

John F. Kennedy International Airport: Reconstruction of Runway 13L-31R and Associated Taxiways

The Runways at John F. Kennedy International Airport provided the opportunity for over 61.9 million passengers to travel in and out of New York City in 2018. This high demand of travel results in wear and tear on the runway. Runway 13L-31R has been overlayed with Hot Mix Asphalt since the 1940's. Near the beginning of 2019, after several years and numerous overlays, the 10,000-foot-long and 150-foot-wide Runway 13L-31R underwent construction and rehabilitation. A decision was made to replace Runway 13L-31R with a more durable option, Portland Cement Concrete.

The 13L-31R reconstruction began in April 2019 and was completed in September 2019. In that 7-month period, a total of 111,837 cubic yards of Portland Cement Concrete were placed, with an average of 2,200 cubic yards batched daily. Along with the large quantity of concrete, 44,000 20-inch epoxy coated dowels for transverse joints, 37,000 20-inch epoxy coated dowels for longitudinal joints, and 135,000 linear feet of preformed joints were used. This significant amount of construction replaced the entire existing runway as well as widened it by 50 feet. The total cost of the project was \$152,100,000.

The concrete mix for this project was designed to meet a minimum flexural strength of 700 psi at 28 days. The specifications required a combined uniform aggregate gradation with a maximum aggregate size of 2.5 inches. The contract limited the total cementitious content to 550 pounds per cubic yard with a minimum substitution of 40% slag cement. The concrete was restricted to a mix proportion permeability value of 1000 coulombs at 28 days and a production permeability value of 1500 coulombs at 28 days when cured and tested in a laboratory using ASHTO 277 (accelerated method). The linear drying shrinkage (ASTM C157) was limited to 0.04% at 28 days. The water-to-cement ratio (AASHTO 318) was specified at a maximum of 0.40 and the air content (ASTM C231) to range from 4.0% to 7.0%.

Prior to loading, the contractor was required to remove and replace concrete panels (25 ft x 25 ft) that exhibited drying or plastic shrinkage cracking or damage due to construction. Only 3 out of 2816 panels had to be removed and replaced due to shrinkage cracking. Of the 870 specimens sampled and tested by the Port Authority of NY & NJ, the concrete mix achieved an average flexural strength of 1280 psi at 28 days, water-to-cement ratio of 0.39, and an air content of 4.9%.

Due to the substantial amount of permeability testing, the Port Authority of NY & NJ laboratory utilized a screening process which involved testing the surface resistivity (30 second test) alongside the Rapid Chloride Permeability test, AASHTO 277, (6-hour test) to prove the permeability of the concrete. A study done in the laboratory prior to this project, using the same mix design, developed a requirement of surface resistivity to 19 kΩ cm or greater, which was equivalent to less than 1000 coulombs. Of the 840 samples tested for resistivity, the average resistivity reading was 24.7 kΩ cm. The average permeability when tested in accordance with AASHTO 277, was 911 coulombs after 28 days of an accelerated cure. None of samples tested failed to meet the Contract requirements for permeability and resistivity.

Overall, the concrete mix batched, tested, and placed on Runway 13L-31R for the Reconstruction and Rehabilitation at John F Kennedy Airport met and achieved the strict specifications set by the Port Authority of NY & NJ, which in turn produced a durable concrete that should last 100 years.



Participants:

Owner/Client- **Port Authority of NY & NJ**

Structural Engineer of Record- **Stantec**

Construction Manager- **Port Authority of NY & NJ**

General Contractor- **Walsh Construction Company II/Grace Industries LLC (JV)**

Ready Mix Concrete Supplier- **Walsh Construction Company II (on-site plant)**

Concrete Mix Designer- **Walsh Construction Company II**

Field Testing Laboratories – **Port Authority of NY & NJ**

Cement Manufacturers- **LaFargeHolcim Type I/II**

Pozzolan Manufacturer (Fly Ash or Blast Furnace Slag) – **LaFarge NewCem Grade 120**

Coarse Aggregate- **Silvi – Gibraltor Rock**

Fine Aggregate- **Silvi – Sahara Sand**

Concrete Admixture Manufacturer #1- **BASF MasterGlenium 3030**

Concrete Admixture Manufacturer #2- **BASF MasterAir AE90**

Reinforcing Steel Supplier- **Vimco**

Reinforcing Accessories Manufacturer- **Dayton Superior Cooperation – Epoxy Dowels**

