This research was conducted to establish the effects of fly ash and foundry sand on strength and durability of concrete. Two series (Series 1 and Series 2) of experiments were performed. All concrete mixtures were produced for and at the production plant of an architectural precast concrete products producer. Concrete mixtures produced were used in manufacture of precast concrete panels. For Series 1, one non-air-entrained control mixture with 20% Class C fly ash (FA) and no used foundry sand (UFS) was proportioned. Additionally, three non-air entrained concrete mixtures were proportioned with used foundry sand content of 15%, 20%, and 45% as a replacement of concrete sand compared to the reference. For Series 2, two air-entrained reference mixtures, with about 25% Class C fly ash, were proportioned without foundry sand. Additional air-entrained mixtures were proportioned to contain used foundry sand as a replacement of regular concrete sand by 15, 20, and 45 percent. Concrete test specimens were evaluated for compressive strength, abrasion resistance, salt scaling resistance, freezing and thawing resistance, and chloride-ion penetration resistance. Based on strength and durability evaluations, it was concluded that both non-air and air-entrained concrete mixtures developed in this investigation are appropriate for manufacture of high-quality, architectural precast concrete using used foundry sand and fly ash.