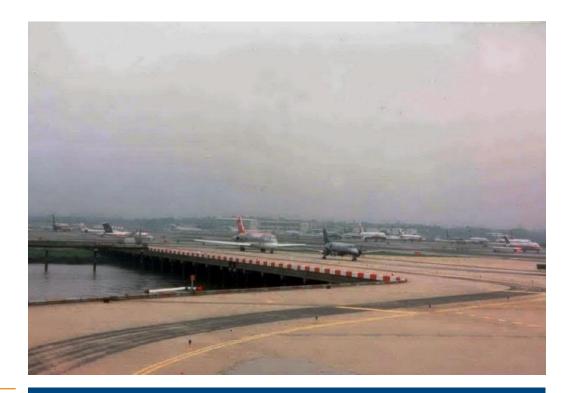# WJE

LaGuardia Airport Over-Water Runway

Load Testing of Retrofit Design | Queens, NY

CLIENT

Port Authority of New York and New Jersey

BACKGROUND

The runway system at LaGuardia Airport was extended over Long Island Sound in the early 1960s. The over-water extension structure consisted of precast/prestressed and post-tensioned concrete girders and precast/prestressed stay-in-place forms. The concrete deck was cast-in-place over the precast system.

Partly submerged in seawater two times a day, the girders were exposed to an aggressive chloride environment. Consequently, the girder members began to deteriorate due to corrosion of their prestressing strands. To restore these deteriorated girders to their original strength, the Port Authority of New York and New Jersey (PANYNJ) made plans to retrofit the girders with a composite steel trough. Because of uncertainties about the interaction between the concrete and the steel, the PANYNJ retained WJE to determine the feasibility of the retrofit design.

SOLUTION

Investigating the utility of the design, WJE engineers built and tested two full-scale retrofitted girder specimens composed of precast concrete retrofitted with steel troughs encapsulating the lower portions and filled with grout. To model the condition of a runway girder whose reinforcement is severely corroded, the concrete specimens were constructed with minimal reinforcement. After instrumenting the specimens with over fifty strain gages and three displacement transducers, each was tested to failure in a five million pound test machine at Lehigh University.

Testing revealed that the steel trough acted compositely with the concrete girder and reached yield level stresses; however, the failure mode was a shear-type failure precipitated by the termination of the external steel trough short of the bearing followed by a horizontal shear failure within the grout layer. Consequently, the engineers modified the retrofit design to improve the shear strength.

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