

Renovation of Plaza Towers Grand Rapids, Michigan

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Architectural precast concrete became the solution of choice in replacing a brick tiled surface with metal frame panel system that had suffered deterioration leading to air and water infiltration over the exterior of a 31-story hotel, residential apartment and condominium building in Grand Rapids, Michigan. A total of 1440 precast components were used on this job including wall panels with punched openings for window units, spandrels, and column covers. Production challenges included a variety of finishes in some panels such as a light buff acid etch, a dark "brick red" retarded finish, accents, and embedded granite panels to replicate and match granite accents on the building. The end result is a magnificent exterior façade that has added elegance and value to a previously deteriorated building. This article discusses the major features of the repair program for renovating the exterior wall.

When the Eastbank Waterfront Towers (original name of project) (see Figs. 1 and 2) — a mixed use residential project located in downtown Grand Rapids, Michigan, consisting of 250 hotel rooms, 135 rental apartments and 149 luxury condominiums — opened for business in 1990, the 31-story building was expected to last for at least the next 30 years without serious repair to the exterior of the structure.

It was, therefore, to the owner's profound consternation when only 5 years after the building was completed, the original metal frame panel system with a thin brick tile



Fig. 1. Panoramic view of west elevation of Plaza Towers showing existing metal cladding.

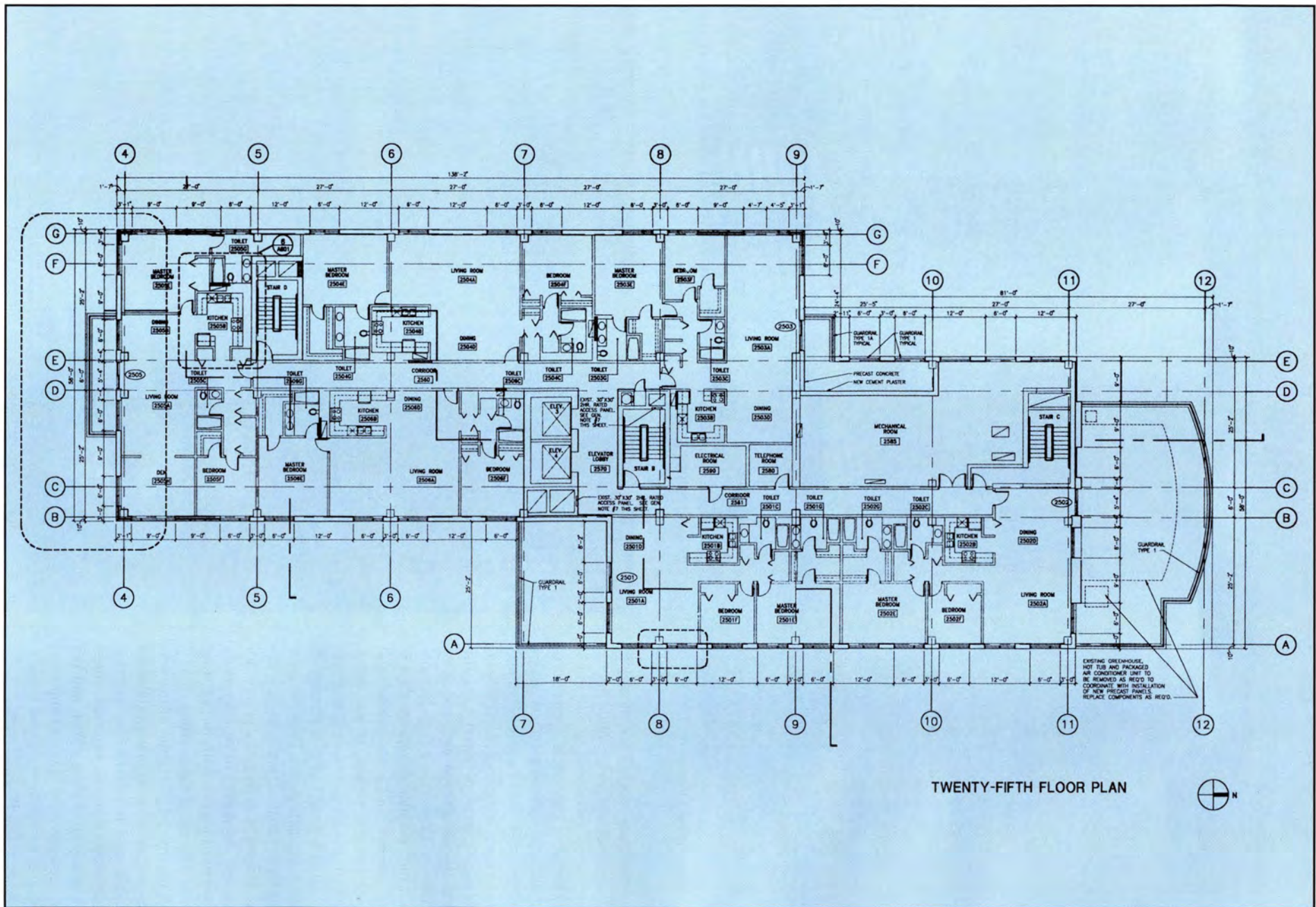
began to deteriorate. Confronted with this dangerous and costly situation, the owner faced an enormous dilemma, i.e., whether to implement a repair program with the same materials or seek a more permanent and durable solution.

The options were limited. After considering several alternatives, the owner, in consultation with architect-engineer A. Epstein and Sons International, Inc., decided to replace the existing exterior wall with architectural precast concrete panels. It was determined by the project team that a precast solution would offer a number of advantages such as the incorporation of multiple finishes, multiple-mix designs, choice of aggregates, granite accents, and the ability to be effectively engineered to work with the existing structural frame of the building.

Put together, the benefits of the versatile precast solution could produce a dynamic new image for the exterior façade of this high-rise structure, creating a powerful skyline effect, and become the basis for a new and improved reputation for the beleaguered project, now to be called Plaza Towers.



Fig. 2. Exterior view of east elevation of building showing metal cladding.



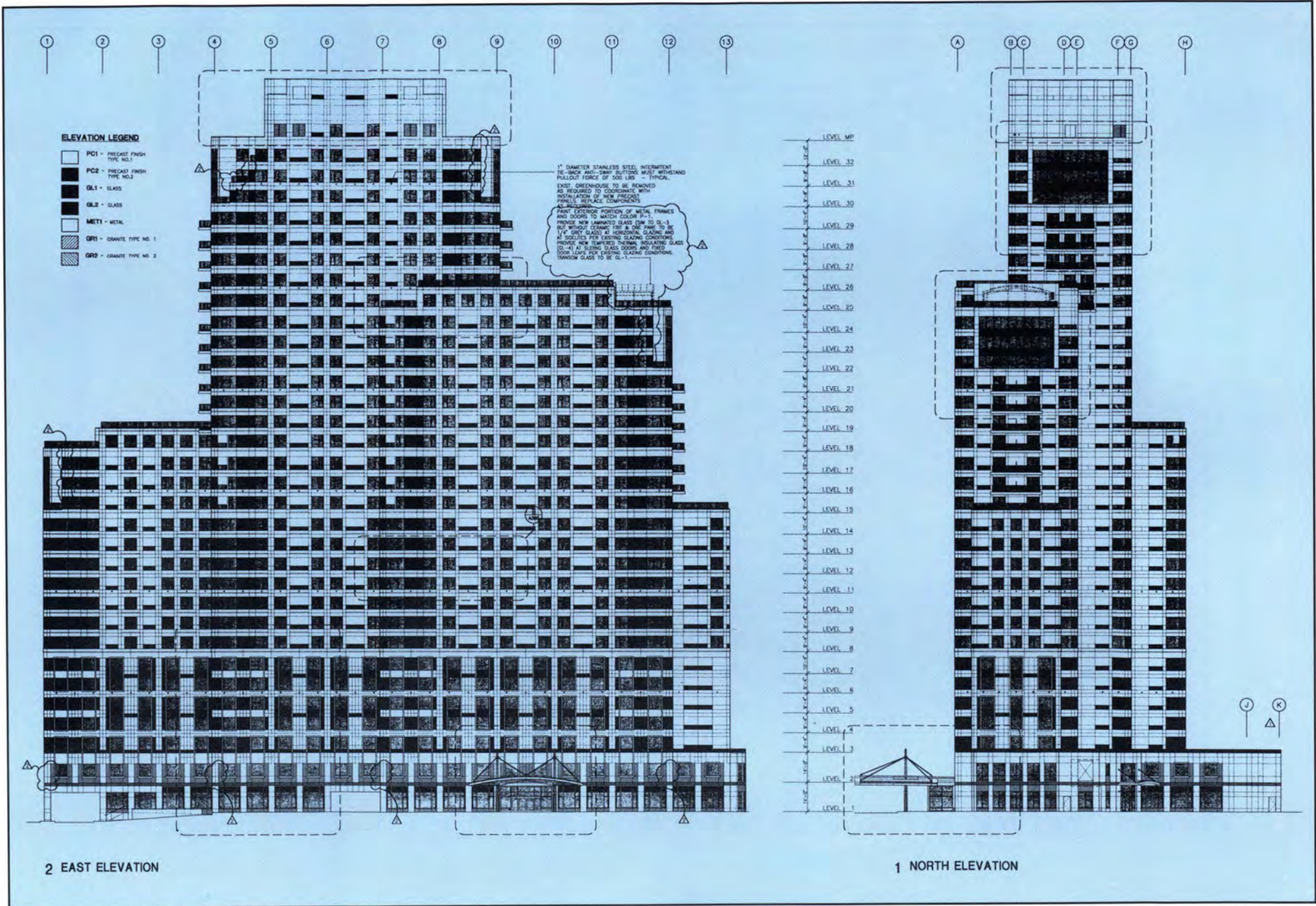


Fig. 4. Elevation of building: east elevation (left); north elevation (right).

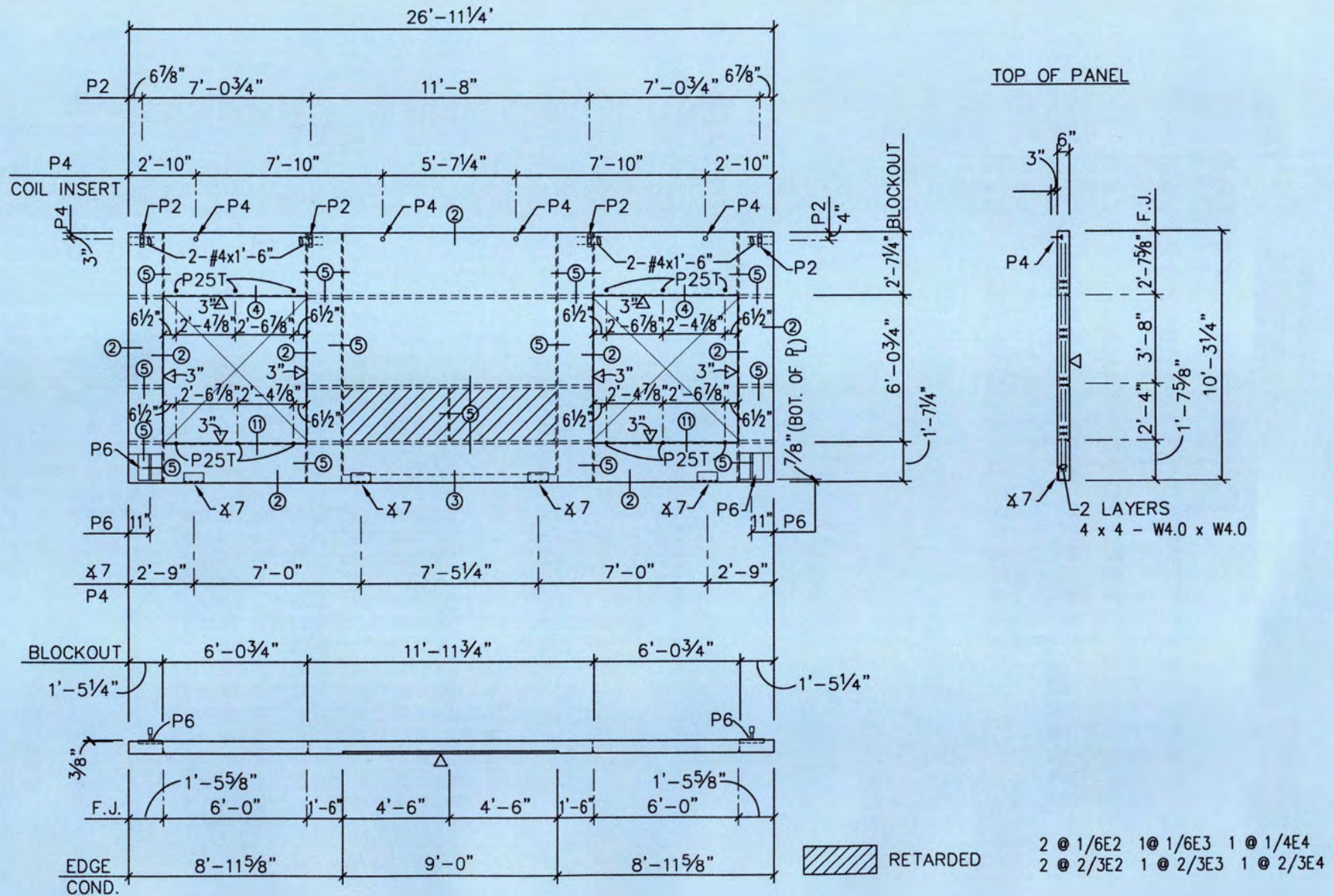
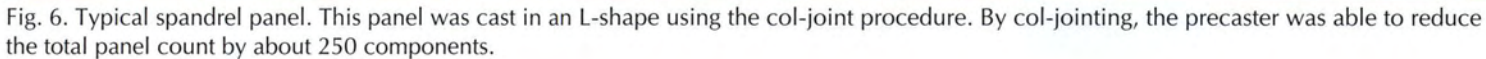


Fig. 5. Typical window unit. This panel also spans column-to-column as do the spandrels.



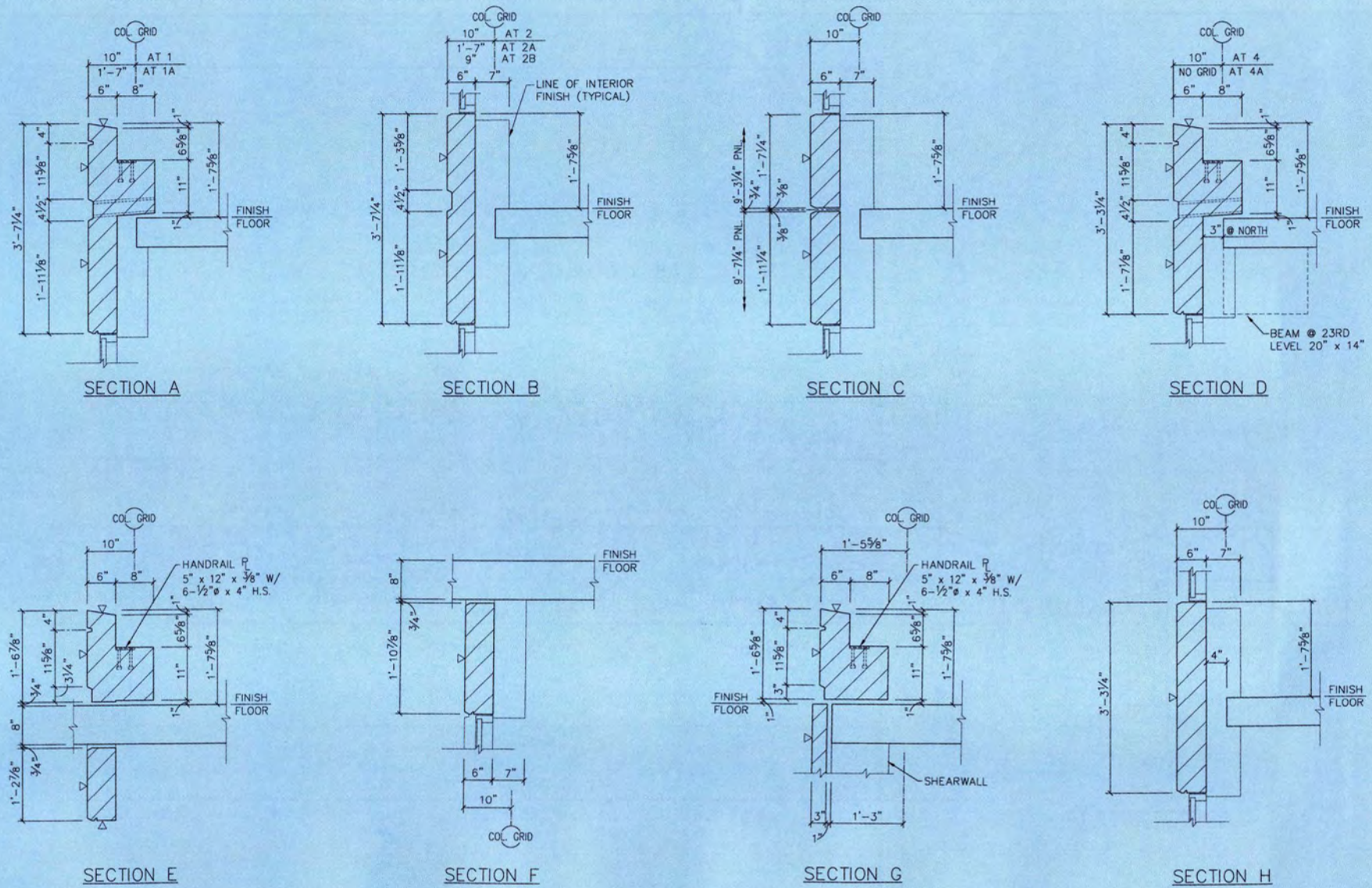


Fig. 7. Typical sections of various spandrel panels and window units. Sections A and D are typical spandrel panels at balcony. Dotted line indicates a scupper and that these panels were cast with plates on top of the haunches to attach handrails. Sections B and H are typical spandrel panels used elsewhere. They have ribbon windows above and below. Section C is a section through typical window unit at floor line. Sections E and G are sections at existing balconies. Section F is a section through top of window unit at existing balcony.

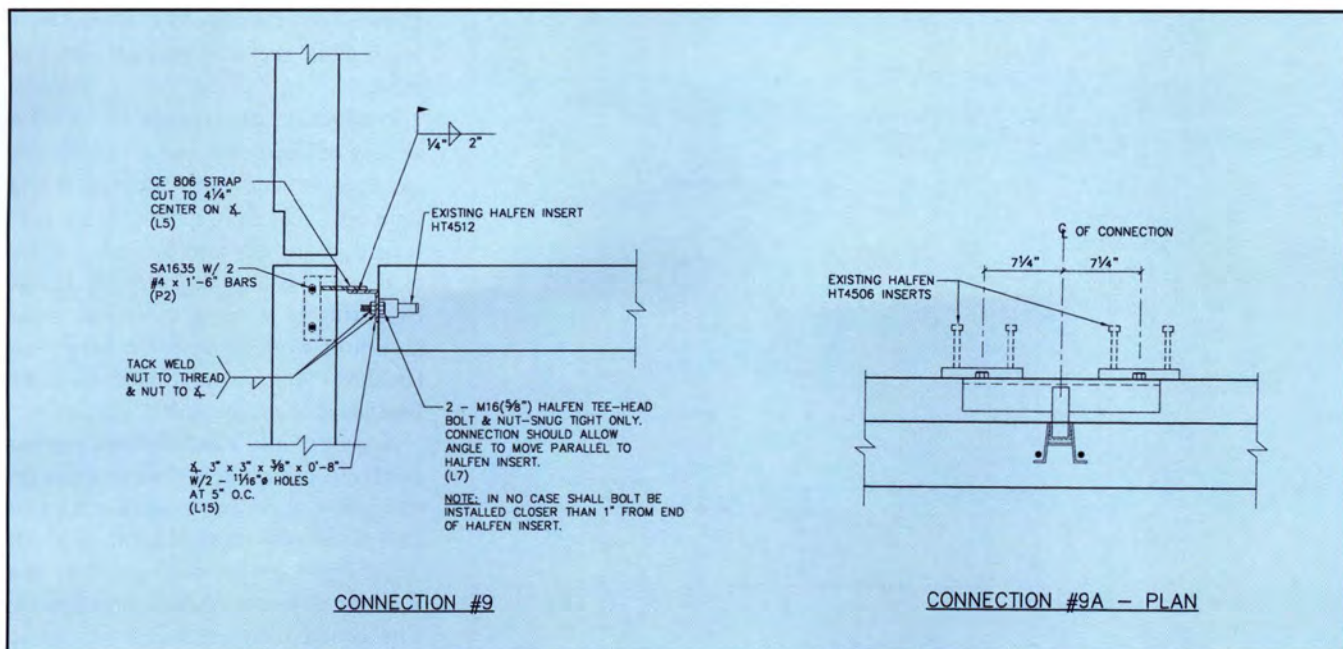


Fig. 8. Connection #9 and Connection #9A plan: Typical lateral connection using existing Halfen embeds. This connection was used on both the window units and spandrels. They were located in the panels by use of the existing embed plan.

The entire exterior façade was bid as one package by Harmon Ltd. of Addison, Illinois. Their package included precast concrete by Kroeger Precast Concrete, Inc., windows by Modu-line of Wausau, Wisconsin, precast erection by Assemblers, Inc.,

Pickney, Michigan, and caulking, cleaning and sealing by Western Waterproofing, Livonia, Michigan.

The cost of this package was estimated to be \$16,540,000. The cost of removing the damaged panels was an additional \$3,210,000.

Figs. 3 and 4 show a plan and elevation of the building. A typical window unit and typical spandrel panel are shown in Figs. 5 and 6, respectively. Typical sections of various spandrel panels at balconies and window units are shown in Fig. 7.

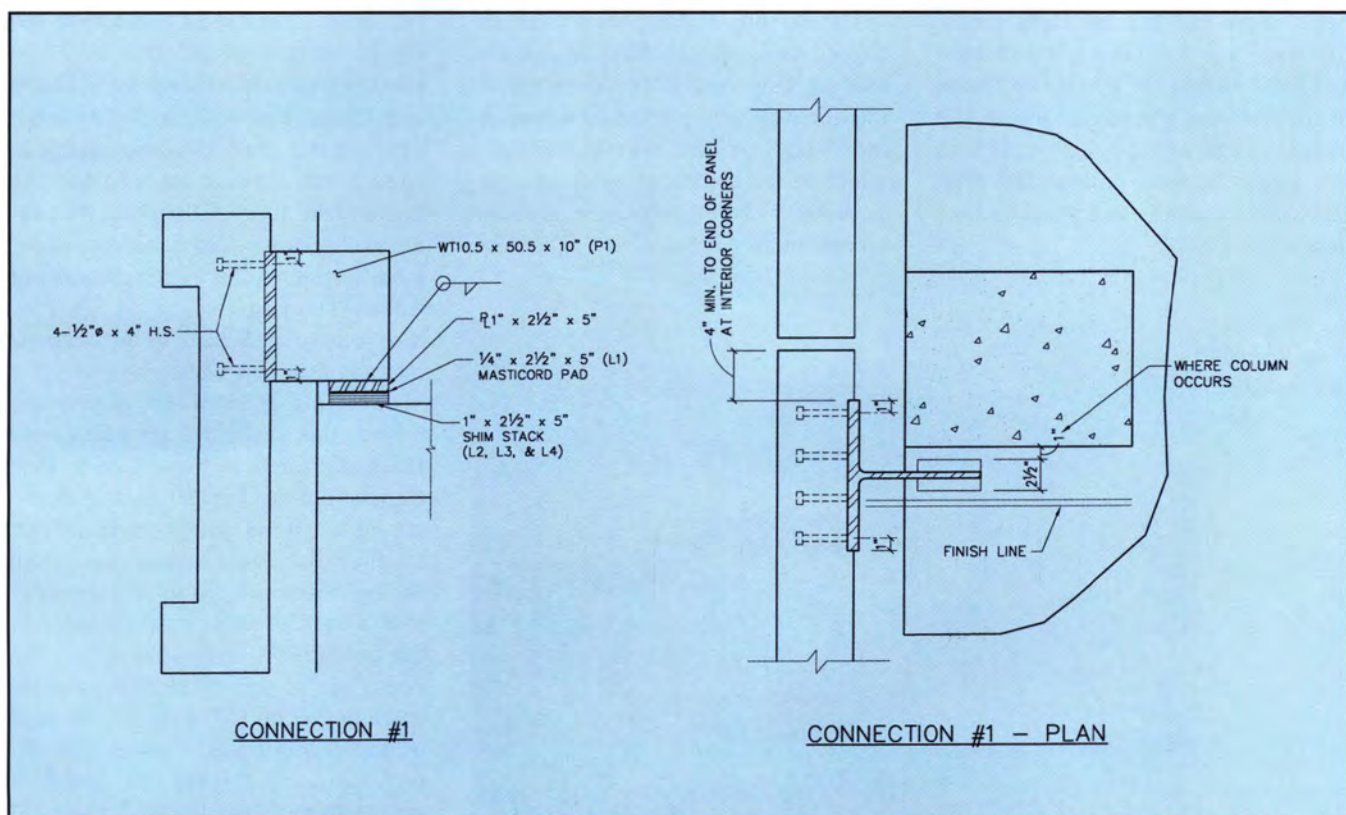


Fig. 9. Connection #1 and Connection #1 plan: Typical loadbearing haunch used on both the window units and spandrels.

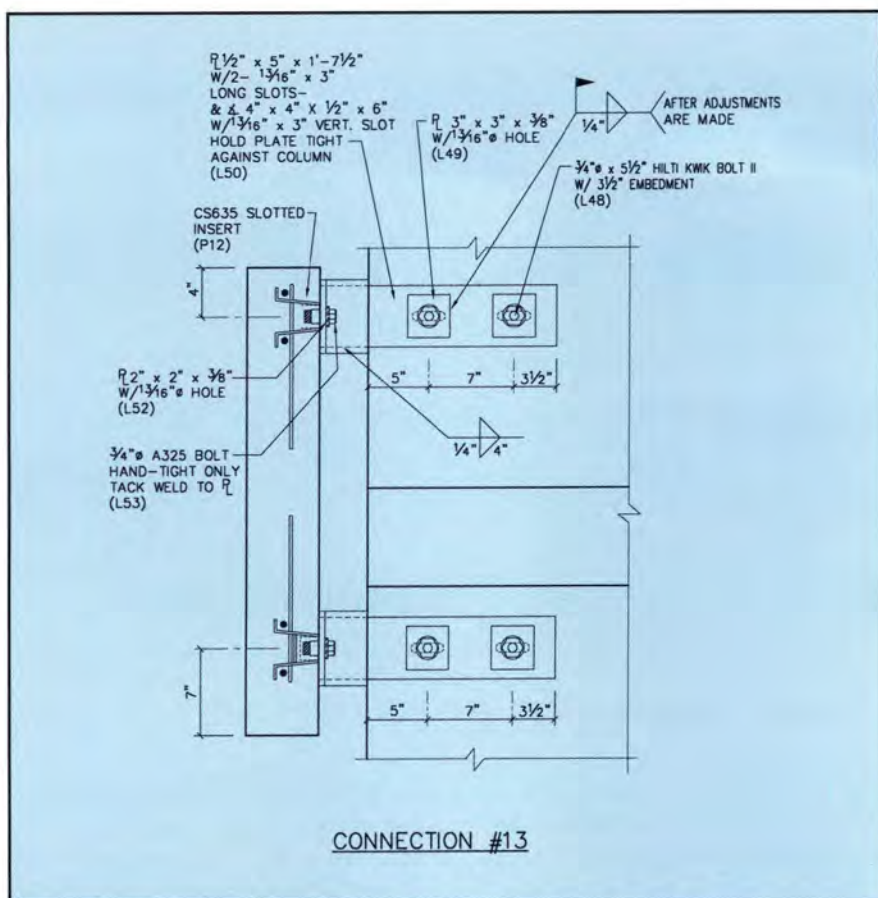


Fig. 10. Connection #13: Typical lateral connection at columns. No existing embeds were located at these locations. This connection was used primarily on the spandrel panels. Note that the loadbearing haunch is not shown for clarity.

The mere fact that the replacement job was in a downtown urban area and that hundreds of tenants and hotel residents were already living in the building made the construction schedule even more critical. But even here, precast concrete proved to be a time saver.

The existing metal panels were removed two column bays at a time, starting at ground level. A temporary interior wall was erected to minimize the impact of cold weather or high winds to the completed internal components of the project while the new precast units were installed. This also

Fig. 11.
Wall panel
in precaster's
yard.



allowed other trades to continue their work while the new precast skin was erected.

Production challenges included a variety of finishes in some panels. For example, several panels consisted of a light buff acid etch, a dark "brick red" retarded finish, and actual granite cladding. Skilled carpentry work was essential as were production techniques in working with the variety of finishes. Some panels used all three finishes in the same unit.

A total of 1440 architectural precast concrete components were used on this job, comprising a surface area of about 168,000 sq ft (15600 m²). All drafting was performed by the Kroeger in-house drafting department. The precast engineering was done by Semaan Engineering, Omaha, Nebraska.

The individual components were as follows:

- Wall panels with punched window openings: 10 x 30 ft (3.05 x 9.15 m).
- Spandrels: 3 ft 6 in. x 30 ft (1.07 x 9.15 m).
- Wall panels: variable sizes.
- Column covers: variable sizes.

The panels were designed to take advantage of the existing slab anchors for lateral ties (see Connection #9, Fig. 8), while steel haunches were cast into the panels to bear off the columns (see Connection #1, Fig. 9). By engineering the precast components to span from column to column, the higher dead load of the concrete panels was accommodated without major modification to the existing structural frame. The panels were designed to take gravity loads back to the columns instead of the slab edge.

Each panel utilized a bearing haunch that sat on the post-tensioned floor slab next to the columns (see Connection #1, Fig. 9). It was determined by the architect-engineer that the floor slab could support loads from the new skin at a distance of no more than 8 in. (203 mm) from the edge of the column. To maximize space, the centerline of this connection was located at 2 1/4 in. (57 mm) off the edge of the column (see Connection #1, plan view, Fig. 9) and was then covered with metal studs and drywall. At columns with no cast-in embedments,



Fig. 12. Precast repair in progress.



Fig. 14. Precast cladding partially in place.



Fig. 13. Closeup of Connection #1 (see Fig. 9).

lateral tie hardware was bolted to the columns (see Connection #13, Fig. 10). Connection #13 was used primarily at the spandrel panels. Using this method, the new panels were erected very quickly.

Maximizing economy was important to the owner and the design team; hence, cold joints were used at the corners of the structure to reduce the number of panels. This cold joint procedure reduced the total panel count by approximately 250 components. Attaching the L-shaped precast corner panels to the spandrels allowed for a faster, less costly erection. It also eliminated the cost and need for connection hardware at corner locations.

The panels were designed to provide a solid stone-like appearance while



Fig. 15. Exterior view of north elevation of building showing receiving of precast components.

Fig. 16.
Exterior view of
east elevation of
building showing
removal of
existing metal
panels. Structure
is ready to receive
new precast
panels.



Fig. 17. Exterior view of southeast elevation of building complete with new precast cladding.

maintaining a residential feel for the building. Granite aggregates were added to a colored concrete mix to provide a rich, quality look resembling flamed granite at the base of the building. In some cases, granite stones were embedded in the panels for special effect. An acid-washed finish was applied to buff concrete panels to make them resemble limestone. Quality work and close attention to detail were imperative in view of the repetitive aspect of the job and the necessity to avoid delays.

Because of the single source of responsibility delivery approach, the windows and other exterior work followed immediately after each panel portion was completed. To keep the construction schedule on track, no time was available for dimensional or finish inconsistencies, downtime, or other unforeseen problems. Fortunately, only minor problems arose and these were quickly resolved.

The precast panels were manufactured by Kroeger Precast Concrete, Inc., at their plant in Omaha, Nebraska, between February and November 1996. During the peak production, an average of ten panels per day were manufactured. The panels were then shipped by Enterprise Transport, Inc. (a sister company of Kroeger Precast) by truck-trailer to the project site in Grand Rapids. There were a total of 341 loads shipped a distance of 650 miles (1053 km).

Removal of the existing metal panels was carried out by the general contractor, Erhardt Hunt, A Joint Venture. Installation of the new precast components was part of the complete exterior skin package by Harmon Ltd. Supervision of the new exterior skin was provided by Erhardt Hunt, A Joint Venture. The entire erection and removal of the existing skin took 9 months to complete. The renovation was completed in June 1997.

Figs. 11 through 16 show several construction stages of the building. Figs. 17 through 19 show various views of the finished building.

CONCLUSION

The three keys to the success of this high profile project were: (1) the decision to contract the renovation of the exterior wall as a single source of



Fig. 18. Exterior view of northeast elevation of building complete with new precast cladding.



Fig. 19. Exterior view of completed east elevation of courtyard of building.

responsibility with a single trade contractor in charge; (2) the high level of quality control in the architectural precast concrete; and (3) the high degree of cooperation among the design-construction team.

The precast concrete exterior wall solution completely changed and improved the image of the building. For example, before the project was completed, less than 50 condominiums in the facility were sold. Within 9 months after substantial completion of the renovated building, all of the available condominium units were under contract and most of the rental apartments had been leased.

This project won an award in the "Best Hotel/Housing" category of the 1997 PCI Design Awards Program. The following were the jury's comments:

"This was a challenging project because in choosing the precast solution it meant the existing cladding system would not be duplicated. The result is a very attractive façade that provides a high-quality look. Fitting the precast pieces onto the existing frame was a great approach, but it meant that the panels needed precise dimensional accuracy. It was a nice fix."

The newly renovated project has now been in service for about a year. The owner, design-construction team and tenants of the building are very pleased with the distinguished appearance of their rehabilitated home. Indeed, this imposing structure is already an important landmark in downtown Grand Rapids.

CREDITS

Owner: Plaza Tower Associates Limited Partnership, Ada, Michigan.

Architect/Engineer: A. Epstein and Sons International, Inc., Chicago, Illinois.

General Contractor: Erhardt Hunt, A Joint Venture, Ada, Michigan.

Precast Concrete Manufacturer: Kroeger Precast Concrete, Inc., Omaha, Nebraska.

Photographer: Image Productions, Grand Rapids, Michigan