

PROJECT SPOTLIGHT

Precast, prestressed concrete serves dual role at new NASA wind tunnel testing facility

In the 1930s and 1940s, NASA built two wind tunnels at Langley Research Center in Hampton, Va., to test and refine designs for aircraft spanning commercial, military, and spaceflight for more than 80 years. One assessed flight stability and controllability against 53 mph (77 ft/s [23 m/s]) winds. The other assessed spin recovery against 58 mph (85 ft/s [26 m/s]) winds.

With the July 2026 opening of the Flight Dynamics Research Facility (FDRF), NASA combined flight and spin testing into one building with a wind tunnel that is twice as powerful. Although the old wind tunnels were steel, this one is almost entirely precast, prestressed concrete, as is the building that houses it.

In fact, the concrete provides both structural and research support. Four 750 horsepower fans at ground level blow a 117 mph (172 ft/s [52 m/s]) airstream up 116 ft (35 m), where the airflow splits to the right and left under the roof and moves back down into the fans through a hollow four-sided tower on each side of the building. The towers are 25% wider at the base to accommodate two 14 ft (4.3 m) diameter fans on each side.

Minimizing turbulence as pressurized air changes volume requires creating as little friction as possible. To provide a smooth surface, Tindall Corp. of Petersburg, Va., cast solid wall panels with the airflow-facing side down in forms. Eleven horizontal wall panels, all wider than they are tall with gently inward-angled sides, were delivered for each of the tower's four sides.

EDI Precast LLC of Upper Maryland, Md., used a 230-ton (209-tonne) crawler crane to lift and stack panels weighing up to 40 tons (36 tonnes). Crews joined the panels into one monolithic wall via four grouted-sleeve-and-reinforcing-bar connections in each panel, inserting as many 1 in. (25.4 mm) plastic shims as necessary to achieve the required ¼ in. (6.35 mm) panel alignment tolerance. Using this simple but elegant process, they erected six to twenty panels per day. Once assembled, the tower's four sides were welded together.

"We initially considered a steel frame with precast towers but that approach was cost prohibitive," says Garrett Goodman, design director for general contractor BL Harbert International in Birmingham, Ala. "Had we not asked NASA and GSA to allow an all-precast solution, this project would have been millions of dollars over budget." At \$4,445,000, precast concrete represents 9% of \$47,948,447 in construction costs.

"Tindall went above and beyond to meet the project's needs, collaborating to integrate project delivery models with

design models for penetrations, embed, and racking systems for building and wind tunnel equipment."

Tindall also supplied 30 spandrels, 35 beams, 48 columns, 141 floor slabs raked on one side to bond to a cast-in-place topping, and 26 flat insulated panels with architectural detailing that mimics the wind tunnel's upward trajectory.

Delivered under a design-build contract awarded in September 2021, fast-track site and precast concrete design packages were prepared by Mason & Hanger of Glen Allen, Va., allowing FDRF construction to begin in April 2022.

Precast concrete manufacturing ran from September 2022 to May 2023, and erection ran from March to December 2023.

—Stephanie Johnston

Using precast concrete as both building enclosure and wind tunnel flow circuit for its Flight Dynamics Research Facility in Virginia saved NASA millions of dollars in construction costs while delivering a testing facility that will outlive the required 30-year life cycle. Photo

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Preglazed architectural precast concrete walls fast-track condo building

In the pantheon of precast concrete challenges, nothing surpasses fabricating, delivering, and erecting preglazed wall panels—panels with windows already installed—without cracking the glass. Universal Concrete Products (UCP) of Stowe, Pa., lost just two insulated window panes out of 585 installed windows for a 36-story condominium building at 255 E. 77th St. in Manhattan’s Upper East Side in New York, N.Y.

Preglazed wall panels take architectural precast concrete to the next level. As always, cladding can provide virtually any color and finish an architect could envision with quality ensured by manufacturing in a controlled environment. But anchoring and sealing windows during fabrication eliminates an entire trade from the construction schedule, enabling build-out to begin months sooner.

The building streamlines the Art Deco design aesthetic common to New York City pre–World War II buildings, such as the Empire State Building. The 500 ft (152.4 m) building is set back at different locations among eight floors to provide architectural interest. Additional depth and texture are provided by loggias, terraces, pergolas, and two-story arches at the midpoint that form an arcade around indoor amenities. Ornamental panels echo carved oak leaf panels recessed into the facade above ground-level windows. A crown with sloping curves and rectangular cutouts houses mechanical, electrical, and plumbing equipment.

Wall panels reflect the building’s articulation in several ways. Horizontal and vertical reveals create a horizontal block grid. Most windows are slightly recessed with no embellishment, but some are surrounded by a two-story frame featuring bullnoses. If the design requires a recessed window to provide texture and shadow line, precast concrete can form the entire window surround, including the soffit, sill, and jambs to eliminate potential water infiltration.

Considerable coordination was required with both the architect and window supplier as well as the exterior facade consultant in the hoist area and for the multistory windows because these windows were field installed and spanned between multiple panels that sat on different floors. Because the floors could have differential deflection, close coordination was required to ensure that appropriate tolerances were built into the precast concrete–window system. UCP made panels and tested the final window design, which was a custom design based on a performance specification. A UCP mockup demonstrating the window installation also showed corner jointing, a cornice, and several sill options. Architectural Window Manufacturing Corp. based in Rutherford, N.J., provided the windows.

UCP manufactured nearly 1100 architectural precast concrete wall panels, 165,232 ft² (15,350 m²), that replicate

the warmth and durability of natural limestone, a common pre–World War II color. The panel system carries the full range of the building’s architectural detailing: articulated arch surrounds, arcade and loggia elements, pergola features, cornice profiles, and the multifaceted crown, all achieved through precast concrete fabrication with precision and repeatability.

Facade installation followed closely behind the pace of vertical construction, enclosing the building well ahead of a typical schedule on a constrained inner-city jobsite. An interior bead of caulk was installed after each floor was erected to allow for the interior space to be dried in before the exterior of the building became available for swings to caulk the building exterior. With preinstalled windows, this allowed for work to begin early on interior finishes. Production began in April 2024 and erection spanned approximately 10 months starting in late September 2024 through July 2025, with some panels at the material hoist being erected at a later date when the hoist was removed.—Stephanie Johnston [N](#)

Of the nearly 1100 architectural precast concrete wall panels that Universal Concrete Products (UCP) fabricated for the facade of 255 E. 77th St. in New York, N.Y., 339 panels were delivered with factory-installed windows. It was the company’s largest order for preglazed window wall panels at the time. Courtesy of Elizabeth Strohl Universal Concrete Products.

