



# A 'FAB' INVESTMENT

Mechanical Contractors Enhance Efficiency With Prefabrication

By Joanna Masterson

**U**p until 2009, Cincinnati-based TP Mechanical used prefabrication for its industrial, commercial and institutional projects sparingly—attributing about 4 percent of total field labor hours to the shop. But with the growth of coordination, drafting and 3-D modelling, the company saw the potential for additional fabrication opportunities.

"We moved into a new 45,000-square-foot facility and we made a very concerted effort to equip it with the right machinery and state-of-the-art software," says TP Mechanical President Bill Riddle. "Now we're averaging 20 percent of field labor hours in our fab shop."

In the past five years, the shop workforce has grown from 12 people working one shift per day to about 40 people working two shifts daily. Riddle's goal is to funnel enough work to the shop to warrant three shifts.

Shapiro & Duncan, Rockville, Md., is experiencing similarly impressive growth in the Mid-Atlantic region, where it has completed more than 2,000 commercial, government, institutional and high-rise residential projects during the past three decades. The firm opened its first prefabrication facility in 2002 and, upon realizing how well it was working, invested in a 51,000-square-foot shop in Landover, Md., just five years later.

Shapiro & Duncan

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TP Mechanical's fabricated products include steel, cast iron, CPVC, PVC and copper pipe assemblies, pipe hangers and supports, equipment, and pump seats and corner groups used in HVAC, plumbing and fire protection construction.

"We saw it as an industry trend," says Mark Drury, vice president of business development for Shapiro & Duncan. "We couldn't get enough skilled craft professionals, and we couldn't control work in the field as well. We were already doing coordinated 3-D drawings, so fabrication was the next step."

Other drivers included incessant pressure from clients to keep prices as low as possible, the ability to meet lean requirements, the lack of skilled labor and the safety benefits of working in a controlled environment. Today, Shapiro & Duncan fabricates components for every job it wins, and CEO Sheldon Shapiro estimates the firm's prefab operation has tripled in the past decade.

"The economy hasn't been very good for the last five years, but the amount of prefab we're doing has grown, as

has the detail of the work," he says. "To give you an idea of the culture change: We used to ask what we're going to prefab; now we ask what aren't we going to prefab."

#### **LESS WASTE AND HIGHER PRODUCTIVITY**

In a sign of TP Mechanical's commitment to prefabrication, the company recently underwent a two-year process to be certified by the International Organization for Standardization (ISO)—one of the first shops to do so in the Midwest. The certification reflects independent third-party verification of the shop's quality management systems.

"It was a way for us to build and enhance our quality control," Riddle says. "We're doing the same procedures every time, which aids productivity."

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Source: TP Mechanical

For a utility plant project at The Ohio State University, TP Mechanical was responsible for the concept, design, 3D, prefabrication of equipment skids, packaging, shipping and installation.

Standardization is key. TP Mechanical organizes its fabrication department into specialized work groups consisting of highly trained technicians who are singularly focused on the production and assembly of assigned units and modules. Additionally, automated equipment ensures the consistency and quality of every cut and weld. Each piece of pipe is utilized to the max, with software taking into account every length needed for a job.

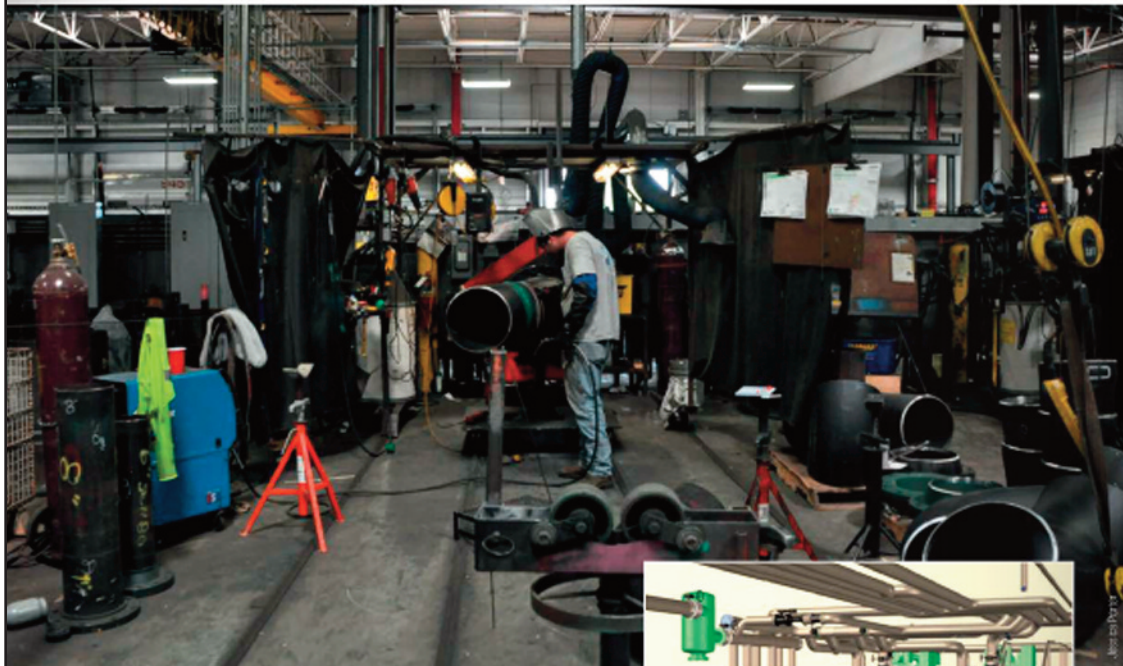
"There is a reduction of materials waste, as well as a reduction of packaging and shipping materials," Riddle says. "Instead of sending nuts, bolts and washers to the site, a whole unit can be produced here and shipped out. Little by little, those things add up."

Beyond individual components, TP Mechanical fabricates larger units, including the walls that house medical gas equipment for health care facilities, or piping and

packaging entire pump and boiler systems. Work done onsite five years ago now can be completed in-house more safely and with better quality control.

Looking ahead, multi-trade prefabrication—requiring shop-level collaboration among mechanical, electrical, insulation and other subcontractors—is expected to gain momentum. Shapiro & Duncan has done this on some projects it controls (i.e., when the electrical contractor works under Shapiro & Duncan) in order to prefabricate entire mechanical units. Not surprisingly, this approach requires more culture change.

"Multi-skilled prefab has to originate in the beginning of the project. It has to be a defining feature of how the project is going to be designed," Drury says. "We invest a lot of intelligence upfront to do the drawings and coordination because once you prefab, it



Source: TP Mechanical

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Shapiro & Duncan's prefabrication shop features state-of-the-art workstations and hoisting equipment, as well as office/training space and 8 acres of outside storage.



Shapiro & Duncan uses Autodesk Fabrication CAD MEP to draw and lay out equipment and piping.

has to be right. A lot of owners and designers are used to passing off the grunt work, and once the design is partially completed they'll bring in more experienced people to take over. That investment should be done at the beginning."

To help bridge the gap, Shapiro & Duncan organizes shop tours and hosts lunch and learns to show general contractors and clients how BIM is being used in real life—not just as a showpiece for the owner to fly through, but as a tool for productivity, quality and sustainability. Indeed, as more subcontractors have adopted BIM, coordination drawings have become more accurate, which in turn makes prefabrication more accurate.

"It's not an expense for us to do BIM because we offset those costs in the prefab shop," Shapiro says. "We save time, we don't need as many people onsite to do the work, and the general contractors love that we're not in their way onsite."

Mechanical systems delivered just in time on skids can take less than a week to install. Overall, Drury estimates the company has seen productivity improve up to 13 percent compared to a few years ago.

#### IMPACT ON PERSONNEL

Even with all the known benefits of large-scale prefabrication—from accelerating installation time to ensuring pricing accuracy and eliminating weather delays and schedule conflicts—it can take time to convince in-house staff that this is the way of the future.

"There was a fear our fab shop would eliminate jobs," Shapiro says. "But instead, it allows us to do more work, safer, at a higher quality level, and hire more people." One early project helped the company and its employees see the possibilities: A school system wanted a unit ventilator project completed over spring break. Every contractor told the owner it couldn't be done, but Shapiro & Duncan was up to the challenge.

"The electrician, insulator, controls contractor and others completed their work together in the shop, and the onsite installation ended up finishing a day or two early," Drury says. "It was a big selling point for the prefabrication process, for our people and for the school system."

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Visit [www.constructionexec.com](http://www.constructionexec.com) for prefabrication videos from TP Mechanical and Shapiro & Duncan.



This year, TP Mechanical drastically reduced onsite installation of components for a utility plant supporting student housing construction at The Ohio State University (OSU). In addition to its usual services, TP Mechanical functioned as the prime contractor handling the underground work, tie-ins, building slab and construction, and electrical coordination. Workers fabricated 40-foot-long skids in the shop—shrinking fieldwork for the turnkey job from six months to six weeks.

"We have done a lot of work with OSU over the years, so they know our capabilities, but I think we surprised them a little on this job. We put ourselves in an even better light," Riddle says.

There are positive labor results as well, which is crucial given the fact young people are entering the trades at a slower rate than workers are retiring. Riddle estimates 40 people working in his fab shop equal about 60 people working onsite. "Contractors

are going to have to depend on prefabrication as the skilled worker shortage continues," he says.

Drury concurs, noting that it's important to have the right mix of seasoned employees and "digital natives" involved in the prefabrication process. For example, Shapiro & Duncan's 12-member CAD team ranges from recently graduated tech whizzes to foremen who have logged 30 years in the field.

"This is a way to attract millennials," Drury says. "They like to see the application of technology; they get engaged with things like the automated cutters being driven by the CAD program."

As for existing employees, Shapiro says: "If they have the right attitude and a willingness to learn, they will succeed at Shapiro & Duncan." ☑

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