



2020 Minerals Yearbook

ZINC [ADVANCE RELEASE]

ZINC

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In 2020, U.S. mine production of zinc contained in ores and concentrates was 723,000 metric tons (t), 4% less than that in 2019 (table 1). Recoverable zinc mine production was 701,000 t, a 4% decrease from that in 2019, and the value of domestic recoverable zinc mine production was approximately \$1.7 billion. Alaska continued to be the dominant zinc-producing State (table 2). Other producing States included Idaho, Missouri, New York, and Tennessee (table 3). The United States exported most of its zinc mine production to foreign smelters for processing. Leading destinations for domestic exports of zinc contained in concentrates were Canada (53%), Australia (12%), the Republic of Korea (10%), and Japan (7%) (table 8). Imports for consumption of zinc contained in concentrates were significantly less than exports because the only domestic primary zinc smelter mostly consumed domestically produced zinc concentrates (table 1). Estimated total U.S. refined zinc production in 2020 increased by 57% to 180,000 t from 115,000 t in 2019. Imports for consumption of refined zinc in 2020 decreased by 16% to 700,000 t from 830,000 t in 2019. Domestic exports of refined zinc decreased to 2,480 t from 5,170 t in 2019. Apparent consumption of refined zinc decreased by 7% from that in 2019 to 878,000 t. Most reported refined zinc consumption was for galvanizing; other major end uses were brass and bronze and zinc-base alloys (table 7).

Global zinc mine production decreased by 6% to 12.0 million metric tons (Mt) of zinc content from 12.7 Mt in 2019, and zinc smelter production increased slightly to 13.8 Mt from 13.6 Mt (revised) (tables 1, 11, 12). According to data from the International Lead and Zinc Study Group (ILZSG), global zinc metal consumption decreased by 4% to 13.3 Mt in 2020 from 13.8 Mt in 2019 (International Lead and Zinc Study Group, 2021c, p. 43).

Data in this chapter are rounded to no more than three significant digits, except prices and reported world production, and percentages are calculated from unrounded data.

Legislation and Government Programs

A U.S. Government stockpile of refined zinc has been maintained since 1967 for national defense purposes. Public Law 102-484, signed in 1992, authorized the disposal of the entire inventory of zinc from the National Defense Stockpile (NDS). The Defense Logistics Agency Strategic Materials listed zinc for potential disposal on the Annual Materials Plan (AMP) for fiscal year 2020 (October 1, 2019, through September 30, 2020). The AMP ceiling disposal quantity for zinc in fiscal year 2020 was 7,250 t (7,993 short tons), which represented the maximum quantity of zinc that could be sold from the NDS during the fiscal year and the same quantity of zinc remaining in the stockpile (Defense Logistics Agency Strategic Materials, 2019). During 2020, no zinc was disposed of, and the stockpile remained at 7,250 t at yearend (table 1).

Production

Mine.—In 2020, zinc was produced in five States—Alaska, Idaho, Missouri, New York, and Tennessee. Domestic mine production of zinc in ores and concentrates was 723,000 t, 4% less than that in 2019, and recoverable zinc mine production was 701,000 t, 4% less than that in 2019. About 80% (562,000 t) of U.S. recoverable zinc mine production took place in Alaska, mostly at the Red Dog Mine, followed by the Greens Creek Mine. Production in 2020 decreased in Alaska and in all other States combined compared with production levels in 2019 (tables 1–3).

Alaska.—Teck Alaska Inc. (a subsidiary of Teck Resources Ltd., Canada) operated the open pit Red Dog zinc-lead mine in the Northwest Arctic Borough, the leading zinc-producing mine in the United States (table 3). The Red Dog property consists of several sedimentary-exhalative lead-zinc sulfide ore bodies and was leased and operated under an agreement with NANA Regional Corp. Inc. (Kotzebue, AK), an Alaska Native-owned corporation. Teck reported that zinc-in-concentrate production at Red Dog decreased to 491,000 t in 2020 from 552,000 t in 2019 owing primarily to a lower average zinc ore grade and mill recovery rate compared with those in 2019. Most of Red Dog's concentrates were exported to Asia, Australia, and Europe, and the rest were processed at Teck's metallurgical complex at Trail, British Columbia, Canada. During 2020, Teck completed a mill upgrade project at Red Dog, which would increase the ore throughput rate by 15% to offset the lower ore grades and harder ore of the currently mined Aqqaluk and Qanaiyaq deposits. Reported reserves at yearend 2020 contained 4.9 Mt of recoverable zinc metal. Mine life was expected to extend to 2032; however, the company was conducting an exploration drilling program to study the development of other deposits near the mine site, which could potentially extend the life of the mine after 2032. Teck projected that zinc production at Red Dog would range from 490,000 to 510,000 t in 2021 and from 510,000 to 550,000 metric tons per year (t/yr) from 2022 through 2024 (Teck Resources Ltd., 2021, p. 34–37, 52).

Hecla Mining Co.'s (Coeur d'Alene, ID) underground Greens Creek Mine recovered metals from a polymetallic (gold-lead-silver-zinc) massive sulfide deposit on Admiralty Island in the Tongass National Forest near Juneau. The mine produced bulk zinc-lead, lead, and zinc concentrates and a gravity concentrate that was upgraded into gold and silver dore by a third-party processor. Hecla reported that zinc-in-concentrate production in 2020 was unchanged from that in 2019 at 51,500 t. Reported yearend proven and probable ore reserves at the Greens Creek Mine contained 590,000 t of zinc. The company reported that definition drilling activities at the mine during the year were limited owing to the global coronavirus disease 2019 (COVID-19) pandemic (Hecla Mining Co., 2021, p. 38–43).

Arizona.—South32 Ltd. (Australia) continued to advance the development of its Hermosa project, composed of the polymetallic Clark and Taylor deposits in Santa Cruz County. During 2020, the company was working on a preliminary feasibility study of the Taylor zinc-lead-silver deposit, which was expected to be complete in the second quarter of 2021, and initiated a scoping study of the zinc-manganese-silver Clark deposit to determine its potential to supply manganese to the battery markets (South32 Ltd., 2020, p. 1; 2021, p. 3).

Idaho.—Hecla operated the Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d'Alene mining district in northern Idaho, which produced silver-lead concentrate and zinc concentrate. Reported zinc production in 2020 increased to 5,710 t from 1,860 t in 2019. The mine operated on a limited basis in 2019 during an ongoing strike of unionized employees that began in March 2017 and ended on January 7, 2020, when a new collective bargaining agreement was established. After the strike was resolved, Hecla initiated ramp-up activities at the Lucky Friday Mine, and the mine returned to full production in the fourth quarter. All concentrates were sent to Teck's metallurgical facility in Trail for processing. Reported proven and probable ore reserves at yearend contained 210,000 t of zinc, and mine life was expected to extend for 17 years (Hecla Mining Co., 2021, p. 23–24).

Michigan.—In August, Aquila Resources Inc. (Canada) announced the results of a preliminary economic assessment of its Back Forty project in Menominee County. Back Forty is a polymetallic (zinc-copper-lead-gold-silver) volcanic massive sulfide deposit, and Aquila planned to mine Back Forty by open pit methods for the first 5 years of production, followed by the development of an underground mine that would operate for at least 6 additional years. Production was projected to average about 30,000 t/yr of zinc in concentrate (67 million pounds per year) over the life of the mine. Initial capital costs for the development of Back Forty were estimated to be \$250 million (Aquila Resources Inc., 2021, p. 31, 37, 49; undated).

Missouri.—Doe Run Resources Corp. (St. Louis, MO) operated a series of production shafts that ran along the Viburnum Trend within the Mississippi Valley-type lead-zinc-copper ore bodies in southeast Missouri. In 2020, Doe Run recovered zinc from ore produced at the Brushy Creek, Fletcher, Sweetwater, and Viburnum Mines.

New York.—Titan Mining Corp. (Canada) owned and operated the underground Empire State (No. 4) zinc mine, formerly known as the Balmat (No. 4) Mine, in St. Lawrence County. Empire State is one of several sedimentary-exhalative deposits in the Balmat-Edwards zinc mining district. In 2020, zinc-in-concentrate production was 24,300 t, an increase from 15,900 t in 2019 as the company continued to ramp up production. During the year, Titan conducted advanced definition drilling and surface exploration programs around the mine to identify additional high-grade resources (Titan Mining Corp., 2021, p. 5–7).

Tennessee.—Nyrstar Tennessee Mines - Strawberry Plains LLC (a subsidiary of Nyrstar NV, Belgium) operated the East Tennessee and Middle Tennessee zinc mine complexes that recovered ore from Mississippi Valley-type zinc deposits. The two mine complexes produced zinc concentrates, which were

sent to Nyrstar's Clarksville, TN, zinc smelter for processing. On July 31, 2019, Trafigura Group Pte Ltd., a privately held commodity trading company headquartered in Singapore, acquired majority ownership of Nyrstar (Trafigura Group Pte Ltd., 2019).

Intermediate.—In 2020, there were five plants that produced Waelz oxide, or crude zinc oxide, from electric arc furnace dust (EAFD) in the United States (table 4). EAFD is a waste product generated from the recycling of steel scrap at steel minimills and, on average, is 14% to 35% zinc (Suetens and others, 2014, p. 153). Recyclers of EAFD process the material in Waelz kilns to produce Waelz oxide, which is about 62% zinc (Steel Dust Recycling LLC, 2016), and an iron-rich slag. The Waelz oxide can be sold to smelters or other processors for the production of zinc metal, zinc oxide, or zinc sulfate.

Smelter.—Three smelter facilities, one primary and two secondary, operated by three companies, produced refined zinc metal in 2020 (table 5). Refined zinc was produced mainly in Tennessee (Nyrstar's Clarksville zinc refinery) and North Carolina (American Zinc Recycling Corp.'s Mooresboro zinc refinery). A smaller quantity of zinc metal was produced by U.S. Zinc Corp.'s recycling operation in Houston, TX. The three facilities did not publicly disclose their zinc production in 2020. Refined zinc production in 2020 was estimated to be 180,000 t, 57% more than estimated production in 2019 (table 1).

Nyrstar's Clarksville electrolytic zinc refinery was the only primary zinc smelter in the United States. Clarksville was designed to treat zinc concentrates produced at the East Tennessee and Middle Tennessee mines but also could treat imported zinc concentrates and domestically sourced secondary Waelz oxide. Clarksville produced Special High Grade (SHG) and Continuous Galvanizing Grade (CGG) zinc. Potential byproducts included cadmium metal, copper cementate, copper sulfate, germanium leach product, sulfuric acid, synthetic gypsum, and zinc sulfate.

American Zinc Recycling Corp. (AZR) (Pittsburgh, PA) operated a solvent extraction–electrowinning (SX–EW) zinc refinery in Mooresboro, NC. The refinery reopened in March 2020 after being idle for most of 2019. The plant had the capacity to produce about 141,000 t/yr (155,000 short tons per year) of SHG zinc from secondary materials, mostly Waelz oxide sourced from the company's four EAFD recycling operations in Barnwell, SC, Calumet, IL, Palmerton, PA, and Rockwood, TN (American Zinc Recycling LLC, 2020).

U.S. Zinc Corp. produced Prime Western zinc and zinc dust at its zinc recycling facility in Houston, TX. Feed materials were mainly top dross from continuous galvanizers and bottom dross and skimmings from general galvanizers. U.S. Zinc also produced zinc oxide at two recycling facilities in Tennessee (U.S. Zinc Corp., 2017).

Consumption

Changes in zinc consumption generally follow trends in industrial production or, more generally, economic growth. Domestic apparent consumption of refined zinc in 2020 was 878,000 t, a 7% decrease from that in 2019 (table 1).

According to reported data, most of the zinc consumed domestically in 2020 was for the production of galvanized (zinc-

coated) steel (table 7). Galvanized steel was used extensively in the automotive and construction industries. Most of the zinc consumed domestically for galvanizing was at continuous galvanizing plants. About 50 continuous galvanizing plants were operated by 20 companies in the United States and leading producers of galvanized sheet included AK Steel Corp. (West Chester, OH), ArcelorMittal USA LLC (East Chicago, IN), Nucor Corp. (Charlotte, NC), Steel Dynamics, Inc. (Fort Wayne, IN), and U.S. Steel Corp. (Pittsburgh, PA). According to the American Iron and Steel Institute (2021a), domestic net shipments of galvanized sheet and strip (including hot dipped, electrolytic, and all other metallic coated) totaled 15.2 Mt in 2020, a 9% decrease from shipments in 2019. Galvanized sheet and strip accounted for 21% of domestic steel mill product shipments in 2020. More broadly, U.S. raw steel production and finished steel products consumption in 2020 decreased compared with 2019 by 17% and 18%, respectively (American Iron and Steel Institute, 2021b; World Steel Association, 2021). Domestic steel producers enacted significant production cuts and plant closures in the second quarter in response to the COVID-19 pandemic, and production was later slow to meet a rebound in demand in the second half of 2020 (Allen, 2021).

The balance of zinc consumed for galvanizing was at general galvanizing plants that treated fabricated steel shapes (for example, structural beams or fasteners). About 170 general galvanizing plants were operated by 80 companies in the United States in 2020, of which the leading producers included AZZ Inc. (Fort Worth, TX), Valmont Industries Inc. (Omaha, NE), and Voigt & Schweitzer LLC (Columbus, OH).

Other major end uses of zinc included brass and bronze, chemicals, semimanufactures, and zinc-base alloys. According to the Copper Development Association Inc. (2021, p. 14, 16), about 116,000 t of zinc, including in unalloyed form and in secondary (scrap) copper alloys, was consumed by copper fabricators, mostly brass mills, in 2020, 4% less than in 2019. The quantity of zinc consumed by brass mills and other copper fabricators has generally trended downward since 2000.

The leading zinc chemicals, by production quantity, included zinc oxide, which was used extensively in the rubber and tire and manufacturing industry as an activator in the vulcanization process. Zinc oxide also was used in a variety of other industries including agriculture, ceramics, chemicals, coatings and paints, cosmetics, and pharmaceuticals. Major zinc oxide producers in the United States included U.S. Zinc and Zochem LLC (Zinc Oxide LLC) (Dickson, TN). U.S. Zinc consumed zinc dross and skimmings to produce zinc oxide at its two plants in Clarksville, TN, and Millington, TN. Zochem consumed zinc metal and secondary zinc materials at its zinc oxide plant in Dickson, TN. The company also operated a zinc oxide plant in Brampton, Ontario, Canada. The two facilities had a combined production capacity of 95,000 t/yr of zinc oxide (Zochem LLC, undated).

Zinc semimanufactures included mainly zinc sheet, also known as rolled zinc, which was used in architectural applications and for the production of the U.S. 1-cent coin. Zinc-base alloys were predominantly used to make die-cast parts for such applications as automotive parts, builders and household hardware, electronics, home appliances, medical instruments, office equipment, power tools, and zippers.

Stocks

Reported producer and consumer stocks of zinc in the United States were 120,000 t at yearend 2020 (table 1). Yearend stocks of SHG zinc in London Metal Exchange Ltd. (LME)-approved warehouses in the United States were 54,975 t at the end of 2020, an increase from 6,125 t at yearend 2019. Warehouses in New Orleans, LA, held 54,500 t of zinc, and the remainder was held in Baltimore, MD. In February, the LME implemented several warehousing reforms to increase stock levels on the exchange and improve transparency, including the reporting of off-warrant stocks. Reported off-warrant stocks of zinc in LME-approved warehouses in the United States were 78,640 t at yearend, most of which were held in New Orleans, LA (London Metal Exchange Ltd., 2019, 2020; Mason, 2019).

Prices

The annual average LME cash price for SHG zinc in 2020 decreased by 11% from that in 2019 to \$2,264.42 per metric ton (102.71 cents per pound) (table 1). The average monthly price decreased during the first 4 months of the year from \$2,356.60 per metric ton (106.89 cents per pound) in January to an annual low of \$1,894.08 per metric ton (85.91 cents per pound) in April and then generally increased for the remainder of the year to an annual high of \$2,782.36 per metric ton (126.21 cents per pound) in December. The annual average Platts North American price for SHG zinc in 2020, which was based on the LME cash price plus a regional North American premium, was 110.79 cents per pound, 11% less than that in 2019 (table 1). The monthly average North American SHG premium began the year ranging between 8.4 and 8.5 cents per pound from January through April and then decreased to between 7.8 and 8.0 cents per pound from May through December. Decreasing regional premiums generally are indicative of an increasing supply of zinc in a regional market.

Foreign Trade

The United States was a net exporter of zinc in ores and concentrates, as domestic zinc mine production was significantly more than primary smelting capacity. In 2020, domestic exports of zinc in ores and concentrates were 546,000 t, 31% less than those in 2019, and were sent primarily to Canada (53%), Australia (12%), the Republic of Korea (10%), Belgium (7%), and Japan (7%) for processing. These countries had been leading destinations for exports for the previous several years. However, Spain, which received an average of 14% of United States exports annually from 2016 through 2019, accounted for only 3% of exports in 2020. At a regional level, 53% of exports were sent to North America, 18% to Europe, 17% to Asia, 12% to Australia and Oceania, and less than 1% were sent to Central America and South America. Imports of zinc in ores and concentrates totaled 3,170 t, an increase from 10 t in 2019 (tables 1, 8).

The United States was reliant on imports of refined zinc to meet its domestic consumption needs. Domestic imports for consumption of refined zinc equaled 700,000 t in 2020, 16% less than imports in 2019 (table 1) and were mostly sourced from Canada (70%) and Mexico (19%). Canada and Mexico

were leading suppliers of refined zinc to the United States from 2016 through 2020 and together supplied about 80% of refined imports during those years.

Leading zinc compounds, by import quantity, were zinc oxide, followed by zinc sulfate (table 10). U.S. imports for consumption of zinc oxide equaled 102,000 t in 2020, 3% more than imports in 2019, and imports of zinc sulfate equaled 92,600 t, 28% more than imports in 2019. Imports of most other zinc compounds, including chromates of zinc or of lead, zinc chloride, and zinc sulfide, also increased in 2020. Domestic exports of zinc oxide equaled 44,900 t, almost three times more than exports in 2019, and exports of zinc sulfate equaled 507 t, 4% more than exports in 2019 (table 9).

World Review

Mine Production.—Global zinc mine production in 2020 decreased by 6% to 12.0 Mt from 12.7 Mt in 2019 (table 11). China (34% share of global production), Australia and Peru (11% each), and the United States and India (6% each) were, in descending order of production, the leading producers of zinc in concentrate in 2020. Zinc mine production was reported or estimated to have decreased in most producing countries in 2020, notably in Bolivia (by 168,000 t), China (by 155,000 t), Canada (by 125,000 t), and Peru (by 75,000 t). Partially offsetting these decreases were production increases in South Africa (by 36,000 t), Chile (by 23,000 t), and Brazil (by 10,000 t). According to ILZSG (2021b, p. 6, 10), global zinc mine capacity decreased in 2020 from that in 2019 by a net 89,000 t, mostly as a result of temporary suspensions and permanent closures of zinc-producing mines in Australia, Mexico, and Namibia.

Metal Production.—Global zinc metal production increased slightly in 2020 to 13.8 Mt from 13.6 Mt (revised) in 2019 (table 12). China (46% share of global production), the Republic of Korea (7%), Canada (5%), and India (5%) were the leading producers of refined zinc metal in 2020. In terms of quantity, production increased most notably in China (by 263,000 t), the United States (by an estimated 65,000 t), and Canada (by 27,000 t), which was partially offset by production decreases in Namibia (by 49,000 t), Peru (by 35,000 t), and Japan and Mexico (by 26,000 t each). Global zinc smelter production capacity increased in 2020 by a net 205,000 t, owing mostly to several zinc smelters opening in China and the restart of AZR's zinc refinery in Mooresboro, NC (International Lead and Zinc Study Group, 2021c, p. 7).

Metal Consumption.—According to ILZSG (2021c, p. 30–31, 43), global zinc metal consumption decreased by 4% to 13.3 Mt in 2020 compared with 13.8 Mt in 2019. The leading consumer of zinc was China, accounting for 51% of global consumption, up from 48% in 2019. Other significant consumers included, in decreasing order of consumption, the United States, India, the Republic of Korea, Japan, Belgium, and Germany. Collectively, these countries accounted for 23% of global consumption. Zinc consumption decreased in most major-consuming countries in 2020 compared with that in 2019, most notably India, Japan, and the United States. ILZSG's data indicated that 2020 zinc metal production exceeded consumption for the first time since 2015, by 590,000 t.

Outlook

ILZSG forecast global zinc consumption in 2021 to increase compared with that in 2020 to approximately 14.1 Mt. Zinc metal consumption is expected to increase most notably in Europe, by almost 9%, and increase slightly in China. On the supply side, ILZSG forecast global zinc mine production to increase by 5% as a result of increases in Bolivia, India, Kazakhstan, Mexico, Peru, and South Africa, which would be partially offset by decreases in Brazil, Namibia, and Poland. Metal production is forecast to increase to 14.3 Mt, mostly as a result of a 3% increase in production in China. Overall, zinc metal production is expected to continue to exceed consumption in 2021, by 217,000 t (International Lead and Zinc Study Group, 2021a).

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TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2020, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of zinc
1	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	East Tennessee Zinc Complex ³	Jefferson and Knox, TN	Nyrstar Tennessee Mines - Strawberry Plains LLC	Zinc ore.
3	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Silver-zinc ore.
4	Middle Tennessee Zinc Complex ⁴	Smith, TN	Nyrstar Tennessee Mines - Strawberry Plains LLC	Zinc ore.
5	Empire State (No. 4)	St. Lawrence, NY	Titan Mining Corp.	Do.
6	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
7	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
8	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
9	Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
10	Sweetwater	do.	do.	Do.

Do., do. Ditto.

¹The mines on this list accounted for 100% of recoverable U.S. zinc mine production in 2020.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 76, Alaska's mineral industry 2020.

³Includes the Coy, Immel, and Young Mines.

⁴Includes the Cumberland, Elmwood, and Gordonsville Mines.

TABLE 4
WAEZL ZINC OXIDE PRODUCERS IN THE UNITED STATES IN 2020¹

Company	Location
American Zinc Recycling LLC	Barnwell, SC.
Do.	Calumet, IL.
Do.	Palmerton, PA.
Do.	Rockwood, TN.
Steel Dust Recycling LLC	Millport, AL.
Do. Ditto.	

¹Table includes data available through October 7, 2021.

TABLE 5
ZINC SMELTERS AND ZINC OXIDE PRODUCERS IN THE UNITED STATES IN 2020¹

Company and type	Location
Zinc smelters:	
Primary, Nyrstar Clarksville Inc. ²	Clarksville, TN.
Secondary:	
American Zinc Recycling LLC	Mooresboro, NC.
U.S. Zinc Corp.	Houston, TX.
Zinc oxide plants:	
U.S. Zinc Corp.	Clarksville and Millington, TN.
Zochem LLC	Dickson, TN.

¹Table includes data available through October 7, 2021.

²Capable of processing some secondary raw materials.

TABLE 6
ZINC RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF SCRAP¹

(Metric tons)

Type of scrap	2019	2020 ^c
New scrap:		
Zinc-base	W	W
Copper-base	80,700	80,000
Magnesium-base	440 ^c	400
Total	W	W
Old scrap:		
Zinc-base	W	W
Copper-base	6,000 ^c	6,000
Aluminum-base	971	1,000
Magnesium-base	70 ^c	70
Total	W	W
Grand total	W	W

^cEstimated. W Withheld to avoid disclosing company proprietary data.

¹Table includes data available through October 7, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
U.S. REPORTED CONSUMPTION OF ZINC IN 2020, BY INDUSTRY USE AND GRADE¹

(Metric tons)

Industry use	Special High Grade	High Grade	Continuous Galvanizing Grade	Prime Western	Remelt and other grades	Total
Galvanizing	128,000	76,200	205,000	62,500	--	472,000
Zinc-base alloys	19,800	82	--	--	--	19,900
Brass and bronze	19,200	21,000	--	98	--	40,300
Other	2,560	--	--	--	--	2,560
Total	170,000	97,200	205,000	62,600	--	535,000

-- Zero.

¹Table includes data available through October 7, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8
U.S. EXPORTS OF ZINC ORES AND CONCENTRATES, BY COUNTRY OR LOCALITY¹

Country or locality	2019		2020	
	Quantity (metric tons, zinc content)	Value (thousands)	Quantity (metric tons, zinc content)	Value (thousands)
Australia	64,100	\$101,000	63,300	\$87,200
Belgium	107,000	159,000	40,000	58,000
Brazil	7,030	9,360	--	--
Canada	268,000	475,000	287,000	413,000
China	16	44	--	--
El Salvador	45	150	22	84
Finland	29,400	48,900	15,700	23,600
Germany	29,700	46,900	21,100	32,100
India	18	11	--	--
Italy	33,800	60,600	5,290	7,600
Japan	35,300 ^r	71,500 ^r	38,400	63,100
Korea, Republic of	69,200	132,000	56,500	90,200
Mexico	10,700	17,500	2	3
Panama	4	37	6	28
Peru	5,000	2,010	120	76
Spain	116,000	178,000	18,400	28,600
Switzerland	17,500	17,900	--	--
Total	792,000 ^r	1,320,000	546,000	804,000

^rRevised. -- Zero.

¹Table includes data available through September 15, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF ZINC COMPOUNDS¹

	2019		2020	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or of lead	9	\$624	9	\$507
Lithopone	170	905	522	1,900
Zinc chloride	185	316	419	747
Zinc oxide	15,100	30,900	44,900	56,000
Zinc sulfate	486	648	507	507
Zinc sulfide	2,070	17,300	1,420	13,000

¹Table includes data available through September 15, 2021. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS¹

	2019		2020	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or of lead	32	\$178	36	\$511
Lithopone	1,170	4,240	1,150	4,200
Zinc chloride	196	1,450	275	1,640
Zinc oxide	99,300	272,000	102,000	252,000
Zinc sulfate	72,100	64,700	92,600	70,900
Zinc sulfide	956	3,590	964	4,720

¹Table includes data available through September 15, 2021. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 11
ZINC: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Thousand metric tons, zinc content of concentrate and direct shipping ore, unless otherwise specified)

Country or locality ²	2016	2017	2018	2019	2020
Argentina	23	23	22	15 ^r	15 ^e
Armenia	5 ³	6 ³	6 ^r	6 ^r	8
Australia	885	852	1,147 ^r	1,337 ^r	1,312
Bolivia	487	504 ^r	520	528 ^r	360
Bosnia and Herzegovina	10	10	10	10	12
Brazil	158	156	167	163	173
Bulgaria	15 ^r	16 ^r	16 ^r	18 ^r	15 ^e
Burkina Faso	81	93	99	97	80
Burma	6	13	18 ^{r,e}	21 ^{r,e}	20 ^e
Canada	301	305	305 ^r	336	211
Chile	43	29	27	6	29
China	4,710	4,300	4,172	4,213	4,058
Congo (Brazzaville)	--	4 ^e	4 ^e	5 ^e	5 ^e
Congo (Kinshasa)	13	12	1	6	15
Cuba	--	5 ^e	45 ^e	60 ^e	60 ^e
Dominican Republic	4	4	4	6 ^r	5 ^e
Eritrea	41	95	125	121	122
Finland	46	66	85	68	58
Greece	19 ^{e,3}	18 ³	20	22	26
Guatemala	6	6	--	--	--
Honduras	15	20	28	29	30
India ^e	658	830	750	720	720
Indonesia ³	--	14 ^e	21 ^e	25 ^e	20 ^e
Iran	135	140 ^e	140 ^e	140 ^e	140 ^e
Ireland	148	131	132	122	127
Kazakhstan ⁴	325	316	304	245 ^r	222
Korea, North ^e	30	20	20	20 ^r	20
Korea, Republic of ^{e,3}	2	3	4	4	4
Kosovo	5	4	4	3	4
Mexico	662	671	691	677	638
Mongolia ^{e,3}	50 ^r	41	44	42 ^r	38
Montenegro	16	16	21	19	20
Morocco ^e	42 ³	51 ³	57 ³	51 ^r	50
Namibia	125	133	118	117 ^r	62
Nigeria ^e	14 ^r	22 ^r	27 ^r	23 ^r	20
North Macedonia ^{e,3}	25	24	30	31	32
Pakistan	8 ^{e,3}	20 ^{e,3}	27 ^{e,3}	37 ^{e,3}	35
Peru	1,337	1,473	1,474 ^r	1,404	1,329
Poland	61	50	43	40	40 ^e
Portugal	70	71	145	162 ^r	160 ^e
Russia ⁵	246	255	288 ^r	275 ^r	280
Saudi Arabia	3	22 ^r	24 ^r	30 ^r	27 ³
Serbia	6	4	4 ^r	7 ^r	6
South Africa	27	31	28	125 ^r	161
Spain	76	70	106 ^r	91 ^r	90 ^e
Sweden	258	251	234	245	232
Tajikistan	72	91	83	78 ^r	48
Thailand	34	1	--	--	--
Turkey	202	150 ^{e,6}	190 ^{e,6}	150 ^{e,6}	130 ^{e,6}
United States	805	774	824	753	723
Uzbekistan ^e	30	30	30	30	30
Vietnam	12	12	12	12	12
Total	12,400 ^r	12,300	12,700 ^r	12,700	12,000

See footnotes at end of table.

TABLE 11—Continued
ZINC: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

⁶Estimated. ⁷Revised. -- Zero.

¹Table includes data available through July 12, 2021. All data are reported unless otherwise noted; totals may include estimated data. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Algeria, Romania, and Tunisia may have produced zinc, but available information was inadequate to make reliable estimates of output.

³Data derived from reported production of zinc concentrates.

⁴Data reported by the Agency on Statistics of the Republic of Kazakhstan. May exclude some zinc mine production.

⁵May not include production from some small-scale mining operations.

⁶Estimated based on reported exports of zinc ores and concentrates.

TABLE 12
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, gross weight)

Country or locality	2016	2017	2018	2019	2020
Algeria, primary	3	1 ^r	2 ^r	1 ^r	--
Australia, primary	464	462	490	436	442
Belgium, primary	236	249	275	270 ^e	270 ^e
Brazil, primary	284	245	246	253 ^r	257
Bulgaria, primary	76	74	75	74 ^r	75 ^e
Canada, primary	691	598	620 ^r	655	682
China:					
Primary	5,900	5,674 ^r	5,057 ^r	5,372 ^r	5,545
Secondary	296	470	550	790	880
Total	6,196	6,144	5,607	6,162	6,425
Finland, primary	291	285	295	291	297
France, primary	149	166	155	160 ^e	160 ^e
Germany:					
Primary	134	138	130	131 ^r	130 ^e
Secondary	34	36	50	51 ^r	50 ^e
Total	168	174	180	182 ^r	180 ^e
India, primary	612	800	728	691	688
Iran, primary and secondary	135	140	140 ^e	140 ^e	140 ^e
Italy, primary and secondary	189	186	195 ^e	189	180 ^e
Japan:					
Primary	439	437	442	438	417
Secondary	95	87	79	89	85
Total	534	524	521	527	501
Kazakhstan, primary and secondary	326	331	318	318 ^r	319
Korea, North, primary and secondary ^e	20	15	10	10	10
Korea, Republic of, primary	1,013	970	989	986	987
Mexico, primary	321	327	336	389	363
Namibia, primary	89	84	67	65	16
Netherlands, primary	283	248	268	250 ^{r,e}	250 ^e
Norway, primary	171	172	191	195	192
Peru, primary	342	312	334	340 ^r	305
Poland, primary	161	162	160	159 ^r	154
Russia, primary and secondary	247	257	255	207 ^r	212
Spain, primary	495	500	505	508 ^r	500 ^e
Thailand, primary	73	30	--	--	--
United States:					
Primary	111	117	101	100 ^e	110 ^e
Secondary ^e	15	15	15	15	70
Total	126	132	116	115 ^e	180 ^e
Uzbekistan, primary	85 ^e	47 ^r	38 ^r	35 ^r	35 ^e
Vietnam, primary ^e	10	10	10	11 ^r	10
Grand total	13,800 ^r	13,600 ^r	13,100 ^r	13,600 ^r	13,800
Of which:					
Primary	12,400	12,100 ^r	11,500 ^r	11,800 ^r	11,900
Secondary	440 ^r	609 ^r	695 ^r	945 ^r	1,080
Undifferentiated	917	929	918	864 ^r	861

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through July 12, 2021. All data are reported unless otherwise noted; totals may include estimated data. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Wherever possible, detailed information on raw material source of output (primary—directly from ores and concentrates and secondary—from scrap) has been provided. In cases where raw material source is unreported and insufficient data are available to estimate the distribution of the total, that total has been left undifferentiated (primary and secondary). To the extent possible, this table reflects metal production at the first measurable stage of metal output.