



## Case Study: Hartsfield-Jackson Airport

### The world's busiest airport leverages intelliRock

*With over 80 million passengers and 700,000 tons of cargo passing through each day, Hartsfield-Jackson Atlanta International Airport is the busiest airport in the world. As part of the current 10 year expansion project, Kiewit Southern Co. used intelliRock to execute a rapid replacement of one of the airport's main runways in under 60 days.*

#### Introduction

Hartsfield-Jackson Atlanta International is a critical link in the world's air transportation infrastructure. At over 80 years old, the airport has had several expansion projects to keep up with the substantial traffic load increases, and has established itself as an innovator in rapid runway construction. The current expansion is a 10 year, \$6.2 billion project that is one of the largest capital projects in the United States. The expansion includes a new remotely located rental car facility, a new terminal, a new runway, the replacement of existing runways, and major changes to the network of taxiways.

During September through November of 2006, a 10,000 ft main runway was replaced by GSC Atlanta, Inc, a wholly owned subsidiary of Kiewit. With a 60 day traffic interruption window, and \$225,000 per day in liquidated damages on the line, Kiewit used intelliRock to optimize concrete workflow and monitor concrete quality.

#### Project Overview

The runway project entailed the removal and replacement of the 10,000 ft long runway 8R/26L, a 3500 ft long taxiway and 14 taxiway/runway approaches. Over 140,000 cubic yards of concrete were used to complete the 150 foot wide and 20 inch thick pavement. With a 60 day clock ticking, time and resources were critical. Prior to the runway closing, Kiewit was already saw-cutting the runway into panels at night to prepare for rapid



removal. Once paving was started, Kiewit was placing up to 8,000 cubic yards per day during their 24 hour per day, 7 day work weeks. At this rate, timely and accurate information for quality control and workflow decisions was critical.

#### Concrete Maturity for Workflow Decisions

By analyzing the thermal profiles and the properties of the mix design, the intelliRock system is able to report up-to-the-minute concrete strength information with the push of a button using well-established concrete maturity techniques (ASTM C 1074). Kiewit introduced this technology to Atlanta's Department of Aviation (DOA) on a previous project, and the DOA has been subsequently experimenting with the technology. On this project, concrete maturity technology was mandated by the DOA to ensure rapid construction – and was a welcomed tool for the staff at Kiewit.



During construction, the Kiewit team was looking for flexural strength targets of:

- 450 PSI to drill dowel holes
- 500 PSI to allow construction traffic
- 650 PSI for air traffic

The runway was paved in 25 ft. wide lanes averaging 1600 ft. in length. Timing of the doweling operation, which included the drilling and placement of over 60,000 dowels, was critical to allow the rapid placement of adjacent lanes. Also, construction traffic needed access to the pavement as soon as possible.

If conventional methods were used, the time frame for drilling the dowels would have been approximately 45-55 hours after completion of each lane of pavement and additional hours would be required to allow construction traffic. However, considering the heat generated and trapped in the concrete placement itself, IntelliRock indicated the 450 PSI flexural strength requirement for drilling was met in only 13-15 hours, far before the 2-3 days needed to reach strength in the standard-cured beams. This saved about one and a half days of wait time for each lane where dowels were required. Since \$225,000 would be assessed for each day the project was late, the IntelliRock system greatly reduced that risk. Overall it is estimated that 2-4 weeks of construction time were saved by the use of IntelliRock.

### Concrete Maturity for Quality Control

One of the many challenges faced on this project was getting timely information to monitor concrete quality. Since sometimes 10,000+ cubic yards of concrete were being placed per day, a considerable amount of concrete was placed before the first traditional beam specimens were broken. Furthermore, 110,000 cubic yards were already placed before receiving the first 28 day break. By comparing IntelliRock strength information to the actual early age strength of beam specimens, mix quality could be verified within hours of placement, thereby allowing rapid responses to strength deviations and rapid feedback from mix design

changes, and minimizing risk. This rapid QC, along with the additional information provided by IntelliRock, resulted in a high level of quality assurance and risk mitigation. Furthermore the project never hit a “red light” resulting from mix quality issues.

### Reducing the Need for Beams

The project originally required 7 beams for every 200 cubic yards of concrete (750 sets or 5250 beams), however, based on early trial successes with IntelliRock to manage workflow, that number was reduced to one set per 500 cubic yards, thereby reducing the number of beams by over 3,000 specimens – a 60% reduction.

### Conclusions

Air traffic was interrupted on midnight on September 8<sup>th</sup>, and did indeed resume the morning of November 6<sup>th</sup>, 2006. Due to the forethought by the DOA, information from IntelliRock kept the project on schedule and resulting in substantial savings to both, the contractor and owner. If workflow decisions would have been based only on traditional beams, the resources needed to complete the project on time would have been increased substantially to avoid the \$225,000 per day penalty. Also, more expensive concrete would have been needed which would have added \$200,000 to the cost of materials. Additional construction staffing and equipment would have also been necessary.

Overall, IntelliRock system:

- Reduced the overall cost to the contractor and owner.
- Enabled earlier drilling for dowels and access for construction traffic
- Provided rapid concrete QC information
- Reduced the number of required test specimens by over 60%