



2015 Minerals Yearbook

GYPSUM [ADVANCE RELEASE]

GYPSUM

By Robert D. Crangle, Jr.

Domestic survey data and tables were prepared by Susan M. Weaver, statistical assistant, and the world production table was prepared by Lisa D. Miller,¹ international data coordinator.

In 2015, the United States ranked third worldwide in the production of crude mined gypsum, with 15.2 million metric tons (Mt) of production and a reported value of \$135 million. That was an increase of about 3% each from the revised 2014 production of 14.9 Mt valued at \$132 million. China was the world's leading producer and consumer of mined gypsum, with estimated production of 130 Mt of crude gypsum, followed by Iran (16 Mt) (table 7). The apparent consumption of gypsum in the United States increased by 4% to 35,200 Mt in 2015 from 33,700 Mt in 2014. Calcined gypsum production increased slightly to 15.0 Mt in 2015 compared with 14.7 Mt produced in 2014.

The sales of synthetic gypsum increased to 15.5 Mt in 2015. Coal-burning powerplants in the United States are required to operate sulfur dioxide scrubbing systems, which results in the precipitation of large amounts of byproduct gypsum. Because byproduct gypsum is available at a substantially lower cost than its mined counterpart, a number of wallboard production facilities have been constructed adjacent to coal-fired electric powerplants. Approximately 48% of the synthetic gypsum produced in 2015 was neither sold nor used and in most cases was discarded (American Coal Ash Association, 2016).

Legislation and Government Programs

Several million tons of gypsum waste are generated every year by building demolition, wallboard installation, and wallboard manufacturing. Construction costs are lower when full pieces of uncut wallboard are used rather than multiple, smaller remnants. As a result, between 10% and 12% of the wallboard used in new construction and renovation is discarded as scrap and only a small part of this waste has been recycled. The most recent legislative action concerning the disposal of gypsum was in 2010 when the Massachusetts Department of Energy and Environmental Affairs banned the disposal of clean wallboard from State waste disposal facilities (Massachusetts Department of Energy and Environmental Affairs, 2011). To date, no other State has instituted a similar regulation that addresses the disposal of wallboard. As landfill space becomes scarcer, recycling is expected to increase. In addition to recycling scrap in wallboard plants, wallboard scrap may also be ground and used as a soil conditioner.

Wallboard manufacturers and the construction industry have been exploring ways to return scrap and waste wallboard to plants for recycling. Other potential markets for recycled gypsum include cement production, as a stucco additive, sludge drying, water treatment, grease absorption, and marking of athletic fields. Until costs and legislation associated with the disposal of scrap gypsum in landfills become more restrictive, recycling likely will continue to remain a low priority within the industry.

Imports of corrosive wallboard from China into the United States remained an issue, although new complaint reports have slowed. By yearend 2015, the U.S. Consumer Product Safety Commission received 4,051 reports of possible corrosive wallboard from residents in 44 States, the District of Columbia, American Samoa, and Puerto Rico. Most complaints were filed for homes constructed between 2006 and 2007 (U.S. Consumer Product Safety Commission, 2016). Sulfide gases emitted from the problematic drywall were suspected of damaging copper wiring and plumbing and also posed concerns for human health (Global Gypsum Magazine, 2010a). Following several years of complaints regarding corrosive wallboard imported from China, a class-action settlement among owners of approximately 20,000 affected single-family homes, most of which are located in Gulf Coast States and the southern United States, and Chinese wallboard manufacturer, Knauf Plasterboard Tianjin Co. Ltd., was settled on July 9, 2013, with claims accepted through October 25, 2013 (U.S. District Court, 2013). In January 2015, 19,726 of 22,491 received claims had been reviewed under the \$76.2 million Chinese Drywall Settlement Program. As of March 2016, a total of \$82.6 million had been distributed to 24,312 claims under the Chinese Drywall Settlement Program (U.S. District Court, 2016).

Production

Industry data for gypsum were collected by the U.S. Geological Survey (USGS) from semiannual and annual surveys of gypsum operations and from quarterly data provided by the Gypsum Association. In 2015, the USGS annual survey canvassed 117 gypsum operations that accounted for all domestic output of crude, calcined, and byproduct gypsum. Data were available for all the operations through this survey, the Gypsum Association, the American Coal Ash Association, State agencies, and Federal agencies. Of the 117 operations, 7 did not respond to the survey and their respective production levels were estimated on the basis of prior reported production levels in conjunction with employment records published by the Mine Safety and Health Administration.

The United States was the world's third-leading producer of crude gypsum in 2015, accounting for 6% of global output (table 7) and increasing from fourth-ranked in 2014. During 2015, crude gypsum in the United States was produced at 50 mines in 16 States (table 2). The leading crude-gypsum-producing States were, in descending order, Oklahoma, Texas, Nevada, Kansas, Arkansas, Iowa, California, Colorado, Arizona, and Wyoming, which together accounted for 93% of total domestic output.

The U.S. gypsum industry primarily consisted of a few large, vertically integrated companies that mined gypsum and manufactured wallboard, plaster, and other gypsum products.

¹Deceased.

Companies with the highest production levels of crude gypsum were USG Corp. with nine mines, National Gypsum Co. with six mines, CertainTeed Corp. with four mines, American Gypsum with three mines, Georgia-Pacific LLC with three mines, and PABCO Gypsum with one mine. In 2015, these six companies produced an estimated 50% of U.S. crude gypsum.

In 2015, domestic output of calcined gypsum increased slightly to 15.0 Mt valued at \$462 million (table 1); 12.9 Mt of calcined gypsum was used in the production of plasters and prefabricated products (table 3).

In addition to crude gypsum production, synthetic gypsum was generated as a byproduct of various industrial processes. The primary source of synthetic gypsum was flue gas desulfurization (FGD) systems at coal-fired electric powerplants. Smaller quantities of synthetic gypsum were derived as byproducts of chemical processes such as acid neutralization, citric acid production, sugar production from sugar beets, and titanium dioxide production. Synthetic gypsum was used as a substitute for crude gypsum, principally for wallboard manufacturing, cement production, and agricultural purposes, in descending order of tonnage.

Approximately 400 synthetic gypsum producers synthesized an estimated 34.1 Mt of flue-gas desulfurized gypsum. Of the total 34.1 Mt of synthetic gypsum produced, only 17.1 Mt was sold or used in 2015, with a total estimated value of \$85.5 million (American Coal Ash Association, 2016). An estimated 52% of all synthetic gypsum produced in 2015 was neither sold nor used and in most cases was discarded.

For 2015, gypsum-derived products, including agricultural products, cement, plasters, and wallboard, totaled 20.1 Mt with a value of \$3.48 billion. This represented a 5% increase in both tonnage and value compared with the 19.1 Mt produced in 2014 valued at \$3.30 billion (table 3).

During 2015, seven companies manufactured gypsum wallboard products in the United States. Approximately 2.05 billion square meters (22.1 billion square feet) of wallboard products were shipped, which is a 3% increase compared with that of 2014 (table 4).

The decline in the U.S. housing market that began in 2007 and continued through 2010 resulted in flat and declining sales for most gypsum producers, which led to layoffs and the idling of wallboard production plants (Crangle, 2011). However, beginning in late 2010 and continuing through 2015, housing starts, an indicator of gypsum consumption in residential construction, increased each year. In 2015, housing starts increased by 11% from those of 2014 (U.S. Census Bureau, 2016b).

Consumption

In 2015, U.S. apparent consumption of domestically sourced gypsum was 34.4 Mt, 4% more than that of 2014. Domestic sources (mined crude plus an estimated 16.0 Mt of synthetic gypsum sales) met approximately 88% of domestic consumption requirements; imports, totaling 4.03 Mt, satisfied the remaining need. Sales of synthetic gypsum were 5% more than those of 2014. This was largely the result of the lower costs associated with the purchase and transportation of FGD gypsum, which is often located near wallboard production facilities.

Gypsum products are categorized as either calcined or uncalcined (table 3). Calcined gypsum was produced domestically from mined crude and synthetic gypsum to manufacture wallboard and plaster products. Uncalcined gypsum was used to produce portland cement and in agriculture. Miscellaneous uses, such as athletic field markings, accounted for less than 1% of consumption.

In 2015, more than 99% of calcined gypsum was used in the production of prefabricated products, most of which consisted of wallboard (table 4). Type X gypsum board, so named because of extra fire retardation qualities, consumed 43%, by weight, of calcined gypsum. Half-inch wallboard accounted for 38% of total calcined gypsum consumption. Water- and moisture-resistant board, typically used in bathroom and kitchen walls, accounted for 10% of calcined gypsum. Other wallboard, including mobile-home board, predecorated wallboard, sheathing, and veneer base constituted most of the balance (table 4).

Uncalcined gypsum consumption in the United States increased by 9% to 7.16 Mt in 2015 from revised 6.54 Mt in 2014. About 4.15 Mt, or 58%, was consumed in portland and masonry cement production (table 3). Gypsum is added to cement to retard its setting time and accounts for 3% to 7%, by weight, of cement output (van Oss, 2005, p. 8; Roskill Information Services Ltd., 2009, p. 320). Most of the remainder of the uncalcined gypsum consumed, about 3.01 Mt, was used for agricultural purposes, an increase of 39% from that of 2014. Finely ground gypsum rock was used in agriculture and other industries to neutralize acidic soils, improve soil permeability, add nutrients, stabilize slopes, and provide catalytic support for maximum fertilizer benefits. Small quantities of high-purity gypsum also were used in a wide range of industrial applications, including the production of food, glass, paper, and pharmaceuticals.

Prices

In 2015, the average unit values (free on board, mine or plant) reported by U.S. producers were \$8.88 per metric ton for crude gypsum, a slight decrease from that of 2014, and \$30.86 per ton for calcined gypsum, an increase of 4% from that of 2014 (table 1). The average unit value for plaster reported by domestic producers during the year was \$439 per ton, slightly more than that in 2014 (table 3). The average unit value of uncalcined gypsum used primarily for agricultural purposes was estimated to be \$33 per ton, unchanged from that in 2014, and that used in cement production was about \$25 per ton, also unchanged from that in 2014 (table 3).

During 2015, the average unit value of gypsum wallboard increased slightly and total wallboard production increased by 3% (table 4).

Foreign Trade

The United States imported crude gypsum from 9 countries and exported to 72 countries and territories; 44% of total exports went to Canada. Imports of crude gypsum in 2015 increased by 8% from those of 2014 and accounted for 12% of apparent consumption. Canada, Mexico, and Spain accounted for more

than 99% of imported gypsum. The majority of imports from Canada went to east coast plants, and sources in Mexico chiefly served the west coast. Most of the crude gypsum imported by the United States from Mexico was produced by *Compañía Minera Caopas, S.A. de C.V.*, and *Compañía Occidental Mexicana, S.A. de C.V.*, in Baja California Sur, both of which operate mines on the Baja California Peninsula (*Compañía Occidental Mexicana S.A. de C.V.*, 2005; *Compañía Minera Caopas, S.A. de C.V.*, 2010). Almost all gypsum imported from Canada came from Nova Scotia. The completion of large wallboard manufacturing plants near coal-fired electric powerplants along the east coast may reduce gypsum imports in the future.

Wallboard exports decreased by 7% in 2015, totaling about 767,000 metric tons (t) valued at \$137 million, of which approximately 93% went to Canada. Wallboard imports, almost all of which originated from Canada and Mexico, decreased by 4% in 2015 to 348,000 t valued at \$86.1 million (table 6).

World Review

Global crude gypsum production in 2015 was estimated to be 261 Mt, unchanged from that of 2014 (table 1). In 2015, 78 countries produced gypsum, with the top 10 producers accounting for 82% of total world production (table 7). China was the leading producer of crude gypsum in 2015 with an estimated 130 Mt, followed, in decreasing order by tonnage, by Iran with 16.0 Mt, the United States with 15.2 Mt, Turkey with 12.6 Mt, Thailand with 11.2 Mt, Italy with 8.6 Mt, Spain with 7.0 Mt, Oman with 6.0 Mt, Mexico with 5.4 Mt, Japan with 4.7 Mt, and Russia with 4.4 Mt. Gypsum production in Iran of 16.0 Mt in 2015 was based on dated historical production that does not fully account for 25 years of double-digit inflation, unemployment in the range of 10%, or the increased cost of land and housing in urban areas, all of which has likely hampered the actual production level of gypsum (Esmacili, 2008; Khajehpour, 2013; World Bank, 2016).

Production in North America accounted for 9% of total crude gypsum production. Although the use of gypsum wallboard increased worldwide, only industrialized nations used gypsum primarily for wallboard products. In developing countries, especially in Asia and the Middle East, most gypsum was used in the production of cement or plaster products. World production may have been underestimated because output by some foreign gypsum producers was used to manufacture products onsite, which may not have been reported. Additionally, production from small deposits in developing nations was intermittent and in many cases unreported.

Worldwide, the leading use of gypsum is in the manufacture of cement and concrete. In 2014, the last year for which worldwide end-use data were available, cement manufacture accounted for approximately 50% of worldwide gypsum consumption, and plaster products, including wallboard, accounted for approximately 30% of all consumption (Satterthwaite, 2013; van Oss, 2016).

As a low-value, high-bulk mineral commodity mined from deposits widely distributed throughout the world, gypsum tended to be consumed within the many countries where it was produced. Less than 20% of the world's crude gypsum production was estimated to enter international trade. Only a

few countries, such as Canada, Mexico, Spain, and Thailand, were major crude gypsum exporters; of these, Canada and Mexico were significant exporters because their large deposits were near wallboard markets in the United States.

Estimated world production capacity for gypsum wallboard in 2014 exceeded about 17 billion square meters per year (183 billion square feet per year) at more than 250 plants worldwide. Approximately 20% of this capacity was in the United States; Asia and Western Europe each accounted for about 20% of capacity.

Australia.—Boral Ltd., Australia's leading building and construction materials producer, recorded a 2015 profit, after taxes, of \$189 million, 45% higher than that of 2014. The primary factors that led to the increase in year-over-year profits were related to the sale of its landfill business, building products write-downs, and restructuring within its construction materials and cement division (Boral Ltd., 2016, p. 2). An increase in United States and Australian residential housing markets, combined with strengthened commercial Asian and New South Wales marketplaces, also contributed to Boral's increased profitability in 2015 (Boral Ltd., 2016, p. 3). Boral remained the leading supplier of wallboard to Asia in 2015, generating \$485 million of revenue (Boral Ltd., 2016, p. 6). A joint venture between Boral and USG, named Boral Gypsum, which began in March 2014 and earned \$37 million in FY 2015, was expected to grow through increased sales of Sheetrock™ products throughout Australia, Indonesia, New Zealand, and Thailand (Boral Ltd., 2016, p. 16).

Canada.—Canada produced an estimated 1.63 Mt of crude gypsum in 2015, unchanged from that of 2014. About 1.24 Mt, or 69% of Canada's production, was exported to the United States. In 2015, CGC Inc. (a subsidiary of USG) was the leading manufacturer of gypsum wallboard in eastern Canada and accounted for approximately \$321 million in net sales, which represented a decrease of 7% compared with those in 2014. Much of the decrease was reportedly related to the rise in the U.S. dollar coupled with reduced production at some plants along with higher employee costs (USG Corp., 2016, p. 2, 30).

China.—In 2015, Beijing New Building Materials PLC (BNBM), the largest gypsum board producer in the world, managed 43 wallboard plants, in production or under construction, in China with an estimated production capacity of 1.65 billion square meters per year (Beijing New Building Materials PLC, 2016). Between 2006 and 2013, China's wallboard production increased at an annual rate of 17%, with 2.7 billion square meters of wallboard manufactured in 2013 (Tiwari, 2014). Wallboard has become the standard building material in commercial construction for non-load-bearing walls and ceilings in China, with an estimated 80% of all domestically consumed wallboard used in commercial construction (Global Gypsum Magazine, 2011). Although the housing market in China has continued to grow, with few periods of extended downturns, Fitz Ratings issued a recent warning with regard to the increased use of credit to finance a number of large projects. Of 198 publicly traded real estate companies, their average debt to equity ratio was 96%, an increase of more than 7% from 2014 (Rapoza, 2016). The increase in debt could signal a problem with the financing of future large-scale projects.

India.—Saint-Gobain S.A. announced a planned expansion of gypsum wallboard production and sales in India. As the world's second largest producer of cement, which requires a considerable use of gypsum in the cement manufacturing process, the consumption of gypsum in India remained strong. India produced an estimated 3.5 Mt of gypsum but ranked only 20th in terms of its gypsum wallboard production (Global Gypsum Magazine, 2015; van Oss, 2016).

Japan.—Yoshino Gypsum Co., Ltd., which opened Japan's first wallboard factory in 1921, was the leading wallboard producer with 16 plants throughout Japan. The company's combined capacity of 350 million square meters per year of its Tiger Board product accounted for 78% of Japan's total wallboard output (Global Gypsum Magazine, 2012; Yoshino Gypsum Co., Ltd., 2016). With few crude gypsum mining resources, Japan stopped producing crude gypsum in 1976 and has relied on synthetic and recycled gypsum since then to meet much of its domestic demand (Pressler, 1984; Global Gypsum Magazine, 2010b).

Mexico.—In 2015, gypsum production in Mexico was estimated at 5.38 Mt, down slightly from that of 2014. About 1.72 Mt, or 31% of Mexico's 2015 crude gypsum production, was exported to the United States. In 2015, USG Mexico, S.A. de C.V., the leading manufacturer of wallboard in Mexico with three manufacturing facilities, produced more than 55% of Mexico's wallboard with net sales of \$187 million, a decrease of 4% compared to net sales in 2014 of \$195 million. As was the case in Canada, USG's decreased net sales in Mexico were related to currency differences between the strengthening U.S. dollar and the respective drop in the Mexican peso (USG Corp., 2016, p. 2, 31).

Outlook

The average sales price for residential new homes increased nationwide in 2015 by approximately 3% from that of 2014 (U.S. Census Bureau, 2016a). A combination of increased housing starts, up by more than 11% from 2014, coupled with historically low 30-year mortgage interest rates and a low level of housing inventory continued to encourage increased sales activities within the housing sector in 2015, and by extension, the wallboard market (Carlyle, 2015; Freddie Mac, 2016). Because the residential housing market is responsible for approximately 60% of the consumption of gypsum products, a key economic indicator used by the gypsum and wallboard industries is the number of new housing starts, as measured by the issuance of new building permits. Since 1959, an increase in housing starts has been closely paired with an increase in gypsum consumption. Likewise, during periods of economic recession when housing starts often precipitously declined, gypsum consumption also decreased (fig. 1).

Since 1959, the average number of housing starts, including multidwelling units, is 1.5 million per year. Housing starts averaged about 1.8 million per year during the 5 years preceding the recessionary years that began in 2007. Housing starts in 2014 and 2015 were 1,112,000 and 1,003,000, respectively (U.S. Census Bureau, 2016b). As the surplus of residential real estate constructed before 2009 is drawn down, the Nation's annual population growth of more than 3,000,000 may necessitate an

increase in residential construction in the near future (Bachman, 2015; Reyes, 2015; U.S. Census Bureau, 2016c).

The future of synthetic gypsum, following more than 20 years of large annual growth rates, may begin to slow as significant supplies of comparatively less expensive and cleaner burning natural gas compete with coal in the generation of electric power. The increased production and consumption of domestic shale gas could lead to a corresponding decrease in coal consumption and, with it, a decrease in the production of synthetic gypsum. Shale-gas production in 2014, the most recent year for which data were available, was 380 million cubic meters (13.4 billion cubic feet), which was 18% more than that of 2013 and more than four times the 88 million cubic meters (3.11 billion cubic feet) produced in 2009 (U.S. Energy Information Administration, 2015).

In the long term, as disposal areas reach capacity and the opening of new disposal sites becomes increasingly difficult, power companies may continue in the trend of converting electric generation plants to operate on natural gas, especially if shale-gas supplies continue to offer an economically attractive alternative to coal. Because the retrofitting of coal-fired electric powerplants with desulfurization systems has been accomplished for most plants and less expensive natural gas is available for electrical generation, FGD production may stabilize. The changeover of crude to FGD gypsum likely will be limited to FGD plants within close proximity to wallboard production facilities or to new wallboard plants that would be constructed adjacent to existing FGD plants.

The U.S. gypsum industry has been moving toward the use of large-capacity wallboard plants supplied from multiple sources, including synthetic gypsum from coal-fired electric powerplants. These larger wallboard plants have been built in regions of high population and growth, which are the areas of highest consumption. Older and less efficient crude-gypsum-fed plants could become less competitive, but could see a revival with regard to the possibility of lesser amounts of FGD produced. In response to increased public awareness, the gypsum industry may boost the recycling of scrap gypsum in its raw materials streams. The industry may also increase the use of labels, such as the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program, which certifies varying levels of ecologically conscious building practices (U.S. Green Building Council, undated).

Industry trends indicate significant developments abroad in the coming decade. The pace and magnitude of wallboard plant construction in Asia, particularly in China, India, and Thailand, suggest that the continent, with billions of potential consumers, will likely become one of the world's leading gypsum wallboard markets. Should the economic conditions in the United States more favorably affect the U.S. housing sector, and in turn domestic consumption for gypsum, Canada's gypsum production could increase. Elsewhere, wallboard production capacity growth and the recognition of the convenience and economy of wallboard as a building material in Central America, Europe, and South America means that wallboard manufacturing may require increased gypsum production in future years. A decline in national and global economic conditions, however, could hamper such growth.

References Cited

- American Coal Ash Association, 2016, Coal ash recycling reaches 52 percent as production and use trends shift: Farmington Hills, MI, American Coal Ash Association press release, October 12, 4 p. (Accessed March 6, 2017, at <https://www.aca-usa.org/Portals/9/Files/PDFs/News-Release-Coal-Ash-Production-and-Use-2015.pdf>.)
- Bachman, Daniel, 2015, Housing construction—What happens when the kids finally leave?: Westlake, TX, Deloitte University Press, March 12. (Accessed December 28, 2015, at <http://dupress.com/articles/future-of-us-housing-market/>.)
- Beijing New Building Material PLC, 2016, Gypsum board production line: Beijing, China, Beijing New Building Material PLC. (Accessed August 9, 2016, at <http://english.bnbm.com.cn/>.)
- Boral Ltd., 2016, Boral Ltd. annual report 2015: Sydney, New South Wales, Australia, Boral Ltd., 136 p. (Accessed July 27, 2016, at <http://www.boral.com.au/Images/common/pdfs/annual-reports/Boral-Annual-Report-2015.pdf>.)
- Carlyle, Erin, 2015, 2014 housing starts hit highest level since 2007: Forbes, January 21. (Accessed July 11, 2016, at <http://www.forbes.com/sites/erincarlyle/2015/01/21/2014-housing-starts-hit-strongest-finish-since-2007-as-single-family-construction-rises/#42bfec35e1e1>.)
- Compañía Minera Caopas, S.A. de C.V., 2010, Company profile: Saltillo, Mexico, Compañía Minera Caopas, S.A. de C.V. (Accessed August 11, 2016, at <http://www.caopas.net>.)
- Compañía Occidental Mexicana S.A. de C.V., 2005, Untitled: Isla San Marcos, Mexico, Compañía Occidental Mexicana S.A. de C.V. (Accessed August 11, 2016, at <http://www.comsamexico.com.mx/mision.htm>.)
- Crangle, R.D., Jr., 2011, Trends in U.S. gypsum consumption: Global Gypsum Magazine, January, p. 28.
- Esmaili, Abdoulkarim, 2008, Economics of gypsum production in Iran: Journal of Applied Sciences, v. 8, no. 4, p. 711–714.
- Freddie Mac, 2016, 30-year fixed-rate mortgages since 1971: McLean, VA, Freddie Mac. (Accessed July 11, 2016, at <http://www.freddiemac.com/pmms/pmms30.htm>.)
- Global Gypsum Magazine, 2010a, Corporation focus—China National Building Material Group Corporation: Global Gypsum Magazine, September/October, p. 28.
- Global Gypsum Magazine, 2010b, Japanese gypsum board market profile: Global Gypsum Magazine, November 1. (Accessed August 25, 2016, at <http://www.globalgypsum.com/magazine/articles/326-japanese-gypsum-board-market-profile>.)
- Global Gypsum Magazine, 2011, The status and development trends of the wallboard industry in China: Global Gypsum Magazine, March 3. (Accessed August 16, 2016, at <http://www.globalgypsum.com/magazine/articles/322-the-status-and-development-trends-of-the-wallboard-industry-in-china>.)
- Global Gypsum Magazine, 2012, Yoshino Gypsum: Global Gypsum Magazine, March, p. 16.
- Global Gypsum Magazine, 2015, Global gypsum, Asia: Global Gypsum Magazine, July, p. 22.
- Khajehpour, Bijan, 2013, Iran's housing crisis: Al-Monitor, June 17. (Accessed July 26, 2016, at <http://www.al-monitor.com/pulse/originals/2013/06/iran-housing-sector.html>.)
- Massachusetts Department of Energy and Environmental Affairs, 2011, Summary of waste ban regulations: Boston, MA, Massachusetts Department of Energy and Environmental Affairs, March, 2 p. (Accessed August 15, 2016, at http://www.dighton-ma.gov/public_documents/dightonma_health/MADEP%20Waste%20Ban%20Regulation%20&%20Materials%20Listing.pdf.)
- Pressler, Jean, 1984, Byproduct gypsum, in Kuntze, R.A., ed., The chemistry and technology of gypsum: American Society for Testing and Materials Special Technical Publication 861, p. 105–115.
- Rapoza, Kenneth, 2016, New warnings on China housing: Forbes, June 3. (Accessed August 14, 2016, at <http://www.forbes.com/sites/kenrapoza/2016/06/03/new-warnings-on-china-housing/>.)
- Reyes, C.B., 2015, Population growth exceeds new housing—By a lot: First Tuesday Journal [Riverside, CA], April 3. (Accessed December 28, 2015, at <http://journal.firsttuesday.us/population-growth-exceeds-new-housing-by-a-lot/42627/>.)
- Roskill Information Services Ltd., 2009, Gypsum and anhydrite—Global industry markets and outlook (10th ed.): London, United Kingdom, Roskill Information Services Ltd., 367 p.
- Satterthwaite, Kerry, 2013, Roskill's market outlook for North American gypsum to 2017: London, United Kingdom, Roskill Information Services Ltd., October 23. (Accessed August 8, 2016, at <https://roskill.com/wp-content/uploads/2014/11/roskill2019s-market-outlook-for-north-american-gypsum-to-2017.attachment1.pdf>.)
- Tiwari, Ritesh, 2014, Global and China gypsum board industry report 2014–2016: PRWeb, September 9. (Accessed August 26, 2016, at <http://www.prweb.com/releases/gypsum-board-industry/report-2014-2016/prweb12155688.htm>.)
- U.S. Census Bureau, 2016a, Median and average sales prices of new homes sold in United States: U.S. Census Bureau, 13 p. (Accessed July 29, 2016, at <https://www.census.gov/construction/nrs/pdf/uspricemon.pdf>.)
- U.S. Census Bureau, 2016b, New privately owned housing units started: U.S. Census Bureau. (Accessed July 29, 2016, via <http://www.census.gov/econ/currentdata>.)
- U.S. Census Bureau, 2016c, 2012 national population projections—Summary tables: U.S. Census Bureau. (Accessed July 7, 2016, at <http://www.census.gov/population/projections/data/national/2012/summarytables.html>.)
- U.S. Consumer Product Safety Commission, 2016, Drywall information center: U.S. Consumer Product Safety Commission. (Accessed August 17, 2016, at <http://www.cpsc.gov/en/Safety-Education/Safety-Education-Centers/Drywall-Information-Center/>.)
- U.S. District Court, 2013, MDL–2047 Chinese-manufactured drywall products liability litigation: New Orleans, LA, U.S. District Court, January 14. (Accessed August 17, 2016, at http://webcache.googleusercontent.com/search?q=cache:http://chinesedrywall.com/files/BG_status_report_6.pdf.)
- U.S. District Court, 2016, MDL–2047 Chinese-manufactured drywall products liability litigation: New Orleans, LA, U.S. District Court, March 22. (Accessed August 24, 2016, via <http://www.laed.uscourts.gov/drywall/drywall.htm>.)
- U.S. Energy Information Administration, 2015, Natural gas: U.S. Energy Information Administration, November 19. (Accessed August 10, 2016, at http://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm.)
- USG Corp., 2016, Form 10–K—2015: U.S. Securities and Exchange Commission, 88 p. (Accessed August 16, 2016, via <http://phx.corporate-ir.net/phoenix.zhtml?c=115117&p=irol-IRHome>.)
- U.S. Green Building Council, [undated], Overview: Washington, DC, U.S. Green Building Council. (Accessed August 4, 2016, at <http://www.usgbc.org/leed>.)
- van Oss, H.G., 2005, Background facts and issues concerning cement and cement data: U.S. Geological Survey Open-File Report 2005–1152, 80 p. (Accessed July 17, 2016, at <http://pubs.usgs.gov/of/2005/1152/2005-1152.pdf>.)
- van Oss, H.G., 2016, Cement: U.S. Geological Survey Mineral Commodity Summaries 2016, p. 44–45.
- World Bank, 2016, Iran in the world today: World Bank. (Accessed August 25, 2016, at <http://www.worldbank.org/en/country/iran/overview>.)
- Yoshino Gypsum Co., Ltd., 2016, Company profile: Tokyo, Japan, Yoshino Gypsum Co., Ltd. (Accessed August 26, 2016, at <http://yoshino-gypsum.com/en/company/gaiyou.html>.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

- Coal Combustion Products. Ch. in Minerals Yearbook, annual (1994–2000).
- Gypsum. Ch. in Mineral Commodity Summaries, annual.
- Gypsum. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
- Gypsum. Mineral Industry Surveys, monthly.
- Gypsum Deposits of the United States, Bulletin 697, 1920.
- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

Other

- Gypsum. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
- Gypsum Association.

TABLE 1
SALIENT GYPSUM STATISTICS¹

(Thousand metric tons and thousand dollars)

| | 2011 | 2012 | 2013 | 2014 | 2015 |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| United States: | | | | | |
| Crude: | | | | | |
| Production: | | | | | |
| Quantity | 11,300 ^r | 12,800 ^r | 14,400 ^r | 14,900 ^r | 15,200 |
| Value | 92,000 ^r | 98,100 ^r | 128,000 ^r | 132,000 ^r | 135,000 |
| Imports for consumption | 3,330 | 3,250 | 3,290 | 3,720 | 4,030 |
| Synthetic gypsum sales ² | 11,800 | 12,100 | 10,800 | 15,200 | 16,000 |
| Calcined: | | | | | |
| Production: | | | | | |
| Quantity | 11,900 | 12,800 | 14,600 | 14,700 | 15,000 |
| Value | 340,000 | 366,000 | 402,000 | 437,000 | 462,000 |
| Products sold, value | 1,470,000 | 2,230,000 | 2,940,000 | 3,090,000 | 3,240,000 |
| Exports, value | 48,300 | 39,200 | 44,100 | 46,000 ^r | 42,100 |
| Imports for consumption, value | 7,780 | 7,150 | 5,830 | 7,620 | 7,210 |
| World, production | 241,000 ^r | 243,000 ^r | 252,000 ^r | 261,000 ^r | 261,000 ^e |

^eEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits.

²Source: American Coal Ash Association.

TABLE 2
CRUDE GYPSUM MINED IN THE UNITED STATES, BY STATE¹

| State | 2014 | | | 2015 | | |
|-------------------------------|-----------------|---------------------------------|----------------------|--------------|---------------------------------|-------------------|
| | Active mines | Quantity (thousand metric tons) | Value (thousands) | Active mines | Quantity (thousand metric tons) | Value (thousands) |
| Arizona, Colorado, New Mexico | 7 | 1,210 | \$10,900 | 6 | 1,040 | \$9,300 |
| Nevada and Utah | 6 ^r | W | W | 9 | 2,110 | 25,200 |
| Arkansas and Louisiana | 2 | W | W | 2 | W | W |
| California | 5 | 689 | 6,030 | 4 | 690 | 5,930 |
| Iowa and Indiana | 5 | 1,410 | 12,500 | 4 | 995 | 8,550 |
| Michigan | 3 | 233 | 2,050 | 2 | W | W |
| South Dakota and Wyoming | 3 | W | W | 3 | W | W |
| Kansas, Oklahoma, Texas | 20 | 8,300 ^r | 73,300 ^r | 20 | 8,780 | 71,500 |
| Total | 51 ^r | 14,900 ^r | 132,000 ^r | 50 | 15,200 | 135,000 |

^rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
GYPSUM PRODUCTS (MADE FROM DOMESTIC, IMPORTED, AND
SYNTHETIC GYPSUM) SOLD OR USED IN THE UNITED STATES, BY USE¹

(Thousand metric tons and thousand dollars)

| Use | 2014 | | 2015 | |
|--|----------------------------|-------------------------------|---------------|------------------|
| | Quantity | Value | Quantity | Value |
| Uncalcined: | | | | |
| Portland and masonry cement | 4,380 ^r | 110,000 ^r | 4,150 | 104,000 |
| Agriculture and miscellaneous ² | 2,160 ^r | 71,300 ^r | 3,010 | 99,400 |
| Total | 6,540 ^r | 181,000 ^r | 7,160 | 203,000 |
| Calcined: | | | | |
| Plaster | 80 | 34,300 | 80 | 35,100 |
| Prefabricated products ³ | 12,500 | 3,090,000 | 12,800 | 3,240,000 |
| Total | 12,500 | 3,120,000 | 12,900 | 3,270,000 |
| Grand total | 19,100 ^r | 3,300,000 ^r | 20,100 | 3,480,000 |

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes synthetic gypsum.

³Includes weight of paper, metal, or other materials and some synthetic gypsum.

TABLE 4
PREFABRICATED GYPSUM PRODUCTS SOLD OR USED IN THE UNITED STATES¹

| Product | 2014 | | | 2015 | | |
|-------------------------------------|---------------------------------------|--|----------------------|---------------------------------------|--|----------------------|
| | Quantity (thousand square feet) | Quantity ² (thousand metric tons) | Value (thousands) | Quantity (thousand square feet) | Quantity ² (thousand metric tons) | Value (thousands) |
| Veneer base | 230,000 | 167 | \$41,500 | 261,000 | 189 | \$52,200 |
| Sheathing | 446,000 | 324 | 134,000 | 480,000 | 348 | 161,000 |
| Regular gypsum board: | | | | | | |
| ³ / ₈ -inch | 454,000 | 144 | 31,800 | 358,000 | 114 | 25,100 |
| ¹ / ₂ -inch | 10,300,000 | 4,660 | 1,030,000 | 10,800,000 | 4,890 | 1,080,000 |
| ⁵ / ₈ -inch | 1,210,000 | 712 | 180,000 | 645,000 | 381 | 101,000 |
| Total | 11,900,000 | 5,520 | 1,240,000 | 11,800,000 | 5,380 | 1,200,000 |
| Type X gypsum board | 6,960,000 | 5,050 | 1,220,000 | 7,530,000 | 5,470 | 1,360,000 |
| Water- and moisture-resistant board | 1,670,000 | 1,210 | 401,000 | 1,740,000 | 1,270 | 419,000 |
| Other | 160,000 | 116 | 16,000 | 171,000 | 124 | 17,100 |
| Grand total | 21,500,000 | 12,500 | 3,090,000 | 22,100,000 | 12,800 | 3,240,000 |

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes weight of paper, metal, or other materials.

TABLE 5
IMPORTS FOR CONSUMPTION OF CRUDE GYPSUM, BY COUNTRY¹

(Thousand metric tons and thousand dollars)

| Country | 2014 | | 2015 | |
|---------------------|----------|--------|----------|--------|
| | Quantity | Value | Quantity | Value |
| Canada ² | 1,190 | 18,800 | 1,240 | 14,300 |
| Mexico | 1,600 | 17,800 | 1,720 | 19,000 |
| Spain | 900 | 19,100 | 1,060 | 20,500 |
| Other | 38 | 1,120 | 2 | 289 |
| Total | 3,720 | 56,800 | 4,030 | 54,100 |

¹Data are rounded to no more than three significant digits; may not add to total shown.

²Includes anhydrite.

Source: U.S. Census Bureau.

TABLE 6
U.S. GYPSUM AND GYPSUM PRODUCTS FOREIGN TRADE¹

(Thousand metric tons and thousand dollars)

| Year | Crude ² | | Plasters ³ | | Boards ⁴ | | Other, value ⁵ | Total, value |
|--------------------------|--------------------|--------|-----------------------|---------------------|---------------------|---------|---------------------------|----------------------|
| | Quantity | Value | Quantity | Value | Quantity | Value | | |
| Exports: | | | | | | | | |
| 2014 | 67 | 29,900 | 101 | 46,000 ^r | 829 | 150,000 | 73,100 | 299,000 ^r |
| 2015 | 63 | 28,000 | 95 | 42,100 | 767 | 137,000 | 79,100 | 286,000 |
| Imports for consumption: | | | | | | | | |
| 2014 | 3,720 | 56,800 | 20 | 7,620 | 362 | 84,000 | 37,300 | 186,000 |
| 2015 | 4,030 | 54,100 | 21 | 7,210 | 348 | 86,100 | 37,000 | 184,000 |

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Data are for "Gypsum, anhydrite," Harmonized Tariff Schedule of the United States (HTS) code 2520.10.0000.

³Data are for "Plasters," HTS code 2520.20.0000.

⁴Data are for "Boards, sheets, panels, tiles, and similar articles, not ornamented—Faced or reinforced with paper or paperboard only," HTS code 6809.11.0000.

⁵Data are for "Boards, sheets, panels, tiles, and similar articles, not ornamented: Other," HTS code 6809.19.0000, and "Other articles," HTS code 6809.90.0000.

Source: U.S. Census Bureau.

TABLE 7
GYPSUM: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

| Country ³ | 2011 | 2012 | 2013 | 2014 | 2015 ^e |
|-------------------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
| Algeria | 1,610 ^e | 1,958 | 2,078 | 2,130 | 2,130 |
| Argentina | 1,453 | 1,433 | 1,548 ^r | 1,500 ^e | 1,500 |
| Australia ^e | 2,220 | 2,120 | 2,270 | 2,580 | 2,580 |
| Brazil | 3,229 | 3,750 | 3,333 | 3,330 ^e | 3,330 |
| Canada ⁴ | 2,449 | 1,832 | 1,837 | 1,811 ^r | 1,633 ⁵ |
| Chile | 918 | 799 | 1,015 | 843 | 843 |
| China ^e | 127,000 | 128,000 | 129,000 | 130,000 | 130,000 |
| Egypt ^{e,4} | 2,138 ⁵ | 2,200 | 2,200 | 2,200 | 2,200 |
| France | 4,231 | 3,685 | 3,455 | 3,279 | 3,280 |
| Germany, marketable | 2,021 | 1,949 | 1,778 | 1,802 | 1,800 |
| India | 3,114 ^r | 3,537 ^r | 3,189 ^r | 3,902 ^r | 3,500 |
| Iran ^{e,6} | 15,353 ⁵ | 14,179 ⁵ | 15,800 | 16,000 | 16,000 |
| Italy | 5,939 | 2,563 | 2,994 | 8,551 | 8,550 |
| Japan | 4,770 | 5,002 | 4,771 | 4,674 | 4,670 |
| Mexico ⁴ | 3,560 | 4,693 | 5,091 | 5,496 | 5,378 ⁵ |
| Oman | 1,254 | 1,915 | 2,785 | 4,210 ^r | 6,049 ⁵ |
| Pakistan | 1,131 ^r | 1,173 ^r | 1,753 ^r | 1,436 | 1,660 ⁵ |
| Poland ⁴ | 1,225 | 1,228 | 1,085 | 1,052 | 1,018 ⁵ |
| Russia | 3,907 | 4,179 | 4,223 | 4,400 ^e | 4,400 |
| Saudi Arabia ^e | 2,205 ⁵ | 1,700 | 1,700 | 1,780 | 1,860 |
| Spain ⁴ | 7,826 | 6,360 | 7,125 | 7,000 ^e | 7,000 |
| Thailand | 10,994 | 11,447 | 12,383 | 12,445 | 11,217 ⁵ |
| Turkey | 8,894 ^r | 11,442 ^r | 13,357 ^r | 12,618 ^r | 12,600 |
| United Kingdom ^{e,4} | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| United States ⁷ | 11,300 ^r | 12,800 ^r | 14,400 ^r | 14,900 ^r | 15,200 ⁵ |
| Other | 11,400 ^r | 12,300 ^r | 11,900 ^r | 12,300 ^r | 11,800 ⁵ |
| Total | 241,000 ^r | 243,000 ^r | 252,000 ^r | 261,000 ^r | 261,000 |

^eEstimated. ^rRevised. -- Zero.

¹Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Includes data available through February 23, 2017.

³In addition to the countries listed, Colombia, El Salvador, Honduras, Latvia, Luxembourg, Mongolia, and Serbia produced gypsum, but available information is inadequate to make reliable estimates of output levels.

⁴Includes anhydrite.

⁵Reported figure.

⁶Data are for years beginning March 21 of that stated.

⁷Does not include byproduct gypsum.

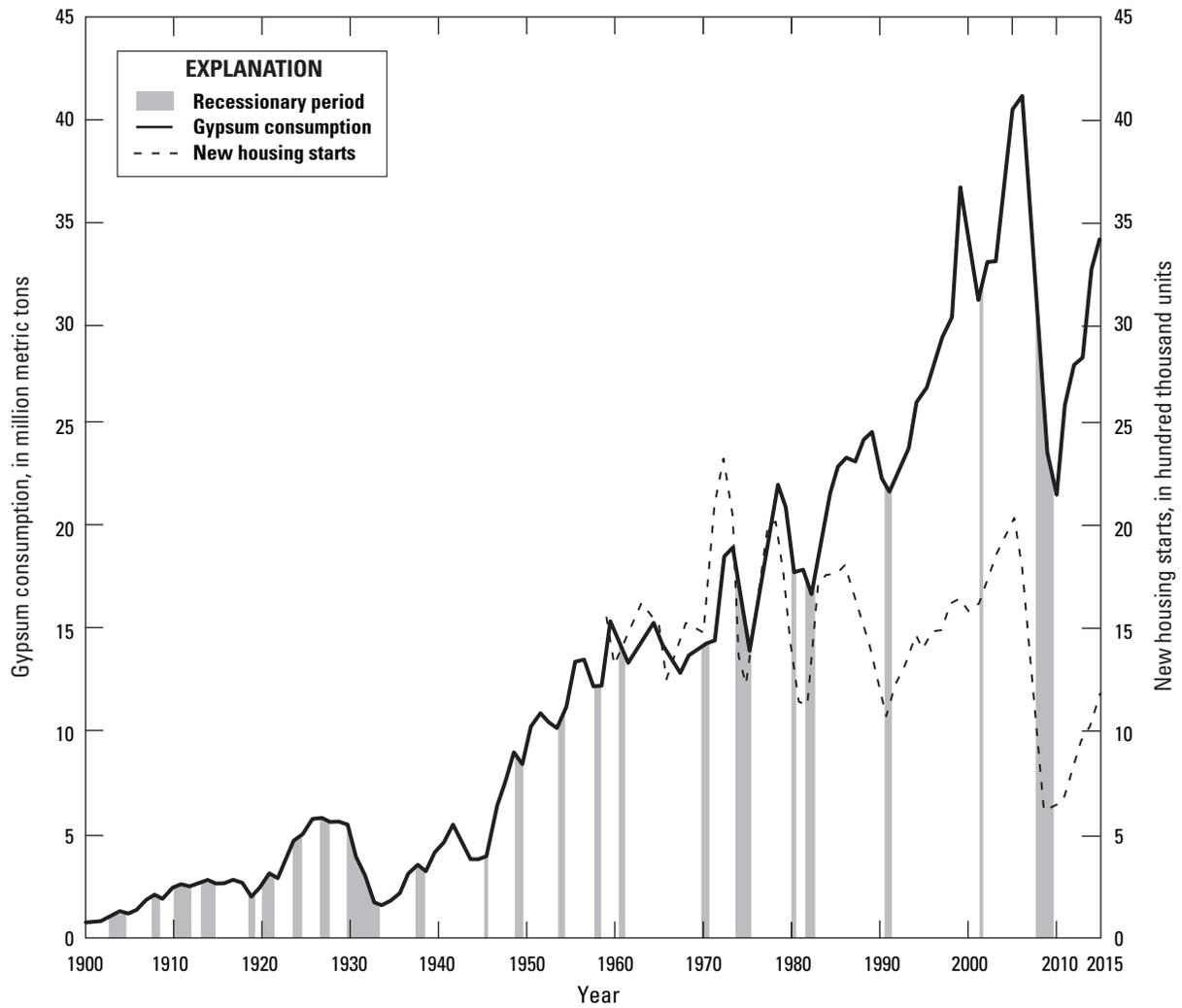


Figure 1. U.S. gypsum consumption and economic recessions from 1900 through 2015 and new residential building permits beginning in 1959. Sources: U.S. Census Bureau and U.S. Geological Survey.