

Historic Category

Ronald Reagan Washington National Airport Terminal: A Historic Concrete Façade Rehabilitation

Gravelly Point, Arlington, Virginia
Submitted by C.A. Lindman, Inc.

National Airport was founded not by an act of The United States Congress but in desperation by President Franklin D. Roosevelt in 1938 after much debate over the lack of air service for the members of Congress. Prior to its construction, Washington, DC, was served by two independently owned air strips that were dangerous at best, with roads crossing runways and high tension wires along the flight paths. On land, or actually mudflats, once owned by Captain John Alexander, relative of Philip Alexander who donated most of the land upon which Alexandria, VA, was established, the airfield as we know it today was underwater.

Gravelly Point was chosen as a logical site due to its excellent line-of-sight up and down the Potomac River. The first step in construction was to erect a dike around the water side of the site, the second was to dredge and fill inside that dike with over 20 million yd³ (15 million m³) of sand and gravel to elevate the land 20 ft (6.1 m) above river level.

On September 28, 1940, President Roosevelt laid the cornerstone of the original terminal building built by John McShain, “The Man Who Built Washington.” The designers had to trace the colonial history of the area and honor the neoclassical architecture of the nation’s capital; so with a design reminiscent of Mount Vernon, they created a neoclassical moderne structure, considered the epitome in airport construction. This structure has been recognized by the National Trust for Historic Preservation—a concentration of ultramodern developments in building construction, handling of air traffic, field lighting, and public comfort and convenience. National Airport opened for business with flight service on June 16, 1941.

PROJECT SCOPE

On June 1, 2007, the repair contractor began Phase 2, Restoration of the Terminal: A Historic Concrete Façade, as seen by the public upon approach by car or metro. Following a comprehensive conservation survey previously performed by Metropolitan Washington Airport Authority (MWA) architects during Phase 1, the scope outline was as follows:

- to fully enclose the structure with scaffold access;
- to protect all historic elements to be retained that would not be repaired at this time, such as the mosaic ceiling and decorative paving of the loggia;
- to prepare the structure for the realkalization process to raise the pH factors in existing concrete;
- to remove all paint from the existing surfaces prior to the hand survey and layout of repairs;
- to perform all concrete repairs designated by inspections conducted by the architect; and
- to apply the specified repair mortars and mineral coating system and color.

The ultimate result per National Park Service Historic restoration specifications was to retain as much parent and original materials during repair, so the project had many small areas left intact between spalls.

As the repair contractor’s employees were to be working on a 24-hour schedule at a protected site in a post-9/11 environment, before anyone from the contractor’s designated field team and crew could commence work, all potential employees’ names (60) were submitted and subjected to stringent background identity checks, including fingerprinting. Everyone had to be a U.S. citizen or legal alien and had to pass a Public Safety Training series conducted by the Airport Authority; all material

handlers had to pass the material supplier Certified Installer 2-day training class. After that process was completed, the contractor had a base crew of 25 technicians on site full time, working split shifts.

High decibel-producing work was conducted at night and repair procedures were executed during daytime hours. The specialty contractor installed over 1700 ft³ (48 m³) of repair mortar. The material supplier provided on-site inspection as a requirement of the 10-year extended warranty. Mock-ups and the resulting learning curve were worked through on site under extremely high levels of inspection by MWAA's team of consultants, conservators, engineers, the general contractor, and the materials manufacturers' representatives. This process was continued for 545 days to substantial completion—on time, on schedule, and on budget at \$3,509,978.

REALKALIZATION

The contractor and a designated subcontractor set up the processes for realkalization to 100% of the surface area, 22,000 ft² (2044 m²). A steel mesh electrode was attached to the structure. The electrode was embedded in a nontoxic biodegradable electrolytic media. Next, electric contacts were established between the attached electrode and the steel reinforcing inside the concrete. When an electric field is applied, chloride ions migrate away from the reinforcing steel toward the externally attached electrode, eventually ending up in the temporary electrolytic media, which is then discarded. Simultaneously, alkali ions migrate from the electrolyte into the concrete, raising its pH to the original levels. The passivating layer of the reinforcing steel is thus reestablished to protect them from corrosion. This system required 72-hour constant charge and monitoring.

Protection of surrounding surfaces was effected by multiple layers of poly sheeting, plywood decking, a rain gutter chemical solution capture system, and mandated contaminated debris removal techniques. No foreign matter was allowed to escape the work area or contaminate public spaces.

PAINT REMOVAL

All 24,740 ft² (2298 m²) of existing concrete surfaces coated by layers of paint were to be cleaned prior to commencing concrete repairs. The methods chosen by the architect were tested by mock-up panels to the Park Service standards. Chemical strippers were tested from mild to stringent, with a solvent-based material being chosen and spray-applied, with dwell times ranging from 8 to 28 hours. Additionally, to ensure the concrete face of the building was not damaged by traditional paint-blasting systems, a mechanical system of abrasive glass media mixed at the nozzle with low water volume directed against the surface at a distance of



Before construction



During construction



Setup for realkalization without absorbent media cover

12 in. (300 mm) was used to remove all remaining materials and perform detail area cleanup. This collective system proved to be the most effective and produced the surface texture required by the architects and material supplier. All cleaning media and chemicals were collected, contained, and tested by independent lab services prior to disposal. If any materials were found to be hazardous, the testing agent was responsible for proper disposal.

SPALL REPAIRS

The areas of removal were extensive, some 1700 ft³ (48 m³) were laid out regardless of size.



Large field carved lettering panel



Completed façade

The repair contractor's crews mechanically chiseled with air-operated hammers, working under the lights at night. The reinforcing steel was inspected for deterioration and, if necessary, was spliced—500 linear feet (152 m) were welded in to replace portions removed. All exposed reinforcing steel, over 17,000 linear feet (5182 m), was cleaned, primed, and painted before spalls were inspected by the architect's conservator. Small spalls were hand patched with special repair mineral based mortars under the guidance of the material manufacturer, with the trained technicians reshaping curvatures to match surrounding areas.

The large field-carved name panel above the loggia was one of the most severely damaged areas, requiring not only expert masons but also carvers to return the lettering to its original state, which would later be gilded upon completion. Larger spalls, such as the 240 linear feet (73 m) radius cornice, were removed completely. New reinforcing steel was set and tied and special forms were created, set, and poured with the specified concrete mixture.

COATING AND PAINTING

After allowance for proper curing of repair mortars, the contractor's forces began the massive effort of preparing the surfaces again and applying three and sometimes four coats of a potassium silicate mineral-based specialty coating system to all of the façade elevations, approximately 24,740 ft² (2298 m²). This material was chosen by the preservation architects to enhance and protect the Terminal A structure for a minimum of 25 years with proper maintenance. Windows, doors, eagle emblems, and signage received hand-applied paint systems as required, including gilding the incised lettering "Washington National Airport."

Ronald Reagan Washington National Airport Terminal

OWNER

Metropolitan Washington Airport Authority
Washington, DC

PROJECT ENGINEER/DESIGNER

Parsons Management Consultants
Washington, DC

REPAIR CONTRACTOR

Grunley Construction Company, Inc.
Rockville, Maryland

MATERIAL SUPPLIERS/MANUFACTURERS

Cathedral Stone Products, Inc.
Hanover, Maryland

Keim Mineral Systems
Lewes, Delaware