MARKET OVERVIEW:
The United States is one of the chief producers of dimension stone in the world, having generated an estimated 1.5 million tons in 2006. Limestone sales generally make up the largest portion of the market, occasionally overcome by only granite sales. Dominating limestone production are curbing, paving, rough blocks, slabs, veneer, wall panels, and tile.
Likely a result of limestone’s prevalence in North America, Canada was the principle supplier and purchaser of the majority of 2006 U.S. imports and exports, respectively.


PRODUCTS & APPLICATIONS:

Common Dimensions
Characteristics of quarried stone are dependent upon the attributes of the deposit from which the stone was extracted; each quarry is able to offer a range of products unique in dimensions, color, and structural properties to its deposit. Therefore, it is preferable that the designer and stone supplier collaborate closely prior to and throughout the design process since planning a project around readily available stone reduces the environmental impact of raw material extraction. Nevertheless, when possible, the most common dimensions of limestone on the market are as follows:

BLOCKS: Maximum size of 8ft x 4ft x 4ft
SLABS: Maximum size of 8ft x 4ft with thickness of 2-3cm

Common Building Applications
• Cladding (exterior/interior)  • Landscaping  • Paving
• Flooring  • Coping • Statuary
Other Uses: aggregate, curbing, lime, mulch, & paving

Available Finishes

<table>
<thead>
<tr>
<th>TEXTURED</th>
<th>Bush-hammered</th>
<th>Rock face</th>
<th>Shot-sawn</th>
<th>Chat-sawn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine-tooled</td>
<td></td>
<td>Sandblasted</td>
<td>Split face</td>
<td>Plucked</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SMOOTH</th>
<th>Circular-sanded</th>
<th>Polished</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Honed</td>
<td></td>
</tr>
</tbody>
</table>

Custom finishes may also be available through your stone supplier.

FORMATION & SOURCES:
Limestone is a sedimentary rock composed of calcium carbonate, plus calcium and/or magnesium. It is formed when layers of minerals (particularly calcite), fine sediment, and the skeletons and shells of marine organisms undergo lithification. Terrestrially-formed limestone is known as travertine.

Limestone is commonly quarried across North America, particularly in the Midwest United States.
ENVIRONMENTAL DATA:

<table>
<thead>
<tr>
<th>Embodied Energy (MJ/ft³ stone)</th>
<th>quarrying</th>
<th>processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embodied Water (gal/ft³ stone)</td>
<td>63</td>
<td>10,000</td>
</tr>
<tr>
<td>Global Warming Potential (kg CO₂ equivalents/ft³ stone)</td>
<td>3.7</td>
<td>45</td>
</tr>
</tbody>
</table>


INDOOR AIR QUALITY:

Volatile Organic Compounds (VOCs)
- None emitted directly from limestone
- May source from adhesives and sealants applied; low-VOC options are available on the market
- Resources: refer to MSDS of chemical(s) used

PHYSICAL PROPERTIES:
An especially wide variety of limestones exist on the market, both foreign and domestic, and these can be drastically different in density, hardness, porosity, and aesthetics. Users should verify that the limestone they plan to use is applicable to the demands of the project and has a successful history in such installations. ASTM test data is the most common data available to compare the properties of any stone, including limestone.

PERFORMANCE:

Durability
- Interior applications: lifetime
- Exterior applications: lifetime


Reuse & Recyclability
- Ensure reclaimed limestone meets ASTM specifications before using for structural purposes
- Example applications:
  - Concrete mixture
  - Landscaping
  - Fill
  - Retaining walls
  - Re-installation on new buildings
  - Statuary
  - Walkways

ASTM STANDARDS:

ASTM C-568 “Standard Specification for Limestone Dimension Stone”
- Includes material characteristics, physical requirements, and sampling appropriate to the selection of limestone for general building and structural purposes.
- Classifies dimensional limestone into three categories: Type I (Low density), Type II (Medium density), and Type III (High density). The table below lists the required test values for each type of limestone; the necessary tests are prescribed by and located in the ASTM standards.

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, min lb/ft³ (kg/m³)</td>
<td>110 (1760)</td>
<td>135 (2160)</td>
<td>160 (2560)</td>
</tr>
<tr>
<td>Absorption by weight, max, %</td>
<td>12.00</td>
<td>7.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Compressive strength, min, psi (MPa)</td>
<td>1800 (12)</td>
<td>4000 (28)</td>
<td>8000 (55)</td>
</tr>
<tr>
<td>Modulus of rupture, min, psi (MPa)</td>
<td>400 (2.76)</td>
<td>500 (3.45)</td>
<td>1000 (6.89)</td>
</tr>
<tr>
<td>Abrasion resistance, min, hardness*</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

*Pertains only to stone subject to foot traffic.

Adapted from C-568-08a Standard Specification for Limestone Dimension Stone, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM (www.astm.org).