American Granite Curb Producers

Granite is one of Earth's most perfect natural materials and in abundant supply.

Granite is quarried in large blocks.

Large blocks are cut into slabs with saws similar to this.

The slabs are cut to the required thickness. A hydraulic splitter is then used to cut these slabs into curbing.

Finished curb is inventoried for immediate shipment.

This granite curb was originally installed over 100 years ago in Milford, New Hampshire. It recently was re-installed due to road improvements and still looks great!

AGCP
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This two-part study is available free at www.GraniteCurbProducers.com

www.AmericanGraniteCurb.com

Member Companies of the American Granite Curb Producers

The North Carolina Granite Corporation
P.O. Box 151
Mount Airy, NC 27030
(336) 786-5141
Fax: (336) 786-6984

Swenson Granite Company, LLC
369 North State St.
Concord, NH 03301
(603) 225-2783
Fax: (603) 227-9541

Williams Stone Company, Inc.
P.O. Box 278
East Otis, MA 01029
(413) 269-4544
Fax: (413) 269-6148

The strength and durability of granite are due to its crystalline structure. This structure cannot be duplicated by synthetic curbing products.

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The American Granite Curb Producers announce the results of the most exhaustive tests and analyses ever performed, providing an unbiased comparison of the properties of granite and precast concrete curb.

THE RESULTS ARE IN - AND THE VERDICT IS DRAMATIC AND CONCLUSIVE.

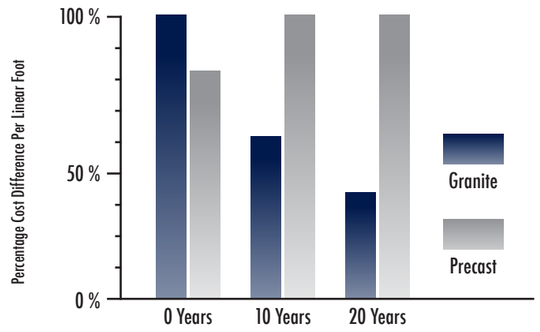
The civil engineering department of the University of Massachusetts has published the results of a joint study conducted with the University of Connecticut and commissioned by the American Granite Curb Producers. The report, A Comparative Analysis of Granite and Precast Concrete Curbing, states the results of comprehensive testing and analysis conducted to determine the relative merits of granite and precast Portland cement concrete curbing. Economic factors, as well as physical characteristics, were carefully examined and documented.

American Granite Curb Producers believes that the results are so striking that every civil engineer, highway department, architect, and contractor should read this study. We are pleased to provide a synopsis in this brochure, which we believe will assist all concerned in reaching a cost-effective curbing solution.

Granite curbing enhances the appearance of every street, highway, and parking lot. Its natural beauty is appreciated for generations.

GRANITE VS PRECAST CONCRETE

Graphic comparison of 20-year period



Concrete curb cannot survive even a short period if it is not backed up by soil. Berm always fails the snowplow test.

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PHYSICAL COMPARISON

The study noted that there are many structures of granite and concrete curb. The range of structural variation in granite, however, is minimal when compared to that of concrete curb. Since it is synthetic, the properties of concrete vary with the materials used and production processes. To provide the most objective comparison, the best available 5000-6000 psi, low slump, air entrained, precast concrete curbing was tested, rather than the inferior poured-in-place concrete. Dimensional granites from quarries in New England and North Carolina were utilized.

The principal factors affecting the life span of curbing are both natural and synthetic. They are loads, impacts, and elements. The strength of the curb to resist loads and impacts decreases with exposure to the elements. Durability typically is defined as the ability of a material to maintain strength and resist breakdown so that it can perform its intended function. There are three principal factors that are considered when evaluating durability: climatic conditions, service and exposure conditions, and maintenance requirements.

The two most significant climatic factors that affect curbing are freezing and thawing. In the tests, both granite and concrete curb were subjected to 360 free/thaw cycles. *Although no change in appearance of the granite was apparent as result of the freeze/thaw cycles, the concrete exhibited a marked deterioration.* This was particularly apparent on corners and edges that were rounded as a result of spalling. Results of the tests indicate that concrete curb will show distress and deterioration after five years in regions that experience around 75 or more freeze/thaw cycles.

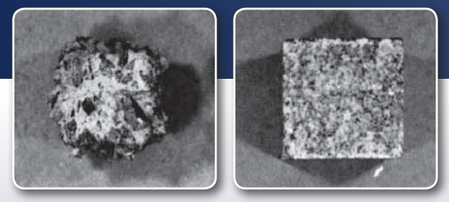
Chemical de-icing agents used on roads can affect the durability characteristics of both concrete and granite, causing weight loss in curbing materials. *Immersion of concrete in various salt solutions was accompanied by a reduction in strength of 25.1% to 74.4%. Reduction in granite was from 0 to 3.41%.* De-icing salts also can cause weight loss in curbing materials. Cyclic salt immersion and drying caused extensive surface scaling in concrete curb, and up to 160 times more weight loss. *The effect on granite was negligible. The tests established that granite is significantly stronger and far more resistant to weathering than concrete curb.* It also can withstand road milling, a commonly used resurfacing technique.

Granite curbing, because of its strength and durability, has an indefinite life span, and can be routinely salvaged and reused. Concrete curb, due to its deterioration and loss of strength, becomes unable to serve the purpose of a curb after a short period of time.

This granite curb was installed eleven years ago and exhibits no sign of damage. The rust stains from snowplow blades demonstrate its unmatched resistance to impact.

This precast curb was installed fifteen months ago and has been damaged by impact. It is highly susceptible to chemical freeze/thaw damage and will continue to disintegrate.

This eleven-month-old berm already is showing damage from compression and impact. Its useful life is almost over.



Concrete (left) and granite (right) were subjected to ammonium nitrate immersion tests. After 40 cycles, concrete lost 50% of its weight - granite lost none.

The effects of impact are obvious in these examples of precast curb installed less than three years ago.

ECONOMIC COMPARISON

To evaluate the two materials from an economic point of view, a life-cycle cost analysis was employed. This procedure considered initial cost, maintenance requirements, life-span, and re-installation. As of 1993, the Federal Highway Administration requires that all states use life-cycle cost analysis as part of the federally mandated pavement management program. Logically, we can expect cities and towns to follow suit as part of their cost reduction programs.

There are three major factors to consider when making an objective cost comparison between granite and concrete curb. These are initial cost, recurring costs, and life expectancy.

To determine the true initial cost, the University of Massachusetts examined the actual delivered and installed price, rather than simply the price of material as purchased from the distributor. At the time of the survey, the material cost of granite averaged about 25% higher than that of concrete curb. Installation prices, which include excavation, compaction, and backfilling, were found to be the same for both materials.

Preventive maintenance and disposal are two recurring costs that can be examined with a high degree of certainty. Properly installed granite curb requires no maintenance. Concrete curb, on the other hand, demands periodic sealing with silicones, linseed oil, plastic, or other materials to extend its life. Such applications have been only moderately successful, and in point of fact are rarely performed. *Since recycling of concrete curb is not economically feasible, it must be removed, disposed of, and replaced.*

The cost of disposal has risen dramatically in recent years, due to the declining availability of disposal space.

Granite has an "indefinite" life expectancy. It can be removed and reset when curb "reveal" (exposed face) is diminished due to resurfacing. Its structural properties allow it to be left in place during road milling operations.

Concrete curbing has no salvage value. Deterioration and breakage, which is very common during removal operations, prevent reinstallation. Installers have acknowledged that breakage of concrete curb during installation is quite common.

Utilizing a life-cycle cost approach is assessing the economic realities of granite versus concrete curb makes it apparent that granite is far more effective that precast concrete. The only perceived advantage of concrete curb is its initial lower cost, which is neutralized by granite's durability, lower maintenance cost, longer life, and the disposal cost of concrete curb. Granite is far less susceptible to damage and needs substantially fewer repairs.

The above char demonstrates total cost comparisons of granite and precast curb over a twenty year period assuming precast is replaced at year ten. Both initial and recurring costs were considered. Replacement of precast curb at year twenty is not included. Detailed charts and discussions of the effect of NPV's are contained in the study.

SUMMARY

The term "cost-effective" is an often-used buzzword that frequently is misapplied. Many times, an uninformed observer uses initial cost as the only factor in determining cost. The short-sightedness of this approach already is evident along the streets, highways, and bridges of states and communities that considered only initial costs in selecting curbing material. In today's and future economies, mid-range and long-range costs factors must be included.

It has been our objective to present the facts in a clear and understandable manner that will enable everyone to arrive at the proper conclusion.

80-year-old granite curb (left) was compared with precast concrete (center and right) in freeze/thaw tests. The granite was totally unaffected after 450 freeze/thaw cycles. Concrete showed considerable deterioration.

Here, a section of precast curb was completely pulverized by construction equipment at a shopping center.