Steel Dynamics Commissions Its New Structural and Rail Division

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Following a more than two-year delay in obtaining a PSD air permit from the state of Indiana, Steel Dynamics, Inc. (SDI) began commissioning its new Structural and Rail Division, located in Columbia City, Ind., in May 2002.

Built at a total capital cost of $315 million, the new structural and rail facility is capable of producing up to 1.2 million tons per year of wide-flange beams, H-piling, angles, channels, sheet piling and rail products.

Background

The 611-acre greenfield plant (Figure 1) is located in Whitley County along U.S. 30, midway between Fort Wayne and Columbia City, and is approximately 10 miles west of Interstate 69. This location was chosen to provide truck access to the large markets of the Midwest and northeastern U.S. and Canada. In addition to truck access, an existing main rail line across the southern boundary of the property provides direct rail access to CSX Transportation and Norfolk Southern railroads.

SDI first announced its intentions to build a structural mill in the upper Midwest in Aug. 1997. Site selection was finalized in July 1998. Later, in May 1999, SDI announced that the project was being expanded to include the manufacture of standard- and premium-quality rail products.

As previously mentioned, construction was delayed for approximately two years due to the filing of appeals by local groups against the PSD air permit, which was considered the most comprehensive air permit in the country to date. In April 2001, the U.S. Environmental Protection Agency's Environmental Appeals Board denied the sole remaining opponent's appeal.

During the permitting process, engineering progressed, and much of the construction material and manufacturing equipment was moved on site. SDI served as the general contractor, and Centerline Engineering/Lockwood Greene was employed for general engineering. Following permit issuance, groundbreaking ceremonies were held on May 29, 2001. A short 11 months later, the facility was melting and casting its first steel. Rolling and shipping of product were commenced 13 months after groundbreaking.

Plant Facilities

The plant is laid out running west to east, with scrap entering the meltshop at the extreme west end of the building (Figure 2) and finished product leaving the facility at its southeast corner.

Electricity is provided to the plant by Northeastern REMC. The main electrical substation was located on the south side of the plant and was designed and built by GE. It consists of one 345-kV bus and three 34.5-kV busses, with one for the meltshop, one for the rolling mill and one spare. Three 80/149 MVA transformers were supplied by GE Prolec, and the static VAR compensation system was supplied by Alstom. Should the facility be expanded to a two-furnace operation, a fourth transformer would be installed on the meltshop bus. Power distribution equipment was standardized throughout the mill and was supplied by Toshiba and Square D.

Natural gas is supplied to the mill by NIPSCO.

USFilter designed the water treatment plant that is owned and operated by SDI. Make-up water is provided by two independent deep-well sources located on the property. Two retention ponds are located on the property for surface water runoff control.

Praxair owns and operates an industrial gas plant on the facility.

Slag processing is done on site under contract with Edward C. Levy Co.

After experiencing a two-year permitting delay, construction at Steel Dynamics' new Structural and Rail Division was completed in 13 months. Commissioning of structural products commenced in July 2002. Rail production is expected to commence in the first quarter of 2003.

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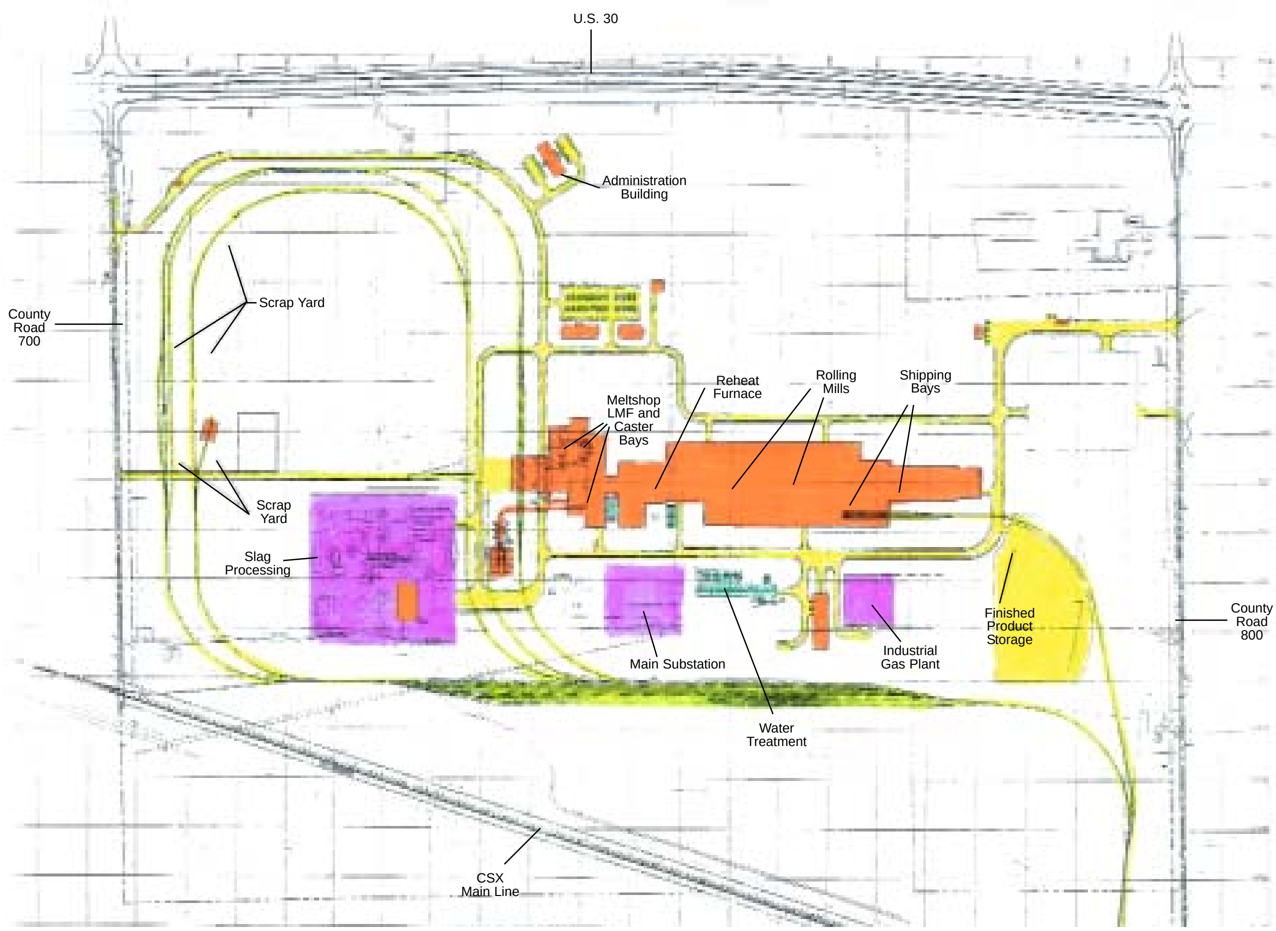
Figure 1



Footprint of SDI's new Structural and Rail Division.

From SDI's Structural and Rail Division Management Team

SDI's management team, left to right: Kevin Bort, Engineering Manager; Dick Teets, Vice President and General Manager; Will Hawley, Construction Manager; Kevin Perala, Melting and Casting Manager; Roy Perala, Rolling and Finishing Manager; Chris Graham, Material and Transportation Manager; and Bill Kautz, Controller.

All of us at Steel Dynamics' Columbia City facility are very pleased with the successful completion of construction and ongoing commissioning of our new mill. The meltshop and caster are working extremely well, and the rolling mill and finishing equipment have been in full operation since mid-July, performing rolling trials each week on new sizes and shapes. It is satisfying to see finished beams staged in our yard and being loaded onto semi-trailers and railcars for shipment to customers.

We are extremely proud of all our employees and contractors who worked together to move this project along safely, on budget, and ahead of schedule. They made it possible for us to initiate our production within 13 months from the start of construction of the mill.

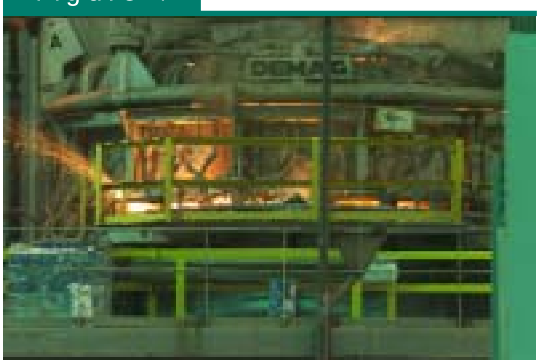
We are proceeding with the installation of additional equipment for the production of all popular sizes of rail in the early part of 2003. In rail, we see an opportunity to become the premier supplier of high-quality, long-length rail to North America's railroads. Producing rail in the same plant as structural steel gives us the ability to be the low-cost producer of both products, while exceeding stringent quality demands.

We look forward to the success of SDI's entry into the Midwest structural steel and North American rail businesses. We expect our cost structure and close proximity to major structural steel markets to permit us to be extremely competitive. Our goal as a team is to provide exceptionally high quality long steel products, and to do so with the flexibility and level of service that will earn us distinction as the preferred supplier.

Figure 2

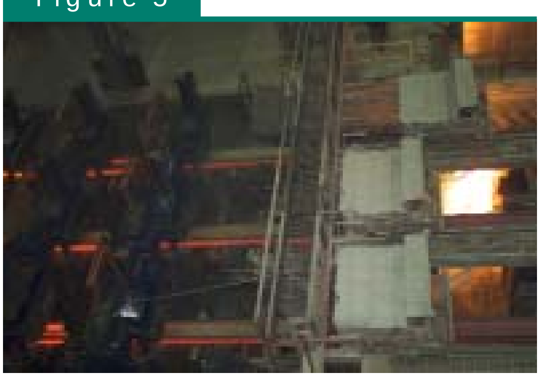
Aerial view of the SDI facility, looking west to east. The scrap-handling building and baghouse are in the foreground, with finishing facilities located in the background.

Figure 4



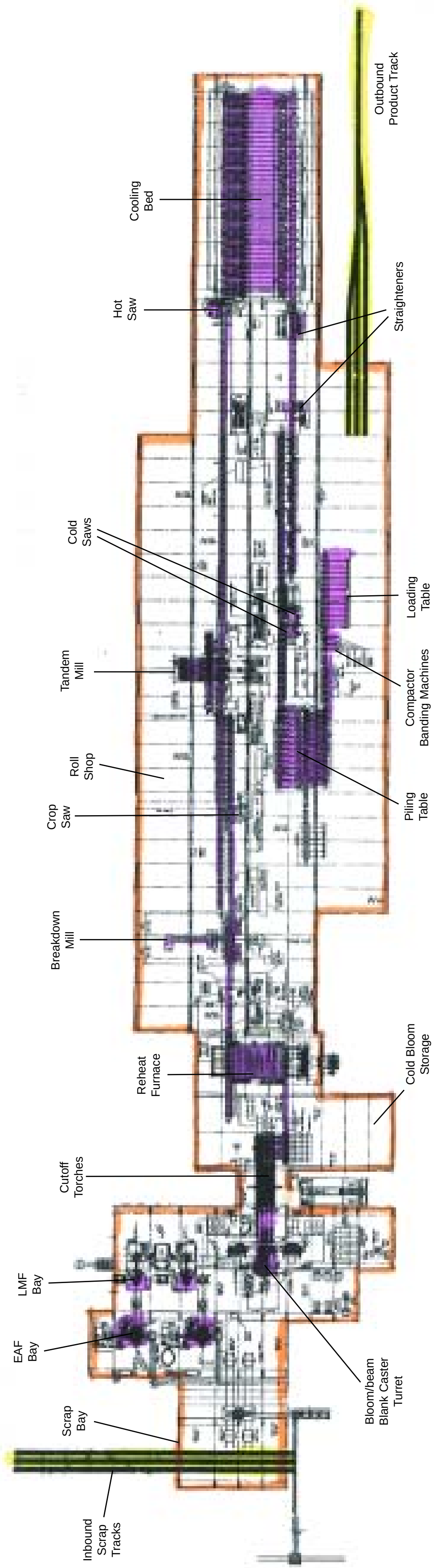
View of the A-furnace in operation.

Figure 5



View of three beam blank strands exiting unbending and undergoing torch cutoff.

Figure 3



General arrangement of the major operating equipment at SDI's Structural and Rail Division.

Table 1

EAF Specifications

Tap weight	120 tons
Shell diameter	22 ft.
Transformer rating	120 MVA
Electrode diameter	24 in.
Electrode arms	power conducting copper-clad steel
Chemical energy input	five oxy-fuel sidewall burners (each rated at 8.0 MW); three are capable of decarburizing
	one O_2/C sidewall injection lance

Table 2

LMF Specifications

Heat size	120 tons
Treatment time	40 min.
Heating rate	7°F/min. (max.)
Ladle freeboard	20 in.
Electrode diameter	16 in.

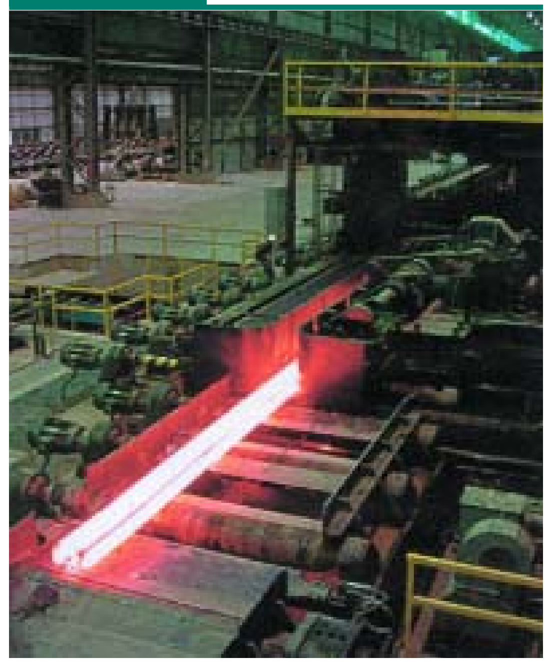
A general arrangement showing the major pieces of operating equipment is shown in Figure 3. Equipment descriptions follow under the appropriate heading.

Inbound Materials and Transportation

The plant is configured with two main entrances. A truck entrance for inbound scrap and outbound product, complete with a scale and a radiation detection device, is located on the east side of the plant. The state of Indiana made infrastructure improvements to County Road 800 to accommodate the increased truck traffic. A visitor/employee entrance is located on the west side of the property from County Road 700 to minimize congestion and interference with truck traffic.

Inbound scrap arriving via rail crosses over a car scale and a radiation detection device located in the scrap yard on the west side of the mill. Track-driven excavators configured

Figure 6



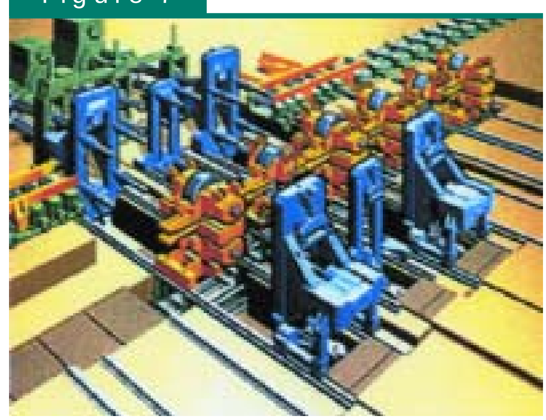
Product first goes across a breakdown mill.

Table 3

Bloom/Beam Blank Caster Specifications

Number of strands	3, expandable to 4
Mold type	curved mold, tube and plate configurations
Cast sizes	10 x 6 in. bloom, tube mold 12 x 10 in. bloom, plate mold BB1, tube mold BB2, plate mold BB3, plate mold BB4, plate mold
Nominal casting speeds	10 x 6 in. bloom; 70 ipm 10 x 12 in. bloom; 32 ipm BB1; 60 ipm BB2; 32 ipm BB3; 34 ipm BB4; 27 ipm
Casting radius	33 ft.
Number of unbending points	2
Containment length	193 in.

Figure 7

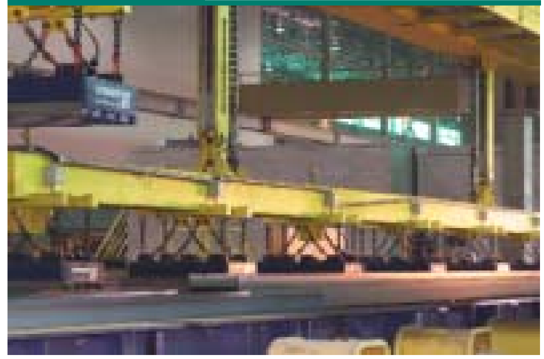


A complete roll change of all three stands, including guides, is accomplished in less than 25 minutes using the compact cartridge stand changing procedure.

Figure 8

Product goes across either of two straighteners after exiting the cooling bed. The No. 1 straightener is shown here.

Figure 10



Product is bundled for shipment on a piling table after being cut to length.

Figure 9

A fixed or a moveable cold saw gang-cuts product to finished lengths.

Figure 11

A compacting/banding machine completes the finishing operation. Product is now ready for shipment.

with magnets unload scrap onto the ground and reload it into in-plant gondola cars for delivery to the meltshop. Three tracks are located under roof in the meltshop, and transfer cars are spotted under two 30-ton cab-operated Zenar cranes for loading of scrap into charge buckets.

Inbound scrap arriving via truck can either be dumped in the scrap yard or onto a concrete pad outside the meltshop and then pushed into the scrap-loading building via front-end loaders.

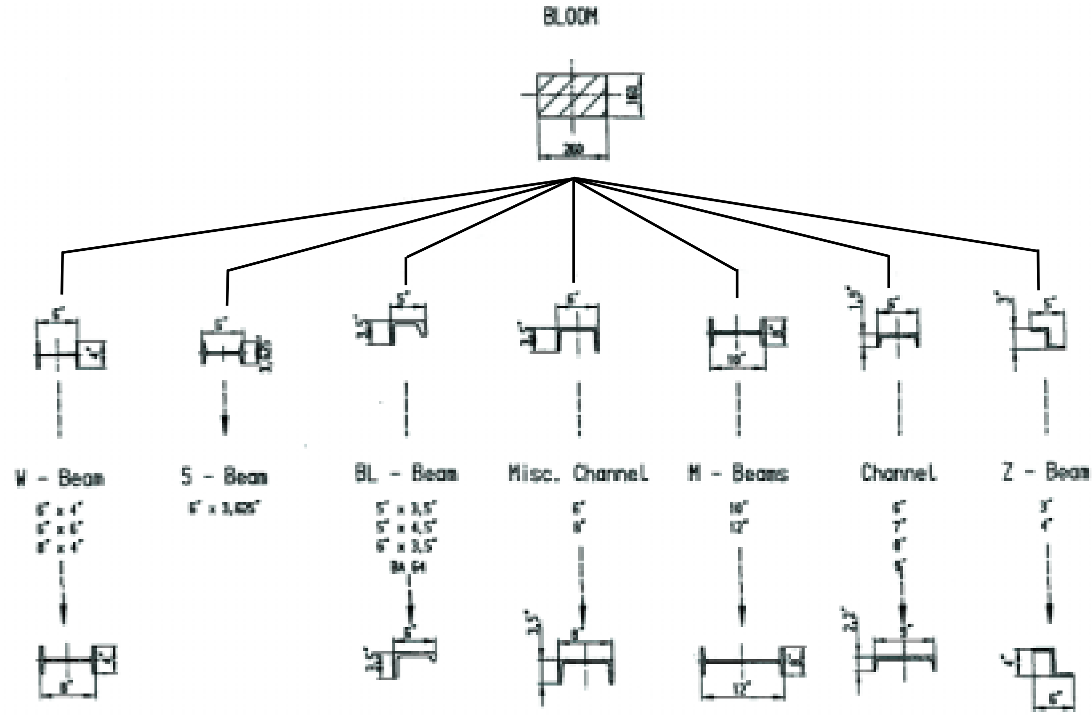
Lime, dolomitic lime and carbon are stored in EMCI-supplied silos and conveyed into charge buckets during magnet loading of scrap. Magnets hauling scrap pass a second radiation detection device as buckets are being filled. Fully loaded buckets are transported on SES cars into the meltshop bay and charged into the EAF via a 250-ton radio-controlled Alliance overhead crane.

Steelmaking Facilities

SDI installed two SMS-Demag 120-ton AC eccentric bottom tapping EAFs (Table 1), each fed by 120-MVA ABB transformers. The transformers installed were identical to those at SDI's Butler, Ind. facility to allow spares to be fully interchangeable. Water-cooled ductwork on both furnaces was supplied by AmeriFab.

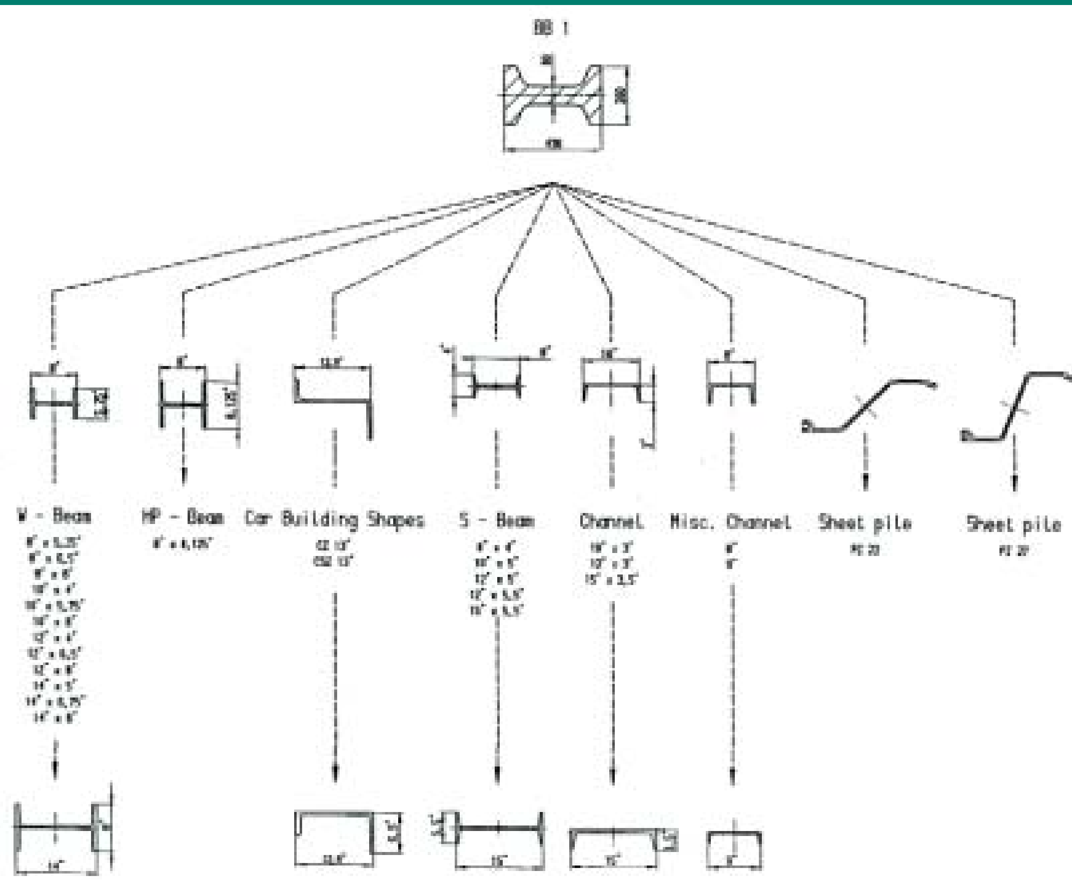
While two EAFs were installed, the facility was permitted to operate only as a one-furnace operation at a rated annual capacity of 1.2 million tons (Figure 4). The second furnace is available as a ready spare. In the event of an extended furnace outage, production can proceed on the backup furnace. With such an arrangement, SDI positioned the meltshop to accommodate future production level expansion by installing a working spare during plant construction.

Figure 12



Structural shapes rolled from the 6-by-10-inch bloom.

Figure 13



Structural shapes rolled from the BB1 beam blank.

Level 2 control for the EAFs was provided by CTG. The furnace is capable of operating with a single bucket scrap charge, with a typical charge containing 7% bundles, 5% pig iron, 30% shredded, balance home and pit scrap. Tap-to-tap times achieved thus far are consistently under 45 minutes.

The meltshop is complemented by two SMS-Demag porous plug stationary roof LMFs (Table 2). Each is powered by a 22-MVA ABB transformer; these transformers, likewise, are duplicates of those at the Butler, Ind., facility to make spares interchangeable.

Ladles, supplied by Ewing, are transported to and from the LMFs via SES transport cars. The north EAF and LMF are connected via a dedicated east/west track. The east/west track from the south EAF is dead-headed, and ladles from this furnace must be lifted by crane onto a second car on a north/south track for transport under an LMF. Alloys are supplied to the LMF by conveyor from storage silos located outdoors, north of the meltshop bay. Finished ladles are lifted onto the caster's turret by 250-ton cab-operated Alliance cranes.

A 3-strand SMS-Concast continuous bloom/beam blank caster was installed (Figure 5 and Table 3). The curved mold machine casts two bloom (10 x 6 and 10 x 12 inches) and four beam blank (BB1, BB2, BB3 and BB4) sizes. Provisions, including foundations and deck structurals, were built into the caster for future expansion to four strands.

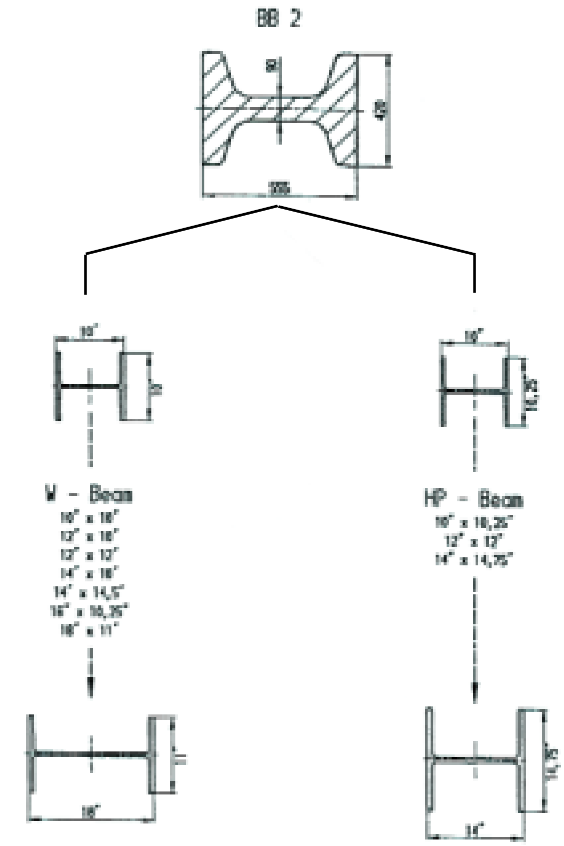
Level 2 for the caster was supplied by CTG. Two tundish heaters, supplied by American Combustion, were located on either side of the casting position for added flexibility. Cast lengths are 17 to 47.5 feet. Cutoff torches were supplied by Gega.

While containment for the caster is accomplished with one segment, provisions were made for the installation of a second segment when required. Water spray cooling is also employed.

All as-cast product is tagged after cutoff, and identification is maintained relative to heat number, chemistry and strand number. As-cast blooms and beam blanks can be hot charged into the reheat furnace via a cross-transfer table for subsequent rolling on the mill, or walked onto a storage bed for cold storage. There a cab-operated 40-ton Zenar crane off-loads as-cast product, using a spreader beam outfitted with electromagnets, for off-line storage. Cold blooms and beam blanks are individually loaded onto the cold charging table using the same crane and spreader beam arrangement.

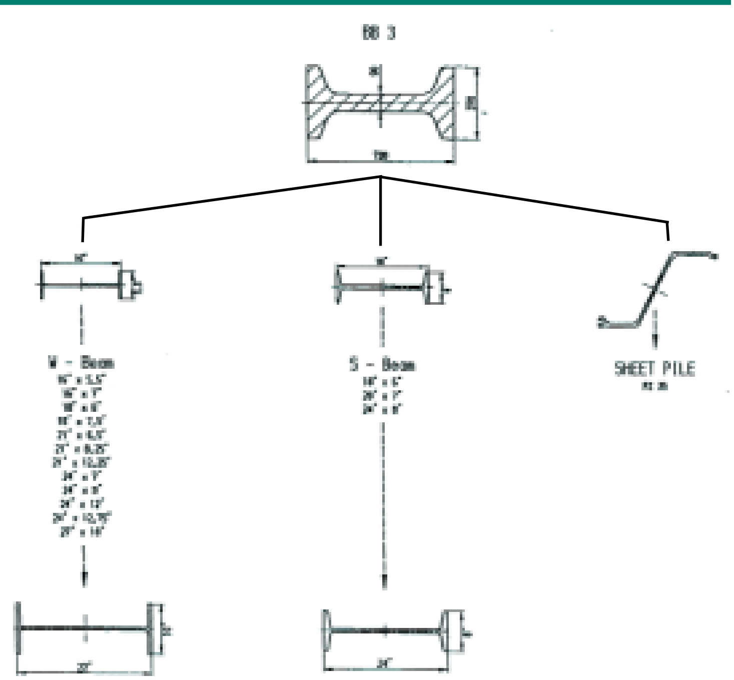
Direct evacuation of the EAF and LMF canopies and the entire meltshop is to a 10-compartment, 1,200,000-acfm positive-pressure

Figure 14



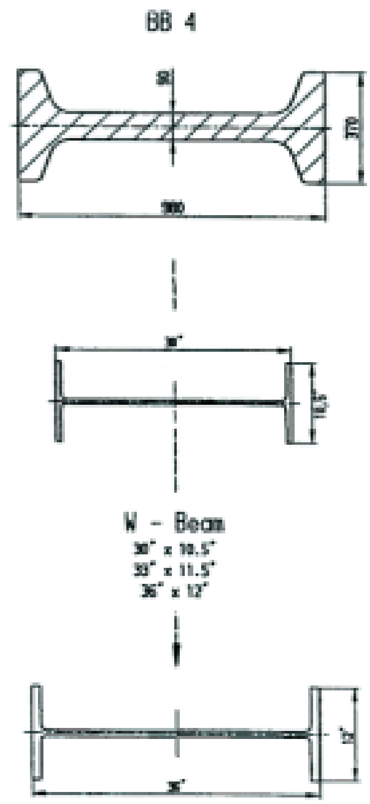
Structural shapes rolled from the BB2 beam blank.

Figure 15



Structural shapes rolled from the BB3 beam blank.

Figure 16



Structural shapes rolled from the BB4 beam blank.

baghouse, supplied by Wheelabrator. The baghouse uses reverse-air fabric filters at a maximum gas temperature of 275ºF and was built to be expandable to 16 compartments for a 2-furnace operation. Baghouse fan motors were sized the same as those at the Butler, Ind., facility to utilize common spares.

One vertical and three horizontal ladle preheaters, supplied by Process Technology International, are located at the south end of the LMF bay.

With SDI's planned expansion into rail products, a vacuum tank degasser was envisioned to be installed at the north end of the LMF bay. Engineering work is already under way for this equipment, with installation slated for the first quarter of 2003.

Rolling Facilities

A walking beam reheat furnace was provided to SDI by A.C. Leadbetter on a turnkey basis. Leadbetter also supplied the level 1.5 controls for the furnace. Throughput is rated at 350 and 250 tons per hour for hot and cold charging, respectively. The furnace is nominally rated at 260 MMBtu/hr.

Product exiting the reheat furnace undergoes high-pressure descaling using AC pump motors fed by a Toshiba drive.

Rolling is done across a single-stand 2-high 51-inch reversing breakdown mill (Figure 6), followed by cross-transfer to a 3-stand 51-inch tandem X-H mill, consisting of a universal roughing, edger and universal finishing stand. A crop saw is located at the east end of the breakdown mill delivery table to cut product head-ends, when necessary, before the product enters the tandem mill.

SMS Demag supplied the mechanical equipment for the four rolling mill stands, while Toshiba International supplied the drives and automation. Extensive use was made of packaged control rooms to facilitate drive installation. Drives are sized at 5500 kW for the breakdown, universal roughing and finishing mill stands and 3500 kW for the edger stand. Level 2 controls for the mill were supplied by SMS Demag.

The 3-stand X-H mill is equipped with compact cartridge stands, allowing all three stands to be completely changed out in less than 25 minutes, including guides. To accomplish this, the front of the mill stands are sledded out from the mill, and a perpendicular sled arrangement replaces the old roll assemblies with new assemblies, complete with all guides (Figure 7).

The breakdown and tandem mills are serviced by a 55/25-ton radio-controlled Zenar crane.

Following tandem rolling, products cross an 82-inch-diameter hot saw before traversing south across a 246-by-105-foot cooling bed. Cooled product is transported west off the cooling bed and then goes through one of two straighteners—No. 1 being a four-over-five-roll configuration for larger sections (Figure 8) and No. 2 being a four-over-three-roll configuration for smaller sections.

After straightening, product is gathered on a collecting transfer table before being transported to two 82-inch cold saws, one fixed and one moveable (Figure 9), for cutting to finished lengths using laser measurement equipment. Product is then cross-transferred south and routed across a 120-foot piling bed (Figure 10), to compactor and banding machines (Figure 11) and then delivered onto the loading bed as finished, tagged product, ready for shipment.

Figures 12 through 16 present the structural products rolled by SDI from the 10-by-6-inch bloom and four beam blank sizes. Future rail products will be rolled from a 12-by-10-inch bloom (not pictured).

SDI also plans to produce standard and high-quality rail product at this facility. Engineering and construction is currently under way to install an induction head-hardening facility ahead of the cooling bed. This equipment is being supplied by SMS Demag, ABB and GE Toshiba.

After rail product exits the cooling bed, it passes through the No. 1 straightener and a new vertical straightener supplied by SMS Demag. Rail product then proceeds east through an in-line testing center, where product is checked for internal and external defects, straightness, and profile. Product will then be cross-transferred to a cold saw and gag press before being delivered to the loading table. This equipment is being supplied by SES, NDT and Linsinger. An extension of the finishing buildings is under way to house the rail finishing equipment.

Production of rail products is planned to occur in the first quarter of 2003. SDI has planned its rail facility to produce 320-foot finished lengths. These longer rails are expected be quite attractive to the market, as they will reduce by 80% the number of field welds required when installing track. Most rail product is supplied in finished lengths of 80 feet.

Outbound Materials and Transportation

Given the mill's geographic location, finished product is expected to ship from the plant predominantly by truck, with an anticipated mix of 70% truck, 30% rail. Most product going outbound by rail will be stored inside and loaded by cab-operated cranes onto rail cars.

Approximately 20 acres of finished product storage yard have been developed for truck shipments. Finished product will be removed from the loading table by crane and deposited onto in-house flatbed trailers for transport to the storage yard, where they will be off-loaded by rubber-tired fork trucks. These same fork trucks will load outbound trucks in the yard.

SDI, with CTG, has developed a computerized method to allow cross-application of product in the storage yard. Currently, this system is being manually managed, but plans exist to convert this system over to a handheld wireless bar code scanner system in the near future.

Staffing

Total staffing is expected to approach 325 persons upon start-up of the rail products facility. Many of the management personnel are from SDI's Butler facility, and approximately 50 to 60 production and maintenance personnel transferred to the Structural and Rail Division from SDI Butler and Iron Dynamics facilities. The balance of personnel were new hires who either had experience in structural or rail production or were brought on board by SDI during the mill's construction in order to begin their training.

SDI is proud of its employees' achievements and their safety performance during the fast-tracked construction project. SDI also expects similar success as they move forward with production.

Summary

After overcoming more than two years of permitting delays, SDI constructed its Structural and Rail Division in Columbia City, Ind., in 13 months. Given its geographic location in the Midwest, the company expects to reach its faceplate capacity of 1.2 million tons to trade in 2004, with a mix of 400,000 tons of rail and 800,000 tons of structural products. *AISE*

NEW TECHNOLOGIES REDUCE AUTOMOBILE EMISSIONS AND SAVE ENERGY

The U.S. Environmental Protection Agency (EPA) has just published the American Iron and Steel Institute's (AISI) "green engineering" case study on its website (www.epa.gov/opptintr/greenengineering/docs/ulsab-avc.pdf). The case study, entitled "Reducing Automobile Emissions and Saving Energy: ULSAB-AVC," details the environmental benefits of new technologies emerging from AISI's ULSAB-AVC (Advanced Vehicle Concepts) program. The program demonstrates how advanced steels and manufacturing techniques can provide solutions to today's environmental problems in a safe, affordable manner. Utilizing ULSAB-AVC designs, mid-size sedans will achieve 52 miles per gallon when powered with a gasoline engine and 68 miles per gallon if equipped with a diesel engine, reducing engine emissions by more than 50%. The ULSAB-AVC designs achieve "Five Star" crash safety ratings based on anticipated 2004 safety standards and cost no more to build than traditionally engineered vehicles.