-compacting concrete for varying column heights. The mechanical properties of the core specimens before freeze-thaw and after 8-56 freeze-thaw cycles were reported for varying column heights. The average compressive strength value of the reference cubic samples was determined as 40.28 MPa, while the compressive strengths of the core specimens before freeze-thaw were ranged from 40.25 MPa to 49.62 MPa, implying an increase in compressive strength values up to 23.18% compared to the reference cubic samples. Compressive strengths of the specimens subjected to 8 and 56 freeze-thaw cycles varied between 38.71–48.07 MPa and 31.72–39.11 MPa, respectively. Statistical analysis revealed that the compressive strength of the concrete exposed to 56 freeze-thaw cycles was significantly different from that of the other specimens.

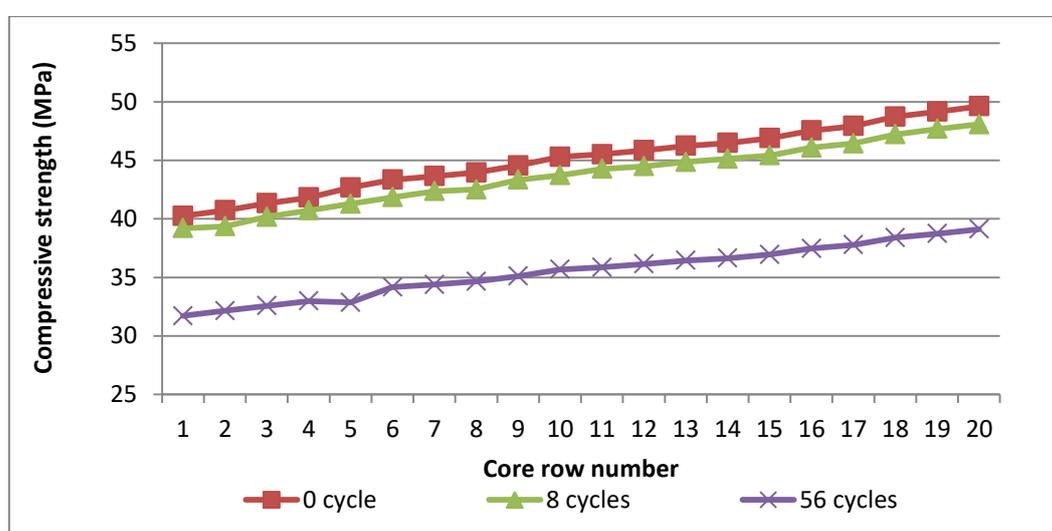


Fig 3. Compressive strengths of 0-, 8-, and 56-cycle freeze-thaw specimens

- An average of 3.09% and 21.17% decrease was observed in the compressive strength of core specimens after 8 and 56 freeze-thaw cycles, respectively.
- The highest losses in the compressive strength values of core specimens after 8 and 56 cycles were observed as 3.83% and 22.99%, respectively.
- When the compressive strength data of the non-subjected samples were compared, it was determined that the compressive strength of the non-subjected samples in the lower region was approximately 20% higher than the upper region and 10% higher than the middle region.
- According to the compressive strength data obtained as a result of the freeze-thaw cycles of 8 and 56, it was found that the compressive strength changes similar to those seen in the non-subjected samples.
- In the core sample taken at the bottom of the column having a height of 300 cm, the unit weight was found to be 3% higher than the unit weight of the sample taken at the top.
- When the water absorption data of the concrete were examined, the water absorption values of the lower point where the void ratio was lower and the highest point with the highest void ratio were recorded as 1.68% and 2.38%, respectively.

