

THE EVOLUTION OF STAIR STRINGERS

BY JEANETTE VECCHIO

Ornamental bending and rolling have changed dramatically over the past century, beginning with detailed ironwork, and continuing through today's grand staircases. Chicago Metal Rolled Products (CMRP), a fourth-generation family business, has seen this evolution take place and experienced firsthand how industry demand has driven innovation in the fabrication space over the past 114 years.

Function over Form

Throughout the 1900s, market needs evolved to keep pace with consumer preferences and economic circumstances. Diversification was key to company success, including expanding into diverse industries in the United States. As the American economy, with all its might, roared into the battle for Europe and the Pacific in World War II, metals companies pivoted capabilities to adapt to shifting demand. CMRP began to produce valuable fabricated curved steel products for top-secret projects sponsored by the United States Government.

From the 1940s until the present day, the steel industry has remained one of the Chicago area's leading economic sectors. Immediately after World War II, the United States made over half the world's steel, and mills in Indiana and Illinois accounted for about 20 percent of total U.S. production capacity. The post-war boom in construction brought even more changes to the metals industry. Profitable companies were those who carefully and steadfastly honed their expertise in the space in order to stand out from the pack.

In the mid-1990s, architects began expanding their use of hollowed structured steel (HSS) products and shapes for both structural and aesthetic components. CMRP observed this trend early on, and took the dive into "big bending" fabrication for HSS products and structural shapes. Demand was high, and for companies involved in this growing sector of the metals industry, fulfilling that demand meant acquiring equipment to accommodate rolling the largest and smallest members available.



CMRP's shop in the 1930s. Though these machines are now retired, CMRP's current Chicago shop is in the original location from 1908.

The Road to the Ornamental Stair Stringers

In the early 2000s, staircases moved from being just functional to being both functional and aesthetically pleasing, driving the advancement of stair stringer capabilities. New initiatives included the technically complex art of helical bending, as well as supporting architects and fabricators as they incorporated the use of steel in monumental curved stairs. CMRP was excited to be a driving force for these endeavors, and the momentum has carried them through the present day, as the use of ornamental metal and steel continues to grow exponentially in popularity.

Keeping up with customer needs and technological advances is a never-ending labor of love for successful metals companies – a fact which CMRP can attest to after many years of personal experience. A close customer and leader in the industry of sculptural and architectural metals, Vector Custom Fabricating, is still collaborating with CMRP to



Vector assembling a multi-story stair stringer in their shop. CMRP rolled several 3/8" plates to a 31" radius on a 24-degree pitch. See next page for finished product.

explore cutting-edge techniques after working together for nearly 3 decades.

The Basics of Rolling Stair Stringers

Ornamental stair stringers continue to be a widely popular (and highly specialized) product in the metals industry. They are a substantial part of CMRP's business today, and the company has some key insights to share on the subject of rolling this specific product.

Custom spiral staircases can be created out of several materials. Stair stringers can be rolled from plate sections, and solid plate stringers are perhaps the most versatile for rolling the components on a helical layout. These are easier to match to helical pitch and

radius and can thus be rolled to tighter radial dimensions than other stringers.

For the structural curved stair stringers, materials can include square and rectangular tubing, round pipe, channels, and curved plate. Unlike a level bending process which is usually done on a single machine, the helical bending process for spiral staircases sometimes uses multiple machines to get the desired radius and pitch. Depending on the material used, a helically curved structure may require special care and preparation to improve accuracy and minimize deformation that might affect installation and fabrication on-site.

Successfully rolling rectangular tubes and helical pipes is incredibly challenging. However, this type of rolling can be extremely

rewarding – when it's the right fit for a company's abilities and product offerings. CMRP took many years to research and develop this capability in their own shop before they became a leader in the field.

When it comes to rolling rectangular tube stringers, two significant issues need to be considered. The first issue is often the size of the stringer to be rolled. When rolling a stringer, the concavity or deformation of the tube wall is a serious concern that is encountered frequently. The larger the hollow section of the stringer, the more difficult it can be to lessen the deformation. The added size can pose problems with the mechanical limitations of the rolling equipment. The machines that roll stringers helically are often not the same machines that roll the tubes when level. As a result, the configuration of the helical rolling machines may be more suited to rolling smaller tubing, channels, or plates.

One method to counter some of this flattening pressure is to increase the hollow section support internally with additional steel cross-beams. The larger the gap space between the walls of the tube, the greater the deformation is likely. These steel supports may enable a tighter radius to be acquired on the helical curved stringer, but there is a trade-off in added weight to the stringers.

Ultimately though, a point can be reached where the radius is too tight to roll an HSS tube section even with interior steel bracing without suffering excessive cross-section deformation, and other substitutions may be required.

From years of experience, CMRP is confident in this methodology to curve a stair stringer successfully.

The Art of the Stair Stringer

Today, staircases have become art – not only in the finished materials used but also in the design and structure. It is no longer simply about getting from one floor to the next – it is about style and aesthetics.

Customers are bringing exciting and challenging projects that continue to push the boundaries of design and the limits of skilled companies. Now more than ever, successful metals companies rely on their dedicated, skilled team members to help them become experts in this industry.

One example close to heart for CMRP is the career of their Senior Estimator, Engineer, and Project Manager, Moddassir Mithaiwala. Mo started his career at CMRP as an intern fresh

About Chicago Metal Rolled Products

In 1908, George F Hauf founded Chicago Metal Rolled Products, originally named Chicago Metal Manufacturers, a sheet metal shop on the south side of Chicago. Over time he expanded the business and began to make his own section bending rolling machines. To this day, some of his original rolling machines are still in use. Through the years, Chicago Metal Rolled Products has continued to evolve, ensuring that progress and innovation never stop. With pride and a sense of history, our fourth generation is taking their role in the company, and continuing CMRP's ability to serve the ornamental industry at large. We are blessed to have five family members who still work at CMRP today, preserving the valued relationships that our company has formed before us and continuing the tradition of making ideas happen.



Vector's installed multi-story stair stringer, rolled by CMRP. Architect: Booth Hansen, Engineer: Thornton Tomasetti, Contractor: Power Construction, Fabricators: Byus Steel and Vector Custom Fabricating.



Amrit Ocean Resort Stair Stringer. CMRP rolled aluminum 1/2" plate for the stringer, aluminum 1/4" perforated plate for the guard rail, and 1.5" schedule 40 aluminum pipe for the handrails.



Fourth generation family members, from left: Jeanette Vecchio, Chris Wendt, Elise Spadavecchio (with generation 5 on the way).

out of college, and he was on the team that created the methodology that CMRP uses today to create stair stringers. Mo is CMRP's in-house expert on stair stringers, and, propelled by the demands of the industry, he continues to push CMRP's ability to partner with our customers to create new and innovative stair stringer products.

A New Frontier for Stair Stringers

Since 2013, CMRP has offered induction bent parts up to a 12" x 12" square tube. Compared to cold forming methods, induction bending



12" tube being induction bent.

minimizes deformation of the material and distortion of the cross-section even when tight radius bends are required. This hot bending

process is a preferred alternative to the traditional cold bending process as it limits wall thinning, rippling and ovality. It is the consistency and predictability of this bending process that contribute to the high quality and reliability of bends. Heat induction bending enables the bending of large pipes, steel beams, as well as square and rectangular tubes.

The ornamental industry has made enormous strides in stair string innovation, and with the dedication of the metals industry and the NOMMA community, it will continue to reach new heights in the years to come. •



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