

IRON AND STEEL SLAG

(Data in million metric tons unless otherwise noted)

Domestic Production and Use: Ferrous slags are marketable coproducts of iron- and steelmaking. In 2006, about 21.5 million tons of domestic iron and steel slag, valued at about \$375 million¹ (f.o.b.), was consumed. Iron or blast furnace slag accounted for about 60% of the tonnage sold and was worth about \$340 million; about 90% of this value was granulated slag. Steel slag, produced from basic oxygen and electric arc furnaces, accounted for the remainder.² Slag was processed by about 30 companies servicing active iron and/or steel facilities or reprocessing old slag piles: iron slag at about 40 sites in 14 States and steel slag at about 100 sites in 30 States. Included in these data are about a dozen facilities that grind and sell ground granulated blast furnace slag (GGBFS) based on imported unground feed.

The prices listed in the table below are the weighted average for a variety of ferrous slag types. Actual prices per ton range from about \$0.25 for steel slags in areas where natural aggregates are abundant to nearly \$90 for some GGBFS. The major uses of air-cooled iron slag and for steel slag are as aggregates for asphaltic paving, fill, and road bases, and as a feed for cement kilns. Air-cooled slag also is used as an aggregate for concrete. In contrast, GGBFS is mainly used as a partial substitute for portland cement in concrete mixes and in blended cements. Owing to their low unit values, most slag types are shipped by truck over short distances only (rail and waterborne transportation can be longer). Because of its much higher unit value, GGBFS can be shipped economically over longer distances.

Salient Statistics—United States: ³	2002	2003	2004	2005	2006^e
Production, marketed ^{1,4}	19.1	19.7	21.2	21.6	21.5
Imports for consumption	1.1	1.1	1.0	1.6	1.5
Exports	0.1	0.1	0.1	(5)	(5)
Consumption, apparent ⁶	19.1	19.7	21.1	21.6	21.5
Price average value, dollars per ton, f.o.b. plant	15.50	15.00	15.50	17.20	17.50
Stocks, yearend	NA	NA	NA	NA	NA
Employment, number ^e	2,700	2,700	2,700	2,600	2,500
Net import reliance ⁷ as a percentage of apparent consumption	5	5	4	7	7

Recycling: Apart from the large outside markets for slag in the construction sector, some iron and steel slags are returned to the furnaces as ferrous and flux feed. Entrained metal, particularly in steel slag, is routinely recovered during slag processing for return to the furnaces. However, data for such furnace-feed uses are unavailable.

Import Sources (2002-05): Canada, 43%; Italy, 23%, France, 21%; Japan, 7%; and other, 6%.

Tariff:	Item	Number	Normal Trade Relations
			12-31-06
	Granulated slag	2618.00.0000	Free.
	Basic slag	3103.20.0000	Free.
	Slag, gross, scale, from manufacture of iron and steel	2619.00.3000	Free.

Depletion Allowance: Not applicable.

Government Stockpile: None.

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Events, Trends, and Issues: Domestic supplies of air-cooled blast furnace slag are in decline owing to depletion of old slag piles and the closure of many blast furnaces over the years for economic and/or environmental reasons. No new blast furnaces are under construction or are planned. Steel slag from integrated works also is in decline, but slag from electric arc furnaces (largely fed with steel scrap) remains abundant. Both of these slag types compete with natural aggregates. Demand is growing for GGBFS in concrete; this demand and the much higher unit sales price for GGBFS have led to two new granulators being added in recent years to existing blast furnaces, and the construction of a number of grinding facilities at independent sites or at cement plants to process imported granulated slag. Against this expansion of GGBFS-production capacity was the likely permanent idling, in mid-2005, of one blast furnace that had long been equipped with a granulator. Also, production at an import-based grinding plant in Louisiana ceased from the end of August 2005 for about 6 months owing to damage sustained during Hurricane Katrina. Pelletized slag, used mainly as a lightweight aggregate, remains in limited supply. Overall, most of the demand for slag is in large-scale (mostly public-sector) construction projects and fluctuates with levels of construction spending.

World Mine Production, Reserves, and Reserve Base:⁸ Slag production data for the world are unavailable, but it is estimated that annual world iron slag output is on the order of 200 to 240 million tons, and steel slag about 115 to 180 million tons, based on typical ratios of slag to crude iron and steel output.

World Resources: Not applicable.

Substitutes: Slag competes with crushed stone and sand and gravel as aggregates in the construction sector. Fly ash, certain rock types, and silica fume, are common alternatives to GGBFS as cementitious additives in blended cements and concrete. Slags (especially steel slag) can be used as a partial substitute for limestone and some other natural (rock) materials as raw material for cement kilns.

⁰Estimated. NA Not available.

¹The data (obtained from an annual survey of slag processors) pertain to the quantities of processed slag sold rather than that processed or produced during the year. The data exclude any entrained metal that may be recovered during slag processing and returned to iron and, especially, steel furnaces, or any slag itself returned to the furnaces. Data for such recovered metal and returned slag were unavailable.

²There were very minor sales of open hearth furnace steel slag from stockpiles but no domestic production of this slag type in 2002-06.

³Owing to inclusion of more complete information (especially for granulated slag), data in 2002-06 are not strictly comparable to those of recent years prior to 2002.

⁴The data include sales of imported granulated blast furnace slag, either after domestic grinding or still unground, and exclude sales of pelletized slag (proprietary but very small). Overall, actual production of blast furnace slag may be estimated as equivalent to 25% to 30% of crude (pig) iron production and steel furnace slag as about 10% to 15% of crude steel output.

⁵Less than ½ unit.

⁶Defined as total sales of slag (includes that from imported feed) – exports. Calculation is based on unrounded original data.

⁷Defined as total sales of imported slag – exports of slag. Data are not available to allow adjustments for changes in stocks.

⁸[See Appendix C. for definitions.](#) Slag is not a mined material, and the concept of reserves thus does not apply to this commodity.