Designers for the Federal Metropolitan Detention Center in downtown Philadelphia, Pennsylvania had to balance the need for a highly secure appearance against the facility’s location in a historic district. They also had a constrained site and budget requirements with which to work. These challenges were met with the use of precast concrete insulated panels with several finishes, including polished concrete at the base, a cut-stone appearance on the first two floors and varied sandblasting on the upper levels. A parking lane along the building’s side served as a staging area for the crane, which was located inside the building’s perimeter during erection. This article presents the architectural precast features of the structure as well as the erection highlights.

The new Federal Metropolitan Detention Center in Philadelphia, Pennsylvania provides a sober, dignified addition to a historic downtown area while supplying the specialized functions required to house detainees awaiting trial, sentencing or transfer to other facilities.

Interesting challenges were posed: how to achieve the functional and aesthetic goals of the project while working within the confines of an urban historic area. The use of architectural precast concrete panels for the exterior cladding allowed the creation of a distinctive design that could be erected on a tight site and at a cost that met the Federal Bureau of Prisons’ (FBOP) budget requirements.

The facility consists of a 320,000 sq ft (29,700 m²), eleven-story structure containing 628 cells and support functions for
short-term detainees (see Fig. 1). Programmatically, the basement and sub-basement include service and vehicular access as well as mechanical, storage, and maintenance shops.

Level 1 features the entry, reception, control, executive administration, financial management, and visiting areas. Level 2 houses administration and support systems such as inmate receiving and discharge, human resources, health services, associate wardens, staff assembly, food service, and laundry. The upper levels contain inmate housing, an administrative detention unit, and a disciplinary segregation unit on the top floor (see Figs. 2, 3 and 4).

Prior to the creation of this facility, the U.S. Marshals Service had used a variety of remote sites to house detainees, and the goal for the new structure was to bring all of them together near the federal courthouse. The downtown site consisted of a surface parking lot and a small, one-story office building which was easily cleared.

Nonetheless, the site had some important neighbors. Located just a few hundred feet from historic Independence Mall, the new facility sits near the Byrne-Green Federal Courthouse complex, the Federal Reserve Bank and the Gallery at Market East. The urban site was constrained by busy streets on two sides and small streets on two sides, but its location was ideal because the building could be connected to the courthouse by tunnel, eliminating the need for transporting prisoners by vehicle or removing them from a secure environment.

Officials at the FBOP requested that the architects produce three design schemes for the facility. The design criteria which led to the selected scheme were the functional advantages of symmetrical housing unit plans and the perceived appropriateness of exterior imagery.

The selected scheme features a cast-in-place reinforced concrete frame and 10 in. (254 mm) thick insulated precast concrete sandwich wall panels in a buff color with different finishes used on various parts. The design dictated organization of the program into a base, center and top. The main entry was placed on Arch Street – a major artery – with round precast columns identifying it.

The design was partly inspired by
Fig. 2. Section plan shows below-grade floor, two service levels and upper inmate floors.

Fig. 3. North elevation of center shows variations in reveals and form liners.

Fig. 4. East elevation shows the detailed architectural look that reduces the building's visual mass.
Egyptian Revival architecture used for 19th century prison facilities. Such structures as the Tombs in New York City by John Haviland and the Moya-Mensing Prison by Thomas U. Walter in Philadelphia, provided historical examples which made this architectural vocabulary seem appropriate to the FBOP. Furthermore, the proposed scheme conveyed an image of seriousness and a high level of security.

Precast concrete also met the tight budget criteria. Except for glass and glass block, no other material was used on the facade. The FBOP had recently completed justice facilities in Miami, Florida and Houston, Texas, using precast facades, so they were familiar with the quality of the material and precast construction methods. They liked the fact that the 10 in. (254 mm) thick precast concrete panels could provide both the exterior and interior facade wall on
the prison levels, which left no gaps on the interior surface.

The panels featured 2 in. (51 mm) of insulation sandwiched between two 4 in. (102 mm) wythes of concrete. Typical panels measured 30 x 10 ft x 10 in. (9.14 x 3.05 m x 254 mm), although some panels on the lower floors have different dimensions and less regular shapes (see Fig. 5). The precaster’s ability to cast panels off-site and deliver them as needed kept the project on schedule without tying up downtown traffic during construction.

The precaster was brought onto the project early in the design process to help ensure that all advantages were maximized. This included helping to devise the appropriate panel sizes and aiding with placement of reveals and connections, as well as evaluating the various finishes that were used. The designers had worked with precast concrete components in the past, but wanted to push the limits of the material in terms of variation of surface appearance.

The final design features polished concrete for several feet at the base of the building, replicating a granite appearance (see Fig. 6). This is topped by two stories of rusticated stone-appearing blocks, with upper floors employing both light and heavy sandblasted finishes (see Fig. 7).

Achieving the desired look with several of these finishes proved to be challenging. In particular, hand-polishing
the radiused columns at the entries was
difficult and required careful attention
(see Fig. 8). Fig. 9 shows unpolished
column covers in precaster’s yard prior
to special treatment.

Selecting the appropriate coloration of
the panels also took some evaluation,
with the initial selection changed once
mockups were cast. Initially, the design-
ers and bureau officials decided on a
slightly reddish cast for the precast con-
crete to complement the adjacent brick
courthouse and the Federal Reserve
Bank. But initial panel samples com-
pleted by the precaster showed that the
desired hue could not be achieved con-
sistently across all panels because of
dusting from the aggregate. This would
have caused significant consistency
problems across the face of the building.

Instead, the design team decided on a
white cement with a harder aggregate
that created a buff color. This offered a
limestone-like appearance and consis-
tency. To ensure that all aspects of the
panels in application were considered
prior to casting, the precaster drove the
mockup panels into both sunny and
shady areas and hosed them down to
show variations that would occur in
rainy weather. The result of this attention
to detail was a final mix that offered a
uniform appearance across the entire
building and furthermore suited the
client’s wish to fit in architecturally.

The windows comprise steel frames
with factory-cast stud anchors embedded
in the panels for maximum strength (see
Figs. 10 and 11). The windows were
 glazed at the plant by the precaster, thus
allowing the panels to be delivered to the
site ready for installation. It also ensured
one-piece construction for the windows,
thus enhancing security.

Security was heightened further by the
addition of reinforcing bars embedded in
the precast panels at 8 in. (203 mm) on
center in both directions. This reinforce-
ment satisfied FBOP design guidelines
for making the panels more secure and
provided the required structural strength
in the panels. In addition to window pan-
els, other types of wall panels were used
(see Fig. 12).

A decorative element was added at the
cornice level, where panels with a 3 ft
(0.914 m) radius curve out over the side
of the cornice (see Fig. 13). This gives
the building a top, especially at night
Fig. 14. Elevation detail of precast concrete cornice.
Fig. 15. Elevation and typical connection details of panels.
when the spotlights shine on it. The panels also hide mechanical equipment and air wells for outdoor exercise areas located on the roof.

Fig. 14 shows the elevation detail of the cornice. Typical connection details of the panels are shown in Fig. 15.

The building was sited to pull it forward to the wider streets and push it away from the narrower streets along the sides. This ensured that occupants in nearby buildings would have less visual access to prison cells and added some measure of privacy.

Unfortunately, the site offered no space for staging areas. Access to the city center was limited for large construction deliveries requiring close communication between the precaster and the site crew. This presented a new challenge, namely, how to ensure the arrival of appropriate precast components when needed.

**ERECTION HIGHLIGHTS**

Because no parking is allowed in front of federal buildings (in response to the Oklahoma City bombing tragedy), the precaster had the parking lane available for delivery and staging of panels (see Fig. 16).

Most deliveries had to be made at night, but some permit loads had to be delivered during the afternoon, before and after rush-hour traffic (resulting in several trucks lined up around the building in the parking access lane) (see Fig. 17). However, once the staging system was settled in, the deliveries went smoothly.

Erecting the panels in this constrained space took some logistical maneuvering. The crane was positioned in a portion of the building where a two-story building section of the structure was to be built, and then it was used to erect first the cast-in-place reinforced concrete column and floor slab followed by the precast panels (see Fig. 18). The hydraulic crane erected several stories of cast-in-place concrete, and after curing over several days, the precast concrete erection began to follow it up the building.
The crane was put into use day and night, with both operations underway simultaneously. This proved to be beneficial for the precast concrete, as it could follow the frame up the building sides almost immediately. The precast panels had to be picked and lifted by the crane operator while he was not in visual contact with the panels, but this was a typical operation for the precast erector and did not pose any unusual difficulties.

Panel connections were designed so all of them are concealed by the block walls that separate the individual cells. In some locations, these demising walls were cast-in-place shear walls which required a special connection process for the panels (see Fig. 19).

The shear walls were cast to include one sq ft (0.093 m²) access holes, through which the connections were welded (see Fig. 20). The holes were then filled in with concrete and grouted to form a smooth, monolithic interior surface, which was painted. Aligning these cast-in-place access holes with the precast concrete panels took considerable maneuvering, but the procedure was accomplished without incident to eliminate any interior seams.

**CONSTRUCTION SCHEDULE**

Site impact studies began in 1992. The location finally was decided in early 1995, at which time design and documentation began. This process continued through 1996, when an archeological site investigation was conducted which turned up various artifacts from commercial enterprises from the 18th and 19th centuries on the site (primarily pottery and glass shards).

Construction began in 1997 with precast erection commencing in August 1998 and continuing through the early winter. The project was finished in January 1999 except for one bay, which was left open to provide space for the construction elevator and other access requirements. That bay was...
closed in August 1999. Construction was completed in March 2000 and inmates began to be accepted in June 2000. In all, the $4 million precast concrete contract required 492 pieces: 381 insulated wall panels, 70 non-insulated panels, 23 special cornice pieces, 14 column covers, and four round column covers.

The precast concrete panels were produced by High Concrete Structures at their plant in Denver, Pennsylvania. High Concrete was also responsible for the transportation and erection of the precast panels. The panels were shipped to the project site by truck-trailer — a distance of about 60 miles (97 km).

Figs. 21 and 22 show completed views of the Federal Detention Center. It is apparent that the design-construction team achieved their purpose of creating a functional, secure and yet aesthetic looking building.

CONCLUSION

The resulting project creates a dramatic presence in downtown Philadelphia that belies its highly functional and serious nature. The façade projects a solid but attractive look that provides visual interest without elaborate decoration or cost.

Best of all, nearby residents are pleased with the structure, including some who were skeptical and fearful of having this facility constructed near their place of business. It has been well received in the neighborhood, having been featured by the architecture critic of the local newspaper.

The building also has been recognized by design peers, winning the award for Best High-Rise Correctional Facility in the 2000 Design Awards Program sponsored by the Precast/Prestressed Concrete Institute.

In presenting the award, the judges said, “This building does a marvelous job of dealing with a security institution while still providing interest, especially in the transition from the ground to the roof line. Even the lighting helps to break down the scale. The structure could have been more of a bunker than it is, and it deals with these challenges in a very elegant way. It uses the efficiency and affordability of precast concrete to give texture and vitality to the façade for the
In retrospect, the Federal Bureau of Prisons, as well as the design-construction team are pleased with the quality and appearance of the architectural precast concrete façade on this building. Indeed, the new Detention Center has become a major downtown Philadelphia landmark!

Fig. 21. The elegantly detailed cornice features a 3 ft (0.914 m) radius that adds interest and hides mechanical equipment on the roof. Photo courtesy: Jeffrey Totaro.

Fig. 22. Finished view of building at dusk uplighting the variety of textures achieved on precast panels. Photo courtesy: Jeffrey Totaro.

sake of the city around it.”

CREDITS


General Contractor: Keating Building Corp., Bala Cynwyd, Pennsylvania.

Precast/Prestressed Concrete Manufacturer: High Concrete Structures Inc., Denver, Pennsylvania.