



2016 Minerals Yearbook

CEMENT [ADVANCE RELEASE]

CEMENT

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Production of portland and masonry cement in the United States, excluding Puerto Rico, increased slightly to 84.7 million metric tons (Mt) in 2016 (table 1). Production in 2016 was 15% lower than the record-high 99.3 Mt in 2005. Overall cement consumption, as measured by sales to domestic final customers, increased by 2.6% to 94.7 Mt (table 9), 26% lower than the 2005 record-high consumption of 127.9 Mt. The large difference between consumption and production in 2016 was reflected, in part, by a 13% increase in cement imports (table 1). The average mill net value (“price”) for cement increased by 4% to a record-high \$111.00 per metric ton, surpassing the previous record in 2015. The overall value of sales increased by 7.1% to \$10.5 billion, 19% lower than the previous record high of \$12.9 billion in 2006. World production of cement was essentially unchanged at 4.14 billion metric tons (Gt) (tables 1, 22).

Percentages or other changes expressed in this report compare activity in 2016 with that of 2015 unless otherwise specified and, except where otherwise indicated, data and trends in this report exclude those in Puerto Rico. Cements covered in this report are limited to the hydraulic varieties broadly classified as portland cement (including blended cements and other varieties listed in table 15) and masonry cement (including portland-lime and plastic cements). A few other types of hydraulic cement (notably aluminous cement) and (or) clinker are included in some of the trade data (tables 16–18, 21) and within the world production data (table 22). Except to the degree that the materials are incorporated within finished cement (especially blended varieties of portland cements and some masonry cements) or are used as raw feeds for making clinker, the tables in this report exclude supplementary cementitious materials (SCMs), such as fly ash, other pozzolans, and ground granulated blast furnace slag (GGBFS). Sales data for blended (also called composite) cements listed separately from portland cement are available in the monthly Mineral Industry Surveys reports of the U.S. Geological Survey (USGS). General background information on cement and its manufacture and on the USGS cement canvasses can be found in van Oss (2005).

The current report is largely based on data compiled from USGS annual questionnaires sent to U.S. cement and clinker manufacturing plants and associated distribution facilities and import terminals, including certain terminals that are independent of U.S. cement manufacturers. For 2016, 129 forms were received of the 133 forms sent (some forms incorporated terminals that formerly reported separately), a response rate of 97%. The data received, however, included all production facilities. Not all surveys were fully complete, but the data included 100% reporting of the production tonnages of cement and clinker and, in terms of total tonnages listed in the tables, all but 0.8% of the sales in 2016. Missing data were estimated based on monthly data (which supplied most of the “missing”

annual sales data) or past annual reporting; however, certain breakout data contain a higher component of estimates than in previous years.

The data did not include a few importers that did not participate in the surveys. To the degree that they were independent of the respondent companies, sales by the missing importers were estimated to be no more than an additional 0.5% of the total portland cement sales.

Government Programs and Environmental Issues

Much of the cement consumption, within concrete, is for public sector construction projects. Cement volumes sold for these projects are dependent on various Government funding sources, especially for new construction rather than repairs. State and Federal funding for public sector construction, in decline for several years, increased slightly in 2016 (Portland Cement Association, 2018). At yearend 2015, Public Law 114–94, “Fixing America’s Surface Transportation Act” (FAST), authorized expenditures of \$305 billion during fiscal years 2016–20 for a variety of programs related to U.S. highway and railroad infrastructure. Approximately two-thirds of the authorized spending could potentially involve concrete, but offsetting some of this was a proposed reduction in FAST of annual funding for the existing Transportation, Infrastructure and Innovation Act from approximately \$1 billion per year to less than \$300 million per year. In its analysis of the net effects of FAST, the Portland Cement Association estimated that FAST expenditures could boost U.S. consumption of portland cement by an average of about 0.8 million metric tons per year (Portland Cement Association, 2015).

Environmental issues related to the cement industry mainly derive from the manufacture of the intermediate product called clinker. Large quantities of raw materials (mainly carbonate rocks, especially limestone) and fuels are burned at high temperatures to make clinker, resulting in large emissions of carbon dioxide (CO₂) and potentially significant emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), mercury and some other metals, volatile organic carbon compounds, and particulates. Increasingly, these emissions are being stringently regulated. The cement industry is one of the leading industrial emitters of CO₂, an important greenhouse gas (GHG). For 2016, overall emissions of CO₂ by the U.S. cement industry were calculated to be about 66.0 Mt or 0.87 metric ton (t) of CO₂ per ton of clinker produced. This calculation incorporates the average of two methodologies of estimating the emissions from the combustion of fuels on an individual plant basis: one that uses “standard” heat values for the fuel quantities consumed (table 7), which yields a total of 68.0 Mt, and another that incorporates heat values reported by the individual plants, which yields 64.0 Mt. For process emissions from calcination of limestone, the emission factor incorporated is that of the

Intergovernmental Panel on Climate Change (IPCC) (Hanle and others, 2006). The calculation omits any deductions from calcination for calcium oxide contributed by noncarbonate alternative raw materials such as ferrous slags and coal combustion ashes. Such a deduction would allow a reduction of the calcination-related emissions by about 1.1 Mt in 2016, or about 3%, equivalent to removing the total emissions (including from fuels and without adjustments) of 1.5 average-capacity U.S. cement plants. Relative reductions can be significantly larger for the subset of individual plants that actually burn these alternative raw materials. Certain fuels, including alternative or waste fuels, can either directly reduce plant-level CO₂ emissions or may be allowed to be deducted from some reporting protocols for combustion emissions because (1) they are lower in carbon content per unit of heat produced than other fuels, (2) they are considered to be carbon-neutral (certain biofuels), or (3) credits may be allowed for their use (certain waste fuels). Fuel deductions have not been made in the averages noted above. Apart from substitution of alternative raw materials, plant-level emissions from combustion can be reduced through upgrading to more fuel-efficient kiln line technology. Unit emissions on a finished product basis can also be reduced by use of SCMs and crushed limestone or other fillers in finished cement and in concrete to reduce the clinker content of these products.

The U.S. Environmental Protection Agency (EPA) continued to apply emissions factors similar to those noted above to the USGS published data on clinker production to calculate and formally report GHG emissions associated with the U.S. cement industry. The USGS and EPA calculations, based on the IPCC methodology for cement, have an estimated 5% uncertainty. The EPA compared its calculations to the results of mandatory GHG reporting by major emitter industries; these data began for the 2010 (emissions) data year and are available for 2010–16 as summary spreadsheets for each year (U.S. Environmental Protection Agency, 2017).

Certain other emissions from cement plants have come under regulation in recent years. On September 9, 2015, rules came into effect pertaining to the national emissions standards for hazardous air pollutants (NESHAP); the NESHAP rules were finalized in 2013 and amended in July 2015 (U.S. Environmental Protection Agency, 2015). The NESHAP rules established new, very low limits on individual plant emissions of mercury, total hydrocarbons, particulate matter (as a surrogate for nonvolatile metal pollutants), and hydrochloric acid; the new rules apply to plants that do not burn hazardous wastes. Separate performance standards and emissions limits apply to commercial and industrial waste incinerator units.

Production

Portland cement output of 82.2 Mt was about the same in 2016 as that in 2015 (table 3). Reported annual grinding capacity in 2016 fell slightly to about 117 Mt but was subject to reporting ambiguities. Grinding capacity utilization increased slightly to 70.1%. By comparison, during the record-high production year of 2005, production capacity utilization was 82%, with levels of 85% or higher generally considered to represent plants, or the industry overall, operating at full practical capacity. Overall, about one-half of the producing districts

registered production increases during 2016. Yearend stocks of portland cement increased modestly to 7.05 Mt. Ending stocks of portland (and of masonry cement in table 4) are sensitive to several variables, including overall market conditions, possible omission of stocks at terminals, weather-affected yearend sales, and, along with clinker, stock buildups ahead of planned kiln shutdowns for routine maintenance scheduled for early in the following year. On a district basis, stocks for given respondent plants also reflect the inclusion of distribution terminals located in other districts, including some that in fact handle cement from more than one plant. The large quantity of cement stocks and increase in stocks in Missouri in 2016, for example, included a multitude of terminals, assigned to the Missouri plants but likely not entirely supplied by them, located along the entire Mississippi River system transportation corridor.

Cement production capacity (as grinding capacity) data are reported directly by the individual plants and include portland and masonry cements. The capacity utilization percentages listed, however, are with respect to portland cement production only. Capacity changes reported from year to year can reflect a variety of factors, including changes in demand for cements of various degrees of fineness, grinding equipment upgrades, shifts of some grinding capacity to other products (such as GGBFS), new plants and plant upgrades, and plant closures.

Housing construction expenditures have increased in recent years, and production of masonry cement increased by 8.8% to 2.51 Mt in 2016 (table 4), after a 4.1% increase in 2015, a 4.9% (revised) increase in 2014, and a 9.7% increase in 2013. Production in 2016, however, was less than one-half of the record-high output of 5.4 Mt in 2005.

With subsidiaries of a common parent company combined under the larger subsidiary's name and with joint ventures' ownership and any plant ownership changes apportioned, the 10 leading cement companies in 2016 were, in descending order of portland cement production, LafargeHolcim Ltd; Lehigh Hanson, Inc.; CEMEX, Inc.; Buzzi Unicem USA, Inc. (including Alamo Cement Co.); Ash Grove Cement Co.; Eagle Materials Inc.; Argos USA Corp.; Martin Marietta Materials, Inc.; CalPortland Co.; and St. Marys Cement. The U.S. industry continued to be heavily consolidated, with the five leading cement companies, combined, contributing 60% of total U.S. portland cement production and the 10 leading companies accounting for 81%. Of the 10 leading companies, all except Ash Grove, Eagle Materials, and Martin Marietta were foreign owned as of yearend. For the U.S. industry overall, about 79% of total cement capacity was foreign owned in 2016.

Clinker production decreased very slightly in 2016 to 75.6 Mt (tables 1, 5), 15% below the record-high production of 88.6 Mt in 2006. Most district-level changes in output were only 0.2 Mt or less. Production in the Maine and New York district, however, declined by 0.5 Mt because of the closure of two wet kilns at a plant in New York ahead of the startup of a new preheater-precalciner kiln at the facility in early 2017. In northern Texas, a nearly 0.5-Mt increase in clinker production reflected higher capacity utilization at several plants. Notwithstanding this, the overall capacity utilization for the district fell because, at one plant, a new preheater-precalciner kiln was commissioned in June, followed in August by the decommissioning of the

plant's old preheater kilns; the full capacity of all the kilns was counted for 2016, but the new kiln's output was constrained by ramp-up protocols.

Apparent annual capacity is a statistic sensitive to the survey respondents' apportionment of total downtime on the kilns between that for routine maintenance and that for all other reasons, including slow sales. Thus, in the absence of new kilns or closure of kilns, small district-level changes in annual capacity likely were of no statistical significance.

Clinker production capacity utilization overall decreased slightly to 72% from 73% in 2015. This partly reflects kiln closures at midyear 2016 in New York and in northern Texas. In Texas, capacity was counted for the full year with only part-year clinker output from a new preheater-precalfiner kiln. The reported subset for average days of routine maintenance did not change for the country overall. At some of the multikiln plants, reliance continued to be on a single (generally the newest, more energy efficient) kiln for most of the plants' clinker outputs. At a time of relatively modest unit costs for fuels, the continued idle or semi-idle status of many of the older kilns could reflect other impediments to their restart, such as a lack of employees familiar with the operational quirks of these individual kilns, poor physical condition of the kilns, and the possibility that these kilns, if run extensively, might cause the plants overall to exceed NESHAP limits. To the degree that these factors are valid, the active kiln count and overall plant capacities in table 5 actually may be lower than those listed, and actual capacity utilization percentages thus might be higher than indicated in table 5. In some districts, kiln capacity utilization may have been constrained by increased reliance on cement imports in the local markets.

Table 6 lists the U.S. cement industry's consumption of nonfuel raw materials to make clinker and cement. Cement plants commonly can substitute a variety of raw materials to make clinker provided that the mix of materials yields the requisite oxide balance to make the key clinker compounds (minerals). For the major materials consumed, changes, such as the slight decline in "limestone," tend to parallel clinker production. For some of the smaller tonnage commodities, seemingly significant changes may reflect activity at just a few plants. The approximately 8% increase in limestone for cement production (added into the finish mill) is in contrast to the stagnant production of portland cement (table 3); about one-half of the increase can be attributed to the increase in production of masonry cement (table 4), and the remainder may indicate use of more ground limestone as an additive in finished portland cement, especially in varieties marketed under ASTM International (ASTM) standards C1157 and allowed for in the recently (2013) introduced categories of Types IL and IT in the blended cement standard ASTM C595. The decline in use of cement kiln dust (CKD) as a clinker raw material likely reflected a combination of incomplete reporting and possible mischaracterization of some CKD as an additive into the finish mill, although it can be used as an SCM. The increase in use of "other slag" largely reflected an increased use of copper slag as an iron source. The nearly 12% decline in GGBFS used for cement is on trend with the nearly 8% drop in sales of blended cement noted as having this SCM (table 15); the percentage

difference may reflect a change in the proportion of slag used in the blended cements or the inclusion of some GGBFS in ternary blends reported as containing "other pozzolans," a category that increased by 40%. Part of this large relative increase likely also reflects a near doubling of consumption of natural rock pozzolans and "other" pozzolans, although some categories of these may be mischaracterized or incomplete. The 10% increase in fly ash consumed for cement was in trend with the 12% increase in sales of fly-ash-containing blended cement (table 15). Fly ash consumed to make clinker fell by 10%, as did the consumption of bottom ash (table 6). The overall consumption of 2.2 Mt of fly ash is less than the 2.4 Mt of fly ash reported by the American Coal Ash Association (ACAA) as consumed for blended cement and clinker, but the 1.5 Mt of bottom ash (table 6) is significantly higher than the 0.9 Mt reported by the ACAA (American Coal Ash Association, 2017). The differences may point to the common misidentification of various types of ashes and slags by respondents to the USGS canvasses but also could reflect the difference between tonnages sold for a specific purpose (ACAA) and tonnages actually consumed by the cement plants (table 6). Although not broken out in table 6, synthetic gypsum made up 31% or 1.4 Mt of the total gypsum consumed in 2016, and the fraction could be higher because differentiation between natural and synthetic material is not required on the canvass. The ACAA reported sales of slightly less than 1 Mt of synthetic gypsum to the cement industry.

Fuel consumption by the U.S. cement industry is shown in table 7. As with nonfuel raw materials, data shifts can reflect activities at just a few plants. Major increases were evident in the consumption of natural gas; continued low unit prices for this fuel have led some plants to adopt natural gas as a major "running" fuel instead of using it primarily for the warmup stage of kiln restarts. Significant increases also were seen in the consumption of fuel oils, but liquid waste use declined. Some of this shift may reflect the characterization of certain waste fuel oils. In contrast, coal consumption declined significantly; at some plants, much of the coal consumption has been replaced by natural gas.

Although not revealed in table 7, overall unit heat consumption (gross heat basis) in 2016 was about 4.1 billion joules per metric ton (GJ/t) of clinker, slightly higher than the 4.0 GJ/t in 2015. Wet kiln plants averaged 7.3 GJ/t of clinker, an increase of 6% compared with 6.9 GJ/t of clinker in 2015. Dry kilns, responsible for nearly 97% of total clinker production in both years, averaged about 4.0 GJ/t of clinker, compared with 3.9 GJ/t in 2015. Several plants have switched to natural gas as a major running fuel, and some of these have reported significantly higher overall plant unit heat consumptions, seemingly as a result. Overall, coal continued to supply the largest share of total heat consumed (46%, down from 55%), followed by petroleum coke (21%, up from 18%), natural gas (17%, up from 12%), and waste fuels (about 15%, unchanged); fuel oil (not including any reported with liquid wastes) contributed less than 1% of total heat.

Electricity consumption in 2016 is shown in table 8. Unit consumption declined for the remaining operational wet plants

(mostly reflecting the closure of the wet kilns at the Ravena, NY, facility during the year) but was unchanged for dry plants.

Industry Structure Changes

In recent years, a number of mergers and acquisitions have been made in the North American cement industry, and this continued in 2016. In July 2015, HeidelbergCement AG (Germany) announced that it would purchase Italcementi SpA (Italy) subject to competition authorities' approvals. In the United States, HeidelbergCement operated as Lehigh, and Italcementi operated as Essroc Corp.; the purchase was finalized in July 2016. As a result, Lehigh assumed operational control over Essroc's Logansport and Speed, IN, cement plants. Along with its longstanding ownership of the Mitchel, IN, plant, Lehigh became the owner of three of the four plants in that State. By acquiring Essroc's Nazareth, PA, plant complex, Lehigh also completed the merger with three plants in eastern Pennsylvania. The purchase of Essroc gave Lehigh control over the Martinsburg, WV, plant, which along with Lehigh's Union Bridge, MD, plant, gave Lehigh ownership of two of the three plants in the Washington, DC, market area, which required a plant divestiture. In mid-November, Lehigh sold the Martinsburg cement plant to Argos (Colombia) along with terminals in Maryland and western Pennsylvania. Lehigh's purchase of Essroc also included Essroc's Dorado (San Juan, PR) plant.

In mid-September, CEMEX (Mexico) announced the sale of the Fairborn (Xenia), OH, plant to Eagle Materials; the sale was expected to be finalized in early 2017. In mid-November, Cemex completed the sale of the Odessa, TX, plant to Grupo Cementos de Chihuahua (Mexico). Odessa is primarily an oil-well cement producer.

At the beginning of December, Elementia, S.A.B. de C.V. (Mexico) purchased 55% and operational control of Giant Cement Holdings, Inc. from Cementos Portland Valderrivas, S.A. (Spain). Through this purchase, Elementia, new to the U.S. cement industry, acquired three U.S. cement facilities: the Dragon Cement Co. plant in Thomaston, ME, the Giant Cement plant in Harleyville, SC, and the Keystone Cement Co. plant in Bath, PA.

A number of plant upgrades were underway during the year. At its Hagerstown, MD, plant, LafargeHolcim (Switzerland) completed the transition from the old long dry kiln to a new preheater-precalciner kiln in June; the preheater tower straddled the old kiln, part of which became the new kiln. The company's upgrade of the Ada, OK, plant from wet to dry (semidry) technology was expected to be completed in late 2017. At the company's Ravena, NY, plant, the facility's final wet kiln was shut down in June 2016, ahead of the completion of a new preheater-precalciner kiln line, which was expected to be completed in early 2017. In the interim, the plant's finish mill was fed by imported clinker, largely from Turkey; thus, the facility acted as a grinding plant for the second half of 2016. At midyear 2016, Buzzi Unicem (Italy) commissioned a new preheater-precalciner kiln line at its Maryneal, TX, plant and, in August, closed the plant's three old preheater kiln lines.

Consumption

Cement consumption data are in terms of sales to final domestic customers and are derived from the USGS annual canvass (tables 1, 11, 12, and 14) and monthly surveys (table 9). Although the overall national totals are in close agreement among these tables, only table 9 regional breakout tonnages represent State-level consumption. In contrast, the State or district breakouts in tables 11, 12, and 14 pertain to the locations of the reporting entities (chiefly the production sites), not the locations of consumption; it is very common for shipments to cross State lines. In both datasets, the sales include domestically produced cement (made from domestic and imported clinker) as well as imported cement.

Portland cement sales to domestic final customers, which are based on monthly survey data, increased in 2016 by 2.5% overall to 92.3 Mt (table 9). States with significant oil-well drilling mainly showed declines related to reduced oil-well cement sales. Imports of portland cement increased by 10%. Masonry cement sales also showed a mix of gains and losses by State, but increased by 4.4 % to 2.4 Mt overall.

Cement consumption tonnage can be correlated broadly with construction spending levels, although the comparison is constrained by a number of factors, such as spending applied to repairs rather than to new construction, lags in time between the onset or cutoff of construction spending and the actual consumption of cement (within concrete), and because some types of construction require proportionately more concrete (are more cement intensive) than others.

The Portland Cement Association converts U.S. Census Bureau data on construction spending from current dollars to 2009 constant dollars, believing the constant dollar data to provide a more reliable basis for cement consumption analysis. In terms of 2009 constant dollars, overall construction spending increased by 4.5% in 2016 to \$1,022.5 billion (Portland Cement Association, 2018). The total cement "intensity" in 2016 was about 92.6 t of cement consumed per \$1 million of construction spending, down by 2%. Of the total construction spending, the largest sector was residential construction, which accounted for \$388 billion, up by 6.1%; within residential construction, new construction totaled \$252.1 billion, up by 6.4%. The major component of this was single family housing, which is masonry cement intensive, and brick and block intensive, totaling \$201.4 billion, up by 5.2%. Multifamily housing, which is concrete intensive, totaled \$50.7 billion, up by 11.5%. Nonresidential building construction, also concrete intensive, totaled \$254.2 billion, up by 10.0%. Public-sector construction totaled \$219.7 billion, up slightly from 2015. Within the public construction sector, however, buildings accounted for \$95.0 billion, up by 2.5%, and road (and bridge) construction accounted for \$79.9 billion, up slightly. The remaining public-sector construction categories experienced declines in spending, notably by 5.3% for sewage and waste disposal and slightly for water supply.

Table 14 breaks out regional sales of portland cement by type of customer. As listed, ready-mixed concrete producers accounted for 73% of total shipments, but the true percentage

for this type of customer was larger (probably close to 80%) because some sales were instead registered to other customer categories, especially airport and road paving contractors, that also use ready-mixed concrete. The ready-mixed customer category (as listed) increased by 2.4%, in line with the overall sales of portland cement. Sales to road-paving contractors increased by 4.8% to 3.9 Mt, a more robust percentage change than for road construction spending noted above. Sales of portland cement for oil and gas well drilling fell by 31%, which was in line with the reduced sales in oil-producing and exploration States, as noted earlier and in trend with the 48% drop in the average weekly drill count for the year resulting from low crude oil and natural gas prices (Baker Hughes Inc., 2018). Sales to concrete product manufacturers increased by 1.9%; within this, sales to brick and block makers were up by 3.5%, as were sales to precast and prestressed slab makers. Sales to pipe manufacturers were down by 11%, which corresponded to the spending declines for sewage and waste disposal and for water supply noted above. These concrete product breakout tonnages may be understated because some such sales might have been reported under the subcategory “other or unspecified,” which increased by 6.3%. Sales to building materials dealers increased by nearly 25%, but this represents only a small fraction of total portland cement sales.

Reported sales to the smaller categories of customers likely are underrepresented because some respondents provide breakouts only into broad groupings of their customers. As listed in table 14, sales into the mining sector increased by 6.3% but represent only a few respondents. Reported sales of cement for waste stabilization fell by nearly 35%, in line with the decline in sewage and waste disposal spending noted above.

Table 15 breaks out the sales of portland cement by the subset type. Sales continued to be dominated by Types I and II cements (undifferentiated in the data) and by sulfate-resistant varieties of cement (Type V and Type II/V hybrids reported as Type V); these also included equivalent cements sold under the specifications of ASTM C1157. Assignment between “General use and moderate heat” cements and “Sulfate resisting” categories is somewhat artificial because some hybrid cements are listed as meeting the standards for both Type II (or I/II) and Type V (such as II/V) cements; these are intended to be included under the more restrictive category “Sulfate resisting” cements but may not always be reported as such. As listed, sales of oil-well cements (including non-API varieties) fell by 39%, in line with the decreased number of active drill rigs, as noted earlier. Sales of blended cements overall increased by 10.3%. Sales of blended cement with GGBFS declined by 7.9%, in line with the nearly 12% decline in consumption of granulated slag for cement (table 6) noted earlier. Fly ash blended cement sales increased by 12.0%, in line with a 10% increase in consumption of fly ash for cement (table 6).

Prices

Data on cement prices (as mill net values) are given for the United States overall in table 13, and this table also provides a breakout between white and gray portland cement. Tables 11 and 12 provide price data by district for portland cement (gray and white combined) and masonry cement, respectively. Mill

net values are ex-factory average values for all varieties of cement sold and include bagging and palletizing charges for cements sold in bags or packages. Most portland cement is sold in bulk (table 10), but most masonry cement is sold in bags or packages. Except for independently reporting terminals (which report on a “terminal net” basis), the valuations exclude charges for transportation to terminals from where, in fact, much of the cement was sold. Accordingly, mill net values are better viewed as price indexes rather than “shopping prices” for cement. They serve mainly to show general regional variations and trends over time, and small unit price differences are of little statistical significance. Unlike sales tonnages, price data include a significant component of estimates in some districts, and this component was higher in 2016 than in previous years.

For the country overall, the average price (including the districts that contain estimates) for portland cement increased by 4.8% to \$110.00 per metric ton (table 13); the increase for gray portland cement was 4.3% to \$109.00 per metric ton, a new record high. The average price for masonry cement increased by 4.0% to a new record high of \$157.50 per metric ton, but the average is sensitive to even small shifts in the proportion of bulk sales; as noted above, most masonry cement is sold in bag or packaged form. Unit values for portland cement increased in all but two districts (table 11).

Foreign Trade

Export data from the U.S. Census Bureau are provided in table 16, and import data are in tables 17–21. Exports for many years have been only a small fraction of the U.S. cement industry’s sales but did reach the record-high 1.75 Mt in 2012. Exports have declined since then, largely because of increasing domestic cement sales. Exports fell by 17% in 2016 to about 1.3 Mt (table 16), and exports to final customers fell by 28% to about 0.7 Mt (table 9). The main destination of United States cement exports continued to be Canada, which accounted for 83% of exports in 2016 (table 16).

Total imports of cement and clinker increased by 17.6% to 13.2 Mt (tables 1, 17) in 2016. Data have been adjusted by the USGS to remove granulated blast furnace slag that was misreported by the importer as clinker. Import volumes, however, remain incomplete, as discussed below. As listed, the total in 2016 remained well below the record high of 35.6 Mt in 2006. Nevertheless, imports in 2016 supplied much of the growth in cement sales noted previously. Imports of gray portland cement accounted for 77% of the total imports (table 19) and were up by nearly 1.2 Mt. The leading import sources of cement and clinker in 2016 were, in decreasing order of tonnage, Canada, Greece, China, Turkey, the Republic of Korea, Mexico, Spain (adjusted), Taiwan, Sweden, and Denmark.

Data for cement imports from Mexico were incomplete for both years, and all or most of the deficit related to gray portland cement entering the El Paso, TX, customs district (table 18); most of what is shown for this district in table 18 is white cement. The missing cement was estimated to be about 0.5 Mt in 2016.

White cement imports are listed in table 20. Based on unexpectedly low unit values, the data for white cement in some years have appeared to have included some gray cement or clinker; the apparent errors likely were owing to the use of

the wrong tariff code by importers. For 2016, the bulk of the component tonnage within the entry for Germany has a value far too low to be white cement, and the entries for Mexico and Norway appear to include at least a component of gray portland cement and (or) clinker. Mexico and Norway show tonnage increases that likely correspond to this apparent gray material, and this material also appears to account for much of the overall increase in total white cement imports in 2016.

As has been the case for many years, the white cement imports in 2016 significantly exceeded the white portland cement sales in table 15, and the apparent discrepancy increases if consideration is also given to the component of domestically produced white cement in the white cement sales. Part of the discrepancy is explained by the fact that white cement can be the base for colored portland cement (perhaps reported as gray portland) and used to lighten the color of some gray portland cement, as well as for making white or colored masonry cement (not included in table 15). Some sales of so-called domestically produced white portland cement are blends of domestic and imported material. Finally, white cement is a significant fraction of the cement brought in (and sold) by some of the importers that do not report to the USGS.

Apparent imports of clinker (adjusted to remove granulated blast furnace slag misreported as clinker) increased by 70% to 1.5 Mt (table 21); the increase was largely the result of material from Greece and, especially, Turkey that was brought in to feed the finish mill at an integrated plant in New York that had shut down its wet kilns ahead of the startup of a new preheater-precalciner kiln anticipated for early 2017. Imports from Canada, as listed, fell 5.6% but were underreported because of sub-\$2,500 truckloads that, as with cement from Mexico noted previously, were being registered as “informal entries.” The deficits have seemingly declined in recent years; they were estimated to be 0.1 Mt in 2016. No clinker imports from France were listed in 2016, but in past years, such material, all coming into the Norfolk, VA, customs district, has been for the manufacture of aluminous cement; however, all of the imports from France into Norfolk (table 18) were of aluminous cement.

For cement and clinker combined, the 10 busiest customs districts of entry in 2016 were, in descending order of tonnage, Houston-Galveston, TX; New York City, NY; Seattle, WA; Detroit, MI; San Francisco, CA; Cleveland, OH; Buffalo, NY; Columbia-Snake, OR and WA; Miami, FL; and Providence, RI (table 18). These leading districts accounted for about 73% of the total imports for the year.

World Review

Production of hydraulic cement, by country, is listed in table 22. For most countries and localities, the data include all forms of hydraulic cement. However, the data for the United States are for portland and masonry cement only, and data for some other countries or localities may be incomplete. For some countries or localities, the production data may include exports of clinker.

World production of hydraulic cement in 2016, at about 4.1 Gt, essentially was unchanged from that in 2015. China's output in 2016 increased by 51 Mt to 2.41 Gt, more than eightfold that of India, which had the second highest output. The remaining top 15 producers in 2016 were, in descending

order, the United States, Vietnam, Turkey, Indonesia, Brazil, Russia, Saudi Arabia, Egypt, Iran, the Republic of Korea, Japan, Mexico, and Thailand. Altogether, cement was produced in about 160 countries and localities, but output was very unevenly distributed. Cumulatively, the top 5 countries accounted for about 71% of total world output; the top 10 countries, about 78%; and the top 15 countries, about 84%.

In terms of regional production, Asia and the Pacific in 2016 accounted for about 76% of the world total; the region included 7 of the 15 leading producing countries and has had the highest growth rate of all regions in recent years. China's production accounted for 58% of the world total output in 2016.

Western Europe (including Turkey) was the next ranked producing region, with 5.0% of 2016 world output. Western Europe was followed by Africa, at 4.9%; the Middle East, 4.4%; North America (including Mexico), 3.3%; Central America and South America (including the Caribbean), 3.3%; the Commonwealth of Independent States, 2.5%; and Eastern Europe, 1.1%.

Outlook

Domestic cement sales increases in 2016 were somewhat lower than expected, with significant month-to-month relative variation. Continued uncertainties in public sector and housing construction are expected to constrain growth in cement sales in 2017 to less than 3%. Imports are expected to capture additional market share in 2017. Production of cement is expected to increase only modestly in 2017, and this could largely be due to plant upgrades coming online. Some plants are expected to continue to operate at below rated production capacity owing to idle kilns, which are unable to run full time, largely for environmental reasons. In the longer term, the poor overall (and deteriorating) condition of U.S. transportation infrastructure is expected to lead to increased levels of public sector construction spending. Given the permitting difficulties in constructing new (greenfields) plants, domestic production capacity, even augmented by an increased use of SCMs (such as within blended cements), will be inadequate to supply a long-term return to high sales volumes comparable to those of the prerecession construction boom, and an increasing share of the market will thus need to be supplied by imports.

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TABLE 1
SALIENT CEMENT STATISTICS^{1,2}

(Thousand metric tons unless otherwise specified)

	2012	2013	2014	2015	2016
United States:					
Production:					
Cement ³	74,151	76,804	82,535	84,405	84,695
Clinker	67,173	69,420	74,372	76,043	75,633
Shipments from mills and terminals: ^{3,4,5}					
Quantity	78,300	81,700	88,900 ^r	92,000	94,300
Value ⁶ thousand dollars	7,020,000	7,760,000	8,940,000 ^r	9,800,000	10,500,000
Average value ⁶ dollars per metric ton	89.50	95.00	100.50	106.50	111.00
Stocks, yearend:					
Cement	6,900	6,570	6,140	7,230	7,420
Clinker	4,870	5,090	4,530	4,840	5,430
Exports	1,749	1,670	1,397 ^r	1,543 ^r	1,283
Imports: ⁷					
Cement	6,107	6,289	7,584	10,376 ⁸	11,742
Clinker	786	806	720	879 ^{r,9}	1,496
Total ¹⁰	6,893	7,095	8,303	11,254 ^{r,8,9}	13,237
Consumption, apparent ¹¹	77,880	81,750	89,220 ^r	92,150 ^r	94,960
World production ^{c,12}	3,820,000	4,070,000	4,190,000	4,100,000	4,140,000

^cEstimated. ^rRevised.

¹Table includes data available through May 8, 2019. Unless otherwise indicated, data are for portland (including blended) and masonry cements only. Even where presented unrounded, data are thought to be accurate to no more than three significant digits.

²Excludes Puerto Rico.

³Includes cement made from imported clinker. Includes a double counted component (less than 0.5% per year) of portland cement subsequently converted at the plants to masonry cement; because of the involvement of stockpiles, the precise amount converted from actual production cannot be determined.

⁴Includes imported cement.

⁵Shipments to final domestic customers. Data are from an annual survey of plants and terminals and may differ from the totals in table 9, which are based on consolidated monthly surveys from companies.

⁶Free on board mill or independently reporting terminal.

⁷All forms of hydraulic cement or clinker.

⁸Adjusted by the U.S. Geological Survey to include cement that was misregistered by the importer under the tariff code for another commodity.

⁹Adjusted by the U.S. Geological Survey to exclude granulated blast furnace slag misregistered by the importer under the tariff code for clinker.

¹⁰May not add to totals shown because of independent rounding.

¹¹Production (including that from imported clinker) of cement plus imports of cement minus exports of cement minus the change in yearend cement stocks.

¹²Total hydraulic cement. May include clinker exports for some countries.

TABLE 2
COUNTY BASIS OF SUBDIVISION OF STATES IN CEMENT TABLES

State subdivision	Defining counties
California, northern	Alpine, Fresno, Kings, Madera, Mariposa, Monterey, Tulare, Tuolumne, and all counties farther north.
California, southern	Inyo, Kern, Mono, San Luis Obispo, and all counties farther south.
Illinois, excluding Chicago	All counties other than those in metropolitan Chicago.
Illinois, metropolitan Chicago	Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will Counties in Illinois.
New York, eastern	Delaware, Franklin, Hamilton, Herkimer, Otsego, and all counties farther east and south, except those within metropolitan New York.
New York, western	Broome, Chenango, Lewis, Madison, Oneida, St. Lawrence, and all counties farther west.
New York, metropolitan	New York City (Bronx, Kings, New York, Queens, and Richmond), Nassau, Rockland, Suffolk, and Westchester.
Pennsylvania, eastern	Adams, Cumberland, Juniata, Lycoming, Mifflin, Perry, Tioga, Union, and all counties farther east.
Pennsylvania, western	Centre, Clinton, Franklin, Huntingdon, Potter, and all counties farther west.
Texas, northern	Angelina, Bell, Concho, Crane, Culberson, El Paso, Falls, Houston, Hudspeth, Irion, Lampasas, Leon, Limestone, McCulloch, Reagan, Reeves, Sabine, San Augustine, San Saba, Tom Green, Trinity, Upton, Ward, and all counties farther north.
Texas, southern	Brazos, Burnet, Crockett, Jasper, Jeff Davis, Llano, Madison, Mason, Menard, Milam, Newton, Pecos, Polk, Robertson, San Jacinto, Schleicher, Tyler, Walker, Williamson, and all counties farther south.

TABLE 3
 PORTLAND AND BLENDED CEMENT PRODUCTION, CAPACITY, AND STOCKS IN THE UNITED STATES, BY DISTRICT¹
 (Thousand metric tons unless otherwise specified)

District ²	2015					2016				
	Number of plants	Production ³	Grinding capacity ⁴	Percentage utilized ⁵	Yearend stocks ⁶	Number of plants	Production ³	Grinding capacity ⁴	Percentage utilized ⁵	Yearend stocks ⁶
Maine and New York	4	1,764	3,184	55.4	174	4	1,770	3,707	47.8	181
Pennsylvania	8	3,919	5,992	65.4	255	7	3,819	6,130	62.3	318
Illinois	3	1,411	2,532	55.7	170	3	1,551	2,532	61.3	170
Indiana and Ohio	6	3,478	4,950	70.3	296	6	3,453	4,940	69.9	290
Michigan	3	4,191	5,220	80.2	405	3	4,095	4,945	82.8	448
Iowa, Nebraska, South Dakota	4	3,286	4,346	75.6	389	4	3,406	3,730	91.4	368
Kansas	2	2,141	3,172	67.5	166	2	2,226	3,172	70.2	163
Missouri	5	8,535	11,500	74.2	962	5	8,342	11,500	72.5	1,349
Florida	8	5,499	10,100	54.5	338	8	5,857	10,087	58.1	322
Georgia, Maryland, Virginia, West Virginia	6	5,680	7,358	77.2	364	6	5,748	7,358	78.1	342
South Carolina	3	3,069	5,090	60.4	219	3	2,858	5,085	56.2	210
Alabama, Kentucky, Tennessee	8	7,008	10,100	69.1	582	8	6,843	9,942	68.8	495
Arkansas and Oklahoma	4	2,429	3,729	65.1	203	4	2,597	3,729	69.6	211
Texas, northern	6	4,490	7,400	60.7	395	6	4,935	7,425	66.5	344
Texas, southern	5	5,886	7,730	76.1	359	5	5,931	7,730	76.7	313
Arizona and New Mexico	4	2,333	3,715	62.8	127	4	2,149	3,715	57.9	96
Colorado and Wyoming	4	3,197	4,889	65.4	243	4	3,032	4,419	68.6	211
Montana, Nevada, Utah	5	2,482	3,223	77.0	283	5	2,448	3,232	75.7	257
Alaska and Hawaii	--	--	--	--	73	--	--	--	--	96
California	9	9,772	12,050	81.1	366	8	9,597	11,324	84.7	449
Oregon and Washington	4	1,524	2,472	61.6	223	4	1,524	2,470	61.7	225
Importers ⁸	--	--	--	--	234	--	--	--	--	144
Total ⁹	101	82,093	119,000	69.1	6,830	99	82,181	117,000	70.1	7,000
Puerto Rico	2	536	1,780	30.1	59	2	458	1,780	25.7	49
Grand total ⁹	103	82,629	121,000	68.5	6,890	101	82,639	119,000	69.5	7,050

-- Zero.
¹Table includes data available through May 8, 2019. Even where presented unrounded, data are thought to be accurate to no more than three significant digits. Includes data for white cement. Includes cement made from imported clinker.

²District assignment is the location of the reporting facilities. Specific districts include importers where district assignments were possible.

³Data include a small amount of portland cement subsequently consumed at the plant to make masonry cement; the amount thus double counted cannot be determined precisely because of the involvement of cement stockpiles, but is thought to be less than 0.5% of the grand totals listed.

⁴Based on fineness needed to produce a plant's normal output mix, including masonry cement, and allowing for downtime for routine maintenance.

⁵Calculated relative to portland cement output; utilization would be higher if calculated to include output of masonry cement.

⁶Includes imported cement and stocks of domestic and imported cement at mills, and terminals assigned to plants (some of which may be outside the district indicated), and in transit.

⁷Includes estimates for nonrespondents or facilities that provided incomplete information; data have been rounded to three significant digits.

⁸Includes only those importers or terminals for which district assignments were not possible.

⁹May not add to totals shown because of independent rounding.

TABLE 4
MASONRY CEMENT PRODUCTION AND STOCKS IN THE UNITED STATES, BY DISTRICT¹

(Thousand metric tons unless otherwise specified)

District ²	2015			2016		
	Number of active plants	Production ³	Yearend stocks ⁴	Number of active plants	Production ³	Yearend stocks ⁴
Maine and New York	4	38	16	4	26	10
Pennsylvania	7	179	39 ⁵	7	170	39 ⁵
Indiana and Ohio	6	262	42	6	271	50
Michigan	3	92	30	3	83	43
Iowa, Nebraska, South Dakota	--	--	--	1	W	W
Kansas and Missouri	3	W	W	3	W	W
Florida	5	400	41	6	509	90
Georgia, Maryland, Virginia, West Virginia	5	269	34	5	276	27
South Carolina	3	168	14	3	185	17
Alabama, Kentucky, Tennessee	6	245	47	7	281	39
Arkansas and Oklahoma	4	118	49	4	126	11 ⁵
Texas	6	268	17	6	287	18
Arizona and New Mexico	3	46	5	3	26	4
Colorado, Montana, Nevada, Utah, Wyoming	2	W	W	2	W	W
California	6	188	27	5	220	30
Importers ⁶	--	--	5 ⁵	--	--	8 ⁵
Total ⁷	63	2,311	393 ⁵	65	2,514	417 ⁵
Puerto Rico	--	--	--	--	--	--
Grand total ⁷	63	2,311	393 ⁵	65	2,514	417 ⁵

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

¹Table includes data available through May 8, 2019. Includes masonry, portland-lime, plastic, and stucco cements. Even where presented unrounded, data are thought to be accurate to no more than three significant digits.

²District assignment is the location of the reporting facilities. Specific districts include importers where district assignments were possible.

³Includes cement produced from imported clinker.

⁴Includes imported cement and stocks of domestic and imported cement at mills, and terminals assigned to plants (some of which may be outside the district indicated), and in transit.

⁵Includes estimates for nonrespondents or facilities that provided incomplete information.

⁶Includes only those importers or terminals for which district assignments were not possible.

⁷May not add to totals shown because of independent rounding.

TABLE 5
CLINKER CAPACITY AND PRODUCTION IN THE UNITED STATES IN 2016, BY DISTRICT¹

District	Number of active plants ²			Number of kilns ³	Daily capacity ^{3,4,5} (thousand metric tons)	Average days of routine maintenance ⁶	Apparent annual capacity ^{3,7} (thousand metric tons)	Production (thousand metric tons)	Percentage of capacity utilized	Year-end stocks (thousand metric tons)
	Process used		Total							
	Dry	Wet								
Maine and New York	2	1	--	3	6.6 ⁸	30.7 ⁸	2,230 ⁸	1,009	45.3 ⁸	137
Pennsylvania	5	2	--	7	16.9	34.4 ⁸	5,570 ⁸	3,568	64.1 ⁸	225 ⁸
Illinois	3	--	--	3	7.7	32.0 ⁸	2,580 ⁸	1,573	60.9 ⁸	186
Indiana and Ohio	4 ⁹	2	--	6	13.4	32.6	4,471	3,373	75.5	215
Michigan	2	--	--	2	11.2	26.3 ⁸	3,780 ⁸	3,211	84.9 ⁸	200
Iowa, Nebraska, South Dakota	4	--	--	4	10.2	26.9	3,630	3,011	86.5	205
Kansas	2	--	--	2	7.3	32.3	2,478	2,053	82.9	85
Missouri	5	--	--	5	29.3	32.5	9,540	7,703	80.7	502
Florida	7	--	--	7	26.4	18.1	9,151	5,532	60.5 ⁸	184
Georgia, Maryland, Virginia, West Virginia	5	--	--	5	20.2	30.5	6,767	5,298	78.3	283
South Carolina	3	--	--	3	12.2	28.3 ⁸	4,100 ⁸	2,782	67.9 ⁸	169
Alabama, Kentucky, Tennessee	8	--	--	8	26.6	26.1	8,995	6,618	73.6	305
Arkansas and Oklahoma	3	1	--	4	9.8	22.7	3,363	2,416	71.8	178
Texas, northern	5 ⁹	1	--	6	22.6	23.3	6,380	4,753	63.0	614
Texas, southern	5	--	--	5	20.4	18.9 ⁸	7,070 ⁸	5,539	78.3 ⁸	494
Arizona and New Mexico	4	--	--	4	10.3	21.0	3,533	1,927	54.5	155
Colorado and Wyoming	4	--	--	4	11.8	20.6	3,997	2,726	68.2	187
Idaho, Montana, Nevada, Oregon, Utah, Washington	5	2	--	7	12.6	26.1 ⁸	4,310 ⁸	3,550	82.4 ⁸	501
California	8	--	--	8	34.6	24.2 ⁸	12,000 ⁸	8,990	75.2 ⁸	604
Total ¹⁰	84 ⁹	9	--	93	311.0 ⁸	26.2 ⁸	105,000 ⁸	75,633	72.1 ⁸	5,430 ⁸
Puerto Rico	2	--	--	2	5.0	32.0 ⁸	1,690 ⁸	390	23.1 ⁸	45
Grand total ¹⁰	86 ⁹	9	--	95	316.0 ⁸	26.3 ⁸	107,000 ⁸	76,022	71.3 ⁸	5,480 ⁸

¹Table includes data available through May 8, 2019. Even where presented unrounded, data are thought to be accurate to no more than three significant digits.

²Includes all plants (gray or white) that produced clinker for at least 1 day during the year, as well as idle facilities that can be restarted, fully permitted, in less than 6 months.

³Includes kilns active for at least 1 day during the year. For kilns idle all year, includes those that can be restarted, fully permitted, in less than 6 months.

⁴Plants that can operate both wet and dry kilns, whether or not both types were active during the year. Includes plants that converted from wet to dry technology during the year.

⁵Sum of reported kiln capacities for all plants in a district.

⁶Total days of routine maintenance (summed for all kilns) divided by the number of kilns.

⁷Sum of apparent annual capacities for all kilns. For each kiln, the statistic is calculated as 366 days (leap year) minus days reported for routine maintenance and then multiplied by the unrounded daily capacity.

⁸Contains estimates for some facilities and have been rounded to no more than three significant digits.

⁹Includes one semiwet kiln in Indiana and one semi-dry kiln in northern Texas.

¹⁰May not add to totals shown because of independent rounding.

TABLE 6
RAW MATERIALS USED TO PRODUCE CLINKER AND CEMENT IN THE UNITED STATES^{1,2}

(Thousand metric tons)

Material	2015		2016	
	Clinker	Cement ³	Clinker	Cement ³
Calcareous:				
Limestone (aragonite, chalk, coral, marble)	97,700	2,470	99,500	2,670
Cement rock (includes marl)	9,450	8	9,330	--
Cement kiln dust (CKD) ⁴	19	157	1	220
Lime ⁴	48	13	25	12
Other	98	(5)	70	1
Aluminous:				
Clay	4,070	--	3,730	--
Shale and schist	2,580	45	2,610	22
Other ⁶	705	--	710	--
Ferrous:				
Iron ore	816	--	768	--
Mill scale	695	--	552	--
Other ⁷	17	--	23	--
Siliceous:				
Sand, calcium silicates	3,430	--	3,345	--
Sandstone, quartzite, soils, nonpozzolanic rocks	705	--	722	(5)
Fly ash	2,280	128	2,050	141
Other ash, including bottom ash	1,710	--	1,540	--
Granulated blast furnace slag ⁸	1	296	--	261
Other blast furnace slag	27	--	7	--
Steel slag	409	--	457	--
Other slag	223	--	385	--
Natural rock pozzolans ⁹	--	30	1	60
Other pozzolans ¹⁰	64	11	90	10
Other:				
Gypsum and anhydrite	(11)	4,390	(11)	4,610
Miscellaneous ¹²	27	28	22	29
Total ¹³	125,000	7,580	126,000	8,030
Clinker, imported, raw materials equivalent ¹⁴	--	1,520	--	722
Grand total ¹³	125,000	9,090	126,000	8,750

-- Zero.

¹Excludes Puerto Rico.

²Table includes data available through May 8, 2019. Data have been rounded to no more than three significant digits.

³Includes portland, blended, and masonry cements.

⁴Data are thought to be underreported.

⁵Less than ½ unit.

⁶Includes alumina, aluminum dross, bauxite, spent catalysts, and other aluminous materials.

⁷Includes iron sludges, pyrite, and other ferrous materials.

⁸Includes both ground and unground material.

⁹Includes pozzolana and burned clays or shales (except where directly reported as clay or shale).

¹⁰Includes diatomite, silica fume, other microcrystalline silica, and other pozzolans, even if not used as such.

¹¹Included with "Calcareous: Other."

¹²Includes fluorspar and all other materials not listed above.

¹³May not add to totals shown because of independent rounding.

¹⁴Converted as 1.7 times the weight of foreign clinker consumed.

TABLE 7
CLINKER PRODUCED AND FUEL CONSUMED BY THE U.S. CEMENT INDUSTRY, BY KILN PROCESS^{1,2}

Kiln process	Production			Conventional fuels ³				Waste fuels ³		
	Number of plants ⁴	Quantity (thousand metric tons)	Percentage of total	Coal ⁵ (thousand metric tons)	Petcoke (thousand metric tons)	Oil ⁶ (thousand liters)	Natural gas ⁷ (thousand cubic meters)	Tires (thousand metric tons)	Solid (thousand metric tons)	Liquid (thousand liters)
2015:										
Wet	9	2,536	3.3	458	48	3,460	110,000	22	29	197,000
Dry ⁸	83	73,507	96.7	5,850	1,640	24,100	874,000	376	991	950,000
Both ⁹	--	--	--	--	--	--	--	--	--	--
Total ¹⁰	92	76,043	100.0	6,310	1,690	27,600	984,000	397	1,020	1,150,000
2016:										
Wet	9	2,099	2.8	203	63	505	84,600	16	12	188,000
Dry ⁸	83	73,676	97.2	5,150	1,920	45,200	1,360,000	361	1,140	758,000
Both ⁹	--	--	--	--	--	--	--	--	--	--
Total ¹⁰	92	75,775	100.0	5,350	1,980	45,700	1,440,000	378	1,150	947,000

-- Zero

¹Table includes data available through May 8, 2019. Data are all reported. Although unrounded, data are thought to be accurate to no more than three significant digits.

²Excludes Puerto Rico.

³All fuel data have been rounded to no more than three significant digits.

⁴Excludes idle plants that, although retained as active in terms of clinker capacity, had no production during 2015–16.

⁵All reported to be bituminous.

⁶Distillate and residual fuel oils. Excludes used oils that were reported under liquid wastes.

⁷Includes landfill gas and propane.

⁸Includes one semiwet plant and one semidry plant.

⁹Plants that can operate both wet and dry kilns, whether or not both types were active during the year. Includes plants that converted from wet to dry technology during the year.

¹⁰May not add to totals shown because of independent rounding.

TABLE 8
ELECTRICITY CONSUMED BY U.S. CEMENT PLANTS, BY PLANT PROCESS¹

Plant process	Electricity consumed ²										Average consumption (kilowatthours per ton of cement produced)									
	Generated					Purchased						Total ⁴ Quantity (million kilowatthours)	Percentage of total	Cement produced ³ (thousand metric tons)						
	Number of plants	Quantity (million kilowatthours)	Number of plants	Quantity (million kilowatthours)	Number of plants	Quantity (million kilowatthours)	Number of plants	Quantity (million kilowatthours)	Number of plants	Quantity (million kilowatthours)										
2015:																				
Integrated plants:																				
Wet	--	--	9	438	9	438	4	438	9	438	4	438	4	2,950	149					
Dry ⁵	4	239	84 ⁶	10,800	84	10,800	96	11,000	84	11,000	96	11,000	96	80,146	137					
Both ⁷	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					
Total or average ⁴	4	239	93 ⁶	11,200	93	11,200	100	11,400	93	11,400	100	11,400	100	83,096	138					
Grinding plants ⁸	--	--	4	116	4	116	--	121 ^r	4	121 ^r	--	121 ^r	--	1,187	97					
Exclusions ⁹	--	--	2	XX	2	XX	--	XX	2	XX	--	XX	--	122	XX					
2016:																				
Integrated plants:																				
Wet	--	--	9	378	9	378	3	378	9	378	3	378	3	3,105	122					
Dry ⁵	4	240	83	10,800	83	10,800	97	11,100	83	11,100	97	11,100	97	80,474	137					
Both ⁷	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					
Total or average ⁴	4	240	92	11,200	92	11,200	100	11,400	92	11,400	100	11,400	100	83,578	137					
Grinding plants ⁸	--	--	3	104	3	104	--	104	3	104	--	104	--	1,005	103					
Exclusions ⁹	--	--	2	XX	2	XX	--	XX	2	XX	--	XX	--	112	XX					

^rRevised. XX Not applicable. -- Zero.

¹Excludes Puerto Rico.

²Table includes data available through May 8, 2019. Data are rounded to no more than three significant digits because they contain estimates.

³Portland and masonry cement. Data are all reported and are unrounded but are thought to be accurate to no more than three significant digits.

⁴May not add to totals shown because of independent rounding.

⁵Includes one semidry plant and one semiwet plant.

⁶Includes one grinding plant; the data were included with an integrated plant.

⁷Plants that can operate both wet and dry kilns, whether or not both types were active during the year. Includes plants that converted from wet to dry technology during the year.

⁸Plants that did not produce clinker but ground clinker from outside sources. Excludes plants that only made masonry cement or just reground one type of portland cement into another, or which reported a substantial component of grinding of excess granulated blast furnace slag. Excludes two plants that were reported under "Dry" as noted in footnote 6.

⁹Plants at which production of portland cement was by regrinding of one type into another or which reported production only of masonry cement.

TABLE 9
CEMENT SHIPMENTS TO FINAL CUSTOMER, BY DESTINATION AND ORIGIN^{1,2}

(Thousand metric tons)

Destination and origin	Portland cement		Masonry cement	
	2015	2016	2015	2016
Destination:				
Alabama	996	1,115	71	81
Alaska ³	154	142	--	--
Arizona	2,020	1,988	26	25
Arkansas	807	871	44	50
California, northern	3,436	3,317	32	27
California, southern	5,998	5,996	173	184
Colorado	2,094	2,258	5	6
Connecticut ³	581	582	14	14
Delaware ³	231	197	5	5
District of Columbia ³	238	228	(4)	(4)
Florida	5,929	6,523	412	443
Georgia	2,628	2,964	141	155
Hawaii ³	408	336	2	2
Idaho ³	498	538	(4)	--
Illinois, excluding Chicago	1,418	1,406	9	8
Illinois, metropolitan Chicago ³	1,672	1,707	19	20
Indiana	1,892	1,806	34	34
Iowa	1,895	1,907	1	(4)
Kansas	1,301	1,382	4	4
Kentucky	1,116	1,157	52	55
Louisiana ³	2,154	1,898	49	47
Maine	194	210	1	1
Maryland	1,229	1,201	34	32
Massachusetts ³	929	1,018	9	10
Michigan	1,968	2,068	54	54
Minnesota ³	1,656	1,622	5	1
Mississippi ³	697	734	35	39
Missouri	1,644	1,814	12	11
Montana	313	335	(4)	(4)
Nebraska	1,309	1,314	(4)	(4)
Nevada	1,132	1,316	5	5
New Hampshire ³	199	190	7	6
New Jersey ³	1,434	1,406	45	37
New Mexico	504	446	2	3
New York, eastern	535	550	8	7
New York, western ³	655	648	10	11
New York, metropolitan ³	1,658	1,741	50	41
North Carolina ³	2,028	2,487	148	164
North Dakota ³	1,041	764	(4)	1
Ohio	3,144	3,239	74	73
Oklahoma	1,624	1,614	26	35
Oregon	770	838	(4)	(4)
Pennsylvania, eastern	1,686	1,692	41	51
Pennsylvania, western	1,032	1,007	27	26
Rhode Island ³	95	107	1	1
South Carolina	1,386	1,689	67	73
South Dakota	478	467	--	--
Tennessee	1,469	1,584	128	144
Texas, northern	5,940	6,418	117	117
Texas, southern	8,405	7,816	207	216
Utah	1,226	1,337	(4)	--
Vermont ³	99	102	(4)	1
Virginia	1,664	1,835	73	70
Washington	1,750	1,740	(4)	(4)
West Virginia	414	386	9	9
Wisconsin ³	1,873	1,959	12	10

See footnotes at end of table.

TABLE 9—Continued
CEMENT SHIPMENTS TO FINAL CUSTOMER, BY DESTINATION AND ORIGIN^{1,2}

(Thousand metric tons)

Destination and origin	Portland cement		Masonry cement	
	2015	2016	2015	2016
Destination:—Continued				
Wyoming	346	252	--	--
Total ⁵	89,991	92,263	2,304	2,406
Puerto Rico	575	516	--	--
Foreign countries and (or) localities ⁶	981	704	(4)	(4)
Grand total ⁵	91,547	93,483	2,305	2,406
Origin:				
United States	81,400	82,408	2,284	2,385
Puerto Rico	528	472	--	--
Foreign countries and (or) localities ⁷	9,619	10,602	21	21
Total shipments ⁵	91,547	93,483	2,305	2,406

-- Zero.

¹Table includes data available through May 8, 2019. Includes cement produced from imported clinker and imported cement shipped by domestic producers and importers.

²Data are developed from consolidated monthly surveys of shipments by companies and may differ from data in tables 1, 10–12, and 14–15, which are from annual surveys of individual plants and importers. Although unrounded, data are thought to be accurate to no more than three significant digits.

³Has no cement plants.

⁴Less than ½ unit.

⁵May not add to totals shown because of independent rounding.

⁶Includes shipments to U.S. possessions and territories.

⁷Imported cement sold to final customers in the United States as reported by domestic producers and other importers. Data do not match the imports in tables 17–20.

TABLE 10
SHIPMENTS OF PORTLAND CEMENT IN THE UNITED STATES, BY TYPE OF CARRIER^{1,2}

(Thousand metric tons)

Type of carrier	Plant to terminal		Plant to customer		Terminal to customer		Total to customers ³
	In bulk	In bags ⁴	In bulk	In bags ⁴	In bulk	In bags ⁴	
2015:							
Railroad	13,600	9	1,140	--	147	6	1,290
Truck	4,210	55	45,400	713	42,000	320	88,400
Barge and boat	9,590	--	40	--	--	--	40
Total ³	27,400	63	46,600	713	42,100	326	89,700 ⁵
2016:							
Railroad	12,000	9	758	--	99	6	863
Truck	4,200	56	47,200	762	42,600	303	90,900
Barge and boat	8,580	--	142	--	--	--	132
Total ³	24,800	65	48,100	762	42,700	309	91,900 ⁵

-- Zero.

¹Table includes data available through May 8, 2019. Data are rounded to no more than three significant digits.

²Includes imported cement and cement made from imported clinker. Excludes Puerto Rico.

³May not add to totals shown because of independent rounding.

⁴Includes packages, bags, and supersacks.

⁵Shipments are based on an annual survey of plants and importers; may differ from totals in table 9, which are based on consolidated monthly data.

TABLE 11
PORTLAND CEMENT SHIPPED IN THE UNITED STATES, BY DISTRICT¹

District ²	2015			2016		
	Quantity ³ (thousand metric tons)	Value ⁴		Quantity ³ (thousand metric tons)	Value ⁴	
		Total (thousands)	Average (per metric ton)		Total (thousands)	Average (per metric ton)
Maine and New York	2,023	\$219,823	\$108.67	2,916	\$305,915	\$104.91
Pennsylvania	4,449	449,000 ⁵	101.00 ⁵	4,263	451,000 ⁵	106.00 ⁵
Illinois	1,281	138,790	108.35	1,540	176,717	114.74
Indiana and Ohio	3,515	361,001	102.70	3,941	437,885	111.11
Michigan	4,669	523,500	112.13	4,590 ⁵	572,000 ⁵	124.50 ⁵
Iowa, Nebraska, South Dakota	4,174	485,379	116.27	4,173	509,878	122.18
Kansas	1,510	146,319	96.87	1,681	168,657	100.30
Missouri	7,463	742,551	99.50	7,570 ⁵	827,000 ⁵	109.00 ⁵
Florida	5,647	566,288	100.29	6,501	666,000 ⁵	102.50 ⁵
Georgia, Maryland, Virginia, West Virginia	5,551	498,176	89.74	5,850 ⁵	586,000 ⁵	100.00 ⁵
South Carolina	2,840	293,803	103.44	3,131	328,000 ⁵	105.00 ⁵
Alabama, Kentucky, Tennessee	6,312	638,166	101.11	5,898	638,504	108.26
Arkansas and Oklahoma	2,382	244,629	102.71	2,345	244,575	104.28
Texas, northern	6,274	701,000 ⁵	111.50 ⁵	6,869	785,774	114.40
Texas, southern	7,005	829,486	118.42	6,749	790,778	117.16
Arizona and New Mexico	2,562	263,507	102.85	2,622	274,975	104.88
Colorado and Wyoming	2,701	339,114	125.57	2,737	363,560	132.85
Montana, Nevada, Utah	2,560	283,734	110.84	2,832	344,043	121.49
Alaska and Hawaii	518	77,870	150.31	436	68,379	156.98
California	10,108	917,490	90.77	9,865	933,000 ⁵	94.50 ⁵
Oregon and Washington	2,036	219,000 ⁵	108.00 ⁵	2,116	228,581	108.03
Importers ^{3,6}	4,140	504,000	121.50	3,200	391,000	122.00
Total or average ^{5,7}	89,700	9,440,000	105.00	91,900	10,100,000	110.00
Puerto Rico	569 ⁵	W	W	506 ⁵	W	W
Grand total ⁷	90,300 ⁵	W	W	92,400 ⁵	W	W

W Withheld to avoid disclosing company proprietary data.

¹Table includes data available through May 8, 2019. Includes gray and white portland cement. Includes cement made from imported clinker. Even where presented unrounded, data are thought to be accurate to no more than three significant digits.

²The location of the reporting entities, not necessarily the location of sales (see table 9 for sales data, by State). Specific districts include shipments by importers where district assignments were possible.

³Tonnages are those reported by entities in the district but may include shipments into other districts. They differ from the data in table 9, which are the actual reported sales into the specific States.

⁴Values are mill net or ex-plant (free on board) valuations of total sales to final customers, including sales from plants' external distribution terminals. The data are ex-terminal for independently reporting terminals. Data include all varieties of portland cement and both bulk and bag shipments. Unless otherwise specified, data are presented unrounded. Unrounded or not, unit value data should be viewed as value indicators, accurate to no more than the nearest \$0.50 or \$1.00 per metric ton.

⁵Data are rounded to three significant digits (unit values to the nearest \$0.50) because they include estimates.

⁶Importers for which district assignments were not possible.

⁷May not add to totals shown because of independent rounding.

TABLE 12
MASONRY CEMENT SHIPPED IN THE UNITED STATES, BY DISTRICT^{1,2}

District ³	2015			2016		
	Quantity ⁴ (thousand metric tons)	Value ⁵		Quantity ⁴ (thousand metric tons)	Value ⁵	
		Total (thousands)	Average (per metric ton)		Total (thousands)	Average (per metric ton)
Maine and New York	44	\$5,742	\$130.12	34	\$4,757	\$138.18
Pennsylvania	185	27,400 ⁶	148.50 ⁶	164	25,300 ⁶	154.50
Illinois, Indiana, Ohio	233	37,999	162.74	244	42,271	172.99
Michigan	82 ⁶	12,400 ⁶	152.50 ⁶	78	13,000 ⁶	168.00 ⁶
Iowa, Nebraska, South Dakota	--	--	--	W	W	W
Kansas and Missouri	38	6,582	173.45	38	6,918	180.71
Florida	395	51,200 ⁶	129.50 ⁶	440	61,200 ⁶	139.00 ⁶
Georgia, Maryland, Virginia, West Virginia	236	47,809	202.36	298	61,197	205.07
South Carolina	174	27,000 ⁶	155.50 ⁶	189	29,100 ⁶	154.50 ⁶
Alabama, Kentucky, Mississippi, Tennessee	325	48,996	150.77	255	38,601	151.18
Arkansas and Oklahoma	87	9,593	110.41	101	12,141	120.28
Texas	260	44,900 ⁶	172.50 ⁶	309	52,300 ⁶	169.50 ⁶
Arizona and New Mexico	35 ⁷	4,191 ⁷	121.46 ⁷	28	3,251	116.50 ⁶
Colorado, Montana, Nevada, Utah, Wyoming	W ⁷	W ⁷	W ⁷	W	W	W
Alaska and Hawaii	2	511	332.78	2	525	348.74
California, Oregon, Washington	210	23,300 ⁶	111.00 ⁶	216	25,202	116.83
Importers ⁸	22	4,750 ⁶	219.50 ⁶	20	4,280 ⁶	218.00 ⁶
Total or average ⁹	2,330	352,000 ⁶	151.50 ⁶	2,422	381,000 ⁶	157.50 ⁶
Puerto Rico	--	--	--	--	--	--
Grand total or average ⁹	2,330	352,000 ⁶	151.50 ⁶	2,422	381,000 ⁶	157.50 ⁶

W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through May 8, 2019. Shipments are those by cement companies to final customers and include imported cement and cement made from imported clinker. Excludes sales of masonry cement by portland cement final customers who made masonry cement from purchased portland cement. Even where presented unrounded, data are thought to be accurate to no more than three significant digits.

²Data include true masonry, plastic, portland-lime, and stucco cements.

³District is the location of the reporting entities, not necessarily the location of sales (see table 9 for sales data, by State). Specific districts include shipments by importers where district assignments were possible.

⁴Tonnages are those reported by entities in the district but may include shipments into other districts. They differ from the data in table 9, which are the actual reported sales into the specific States.

⁵Values are mill net or ex-plant valuations of total sales to final customers, including sales from plants external distribution terminals. The data are ex-terminal for independently reporting terminals. Data include both bulk and bag shipments. Unless otherwise specified, data are presented unrounded. Unrounded or not, unit value data should be viewed as value indicators, accurate to no more than the nearest \$0.50 or even \$1.00 per metric ton.

⁶Data are rounded to no more than three significant digits (unit values to the nearest \$0.50) because they include estimates.

⁷For 2015, data for Colorado, Montana, Nevada, Utah, and Wyoming are combined with data for Arizona and New Mexico to avoid revealing company proprietary data.

⁸Importers for which district assignments were not possible.

⁹May not add to totals shown because of independent rounding.

TABLE 13
AVERAGE MILL NET VALUE OF CEMENT SOLD IN THE UNITED STATES^{1,2}

(Dollars per metric ton)

Year	Portland cement			Masonry cement	All cement
	Gray	White ³	All		
2015	104.50	211.00	105.00	151.50	106.50
2016	109.00	215.50	110.00	157.50	111.00

¹Table includes data available through May 8, 2019. Data are rounded to the nearest \$0.50 per metric ton.

²Values are average of sales to final customers, free on board the plant or independently reporting terminal. Values include any bagging charges, but exclude delivery charges to customers or to external terminals. Data exclude Puerto Rico.

³Data for white cement include a component of resales showing significant price markups.

TABLE 14
PORTLAND CEMENT SHIPMENTS IN 2016, BY DISTRICT AND TYPE OF CUSTOMER¹

(Thousand metric tons)

District ²	Ready-mixed concrete	Concrete product manufacturers	Contractors	Building material dealers	Oil well, mining, waste stabilization	Government and other ³	Total ^{4,5}
Maine and New York	2,190	392	73	175	11	77	2,916
Pennsylvania	2,400	972	504	209	13	167	4,263
Illinois	976	93	156	5	146	164	1,540
Indiana	2,060	310	262	42	9	57	2,740
Michigan	3,300	491	708	70	--	14	4,590 ⁶
Ohio	908	86	144	17	34	12	1,201
Iowa, Nebraska, South Dakota	3,210	383	268	96	69	146	4,173
Kansas	1,310	178	128	44	22	--	1,681
Missouri	5,960	743	484	194	65	127	7,570 ⁶
Florida	4,770	1,220	221	214	5	67	6,501
Georgia, Maryland, Virginia, West Virginia	4,180	921	346	214	25	163	5,850 ⁶
South Carolina	2,400	264	300	147	2	22	3,131
Alabama, Kentucky, Mississippi, Tennessee	4,380	787	286	271	74	99	5,898
Arkansas and Oklahoma	1,790	158	263	42	75	18	2,345
Texas, northern	4,250	498	1,390	113	547	72	6,869
Texas, southern	4,600	643	935	265	235	67	6,749
Arizona and New Mexico	1,860	522	117	105	12	3	2,622
Colorado and Wyoming	2,230	139	189	86	92	4	2,737
Idaho, Montana, Nevada, Utah	2,100	233	141	91	274	35	2,872
Alaska and Hawaii	421	12	--	2	--	1	436
California	7,680	1,010	476	571	78	50	9,865
Oregon and Washington	1,670	235	90	75	34	17	2,116
Importers ⁷	2,590	348	81	32	--	145	3,200 ⁶
Total ⁵	67,200	10,600	7,560	3,080	1,824	1,530	91,900 ⁶
Puerto Rico	293	32	10	170	--	(8)	506 ⁶
Grand total ⁵	67,500	10,700 ⁹	7,580 ¹⁰	3,250	1,824 ¹¹	1,530 ¹²	92,400 ⁶

-- Zero.

¹Table includes data available through May 8, 2019. Includes imported cement and cement made from imported clinker. Except for district totals, data have been rounded to three significant digits, but are likely accurate to only two significant digits. District totals are likely accurate to no more than three significant digits.

²The location of the reporting entity, not the location of sales (see table 9 for sales data, by State). Specific districts include shipments by importers where district assignments were possible.

³Includes shipments to miscellaneous customer types and for which customer types were not specified.

⁴Except where noted, district totals are unrounded but are thought to be accurate to no more than three significant digits.

⁵May not add to totals shown because of independent rounding.

⁶District totals are rounded to three significant digits because they include estimates.

⁷Shipments by importers where district assignments were not possible.

⁸Less than ½ unit.

⁹Includes brick and block—3,220; precast and prestressed—3,800; pipe—943; and other or unspecified—2,720.

¹⁰Includes airport—59; road paving—3,940; soil cement—2,010; and other or unspecified—1,490.

¹¹Includes oil-well drilling—1,320; mining—337; and waste stabilization—161.

¹²Includes other or unspecified—1,490.

TABLE 15
 PORTLAND CEMENT SHIPMENTS IN THE UNITED STATES, BY TYPE OF CEMENT^{1,2,3}

(Thousand metric tons)

Type of cement ⁴	2015	2016
General use and moderate heat (Types I and II) ^{5,6}	69,500	70,200
High early strength (Type III)	2,660	4,450
Sulfate resisting (Type V) ⁵	13,200	13,200
Block	199	209
Oil well	1,600	971
White ⁷	837	882
Blended: ⁸		
Portland, natural pozzolans	44	51
Portland, ground granulated blast furnace slag	745	686
Portland, fly ash	508	569
Portland, other pozzolans ⁹	439	614
Total blended ¹⁰	1,740	1,920
Expansive and regulated fast setting	--	--
Miscellaneous ¹¹	51	66
Grand total ¹⁰	89,700	91,900

-- Zero.

¹Table includes data available through May 8, 2019. Data are rounded to no more than three significant digits.

²Includes sales of imported cement. Excludes Puerto Rico.

³Gray portland-type cements unless otherwise specified.

⁴Sold mostly under ASTM International (ASTM) specifications ASTM C150, ASTM C595, and ASTM C1157.

⁵Type II/V and similar sulfate-resisting hybrids are included within Type V, as are HS and similar cements in ASTM C1157.

⁶Includes ASTM C1157 general use and moderate heat cements that contain no pozzolans.

⁷White or colored portland-type cements. Most are Types I or II but may include Types III and V and block cements.

⁸Cements sold under ASTM C595 and those under ASTM C1157 that contain pozzolans.

⁹Includes blends with cement kiln dust, silica fume, other pozzolans, and limestone, and blends containing multiple pozzolans.

¹⁰May not add to totals shown because of independent rounding.

¹¹Includes low heat (Type IV), waterproof, and other portland-type cements.

TABLE 16
U.S. EXPORTS OF HYDRAULIC CEMENT AND CLINKER, BY COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Country or locality	2015		2016	
	Quantity	Value ²	Quantity	Value ²
Aruba	(3)	114	1	240
Australia	3	1,231	2	990
Bahamas, The	70	7,969	46	7,167
Barbados	1	118	3	693
Brazil	2	1,677	(3)	40
Canada	1,193 ^r	161,074 ^r	1,062	150,070
Cayman Islands	1	257	1	430
Chile	2	597 ^r	3	565
China	6	1,006	5	941
Colombia	2	906 ^r	1	328
Costa Rica	(3)	74	1	88
Dominican Republic	2	655	1	521
Ecuador	(3)	119	2	116
Egypt	(3)	22	1	394
Germany	1	485	(3)	166
Guyana	18	1,878	6	788
Haiti	73	6,742	51	4,917
Honduras	1	198 ^r	(3)	312
Hong Kong	1	287	1	612
Israel	1	311	(3)	181
Italy	(3)	194	1	349
Jamaica	71	7,886	(3)	105
Japan	6	1,156	17	2,410
Korea, Republic of	(3)	486	12	1,798
Kuwait	1	576	(3)	31
Marshall Islands	(3)	6	3	603
Mexico	64 ^r	29,852 ^r	37	8,203
Micronesia	--	--	1	75
Panama	4 ^r	1,694 ^r	2	784
Russia	(3)	64	3	844
Saudi Arabia	1	603 ^r	2	2,069
Taiwan	2	1,027	(3)	89
Thailand	1	174	8	166
Trinidad and Tobago	2	558	2	348
Turks and Caicos Islands	10	1,132	1	195
United Arab Emirates	1	317	(3)	127
United Kingdom	1	523	1	769
Venezuela	1	224	2	843
Other [66 countries and (or) localities]	5 ^r	3,401 ^r	5	3,110
Total ⁴	1,543 ^r	235,595 ^r	1,283	192,476
Puerto Rico:				
Aruba	4	656	8	691
Australia	--	--	1	136
Bahamas, The	--	--	14	901
British Virgin Islands	12	1,777	18	2,411
Cayman Islands	--	--	2	148
Curacao	6	892	8	595
France	(3)	4	36	3,848
Guadeloupe	5	3,738	3	957
Jamaica	2	218	(3)	5
Martinique	7	6,044	11	693
Netherlands	5	570	14	930
St. Kitts and Nevis	--	--	1	148
Turks and Caicos Islands	--	--	11	1,431
Other [4 countries and (or) localities]	(3)	3	(3)	66
Total ⁴	40	13,901	127	12,960
Grand total ⁴	1,583	249,497	1,411	205,436

See footnotes at end of table.

TABLE 16—Continued
U.S. EXPORTS OF HYDRAULIC CEMENT AND CLINKER, BY COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

¹Revised. -- Zero.

¹Table includes data available through May 8, 2019. Includes portland and masonry cements. Data are unrounded but are thought to be accurate to no more than three significant digits.

²Free alongside ship (f.a.s.) value. The value of exports at the U.S. seaport or border point of export is based on the transaction price, including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier. The value excludes the cost of loading the carrier.

³Less than ½ unit.

⁴Data may not add to totals shown because of independent rounding.

Source: U.S. Census Bureau.

TABLE 17
U.S. IMPORTS FOR CONSUMPTION OF HYDRAULIC CEMENT AND CLINKER, BY COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Bulgaria	--	--	--	155	9,365	9,410
Canada ⁴	4,497	356,721	366,353	4,512	362,908	371,390
China	1,620 ⁵	87,201 ⁵	119,403 ⁵	1,740	84,702	118,359
Colombia	16	558	653	--	--	--
Croatia	29	11,935	13,930	20	8,213	9,671
Denmark	159	17,536	20,960	159	20,111	26,630
Egypt	94	10,221	14,135	87	9,394	12,643
France	82	32,739	32,948	107	38,172	38,399
Germany	1	130	154	3	325	364
Greece	1,595	83,873	102,574	2,480	122,016	147,311
Italy	(6) ^{r,7}	34 ^{r,7}	40 ^{r,7}	16 ⁷	1,288 ⁷	1,315 ⁷
Jamaica	7	2,549	2,549	--	--	--
Japan	2	836	1,165	1	646	750
Korea, Republic of	1,103	50,370	73,935	759	32,361	44,854
Malta ⁸	25	1,200	1,788	12	1,252	1,754
Mexico ⁴	338	41,841	44,428	466	47,073	50,900
Netherlands	3	3,123	3,341	3	2,859	3,074
Norway	25	1,331	1,771	8	395	685
Poland	1	177	224	(6)	168	208
Portugal	20	2,341	2,366	34	3,240	3,339
Spain	270	18,111	22,913	389 ⁹	26,365 ⁹	33,815 ⁹
Sweden	499	26,994	38,905	322	17,284	23,136
Taiwan	424	22,560	30,249	345	18,677	25,490
Thailand	11	1,439	2,284	18	1,963	2,682
Trinidad and Tobago	--	--	--	3	316	318
Turkey ⁸	431	28,617	40,313	1,597	73,225	94,584
United Kingdom	1	433	555	2	1,282	1,529
Other [13 countries and (or) localities]	(6)	162 ^r	182 ^r	(6)	67	98
Total ^{4,10}	11,254 ^{r,5,7}	803,033 ^{r,5,7}	938,118 ^{r,5,7}	13,237 ^{7,9}	883,669 ^{7,9}	1,022,708 ^{7,9}
Puerto Rico:						
Mexico	15	2,166	2,419	14	1,708	2,179
Portugal	1	128	188	7	1,018	1,242
Spain	102	7,378	9,193	170	8,541	10,806
Other [4 countries and (or) localities]	(6)	40	53	(6)	71	91
Total ¹⁰	117	9,712	11,852	191	11,337	14,319
Grand total ^{4,10}	11,371 ^{r,5,7}	812,744 ^{r,5,7}	949,970 ^{r,5,7}	13,429 ^{7,9}	895,007 ^{7,9}	1,037,027 ^{7,9}

^rRevised. -- Zero.

¹Table includes data available through May 8, 2019. Includes portland, masonry, and other hydraulic cements. Data are unrounded but are thought to be accurate to no more than three significant digits.

²Customs value. The price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States.

³Cost, insurance, and freight. The value represents the customs value plus insurance, freight, and other delivery charges to the first port of entry, but excludes costs of offloading, other U.S. port handling charges, and demurrage.

⁴Data are underreported with respect to clinker from Canada and cement from Mexico, owing to additional material coming in as "informal

⁵Adjusted by the U.S. Geological Survey to add 155,398 metric tons of cement, with a Customs value of \$10,182,700 and a c.i.f. value of \$10,715,245, that was misreported by the importer under the tariff code for another commodity.

⁶Less than ½ unit.

⁷Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag that was misregistered by the importer as clinker. The quantities debited in 2015 were 63,718 metric tons with a Customs value of \$1,258,431 and a c.i.f. value of \$1,261,931, and in 2016, 61,493 metric tons with a Customs value of \$910,096 and a c.i.f. value of \$930,096.

⁸Malta has no cement plants; material is thought to be from Turkey.

⁹Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag that was misregistered by the importer as clinker. The quantities debited were 58,707 metric tons with a Customs value of \$951,053 and a c.i.f. value of \$971,053.

¹⁰Data may not add to totals shown because of independent rounding.

Source: U.S. Census Bureau.

TABLE 18

U.S. IMPORTS FOR CONSUMPTION OF HYDRAULIC CEMENT AND CLINKER, BY CUSTOMS DISTRICT AND COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Customs district and country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Anchorage, AK:						
Canada	9	654	677	5	415	426
Korea, Republic of	115	5,333	8,512	110	4,605	7,088
Total ⁴	124	5,987	9,189	115	5,020	7,515
Baltimore, MD:						
China	2	181	249	3	313	435
Korea, Republic of	--	47	54	(5)	2	3
Sweden	1	509	610	3	342	405
Turkey	(5)	15	25	46	1,583	2,157
Total ⁴	4	752	938	50	2,241	2,999
Boston, MA:						
Canada	114	7,747	7,747	43	3,171	3,171
Greece	--	--	--	87	4,023	4,023
Other	(5)	90	93	(5)	6	6
Total ⁴	114	7,837	7,840	129	7,201	7,201
Buffalo, NY:						
Canada	531	46,913	49,235	619	50,273	52,142
Germany	--	--	--	(5)	2	2
Total ⁴	531	46,913	49,235	619	50,275	52,144
Charleston, SC:						
Turkey	--	--	--	11	488	641
Other	(5)	354 ^r	448 ^r	(5)	52	55
Total ⁴	(5) ^r	354	448	11	540	696
Chicago, IL:						
Germany	(5)	5	7	2	147	148
Other	1	272 ^r	300 ^r	(5)	511	569
Total ⁴	1	277	307	2	658	717
Cleveland, OH:						
Canada	716	44,341	45,278	685	41,587	42,500
Netherlands	1	874	940	1	1,234	1,318
Other	1 ^r	495 ^r	601 ^r	1	475	555
Total ⁴	718	45,710	46,819	687	43,296	44,373
Columbia-Snake, OR, WA:						
Canada	38	3,074	3,174	61	5,061	5,196
China	458	23,576	33,161	74	3,837	5,372
Korea, Republic of	80	3,679	5,463	446	18,909	26,200
Total ⁴	577	30,329	41,798	582	27,806	36,768
Dallas-Fort Worth, TX: China	(5)	130	156	(5)	3	4
Detroit, MI:						
Canada ⁶	1,244	96,072	98,298	1,247	92,410	94,625
Germany	1	13	14	--	--	--
Other	(5)	185	193	(5)	291	309
Total ^{4,6}	1,245	96,270	98,506	1,247	92,700	94,934
El Paso, TX:						
China	1	107	108	1	109	110
Mexico ⁶	114	16,170	17,353	121	18,011	19,114
Total ^{4,6}	114	16,277	17,461	122	18,120	19,224
Great Falls, MT:						
Canada	47	3,733	3,828	22	1,938	1,986
Other	(5)	87	137	--	--	--
Total ⁴	47	3,820	3,965	22	1,938	1,986
Honolulu, HI:						
Italy	--	8	13	--	--	--
Taiwan	424	22,560	30,249	345	18,677	25,490
Total ⁴	424	22,568	30,262	345	18,677	25,490

See footnotes at end of table.

TABLE 18—Continued

U.S. IMPORTS FOR CONSUMPTION OF HYDRAULIC CEMENT AND CLINKER, BY CUSTOMS DISTRICT AND COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Customs district and country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Houston-Galveston, TX:						
China	663	31,562	48,150	592	22,970	37,251
Colombia	12	465	489	--	--	--
Egypt	45	5,046	6,883	43	4,542	6,046
Greece	719	39,396	49,193	600	31,483	41,553
Korea, Republic of	338	15,532	23,973	48	2,208	3,408
Mexico	--	--	--	4	358	455
Portugal	20	2,338	2,363	34	3,240	3,339
Spain	129	6,849	9,042	208	10,118	12,914
Turkey	329	21,485	29,766	296	15,935	22,802
Other	(5)	56	62	1	213	280
Total ⁴	2,255	122,728	169,921	1,825	91,068	128,048
Laredo, TX:						
Mexico	157	21,931	22,591	162	23,318	24,107
Other	(5)	3	4	(5)	8	9
Total ⁴	157	21,934	22,594	162	23,327	24,116
Los Angeles, CA:						
China	25	2,719	3,584	36	4,034	5,544
Egypt	9	935	1,462	5	536	786
Thailand	5	660	1,051	6	648	912
Turkey	15	1,682	3,064	26	2,921	5,313
Other	(5)	212	250	1	302	353
Total ⁴	55	6,208	9,411	73	8,441	12,908
Miami, FL:						
Egypt	27	2,883	3,954	22	2,404	3,161
Mexico	30	3,163	3,850	24	1,398	2,150
Spain	72	7,494	9,470	121	12,467	15,735
Sweden	310	16,408	23,353	321	16,612	22,353
Thailand	--	--	--	1	64	107
Turkey	16	1,909	2,878	27	2,917	4,444
Other	(5)	86 ^r	103 ^r	(5)	3	3
Total ⁴	455	31,943	43,607	516	35,864	47,951
Minneapolis, MN:						
Canada	133	16,172	16,192	61	7,483	7,491
France	--	--	--	(5)	8	8
Turkey	--	--	--	18	1,378	1,380
Total ⁴	133	16,172	16,192	79	8,869	8,879
Mobile, AL:						
China	--	--	--	(5)	117	138
Greece	71	4,368	4,392	203	12,485	15,095
Total ⁴	71	4,368	4,392	203	12,601	15,233
New Orleans, LA:						
China	3	689	703	2	660	757
Croatia	27	11,319	13,159	19	7,457	8,742
Greece	50	2,388	2,982	--	--	--
Spain	49	2,388	2,982	--	--	--
Turkey	--	--	--	27	1,749	1,849
Other	(5)	67	74	(5)	11	12
Total ⁴	130	16,851	19,901	48	9,877	11,359
New York City, NY:						
Denmark	11	1,262	1,502	13	1,494	2,015
Germany	(5)	7	10	1	3	3
Greece	755	37,721	46,006	817	33,803	41,616
Malta ⁷	--	--	--	12	1,252	1,754
Norway	25	1,331	1,771	8	395	685
Spain	(5)	52	61	1	478	578
Sweden	187	9,818	14,628	--	--	--

See footnotes at end of table.

TABLE 18—Continued

U.S. IMPORTS FOR CONSUMPTION OF HYDRAULIC CEMENT AND CLINKER, BY CUSTOMS DISTRICT AND COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Customs district and country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
New York City, NY:—Continued						
Turkey ⁷	3	461	672	895	35,515	41,755
Other	1	239 ^r	337 ^r	(5)	262	298
Total ⁴	983	50,891	64,988	1,747	73,202	88,704
Nogales, AZ: Other	(5)	71	86	--	--	--
Norfolk, VA:						
Bulgaria	--	--	--	155	9,365	9,410
Canada ⁸	29	1,840	1,841	--	--	--
China	2	1,176	1,336	2	1,019	1,148
Egypt	2	185	256	1	90	137
France	82	32,614	32,758	107	37,965	38,169
Greece	--	--	--	23	1,264	1,667
Italy	--	--	--	6	287	299
Jamaica	7	2,549	2,549	--	--	--
Sweden	(5)	124	147	1	271	307
Turkey	(5)	5	9	21	864	1,274
United Kingdom	--	--	--	2	1,020	1,173
Other	(5)	44 ^r	47 ^r	(5)	39	46
Total ⁴	122	38,537	38,941	317	52,185	53,630
Ogdensburg, NY:						
Canada	252	25,622	26,783	401	41,618	42,255
Other	(5)	3	5	--	--	--
Total ⁴	252	25,625	26,788	401	41,618	42,255
Pembina, ND: Canada	293	23,113	23,349	238	18,071	18,440
Philadelphia, PA:						
Croatia	1	482	598	1	398	498
Egypt	--	--	--	4	430	625
Greece	--	--	--	169	6,906	7,392
Italy	-- ^{r,9}	-- ^{r,9}	-- ^{r,9}	10 ⁹	959 ⁹	969
Korea, Republic of	140	5,735	6,240	93	3,861	4,370
Netherlands	1	1,311	1,421	1	908	999
Spain	19	1,214	1,224	-- ¹⁰	-- ¹⁰	--
Turkey	--	--	--	108	4,414	4,808
Other	(5)	125	176	(5)	240	298
Total ⁴	162 ^{r,9}	8,868 ^{r,9}	9,658 ^{r,9}	387 ^{9,10}	18,117 ^{9,10}	19,959
Portland, ME: Canada	16	1,981	2,212	15	2,022	2,235
Providence, RI:						
Greece	--	--	--	311	17,280	19,008
Malta ⁷	25	1,200	1,788	--	--	--
Turkey ⁷	25	1,225	1,375	120	5,133	7,624
Total ⁴	50	2,425	3,163	430	22,414	26,632
San Diego, CA:						
Greece	--	--	--	(5)	14	14
Mexico	38	577	634	99	386	424
Total ⁴	38	577	634	99	400	438
San Francisco, CA:						
China	464 ¹¹	26,620 ¹¹	31,351 ¹¹	705	34,707	43,705
Egypt	2	242	364	5	513	723
Thailand	6	738	1,171	11	1,212	1,608
Turkey	1	114	194	3	325	531
Other	(5)	86	141	(5)	52	62
Total ⁴	473 ¹¹	27,800 ¹¹	33,221 ¹¹	723	36,809	46,629
Savannah, GA:						
Egypt	9	931	1,216	8	880	1,166
Greece	--	--	--	113	8,318	8,391
Spain	--	114	135	33	2,194	2,320
Turkey	40	1,560	2,096	--	--	--

See footnotes at end of table.

TABLE 18—Continued

U.S. IMPORTS FOR CONSUMPTION OF HYDRAULIC CEMENT AND CLINKER, BY CUSTOMS DISTRICT AND COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Customs district and country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Savannah, GA:—Continued						
Other	(5)	285 ^r	322 ^r	(5)	160	179
Total ⁴	49	2,890	3,769	155	11,552	12,057
Seattle, WA:						
Canada ⁶	922	67,104	68,073	909	73,219	74,069
China	(5)	36	40	324	16,717	23,622
Japan	1	496	696	(5)	89	119
Korea, Republic of	431	19,816	29,452	61	2,515	3,515
Other	(5)	157	223	1	95	152
Total ^{4,6}	1,355	87,609	98,483	1,294	92,635	101,476
St. Albans, VT:						
Canada	152	18,355	19,667	205	25,641	26,855
Germany	--	--	--	(5)	2	2
Total ⁴	152	18,355	19,667	205	25,643	26,857
St. Louis, MO: Other						
	1	248	263	(5)	352	396
Tampa, FL:						
China	(5)	60	69	(5)	60	69
Denmark	148	16,274	19,458	146	18,616	24,615
Greece	--	--	--	157	6,440	8,550
Mexico	--	--	--	54	3,601	4,651
Spain	--	--	--	26	1,096	2,254
Turkey	1	160	233	--	--	--
Total ⁴	150	16,494	19,760	384	29,814	40,138
U.S. Virgin Islands:						
Colombia	4	93	164	--	--	--
Trinidad and Tobago	--	--	--	3	316	318
Total ⁴	4	93	164	3	316	318
Washington, DC: Sweden						
	(5)	3	4	--	--	--
Wilmington, NC: Netherlands						
	(5)	25	27	--	--	--
U.S. total ^{4,6}	11,254 ^{r,9,10,11}	803,033 ^{r,9,10,11}	938,118 ^{r,9,10,11}	13,237 ^{9,10}	883,669 ^{9,10}	1,022,708
San Juan, PR:						
Mexico	15	2,166	2,419	14	1,708	2,179
Portugal	1	128	188	7	1,018	1,242
Spain	102	7,378	9,193	170	8,541	10,806
Other	(5)	40	53	(5)	71	91
Total ⁴	117	9,712	11,852	191	11,337	14,319
Grand total ^{4,6}	11,371 ^{r,9,10,11}	812,744 ^{r,9,10,11}	949,970 ^{r,9,10,11}	13,429 ^{9,10}	895,007 ^{9,10}	1,037,027

^rRevised. -- Zero.¹Table includes data available through May 8, 2019. Includes all varieties of hydraulic cement and clinker. Data are unrounded but are thought to be accurate to no more than three significant digits.²Customs value. The price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States.³Cost, insurance, and freight. The value represents the customs value plus insurance, freight, and other delivery charges to the first port of entry, but excludes costs of offloading, other U.S. port handling charges, and demurrage.⁴Data may not add to totals shown because of independent rounding.⁵Less than ½ unit.⁶Data are underreported with respect to clinker from Canada and cement from Mexico owing to additional material coming in as "informal entries."⁷Malta has no cement plants; material is thought to be from Turkey.⁸Material is thought to be from Bulgaria.⁹Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag that was misregistered by the importer as clinker. The quantities debited in 2015 were 63,718 metric tons with a Customs value of \$1,258,431 and a c.i.f. value of \$1,261,931, and in 2016, 61,493 metric tons with a Customs value of \$910,096 and a c.i.f. value of \$930,096.¹⁰Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag from Spain that was misregistered by the importer as clinker. The amounts debited amounted to 58,707 metric tons, a Customs value of \$951,053 and a c.i.f. value of \$971,053.¹¹Adjusted by the U.S. Geological Survey to add in 155,398 metric tons of cement, having a Customs value of \$10,182,700 and a c.i.f. value of \$10,715,245, that was misreported by the importer under the tariff code for another commodity.

Source: U.S. Census Bureau.

TABLE 19
U.S. IMPORTS FOR CONSUMPTION OF GRAY PORTLAND CEMENT, BY COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Bulgaria	--	--	--	155	9,365	9,410
Canada	3,343	262,365	269,575	3,378	272,989	279,283
China	1,575 ⁴	80,678 ⁴	111,181 ⁴	1,685	77,136	108,594
Colombia	16	558	653	--	--	--
Germany	(5)	44	57	2	171	182
Greece	1,496	78,145	96,846	2,368	117,203	142,473
Italy	(5)	4	4	16	1,252	1,275
Korea, Republic of	1,103	50,095	73,640	758	32,098	44,580
Malta ⁶	--	--	--	6	506	748
Mexico ⁷	10	1,127	1,287	57	3,762	4,887
Norway	25	1,331	1,771	--	--	--
Portugal	--	--	--	34	3,236	3,333
Spain	178	9,241	12,020	239	11,389	15,353
Sweden	466	24,262	35,032	321	16,628	22,372
Taiwan	424	22,560	30,249	345	18,677	25,490
Trinidad and Tobago	--	--	--	3	316	318
Turkey ⁶	301	16,777	23,806	765	33,432	47,351
Other [5 countries and (or) localities]	(5)	29	33	(5)	2	3
Total ^{7, 8, 9}	8,939 ⁴	547,216 ⁴	656,155 ⁴	10,131	598,163	705,650
Puerto Rico:						
Dominican Republic	--	--	--	(5)	11	11
Spain	102	7,378	9,193	101	5,790	7,427
Total ^{8, 9}	102	7,378	9,193	101	5,802	7,439
Grand total ^{7, 8, 9}	9,041 ⁴	554,594 ⁴	665,348 ⁴	10,232	603,965	713,089

-- Zero.

¹Table includes data available through May 8, 2019. Data are unrounded but are thought to be accurate to no more than three significant digits.

²The price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States.

³Cost, insurance, and freight. The value represents the customs value plus insurance, freight, and other delivery charges to the first port of entry, but excludes costs of offloading, other U.S. port handling charges, and demurrage.

⁴Adjusted by the U.S. Geological Survey to add 155,398 metric tons of cement, having a Customs value of \$10,182,700 and a c.i.f. value of \$10,715,245 that was misreported by the importer under the tariff code for another commodity.

⁵Less than ½ unit.

⁶Malta has no cement plants; material is thought to be from Turkey.

⁷Data are underreported with respect to imports into the El Paso, TX, customs district owing to additional material coming in as "informal entries."

⁸Total imports do not include gray portland cement that was misregistered by importers under the white cement tariff code; these quantities are included in table 20.

⁹Data may not add to totals shown because of independent rounding.

Source: U.S. Census Bureau.

TABLE 20
U.S. IMPORTS FOR CONSUMPTION OF WHITE CEMENT, BY COUNTRY OR LOCALITY¹

(Thousand metric tons and thousand dollars)

Country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ^{3,4}		Customs ²	C.i.f. ^{3,4}
Canada	346	45,792	46,880	343	44,017	45,102
China	35	3,613	4,813	46	4,958	6,667
Denmark	159	17,536	20,960	159	20,111	26,630
Egypt	94	10,221	14,135	86	9,319	12,544
Germany	(5)	7	10	1	7	7
Malta ⁶	25	1,200	1,788	7	746	1,006
Mexico	238	28,856	30,356	315	30,348	32,057
Norway	--	--	--	8	395	685
Portugal	20	2,338	2,363	(5)	4	7
Spain	72	7,484	9,459	115	12,271	15,478
Sweden	31	1,953	2,935	--	--	--
Thailand	11	1,435	2,280	18	1,963	2,682
Turkey ⁶	89	10,130	14,226	157	14,124	20,596
Other [6 countries and (or) localities]	(5)	11 ^r	15 ^r	(5)	48	55
Total ⁷	1,120	130,577	150,222	1,254	138,312	163,517
Puerto Rico:						
Mexico	15	2,166	2,419	14	1,708	2,179
Portugal	1	128	188	7	1,018	1,242
Other [2 countries and (or) localities]	--	--	--	(5)	14	23
Total ⁷	15	2,294	2,607	21	2,740	3,443
Grand total ⁷	1,136	132,871	152,829	1,275	141,052	166,961

^rRevised. -- Zero.

¹Table includes data available through May 8, 2019. Data are unrounded but are thought to be accurate to no more than three significant digits.

²The price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States.

³Cost, insurance, and freight. The value represents the customs value plus insurance, freight, and other delivery charges to the first port of entry, but excludes costs of offloading, other U.S. port handling charges, and demurrage.

⁴Values of less than \$100.00 (c.i.f.) per metric ton likely indicate the mistaken total or partial inclusion of data for gray portland or similar cement or clinker. This error happens when the importer records the wrong tariff number with the U.S. Customs and Border Protection. Values that exceed \$200 per ton likely indicate misidentified specialty cement, not white cement.

⁵Less than ½ unit.

⁶Malta has no cement plants; material is thought to be from Turkey.

⁷Data may not add to totals shown because of independent rounding.

Source: U.S. Census Bureau.

TABLE 21
U.S. IMPORTS FOR CONSUMPTION OF CLINKER, BY COUNTRY¹

(Thousand metric tons and thousand dollars)

Country or locality	2015			2016		
	Quantity	Value		Quantity	Value	
		Customs ²	C.i.f. ³		Customs ²	C.i.f. ³
Canada ⁴	712	32,605	32,908	672	30,787	31,151
China	5	810	851	4	484	583
Croatia	1	117	157	(5)	7	10
Germany	1	13	14	--	--	--
Greece	100	5,728	5,728	112	4,813	4,838
Italy	(5) ^{r,6}	8 ^{r,6}	9 ^{r,6}	(5) ⁶	2 ⁶	2 ⁶
Spain	19	1,217	1,228	32 ⁷	1,682 ⁷	1,732 ⁷
Turkey	40	1,578	2,125	675	25,359	26,265
Other [5 countries and (or) localities]	1	86	93	(5)	44	72
Total ^{4,8}	879 ^{r,6}	42,162 ^{r,6}	43,113 ^{r,6}	1,496 ^{6,7}	63,178 ^{6,7}	64,654 ^{6,7}
Puerto Rico: Spain	--	--	--	70	2,748	3,377
Grand total ^{4,8}	879 ^{r,6}	42,162 ^{r,6}	43,113 ^{r,6}	1,565 ^{6,7}	65,926 ^{6,7}	68,031 ^{6,7}

¹Revised. -- Zero.

¹For all types of hydraulic cement. Data are unrounded but are thought to be accurate to no more than three significant digits.

Excludes Puerto Rico, which had no imports of clinker for the years shown.

²Customs value. The price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States.

³Cost, insurance, and freight. The value represents the customs value plus insurance, freight, and other delivery charges to the first port of entry, but excludes costs of offloading, other U.S. port handling charges, and demurrage.

⁴Data are underreported with respect to additional material coming in as "informal entries."

⁵Less than ½ unit.

⁶Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag that was misregistered by the importer as clinker. The quantities debited in 2015 were 63,718 metric tons with a Customs value of \$1,258,431 and a c.i.f. value of \$1,261,931; and in 2016, 61,493 metric tons with a Customs value of \$910,096 and a c.i.f. value of \$930,096.

⁷Adjusted by the U.S. Geological Survey to remove granulated blast furnace slag that was misregistered by the importer as clinker. The quantity debited was 58,707 metric tons with a Customs value of \$951,053 and a c.i.f. value of \$971,053.

⁸Data may not add to totals shown because of independent rounding.

Source: U.S. Census Bureau.

TABLE 22
HYDRAULIC CEMENT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons)

Country or locality	2012	2013	2014	2015	2016
Afghanistan	37	52	87	70 ^e	101
Albania	2,230 ^e	2,000 ^{r,e}	1,740 ^r	1,980 ^{r,e}	2,000 ^e
Algeria ^e	19,000	18,500	21,000	23,000	23,000
Angola ^e	3,000	4,000	5,100	5,200	5,000
Argentina	10,716	11,892	11,408	11,000 ^e	11,000 ^e
Armenia	438	431	422	417	268
Australia ^e	8,500	8,400	9,000	9,100 ^r	9,000
Austria	4,455	4,385	4,500 ^{r,e}	4,700 ^{r,e}	4,600 ^e
Azerbaijan	1,966	2,296	2,941	2,683	2,310
Bahrain ^e	1,350	1,300 ^r	1,300	1,300	1,400
Bangladesh ³	15,250	16,780	17,000 ^e	18,000 ^e	18,000 ^e
Barbados	176	160	160 ^e	160 ^e	160 ^e
Belarus	4,906	5,057	5,617	4,638	4,503
Belgium	6,280	6,119	6,120 ^r	6,400 ^r	6,290
Benin	1,390	1,422	1,396	1,800 ^e	1,800 ^e
Bhutan	521	570	690	791	940
Bolivia	2,714	3,061	3,337	3,468 ^r	3,601
Bosnia and Herzegovina	846	882	840	808	841
Botswana ^e	15	15	15	15	15
Brazil	69,323	69,975	71,254	65,283	57,557
Brunei	330 ^e	340 ^e	240 ^e	230	230 ^e
Bulgaria	1,803	1,812 ^r	1,785 ^r	2,114	1,994
Burkina Faso	659	580	403	263	300 ^e
Burma ⁴	922	1,121	1,317	903 ^r	2,603
Burundi ^e	71	100	70	100	100
Cambodia	980	1,060	1,400 ^e	1,500 ^e	1,600 ^e
Cameroon	1,275	1,400 ^e	1,300	1,600 ^e	2,600 ^e
Canada	12,465	11,611	11,879	12,167	11,870
Chad ^e	140	180	200	200	200
Chile	4,722	4,880	5,000 ^e	4,800 ^e	5,000 ^e
China	2,210,000	2,411,000	2,492,000	2,359,000	2,410,000
Colombia	10,925	11,252	12,384	13,153	12,495
Congo (Brazzaville)	150	250	460	700 ^e	950
Congo (Kinshasa)	413	447	330	399	208
Costa Rica ^e	1,400	1,460	1,500	1,600	1,600
Côte d'Ivoire ^e	1,900	2,300	2,690	3,100	3,600
Croatia	2,254	2,436	2,471	2,449 ^r	2,300 ^e
Cuba	1,825	1,659	1,580	1,518	1,493
Cyprus	1,026	855	735	788	1,099
Czechia	3,434	3,211	3,511	3,781	3,937
Denmark	1,798	1,830	1,876	1,900 ^e	1,900 ^e
Djibouti	--	150 ^e	170 ^e	180 ^e	180 ^e
Dominican Republic	4,130	4,246	5,018	5,181 ^r	5,171
Ecuador	6,025	6,670	6,600 ^e	5,900 ^{r,e}	5,600 ^e
Egypt	55,200	50,000 ^e	52,080	53,940	55,000 ^e
El Salvador ^e	1,380	1,200	1,000	1,000	1,000
Eritrea ^e	230	230	290	200 ^r	200
Estonia	482	457	447	390	395
Ethiopia ⁵	3,548	4,493	5,424	7,500 ^e	8,300 ^e
Fiji	150	181	188	204	220 ^e
Finland ^e	1,300	1,300	1,250	1,300	1,300
France	17,810	18,018	16,400	15,600	16,000 ^e
French Guiana	100 ^e	94	87	76 ^r	76
Gabon ^e	200	170	170	150	225
Georgia	1,546	1,619	1,626	1,759 ^r	1,809
Germany	32,432	31,308	32,099	31,160	32,000 ^e
Ghana	4,600	4,500 ^e	4,500 ^e	3,830 ^e	4,000 ^e
Greece	5,005	5,990	5,560 ^r	5,290 ^r	5,000 ^e
Guadeloupe ^e	300	300	300	300	300

See footnotes at end of table.

TABLE 22—Continued
HYDRAULIC CEMENT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons)

Country or locality	2012	2013	2014	2015	2016
Guatemala	2,880	2,970	3,500 ^e	3,500 ^e	3,500 ^e
Guinea	317	377	435	500 ^e	500 ^e
Guyana	--	--	2 ^e	100 ^e	400 ^e
Haiti ^e	75	100	200	200	200
Honduras	1,730	1,700 ^e	1,700 ^e	1,700 ^e	1,700 ^e
Hong Kong	1,675	1,768	1,900 ^e	1,900 ^e	1,900 ^e
Hungary	1,870	2,022	1,610 ^r	1,750 ^r	2,000 ^e
Iceland	146	--	--	--	--
India ^e	270,000	280,000	280,000	300,000	290,000
Indonesia	52,350	56,690	56,760	59,850	62,000 ^e
Iran	70,250	68,700	66,700	58,600	55,000 ^e
Iraq ^e	10,000	12,000	9,000	10,000	10,000
Ireland	1,198	2,000 ^e	2,000 ^e	2,500	2,500 ^e
Israel	5,892	6,398	6,603	6,904	7,000 ^e
Italy	26,240	23,100	21,400	22,000 ^e	22,000 ^e
Jamaica	760	825	830	808	911
Japan	54,737	57,962	57,913	54,827	53,255
Jordan	4,060	4,200 ^e	4,400 ^e	4,550 ^{r,e}	4,800 ^e
Kazakhstan	7,050	7,072	8,140	8,729	9,204
Kenya	4,694	5,059	5,883	6,353	6,707
Korea, North	6,446	6,600	6,675	6,697	6,800 ^e
Korea, Republic of	46,862	47,291	47,048	52,044	55,000 ^e
Kosovo ^e	535	560	630	590	710
Kuwait ^e	2,400	3,000	3,800	4,200	4,000
Kyrgyzstan	1,239	1,676	1,730	1,496	1,289
Laos ^e	1,500	1,500	1,900	2,000	2,000
Latvia	901	1,000 ^e	1,100 ^e	1,100 ^e	1,100 ^e
Lebanon	5,309	5,831	5,517	5,580 ^r	5,401
Liberia	122	194	295	298	241
Libya ^e	2,000	2,000	7,000 ^r	5,000 ^r	4,300
Lithuania	1,015	1,070	903	980	1,010
Luxembourg	1,040 ^r	980	1,060 ^{r,e}	1,080 ^{r,e}	1,100 ^e
Macau	440	580	590	600 ^e	600 ^e
Macedonia	645	730	660	672	855
Madagascar ^e	230	230	240	240	240
Malawi ^e	240	230	270	280	310
Malaysia	21,726	21,457	21,700	22,000 ^e	22,000 ^e
Mali	--	440	660	630	630 ^e
Martinique ^e	150	150	150	150	150
Mauritania	630	690	870	860	880 ^e
Mexico	36,184	34,612	36,597	39,613	40,000 ^e
Moldova ^e	1,200	1,150	1,300	1,200	1,300
Mongolia	349	259	411	410	429
Morocco	16,270	16,870	15,710	16,000 ^e	16,000 ^e
Mozambique ⁶	1,184	1,299	1,512	1,585	1,900 ^e
Namibia	501	662	731	796	800 ^e
Nepal ^e	2,720	2,990	3,100	2,000	2,200
Netherlands	1,940 ^r	2,050 ^r	2,610 ^r	2,260 ^r	2,300 ^e
New Caledonia ^{e,7}	125	119	106	112	104
New Zealand	1,140	1,200 ^e	1,100 ^e	1,200 ^e	900 ^e
Nicaragua ^e	620	650	700	700	700
Niger	75	29	21	51	51 ^e
Nigeria ^e	16,000	20,000	20,000	21,000	22,000
Norway	1,659	1,700 ^e	1,700 ^e	1,800 ^e	1,850 ^e
Oman	6,100 ^e	5,800	5,100	5,300 ^e	5,000 ^e
Pakistan	30,183	31,460	31,960	33,300 ^r	37,020
Panama	2,310	2,366	2,188	2,200	2,200 ^e
Papua New Guinea ^e	200	200	200	200	200

See footnotes at end of table.

TABLE 22—Continued
HYDRAULIC CEMENT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons)

Country or locality	2012	2013	2014	2015	2016
Paraguay ^c	800	960	1,000	1,200	1,200
Peru	9,847	10,527	10,676	10,410	10,094
Philippines	18,907	20,150	21,305	24,050	25,000 ^e
Poland	15,735 ^r	14,539 ^r	15,534 ^r	15,206 ^r	15,722
Portugal	4,090	5,000 ^e	4,500 ^{r,e}	5,600 ^{r,e}	4,200 ^e
Qatar	5,500 ^e	5,335	6,500 ^e	6,500 ^e	6,500 ^e
Reunion ^c	350	400	350 ^r	250 ^r	250
Romania	8,223	7,451	7,621	8,356	8,038
Russia	61,700	66,503	69,139	62,104	56,000 ^e
Rwanda	106	130 ^e	140 ^e	200 ^e	400 ^e
Saudi Arabia	53,332	56,238	57,223	61,900	55,945
Senegal	4,689	5,191	4,899	4,615	4,600 ^e
Serbia	1,831	1,592	1,605	1,654	1,801
Sierra Leone	335	313	336	324	320 ^e
Slovakia	2,915	3,121	3,319	3,466	3,518
Slovenia	745	614	706	600	700 ^e
South Africa, sales	11,560	12,168	12,068	13,000 ^e	13,000 ^e
Spain, including Canary Islands	15,939	13,736	14,587	15,000 ^e	15,000 ^e
Sri Lanka	2,066	1,929	1,885	2,287	2,695
Sudan	3,511	3,538	3,478	3,708	4,013
Suriname	114	131	140 ^{r,e}	150 ^{r,e}	150 ^e
Sweden	2,141	2,560	2,500 ^e	2,800	2,800 ^e
Switzerland	4,430 ^r	4,740 ^r	4,790 ^r	4,390 ^r	4,580
Syria ^c	6,000	4,000	3,800	4,000	2,000
Taiwan	15,808	16,554	14,592	13,445	12,126
Tajikistan	232	384	1,150	1,418 ^r	1,361
Tanzania	2,581	2,346	2,809	3,135	3,200 ^e
Thailand	31,760	35,854	34,980	36,216	39,940
Togo ⁷	1,605 ^r	1,800 ^e	1,700 ^e	1,500 ^e	1,500 ^e
Trinidad and Tobago	654	802	837	840	721
Tunisia, gross weight, grey and white	7,241	7,504	9,127	9,516	9,028
Turkey	63,879	71,337	71,239	71,419	75,403
Turkmenistan	2,370	2,650	2,900 ^e	3,300 ^e	3,500 ^e
Uganda	1,780	2,023	2,141	2,340 ^r	2,494
Ukraine	9,843	9,857	8,636	8,511	9,023
United Arab Emirates ^c	15,000	16,000	20,000	20,000	20,000
United Kingdom	7,952	8,203	8,958	9,600	9,600 ^e
United States, including Puerto Rico ⁸	74,934	77,415	83,124	84,940	85,153
Uruguay	872	850 ^e	820	730	740 ^e
Uzbekistan	6,800	6,990	7,350	7,900 ^{r,e}	8,300 ^e
Venezuela	8,440	8,846	7,940	8,210	8,000 ^e
Vietnam	56,353	57,516	60,982	67,427	77,278
Yemen	2,760	3,300	3,100 ^e	3,100 ^e	2,400 ^e
Zambia	1,600 ^e	1,810	2,200 ^e	2,100 ^e	2,700 ^e
Zimbabwe	1,480	1,190 ^r	1,300 ^e	1,300 ^e	1,500 ^e
Total ^c	3,820,000	4,070,000	4,190,000	4,100,000	4,140,000

^cEstimated. ^rRevised. -- Zero.

¹Table includes data available through March 3, 2018 (U.S. data through November 30, 2018). All data are reported unless otherwise noted. World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown. Even where presented unrounded, reported data are thought to be accurate to no more than three significant digits.

²Data are from a variety of sources, including the European Cement Association. Data may include clinker exports for some countries and (or) localities.

³Production is based on a fiscal year with a starting date of July 1 of the year listed.

⁴Production is based on a fiscal year with a starting date of April 1 of the year listed.

⁵Production is based on a fiscal year with an ending date of July 7 of the year listed.

⁶Cement sales from Cimentos de Moçambique SARL (Sociedade Anónima de Responsabilidade Limitada) only.

⁷Sales of domestically produced cement as a proxy for production.

⁸Portland and masonry cements only. Includes a small (less than 0.3% per year) component of double counting where portland cement (not clinker) is consumed to make masonry cement; the precise amount of double counting cannot be determined because of the involvement of portland cement stocks.