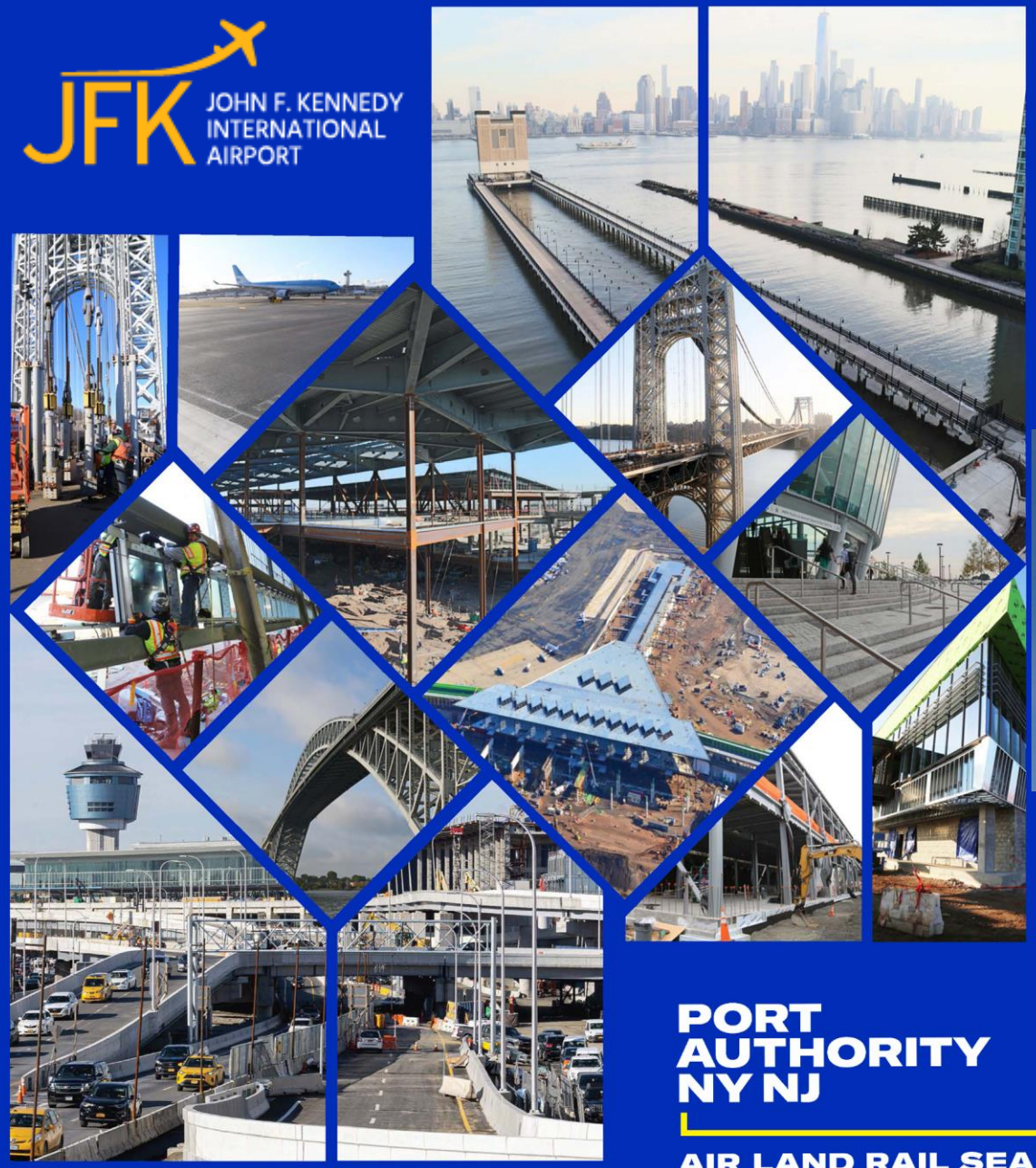
JFK JOHN F. KENNEDY INTERNATIONAL AIRPORT



JFK RUNWAY 13L-31R RECONSTRUCTION

2022 ACI SPRING CONVENTION

Orlando, FL

Mark Wierciszewski, P.E.

PORT AUTHORITY OF NY & NJ

03.28.2022

PORT AUTHORITY NY NJ

AIR LAND RAIL SEA

PORT AUTHORITY NY & NJ

- 5 Airports
- 4 Bridges
- 2 Tunnels
- 2 Bus Terminals
- 5 Marine Terminals
- World Trade Center
- PATH & NYNJ Rail

JFK Runway 13L-31R Reconstruction

Learning Objectives

At the conclusion of this presentation, attendees will be able to identify:

- The specification performance requirements needed to increase the potential for a successful project
- Important non-prescriptive requirements for a concrete pavement mix design
- The reasons why blending aggregates is important
- The importance of performing a successful test pour prior to commencing production
- Key items to monitor during construction

Agenda

- ✓ Project Overview
- ✓ Specification Requirements
- ✓ MIX DESIGN
- ✓ Construction

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Project Overview

JFK Runway 13L-31R Reconstruction

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John F. Kennedy International Airport

4 Runways. 6 Terminals. 4800+ Acres.

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Runway 13L-31R Reconstruction

Project Scope

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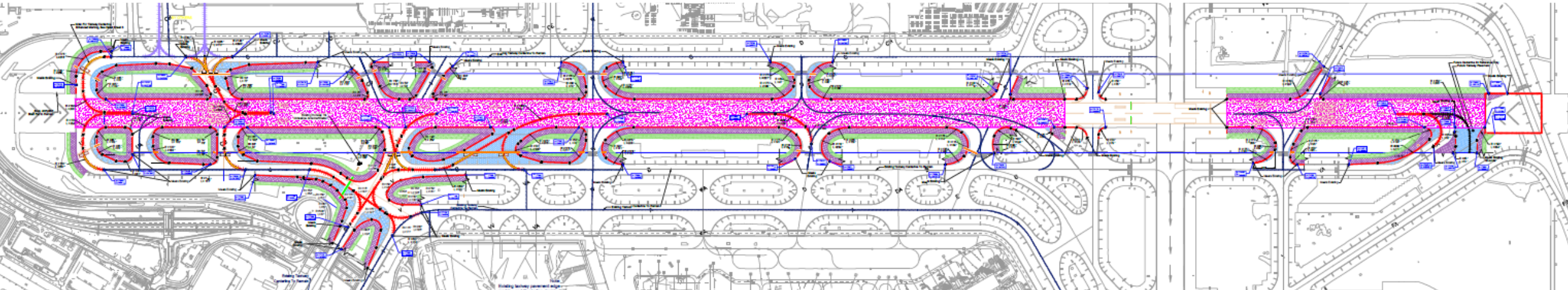
Pavement / Civil Engineering Scope

- Reconstruction Of Runway 13L-31R In Concrete
- Widening Of Runway 13L-31R From 150-ft To 200-ft
- Rehabilitate Existing Adjacent Taxiways And Intersections
- Upgrades Of Taxiway Fillet Radius To Permit Group Vi-compliant
- New High-Speed Taxiway 'WW' – 5.9s Rot Savings
- Reconfigured And Rehabilitated Taxiway 'U'/'V' Intersection For A380 Operations With MOS
- Partial Taxiway 'YA' "Stub" For Future Realignment
- Upgrade Drainage to Infiltration Trench System

FAA Navigation/Electrical Scope

- Runway Edge (Elevated and In-Pavement), Threshold, Centerline Lights
- FAA L-850B Touchdown Zone Lights (TDZ) – 13L, 31R approach
- Taxiway Lead-off Lights at all Intersections
- FAA L-852 Guard Bar Lights (elevated and in-pavement)
- FAA L-858 Guidance Signs and Foundations
- Homeruns to Electrical Switch house
- 31R Medium Approach Light System with Runway Alignment Indicator Lights (MALSR)
- 13L Approach Lighting System with Sequence Flashing Lights (ALSF-2)



Schedule

Phasing Construction to Maintain Flight Operations

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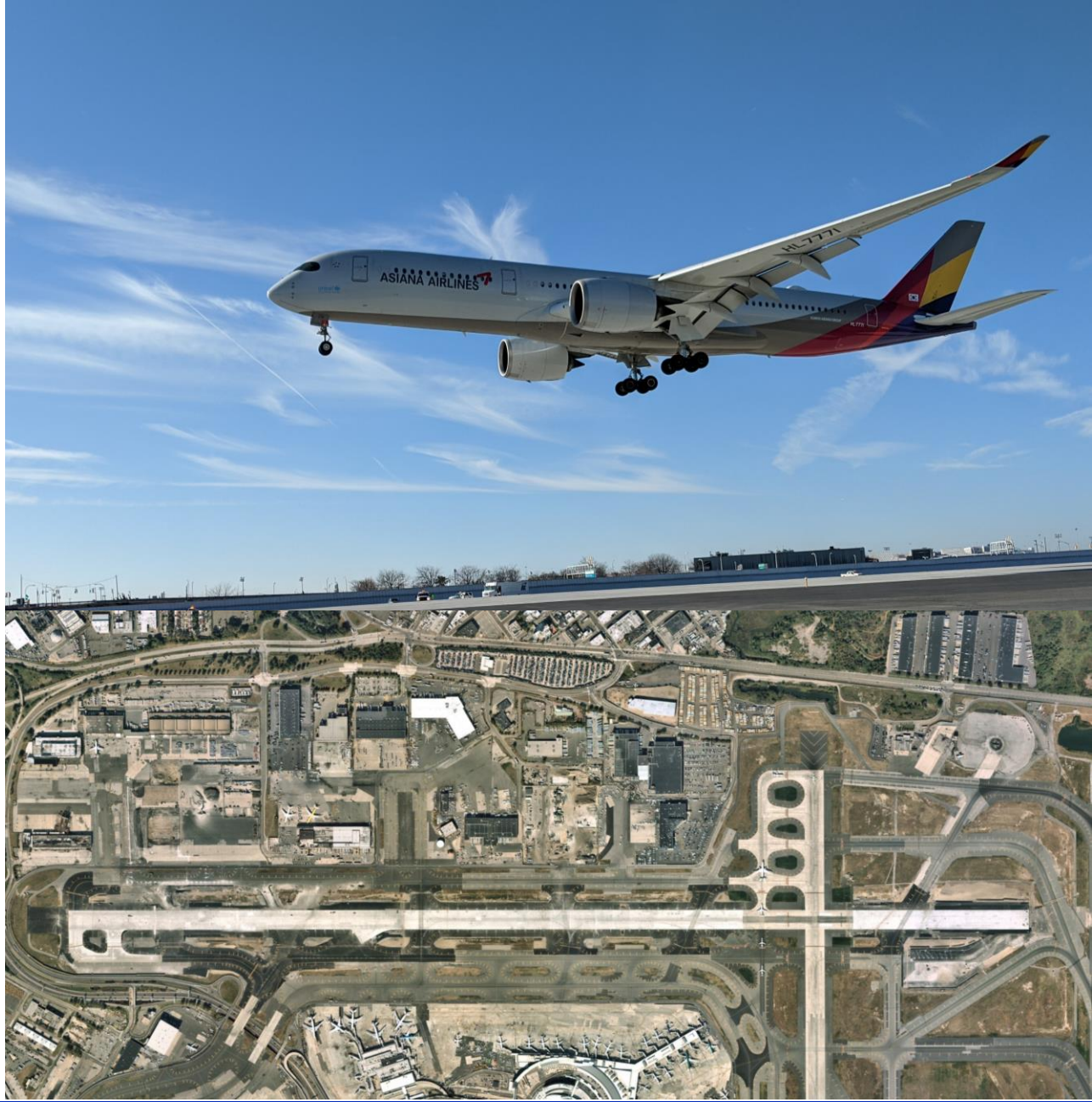
Pre-Purchase Procurement Period	Fall 2018 – Feb 2019
Contract Awarded	March 2019
Electrical Site-Work Started	March 2019
Runway Closed for Construction	April 1, 2019
Partial - T/W ‘W’ to ‘E’	July 1, 2019
Partial - T/W ‘B’ from T/W ‘V’ to ‘W’	August 10, 2019
Partial - T/W ‘U’/’C’ from T/W ‘C1’ to ‘V’	August 25, 2019
Partial - T/W ‘A’ from T/W ‘ V’ to ‘W’	October 17, 2019
FAA ILS Ground Check (Actual)	October 24, 2019
FAA ILS Flight Check (Actual)	October 30, 2019
Construction Completion	November 15, 2019
Runway Open for Arrivals/Departures	November 16, 2019

Summary of Work

Runway 13L-31R

Rebuilt fatigued R/W 13L-31R in concrete in 229-day closure, personnel worked 7 days per week, 24 hours per day, to allow the first landing on Sun, Nov 16 - on schedule.

1. 2,848 concrete slabs (110,000 + CY)
2. 1,937 in-pavement airfield lights
3. 93 FAA directional signs



JFK Runway 13L-31R

Project Site Map

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Batch Plant Layout

On-Site Concrete Batch Plant & Material Stockpile

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2 On-Site Batch Plants

- 8-12 hours of continuous placement
- Project-specific AOA security checkpoint
- Full-time Airport Operations escorts for airside haul route
- Production: 2000 - 3700 CY/day
- Trucks: 180 / day (Max = 335)
- 65 Contract Pour Days

On-Site Batch Plant

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Specification Requirements, Mix Design and Test Results

JFK Runway 13L-31R

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Final Cross-Section

Expanded Transverse Landing Surface from 150 LF to 200 LF

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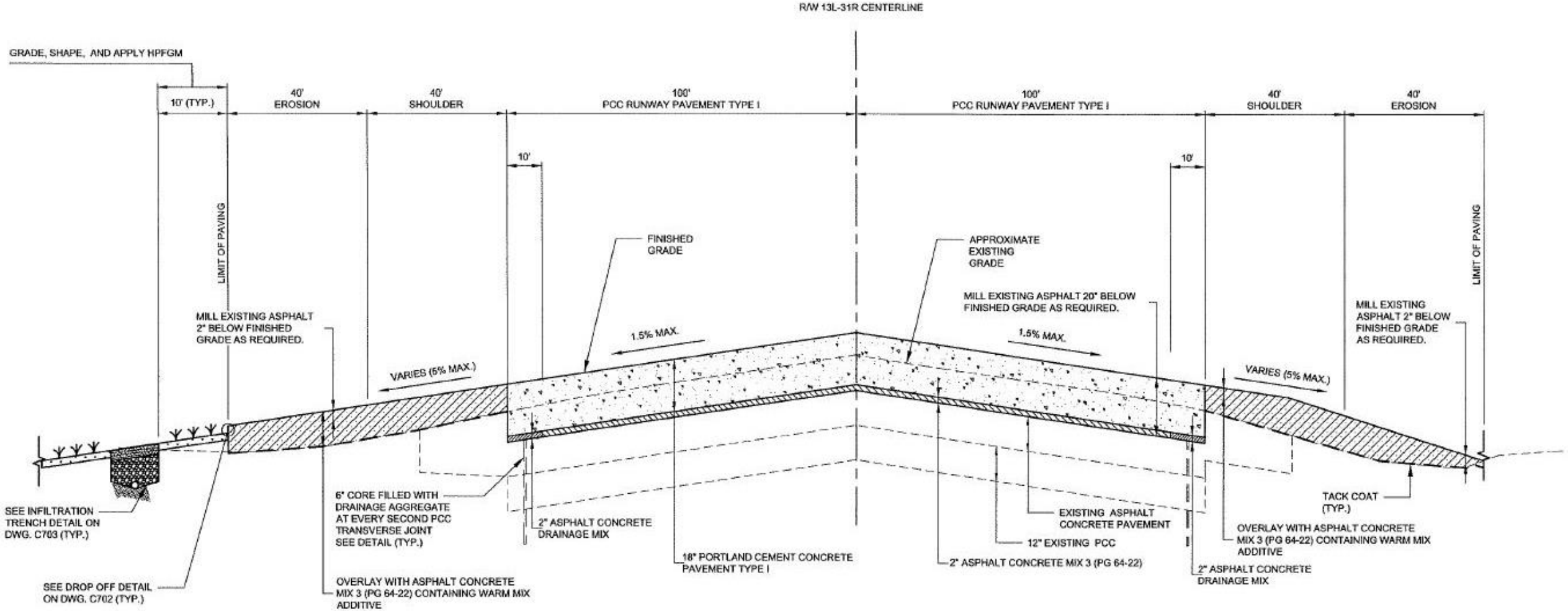
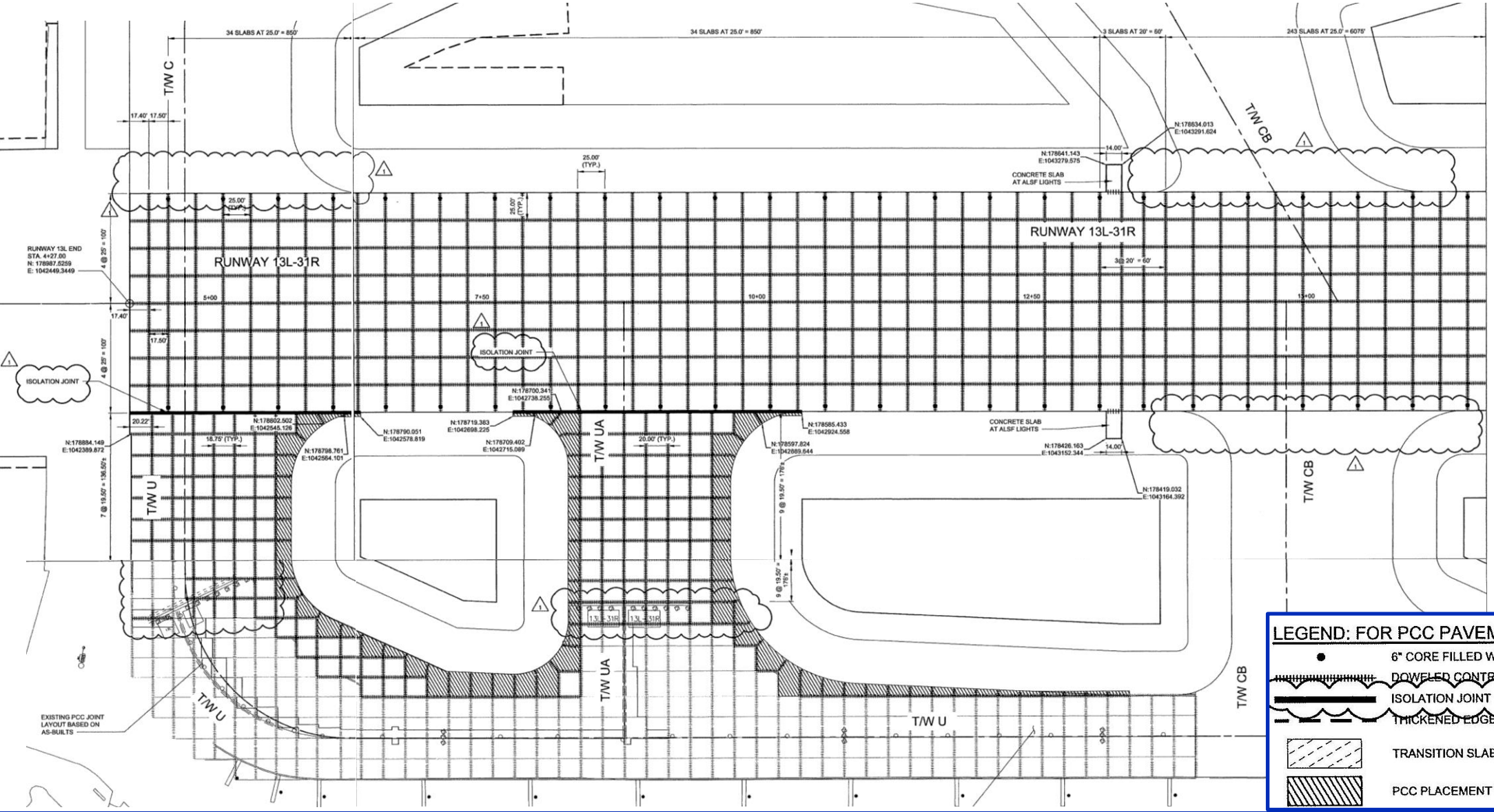


Slab Joint Plan



LEGEND: FOR PCC PAVEMENT DRAWINGS C351-C365

- 6" CORE FILLED WITH DRAINAGE AGGREGATE SEE DETAIL
- DOWELED CONTRACTION JOINT (SAWED OR FORMED)
- ISOLATION JOINT
- THICKENED EDGE
- TRANSITION SLAB WITH DOWELED THICKENED EDGE
- PCC PLACEMENT WITH SLAB REINFORCEMENT

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Concrete Pavements ≥ 10 Inches in Thickness

- ✓ Flexural Strength: 700 psi minimum
- ✓ Maximum cement content: 400 lbs/CY
- ✓ Shrinkage: ≤ 0.03% (ASTM C157 – Modified)
- ✓ 70% Minimum Volume of Aggregates (Combined Sand & Coarse Aggregates; Requires Blending of Coarse Aggregates)
- ✓ Test Section prior to production
- ✓ **NO CRACKS** are acceptable (only 6 of 2848 slabs required removal and replacement, or 0.2%)

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AIR LAND RAIL SEA

JFK-164.020

Placement	Applications					Drawing	Note	Drawing
Cast-In-Place	Full Depth Pavement							
Concrete Supplier	Specfication	Category	PSI	Days	Special	Early PSI	Hours	Additive
	03301 N	I	700	28				
	Supplier's mix Id:							

Product; Source	Constituent	gal; oz	lbs/yd^3	S.G.	Ft^3
LaFargeHolcim I/II	Cement		330	3.15	1.68
No	Fly Ash			1.00	0.00
Essroc I.tech grade 120	Slag		220	2.89	1.22
No	SiFu; Meta.			1.00	0.00
Sahara (Franklin, NJ)	Sand		1285	2.65	7.78
Gibraltar -trap. (Belle Mead, NJ)	Stone 1	#8	530	3.01	2.82
Gibraltar -trap. (Belle Mead, NJ)	Stone 2	#57	725	3.01	3.85
Gibraltar -argil. (Belle Mead, NJ)	Stone 3	#3	880	2.80	5.04
	Water	26.4	220	1.00	3.53
MasterAir AE 90	Air Entrainer	3.3	0.21	1.02	0.00
MasterGlenium 3030	FRWR	27.5	1.72	1.05	0.03
No	none		0.00	1.00	0.00
No	none		0.00	1.00	0.00
No	none		0.00	1.00	0.00
No	none		0.00	1.00	0.00
No	none		0.00	1.00	0.00
	SLUMP; SPREAD:	1.50	4192.3	←Totals→	25.95
	AIR CONTENT:	5.00%	0.00	0.00	1.30
	UNIT WEIGHT:	153.9		YIELD:	27.24

Total Cementitious: 550

% Substitution: 40.0%

Vol. Sand: 28.6%

Vol. Stone: 43.0%

Combined Aggregate Volume: 71.5%

Water/Cement Ratio: 0.40

Incl. admixture water, assumed 85% water by weight.

← Dry admixture only (no water)

100.9% of 27.00 ±2%, 26.46

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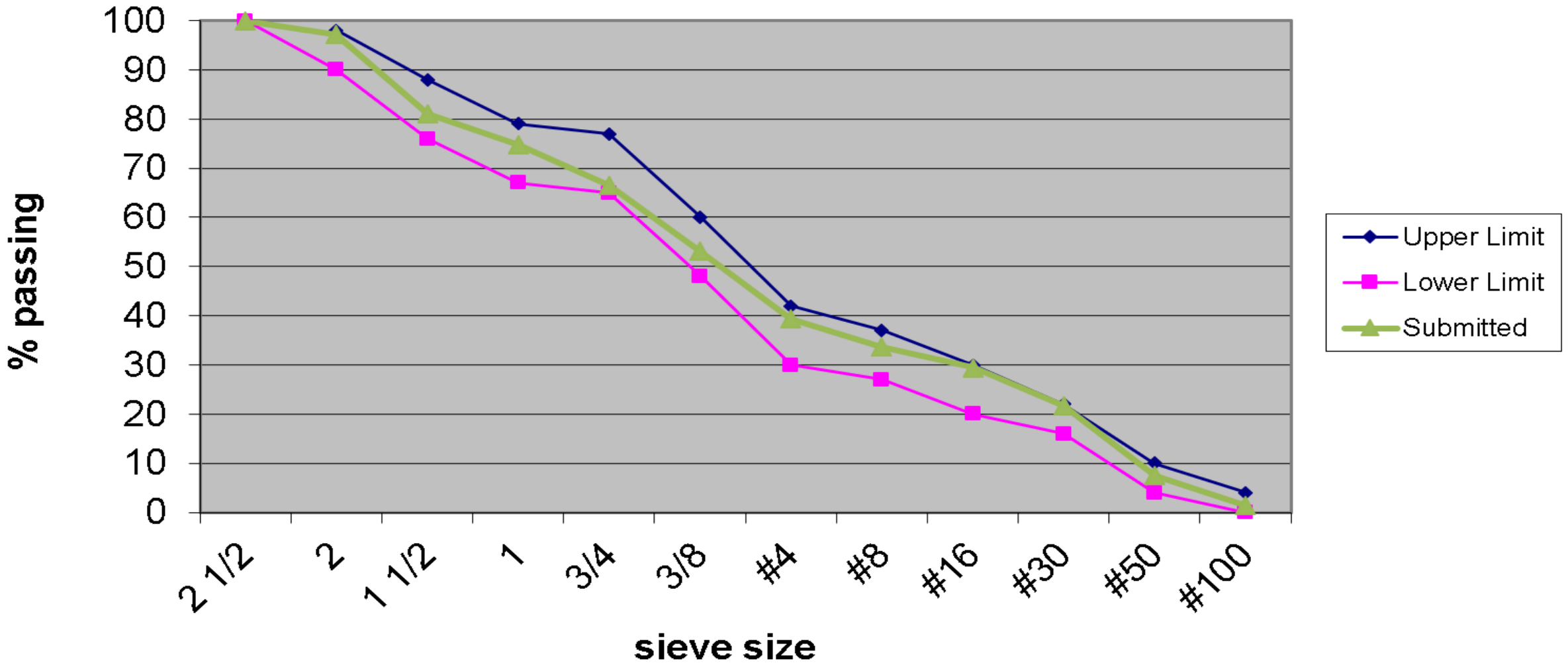
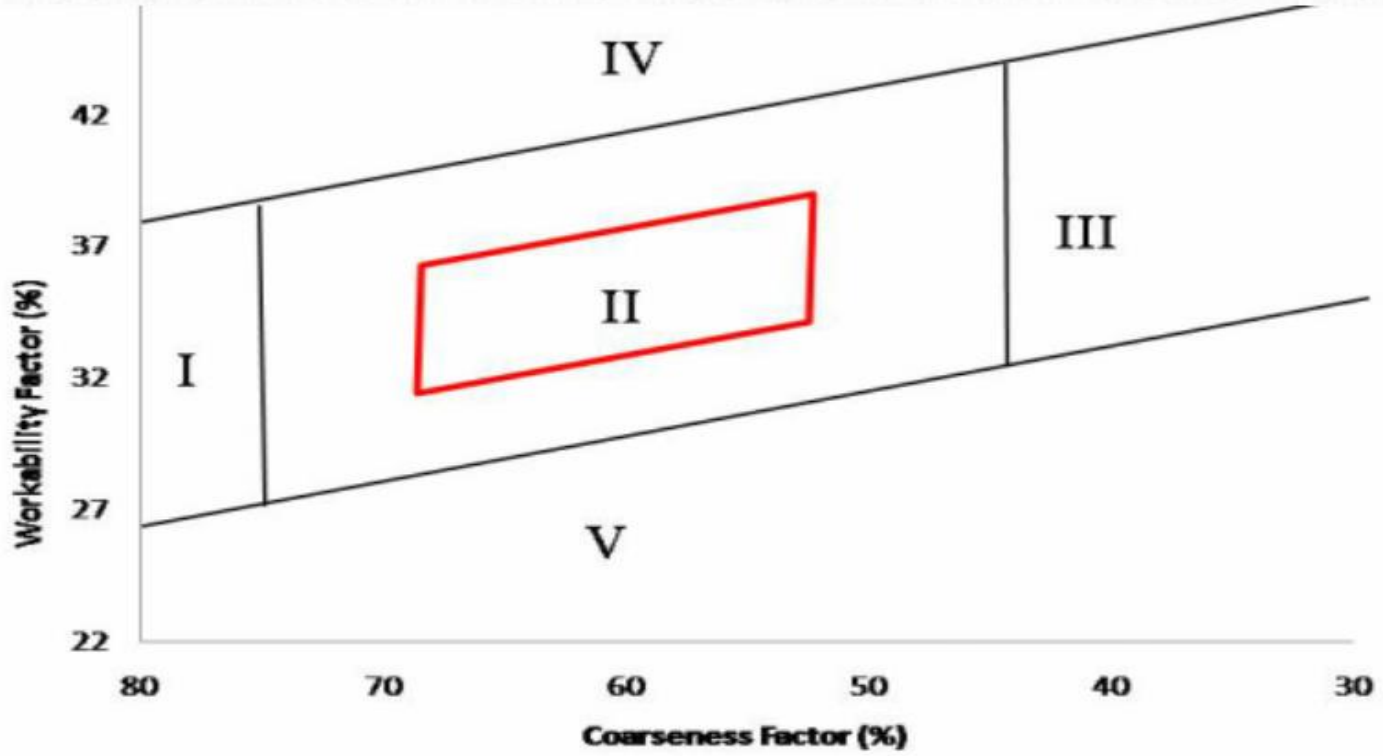
Sieve Size	Sand % passing	Stone #3 % passing	Stone #5 % passing	Stone #57 Mod % passing	Stone #8 % passing	Stone #7 % passing	Combined % passing	SPECIFIED 10" & Above	SPECIFIED Less than 10"
2 1/2	100.0	100.0		100.0	100.0		100.0	100	
2	100.0	89.0		100.0	100.0		97.2	90 - 98	100
1 1/2	100.0	26.0		100.0	100.0		81.0	76 - 88	89 - 98
1	100.0	3.3		98.4	100.0		74.8	67 - 79	74 - 86
3/4	100.0	2.7		60.3	100.0		66.5	65 - 77	64 - 76
3/8	100.0	2.4		3.9	90.5		53.0	48 - 60	48 - 60
#4	94.9	2.4		1.3	17.6		39.3	30 - 42	30 - 42
#8	86.2	2.3		1.2	2.7		33.7	27 - 37	27 - 37
#16	75.3	2.3		1.2	1.7		29.4	20 - 30	20 - 30
#30	55.1	2.2		1.1	1.4		21.7	16 - 22	16 - 22
#50	17.1	2.1		1.1	1.3		7.4	4 - 10	4 - 10
#100	1.2	1.9		1.0	1.0		1.3	0 - 4	0 - 4
#200	1.2	1.4		0.8	0.8				
Lbs. Used	1285	880		725	530				
				2135					
				3420					

FOR 10" & Above


100
90
80
70
60
50
40
30
20
10
0
% passing
2 1/2
2
1 1/2
1
3/4
3/8
#4
#8
#16
#30
#50
#100
sieve size
Upper Limit
Lower Limit
Submitted

Shilstone Chart

- JFK RW 13L-31R Mix Design
- CF = 71
- WF = 33
- Zone II



Coarseness Factor (CF) =(Q/R)*100

Workability Factor (WF) = W + (2.5(C-564)/94)

Q= cumulative % retained on the 3/8 sieve

R= cumulative % retained on the no. 8 sieve

W= % passing the no. 8 sieve

C= cementitious material content in lb/yd^3

Portland Cement Concrete

Category I - 700 psi, Flexural Strength

	Mix Design	Mean (Actual)
f'_{flex} (7-Day)	-	1,021 psi
f'_{flex} (28-Day)	700 psi (LL)	1,282 psi
Coulomb (28-Day)		911.4
Air Content	5.00 %	4.87 %
W/C Ratio	0.40	0.39
Slump	1.50 in	0.94 in
PCF	155.2 pcf	156.3 pcf

Source: PANYNJ MEU, Concrete Field Test Report Data Summary

- Cement: 330 lbs. (LaFarge I/II)
- Slag: 220 lbs.
- Fines: 1,285 lbs.
- Coarse: 2,135 lbs. (#3 + #57 + #8 stone)
- Water: 220 gal.
- Air Entrained Admixture: 3.3 %
- High Range Water Reducer: 27.5 oz.

Performance Statistics

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19/2020

The Port Authority of New York & New Jersey

Engineering Department

Materials Engineering Section

Statistical Report

	Flex 7 Days	Flex 28 Days	Coul 28 Days	Air Content	Mwave Water	Slump	PCF
Mean	1021	1282	911.4	4.87	0.390	0.94	156.30
Standard Deviation	142.4	124.2	132.20	0.593	0.0215	0.539	1.933
Range	845	803	1029.0	4.20	0.120	3.75	14.08
Control Lower Limit = Mean - 2 Standard Deviation	737	1034	647.0	3.68	0.347	-0.14	152.43
Control Upper Limit = Mean + 2 Standard Deviation	1306	1531	1175.8	6.05	0.433	2.02	160.16
Total Number of Tests	430	435	358	435	435	435	435

CONSTRUCTION

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Quality Control
Quality Acceptance

Ensuring Design Performance

- Contractor required to hire QA/QC firm, develop QC Plan, approved by PANYNJ
- Materials (MEU) tests random truck from each lot according to ASTM D3665
- MEU performed water-to-cement ratio test (AASHTO T 318), air test (ASTM C 231), concrete temperature (ASTM C1064), unit weight (ASMT C138), curing of test specimens in the field (ASTM C31), and slump test (ASTM C 143) on-site
- MEU performed modulus of rupture (ASTM C 78), rapid chloride penetration test (ASTM C1202), and bulk resistivity test (ASTM C 1760) in laboratory

CONTRACTOR QC

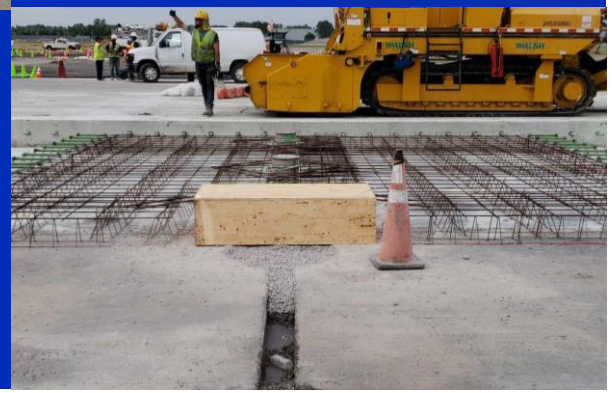
HVEA

PANYNJ QA

RE/
MEU

PANYNJ QA

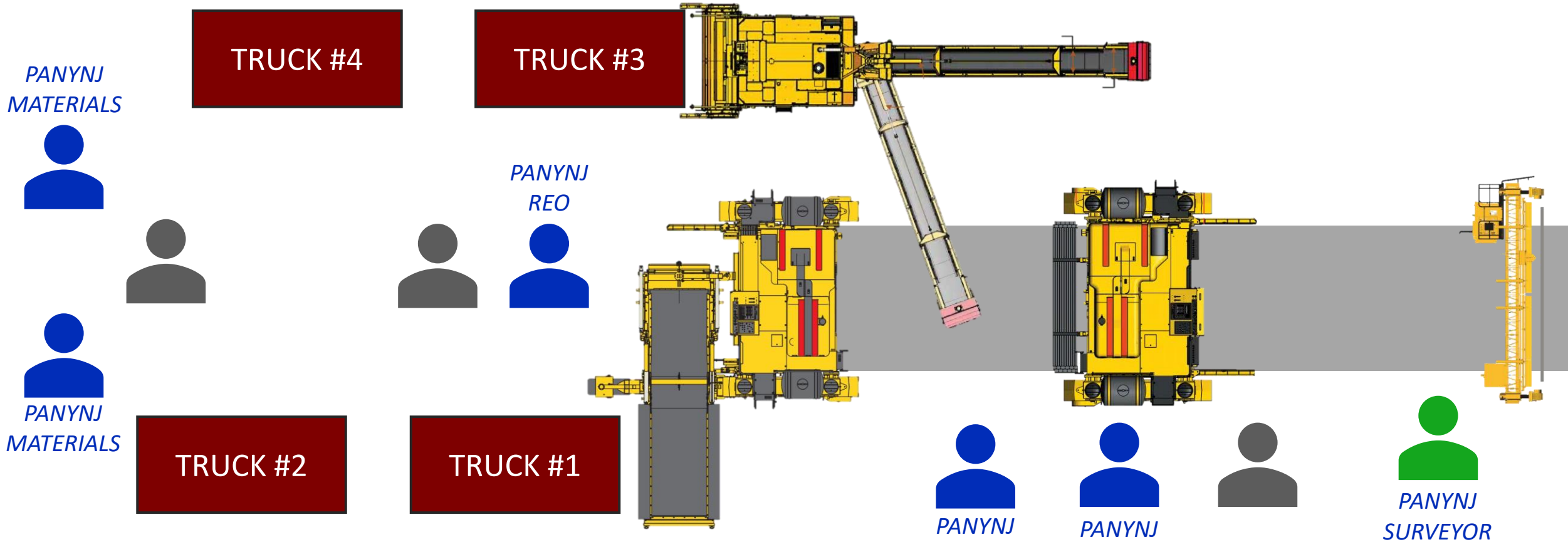
QAD



Placement Process

Typical Layout

DIRECTION OF PAVING PLACEMENT



Slipform Paving Train

GOMACO Paver and Transfer Conveyor Working Concurrently

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Continuous Concrete Feed

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Load Transfer

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End of Train

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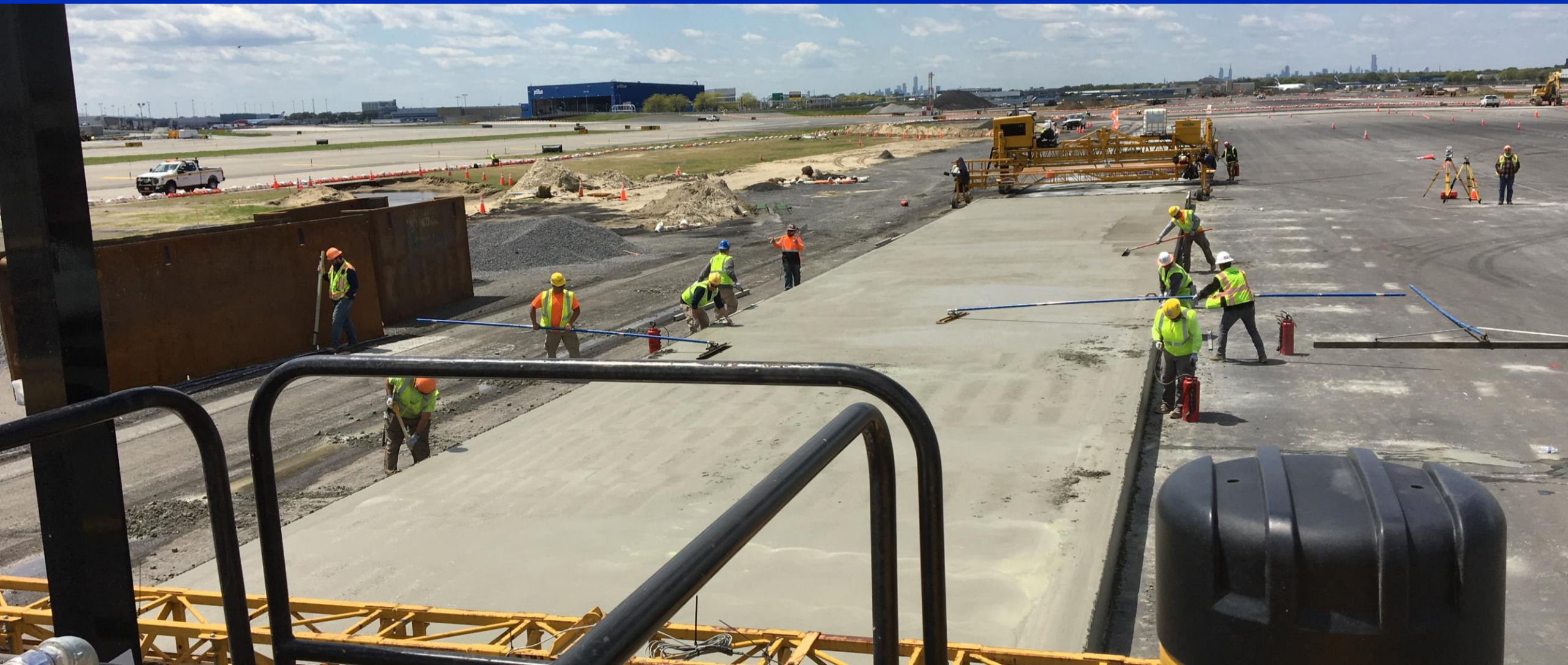

Placement

Walsh-Grace, J.V. Paving Crew Finishing Slab Lane 5

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Final Finish

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T/C-600 Texture/Curing Gantry

Lane 4 - Placement

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Check Grades, Final Finish, Curing

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Aerial

August 10, 2019

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Aerial

Sept 27, 2019

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Ribbon Cutting

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