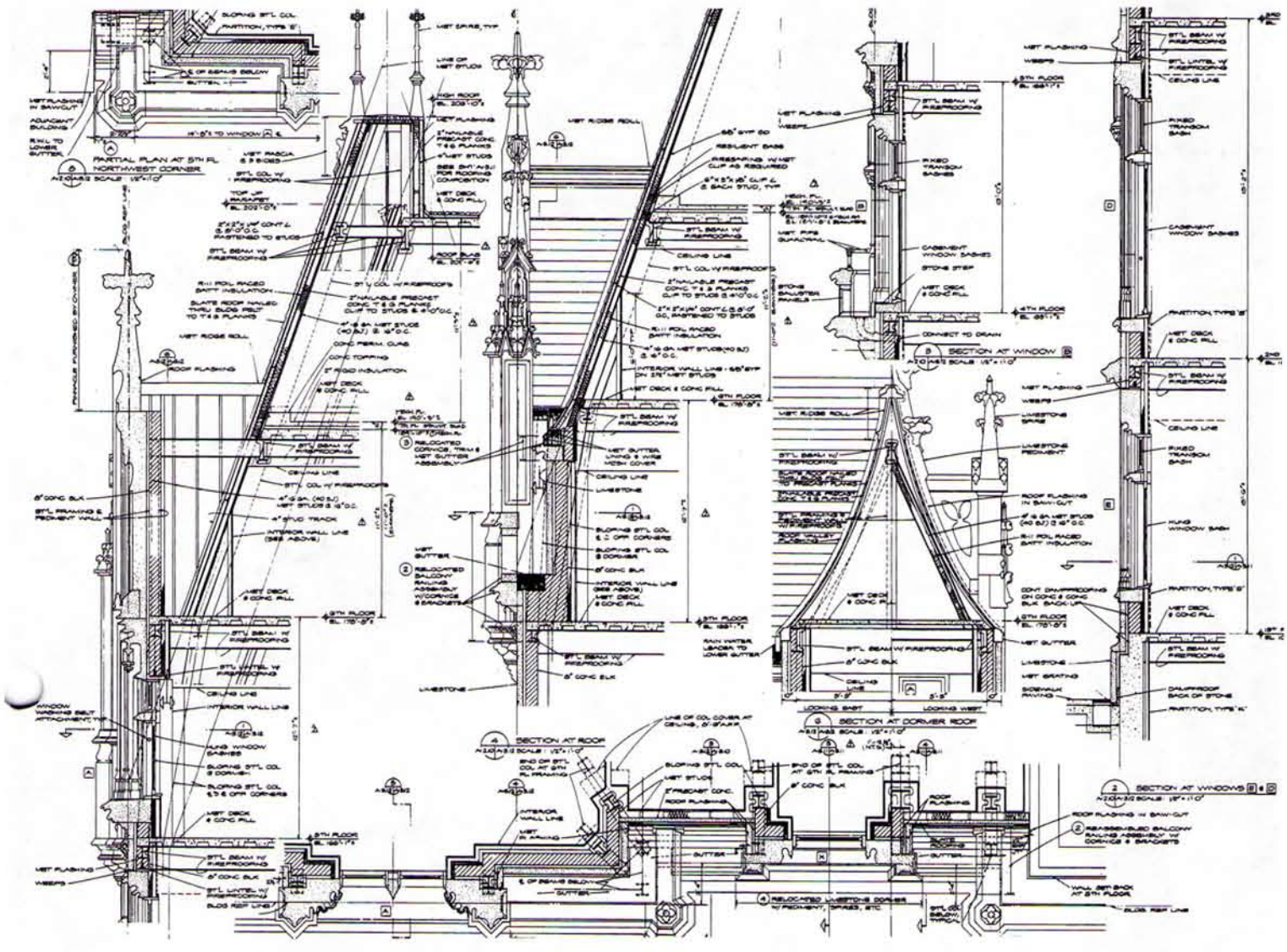
MICHAEL MORAN

**TOP:** Stone blocks for the Roche addition were carved with computer-automated saws, but final details were added manually by stone carvers. **CENTER:** Limestone was fabricated in sections, then attached to the steel-frame structure much like curtain wall. **ABOVE:** Many of the original facade's details were precisely re-created using innovative computer technology. **RIGHT:** New elaborate roof line (left) is punctuated by replicas of the original limestone dormers and spires (right). **FACING PAGE:** New mansard roofs were constructed of steel frames covered by precast concrete planks, onto which slate shingles were nailed.



allowing the artisans to spend more time on intricate detailing. Maintains Cathedral Stonework's Clerk of the Works Alan Bird, "A project like the Jewish Museum could have happened without the use of computers, but it would have taken years longer and would have cost twice as much."

### Wall connections

Once fabricated, the individual stone sections were applied to the structure of the new addition much like a curtain wall. While the original Warburg Mansion was a predominantly load-bearing masonry structure, with some steel framing, the List addition and the new Roche addition were framed entirely in steel, with concrete floor plates and concrete block infill walls. The Bedford, Indiana, firm of Kluesner Engineering consulted with both Tishman Construction and Cathedral Stoneworks and detailed the connections between the stone facing and the structural frame. For this complex project, over 50 types of stainless steel angles and plates were specified to fasten the stone sections. In some instances, the angles function like shelves to hold a particular stone segment; in others, steel connectors are slotted directly into the stone. The connecting angle or plate is typically fastened to the concrete block infill wall with expansion bolts and then grouted. But when these surface-to-frame connections occur at a structural member, the steel plates are welded directly to the beam or column.

Precisely cutting the stone was crucial, as the joints between sections measure a mere 1/4-inch wide, but this accuracy was easily achieved with the CAD/CAM system. According to Teitelbaum, the computers ensure fabrication with micromillimeter accuracy—a far cry from the days of handcarving, when workers would often mount stones only to find enormous gaps between pieces. Once hung on the facade, the narrow joints of the new stone veneer were filled with a standard mortar to which limestone dust was added. The dust—collected from carving the facade stones—imparted a unified color to the entire facade, matching stone and mortar.

### Inspiring model

The latest addition to the Jewish Museum has already inspired architects, whether or not they are preservationists, to consider stone a viable building material. Advances in computer technology have clearly made stone carving more affordable for preservation projects. Deteriorated stone that would have been removed is now being restored—in such diverse projects as the renovation of New York's Grand Central Station, and academic buildings at Johns Hopkins University and Boston College. While these developments hardly suggest a boom in the construction of stone buildings, Cathedral Stoneworks' Alan Bird is optimistic about automated stonecutting's future. "Computer technology," he says, "is the fuel that will keep our medieval craft alive."—*Raul A. Barreneche*