



Profile: Primary Metals and Basic Steel Products



Office of General Industry Enforcement

SIC 331 – Primary Metals and Basic Steel Products

Industry Description:

This industry group (SIC 331) is involved in manufacturing steel from hot metal and pig iron from iron ore, and iron and steel scrap. After the production of liquid steel, the product is initially cast into slab, billet or bloom shapes which is then hot rolled into such products as plates, sheets, strips, rods, bars, and tubing. This group also includes production of coke. The following four digit Standard Industrial Classifications (SICs) fall under this industry group:

SIC 3312: Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills

SIC 3315: Steel Wiredrawing and Steel Nails and Spikes

SIC 3316: Cold-Rolled Steel Sheet, Strip, and Bars

SIC 3317: Steel Pipe and Tubes

This group (SIC 331) does not include: Iron and Steel foundries; Establishments engaged in Primary and Secondary Smelting and Refining of Nonferrous Metals; Rolling, Drawing and Extruding of Nonferrous Metals; and Nonferrous Foundries.

This industry group is large and complex, involving various operations, including blast furnaces. Blast furnaces chemically reduce and physically convert iron oxides into liquid pig iron or “hot metal.” The furnace is up to 300 feet high and 36 feet in diameter, built of steel and refractory brick. Iron ore, coke and limestone are charged into the top, and preheated air is blown into the bottom. The furnace is charged, generally through automatic processes, using such equipment as conveyors and “skip cars.” The most common fuels used in the furnace are coke, natural gas, and coal. Layers of limestone and iron ore are added to the fuel. The raw materials require 4 to 6 hours to descend to the bottom of the furnace where they become the final product of liquid slag and hot metal. The hot air that is blown into the bottom of the furnace ascends to the top in 6 to 8 seconds. The nitrogen in the air passes through the furnace and the oxygen burns the fuel to create heat, carbon monoxide, and carbon dioxide gas. The carbon monoxide reacts with the iron oxides to produce iron. The heat smelts the iron and the other solids to form a liquid that collects in the bottom of the furnace with the slag floating on top of the molten iron. The blast furnace is tapped (emptied) through taphole(s) at the bottom of the furnace. The molten slag and hot metal are separated during tapping. The iron goes to a bottle car [a horizontal, refractory-lined vessel moving in and out of the furnace area on railroad tracks] and then to the steelmaking furnace; the slag goes to a separate ladle and is recycled into many products, primarily concrete and roadways.

The molten hot metal is taken to the basic oxygen furnace [BOF] shop where it is refined into steel. The hot metal is charged into the BOF vessel where it is mixed with recycled steel scrap. Pure oxygen is blown from the top of the vessel, bottom of the vessel, or both. The impurities in the hot metal are oxidized generating large quantities of heat, which melts the scrap and raises the temperature of the mix to approximately 3000 degrees F. The mix is tapped [emptied] into a ladle where alloying elements are added.

An alternative process for making steel involves charging scrap into an electric arc furnace and melting it using electrical energy.

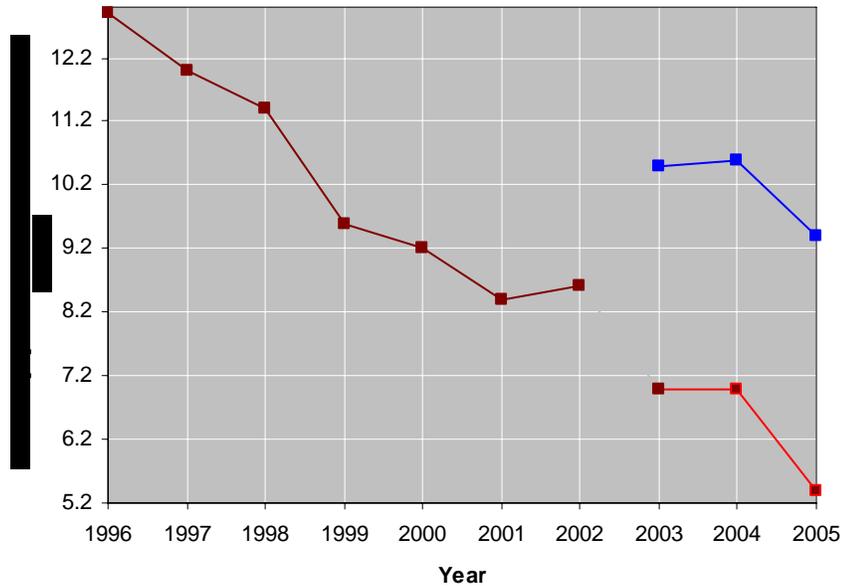
Steel from both the electric arc furnace and the BOF are tapped into a ladle. In some cases the steel undergoes further refining to create the desired chemistry for its ultimate use. The finished molten steel is sent to a continuous casting machine, which continuously solidifies the steel into semi-finished shapes known as blooms, billets, or slabs.

The semi-finished products go to the hot rolling mill where the size is reduced. Many products are sold in the hot-rolled form. The balance goes to various cold finishing and coating operations to produce a variety of steel products, most of which are used to produce other commercial or industrial goods.

BLS Profile

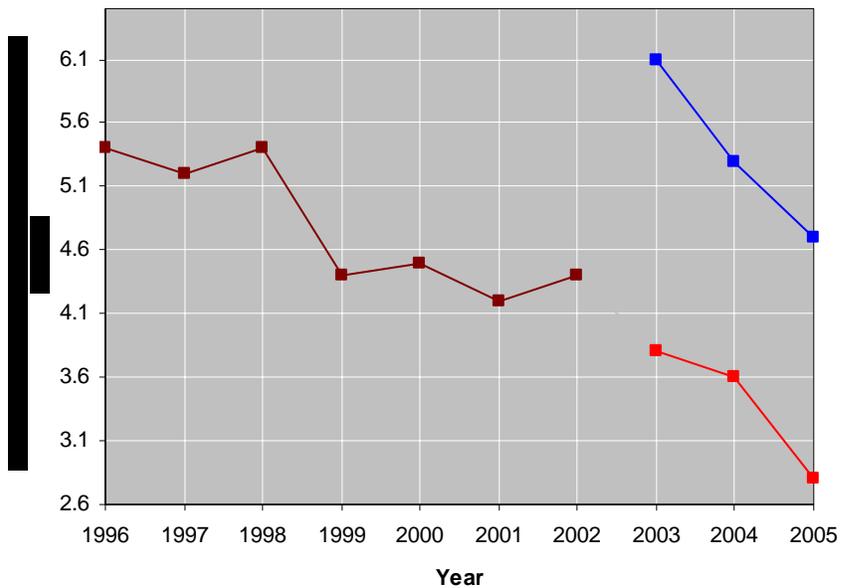
Total Recordable Case Rate (Industry Group 331)

Year	Annual
1996	12.9
1997	12.0
1998	11.4
1999	9.6
2000	9.2
2001	8.4
2002	8.6*
2003	7.0/10.5**
2004	7.0/10.6**
2005	5.4/9.4**



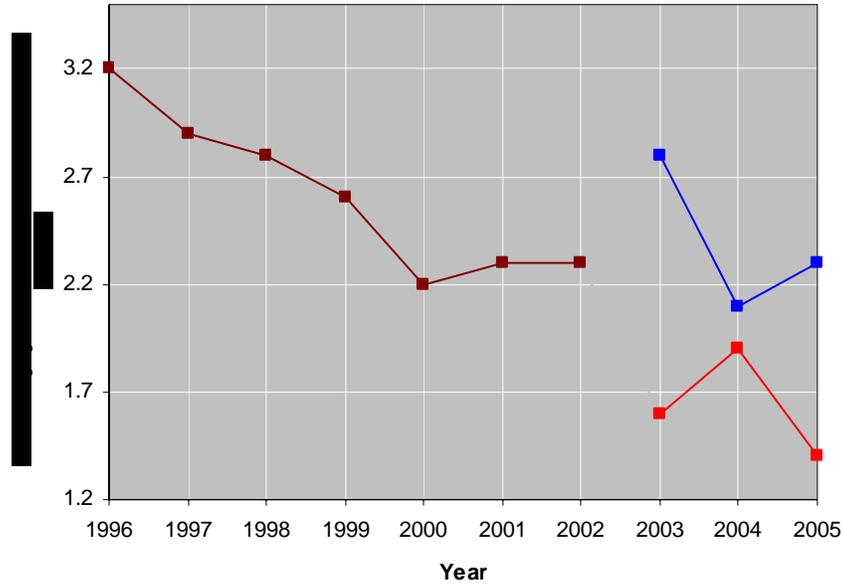
Lost Work Day Case Rate (Industry Group 331)

Year	Annual
1996	5.4
1997	5.2
1998	5.4
1999	4.4
2000	4.5
2001	4.2
2002	4.4*
2003	3.8/6.1**
2004	3.6/5.3**
2005	2.8/4.7**



Cases with Days Away Rate (Industry Group 331)

Year	Annual
1996	3.2
1997	2.9
1998	2.8
1999	2.6
2000	2.2
2001	2.3
2002	2.3*
2003	1.6/2.8**
2004	1.9/2.1**
2005	1.4/2.3**



* Effective January 1, 2002, the Occupational Safety and Health Administration (OSHA) revise it requirements for reporting occupational injuries and illnesses. Due to the revised recordkeeping rule, the estimates from the 2002 survey are not comparable with those from previous years, thus resulting in the discontinuous graph lines.

** Beginning with the 2003 reference year, the BLS Survey of Occupational Injuries and Illnesses began using the 2000 North American Industry Classification System (NAICS). Prior to 2003, the survey used the Standard Industrial Classification (SIC) system. The substantial differences between these systems results in breaks in series for industry data. SIC Group 331 encompasses NAICS groups 3311 and 3312. The rates in the table reflect these two NAICS groups, respectively. From 2003 onward, NACIS Group 3311 is represented on the graph by the red data series, and NAICS 2312 is represented by the blue data series.

Fatality Total for NAICS Group 3311 (2005): 8
Fatality Total for NAICS Group 3312 (2005): 0

Source: Bureau of Labor Statistics (National Data)

National Summary by Region NAICS 3311/3312

Regions	Establishments with 10 or more employees		Establishments with 9 or fewer employees	
	Establishments	Employees	Establishments	Employees
1	95	6412	141	392
2	133	12086	200	587
3	278	56373	255	685
4	165	12492	325	905
5	404	51589	446	1214
6	252	25424	384	1053
7	66	4038	96	314
8	20	2667	79	211
9	N/A	N/A	N/A	N/A
10	2	72	17	41

NA = Data not available

Employment and establishments counts come from Dunn & Bradstreet, March 2006.

Inspection Summary

FY 2006 Federal OSHA Inspection Data Industry Group 331

Federal Data Only	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
Total Inspections	5	13	25	8	44	11	2	3	0	0	111
Records	0	0	0	0	0	0	0	0	0	0	0
Safety	4	9	15	6	34	9	1	2	0	0	80
Health	1	4	10	2	10	2	1	1	0	0	31
Inspections By Type											
<u>Unprogrammed</u>	5	10	15	15	33	9	2	0	0	0	81
Accidents	0	0	1	1	2	3	0	0	0	0	6
Complaints	4	3	11	11	25	5	0	0	0	0	51
Referrals	1	5	3	3	4	0	2	0	0	0	18
Monitoring	0	1	0	0	0	0	0	0	0	0	1
Variance	0	0	0	0	0	0	0	0	0	0	0
Follow-Up	0	1	0	0	1	1	0	0	0	0	4
Unprog. Related	0	0	0	0	1	0	0	0	0	0	1
Other	0	0	0	0	0	0	0	0	0	0	0
<u>Programmed</u>	0	3	10	10	11	2	3	3	0	0	30
Planned	0	3	10	10	8	2	3	3	0	0	27
Prog. Related	0	0	0	0	3	0	0	0	0	0	3
Other	0	0	0	0	0	0	0	0	0	0	0

Source : IMIS database

Top 10 Violations Cited

Standard	#Cited	#Insp	Description
1910.179	50	17	Overhead & Gantry Cranes
1910.147	42	18	The Control of Hazardous Energy, Lockout/Tagout
1910.219	38	16	Mechanical Power-Transmission Apparatus
1910.212	37	27	Machines, General Requirements
1910.23	30	19	Guarding Floor and Wall Openings and Holes
1910.22	24	16	Walking Working Surfaces, General Requirements
1910.305	23	12	Electrical, Wiring Methods, Components & Equipment
1910.303	22	14	Electrical, General Requirements
1910.178	21	12	Powered Industrial Trucks
1910.95	19	9	Occupational Noise Exposure

Source: IMIS Database – FY 2006 (Federal Only)

Average Number of Employees per Establishment: 52.6

Percent small establishments: 57.9 %

Some Potential Hazards and Their Sources

Hazard	Source
Burn and eye injuries	Slag draw-off and metal pouring
Struck-by/crushing hazards	Materials handling equipment in ore and scrap metal receipt and storage
Heat stress	Furnace charging and operations
Respiratory hazards	Exposure to metal fumes, dust, and silica
Strains and sprains	Manual handling of materials and heavy loads
Fall hazards	Elevated furnace walking-working surfaces

Average Case and Demographic Characteristics

Average cases per year, 1995 – 2000		7,010
Demographics of worker	Sex	91.4% men
		22.6% ages 25-34 30.8% ages 35-44 27.1% ages 45-54
	Length of service with employer	51.4% more than 5 years 22.7% 1-5 years 14.6% less than 1 year
	Race/ethnic origin	47.2% white non-Hispanic 40.6% not reported 7.3% black non-Hispanic 4.3% Hispanic of any race
Characteristics of injury/illness	Days away from work	40.1% 1-5 days 34.0% 6-30 days 25.9% 31 or more days
	Nature of injury/illness	41.1% sprains/strains 14.8% “all other” natures 11.2% cuts/lacerations/punctures
	Part of body affected	25.6% arms/wrists/hands/fingers 23.9% legs/knees/feet/toes 20.9% back
	Source of injury/illness	26.5% parts/material 14.3% worker motion/position 13.5% floors/ground surfaces 11.9% all “other sources” 11.0% containers
	Event or exposure	23.7% overexertion 15.2% struck by object 10.0% “all other” events/exposure 9.3% struck against object

Source: OSHA Office of Statistical Analysis compilation of BLS data

Note: The percentages on this table do not sum to 100%. Only the most frequently coded characteristics are listed. The “All Other” category should not be interpreted as being all inclusive of the categories not listed above.

**2005 BLS Industry Data for
NAICS Group 3311 – IRON AND STEEL MILLS AND FERROALLOY
MANUFACTURING**

<u>All Reported Cases</u>	<u>1500</u>	
<u>Nature of Illness or Injury</u>	<u>Number</u>	<u>% Total</u>
Sprains, Strains	590	39.3
Fractures	160	10.7
Cuts, Punctures	60	4.0
Bruises	120	8.0
Heat Burns	100	6.7
Chemical Burns	N/A	N/A
Amputations	20	1.3
Carpal Tunnel	20	1.3
Tendonitis	N/A	N/A
Mult Trauma Total	90	6.0
Mult Trauma With Fracture	30	2.0
Mult Trauma With Sprain	20	1.3
Back Pain Total	40	2.7
Back Pain Hurt Back Only	N/A	N/A
All Other	290	19.3
<u>Part of Body Affected</u>	<u>Number</u>	<u>% Total</u>
Head Total	120	8.0
Eyes	70	4.7
Neck	20	1.3
Trunk Total	380	25.3
Trunk Back	230	15.3
Trunk Shoulder	90	6.0
Upper Extremities Total	350	23.3
Upper Extremities Finger	170	11.3
Upper Extremities Hand	60	4.0
Upper Extremities Wrist	40	2.7
Lower Extremities Total	480	32.0
Lower Extremities Knee	130	8.7
Lower Extremities Foot Toe	100	6.7
Body Systems	20	1.3
Multiple Body Parts	120	8.0
All Other Body Parts	N/A	N/A
<u>Source of Injury or Illness</u>	<u>Number</u>	<u>% Total</u>
Chem And Chem Products	30	2.0
Containers	100	6.7
Furniture And Fixtures	N/A	N/A
Machinery	170	11.3
Parts And Materials	450	30.0
Worker Motion	240	16.0
Floors Walkways	190	12.7
Handtools	90	6.0
Vehicle	50	3.3
Health Care Patient	N/A	N/A
All Other Sources	180	12.0

<u>Sex</u>	<u>Number</u>	<u>% Total</u>
Men	1410	94.0
Women	90	6.0
Sex Not Reported	N/A	N/A

<u>Age</u>	<u>Number</u>	<u>% Total</u>
Under 14	N/A	N/A
14 to 15	N/A	N/A
16 to 19	N/A	N/A
20 to 24	80	5.3
25 to 34	230	15.3
35 to 44	420	28.0
45 to 54	480	32.0
55 to 64	280	18.7
65 And Over	N/A	N/A
Not Reported	N/A	N/A

<u>Race</u>	<u>Number</u>	<u>% Total</u>
White	620	41.3
Black	160	10.7
Asian	N/A	N/A
American Indian or Alaskan Native	N/A	N/A
Native Hawaiian / Other Pacific Islander	N/A	N/A
Hispanic Or Latino And Others	70	4.7
Multirace	N/A	N/A
Race Not Reported	650	43.3

<u>Length of Service</u>	<u>Number</u>	<u>% Total</u>
Less Than 3 Months	70	4.7
3 to 11 Months	170	11.3
1 to 5 years	520	34.7
More Than 5 Years	730	48.7
Service Not Reported	N/A	N/A

<u>Days away from work</u>	<u>Number</u>	<u>% Total</u>
1 Day	140	8.5
2 Days	110	6.7
3 to 5 Days	110	6.7
6 to 10 Days	160	9.8
11 to 20 Days	290	17.7
21 to 30 Days	150	9.1
31 Days Or More	670	40.9
Median Days Away	21	N/A

<u>Event/Exposure Leading to Injury</u>	<u>Number</u>	<u>% Total</u>
Total Contact With Objects	550	36.7
Struck By Object	220	14.7
Struck Against Object	130	8.7
Caught In Object	170	11.3
Fall to Lower Level	80	.5.3
Fall On Same Level	120	8.0
Slips Or Trips	80	5.3
Overexertion Total	300	20.0
Overexertion In Lifting	80	5.3
Repetitive Motion	50	3.3
Exposure to Harmful Substance	140	9.3
Transportation Accidents	20	1.3

<u>Event/Exposure Leading to Injury</u>	<u>Number</u>	<u>% Total</u>
Fires And Explosions	30	2.0
Total Assaults - Violent Acts	N/A	N/A
Assaults By Person	N/A	N/A
All Other Assaults	N/A	N/A
All Other Events	120	8.0

2005 BLS Industry Data for NAICS Group 3312 – STEEL PRODUCT MANUFACTURING FROM PURCHASED STEEL

All Reported Cases 1410

<u>Nature of Illness or Injury</u>	<u>Number</u>	<u>% Total</u>
Sprains, Strains	550	39.0
Fractures	180	12.8
Cuts, Punctures	160	11.3
Bruises	120	8.5
Heat Burns	20	1.4
Chemical Burns	20	1.4
Amputations	20	1.4
Carpal Tunnel	N/A	N/A
Tendonitis	N/A	N/A
Mult Trauma Total	30	2.1
Mult Trauma With Fracture	N/A	N/A
Mult Trauma With Sprain	N/A	N/A
Back Pain Total	70	5.0
Back Pain Hurt Back Only	30	2.1
All Other	210	14.9

<u>Part of Body Affected</u>	<u>Number</u>	<u>% Total</u>
Head Total	60	4.3
Eyes	20	1.4
Neck	N/A	N/A
Trunk Total	510	36.2
Trunk Back	290	20.6
Trunk Shoulder	120	8.5
Upper Extremities Total	490	34.8
Upper Extremities Finger	280	19.9
Upper Extremities Hand	60	4.3
Upper Extremities Wrist	80	5.7
Lower Extremities Total	290	20.6
Lower Extremities Knee	90	6.4
Lower Extremities Foot Toe	50	3.5
Body Systems	20	1.4
Multiple Body Parts	30	2.1
All Other Body Parts	N/A	N/A

<u>Source of Injury or Illness</u>	<u>Number</u>	<u>% Total</u>
Chem And Chem Products	30	2.1
Containers	140	9.9
Furniture And Fixtures	N/A	N/A
Machinery	190	13.5
Parts And Materials	410	29.1
Worker Motion	210	14.9
Floors Walkways	160	11.3
Handtools	70	5.0
Vehicle	30	2.1
Health Care Patient	N/A	N/A
All Other Sources	170	12.1

<u>Sex</u>	<u>Number</u>	<u>% Total</u>
Men	1310	92.9
Women	100	7.1
Sex Not Reported	N/A	N/A

<u>Age</u>	<u>Number</u>	<u>% Total</u>
Under 14	N/A	N/A
14 to 15	N/A	N/A
16 to 19	N/A	N/A
20 to 24	100	7.1
25 to 34	310	22.0
35 to 44	340	24.1
45 to 54	440	31.2
55 to 64	190	13.5
65 And Over	N/A	N/A
Not Reported	20	1.4

<u>Race</u>	<u>Number</u>	<u>% Total</u>
White	810	57.4
Black	100	7.1
Asian	N/A	N/A
American Indian or Alaskan Native	N/A	N/A
Native Hawaiian / Other Pacific Islander	N/A	N/A
Hispanic Or Latino And Others	210	14.9
Multirace	N/A	N/A
Race Not Reported	210	14.9

<u>Length of Service</u>	<u>Number</u>	<u>% Total</u>
Less Than 3 Months	90	6.4
3 to 11 Months	180	12.8
1 to 5 years	300	21.3
More Than 5 Years	850	60.3
Service Not Reported	N/A	N/A

<u>Days away from work</u>	<u>Number</u>	<u>% Total</u>
1 Day	140	9.9
2 Days	140	9.9
3 to 5 Days	170	12.1
6 to 10 Days	150	10.6
11 to 20 Days	240	17.0
21 to 30 Days	100	7.1
31 Days Or More	480	34.0
Median Days Away	16	15

<u>Event/Exposure Leading to Injury</u>	<u>Number</u>	<u>% Total</u>
Total Contact With Objects	550	39.0
Struck By Object	240	17.0
Struck Against Object	90	6.4
Caught In Object	170	12.1
Fall to Lower Level	50	3.5
Fall On Same Level	130	9.2
Slips Or Trips	50	3.5
Overexertion Total	370	26.2
Overexertion In Lifting	130	9.2
Repetitive Motion	50	3.5
Exposure to Harmful Substance	70	5.0
Transportation Accidents	20	1.4
Fires And Explosions	N/A	N/A
Total Assaults - Violent Acts	N/A	N/A
Assaults By Person	N/A	N/A
All Other Assaults	N/A	N/A
All Other Events	140	9.9

Target Industry Selection Criteria

	<u>2000</u> <u>SIC 331</u>	<u>2001</u> <u>SIC 331</u>	<u>2002 *</u> <u>SIC 331</u>	<u>2003 – NAICS**</u> <u>3311 / 3312</u>	<u>2004 –</u> <u>NAICS**</u> <u>3311 / 3312</u>	<u>2005 –</u> <u>NAICS**</u> <u>3311 / 3312</u>
Criterion #1 – Total Cases (5000 or more)	5444	4970	4394	1540 / 1640	2020 / 1260	2900 / 2900
Criterion #2 – LWDII (3.5 or greater) (DART after 2003)	4.5	4.2	4.4	3.8 / 6.1	3.6 / 5.3	2.8 / 4.7
Criterion #3 – Ergonomic Injuries and Illnesses (no more than 30% of total injuries and illnesses involving days away from work caused by ergonomic events)	26%	31%	26%	29% / 33%	27% / 20%	27% / 32%
Criterion #4 – Severe Injuries and Illnesses (at least 50% result in at least six days away from work)	62.4%	64.7%	65.8%	77.5% / 67.0%	58.0% / 68.2%	69.3% / 68.7%
Criterion #5 – No more than 10% of the injuries involve transportation incidents	<10%	<10%	<10%	<10%	<10%	<10%
Criterion #6 – No more than 10% of the injuries involve assaults and violent acts	<10%	<10%	<10%	<10%	<10%	<10%
Criterion #7 – Not in the Construction Industry	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied

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