Steel Industry

Metallurgical High Calcium Lime
Lime, the Proven Solution!

Consistency in delivery of high quality lime for slag chemistry in EAF, BOF, AOD and ladle furnaces provides steelmakers with cost effective flux additions and control of the steelmaking process. Whether the need is for Basic Oxygen Converters, Argon Oxygen Decarburization converters, Electric Arc Furnaces or in secondary metallurgy for ladle furnaces and degassers. High quality high calcium lime is critical to producing quality steel and control of steelmaking cost.

High Calcium limestone is quarried or mined and then graded. The graded limestone is sized and fed to the lime kiln to be converted into quicklime. Limestone is converted to quicklime by heating to over 900°C.

The resulting quicklime, is graded for size and shipped to customers for many uses, including steel manufacture, flue gas desulfurization, paper manufacture and water treatment. Carmeuse supplies both High Calcium Lime and Dolomitic Lime. High Calcium Lime is produced from limestone containing over 98% calcium carbonate, whereas Dolomitic Lime is produced from limestone containing a mixture of calcium and magnesium carbonates.

Pulverized quicklime, a fine powder form of quicklime, is used to manufacture specialized blended products for the steelmaking industry. These products can be further “fluidized,” giving them flow characteristics of liquids, providing the steelmaker with opportunities for improved product application methods in the refinement of hot metal in the ladle from the Blast Furnace for use in the Basic Oxygen Process.

Selected screening of the lime provides product for use in lime injection in the Electric Furnace Process. Other screened products are used in the secondary metallurgy process such as ladle furnaces and degassers.
Product Information

High Calcium lime chemistry may have some differences in various elemental analysis due to locations related to limestone deposits in the United States and Canada where our plants are located.

- **CaO:** Minimum 94%
- **MgO:** Maximum 3%
- **SiO₂:** Maximum 3%
- **Al₂O₃:** Maximum 0.8%
- **S:** Maximum 0.06%

Various sizing of high calcium lime is available for use in the different steelmaking processes.

- **Large Pebble:** 2.625” x 0.25”
  
  *Specific to Production Plant*

- **Small Pebble:** 0.875” x 0.375”
  
  *Specific to Production Plant*

Lime for steelmaking processes is hard burned and ASTM reactivity test using water temperature rise does not dictate the reactivity of lime in slags where FeO, SiO₂, Al₂O₃, Temperature and Basicity determine actual dissolution rates.

CO₂ content of lime can be obtained on an updated annual basis from the lime plant that is delivering the lime to the steel plant.

Additional physical information on high calcium lime:

- **Density:** 55-60 lbs/cu ft
- **Specific Gravity:** 3.2-3.4
- **Angle of Repose:** 50-55

Carmeuse lime plants utilize modern methods of analysis to assure high quality lime products for your use in steelmaking. This includes X-ray analysis, Leco Analyzers and physical analysis.

**Flowability**

Flowability varies with density and particle size. Moisture pickup can influence flowability as well as bin construction design. A tall slender silo with a [H/D] ratio of 2.5 to 4 is most desirable. The discharge area should be as large as possible in relation to the silo cross sectional area. The hopper bottom should have a minimum 60° slope angle.

Technical Aspects of Lime Handling

High calcium lime and dolomitic lime are not corrosive, conventional steel or concrete bins and silos can be used for storage. These units must be water tight to avoid moisture pickup that can cause air slaking.

Having enough storage to meet the production needs is important to account for delivery time. The following shows typical storage silos with sizes and lime capacity:

### Storage Silos — Sizes and Lime Capacity

<table>
<thead>
<tr>
<th>Steel Silos</th>
<th>Height (ft)</th>
<th>Diam. (ft)</th>
<th>Cone</th>
<th>Volume (cu ft)</th>
<th>Tons* Quicklime</th>
<th>Tons* Hydrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>12</td>
<td>60°</td>
<td></td>
<td>1,525</td>
<td>42</td>
<td>19</td>
</tr>
<tr>
<td>25</td>
<td>12</td>
<td>60°</td>
<td></td>
<td>2,090</td>
<td>58</td>
<td>26</td>
</tr>
<tr>
<td>30</td>
<td>12</td>
<td>60°</td>
<td></td>
<td>2,650</td>
<td>73</td>
<td>33</td>
</tr>
<tr>
<td>35</td>
<td>12</td>
<td>60°</td>
<td></td>
<td>3,215</td>
<td>88</td>
<td>40</td>
</tr>
<tr>
<td>40</td>
<td>12</td>
<td>60°</td>
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<td>3,780</td>
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<td>47</td>
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<tr>
<td>60</td>
<td>12</td>
<td>60°</td>
<td>60°</td>
<td>6,000</td>
<td>165</td>
<td>75</td>
</tr>
<tr>
<td>87</td>
<td>12</td>
<td>60°</td>
<td></td>
<td>9,090</td>
<td>250</td>
<td>114</td>
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<tr>
<td>69</td>
<td>20</td>
<td>60°</td>
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<td>18,182</td>
<td>500</td>
<td>227</td>
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<tr>
<td>56</td>
<td>32</td>
<td>45°</td>
<td></td>
<td>36,364</td>
<td>1,000</td>
<td>—</td>
</tr>
<tr>
<td>101</td>
<td>32</td>
<td>45°</td>
<td></td>
<td>72,727</td>
<td>2,000</td>
<td>—</td>
</tr>
</tbody>
</table>

**Poured Concrete Silos**

<table>
<thead>
<tr>
<th>Height (ft)</th>
<th>Diam. (ft)</th>
<th>Cone</th>
<th>Volume (cu ft)</th>
<th>Tons* Quicklime</th>
<th>Tons* Hydrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>42</td>
<td>—</td>
<td>87,768</td>
<td>2,413</td>
<td>—</td>
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<tr>
<td>150</td>
<td>46</td>
<td>—</td>
<td>183,933</td>
<td>5,058</td>
<td>—</td>
</tr>
<tr>
<td>160</td>
<td>62</td>
<td>—</td>
<td>363,636</td>
<td>10,000</td>
<td>—</td>
</tr>
<tr>
<td>180</td>
<td>70</td>
<td>—</td>
<td>545,454</td>
<td>15,000</td>
<td>—</td>
</tr>
</tbody>
</table>

**NOTE:**
1. The listed capacities are approximations and do not allow for freeboard headspace.
2. Height for steel silos includes cone section.

* Based on bulk density of 55 lb/ft³ for quicklime and 25 lb/ft³ for hydrate.

It is preferable to avoid rotary valves or screws when transferring lime. These devices will degrade the sizing of the lime and create excessive fines. Pneumatic systems will provide less degradation.

When utilizing lime injection that consists of finer particle size, assistance from equipment suppliers of semi-dense phase injection units should be utilized when planning installation for use in a steelmaking furnace.

Additional advice on injection products and delivery methods can be obtained from Carmeuse when planning your installation of silos and injection equipment.

### Flowability Diagram

- **Dust Collector**
- **90° Bend**
- **High Level Indicator**
- **Low Level Indicator**
- **60° Cone**
- **Quick Coupling**
- **Safety Valve**
- **Vibrator (or Air Pads)**
- **To Feeder**

*Based on bulk density of 55 lb/ft³ for quicklime and 25 lb/ft³ for hydrate.*
Quality Technical Support — The Carmeuse Technology Center

- On-site material handling studies
- Carmeuse Technology Center support of slag/steel analysis
- Reliable phone support for technical consultation
- Sales team accessibility

Entire Network of CL&S Plants and Terminals

For more information about a Carmeuse Lime plant near you, call 866-243-0965.