

Raleigh-Durham International Airport (RDU) Runway Panel Replacement - Electrical

IESALC Conference – October, 2022

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Challenging today.
Reinventing tomorrow.



Agenda

Background

- Program Development
- Project Description

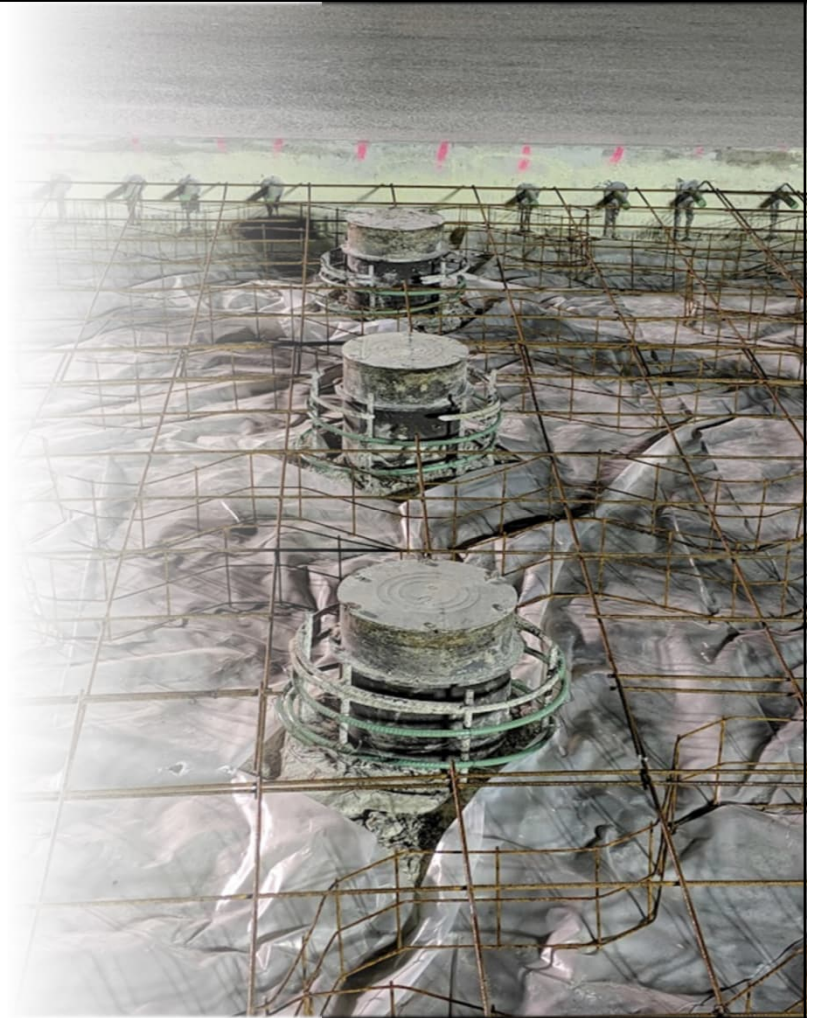
Design

- Considerations
- Accommodations

Construction

- Requirements
- Photos/Video

Discussion

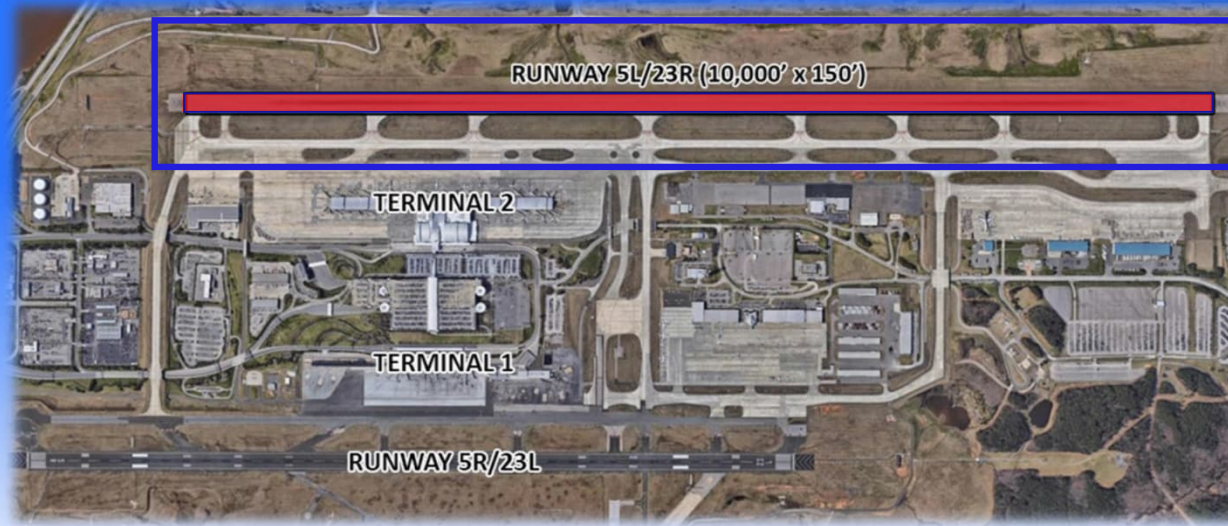
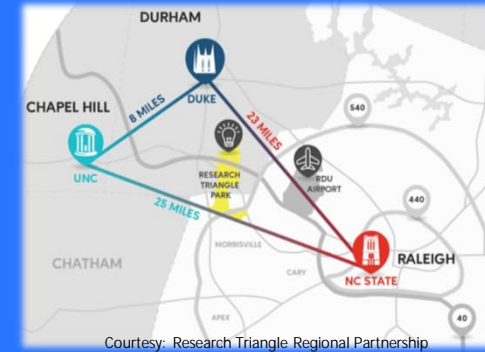




Background

Location Background

- RDU Airport – Raleigh/Durham, North Carolina
- Medium Hub Airport – 37th by enplanements (2019)
- Peak Stats: 600 Operations, 61 Destinations, 10 Airlines
- 3 Runways; 2 Commercial Service: 5R & 5L



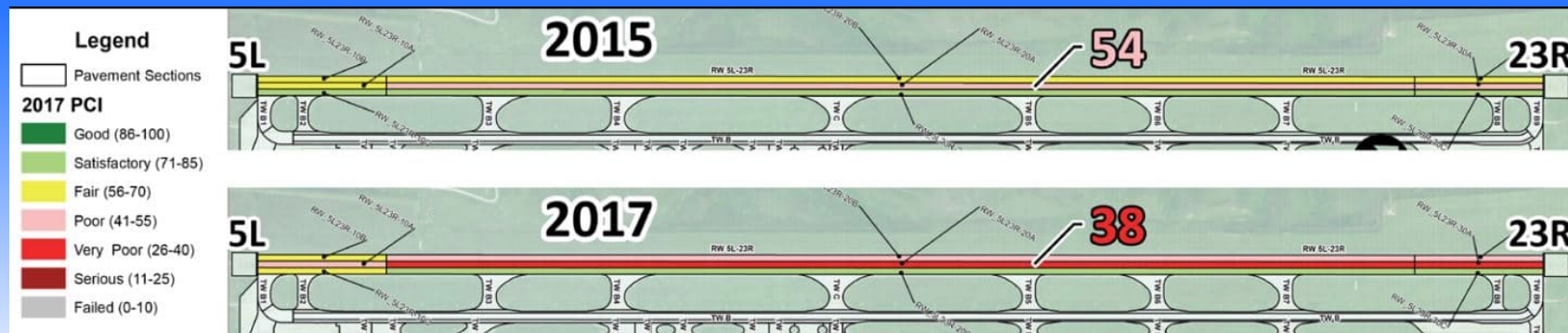
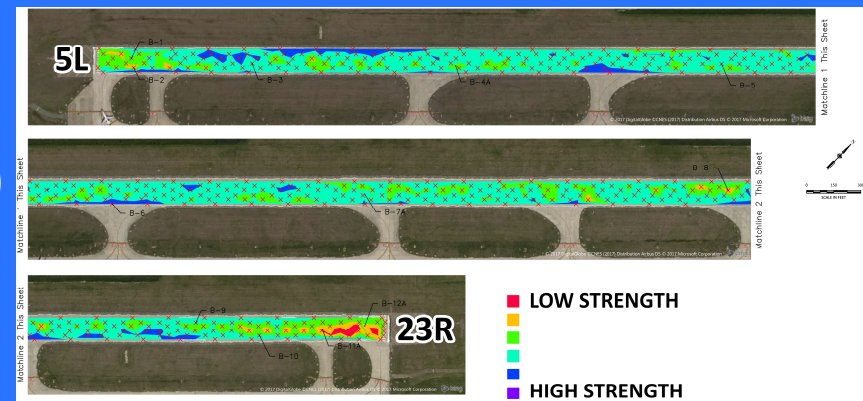
Program Background

- Concrete Runway 5L-23R – Only Runway Able to Handle Full Fleet Mix, with ALSF-2
- Constructed in 1986 – Close to End of Useful Life
- Airport Expansion Requires Relocation of New 5L-23R to the West
 - Could Take Up to 10 Years to Complete (2017)



Project Background: Mission

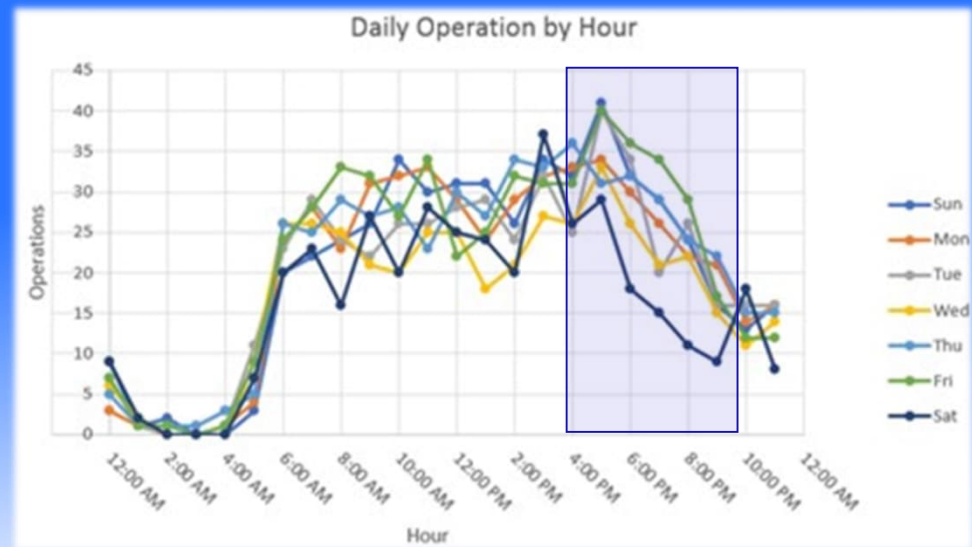
- Preserve Existing Runway 8-10 Years
- Replace Individual Slabs (Checkerboard)
 - Approximately 200 of 2,400 Total
 - 64 Light Bases Impacted
- Slabs Determined by Inspection/GPR



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However...

- Runway 5L-23R Critical to International Operations (2019)
- Airport Determined Extended Closures Untenable for International Operations
 - Selected Daily 18 Hour Closures (Open 4p-10p local)
- Contract called for one slab to be replaced each night, with the runway reopening each day.
- Contractor would have ~5 hours each night to demolish and replace the existing slab – including lights when applicable.

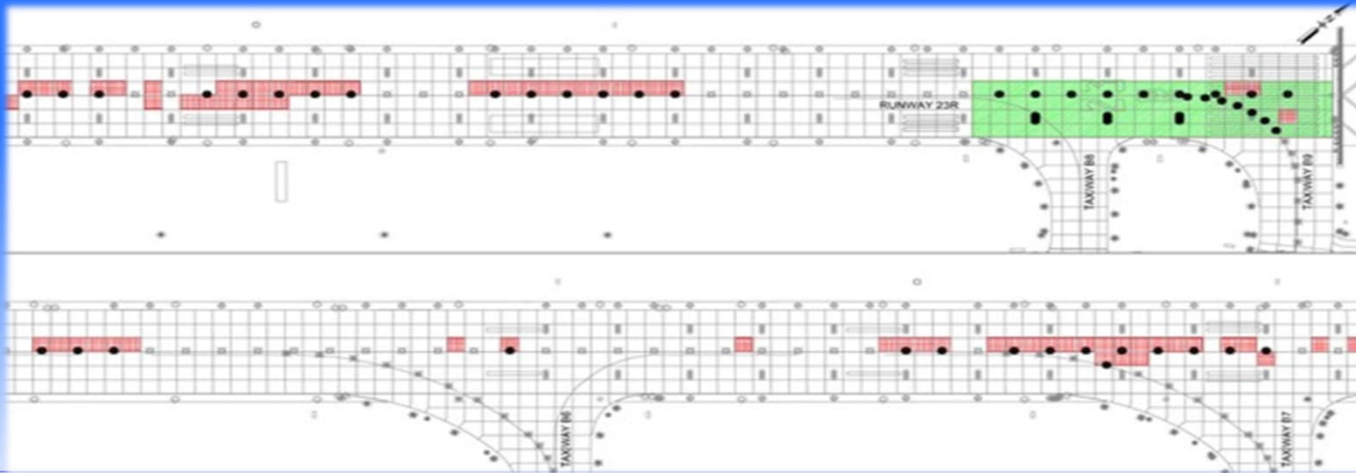


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Design
(Mostly Electrical)

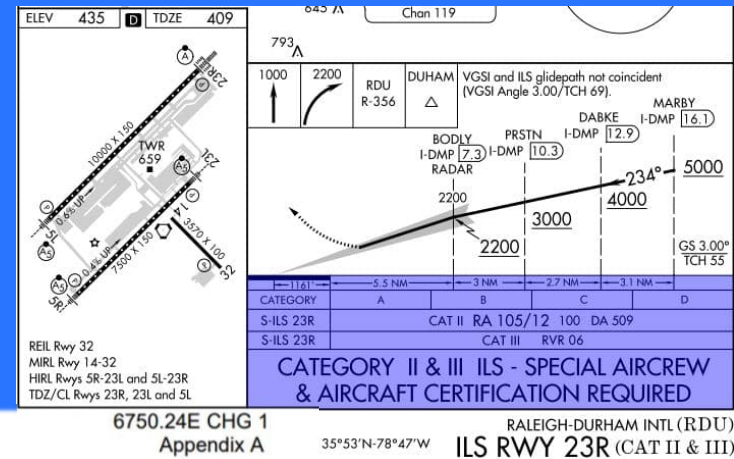
Design Requirements

- Civil: Remove Slab & Replace With New, 1 Per Day
- Electrical:
 - Remove and Replace Impacted Lights and Cable
 - 42 Runway CL, 12 TDZ, 10 Taxiway CL
 - Maintain All Existing Locations (e.g. 24" to RWCL)



Phasing Requirements

- Request to Maintain ILS Approaches
- Refer to FAA Order 6750.24E & AC 5340-26C
 - No more than 3 consecutive RWCL
 - Not more than 1 barrette of TDZ

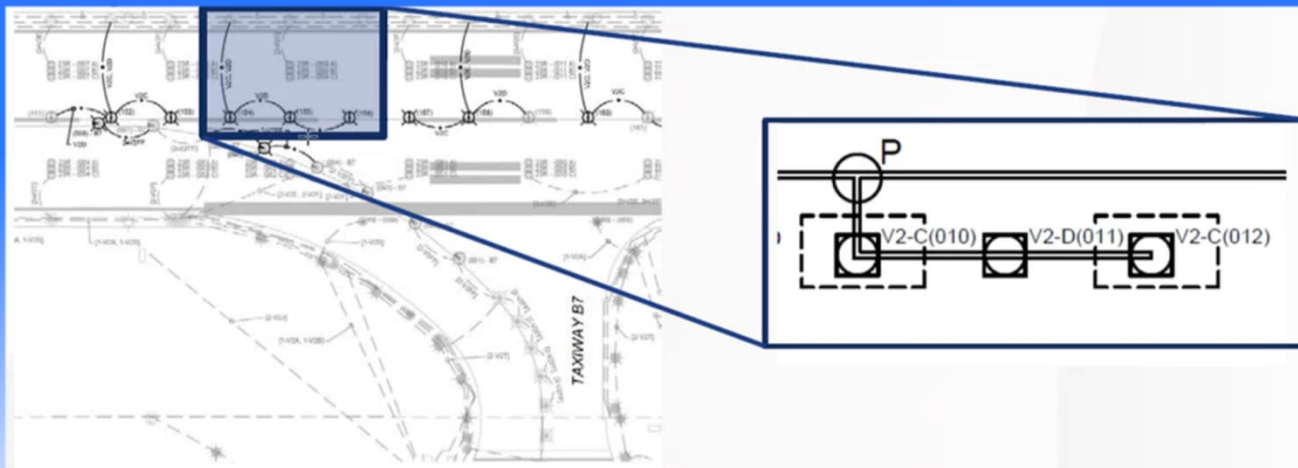


10/29/13

Component	Situation	CAT	Effect on Operation	Maintenance Required?	Notify Aircraft	Facility NOTAM	NOTAM (D)
Runway Centerline (RCL) Lights	Four consecutive lights, or more than 10% of the RCL lights are not functioning	I	Increases RVR to 2400, unless the operator uses a flight director or autopilot or HUD to DA.	No	Yes	Yes	No
		II	Reduced Lighting CAT II operations authorized. Operators require specific OpSpec, MSPEC, or LOA approval and use of autoland or HUD to touchdown.	Yes	Yes	Yes	"REDUCED LIGHTING CAT II OPERATIONS: REQUIRES SPECIFIC OPSPEC, MSPEC, OR LOA APPROVAL AND USE OF AUTOLAND OR HUD TO TOUCHDOWN"
		III	Denies operations.	Yes	Yes	Yes	"CAT 3 NA"

Circuiting Requirements

- Electrical:
 - Centerline Lights Interleaved
 - Fortuitous Existing Circuit Routing
 - Primaries and Isolation Transformers in Shoulder, Long Secondaries to Lights



Why We Are Here

- Airport Requested Re-Use of Existing Bases (!)
 - Survey Trip for Examination of Condition
 - Largely Found to be in Decent Shape, Some Fairly Oxidized
 - Did Not Open Every Can
 - Work to be Completed on a Work-Night 5-Hour Window:
 - Demolition of old can
 - Preparation of RGS conduit
 - Place New Can – Fine Tuning
 - Concrete Boot – Time to Set
 - Grounding/Counterpoise
 - Let the GC Pave
 - Don't run out of time...?
- OR...
- Remove Old Concrete
 - Verify Condition
 - Grounding/Counterpoise
 - Let the GC Pave
 - Don't run out of time.



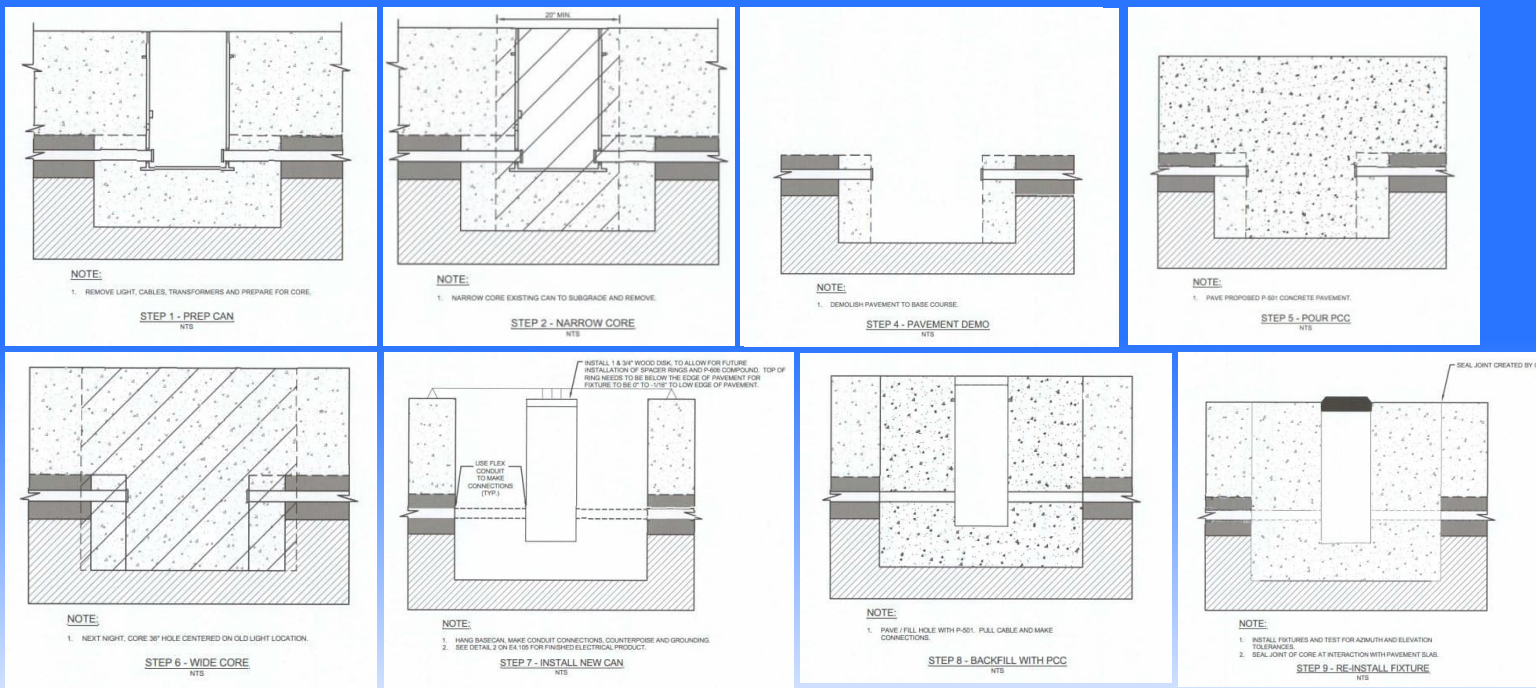
Undamaged Light Base Reuse

- Remove Light & Cable Day of Removal
- Main Concerns of Base-Can Reuse:
 - Ensure Integrity of the Base Can
 - Particularly the Load Ring
 - Examine/Ensure Rebar Around Cans
 - Convey Time Savings
 - Convey Airport's Interests
- Core Concrete & Install Light Day After



Damaged Light Base Removal

- Provided Steps for Coring Out and Installing New, If Needed (*Civil details omitted*):



Specs & Pay Items

- How to Accommodate Re-Use Versus New Basecans?
 - Parallel Specs with Corresponding Line Items
 - Be Transparent During Pre-Bid and Pre-Construction Meetings
- How to Estimate Quantities and be Fair with Contractor?
 - Issue of Cost Versus Issue of Time
 - Issue of Airport's Preference
 - Project Setup: Project Performed by a CMAR

Item No.	Description (Note: Not an AIP-Funded Project)	UOM	Quantity
L-125-5.1	Furnish and Install L-868 Light Base in PCC Pavement and Reinstall Existing In-Pavement Light Fixture	EA	14
L-125-5.2	Remove and Replace In-Pavement Light Fixture from Existing L-868 Light Base in PCC Pavement To Remain	EA	50



Construction

Construction Requirements

- Construction in 2019 & 2020, 4 seasons at 60 days each
- Contractor Worked 2200-1600 daily
 - Daily Go/No-Go Call Held for Weather Purposes; Final Call at 2000.
- Essentially a 5-Hour Work Window to allow 12-13 hours for concrete to set
- Liquidated Damages each day for failure to open
 - Opening Based on Concrete Meeting Strength Requirements
 - \$500/minute, up to \$36,000 for a lost day
 - Civil Had Redundancies in Place
 - Test/Practice Slabs
 - One for Civil Only
 - One for Civil and Electrical

Construction Requirements

- Daytime Test Slab:



Construction Requirements

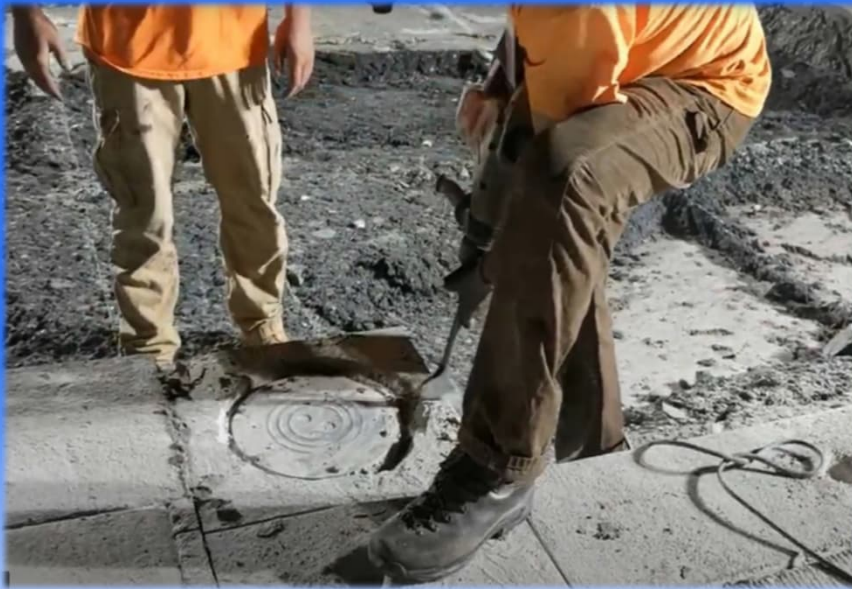
- Can't Damage the Basecan; Test Slab:



Construction Underway – Slide 1



Construction Underway – Slide 2



Construction Underway – Slide 3



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Construction Underway – Slide 4



Construction Underway – Slide 5



Construction Underway – Slide 6



Construction Underway – Slide 7



Construction – Unexpected Conditions

Construction - Unexpected Conditions

- What goes wrong on construction projects?
 - Conduit Installed in Concrete Layer Instead of Base Course; Gets Cut by Slab Sawing



Construction - Unexpected Conditions

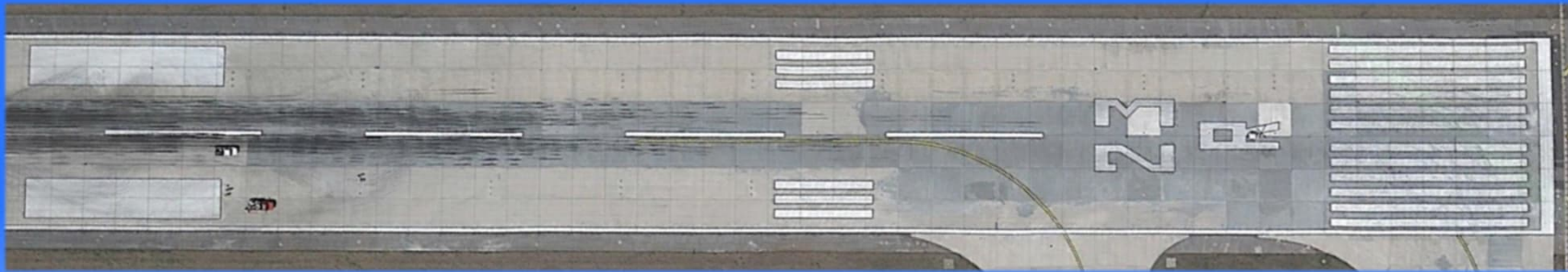
- What goes wrong on construction projects?
 - Concrete Equipment Breaks Down (Video of Concrete Placement from Dump Trucks)



Summary

Project Summary

- Construction Costs: Approximately \$10M for 200 concrete slabs
- Construction Finished Ahead of Schedule (COVID) in 2020
- Electrical: Only the Test Slab Basecan Damaged



- Airport Has Engaged Jacobs to Complete a Second Preservation Effort
 - On 5L-23R and Associated Parallel Taxiway B, Construction Just Underway, Fall 2022

With Appreciation

- RDU Airport Authority (Owner)
 - Ron Jewett, Jim Novak, Victor Malcolm
- Balfour Beatty (CMAR)
 - Trent Johnson
- Parsons (CM)
 - Marshall Whitehurst
- General Contractor: McCarthy
- Electrical Contractor: KOBO
- Jacobs Team
 - Matt Wright, Brock Burns, Alex Eiler, Chris Decker (RDM)



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Thank you!

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Reinventing tomorrow.

