

**New York State**  
**Environmental Investment Program**  
**Research Project Summary**  
**IceStone, LLC**

**Project Background**

IceStone, LLC manufactures IceStone®, a durable surface material made from recycled glass and cement and designed for commercial and residential applications (countertops, showroom surfaces, bathroom vanities, bathroom dividers, etc.). The company employs 30 people in its 55,000 square-foot, day-lit facility in the Brooklyn Navy Yard. IceStone's manufacturing process mixes recycled glass particles, cement, water, pigments and proprietary ingredients for controlling rheological properties and stopping adverse reactions between glass and cement. The mixture is poured into molds, vibrated to remove entrapped air bubbles, and vapor-cured. The resultant slabs are removed from their molds and polished. Visible pores are patched and sealed, and the panels are ready for sale. Unfortunately, only 60% of the panels were salable. About 40% became waste due to porosity, bowing, cracking or other quality issues. IceStone's goal was to find out how to increase yield from 60% to 95%. If implemented, such an increase could potentially reduce defective product by 480 tons/year, save \$437,000/year on avoided disposal costs, and generate another \$1,312,500 in sales.

**Project Description**

To increase yield, IceStone needed to lower porosity, improve thickness uniformity, eliminate warping and segregation, reduce cracking, and increase production process control. The business embarked on a series of controlled experiments, testing the effect of modified (1) mix designs, (2) vibration conditions, such as frequency and amplitude, (3) curing conditions, and (4) procedural and process changes. If facility managers could better understand how these factors affected product quality they could use the knowledge to improve yield. Once quality was improved, IceStone intended to have its product tested by a certified independent third party laboratory using American Society for Testing of Materials (ASTM) protocols. This information was critical for architects and designers interested in specifying IceStone® for use.

**Project Results**

From April 2005 through September 2006, IceStone implemented a series of tests internally to optimize mix design, identify an optimum water-reducing admixture, gain an understanding of the effect of temperature, aggregate shape, and pigment loading on the product, and assure that vibration settings would best compact and de-aerate the product. By the end of the project, IceStone had identified means to refine production processes to increase yield to 95%, and had developed mix design recipes for all of its 20+ products. In addition, a third party lab tested IceStone products using appropriate ASTM procedures and IceStone began including the resultant data in its product literature. This proved invaluable as the disclosure of IceStone's material characteristics means that architects and designers feel more comfortable and less susceptible to liability when specifying IceStone.

By the end of the project, IceStone applied the results of the R&D and significantly improved product yield. For example, porosity yield increased by 15% percent, bowing yield increased by 37% and cracking yield increased by 5%. Despite these advancements however, IceStone's overall yield remained at 60%. This is because, in the period during which the R&D was conducted, IceStone tightened its product quality standards. Product that had been considered saleable at the outset of the project no longer met standards based on for example, surface blemishes and issues related to color. Had these criteria been in place at the outset of the project, the baseline yield would have been 30%, not 60%. Further, most of the 40% unsaleable material is not landfilled but cut and sold as partial slabs or samples cut for donation as garden pavers or crushed and used as foundation material in road beds. This has reduced waste by 360 tons/year and saved IceStone about \$360,000 on disposal costs.

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**Contractor:** IceStone, LLC  
**County:** Kings  
**ESD Region:** New York  
**ESD Contact:** 518/292-5340

**NYS EIP Investment:** \$199,074  
**Contractor Match:** \$159,989  
**Total:** \$359,063  
**Completion Date:** September, 2006