

CEMENT

Products and Solutions for the Oil and Gas Industry

Quality and Consistency for over 60 years



bringing materials to *life*™



CEMENT

▼ Clinker quality controlled by microscopy.



Lafarge innovation led the development of specialty well cements for the oil and gas industry. This legacy of quality, service and innovation continues today.

Lafarge in North America

Lafarge North America Inc. ("Lafarge North America" or "Lafarge"), a Lafarge Group company, together with its subsidiaries, is the largest diversified supplier of construction materials in the United States and Canada. The Lafarge Group, with 76,000 employees in 78 countries, is the world leader in building materials, with top-ranking positions in all of its businesses: Cement, Aggregates & Concrete and Gypsum.

With the world's leading building materials research facility, the Lafarge Group places innovation at the heart of its priorities, working for sustainable construction and architectural creativity.

Lafarge continues to lead the industry in the production of well cements, in North America, and internationally through its affiliates. Lafarge manufacturing plants, distribution centers, sales offices and technical staff are strategically located to service oil and gas exploration and production activities.

Lafarge serves the oil and gas producing areas across North America. Lafarge well cements are used in both traditional oil and gas geological formations and in shale formations; from the Gulf Coast to Alaska, and from east to west in both the U.S. and Canada.

Lafarge plants producing well cements are ISO 9001:2008 certified.



▲ The American Petroleum Institute (API) is recognized worldwide. The API Monogram denotes that the producing plant's Quality Management System meets API Q1 and products meet the specifications of API Spec 10A.



▲ The Brookfield Plant, located 80 km (50 mi) from Halifax, Nova Scotia, supplies well cements for on and off-shore oil and gas sites across Atlantic Canada.

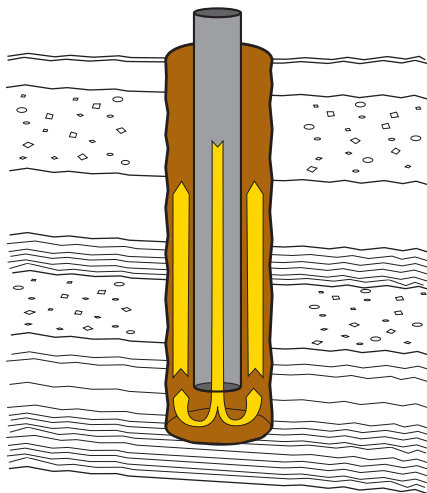
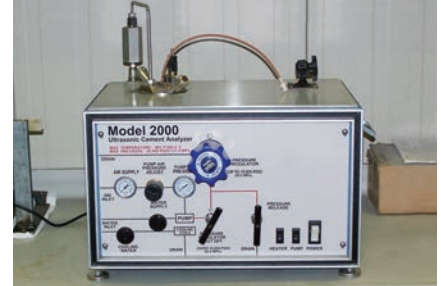
▲ The Joppa Plant is located on the Ohio River in southern Illinois. The plant serves Pennsylvania, West Virginia, Oklahoma, Kentucky, Arkansas, Louisiana, the Gulf Coast and offshore oil and gas producing areas.



▲ The Exshaw Plant is located west of Calgary, Alberta. The plant serves the oil and gas fields in western Canada, Alaska, North Dakota and Montana.

▼ HT-HP “thickening time” testing is part of the Joppa Plant quality control process. Test temperatures reach as high as 315° C (600° F).

▼ Ultrasonic Cement Analyzer (UCA) testing tracks compressive strength in slurry as a function of time.



▲ Typical Cementing Operation During Construction of a Borehole. Grey represents the well casing. Brown represents the annulus between the wall of the well and the casing. The arrows represent the direction of flow of the cement-based slurry during the cementing operation.

Well cement is used in the exploration and production of oil and gas onshore as well as for offshore wells to water depths of up to 2100 meters (7000 feet). A typical well is constructed using a metal casing surrounded by a special cement slurry mix that is pumped down the interior of the well casing and forced back towards the surface from the base of the borehole, filling the annulus between the casing and the wall of the well.

Lafarge well cements provide a flexible foundation to help achieve targeted densities for a multitude of purposes. These include the establishment of the well’s safety and structural integrity during drilling, isolation of the zone of interest, and a more optimal production of oil and gas.

Given the complexity of the application and the extreme conditions of temperature and pressure, well cement must be carefully designed to meet such demanding requirements. Predictable thickening time (set time), high sulfate resistance, long term performance, fluid

loss control, consistency, low viscosity, low free fluid, and strength are all important parameters.

Unlike surface construction, well cementing takes place, for the most part, where it cannot be viewed by the operator. For instance, predictable thickening times are required to ensure proper circulation in the well and to eliminate excessive Wait-On-Cement (WOC) set times between drilling periods.

Lafarge Leads in Cementitious Materials

- Cement
- Fly Ash (Pozz)
- NewCem® (Slag Cement)
- Blended Cements
- Specialty Cements



▲ The Whitehall Plant, located in Allentown, Pennsylvania, provides well cements across the northeast U.S.

When well cement for the oil and gas industry is produced, the clinker is analyzed microscopically. Lafarge's attention to quality and consistency is demonstrated in its design and testing of cements to perform with specific admixtures to help achieve desired rheology and thickening times. Lafarge monitors the performance of its products in end-market applications so as to evolve its product and service portfolio.

The three most commonly API-certified well cements are Class A, Class G and Class H. Class A is used in milder, less demanding well conditions, while Classes G and H are specified for deeper, and higher temperature and pressure well conditions.

Lafarge well cements meet or exceed API specifications. Lafarge products demonstrate high quality and consistent performance.

Value-Added Benefits From Lafarge

- ISO 9001 Certified
- API Q1 Licensed
- Optimized Logistics
- 24/7 Shipping
- Technical Product Support
- Global Presence
- Full Product Testing
- Product Consistency
- Research Leader

Product Support Testing

- Chemistry (XRF and XRD)
- Microscopic Evaluation
- Thickening Times
 - Neat Evaluation
 - Retarder Evaluation
- Fluid Loss Evaluation
- Free Fluid
- Rheology
- Particle Size Evaluation
- Compressive Strengths
 - API
 - UCA
- Complete API Spec10a



▲ Large mills grind the well cement clinker to meet requisite specifications.

▲ Large storage silos provide adequate cement inventories to meet market demand.

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▲ Typical oil or gas drilling rig.

Service

Lafarge well cement is available in oil and gas producing areas across North America.

Trained and experienced well cement sales and technical staff members are committed to providing prompt and dependable technical service.

Lafarge understands the importance of on-time delivery for oil and gas field work. Orders for well cements can be placed through Lafarge Customer Value Centers which are committed to timely and accurate order fulfillment. Orders can be processed and shipped 24/7.

To assist customers with supply logistics, Lafarge offers Vendor Managed Inventory (VMI). The customer's cement storage silo is equipped with an electronic level indicator. When the level of the cement in the silo reaches a certain point, the electronic indicator sends a signal to Lafarge and a load of cement is dispatched.

The following table summarizes the key features and benefits of the company's products:

Cement Classes	Features	Benefits
Class A	<p>Ordinary grade (No C₃A specification)</p> <p>Used at 46% H₂O (water/cement ratio)</p> <p>Comparable to ASTM Type I/II Portland</p>	<p>Used in shallower applications or as a base material in combination with admixtures for more complex applications</p>
Class G	<p>Used at 44% H₂O</p> <p>Comparable to ASTM Type II or Type V Portland Cement</p>	<p>Thickening times controllable with additives to help prevent loss of circulation up to 120° C (250° F)</p>
Class H	<p>Used at 38% H₂O</p> <p>Lower blaine</p> <p>Fluid loss control</p>	<p>Thickening times controllable with additives to help prevent loss of circulation up to 230° C (450° F)</p> <p>Low viscosity to help prevent loss of circulation</p> <p>Low fluid loss to help minimize cracking and gas migration</p> <p>Low permeability for zonal isolation and low gas migration</p>
Class G & H (common to both G & H)	<p>C₃S content of 48% to 65% depending on Class</p> <p>C₃A content of 0% to 8% depending on Class</p>	<p>Excellent retarder response for higher economic benefit in mix design</p> <p>Low free fluids for cement integrity and long term performance</p> <p>High sulfate resistance for high durability under harsh conditions</p> <p>Non-settling for uniformity in the column</p> <p>Consistent quality for slurry design portability</p>

Please contact your Lafarge representative for specific product information, availability and ordering.

LAKES AND SEAWAY BUSINESS UNIT

Bingham Farms, Michigan
Customer Value Centers
1-800-263-3561
Montreal - English 1-800-565-3921
French 1-800-631-9134

RIVER BUSINESS UNIT

Lee's Summit, Missouri
Customer Value Center
1-877-748-7282

U.S. EAST BUSINESS UNIT

Alpharetta, Georgia
Customer Value Center
1-800-331-0022

WESTERN BUSINESS UNIT

Calgary, Alberta
Customer Value Centers
Manitoba/Saskatchewan 1-866-523-2743
Alberta 1-866-661-1522
British Columbia 1-877-998-1122



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Limited Warranty

Where indicated, Lafarge warrants that Lafarge well cements meet applicable API requirements. Lafarge makes no other warranty, whether of merchantability or fitness for a particular purpose with respect to these products. Having no control over their use, Lafarge cannot guarantee finished work in which these products are used.