

➔ Talking Shop with SHoP

Sharples Holden Pasquarelli masters the CAD/CAM process. by Julia Mandell

For many reasons, an increasing number of architects are investigating computer-aided manufacturing (CAM), the fabrication of building components using a variety of computer-driven machines from laser and waterjet cutters to computer-numeric-controlled millers and routers. The technology enables the rapid production of customized building components. But working with CAM, or more accurately, CAD/CAM, entails a high level of involvement. Because the approach is still out of the ordinary, it takes careful planning and knowledge of the available processes and materials to successfully and cost-effectively work with CAM.

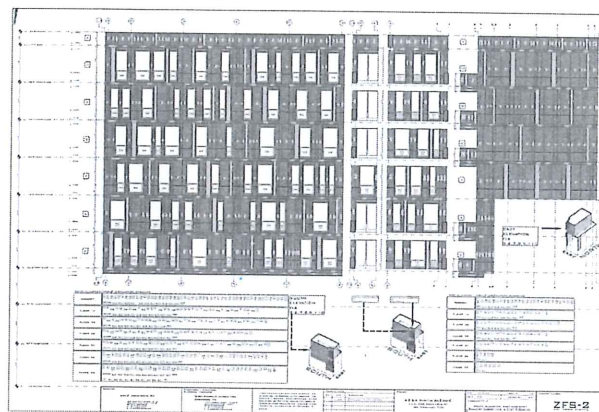
The principals of New York City-based Sharples Holden Pasquarelli, also known as SHoP, have devoted their practice to exploring and refining this process. Since 2000 they have been developing a design/build philosophy that looks to the means and methods of "customized construction" and CAM to formulate unique designs. According to William Sharples, one of the studio's five partners, architects must consider some fundamental guidelines for working with such novel approaches.

1. Consider methods and materials from the beginning of conceptual design. "Think about materials early!" declares Sharples. "For us, everything about a design is determined by the parameters we will be dealing with when building. The scale of the components depends completely on what material we want to use: How big a sheet of metal can you get? How big is the truck that you have to transport it in? Rather than just draw a sketch and hand it over to the contractor, we reach a solution that lets us get unusual things built, on time and under budget."

2. Learn from fabricators, contractors, and tech-savvy staffers. Busy firm principals like those at SHoP don't need to become experts in technology. Instead they should rely on their clued-in younger associates and the knowledge of the fabricators and builders they work with. "Our staff is always talking with fabricators," says Sharples. "At the very beginning of a design process, we gather as much information as we can about the processes we may use for fabrication and construction."

3. Work out details of fabrication and assembly ahead of time to keep costs down. By thinking through the complex details of fabrication and assembly before the process begins, SHoP manages to quiet any objections from potentially skeptical contractors—and to keep bids low. "When contractors don't understand how something will work, they throw money at it," says Sharples. "They have typical problems they anticipate. When we choreograph a solution for them in advance, they look at our plan and see that it won't make things difficult."

4. Communicate assembly through drawings. For SHoP, the key to their managerial role in the CAD/CAM process is their drawings. "Drawing is the medium through which architects communicate, but the traditional conventions don't help much for this type of high-tech building," believes Sharples. "Now that build-



SHoP's CAD/CAM methods were put into action recently when the firm designed Porter House, a renovation and addition to an apartment building in New York City that resulted in 22 residential units, each with a different façade configuration. Working with the Long Island-based roofing contractor Nick Martone of Martone & Sons and metal CAM fabricator Maloya Laser of Commack, New York, SHoP devised a façade system of precut steel panels that arrived on the building site labeled for assembly, minimizing construction staging. The drawings that accompanied the parts—including a full component schedule (above)—left nothing to chance.

ing production is changing, the drawings need to change, too."

Rather than a standard set of construction drawings, the studio produces detailed shop drawings that have more in common with directions for assembling model airplanes than with typical architectural plans. Every single building component is inventoried and appears on a schedule accompanied by axonometric construction drawings.

Producing these drawings is time intensive, but the understanding they promote between architect and builder is indispensable to SHoP's brand of innovation. "We are trying to produce groundbreaking architecture," says Sharples. "But where we want to change things is in the practice. The legacy we want to leave is a new process for building." ■

➔ Technology Profile: SHoP's Software

SHoP runs a PC-based office. The studio began using AutoCAD (www.autodesk.com) in 1999, because the partners found it was the best platform for working with fabricators and making the transition from conceptual modeling to CAM. For 3-D modeling work, the designers use Rhino (www.rhino3d.com), which is affordable and interfaces well with AutoCAD, allowing the transfer of Rhino images into the AutoCAD page format to make drawing sets. Rhino files can go directly to fabricators, who use PCs almost exclusively. The fabricators SHoP works with also often use Solidworks (www.solidworks.com), a 3-D mechanical design software. ■