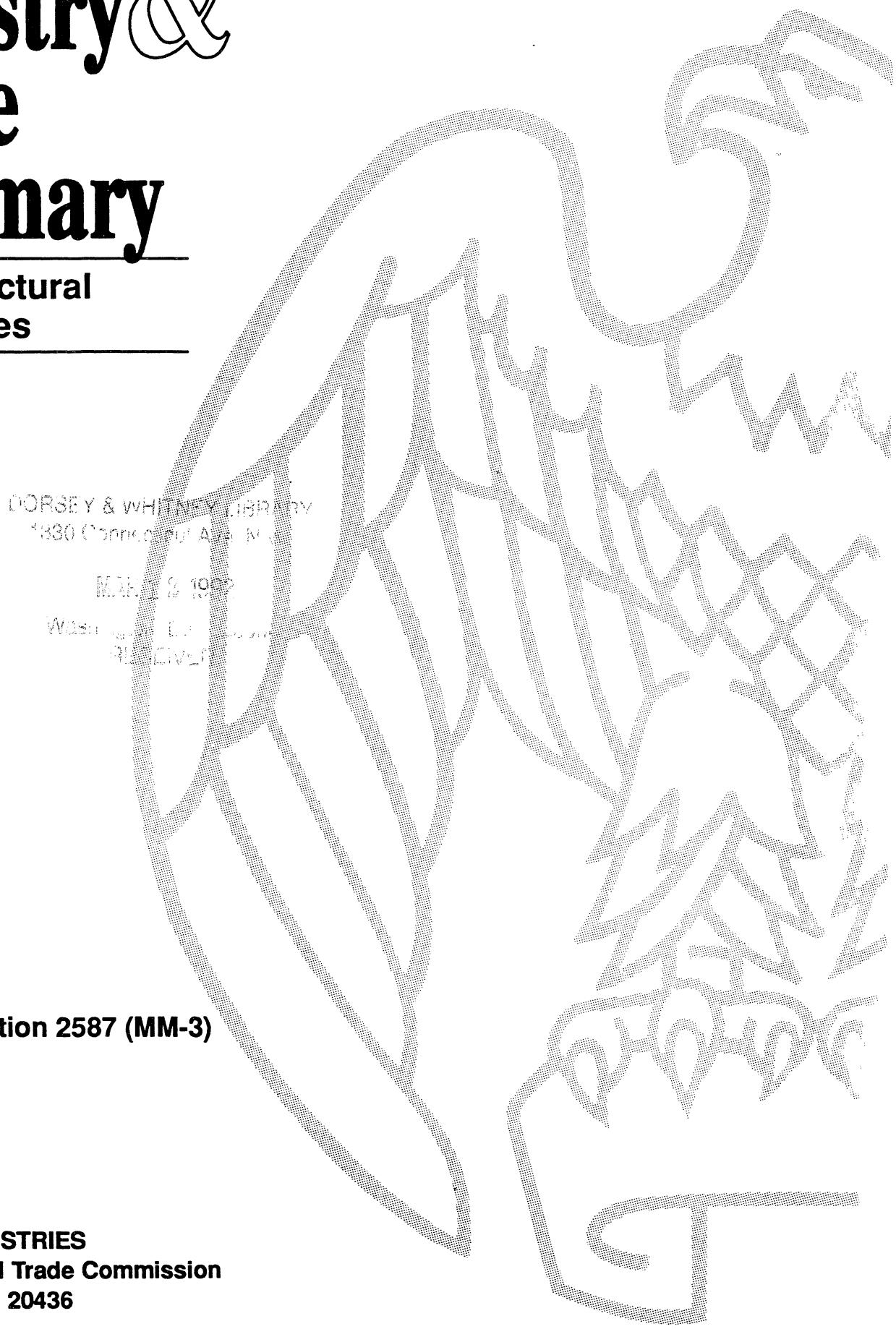
Industry & Trade Summary

Heavy Structural Steel Shapes



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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.[1]

This report on heavy structural steel shapes covers the period 1987 through 1991 and represents one of approximately 250 to 300 individual reports to be produced in this series during the first half of the 1990s. Appendix A explains tariff and trade agreement terms. Appendix B is a glossary of technical terms used in this report. Listed below are the individual summary reports published to date on the minerals and metals sector.

USITC publication number	*Publication date*	*Title*
2475(MM-1)	July 1992	Flurospar and certain other mineral substances
2504(MM-2)	November 1992	Ceramic floor and wall tiles
2587(MM-3)	January 1993	Heavy structural steel shapes

[1] The information and analysis provided in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

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INTRODUCTION

This summary examines the heavy structural steel shapes industry from 1987 to 1991. During this 5-year period the structure of the industry changed substantially, as low-cost minimills successfully captured increasing market share at the expense of imports and the larger integrated mills. These changes are especially notable in the market for wide flange beams. Furthermore, minimills have led the way toward aggressive pursuit of international markets.

The report is broadly divided into four sections. First, this introduction includes a discussion of the products covered and their significance in terms of imports and shipments, the processes and materials used to make heavy structurals, and principal end uses. Second, a detailed picture of the U.S. heavy structural steel industry is presented, emphasizing the major changes within the industry during the relevant period. Profiles of foreign industries follow. Third, U.S. and foreign trade measures are described. Finally, an examination of domestic and foreign markets for heavy structural products reviews consumption, production, import, and export levels and trends.

This report covers heavy structural steel shapes. It does not cover light structural steel shapes or sections with a cross-section of less than 3 inches. Heavy structural shapes (figure 1) include rolled flanged sections and special sections with at least one dimension of their cross-section 3 inches (80 millimeters) or greater. Beams, channels, tees, and zees with a depth dimension of 3 inches or greater and angles with a leg length of 3 inches or greater are all classified as heavy structural steel shapes. This category includes bulb angles, car channels, center sills, H-columns, standard I-beams, ship channels, special sections, stanchions, special car building sections, and wide flange beams.

In 1991, U.S. shipments of these products were 5.2 million tons.[1] Imports the same year were 459,899 tons, worth $186.4 million. Heavy structurals are used primarily for construction purposes, including bridges, buildings, ships, and railroad rolling stock. Wide flange beams make up a major portion of the category under examination, averaging nearly 50 percent of the heavy structural market between 1987 and 1991.[2] Competition in this principal product segment is intense.

This report focuses on the changing structure of the U.S. industry: minimill producers have gradually pushed foreign and domestic integrated producers out of the U.S. market, structural steel producers have successfully competed with concrete producers, and exports have grown tremendously. Combined with falling imports, this export growth has led to a positive trade balance in these products.

[1] American Iron and Steel Institute, interview by USITC staff, Apr. 6, 1992.

[2] American Iron and Steel Institute, interview by USITC staff, Mar. 13, 1992.

Following a period of consolidation and renovation within the U.S. steel industry involving elimination of considerable production capacity, only one integrated producer[3] of structural steel shapes remains. Nonintegrated minimill facilities accounted for the majority of production throughout the period.[4] Minimills produce steel by melting recycled scrap metal in electric arc furnaces.

After being embodied with desired properties, molten steel is cast into a form that can enter the rolling process. The industry currently uses two principal methods of casting: ingot teeming and continuous casting. In ingot teeming, the traditional process, steel is poured into individual molds where it solidifies. The ingots are then placed in "soaking pits" and heated until each reaches a uniform temperature, ensuring uniform metallurgical structure. After this reheating, the ingots are ready to be processed, or rolled, into semifinished shapes in a breakdown mill and, later, rolled to size and profile specifications.

Continuous casting, a newer production process, bypasses several steps of the conventional process by casting steel directly into blooms, billets, or beam blanks, commonly called semifinished shapes (see figure 2). The many benefits derived from this quicker casting method include increased yield and productivity, improved product quality, capital savings, decreased energy consumption, and less pollution. Currently, 76.7 percent of all U.S. steel is continuously cast,[5] compared with 89.7 and 93.9 percent respectively for the European Community and Japan in 1990.[6] In continuous casting, molten steel is poured into a reservoir called a tundish, from which it is released into the molds of the casting machine where a solid skin is formed. As the columns of steel descend through the molds, water sprays cool the cast steel, completely solidifying it. At this point in the process the semifinished steel may proceed directly for further processing or may be cooled and stored for later finishing.

Various innovations at the casting stage have affected the production of structural steel. Most structural shapes producers now cast steel into beam blanks rather than traditional square or rectangular blooms and billets. Beam blanks are "dogbone" shaped and approximate the final shape of a beam. On the very cutting edge of casting technology is near-net-shape casting, currently utilized only by Chaparral Steel (Midlothian, TX), which produces blanks with a web half as thick as those of conventional beam blanks.[7]

[3] Integrated steel production utilizes the blast furnace/basic oxygen furnace (BOF) process of steelmaking: iron ore, limestone, and coke are reduced in the blast furnace and the molten steel is refined in the BOF.

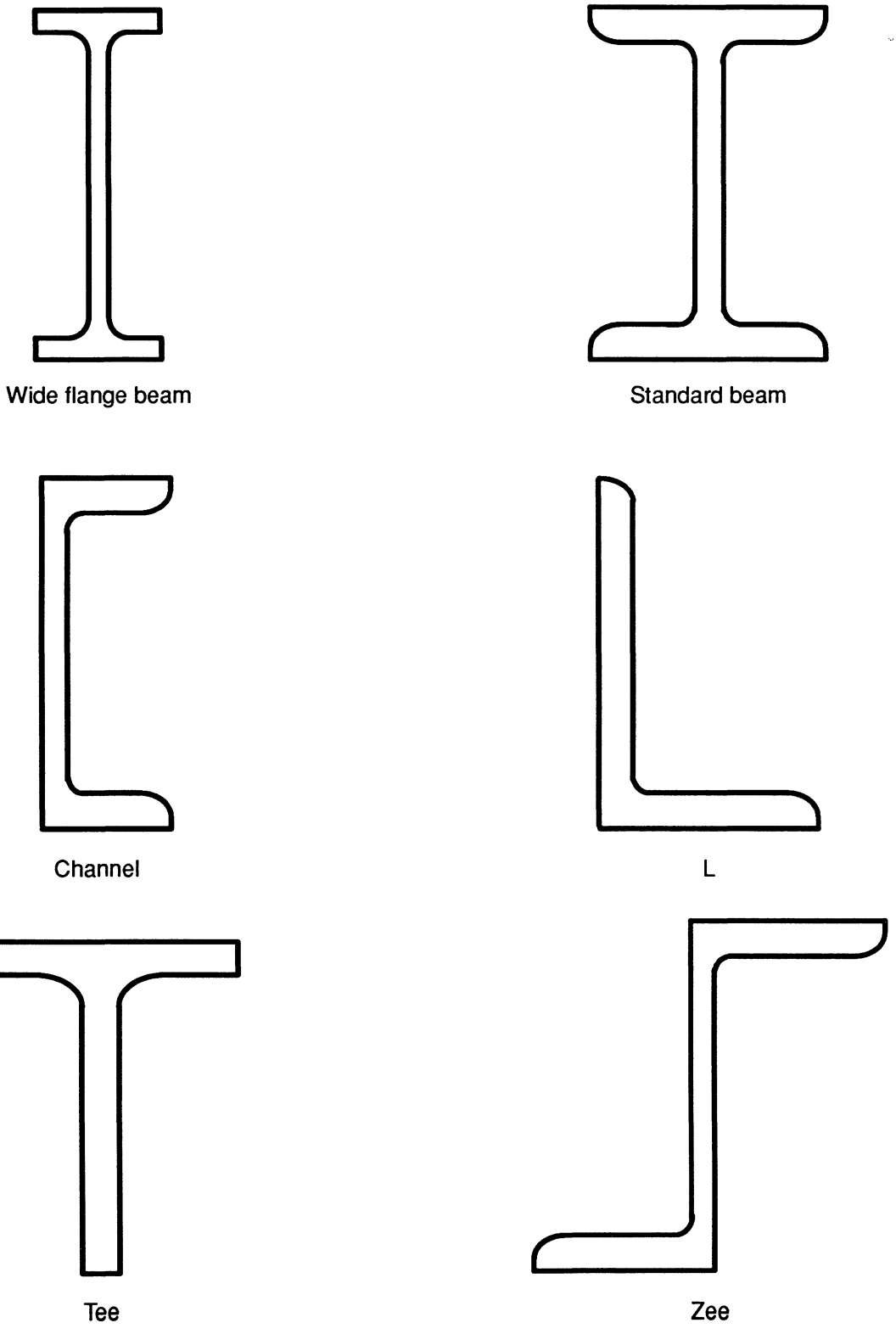
[4] For more detail see "Industry Structure."

[5] American Iron and Steel Institute, monthly publication, Apr. 1992.

[6] International Iron and Steel Institute, *Steel Statistical Yearbook 1990*, Brussels, 1991, p. 11.

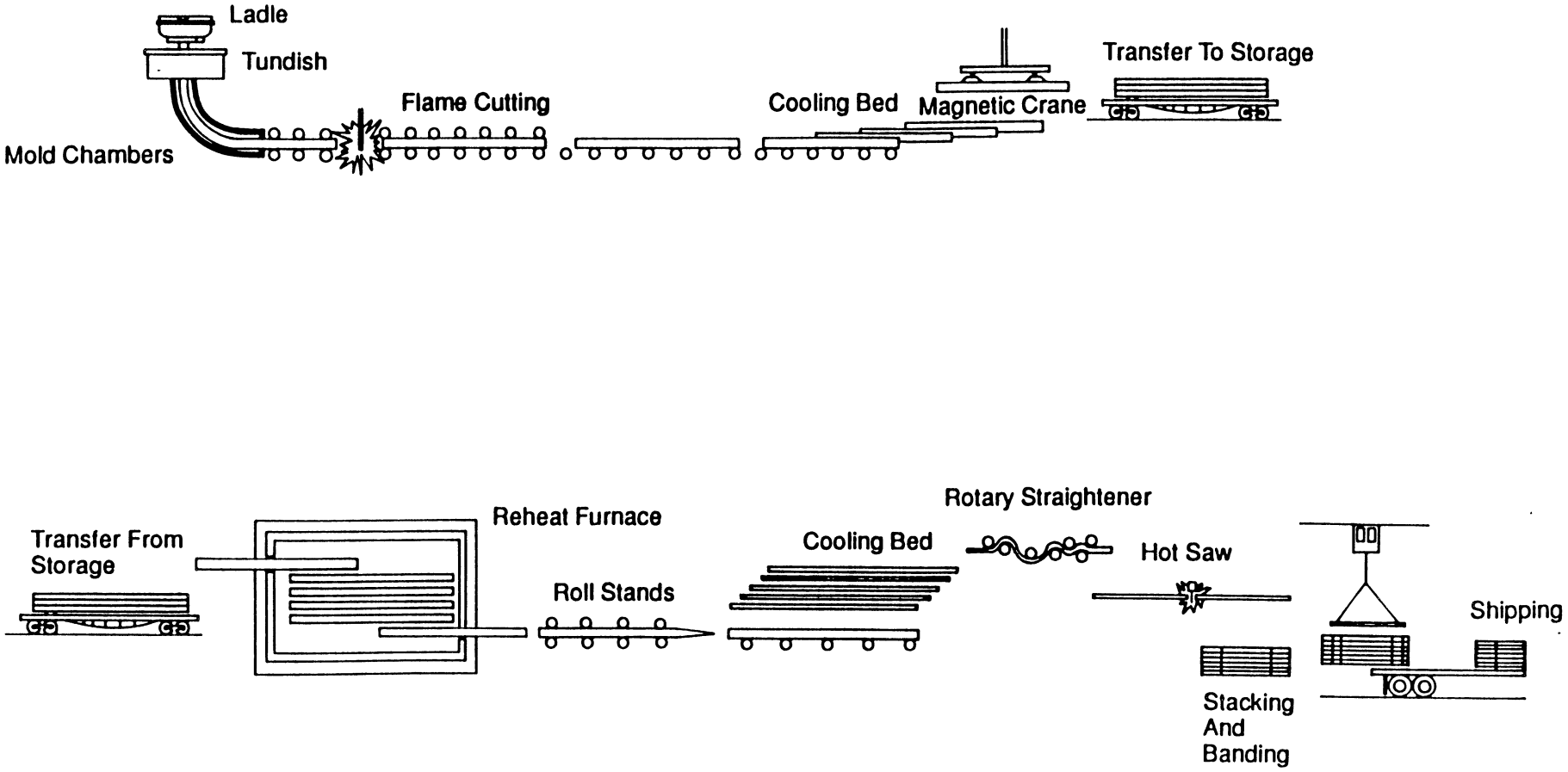
[7] For more information on near-net-shape casting, see "Research and Development."

Figure 1
Structural steel shapes



Source: USS, Division of USX Corp, USX Corp., *USS Structural Steel Shapes*, product catalogue, undated.

Figur
Heavy structural steel shapes: The continuous casting process



Source: Northern Steel and Wire Co., *Northwestern: Making It in Steel*, promotional brochure.

Structural production involves a number of processes generally common to all shapes. After being heated to equalize the temperature throughout the bloom, billet, or beam blank, semifinished steel is passed through various forming rolls to produce the desired shape. Next, the steel shapes are cooled and conveyed to a straightening machine. Finally, they are cut to specified lengths, are inspected for imperfections, and are tested for specified metallurgical properties, making them ready for shipment.

U.S. INDUSTRY PROFILE

Industry Structure

Prior to 1987 cost competition forced many integrated producers to exit this product segment, eliminating significant capacity from the domestic industry and leaving as the dominant integrated producers Bethlehem Steel Corp., Inland Steel Co., and the United States Steel (USS) Division of USX Corp. Over the last 5 years, the structure of the heavy structurals industry has changed dramatically, as low-cost minimill producers have displaced both domestic and foreign integrated mills in the U.S. market. Despite efforts by remaining integrated producers to retain market share through production of niche products, aggressive pricing and production practices by the minimills, combined with generally low prices and depressed demand, had forced out all but one integrated mill by early 1992.

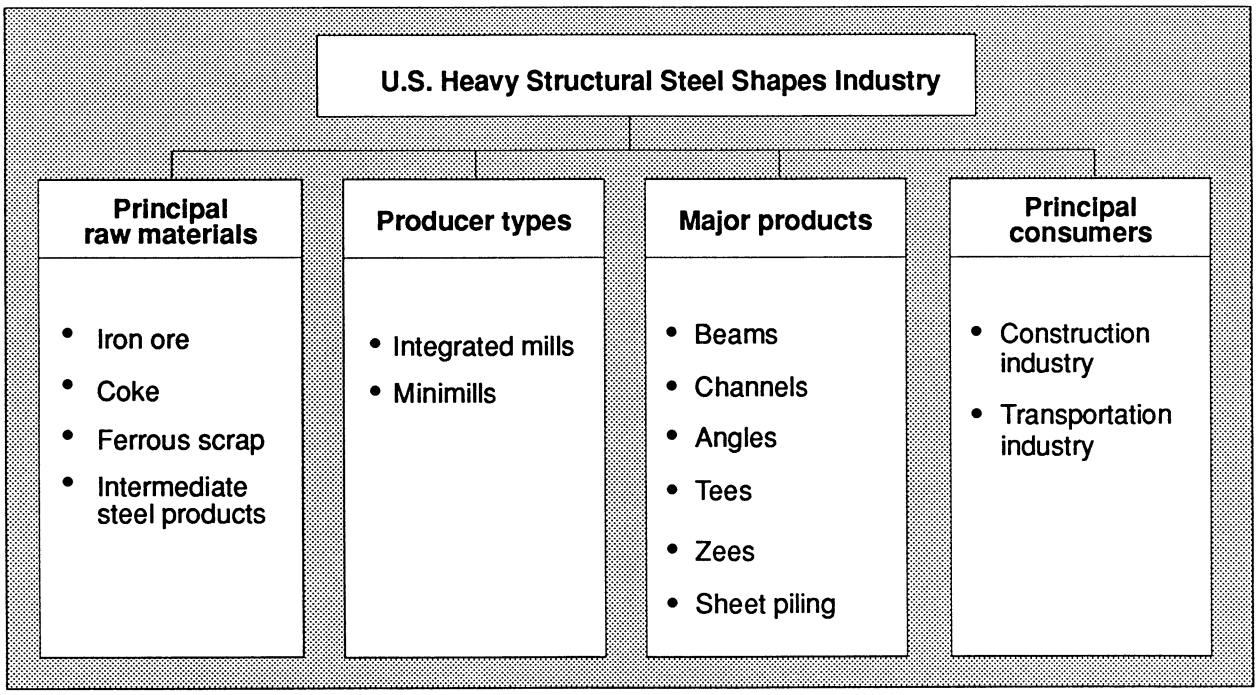
The general structure of the heavy structural steel shapes industry is outlined in figure 3, which details major raw material inputs to production, producer types, products, and consumers. These products are classified under SIC product codes 3312416—carbon steel structural shapes (heavy); 3312434 and 3312435—other wire rods, plates, structural shapes and cold finished strip (except stainless); and 3212453—stainless steel plates and structurals.

Faced with the minimill challenge, Inland Steel discontinued structurals production, shutting down a mill at its Indiana Harbor Works in 1991.[8] USS followed, with an announcement on January 9, 1992, of intent to permanently close its South Works structural plant on April 10, 1992.[9] In 1992 Bethlehem

[8] U.S. International Trade Commission, *Steel Industry Annual Report on Competitive Conditions in the Steel Industry and Industry Efforts to Adjust and Modernize*, (investigation No. 332–289), USITC publication 2436, Sept. 1991, p. 7–6.

[9] U.S. Steel, press release, Chicago, Jan. 9, 1992. Thomas J. Usher, president of U.S. Steel, attributed the decision to several factors, including increased inroads into the large structural beam market by nonunion and lower cost union minimills, a low level of high-rise construction activity, depressed prices, and the negative outcome of a joint Employee Stock Ownership Plan study.

Figure 3
U.S. heavy structural steel shapes industry: Principal raw materials, producer types, major products, and principal consumers



Source: U.S. International Trade Commission, *Steel Industry Annual Report: Competitive Conditions in the Steel Industry and Industry Efforts to Adjust and Modernize*, USITC publication 2436, Sept. 1991.

announced its intention to divest its bar, rod, and wire division. Further rationalization could involve restructuring the Structural Products Division in Bethlehem, PA, the subject of attempted joint venture discussions with British Steel.[10] Bethlehem has stated that it is re-evaluating the future of its structural products division and remains committed to idling blast furnace/BOF steelmaking at the Bethlehem, PA plant.[11] Industry observers, noting minimill incursions into the medium-to-heavy structurals range, particularly by Nucor-Yamato Steel Co., Northwestern Steel & Wire, and Chaparral Steel, maintain that Bethlehem must either significantly lower its costs or exit the market for some size ranges. According to some observers, Bethlehem's ability to attract new investment to its structurals division is limited, as evidenced by the unsuccessful joint venture discussions with British Steel.

Despite industry restructuring, by early 1992 19 producers[12] of heavy structural shapes continued to operate mills throughout the United States (table 1). This number was not a substantial change from the 23 firms operating in 1987. The most important change during the period was Inland's withdrawal from the structurals market in 1991. Concentration among these firms remains moderate but has declined during the past 5 years. In 1987 the four largest firms controlled 64.6 percent of the heavy structurals market; by 1991 their market share had dropped to 57.6 percent.[13]

Production Costs

Reflecting the intense rationalization of production capacity and the resulting restructuring that the entire steel industry underwent during 1987 to 1991, employment at mills producing heavy steel structural shapes declined, to approximately 10,000 employees in 1991.[14] The closure of U.S. Steel's South Works plant reduced employment levels within the industry by an additional 690 employees.

Wages are not available by industry segment. However, production workers in the steel industry as a whole experienced rising nominal earnings and compensation[15] between 1987 and 1990 (the latest year for which data are available), from $13.77 to $14.8 per hour (7.6 percent) and from $22.61 to $24.29 per hour (7.4 percent), respectively. Over this time the Consumer Price Index increased by 24.8 percent. Indexed labor productivity (also available only for the entire steel industry) increased substantially over the time period, by 13.4 percent.[16]

Despite progress in reducing labor costs, part of the integrated mills' lack of competitiveness in this market stems from the higher costs imposed by long-established work rules that require mills to employ more workers than modern technology and work practices necessitate.[17] For example, although intensive rationalization by Bethlehem reportedly has significantly cut labor costs, production costs at minimills are only $20 per hour, allowing them to price aggressively and to expand market share.[18] It is estimated that after Nucor-Yamato's new mill comes on line, the share of the wide flange beam market remaining with integrated mills will be less than 10 percent.[19]

Lower environmental compliance costs have also given minimills a relative cost advantage, although costs for all structurals producers have increased. Minimills' electric arc furnaces (EAF) avoid coking and iron ore pollution, although EAF dust must be captured and treated to meet environmental standards.[20] At least one minimill structurals producer has already been the target of a lawsuit filed by the Environmental Protection Agency for alleged hazardous waste disposal violations. In an effort to reduce costs, the remaining integrated producer plans to close its blast furnace/basic oxygen furnace and will likely source semifinished steel from one of its EAF facilities.

Products, Marketing, and Pricing

The diversity of product lines varies among producers, with integrated mills traditionally concentrating at the heavier end[21] of the spectrum and minimills at the lighter end. Over the past 5 years, construction of new mills, purchase of new equipment,

[10] For more information on this proposed joint venture, see "Globalization."

[11] Bethlehem Steel Corp., press release, Bethlehem, PA, Jan. 29, 1992.

[12] Nine of these producers principally produce light structurals but roll a few products exceeding the 3–inch delineation. The remaining 10 producers all produce beams.

[13] U.S. International Trade Commission, *Quarterly Report on the Status of the Steel Industry*, (investigation No. 332–226), USITC publication No. 2465, Dec. 1991, pp. i–vii.

[14] Includes some employment figures for entire mills and somewhat overstates the number employed specifically by the products under consideration. Industry officials, interviews by USITC staff, Mar. 20, 1992.

[15] Earnings include overtime earnings. Compensation includes both direct and indirect payments to workers. Direct payments include payment for time worked (e.g., wages), payment for time not worked (e.g., vacation and holiday pay), bonuses, and other incentive or special pay. Indirect payments include employer contributions to legally required insurance programs and contractual and private benefit plans.

[16] Official statistics of the U.S. Department of Labor, Bureau of Labor Statistics.

[17] Industry official, interview by USITC staff, July 22, 1992.

[18] James F. Collins, president, Steel Manufacturers' Association, statement presented at Metal Bulletin's 7th International Mini–Mill Conference, Orlando, FL, Mar. 2, 1992.

[19] U.S. industry official, interview by USITC staff, Apr. 23, 1992.

[20] USITC, *Steel Industry Annual Report*, USITC publication 2436, p. 3–27.

[21] Heavy structurals are further classified as lighter ("medium" beams) or heavier ("jumbo" beams) depending on their load–bearing capacity.

Table 1
Heavy strucutural steel shapes: Producers, mill locations, mill type, capacity, products, and size range, 1991

Producer	Mill location	Mill type	Capacity	Products and size range
			In tons	
Arkansas Steel Assoc.	Newport, AR	Minimill	220,000	Angles to 5x3".
Auburn Steel	Auburn, NY	Minimill	350,000	Channels, angles to 4".
Bayou Steel	LaPlace, LA	Minimill	600,000	Equal angles to 6x6", unequal angles 4x3"-7x4", wide flange beams 4-10", standard I-beam, 3-6", channels, 3-8".
Bethlehem Steel Corp.	Bethlehem, PA	Integrated	4,200,000	Wide flange beams 4-40".
Birmingham Steel, Salmon Bay Steel Div.	Seattle, WA	Minimill	220,000	Angles, channels to 4".
Calumet Steel	Chicago Heights,IL	Minimill	150,000	Channels to 5x1/2", Angles 3x2".
Chaparral Steel	Midlothian, TX	Minimill	1,500,000	Angles to 6", channels, 6-12", I-beams 3-8", WF beams 4-24".
CMC Steel Group, SMI Steel, Inc.	Birmingham, AL			
	Sequin, TX	Minimill	350,000	Equal angles to 6", unequal angles to 6x4", channels 3-8", beams 4-8".
Florida Steel	Jackson, TN	Minimill	350,000	Equal angles to 4", unequal angles to 4x3-1/2", channels 3-6".
J&L Structural, Inc.	Aliquippa, PA	Minimill	180,000	Beams to 6", special sections.
McDonald Steel	McDonald, OH	Minimill	145,000	Special sections.
North Star Steel	Calvert City, KY	Minimill	250,000	Channels 6-12", angles 4-8", beams 4-10", misc. channels 3-12".
Northwestern Steel & Wire	Sterling, IL			
	Houston, TX	Minimill	1,550,000	Channels 10-15", WF beam 6x4-18x7-1/2".
Nucor Corp.	Charlotte, NC	Minimill	2,100,000	Angles to 6", channels to 6", standard beams 3-4".
Nucor-Yamato Steel Co.	Blytheville, AR	Minimill	1,000,000	Wide flange beams 6-24".
Roanoke Electric Steel	Roanoke, VA	Minimill	400,000	Angles to 3", channels to 3".
Sheffield Steel	Joliet, IL	Minimill	162,000	Channels to 4", angles to 3x3".
Slater Steels	Ft. Wayne, IN	Minimill	17,000	Equal angles to 3x3/8".
Steel of West Virginia	Huntington, WV	Minimill	170,000	Channels, I-beams to 8.5", special shapes to 6".
USS, Div. of USX Corp.[1]	Chicago, IL	Integrated	800,000	Wide flange beams 8-36".

[1] On January 9, 1992, USS announced a proposal to permanently close the South Works structural facility on April 10, 1992.

Source: "Bar/Structural Mill Roundup," *33 Metal Producing*, vol. 29, No. 5, May 1991, pp. 110-115, and Association of Iron and Steel Engineers, *Directory: Iron and Steel Plants, 1991* (Pittsburgh: AISE, 1991).

and adoption of new technology have allowed minimills to expand into heavier structurals and to successfully compete directly with most of the integrated mills' product lines.

Bethlehem, the only domestic integrated mill remaining in the structurals market, has attempted to maintain market share by concentrating on the heaviest structurals, which are too large for minimills to roll. In 1991 Bethlehem began to offer a limited range of 40-inch wide flange beams. This expansion allowed Bethlehem to compete with imports from British Steel Plc and Arbed SA of Luxembourg. However, Bethlehem's efforts may be affected by Nucor-Yamato's current expansion of its Blytheville, AR, operation, which will enable the minimill to enter the 40-inch market.

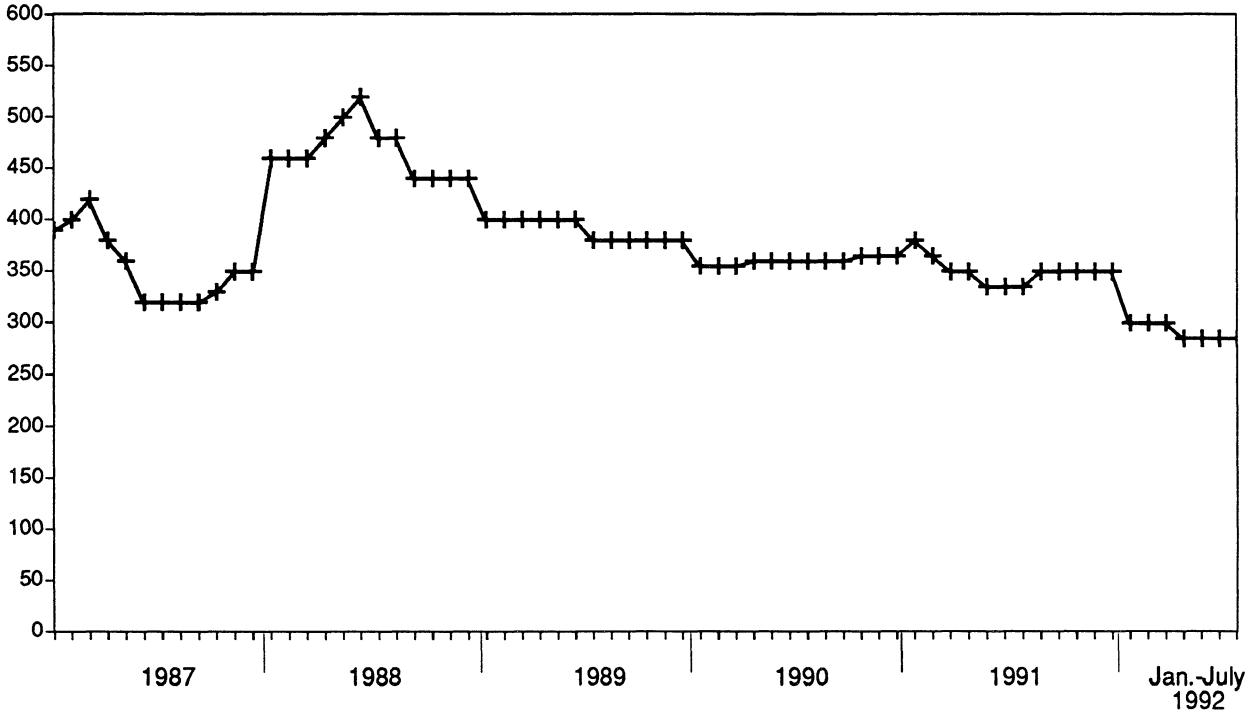
Most structural products are marketed either directly by the producer or through a steel service center. In the early 1980s several service centers began to focus primarily or exclusively on structural shapes, increasing the size and range of heavy section inventories. Sourcing from service centers rather than producers meant fabricators could reduce inventories by relying on centers for just-in-time delivery. Currently some industry executives report that the role of service centers has declined, with more product going directly from mill to fabricator.[22] This observation is supported by the significant retrenchment of the largest structurals service center chain (Levinson Steel Co.) over the past few years. The possible impact of this trend on fabricator and mill inventories remains unclear.

Structurals have been subject to the low prices affecting the entire steel industry. After rising from 1987 to 1988, prices for wide flange beams, generally taken as a standard for the structural industry, have fallen steadily through early 1992 (see figure 4). Faced with weak demand throughout the late 1980s and early 1990s, producers have aggressively cut prices in an attempt to maintain market share. Tentative price hikes by various producers have rarely taken hold, largely due to lack of a clear price leader in this sector. Price competition has become even more aggressive due to an intense battle for market share between Nucor-Yamato and Chaparral. In an attempt to increase orders, producers have offered incentives in addition to low prices, including free tonnage with large purchases.[23]

[22] U.S. industry officials, interview by USITC staff, Mar. 6, 1992.

[23] In March 1992 Nucor–Yamato instituted a "Customer Appreciation Program" that included 3 tons of free beams for every 100 tons purchased within a 3–month period. Only certain segments of Nucor–Yamato's product line were eligible for this incentive. Nucor–Yamato Steel Co., sales manager, interview by USITC staff, June 8, 1992.

Figure 4
Wide flange beams: Transaction price per ton, 1987-91, and January-July 1992
Dollars per ton



Source: Purchasing Magazine, various issues.

Among the market leaders, pricing perspectives vary dramatically. Whereas some firms are willing to support a soft market by cutting production, others remain determined to keep capacity utilization at high levels and are willing to cut prices to keep production levels high.[24] Recently firms have priced aggressively because now that most integrated and import competition has been pushed out of the structurals market, domestic minimills are vying for increased market share.

Research and Development

Most of the new process technology and research and development that have affected the steel industry as a whole have also benefited structurals producers. These developments include advanced process technology, decreasing minimum efficient scale, increased use of computerization, and convergence of integrated and minimill technology. These developments have allowed economic production of steel products at significantly smaller plants with reduced capital requirements.[25]

Regarding structurals production, the most important innovations have resulted from wider adoption of continuous casting technology and from refining the process of casting shapes, both of which significantly reduced production costs. Relatively few mills continue to roll structurals from square or rectangular blooms or billets; instead, beam blank casting allows steelmakers to cast shapes that more closely approximate the final shape. The reduction in rolling mill requirements has decreased minimum efficient scale, permitting small-scale production of most sizes of structural shapes. Beam blank casting has been installed by several U.S. minimills, resulting in costs estimated to be $40 to $50 per ton lower (approximately 10 to 15 percent) than traditional production methods.[26]

Beam blank casting has been further refined at Chaparral, allowing operators to produce a blank for wide flange beams that is even nearer to the final shape. In conventional practice a typical beam blank has a dog bone shape with the center web at least four inches thick. For the heaviest structurals the web can be seven inches or more. At Chaparral, which concentrates on medium structurals, "near-net-shape" casting produces a beam with a web only 2 inches thick. By casting a relatively thin section, Chaparral reduces the amount of reheating and hot working needed, thus speeding up production and reducing energy costs.

Although near-net-shape casting dramatically reduces the number of roll passes necessary, there is a tradeoff between number of passes and number of blank profiles that must be cast. Chaparral has reduced the number of passes and amount of time to finish structurals, but it must cast a large number of profiles to produce its entire product line. In contrast, some mills, notably Nucor-Yamato, have preferred to cast fewer profiles and make more passes. Despite this tradeoff almost all mills have adopted the new technology to some degree. Of the domestic producers, only Bethlehem continues to roll ingots into blooms and blooms into structural shapes. Continued use of ingot teeming reflects Bethlehem's decision to invest modernization capital in other segments of its product line, although their plans for restructuring their operations will eliminate ingot casting. This older technology hampers Bethlehem's efforts to compete with the minimills on quality; continuous beam blank casting leads to more uniform quality, which cuts production costs and fabricators' repair times.[27]

Globalization

The steel industry has historically had a global character in the sense that finished steel mill products, technology, and raw material inputs have long been traded among nations. Until recent years, cross-border ownership of steelmaking assets was relatively limited. Recently, certain producers and steel traders have globalized their operations through the full or partial acquisition of assets that produce, process, or distribute steel.

The formation of joint ventures with foreign firms has provided U.S. steelmakers with greater access to capital and new technology necessary for modernization and has provided foreign partners with increased access to the U.S. market and distribution network. Foreign firms have found joint ventures an attractive means to supply traditional clients who have facilities in the United States. Other factors motivating the participation of foreign producers in the U.S. steel industry are exchange-rate movements, which have made investment in the United States relatively inexpensive, and the potential effect of trade measures, such as the voluntary restraint arrangements (VRAs), which imposed limits on certain countries' steel exports to the United States between October 1984 and March 1992.

The most notable joint venture in heavy structurals products is Nucor-Yamato, owned 51 percent by Nucor Corp. and 49 percent by Japan's Yamato-Kogyo Co., which was conceived in mid-1986 and started operations in 1988. The joint venture exports steel in one of the categories that was limited by Japan's VRA with the United States and provides Yamato with a desired manufacturing base in the U.S. market.

Bethlehem's efforts to maintain market share in the face of growing minimill competition led to joint venture discussions with British Steel Plc. The plans were canceled in late 1991, after failure to reach agreement with the United Steelworkers Union on which the deal was contingent. The venture was designed to open international markets to Bethlehem and to allow British Steel to gain U.S.

[24] U.S. industry officials interview, Mar. 6, 1991.
[25] USITC, *Steel Industry Annual Report*, USITC publication 2436, pp. 3–35 to 3–44.
[26] Ibid.
[27] George J. McManus, "Steel Plant Additions Are One in a Million," *Iron Age*, Jan. 1991, pp. 27–28.

technology and increase market share.[28] The unsuccessful joint venture negotiations cast further doubts on Bethlehem's ability to maintain its position in the structurals market.

Consumer Characteristics and Factors Affecting Demand

The construction industry is the principal consumer of heavy structural steel shapes. Shipments to this industry are even more significant than indicated by table 2 because most of the structural steel routed through service centers and shipped for converting and processing is destined for the construction market. Two observable trends have affected structural shapes consumption over the past 5 years: steel's successful competition with concrete and poor economic conditions within the construction industry.

Structural steel shapes compete closely with reinforced concrete as the load-bearing, structural material for buildings and bridges. The relative cost competitiveness of the two is site specific, depending on a variety of factors, including geographic location; structure height; intended use of structure; climactic, atmospheric, and seismic conditions; price and availability of skilled labor; and architectural preferences.

Steel structurals have successfully captured an increasing share of the high-rise building construction market. Analysis of contract award information for projects over three stories revealed a market share gain of over 10 percentage points in 4 years. The drop in concrete use, from 50 percent in 1985 to 39 percent in 1989, meant that steel captured 17 million square feet in 1989 that once belonged to concrete. In large part (12.2 million square feet), gains came in four- to seven-story buildings, which make up 50 percent of the high-rise market. A report by the Portland Cement Association (PCA) concluded that the downward trend in concrete use shows no indications of slowing.[29] Steel has also made strides in the short-span bridge market, previously considered almost exclusively concrete's domain.[30]

Steel's success at capturing market share from concrete has been based on extensive marketing efforts by the industry and on price reductions to render steel products more competitive. Inspired by the success of a British steel industry advertising campaign, which helped that industry gain an additional 40 percent of the construction market,[31] fabricators and five steel mills have created the American Institute of Steel Construction Marketing (AISC Marketing), which promotes steel use in buildings and bridges. The cement industry attributes a considerable portion of its losses in construction to marketing efforts by this group and others. In response a subcommittee of the PCA's General Promotion Committee in several metropolitan areas has organized multi-industry high-rise concrete promotion groups intended to offset steel industry promotion efforts.[32]

In an effort to capture further market share from concrete, structural producers have been active in promoting the use of high-strength structurals. In association with AISC Marketing, structurals producers are attempting to establish 50,000 pounds per square inch (A572/50) as the standard minimum yield for wide flange beams (36,000 pounds or A36 is the current standard). According to the trade association, adoption of the new standard would slash production expenses for structural steel producers, would cut inventory costs for distributors, and would generate more business for steel fabricators. The new standard is expected to be adopted with relative ease some time in 1994, since the product has already been in use for several years.[33]

[28] Walter Williams, Bethlehem Steel Chairman and CEO, reported in Laura Viani, "Bethlehem–British Steel Deal Seen by End of '91," *American Metal Market*, May 24, 1991, pp. 2, 16.

[29] Portland Cement Association, Market and Economic Research, "Concrete Penetration in High Rise Building Construction," Apr. 1990.

[30] "Steel Proves Economical for Short Span Bridges," *Modern Steel Construction*, promotional publication of the American Institute of Steel Construction, July 1991.

[31] USITC, *Monthly Report on the Status of the Steel Industry*, (investigation No. 332–226), USITC publication 2241, Dec. 1989, p. i.

[32] Portland Cement Association, "Concrete Penetration."

[33] Neil Zundel, president, AISC Marketing, interview by USITC staff, July 22, 1992.

Table 2
Heavy structural steel shapes: U.S. shipments, by major market classifications, 1987–91
(In 1,000 tons)

Market classification	1987	1988	1989	1990	1991
Construction	1,949.2	2,050.8	1,979.6	2,474.1	2,324.4
Service centers	1,099.5	1,054.5	1,095.4	1,259.1	1,133.5
Export	12.9	12.3	38.7	130.6	157.7
Converting & processing	79.8	56.2	70.9	101.0	93.5
Automotive	8.6	12.0	109.4	84.9	76.5
Machinery & equipment	24.5	12.6	51.8	57.8	44.8
Rail transportation	17.9	37.0	43.6	43.4	41.4

Source: American Iron and Steel Institute, *Annual Statistical Reports*, various issues.

In an attempt to hasten adoption of the new standard, Chaparral has eliminated the extra charges traditionally levied for high-strength grades, equalizing the price with that of the current standard. Other mills argue that this move was premature, anticipating by over a year the attempt to get official multicertification on the high-strength grades via AISC and the American Society for Testing and Materials (ASTM).[34]

Despite steel's success in winning a larger share of the construction market, producers of heavy structural steel have experienced a general deterioration of the market over the past few years. Difficult market conditions, brought about mainly by the general recession, have forced structural steel producers to reduce selling prices to retain market share, thus amplifying problems caused by low demand.

Moreover, according to various sources, the prevailing market conditions and near-term business outlook show no immediate signs of a strong turnaround in demand or improvement in price levels, which are said to be at their lowest in 3 years. Demand for new construction is weak because the current economy is unable to absorb the excess office, retail, and apartment space built during the 1980s, and bank financing is tighter because of the savings and loan problem. According to projections by the U.S. Department of Commerce, the total value of new construction is expected to be relatively unchanged between 1991 and 1992 but commercial construction is likely to experience substantial declines.[35] One of the few bright spots in the construction market is congressional passage of the Surface Transportation Act. Under this bill, highway and mass transit programs will receive $151 billion over 6 years. How positively this infusion will affect steel consumption is unknown.[36]

FOREIGN INDUSTRY PROFILE

Canada

The Canadian structural steel industry is composed of 5 companies: Algoma Steel Corp., Ltd.; Lake Ontario Steel Co.; Manitoba Rolling Mills; Sidbec-Dosco; and Stelco Steel. In 1990 net shipments of heavy structurals totaled approximately 719,000 tons.[37] According to one source, overcapacity in Canada is significant and no recovery in the depressed structural market is predicted in the near term.[38] Canada is also dependent on the U.S. market; the vast majority of Canadian exports (98.5 percent in 1991) are destined for the United States.[39]

Some observers predict that excess capacity and competitive pressure may force Algoma, an integrated producer, out of this market segment.[40] In an effort to keep Algoma viable and maintain employment, in February 1992 the Ontario Government, the Canadian Steelworkers Union, Algoma, and various banking representatives reached an agreement. Under this agreement 60 percent of the voting stock would be turned over to employees in return for pay cuts with the remaining 40 percent going to banks holding Algoma's credit. In addition Dofasco, the former owner of Algoma, will pay Can$30 million to Algoma, will receive a Can$150 million tax loss, and will forgive over Can$200 million in loans. The Province of Ontario is to provide loan guarantees and worker retraining.[41]

Europe

Europe has several major producers of heavy structurals.[42] The most prominent producers are British Steel and Arbed. Similar to integrated producers in the United States, these producers have concentrated on the heavier end of the market. Arbed has been producing 44-inch beams since 1989 and for many years was the only supplier of 42-inch structurals. The importance of the U.S. export market for European producers has declined over the past 5 years. In 1987 17.4 percent of exports from Belgium, Luxembourg, Germany, France, Spain, and the United Kingdom were destined for the United States; in 1991 the U.S. market accounted for only 3 percent of these exports. According to one source, these firms view Bethlehem as their principal competition in the U.S. market.[43]

As European producers attempt to remain competitive with U.S. minimills in the European market, there has been a great deal of strategic maneuvering. Arbed and British Steel are attempting to dominate through market and investment alignment. The strength of the European distribution system, which is both well established and owned by the integrated mills, reportedly helps protect the European market from outside competition. This protection is crucial, since the rationalization of existing excess capacity within Europe is made difficult by social pressure.[44]

[34] "Chaparral Moves on High Strength Steels," *Metal Bulletin*, Feb. 17, 1992, p. 19.

[35] U.S. Department of Commerce, International Trade Administration, *U.S. Industrial Outlook '92*, 1992, p. 5–1.

[36] World Steel Dynamics, *Battle of the Minis: Part II*, May 1992, p. VI–1.

[37] This figure includes rail shipments. American Iron and Steel Institute, *Annual Report*, 1990.

[38] Canadian Government official, interview by USITC staff, Apr. 9, 1992.

[39] United Kingdom Iron & Steel Statistics Bureau, *World Trade Steel*, various issues.

[40] U.S. industry officials, interviews by USITC staff, June 2, 1992.

[41] U.S. Department of State Telegram, Mar. 3, 1992, Toronto, message reference No. 00942.

[42] European producers of wide flange beams in 1991 were Thyssen Stahl AG, Stahlwerke Peine Salzgitter AG, and Saarstahl AG (Germany); Irish Steel Ltd (Ireland); Eurocolfer Acciai SpA, Acciaieria e Ferriere Stefana Filli fu Girolama SpA, and Acciaierie del Tirreno SpA (Italy); Arbed SA (Luxembourg); British Steel Plc (United Kingdom); Usinor Sacilor (France); and Ensidesa–Empresa Nacional Siderurgica SA (Spain). Richard Serjeantson, ed., *Iron and Steel Works of the World*, 10th ed. (Surrey: Metal Bulletin Books Ltd., 1991), pp. 622–627.

[43] U.S. industry officials interview, Mar. 6, 1992.

[44] U.S. industry official, interview by USITC staff, Apr. 16, 1992.

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Although integrated mills continue to dominate European structurals production, industry officials predict increasing competition from minimills. Thus far European minimills have been hindered from becoming as advanced or aggressive as U.S. minimills by two factors: limited availability of quality scrap and lack of a labor advantage. EAF production of steel is dependent upon the availability of sufficient quantities of quality scrap at competitive prices. Limited scrap supplies have impeded European minimills' attempts to gain market share. Furthermore U.S. minimills' significant cost advantage because of more flexible work rules, attributed to availability of nonunion labor, does not exist in most European countries, where it is impossible to use nonunion labor.[45] Increasing concern by EC producers about future competition with both European and U.S. minimills has led to efforts by integrated producers to seek to cut costs and incorporate new technology.

In early 1991 the European Commission launched an extended probe into possible collusion in the supply of heavy beams and sections by British Steel, Arbed, Usinor Sacilor of France, and Peine Salzgitter of Germany. The investigation centers on whether articles 65 and 66 of the European Coal and Steel Community treaty, which prohibit market-sharing agreements, have been infringed. The accused face maximum fines of 10 percent of their annual turnover in the affected products. The investigation coincides with a similar investigation in Norway. A final decision is not likely to be made until 1993.

Eastern Europe contains significant amounts of structural steel capacity in largely outdated and inefficient mills. To rationalize the industry and become more competitive, Eastern European producers must attract foreign investment. Certain European companies have already become active in Eastern European markets, reportedly moving rapidly to acquire facilities there as a way of eliminating competition and acquiring low-cost capital equipment.[46]

Pacific Rim

The Pacific Rim region contains significant heavy structural capacity, much of it concentrated in Japan. However, other countries in the region, most notably Thailand,[47] South Korea, and Taiwan, are investing in expanding production capacity.

As of 1990 11 Japanese mills produced wide flange beams.[48] Despite this large domestic supply, Japan was reportedly a net importer of beams in 1990.[49] More recently a weak construction market has forced production cuts by Japanese steelmakers. In an effort to convince buyers that the market has stabilized and will improve, in early 1992 Nippon Steel announced that it planned to keep H-beam prices unchanged. Despite Nippon's confidence, there are reportedly fewer H-beams in the market now, and these products are not being consumed in building construction.[50] Moreover, persistent reports of a worsening recession in the Japanese economy may act to keep the market depressed.

A relatively small portion (3.6 percent in 1991) of Japanese exports are destined for the U.S. market. This share is a significant change from 1987 when the United States received 38.9 percent of Japanese exports. Currently the greatest share of Japanese exports are shipped to other markets in the Pacific Rim.[51]

Japanese H-beam maker Yamato Kogyo is reportedly wrapping up negotiations with Thailand's Siam Iron & Steel to form a joint venture to produce H-beams in Thailand. Currently Thailand imports all of the H-beams it consumes, most of them from Yamato's chief rival, Tokyo Steel Manufacturing. Negotiations are expected to be concluded around mid-1992, with construction starting before the end of the year.

Significant capacity addition is planned in Korea, which has been a good export market for U.S. heavy structural producers. Pohang Iron and Steel Co., Ltd. (Posco) is reportedly doubling capacity at its Inchon facility,[52] and Kangwon Industries of Korea plans to install a new beam mill that will produce heavy sections, including beams, channels, angles, and sheet piling sections, along with bars and special sections.[53] This investment will probably reduce U.S. exports of structurals to Korea.

Tung Ho Steel Enterprise Corp. of Taiwan ordered that country's first universal beam mill in 1990. The mill, with capacity of 600,000 tons per year and located at Tai Chung in central Taiwan, will probably remain reliant on imported blooms.[54]

U.S. TRADE MEASURES

Tariff Measures

Classification of relevant products under the Harmonized Tariff Schedule Annotated (HTSA), column 1 general and special rates of duty for each HTSA statistical reporting number, and U.S. exports

[45] European industry official, interview by USITC staff, Apr. 2, 1992.

[46] U.S. industry official interview, Apr. 16, 1992.

[47] Thailand, along with Indonesia, Malaysia, the Philippines, Singapore, and Brunei, makes up the Association of Southeast Asian Nations (ASEAN).

[48] Japanese producers of wide flange beams in 1990 were Godo Steel, Ltd.; Kawasaki Steel Corp.; Kobe Steel, Ltd.; Nakayama Steel Works, Ltd.; NKK Corp.; Nippon Steel Corp.; Sumitomo Metal Industries, Ltd.; Toa Steel Co., Ltd.; Tokyo Kohtetsu Co., Ltd.; Topy Industries, Ltd.; and Yamato Kogyo Co., Ltd. *Japan's Iron & Steel Industry*, (Tokyo: Tokyo Foreign Service, 1990).

[49] U.S. industry officials interview, Mar. 6, 1992.

[50] "NSC Leaves H-beam Prices Unmoved," *Metal Bulletin*, Feb. 3, 1992, p. 23.

[51] United Kingdom Iron & Steel Statistics Bureau, *World Trade Steel*, various issues.

[52] U.S. industry officials interview, Mar. 6, 1992.

[53] "Korean Mill Plans New Beam Mill," *Metal Bulletin*, Feb. 27, 1992, p. 21.

[54] Bob Jones, "Tung Ho Buys Taiwan's First Universal Beam Mill," *Metal Bulletin*, June 7, 1990, p. 27.

and imports for 1991 are shown in table 3. For 1991 the aggregate, trade-weighted, average rate of duty for all products covered in this summary was 1.1 percent ad valorem.[55] For purposes of the HTSA, heavy structural shapes are distinguished from light structurals by a maximum cross-sectional dimension of 80 millimeters or more.

Voluntary Restraint Agreements

In September 1984 the President directed the United States Trade Representative (USTR) to negotiate voluntary restraint arrangements (VRAs) to cover a 5-year period (from October 1, 1984, through September 30, 1989) with countries "whose exports to the United States had increased significantly in previous years."[56] VRAs were eventually concluded with 20 entitites (19 foreign governments[57] and the European Community), 7 of which had specific quota levels for structural shapes and units.[58]

The President took such action following receipt in July 1984 of a determination from the U.S. International Trade Commission under section 201 of the Trade Act of 1974.[59] The Commission conducted the investigation following the receipt of a petition from Bethlehem Steel Corp. and the United Steelworkers of America seeking relief from increased imports of carbon and alloy steel products. The Commission found affirmatively in five of nine product areas, including structural shapes. The President, however, determined that relief under section 201 was not in the national economic interest and established, under other authority, a nine-point policy to address the concerns of the industry.

Although the structure of the VRA arrangements varied among countries, each involved an agreement by the foreign government to limit exports of steel products to the United States. To bring the agreements into effect, U.S. producers agreed to withdraw pending unfair trade petitions and the U.S. Government suspended antidumping and countervailing-duty orders that were in effect on steel products covered by the VRAs. The trade measures were expected to reduce the overall share of imports in the U.S. market to a level of approximately 18.5 percent, excluding semifinished steel, which subsequent administration statements indicated would be limited to about 1.7 million tons per year.

[55] Calculated by USITC staff from official statistics of the U.S. Department of Commerce.

[56] 49 F.R. 36813.

[57] Countries or regions concluding VRAs with the United States included Australia, Austria, Brazil, Czechoslovakia, East Germany, Finland, Hungary, Japan, Korea, Mexico, Peoples Republic of China, Poland, Portugal, Romania, South Africa, Spain, Trinidad and Tobago, Venezuela, and Yugoslavia. Portugal's and Spain's VRAs were included in the EC agreement that extended the VRAs through March 31, 1992.

[58] Brazil, the European Community, Japan, Korea, Mexico, Poland, and Spain.

[59] 19 U.S.C. 2251; U.S. International Trade Commission, *Carbon and Certain Alloy Steel Products* (investigation No. TA–201–51), USITC publication 1553, July 1984.

On July 25, 1989, the President announced the Steel Trade Liberalization Program, under which the VRAs were extended for 2-1/2 years, terminating March 31, 1992. The President directed the USTR to negotiate VRAs at an overall restraint level of 18.4 percent of domestic steel consumption (the 1988 import-penetration level for VRA countries). To both provide incentives for countries to eliminate trade-distorting practices and to respond to concerns of steel consumers for adequate supplies of raw materials, the President authorized additional import penetration up to 1 percent annually, available to countries that entered into bilateral consensus agreements.

On December 12, 1989, the USTR announced that negotiations had been completed with the European Community and 16 countries that were previous signatories of VRAs.[60] As a result of the negotiations, the restraint levels for steel mill products increased to 19.1 percent of domestic consumption in the first period of the extended VRA program.

Bilateral Consensus Agreements/Multilateral Consensus Agreement

When the VRAs were extended in 1989, the United States sought to address the causes of unfair trade and eliminate subsidization and overcapacity in the steel industry. The bilateral agreements attempted to include commitments by countries[61] to prohibit export and production subsidies specifically for steel products, to reduce tariffs and nontariff barriers to steel trade, and to incorporate a binding arbitration mechanism. The bilateral consensus agreements were to be multilateralized within the GATT through incorporation in the Uruguay Round of GATT negotiations.[62] As envisioned, negotiations on the new Multilateral Steel Agreement (MSA) were to be completed by December 1990. On March 31, 1992, negotiations on the MSA were suspended without agreement, although considerable progress had been made. Negotiators have reportedly agreed to continue to meet bilaterally and multilaterally, but no specific time schedule has been set.

U.S. Government Trade-Related Investigations

During the period covered by this report, several factfinding investigations including detail related to all steel mill products were conducted by the U.S. International Trade Commission under section 332(g) of the Tariff Act of 1930.[63]

[60] Portugal and Spain joined the EC prior to these negotiations. The VRA with South Africa was not renewed, as most steel imports were under embargo.

[61] The United States has negotiated bilateral agreements with the European Community, Japan, Korea, Brazil, Mexico, Australia, Trinidad and Tobago, Austria, Finland, and Yugoslavia.

[62] USTR, press release, Dec. 12, 1989, and accompanying fact sheet, "Steel Trade Liberalization Program."

[63] 19 U.S.C. 1332(g).

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Table 3
Heavy structural steel shapes: Harmonized Tariff Schedule Annotated statistical reporting number; description; U.S. col. 1 rate of duty as of Jan. 1, 1992; U.S. exports, 1991; and U.S. imports, 1991

HTSA statistical reporting number	*Description*	*Col. 1 rate of duty As of Jan. 1, 1992*		*U.S. exports, 1991*	*U.S. imports, 1991*
		General	*Special*[1]		
7216.31.0000	U sections, of iron or nonalloy steel, not further worked than hot-rolled, hot-drawn, or extruded, of a height of 80 mm or more.	0.9%	Free (E,IL,J) 0.5% (CA)	10,912	24,955
7216.32.0000	I sections (standard beams), of iron or nonalloy steel, not further worked than hot-rolled, hot-drawn, or extruded, of a height of 80 mm or more	0.9%	Free (E,IL,J) 0.5% (CA)	17,478	15,187
7216.33.0000	H sections, of iron or nonalloy steel, not further worked than hot-rolled, hot-drawn, or extruded, of a height of 80 mm or more.	0.9%	Free (E,IL,J) 0.5% (CA)	66,264	44,283
7216.40.0000	L or T sections, of iron or nonalloy steel, not further worked than hot-rolled, hot-drawn, or extruded, of a height of 80 mm or more	0.9%	Free (E,IL,J) 0.5% (CA)	4,565	23,674
7216.50.0000	Other angles, shapes, and sections, of iron or nonalloy steel, not further worked than hot-rolled, hot-drawn, or extruded	0.9%	Free (E,IL,J) 0.5% (CA)	36,732	33,643
7216.90.0000	Other angles, shapes, and sections of iron or nonalloy steel	4.4%	Free (E,IL,J) 2.6% (CA)	21,969	4,372
7222.40.3020	Angles, of stainless steel, hot-rolled, not drilled, not punched, and not otherwise advanced, with a maximum cross-sectional dimension of 76 mm or more	2.1%	Free (E,IL,J) 1.2% (CA)	[2]15,636	11,282
7222.40.3040	Other shapes and sections, of stainless steel, hot-rolled, not drilled, not punched, and not otherwise advanced, with a maximum cross-sectional dimension of 76 mm or more	2.1%	Free (E,IL,J) 1.2% (CA)	([3])	2,095
7228.70.3020	Angles, of alloy steel other than stainless steel, hot-rolled, not drilled, not punched, and not otherwise advanced, with a maximum cross-sectional dimension of 76 mm or more	2.1%	Free (E,IL,J) 1.2% (CA)	[4]15,100	686
7228.70.3040	Other shapes and sections, of alloy steel other than stainless steel, hot-rolled, not drilled, not punched, and not otherwise advanced, with a maximum cross-sectional dimension of 76 mm or more	2.1%	Free (E,IL,J) 1.2% (CA)	([3])	26,234

[1] Programs under which special tariff treatment may be provided, and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn, are as follows: United States-Canada Free-Trade Agreement (CA); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Area (IL); and Andean Trade Preference Act (J).

[2] Because export data are compiled only at the 8-digit level, this value includes exports of both stainless steel angles and stainless steel shapes and sections, in addition to certain stainless steel goods not classified as heavy structurals.

[3] Not applicable.

[4] Because export data are compiled only at the 8-digit level, this value includes exports of both other alloy steel angles and other alloy steel shapes and sections, in addition to certain other alloy steel goods not classified as heavy structurals.

Source: U.S. exports and imports compiled from data of the U.S. Department of Commerce.

In response to requests from the USTR, the Commission conducted investigation No. 332-209, *Annual Surveys Concerning Competitive Conditions in the Steel Industry and Industry Efforts to Adjust and Modernize*,[64] instituted on March 8, 1985, and investigation No. 332-289, *Steel Industry: Annual Report on Competitive Conditions in the Industry and Industry Efforts to Adjust and Modernize*,[65] instituted on March 16, 1990. These studies were 5- and 2-year annual surveys designed to assess changes in international competitive conditions, with particular attention to the position of the U.S. steel industry; analyze current conditions in the U.S. industry; and assess major companies' efforts to adjust and modernize. Both investigations were requested by the USTR to help monitor the effect of the VRA program.

In addition to these annual reports, at the request of the Committee on Ways and Means, U.S. House of Representatives, the Commission published investigation 332-226, *Monthly Report on the Status of the Steel Industry*, since 1986 to monitor development in the steel industry through March 1992. As of March 1991 these reports were published quarterly. In September 1992 the Commission will begin publishing *Steel: Semiannual Monitoring Report*, which will incorporate much of the data previously included in the annual and monthly reports.

Investigation No. 332-270, *The Effects of the Steel Voluntary Restraint Agreement on U.S. Steel-Consuming Industries*, was instituted on February 27, 1989, at the request of the Subcommittee on Trade of the House Committee on Ways and Means. *The Western U.S. Steel Market: Analysis of Market Conditions and Assessment of the Effects of Voluntary Restraint Agreements on Steel-Producing and Steel-Consuming Industries*, investigation No. 332-256, was instituted on August 3, 1988, at the request of the Committee on Ways and Means. Both reports provided estimates of the effects of the VRAs on domestic industries.

Between 1987 and 1991, one statutory investigation was instituted related to structurals: *Certain Fabricated Structural Steel From Canada*. Although this summary does not cover fabricated structurals, the investigation is relevant since almost all heavy structurals are fabricated before proceeding to their end use. Investigation No. 731-TA-387 was instituted in response to a petition filed in January 1988 by the American Institute of Steel Construction alleging that an industry in the United States was materially injured and threatened with material injury by reason of less-than-fair-value imports. The Commission determined that there was no reasonable indication that the U.S. industry was injured or threatened with material injury due to Canadian imports of fabricated structurals.

[64] USITC, *Annual Surveys Concerning Competitive Conditions in the Steel Industry and Industry Efforts to Adjust and Modernize*, (investigation No. 332–209), USITC publications 1729, 2019, 2115, and 2226, 1985–89.

[65] USITC, *Steel Industry: Annual Report on Competitive Conditions in the Industry and Industry Efforts to Adjust and Modernize*, (investigation No. 332–289), USITC publication 2316, Sept. 1990, and USITC publication 2436, Sept. 1991.

FOREIGN TRADE MEASURES

Major partners' tariff treatment for structurals is presented in the following tabulation (in percent):[66]

Country/region	*Ad valorem tariff rate*
European Community	4.4-4.9
Canada	6.8
Japan	4.9
Korea	10.0
Brazil	25.0
Mexico	10.0

These rates are higher—in some cases significantly—than the aggregate trade-weighted, average rate of duty of 1.1 percent ad valorem in the United States. The preferential tariff rates on eligible steel mill products imported into Canada under the U.S.-Canada Free Trade Agreement range from free of duty to 6.1 percent ad valorem.

U.S. exporters of heavy structurals report that in addition to significant tariff barriers in some markets, they have been subject to various nontariff measures. The extent to which the markets of less developed countries have opened in recent years varies by country. In many foreign markets U.S. producers must compete with domestic industries protected by extremely high-quality standards, government procurement limitations,[67] and export subsidies.[68]

U.S. MARKET

Over the past 5 years, U.S. shipments of heavy structurals have increased (table 4). However, the significant decline in imports and an 18-percent reduction in import penetration since 1988 have outweighed this increase in shipments, contributing to declining consumption.

Domestic and foreign heavy structurals compete primarily on the basis of price. Here, as in their competition with domestic integrated mills, minimills have succeeded in capturing the lighter end of the market and are expanding into larger and heavier sizes, which continue to make up a large proportion of imports of heavy structurals.

Domestic structural producers have also benefited from favorable exchange rates. Statistical analysis of U.S. trade data indicates that U.S. import prices and volumes were significantly affected by exchange-rate

[66] Data for the European Community, Korea, and Mexico reflect 1990 tariffs; data for Brazil reflect tariffs at the end of 1990; and data for Canada and Japan reflect 1991 tariffs. USITC, *Steel Industry Annual Report*, USITC publication 2436, p. 3–23.

[67] Most governments, including the U.S. Government, have "Buy Domestic" restrictions on certain government purchases.

[68] U.S. industry officials interviews, June 2, 1992.

Table 4
Heavy structural steel shapes: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1987–91

Year	U.S. shipments	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
			1,000 tons		*Percent*
1987	4,839.4	63.2	1,778.3	6,554.5	27.1
1988	4,859.9	61.5	1,847.3	6,645.7	27.8
1989	4,975.8	164.4	1,399.4	6,210.8	22.5
1990	5,670.0	307.7	826.3	6,188.6	13.4
1991	5,245.3	405.6	459.9	5,299.6	8.7

Source: Compiled from official statistics of the U.S. Department of Commerce and the American Iron and Steel Institute, *Annual Report*, various issues.

fluctuations during 1980-89.[69] According to one source these fluctuations have been a much more important contributor to minimill success than the VRAs.[70]

In an effort to increase consumption, structurals producers have turned to promotional efforts. As indicated earlier, organizations like AISC Marketing have promoted steel use over competing materials like concrete. In addition the Rebuild America Coalition, a broad coalition of public and industry organizations, of which the Steel Manufacturers Association is a member, has announced goals for infrastructure rebuilding as a top public policy priority.[71] Such organizations hope to increase both the size of the construction market and steel's share of this market.

Production

Rationalization in structurals occurred early in the process of steel industry restructuring, eliminating significant capacity during the early 1980s. During the past 5 years, minimills have brought significant capacity in heavy structurals online, notwithstanding the withdrawal of certain integrated firms from the industry. As a result the industry is generally characterized as having considerable excess capacity, contributing to very aggressive price competition among various participants. Overcapacity has been estimated by some observers at about 30 percent in the wide flange beam market, made worse by poor economic conditions in 1991 and early 1992.[72]

Despite perceived excess capacity, various minimills, most notably Nucor-Yamato, Northwestern, and Chaparral, have added capacity during the 5-year period. According to these producers, minimal overlap among their product lines, combined with integrated mill attrition, has created room for expanded minimill capacity.[73]

At least one source believes that growing concerns about excess capacity are overstated. Calculation of production capacity is generally based on the theoretical or "nameplate" capacity, which assumes mills are running continuously to produce maximum output. In contrast, certain industry officials argue that optimal capacity should be considered, e.g., production levels that utilize capital most efficiently, minimizing equipment wear and maximizing marginal returns. According to this line of thought, given efficient use of equipment, optimal capacity has been fairly close to production levels over the past few years. These officials suggest that excess capacity is significantly less than that normally stated.[74]

Imports

Heavy structurals imports are largely composed of wide flange beams or H-sections, especially jumbo beams, and iron or nonalloy angles and shapes. According to one source, imports have been dominated by sizes and grades that U.S. mills do not produce.[75]

Over the past 5 years, imports of all heavy structurals have fallen by 74 percent, from 1.8 million tons in 1987 to only 459,899 tons in 1991 (table 5). In 1991 approximately 175,000 tons entered at reduced or no duties, under the U.S.-Canada Free Trade Agreement. The decline has not been offset by imports of fabricated structurals, which fell by approximately 40 percent between 1989 and 1991.

The decline in imports was largely due to aggressive minimill pricing and the decline in the dollar. This was not as true for imports of the larger sections, which also fell but not as much as structurals as a whole (figure 5). However, as minimills move into the heavier ends of the market and increase their product lines to include new sizes and grades, importers may have an even more difficult time maintaining market share.

[69] USITC, *Steel Industry Annual Report*, USITC publication 2436, pp. 3–46.
[70] U.S. industry officials interview, Mar. 6, 1992.
[71] James F. Collins, Steel Manufacturers Association, "A Start Is Needed in Rebuilding the Infrastructure," *American Metal Market*, Mar. 4, 1991, p. 10A.
[72] "US Steel Quits Heavy Sections," *Metal Bulletin*, Jan. 16, 1992, p. 15.
[73] Mike Beirne, "Wide-Flange Beam Capacity Rises, but There's No Glut," *American Metal Market*, Mar. 4, 1991, p. 4A.
[74] U.S. industry officials interview, Mar. 6, 1992.
[75] European industry official interview, Apr. 21, 1992.

Table 5
Heavy structural steel shapes: U.S. imports for consumption, by principal sources, 1987–91

Source	1987	1988	1989	1990	1991
			Quantity (1,000 tons)		
Canada	(1)	(1)	179.9	227.3	174.8
Luxembourg	(1)	(1)	165.5	130.9	69.8
United Kingdom	(1)	(1)	156.1	147.2	67.7
Spain	(1)	(1)	174.5	92.9	41.8
Japan	(1)	(1)	332.9	88.8	29.8
Poland	(1)	(1)	17.6	14.9	24.3
Belgium	(1)	(1)	84.6	39.8	18.5
Germany	(1)	(1)	80.6	15.5	8.0
Argentina	(1)	(1)	30.4	52.4	6.4
Brazil	(1)	(1)	8.3	5.5	5.8
All other	(1)	(1)	168.8	58.3	12.8
Total	1,778.3	1,877.3	1,399.4	856.3	459.9
			Value (million dollars)		
Canada	(1)	(1)	73.8	84.1	62.9
Luxembourg	(1)	(1)	60.0	43.3	28.9
United Kingdom	(1)	(1)	60.0	53.5	30.5
Spain	(1)	(1)	60.0	25.9	13.4
Japan	(1)	(1)	133.2	37.7	20.5
Poland	(1)	(1)	5.6	4.1	6.2
Belgium	(1)	(1)	30.3	13.3	8.1
Germany	(1)	(1)	31.3	9.1	5.5
Argentina	(1)	(1)	10.0	1.8	1.7
Brazil	(1)	(1)	2.7	1.6	1.6
All other	(1)	(1)	62.3	21.5	7.1
Total	537.6	700.0	529.2	295.9	186.4
			Unit value (dollars per ton)		
Canada	(1)	(1)	410.21	369.81	359.89
Luxembourg	(1)	(1)	362.40	330.69	414.04
United Kingdom	(1)	(1)	384.24	363.81	450.83
Spain	(1)	(1)	343.77	279.02	321.31
Japan	(1)	(1)	400.21	424.55	687.92
Poland	(1)	(1)	317.77	278.45	255.54
Belgium	(1)	(1)	358.14	333.48	434.89
Germany	(1)	(1)	387.93	588.62	686.08
Argentina	(1)	(1)	329.97	352.40	265.96
Brazil	(1)	(1)	326.50	283.83	269.84
All other	(1)	(1)	369.16	367.72	554.33
Average	302.31	378.95	378.20	358.10	405.33

[1] Country–level detail is provided only for years in which there are actual trade data under the *Harmonized Tariff Schedule of the United States* (HTS).

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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The principal foreign suppliers of heavy structurals in 1991 were Canada, the European Community, and Japan. Significant changes have included the rapid decline of imports from Argentina and Indonesia.

FOREIGN MARKETS

U.S. Exports

Over the past 5 years exports of heavy structurals have increased significantly, from 63,159 tons valued at $28.3 million in 1987 to 405,641 tons valued at $188.7 million in 1991 (table 6), more than a fivefold increase in volume. Of 1991 exports, 46 percent were comprised of wide flange beams.

The dramatic increase in exports is largely due to minimill efforts to expand into global markets. The increase in exports of heavy structurals reflects an industrywide trend, as producers of virtually all steel products have increased their participation in export markets. This expansion has forced U.S. steel producers to think and compete globally, in many cases producing higher quality structurals or meeting foreign standards to increase competitiveness.

Exports have become increasingly important to U.S. producers, rising to 7.7 percent of shipments in 1990, from 1.3 percent in 1987. This increase reflects the recognition by steel producers of the importance of export markets as a means of balancing fluctuations in the domestic market. Aggressive pricing in the domestic market, as noted earlier, has led structurals producers to develop other markets for their products. The Pacific Rim, Europe, and Mexico have been the major markets for these increased exports.

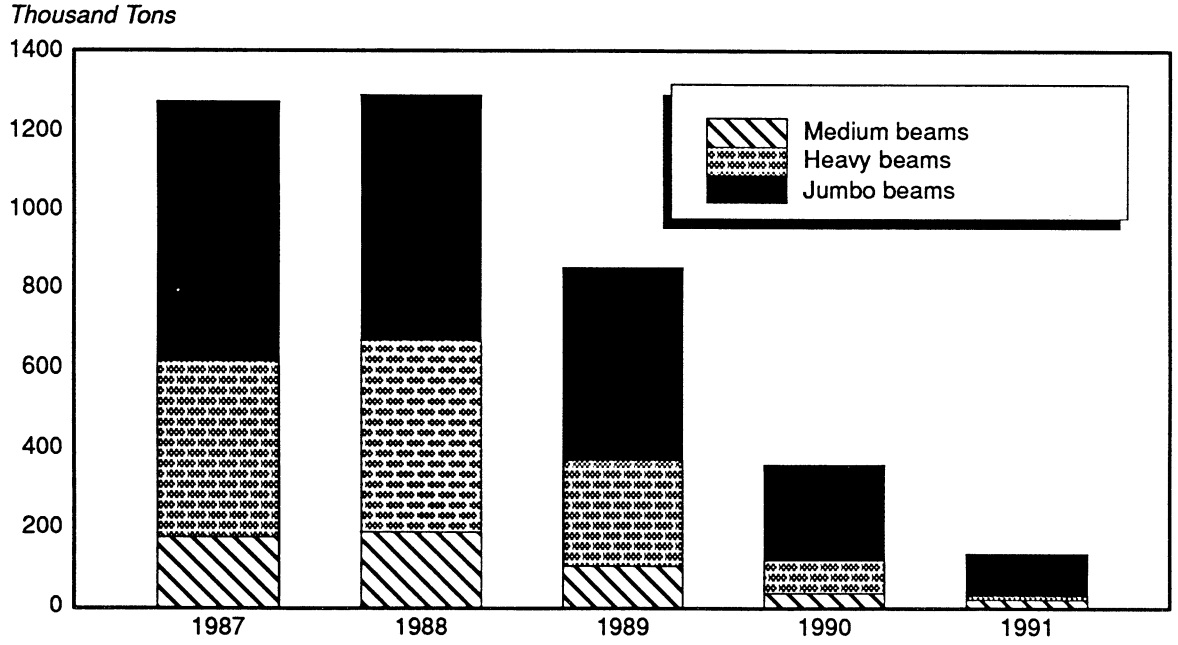
Although a conversion to metric standards is under way, it is not anticipated to make exporting easier. Encouraged by the U.S. Government, the industry will begin with a soft conversion in 1994, when the same sizes will be rolled but described by metric specifications; a full conversion will be made at an unspecified date.[76] Although both European and Japanese specifications are in metric, the United States will adopt a unique set of specifications. A global set of specifications would increase the ease of exporting, but no movement has been made toward this ideal.

Foreign Market Profile

Demand for U.S. exports, similar to domestic demand for these products, is largely predicated on the foreign construction market. Recently the construction sector of many foreign markets has contracted. This difficulty could temporarily reduce demand for U.S. heavy structurals. Although Canada is historically the largest market for U.S. exports, increased shipments to Latin America and the Pacific Rim have made this market less important. U.S. producers have also gained a small share of the European market. These major markets typically account for approximately 95 percent of U.S. exports. The remaining exports are

[76] Industry officials interview, Mar. 6, 1992.

Figure 5
Wide flange beams: U.S. imports for consumption, by weights, 1987-91



Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 6
Heavy structural steel shapes: U.S. exports[1] of domestic merchandise, by principal markets, 1987–91

Market	1987	1988	1989	1990	1991
			Quantity (tons)		
Canada	(2)	(2)	118,239	197,609	177,699
Mexico	(2)	(2)	23,590	45,522	77,671
South Korea	(2)	(2)	382	16,976	52,751
Singapore	(2)	(2)	1,765	8,331	18,995
Japan	(2)	(2)	310	4,432	10,063
Taiwan	(2)	(2)	603	4,560	9,919
Malaysia	(2)	(2)	131	2,493	8,171
Saudi Arabia	(2)	(2)	2,513	1,375	8,052
United Kingdom	(2)	(2)	1,027	1,086	6,953
Belgium	(2)	(2)	96	134	6,638
All other	(2)	(2)	15,778	25,180	28,728
Total	63,159	61,494	164,435	307,700	405,641
			Value (million dollars)		
Canada	(2)	(2)	43,160	82,843	78,320
Mexico	(2)	(2)	13,448	21,066	34,022
South Korea	(2)	(2)	479	6,575	20,644
Singapore	(2)	(2)	841	3,160	6,997
Japan	(2)	(2)	537	5,071	7,269
Taiwan	(2)	(2)	829	1,752	3,420
Malaysia	(2)	(2)	74	864	2,547
Saudi Arabia	(2)	(2)	1,152	739	3,811
United Kingdom	(2)	(2)	2,359	1,961	3,408
Belgium	(2)	(2)	105	269	2,935
All other	(2)	(2)	19,691	25,239	25,286
Total	28,283	35,076	82,675	149,538	188,657
			Unit value (dollars per ton)		
Canada	(2)	(2)	365.02	419.23	440.75
Mexico	(2)	(2)	570.07	462.76	438.03
South Korea	(2)	(2)	1,253.49	387.32	391.35
Singapore	(2)	(2)	476.42	379.30	368.36
Japan	(2)	(2)	1,729.78	1,143.96	722.32
Taiwan	(2)	(2)	1,374.52	384.21	344.78
Malaysia	(2)	(2)	565.65	346.61	311.70
Saudi Arabia	(2)	(2)	458.42	537.31	473.32
United Kingdom	(2)	(2)	2,296.54	1,806.43	490.13
Belgium	(2)	(2)	1,095.23	2,002.11	442.16
All other	(2)	(2)	1,248.02	1,002.34	880.18
Average	447.81	570.40	502.78	485.99	465.08

[1] Data include some products not classified as heavy structurals
[2] Country–level data is provided only for years in which there are actual trade data under the new Schedule B (based on the *Harmonized Tariff Schedule of the United States*).

Source: Compiled from official statistics of the U.S. Department of Commerce.

destined for smaller markets, with most directed toward the Middle East.

Canada

Canada is the largest market for U.S. exports of heavy structural steel shapes, receiving 42 percent of U.S. exports in 1991. Although total tonnage shipped to Canada has increased by approximately 50 percent since 1989, this market has declined in prominence; in 1989 Canada received 72 percent of U.S. exports of heavy structurals. The increased shipments may be partially explained by problems experienced by Algoma, the major Canadian producer of these products. The decline in percentage of shipments to Canada is due primarily to the development of new export markets by U.S. producers, who have used experience gained in the Canadian market and competitive prices to export offshore. 18

Latin America

Latin America received 24 percent of U.S. exports in 1991, with 18 percent going to Mexico and the rest going to Venezuela, Panama, Costa Rica, and the Bahamas. Mexico has been a significant market for U.S. exporters throughout the late 1980s and has considerable potential for long-term growth, thus presenting increased opportunities for U.S. structural producers. According to one producer, potential reduction of Mexican capacity combined with negotiation of a North American Free-Trade Agreement could increase Mexican demand for U.S. products.[77] The region as a whole presents attractive prospects for significant long-term growth, because of the current relatively low use of steel in commercial construction and limited structural production capacity.

Pacific Rim

U.S. shipments to the Pacific Rim have grown tremendously since 1987, when the United States had a negligible share of this market. In 1991, 22 percent of U.S. heavy structurals exports went to the region, primarily to South Korea, Japan, Singapore, Taiwan, and Thailand.

U.S. exports to the region have been spurred by the efforts of Chaparral and Northwestern. In 1989 Chaparral became the first U.S. steel company to receive the Japan Industrial Standards (JIS) certification from Japan's Ministry of International Trade and Industry. JIS certification is a requirement to market products for Government-funded projects and is generally considered an aid in marketing in Asia as a whole. Northwestern's Sterling, IL, mill has also received JIS certification. Northwestern reportedly plans to seek certification for its Houston mill and aims to eventually sell 10 to 15 percent of its output overseas, particularly in the Pacific Rim.[78]

Europe

In 1991, Europe received 7 percent of U.S. exports, the bulk of which went to the United Kingdom, Belgium, and Germany. The European market is generally considered to be sluggish, with the British market regarded as especially weak due to a sharp fall in the commercial construction sector and a downturn in industrial projects.[79] Despite this problem, a more recent weakness in the Far Eastern market, combined with vigorous price competition in the United States, has contributed to the reappearance of U.S. heavy structurals in European markets, where many producers are unable to match U.S. prices.[80] European demand for these products is expected to further increase due to a widely anticipated building boom when eastern Germany's infrastructure is updated and western businesses begin to invest. U.S. producers' ability to capture increased European market share under these conditions will largely depend on their ability to remain price competitive.

U.S. TRADE BALANCE

In 1991 the U.S. trade balance in heavy structurals shifted from a longstanding deficit to a surplus (table 7). After peaking in 1988 at about $665 million, the deficit declined throughout the period, turning to a surplus of approximately $3 million in 1991. This change is due to both decreased imports and the significant increase in U.S. exports of heavy structurals. The most significant changes have been the sharp reduction of the U.S. deficit in these products with Japan and the European Community.

[77] Chaparral Steel Co., written submission for USITC investigation No. 332–309, *Probable Economic Effect on U.S. Industries and Consumers of a Free Trade Agreement Between the United States and Mexico.*

[78] U.S. industry officials interview, Mar. 6, 1992.

[79] European industry official interview, Apr. 2, 1992.

[80] "US Imports Hit UK Sections Market," *Metal Bulletin*, Jan. 20, 1992, p. 17.

Table 7
Heavy structural steel shapes: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1987–91[1]

(Million dollars)

Item	1987	1988	1989	1990	1991
U.S. exports of domestic merchandise:					
Canada	(2)	(2)	43	83	78
Mexico	(2)	(2)	13	21	34
United Kingdom	(2)	(2)	2	2	3
Luxembourg	(2)	(2)	(3)	(3)	(3)
Japan	(2)	(2)	1	5	7
Republic of Korea	(2)	(2)	(3)	7	21
Spain	(2)	(2)	1	(3)	1
Belgium	(2)	(2)	(3)	(3)	3
Germany	(2)	(2)	(3)	2	2
Singapore	(2)	(2)	1	3	7
All other	(2)	(2)	20	27	33
Total	28	35	83	150	189
EC–12	(2)	(2)	5	6	11
OPEC	(2)	(2)	2	2	7
ASEAN	(2)	(2)	1	6	11
CBERA	(2)	(2)	4	7	7
Eastern Europe	(2)	(2)	(3)	0	0
U.S. imports for consumption:					
Canada	(2)	(2)	74	84	63
Mexico	(2)	(2)	6	9	2
United Kingdom	(2)	(2)	60	54	31
Luxembourg	(2)	(2)	60	43	29
Japan	(2)	(2)	133	38	20
Republic of Korea	(2)	(2)	21	1	1
Spain	(2)	(2)	60	26	13
Belgium	(2)	(2)	30	13	8
Germany	(2)	(2)	31	9	6
Singapore	(2)	(2)	0	0	0
All other	(2)	(2)	54	19	14
Total	537	700	529	296	186
EC–12	(2)	(2)	261	154	88
OPEC	(2)	(2)	1	0	0
ASEAN	(2)	(2)	1	(3)	(3)
CBERA	(2)	(2)	(3)	(3)	(3)
Eastern Europe	(2)	(2)	6	4	6
U.S. merchandise trade balance:					
Canada	(2)	(2)	(31)	(1)	15
Mexico	(2)	(2)	7	12	32
United Kingdom	(2)	(2)	(58)	(52)	(28)
Luxembourg	(2)	(2)	(60)	(43)	(29)
Japan	(2)	(2)	(132)	(33)	(13)
Republic of Korea	(2)	(2)	(21)	6	20
Spain	(2)	(2)	(59)	(26)	(12)
Belgium	(2)	(2)	(30)	(13)	(5)
Germany	(2)	(2)	(31)	(7)	(4)
Singapore	(2)	(2)	1	3	7
All other	(2)	(2)	(34)	8	19
Total	(509)	(665)	(446)	(146)	3
EC–12	(2)	(2)	(256)	(148)	(77)
OPEC	(2)	(2)	1	2	7
ASEAN	(2)	(2)	(3)	6	11
CBERA	(2)	(2)	4	7	7
Eastern Europe	(2)	(2)	(6)	(4)	(6)

[1] Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export. U.S. trade with East Germany is included in "Germany" but not "Eastern Europe."

[2] Country–level data is provided only for years in which there are actual trade data under the new Schedule B (based on the *Harmonized Tariff Schedule of the United States*).

[3] Less than $1 million.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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APPENDIX A
TARIFF AND TRADE AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

The ***Harmonized Tariff Schedule of the United States*** (HTS) replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989. Chapters 1 through 97 are based on the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description, with additional U.S. product subdivisions at the 8-digit level. Chapters 98 and 99 contain special U.S. classification provisions and temporary rate provisions, respectively.

Rates of duty in the ***general*** subcolumn of HTS column 1 are most-favored-nation (MFN) rates; for the most part, they represent the final concession rate from the Tokyo Round of Multilateral Trade Negotiations. Column 1-general duty rates are applicable to imported goods from all countries except those enumerated in general note 3(b) to the HTS, whose products are dutied at the rates set forth in ***column 2***. Goods from Armenia, Bulgaria, the People's Republic of China, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Moldova, Mongolia, Poland, Russia, the Ukraine and Yugoslavia are currently eligible for MFN treatment. Among articles dutiable at column 1-general rates, particular products of enumerated countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the ***special*** subcolumn of HTS column 1. Where eligibility for special tariff treatment is not claimed or established, goods are dutiable at column 1-general rates.

The ***Generalized System of Preferences*** (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 and renewed in the Trade and Tariff Act of 1984, applies to merchandise imported on or after January 1, 1976, and before July 4, 1993. Indicated by the symbol "A" or "A*" in the special subcolumn of column 1, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 3(c)(ii) to the HTS.

The ***Caribbean Basin Economic Recovery Act*** (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984; this tariff preference program has no expiration date. Indicated by the symbol "E" or "E*" in the special subcolumn of column 1, the CBERA provides duty-free entry to eligible articles the product of and imported directly from designated countries, as set forth in general note 3(c)(v) to the HTS.

Preferential rates of duty in the special subcolumn of column 1 followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free-Trade Area Implementation Act*** of 1985, as provided in general note 3(c)(vi) of the HTS. When no rate of duty is provided for products of Israel in the special subcolumn for a particular provision, the rate of duty in the general subcolumn of column 1 applies.

Preferential rates of duty in the special duty rates subcolumn of column 1 followed by the symbol "CA" are applicable to eligible goods originating in the territory of Canada under the ***United States-Canada Free-Trade Agreement***, as provided in general note 3(c)(vii) to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn of column 1 followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the ***Andean Trade Preferences Act*** (ATPA), enacted in title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 3(c)(ix) to the HTS.

Other special tariff treatment applies to particular ***products of insular possessions*** (general note 3(a)(iv)), goods covered by the ***Automotive Products Trade Act*** (general note 3(c)(iii)) and the ***Agreement on Trade in Civil Aircraft*** (general note 3(c)(iv)), and ***articles imported from freely associated states*** (general note 3(c)(viii)).

The ***General Agreement on Tariffs and Trade*** (GATT) (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) is the multilateral agreement setting forth basic principles governing international trade among its more than 90 signatories. The GATT's main obligations relate to most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national (nondiscriminatory) treatment for imported products. The GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, and other measures. Results of GATT-sponsored multilateral tariff negotiations are set forth by way of separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as schedule XX.

Officially known as "The Arrangement Regarding International Trade in Textiles," the ***Multifiber Arrangement*** (MFA) provides a framework for the negotiation of bilateral agreements between importing and producing countries, or for unilateral action by importing countries in the absence of an agreement. These bilateral agreements establish quantitative limits on imports of textiles and apparel, of cotton and other vegetable fibers, wool, manmade fibers, and silk blends, in order to prevent market disruption in the importing countries—restrictions that would otherwise be a departure from GATT provisions. The United States has bilateral agreements with more than 30 supplying countries, including the four largest suppliers: China, Hong Kong, the Republic of Korea, and Taiwan.

APPENDIX B
GLOSSARY OF TECHNICAL TERMS

Abbreviations, Coined Words, and Coined Symbols

BOF (BOP)	basic oxygen furnace (process)
EAF	electric arc furnace
VRAs	voluntary restraint agreements

Terms

Alloys

Metallic substances added to steel to enhance properties such as machinability or heat resistance.

Bar

A shaped steel product available in many configurations, including rounds, squares, ovals, hexagons, and rectangles.

Basic oxygen furnace (process)

A steelmaking process that involves blowing high-purity oxygen onto the surface of a bath of molten pig iron. It has been the dominant steelmaking process in the United States since the 1970s.

Beam blanks

Special shapes that are subsequently rolled into structural shapes, mainly I-beams.

Billet

A square or rectangular semifinished piece of steel that is later rolled into a finished product, such as a bar.

Bloom

A square or rectangular semifinished piece of steel (larger than a billet) that is later rolled into a finished product, such as an I-beam or other shape.

Carbon steel

Steel whose properties depend chiefly on its carbon content and microstructure (as opposed, for example, to alloy steels, which depend on alloying elements for their enhanced properties). Carbon steel accounts for the largest percentage of steel produced worldwide.

Coke

Material used in blast furnaces, formed by baking coal in the absence of air. Cokemaking is the largest source of pollution in the steelmaking process.

Cold-rolled/cold-formed products

Flat-rolled products that are not heated immediately prior to rolling/forming. Cold reduction results in a product that is thinner, is smoother, and has a higher strength-to-weight ratio.

Continuous caster

A machine that converts a heat of molten steel to semifinished shapes. The continuous casting process is more efficient and generally yields a higher quality product than the traditional ingot casting method does.

Electric arc furnace (EAF)

A device that passes a strong electric current through steel scrap, thereby melting it (because of scrap's high resistance) and allowing it to be cast into steel shapes. Minimills and specialty mills use EAFs, as do some integrated mills.

Hot end

The melting, refining, and casting facilities of a steel mill.

Hot-rolled products

Flat-rolled products that are reduced to final thickness by heating and rolling at elevated temperature (usually at a range of 815 to 1,205°C)

I-beams

Structural steel product shaped like the letter "I". Used in the construction of bridges, buildings, and ships and for other construction purposes.

Iron

A common mineral found in the earth's surface in the form of iron ore mixed with rock, earth, or sand.

Ingot

A large steel shape, formed when molten steel is poured (teemed) into an ingot mold to solidify. The ingot is later reheated and rolled into a semifinished steel shape such as a billet, bloom, or slab.

Integrated mills

Mills that follow all six steps of steelmaking (ore processing, cokemaking, ironmaking, steelmaking, rolling, and treating). Generally substantially larger than specialty mills or minimills.

Ladle metallurgy

The practice of further steel refinement, performed in a ladle after partial refining of a heat in a steelmaking furnace.

Long products

Steel products that are not flat rolled.

Minimills

Mills that usually bypass the first three steps of steelmaking (ore processing, cokemaking, and ironmaking) and use scrap as the primary raw material in electric arc furnaces. Minimills occupy a growing share of the U.S. steel industry.

Near-net-shape casting

Process of casting steel in a semifinished form that requires only minimal physical alteration to produce finished products.

Open-hearth furnace

A reverbaratory, regenerative steelmaking furnace that has largely been replaced by the BOF. It was the dominant process of steelmaking in the United States until the 1970s.

Pig iron

A metallic product of the blast furnace that is generally not usefully malleable. Contains over 90 percent iron and over 2 percent carbon.

Rationalization

Company efforts to improve their competitive position, usually in response to imbalances between capacity and production and poor financial performance. Rationalization typically includes sizable workforce reductions, plant closure, and modernization of remaining facilities.

Reconstituted mill

A mill whose financial structure has been substantially restructured, usually through bankruptcy or sale.

Rolling mill

Equipment that reduces and transforms the shape of semifinished or intermediate steel products by passing the material between rolls through a gap that is smaller than the entering material.

Secondary steelmaking

See "Ladle metallurgy."

Semifinished steel

Steel shapes such as billets, blooms, or slabs that are later rolled into finished products.

Specialty steel

Steel, such as stainless, heat-resisting, and tool steel, produced in small volumes to meet specialized needs.

Steel

Alloy of iron and carbon, malleable as first cast, and containing by weight 2 percent or less of carbon. May contain other elements, but iron must predominate over each of the other elements.

Structural shapes

Rolled flanged shapes having at least one dimension of their cross-section 76 mm or greater. Used mainly for construction purposes.

Tolerance

The expected deviation from industry-set dimensional specifications.