Abstract: This paper presents the results from an experimental study of the technical viability of two mixture designs for self-consolidating concrete (SCC) proposed by two Portuguese researchers in a previous work. The objective was to find the best method to provide the required characteristics of SCC in fresh and hardened states without having to experiment with a large number of mixtures. Five SCC mixtures, each with a volume of 25 L (6.61 gal.) were prepared using a forced mixer with a vertical axis for each of three compressive strength targets: 40, 55, and 70 MPa (5.80, 7.98, and 10.15 ksi). The mixtures' fresh state properties of fluidity, segregation resistance ability, and bleeding and blockage tendency, and their hardened state property of compressive strength were compared. For this study, the following tests were performed. slump-flow, V-funnel, L-box, box, and compressive strength. The results of this study made it possible to identify the most influential factors in the design of the SCC mixtures.