



A Look at What Goes Into Curving Steel

BY DAVID HORNSBY

With experienced operators, the challenge of curving steel just right is what keeps the job interesting.

AFTER NEARLY TWO DECADES of hands-on experience, David Hornsby opened his own shop to bend and roll steel in 2005. Located in Cleveland, Ala., the firm has carved out a niche for itself with its expertise in curving spirals and other complicated shapes. *MSC* recently invited Hornsby to explain some of the more interesting aspects of their operation.

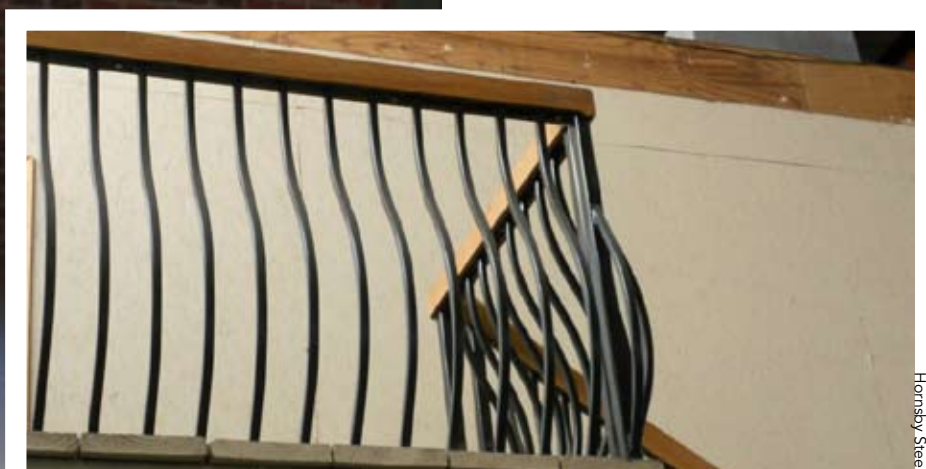
MSC: What makes a bender-roller different from a standard fabrication shop?

HORNSBY: For one thing, bender-rollers have specialized equipment, like angle rolls and beam rolls, that a fabricator might only have a need for once a month. Almost all of our customers are other fab shops. It's not really cost-effective for them to have this type of equipment just sitting around, but by providing this specialized service for a lot of fabricators, we use the equipment all day, every day and that makes it a lot more cost-effective. We don't fabricate anything. All we do is bend and roll material. We furnish parts for the fabricator.

The other big difference is that the equipment and the process we use take an enormous amount of room. For example, if you're curving a 60-ft beam you have to have 60 ft into the machine and 60 ft out. And if you're curving it to a relatively tight radius, you could be 40 ft to 50 ft across from it, so you have to have an area that's 50 ft by 120 ft just to roll a 60-ft beam.

MSC: Is handling the material a big part of the job?

HORNSBY: It is. The handling of the material—getting it in and getting it out—probably costs as much as the curving itself.



Hornsby Steel

Ben Jones

▲ Hornsby Steel curved the steel for this staircase recently built by AISC member Steel-Plus, LLC, Ider, Ala., and installed at Troy University, Troy, Ala. by general contractor Whaley Construction Co. Inc., Troy, Ala.

▲ Closely spaced curved steel balusters provide edge protection at the top of the staircase leading up from the Hornsby Steel shop floor, providing an elegant, unusual appearance.

MSC: Is curving steel a high-tech operation at this point in time?

HORNSBY: Yes and no. Digital readouts on many of the machines help improve repeatability, and we use computers to come up with the layouts. The layouts on drawings are vague at best, and that's where using technology is beneficial. But most jobs are completely different, and because a lot of the benefit of using technology depends on repeatability it's not always as helpful as you would hope.

MSC: What about data being directly transferred from one machine to another—is that happening in your shop?

HORNSBY: Not in the curving operations. If we were doing the same thing day in and day out, that would be a benefit we would look into. But as a general rule, we're not repeating the same thing often enough. Each job is unique.

MSC: How great of an advantage is there to doing a large quantity of pieces that are the same rather than just one or two?

HORNSBY: There's definitely an advantage. The digital readouts allow us to set the machine identical to the piece we rolled before, and that certainly speeds things up. There are advantages on the material handling side, too—it doesn't take any longer to bring a stack of material up to the shop than to bring a piece.

MSC: Did you buy all new equipment when you opened your shop?

HORNSBY: Actually, it's a mix of old and new. I started with an older plate roll and a new press brake. Since then we've added another new press brake and added an old press brake. It is actually a brand new 1952 model press break that was in government storage. The paint was not even worn off the wear area. We also have added a new plate roll since then.

The old machines are just workhorses. They're every bit as functional as the day they were made. They'll last forever if you maintain them properly. But it's some old technology that not many people can do anymore. I have quite a few people that have been in this business for a long time. They're getting older and I thought I need to show the younger ones how to operate these machines or we're going to lose that capability.

MSC: How much of what you do depends on operator skill?

HORNSBY: Operators are priceless in this business. Every piece rolls a little differently. You can use the readouts to get somewhat of a repeat, but even with the machine set the same as for the piece before, the next one might roll not quite tight enough or it may be too tight. The actual strength of each piece is just a little bit different, and it shows up when you start yielding it and curving it into a shape. An experienced operator can make a big difference.

MSC: What ramifications does this have for engineers and architects as they specify and design curved steel?

HORNSBY: The most common misunderstanding we have to deal with among architects and engineers is that when you go tight on a radius, you frequently have to increase the thickness of the material to prevent wrinkling or collapsing the member. But that is improving as time goes by. Today you can use a lot lighter member than you used to be able to, so design professionals just need to remain flexible on increasing the thickness on items that are being curved. There's no universal rule of thumb, because each bender-roller's capability is somewhat different, but that is something that happens with all bender-rollers. The big material has a limit to how tight it can go, and the smaller you go the tighter you can get.

There is a cost relationship between radius and member size. You know if you attempt to roll something that is too big into too tight a radius, the cost will skyrocket. If you can stay smaller on the tight radius and increase the size as the radius increases certainly it can lower the cost dramatically. This is the kind of thing that architects and engineers should talk with bender-rollers about to come up with optimal solutions.

MSC: Is most of your work on the lighter end, or on the heavy?

HORNSBY: It depends on the application. We're not the biggest roll shop by any means, but we can do pretty heavy stuff. Most of what we do tends to be light. We have found a little niche curving spirals and rolling conical-type tubes, and those are typically lighter applications.

Some of the things we see on drawings today, spirals and so on, are approaching impossible. For me that's where the fun begins, because I've got to figure out a way to do it.

We had a job about two years ago that was a flaring out staircase. Both sides were flaring out, which is spiral but it doesn't appear that way. They're just opposite hand spirals put together. The nosings on the stair treads were curved out as well. We couldn't figure out how to do that and finally came up with an idea. We have a little miniature machine shop that we just use for maintaining the equipment and we built a little die that allowed us to curve the nosings out on the stair treads. That staircase is in a jewelry store up in North Carolina. They set a big central platform on that staircase and they do weddings at the jewelry store. It's beautiful.

MSC: What are some of the harder things to do, the nearly impossible?

HORNSBY: A conical rolled tube is technically rolled in two directions. To maintain quality on a piece you have to rigidly hold the piece in order to hold its shape. Well you can't do it in two directions—it can only be done in one direction. But we played around with it and have come up with a way to roll it in two directions and maintain a pretty good quality. It's those little things that add a lot of interest to my day. Trying to figure out something like that is just a lot of fun.

That's also one of the nice things about being a small shop. It allows me to be a little more hands-on. It's kind of like we're a modern-day blacksmith shop. We just use hydraulic power instead of the heat-and-beat method. **MSC**

For additional information on curving structural steel, visit www.aisc.org/benders.

David Hornsby is president of AISC Member Hornsby Steel, Inc., Cleveland, Ala.

