P-401 – A RESIDENT PROJECT REPRESENTATIVE'S PERSPECTIVE

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"P-401 – A Resident Project Representative's Perspective has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP."

ENGINEERING
RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

Purpose and Learning Objectives

P-401 – A Resident Project Representative's Perspective

This session will review P-401 specification requirements for placement of Hot Mix Asphalt, reviewing the specific specification requirements for the QC/QA Workshop, Equipment, Automatic Grade Control, Laydown Plan, Control Strip, and Material Acceptance.

The participants will learn:

- The required QC/QA Workshop discussion topics
- How to evaluate the Contractor Laydown Plan for approval
- Understand the Control Strip process and how to evaluate the Control Strip for compliance to the specification and approval for the start of production paving
- How to evaluate field placed material for acceptance
- Understand the specification Basis of Payment criteria and understand the application of the specification pay factors

OBJECTIVE

- Discuss the Resident Project Representative's role in the placement of P-401 & P-403 Hot Mix Asphalt Pavement
- Discuss critical P-401 specification requirements for a successful material placement
- Review key decision points relative to the changes, additions, and deletions within the P-401 & P-403 specifications
- Review actual project conditions and outcomes
- Discuss key changes to the P-401 & P-403 Specifications made in Advisory Circular 150/5370-10H

ROLE OF THE RESIDENT PROJECT REPRESENTATIVE (RPR)

- Individual authorized by the Sponsor (Owner) to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed or of the materials furnished or being furnished by the Contractor
  - Liaison between Owner and Contractor
  - Construction progress
  - Determine acceptability of the materials, performance of work, and conformance of the work with the plans and specifications
  - Convey & document non-conformance issues for Sponsor reporting to FAA

- Provide summary of test results and disposition of any problem test results
  - Required under Order 5100.38D for projects $500K and greater

OUTLINE

- Job Mix Formula (JMF) / Quality Control / Quality Assurance
- QC/QA Workshop
- Equipment
  - Material Transfer Vehicle (MTV)
  - Pavers
  - Hauling Equipment
  - Rollers / Density Device
- Asphalt Paver Grade Control Systems
- Preparation of Underlying Surfaces
- Laydown Plan
- Compaction
- Control Strip
- Material Acceptance
- Enforcement of Contractor Quality Control Plan
  - Smoothness Testing
  - Control Charts
- Basis of Payment
  - PWL

JOB MIX FORMULA (JMF)

- Marshall Method / Gyratory Method
  - Must Specify only one Method
- PG Binder Grade
  - Polymer Modified
  - Elastic Recovery Requirement
  - Ensure binder meets ASTM D6373
    - Some states follow AASHTO M332
- Aggregate Gradation
  - Gradation 1,2,or 3
  - Current Aggregate Test Results
- Asphalt Pavement Analyzer (APA) Results
- Additional testing to meet local conditions
  - FAA concurrence required
- RAP

QUALITY CONTROL (QC) / QUALITY ASSURANCE (QA) WORKSHOP

- All Paving projects over $500,000.00 are required to have Contractor Quality Control Program (CQCP)
- QA/QC Workshop Topics:
  - Control Strip
  - Equipment
  - Pavers
  - Material Transfer Vehicle (MTV)
  - Hauling Equipment
  - Rollers
  - Asphalt Paver Grade Control Systems
  - Survey Requirements
  - Laydown Plan
  - Compaction
  - Material Acceptance
  - Enforcement of Contractor Quality Control Plan

EQUIPMENT

- Plant
  - Drum / Batch
  - Capacity / Storage Hot Mix
- Contractor QC Laboratory Testing Facilities
  - Requirements are now found in Item C-100
- Hauling Equipment
  - Tarps / Covers
  - Soaping truck beds

EQUIPMENT

- Material Transfer Vehicle (MTV)
  - Required for Runway / Taxiway pavements designed for 100,000 lbs.
  - Recommended for all pavements where the weight of the MTV will not damage the pavement structure

EQUIPMENT

- Material Transfer Vehicle (MTV)

EQUIPMENT

- Pavers
  - Capable of placing HMA to specified thickness, smoothness, and grade
    - Width
  - Shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation

EQUIPMENT - Pavers

EQUIPMENT - Pavers

EQUIPMENT

- Hauling Equipment
  - Trucks – Dump, Belly Dump, Flow Boy
  - Tarping / Covering
  - Soaping truck beds
  - Use of diesel fuel

EQUIPMENT – Hauling Equipment

EQUIPMENT

- Rollers
  - Understand drum frequency and amplitude
  - Speed
  - Sufficient size and weight
  - Adequate number of rollers

EQUIPMENT

- Density Device
  - Compaction (density) monitoring
  - Assist with determination of optimum rolling pattern
  - Monitor rolling operations during production paving

EQUIPMENT - Rollers

Asphalt Paver Grade Control Systems

- AC 150/5370-10H has eliminated specific control system attachments
- Typical Grade Control systems
  - Robotic control
  - GPS based systems
  - Laser
  - String-line
  - Short Ski-Type Device
  - Ski-Type device not less than 30 feet in length
  - Other
- Considerations
  - Survey requirements
  - Time associated with chosen method
  - Location

Asphalt Paver Grade Control – Robotic

Asphalt Paver Grade Control – Robotic

Asphalt Paver Grade Control – Robotic

Asphalt Paver Grade Control – String-line

Asphalt Paver Grade Control – Short Ski Type Device

PREPARATION OF UNDERLYING SURFACE

- AC 150/5370-10H Update to P-401 Specification
  - Requires Tack Coat in accordance with P-603 required
  - Engineer has the option to specify a prime coat (P-602)

LAYDOWN PLAN

- Purpose of the Laydown Plan is to minimize the number of cold joints in the pavement
- Laydown Plan to include:
  - Sequence of paving laydown (lanes)
  - Paving lane widths (longitudinal joint locations)
  - Estimated time of completion for each portion of the work
    - Placement
    - Rolling / Compaction
    - Cooling
    - Haul time
  - Location of transverse joints and temporary ramps
- Laydown Plan and any modifications shall be approved by the RPR

LAYDOWN PLAN

- P-401 Specification calls for the Engineer to add detail to this section to address paving lane widths.

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The Engineer should specify the widest paving lane practicable in an effort to hold the number of longitudinal joints to a minimum. Additional job specific construction limitations may be added as necessary covering such items as echelon paving, hot joint construction, etc.

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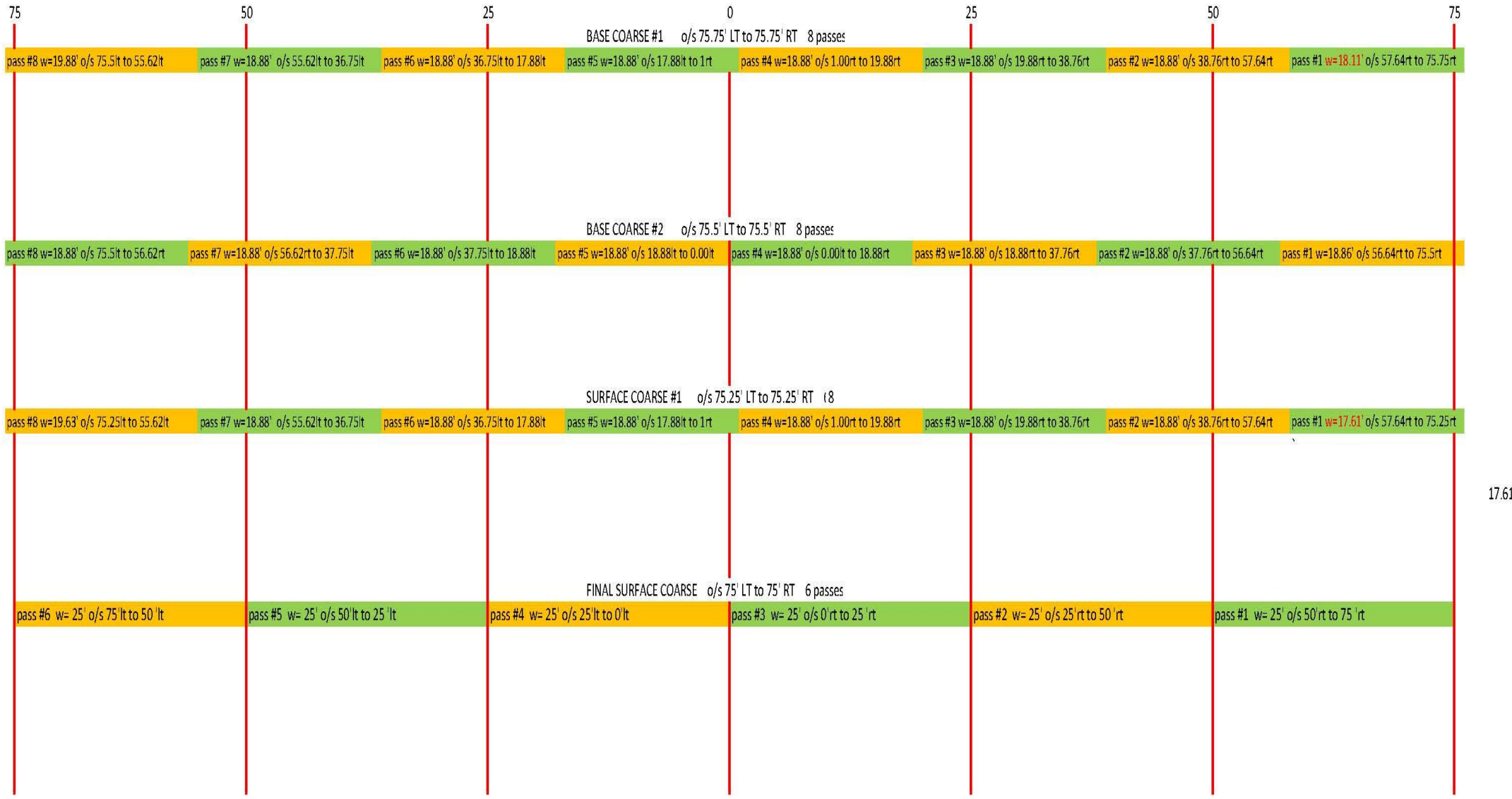
  - 25 foot lane widths with tandem paving
  - Short pulls resulting in all hot joints
- Joint Layout
  - Final surface course longitudinal joint shall fall on the runway or taxiway centerline
  - Underlying longitudinal joints shall be offset a minimum of 1 foot
  - Transverse joints to be staggered a minimum of 10 feet

LAYDOWN PLAN

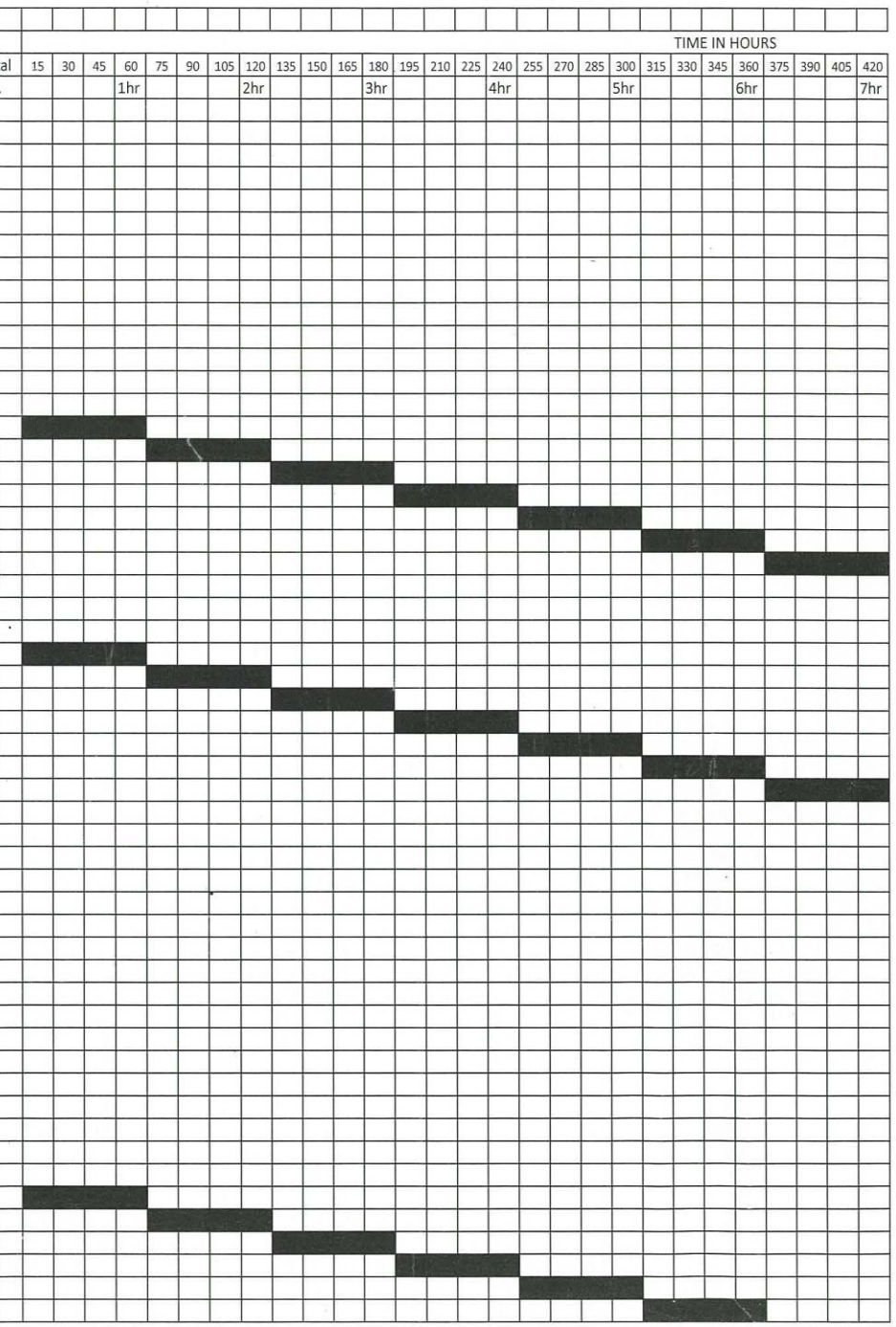
- Contractor shall survey each lift of asphalt surface course and certify to the RPR that each lift meets the grade tolerances
- Material Placement
  - Shall begin along the centerline of a crowned section OR on the high side of areas with a one way slope unless shown otherwise on the laydown plan accepted by the RPR

LAYDOWN PLAN



LAYDOWN PLAN

DAYS		station	PAVER WIDTH and o/s from CL	L	W	D	TONS	pave min.	bckup min.	total min.
	P 401 BASE COURSE									
	PAVER SPEED = 20FT /MIN =9.2TON /MIN									
	Round trip to plant = 50 min to 1hr +-									
	Avg tons hauled =22 ton									
	# of trucks = 380ton / 22ton=17.3trucks=18ea									
	Plant needs to load 400 ton/hr									
Day 1	Test strip P401 base on P-154 subbase									
		0+60 to 3+60	pass #1 w=18.11' o/s 57.64rt to 75.75rt	300	18.11	0.33	134			
		0+60 to 3+60	pass #2 w=18.88' o/s 38.76rt to 57.64rt	300	18.88	0.33	140			
	DAILY TOTAL						274			
Day 2	P401 Base course on P-154 subbase	16+00 to 8+50	pass #1 w=18.11' o/s 57.64rt to 75.75rt	750	18.11	0.33	335	40	20	60
		16+00 to 8+50	pass #2 w=18.88' o/s 38.76rt to 57.64rt	750	18.88	0.33	350	40	20	120
		16+00 to 8+50	pass #3 w=18.88' o/s 19.88rt to 38.76rt	750	18.88	0.33	350	40	20	180
		16+00 to 8+50	pass #4 w=18.88' o/s 1.00rt to 19.88rt	750	18.88	0.33	350	40	20	240
		16+00 to 8+50	pass #5 w=18.88' o/s 17.88lt to 1rt	750	18.88	0.33	350	40	20	300
		16+00 to 8+50	pass #6 w=18.88' o/s 36.75lt to 17.88lt	750	18.88	0.33	350	40	20	360
		16+00 to 8+50	pass #7 w=18.88' o/s 55.62lt to 36.75lt	750	18.88	0.33	350	40	20	420
		16+00 to 8+50	pass #8 w= 20.13' o/s 75.75lt to 55.62lt	750	20.13	0.33	373	40	20	480
	DAILY TOTAL						2806			
Day 3	P401 Base course on P-154 subbase	8+50 to 3+60	pass #1 w=18.11' o/s 57.64rt to 75.75rt	490	18.11	0.33	219	40	20	60
	Use mill to cut 150ft transvers joint to	8+50 to 3+60	pass #2 w=18.88' o/s 38.76rt to 57.64rt	490	18.88	0.33	228	40	20	120
	minimize disturbance to subbase	0+60 to 8+50	pass #3 w=18.88' o/s 19.88rt to 38.76rt	790	18.88	0.33	368	40	20	180
		0+60 to 8+50	pass #4 w=18.88' o/s 1.00rt to 19.88rt	790	18.88	0.33	368	40	20	240
		0+60 to 8+50	pass #5 w=18.88' o/s 17.88lt to 1rt	790	18.88	0.33	368	40	20	300
		0+60 to 8+50	pass #6 w=18.88' o/s 36.75lt to 17.88lt	790	18.88	0.33	368	40	20	360
		0+60 to 8+50	pass #7 w=18.88' o/s 55.62lt to 36.75lt	790	18.88	0.33	368	40	20	420
		0+60 to 8+50	pass #8 w= 20.13' o/s 75.75lt to 55.62lt	790	20.13	0.33	393	40	20	480
	DAILY TOTAL						2682			
Day 4	Test strip P401 base on P-401 base									
	1st Base course ends at 16+00 can we	18+25 to 13+00	pass #1 w=18.11' o/s 57.64rt to 75.75rt	525	18.11	0.33	235			
	extend test strip limits to 18+25 to eliminate	18+25 to 13+00	pass #2 w=18.88' o/s 38.76rt to 57.64rt	525	18.88	0.33	245			
	a colt joint?									
	DAILY TOTAL						480			
Day 4	P401 Base course on P-154 subbase									
	Taxiway R						200			
Day 5	P401 Base course on P-154 subbase									
	Taxiway D and Taxiway P						500			
Day 6	P401 base on P-401 base									
		13+00 to 8+00	pass #1 w=18.86' o/s 56.64rt to 75.5rt	500	18.86	0.33	233	40	20	60
		13+00 to 8+00	pass #2 w=18.88' o/s 37.76rt to 56.64rt	500	18.88	0.33	233	40	20	120
		16+00 to 8+00	pass #3 w=18.88' o/s 18.88rt to 37.76rt	800	18.88	0.33	373	40	20	180
		16+00 to 8+00	pass #4 w=18.88' o/s 0.00lt to 18.88rt	800	18.88	0.33	373	40	20	240
		16+00 to 8+00	pass #5 w=18.88' o/s 18.88lt to 0.00lt	800	18.88	0.33	373	40	20	300
		16+00 to 8+00	pass #6 w=18.88' o/s 37.75lt to 18.88lt	800	18.88	0.33	373	40	20	360



LAYDOWN PLAN

LAYDOWN PLAN

COMPACTION

- Contractor's QC Plan
  - Density monitoring technician
- Sufficient number of rollers
- Overall Paving train speed

JOINTS

- Cut back of all cold joints is required
  - Longitudinal cold joints left exposed for more than 4 hours; surface temperature cooled to less than 175 degrees; or are irregular, damaged, uncompacted, or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches
  - Transverse joints made by means of a bulkhead or tapering the course.
    - Tapered joints shall be saw cut back to its full depth and width

CONTROL STRIP

- Purpose:
  - Demonstrate the Contractor's ability to successfully implement his Paving, Quality Control, and Laydown plan
  - Provide the Contractor and RPR an opportunity to evaluate the quality of the mixture in place
  - Demonstrate equipment and grade control performance
  - Demonstrate proper preparation of the underlying grade and pavement structure

- AC 150/5370-10H Requirement Updates

CONTROL STRIP

- Test Section Requirements:
  - Minimum of 250 tons or ½ sublot, whichever is greater
  - Placed in two lanes of the same width and depth to be used in production
  - Must have a longitudinal cold joint
    - At least 4 hours old OR when the mat has cooled to less than 160^{o} F
    - Must be cut back using same procedure to be used for production paving
  - All equipment used in construction of the control strip shall be the same type, configuration, and weight to be used on the project

TEST SECTION – 5370-10G

- Test Section Requirements:
  - Minimum of 300 feet long, 20 to 30 feet wide, placed in two lanes
  - Must have a longitudinal cold joint
    - At least 4 hours old OR has cooled to less than 160^{o} F
    - Must be cut back using same procedure to be used for production paving
  - Can increase size for larger projects
  - Considered a single lot, with three (3) equal sublots

CONTROL STRIP

- Control Strip Acceptance:
  - Gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a of the P-401 specification
  - Mat & joint density and air voids meet the requirements specified in paragraphs 401.6.2 of the P-401 specification
    - Infer treat control strip as a lot.
    - N=?
- AND
- Smoothness and grade meet the project specification requirements falling under the implementation of the Contractor Quality Control Program

TEST SECTION – 5370-10G

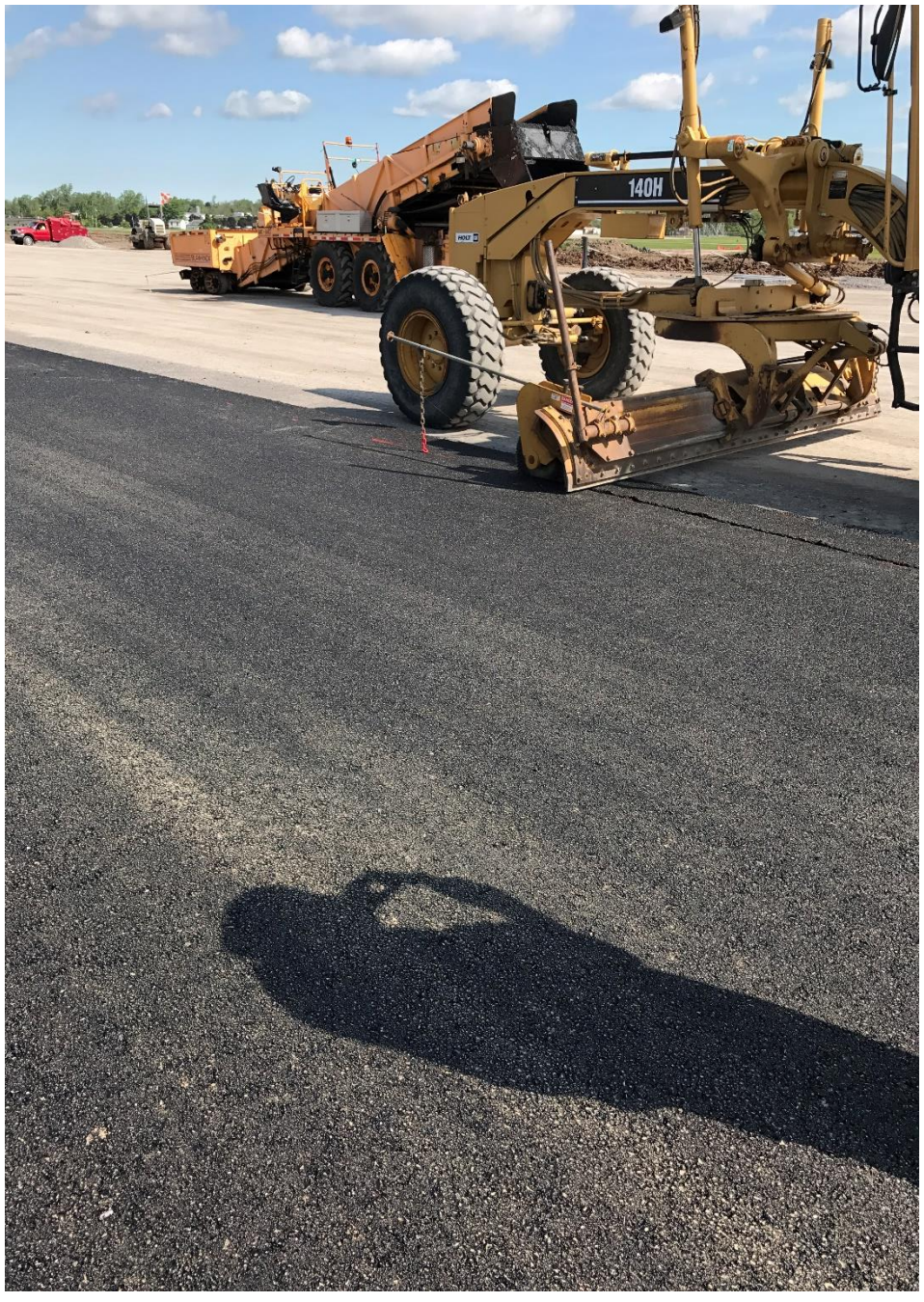
- Test Section Acceptance:
  - Must meet the acceptance criteria in paragraphs 401-5.1 and 5.2 of the P-401 specification
  - Considered acceptable if mat & joint density, air voids, stability, and flow (Marshall only) are 90% within limits or better, gradation, asphalt content, and VMA are within the action limits provided in the specification
  - AND
  - Thickness, smoothness, and grade meet the project specification requirements

CONTROL STRIP

- Unacceptable Control Strips:
  - Shall be removed by the Contractor
  - Contractor shall make necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures
- Payment made only for acceptable control strip
- Contractor Quality Control Program (CQCP) must be APPROVED prior to placing the initial Control Strip

CONTROL STRIP

CONTROL STRIP



CONTROL STRIP

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MATERIAL ACCEPTANCE

- Acceptance Sampling and Testing
- Plant Produced and In-Place HMA –
  - A Standard Lot is one day's production divided into approximately equal sublots of between 400 and 600 tons.
  - When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.
  - For large projects with high production rates, the Engineer may adjust the lot size to be ½ days production
- Quality Assurance testing – plant produced material
  - Air Voids
- Quality Assurance testing – In-place HMA
  - Mat & Joint Density, Bond, Thickness,
- Quality Assurance testing laboratory to be accredited in accordance with ASTM D3666

MATERIAL ACCEPTANCE

- AC 150/5370-10H modifications
  - The revised definition of Lots and sublots has provided clarity to the specification.
  - Plant produced material
  - Field placed material
- Critical for RPR and Contractor to establish the days production Standard Lot and sublot tonnage size
- Operational conditions cause lot or sublot to be terminated prior to specified test or when only one or two sublots are produced in a days production
  - Rain, plant breakdown, equipment breakdown, etc.
  - Stub Taxiways or pavement transitions
- RPR and Contractor must clearly establish which production lot to include in – previous or next day.
- RPR needs to be aware of the number of sublots, n=5, n=6, etc.

MATERIAL ACCEPTANCE – 5370-10G

- Acceptance Sampling and Testing
- Plant Produced and In-Place HMA - Standard Lot is one days production or 2000 tons. Between 2000 and 4000 tons, lot size is half days production, over 4000 tons, lot size is equal sized fraction of the day's production, not to exceed 2000 tons

- Quality Assurance testing – plant produced material
  - Air Voids, Stability, and Flow

- Quality Assurance testing – In-place HMA
  - Mat & Joint Density

MATERIAL ACCEPTANCE – 5370-10G

- Partial Lots
  - Plant produced material
  - Field placed material

*"**Partial lots.** When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.*

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is, n = 5 or n = 6, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is, n = 3"

MATERIAL ACCEPTANCE – 5370-10G

Partial Lots

- Operational conditions cause lot to be terminated prior to specified test
  - Rain, plant breakdown, equipment breakdown, etc.
- Agreed to minor tonnage placements
  - Stub Taxiways, Pavement transitions
- When production is halted, sample last batch of produced HMA.
- Minor placements, random sample out of agreed to tonnage
- When one or two sublots are produced they will be incorporated into the next lot, n=5 or n=6.
- If three (3) sublots are produced, the lot is closed, n=3

MATERIAL ACCEPTANCE CRITERIA

- Sampling
- Bond
- Thickness
- Air Voids
- Mat Density
- Joint Density
- Grade
- Profilograph roughness for QA acceptance
- Smoothness testing for Quality Control
- Film Thickness (other testing)
- Outliers

MATERIAL ACCEPTANCE CRITERIA

- Sampling
  - Air Voids
    - Sample from plant produced material
    - Material from each sublot shall be sampled
    - Samples taken from material deposited into trucks at the plant or job site
    - Samples may be placed in covered metal tin and placed in an oven to maintain compaction temperature
      - Engineer to specify appropriate duration based on aggregates
  - In-place Mat & Joint Density
    - Pavement cores shall be a minimum of 5 inches in diameter
    - Contractor / RPR shall cut the cores
      - Engineer to specify responsibility
    - Contractor is responsible cleaning and filling core holes

SAMPLING

MATERIAL ACCEPTANCE CRITERIA

- Thickness and Bond
  - Based on thickness of cores extracted for mat / joint testing
  - Maximum of ¼ inch less deviation from specified thickness

MATERIAL ACCEPTANCE CRITERIA

- Plant Produced Material (Quality Assurance Testing)
  - Air Voids
    - Air voids shall be determined for each sublot in accordance with ASTM D3203 for a set of specimens prepared with ASTM D6926 or D6925
    - Engineer to select the appropriate Marshal or Gyratory method
  - Mat & Joint Density
    - One core per sublot
    - Joint core centered over longitudinal joint
    - Bulk specific gravity of each cored sample determined in accordance with ASTM D2726
    - *Percent Compaction (Density) of each sample determined by dividing the bulk specific gravity of each sublot sample by the TMD for that sublot*
    - *AC 150/5370-10H SIGNIFICANT CHANGE FROM 5370-10G*
      - *Percent Compaction (Density) of each sample determined by dividing the bulk specific gravity of each sublot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot*

MATERIAL ACCEPTANCE CRITERIA

- Plant Produced Material (Quality Assurance Testing)
  - Air Voids, acceptable if PWL meets or exceeds 90%
  - Mat Density – Acceptable if PWL meets or exceeds 90%
  - Joint Density – Acceptable if PWL meets or exceeds 90%
    - If Joint Density PWL is less than 90% - Contractor shall evaluate the reason and act accordingly
    - If Joint Density PWL is below 80% - Contractor must stop production paving and take corrective action
  - If Joint PWL less than 71% - lot pay factor reduced by 5%

MATERIAL ACCEPTANCE CRITERIA

- Grade
  - Grade shall be evaluated for each lot and corresponding sublot
  - Verify that elevations and cross-sections shown on the plans do not deviate by more than ½ inch vertically (or 0.1 foot laterally)
  - Engineer shall specify the cross-section spacing and grade points as well selection of lateral deviation criteria
  - Performed by a licensed surveyor, stamped & signed
- Payment for sublots that do not meet grade for over 25% of the sublot shall not be more than 95%

MATERIAL ACCEPTANCE CRITERIA

- Grade
  - AC 150/5370-10H Key Modifications
  - Evaluate pavement based on the days production lot.
  - Engineer no longer specifies a separate lot size for grade evaluation
  - Eliminated the requirements for the Contractor to perform corrective action if more than 15% of all measurements in a lot are out of tolerance or having one shot within the lot deviating ¾ inch or more from the design grade

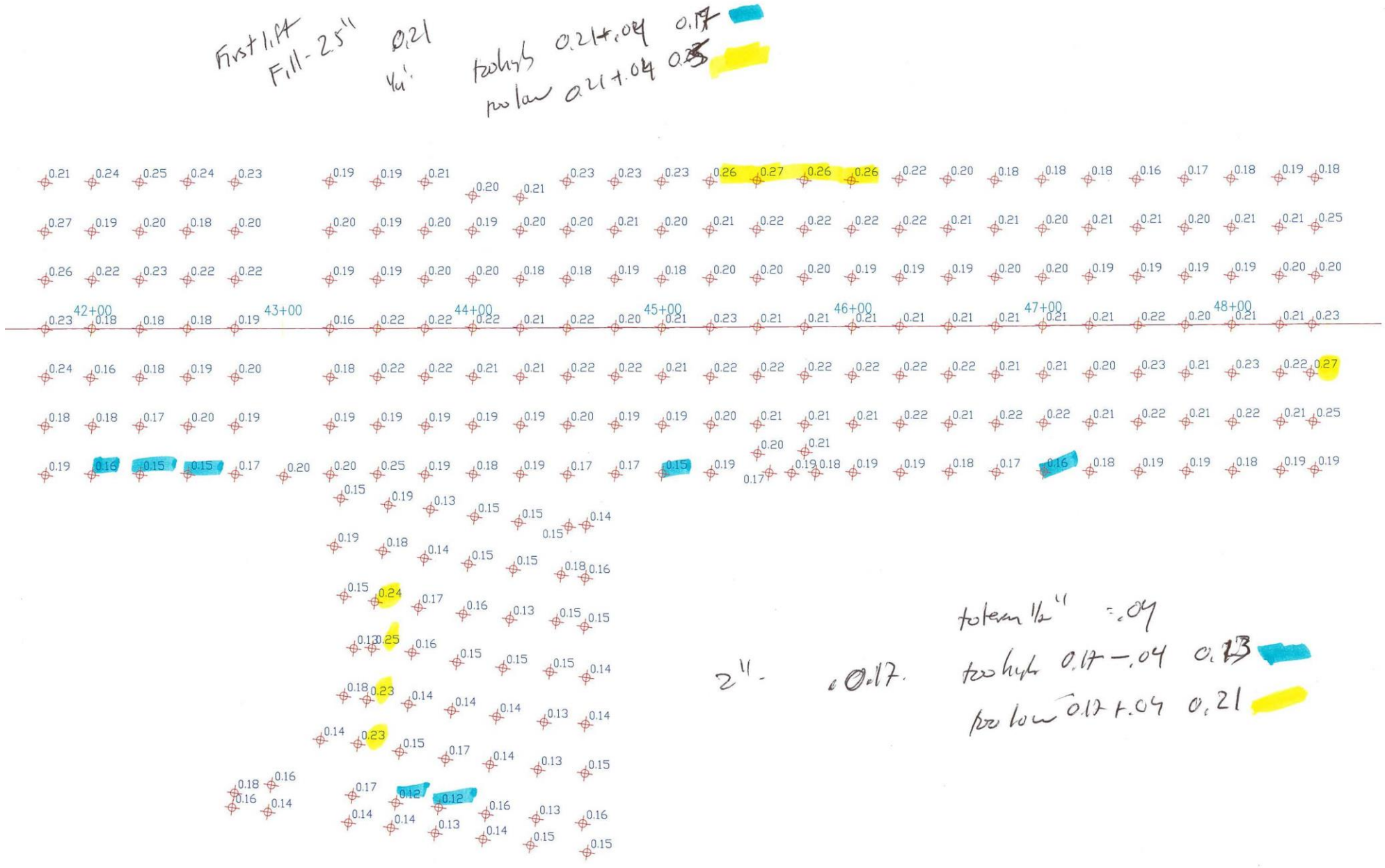
MATERIAL ACCEPTANCE CRITERIA – 5370-10G

- Grade
  - Engineer shall specify appropriate lot sizes expected during production of paving.
    - 2,000 tons @ 2 inches covers approximately 1,000 feet of Runway, 150 feet wide
    - Lots sizes should correlate to expected production paving rates

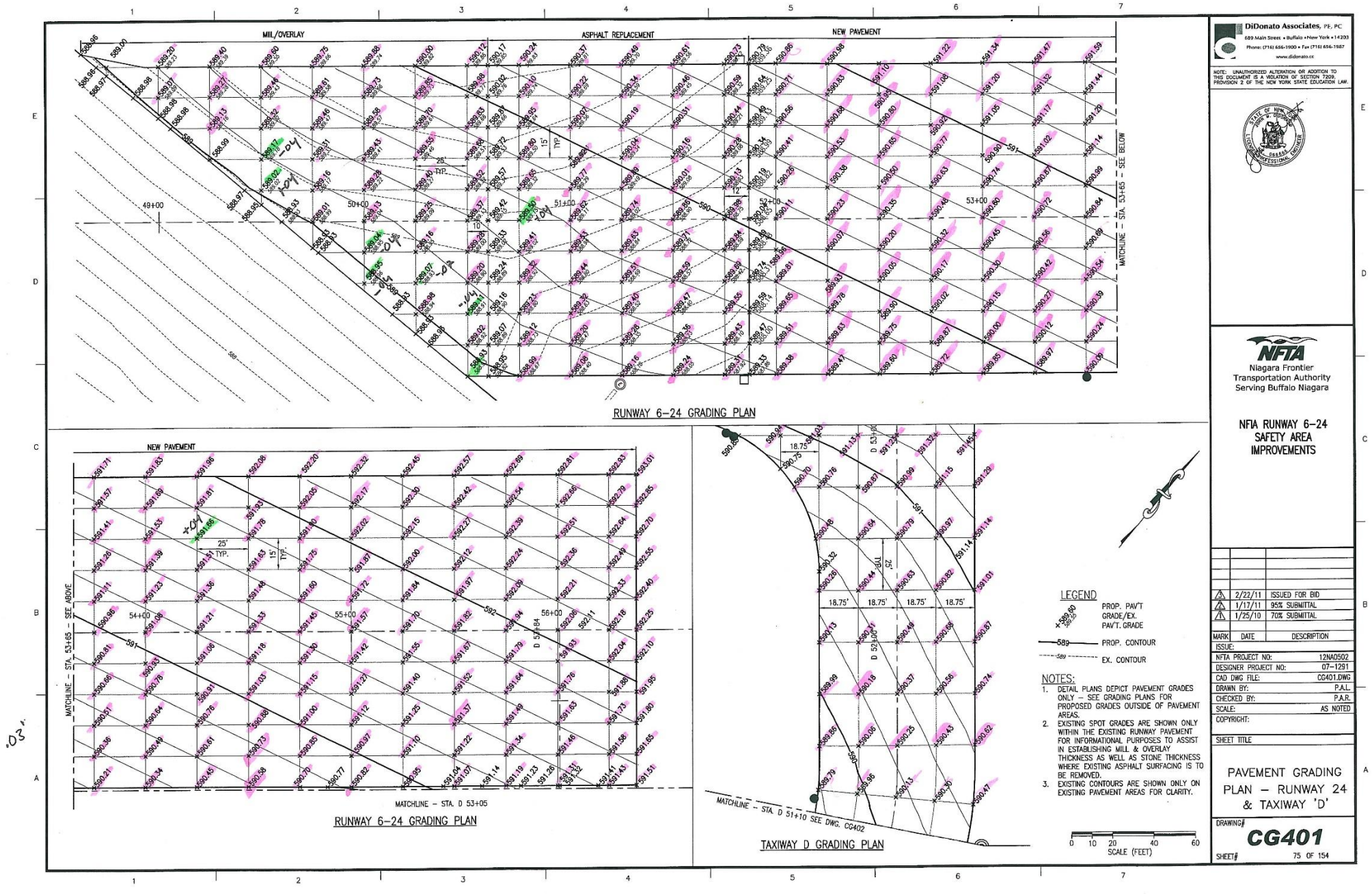
- Critical for the Contractor and Engineer to agree on lot size and number of grade locations prior to the start of the days production
  - Consider skewed intersections / unique geometry

MATERIAL ACCEPTANCE CRITERIA

- Grade



MATERIAL ACCEPTANCE CRITERIA - Grade



MATERIAL ACCEPTANCE CRITERIA

- Profilograph roughness for QA Acceptance
  - Engineer shall include and edit in the specification when appropriate

- Profilograph roughness and acceptance paragraphs ONLY apply when:
  - Project is new or reconstructed runway / taxiway greater than 500 feet in length
  - Not applicable to aprons
  - Should be used with caution on projects to rehabilitate runways / taxiways unless the project includes provisions to correct existing deficiencies
  - Any changes to acceptance limits require a Modification to Standards

- Engineer must select who will provide equipment (RPR or Contractor) and the timeframe for receiving test data.
- Airport should maintain a copy of the data and reports for inclusion in the Airport's Pavement Management Plan

MATERIAL ACCEPTANCE CRITERIA

- AC 150/5370-10H has placed the smoothness testing responsibility on the Contractor as part of the Contractor Quality Control Plan

- Smoothness testing for Quality Control
  - Contractor shall perform smoothness testing daily
  - If smoothness criteria are not met, Contractor shall make necessary changes and corrections prior to construction continuing

MATERIAL ACCEPTANCE CRITERIA

- Smoothness testing for Quality Control
  - Evaluate with 12-foot straightedge, rolling inclinometer meeting the requirements of ASTM E2133, or rolling external device that can simulate a 12-foot straightedge approved by the RPR
  - ¼-inch deviation tolerance
  - Smoothness readings shall not be made across grade changes or cross slope transitions
  - Transitions between new and existing pavements shall be evaluated separately for conformance with the plans
    - Engineer to provide detail including smoothness and grade limitations

MATERIAL ACCEPTANCE CRITERIA

- Smoothness testing for Quality Control
  - Transverse measurements shall be taken for each day's production placed
    - Transverse measurements shall be taken every 50' or more often as determined by the RPR, perpendicular to centerline
    - Joint between lanes shall be tested separately
  - Longitudinal measurements shall be taken for each day's production placed
    - Longitudinal tests shall be taken parallel to centerline of paving
    - Tests taken along centerline for paving lanes less than 20 feet
    - Test taken at third points for paving lanes greater than 20 feet
- Deviations on the final surface course that will trap water greater that than ¼ inch shall be corrected by grinding or removal and replacement
  - Control charts shall be kept indicating day's placement and corrective grinding work required
  - Production shall stop until corrective measures are implemented if the more than 10% of the day's production requires corrective grinding

MATERIAL ACCEPTANCE CRITERIA

- Smoothness testing

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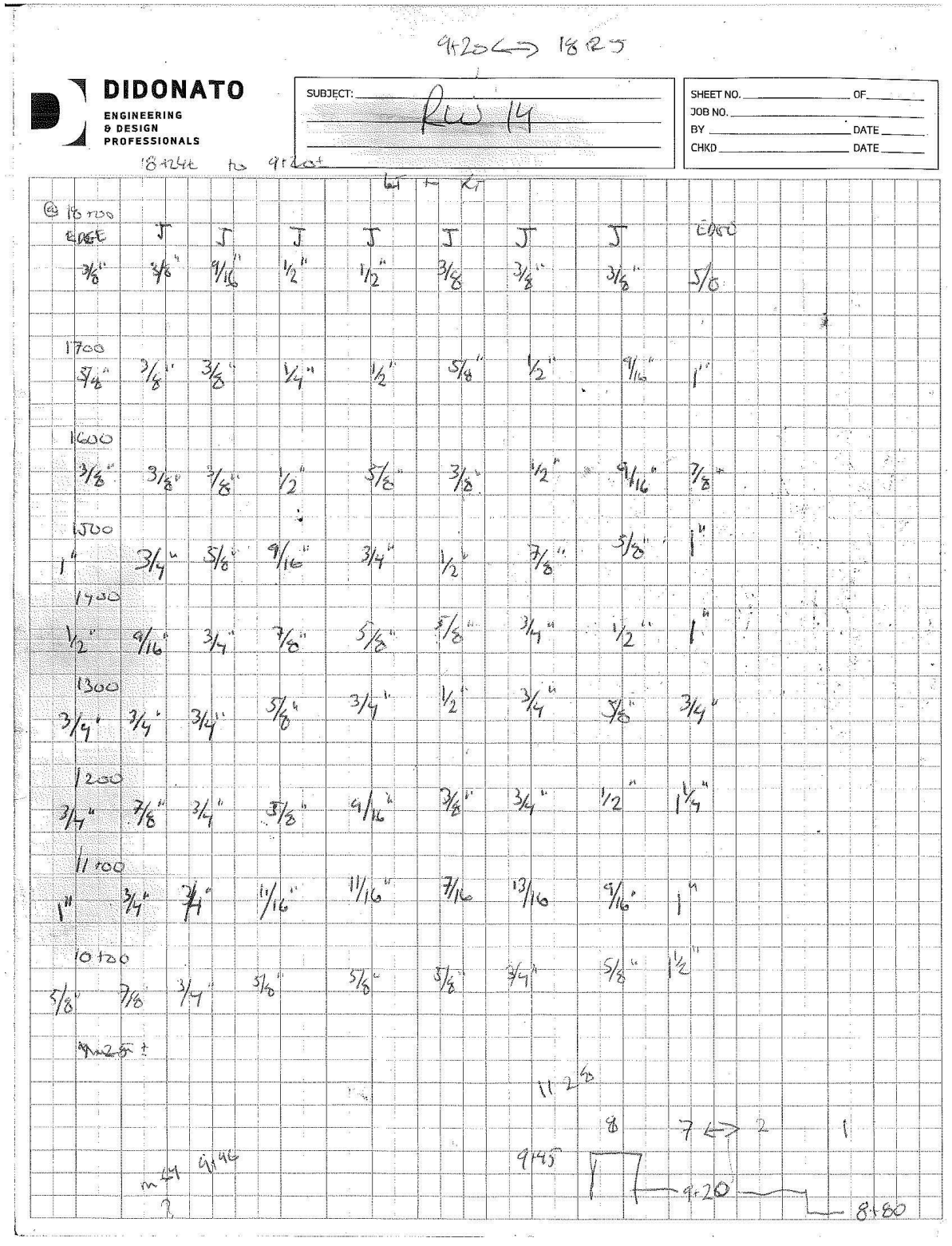


MATERIAL ACCEPTANCE CRITERIA

- Other “acceptance” criteria
  - Other testing
  - Film Thickness
    - Addresses a specific issue with local aggregates

MATERIAL ACCEPTANCE CRITERIA

- Percentage of material within limits (PWL)

Table 5. Acceptance Limits for Air Voids and Density

Test Property	Pavements Specification Tolerance Limits	
	L	U
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	-
Base Course Mat Density (%)	92.0	-
Joint density (%)	90.5	--

- Item C-110 Method of Estimating Percentage of Material Within Specification Limits (PWL) needs to be included

MATERIAL ACCEPTANCE CRITERIA

- Outliers
- Resampling for Mat Density only,
  - Contractor must request in writing
  - Redefined PWL to include initial tests

CONTRACTOR QUALITY CONTROL PLAN ENFORCEMENT

- Contractor Testing Laboratory
  - Compaction monitoring
- Contractor Smoothness Testing
- Control Charts
- Field Placement Controls
  - Mixing and Transportation
  - Placing and Finishing
  - Joints
  - Compaction
  - Surface Smoothness
  - Personnel
  - Laydown Plan

- ASSURE THAT THE REQUIRED TESTING IS BEING PERFORMED
- QUALITY CONTROL REPORTS SHOULD BE SUBMITTED DAILY

BASIS OF PAYMENT

- Payment made for each lot of asphalt, meeting all the acceptance criteria as specified in paragraph 401-6.2 of the P-401 specification shall be made based on results of tests for air voids and mat density
- Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids and paragraph 401-6.2c for joint density
- Payment shall not exceed the specified maximum pay factor ranging from 100% to 106%
  - Engineer shall specify the maximum lot pay factor
  - AC 150/5370-10H has eliminated the double sided density criteria
- FAA does not fund bonus payments
  - Payments in excess of 100% can be used to offset accepted lots of pavement that achieve a lot pay factor less than 100%

BASIS OF PAYMENT

- Adjusted Payment

"The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71 percent then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of HMA shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%."

BASIS OF PAYMENT

- Adjusted Payment

Table 6. Price adjustment schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject [2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

[2] The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

BASIS OF ADJUSTED PAYMENT EXAMPLE

- ONE of the values for mat density or air voids is 100% or higher
  - Air Voids = 92%
  - Mat Density = 100%
  - (1.00x0.92)= 92%
  - From Table 6 – Lot Pay Factor
    - PWL + 10 for PWL between 90-95
    - 92+10 = 102%
- ONE of the values for mat density or air voids is 100% or higher
  - Air Voids = 100%
  - Mat Density = 85%
  - (1.00x0.85)= 85%
  - From Table 6 – Lot Pay Factor
    - 0.5 PWL + 55 for PWL between 75-89
    - (0.5x85)+55 = 97.5%

BASIS OF PAYMENT

Contract Pay Factor Limitation
100%

P-401 - B	PWL		PWL								Bonus (PWL x Bid Price)			Film Thickness	
DATE:	Mat Density	PAY FACTOR%	Joint Desity	PAY FACTOR %	Air Voids	PAY FACTOR %	Pay Factors	Lot Tonnage	Bid Price	Pay (100%)	Pay (106%)	Bank	Stability	Flow	Test #1	Test #2
Lot #1 (5/30/2017)	100	106	100	100	100	106	100%	311.00	$ 85.00	$ 26,435.00	$ 90.10	$ 1,586.10	100	100	10.5	10.2
Lot #2 (6/1/2017)	100	106	100	100	100	106	100%	313.16	$ 85.00	$ 26,618.60	$ 90.10	$ 1,597.12	100	100	11.4	10.6
Lot #3 (6/2/17)	100	106	100	100	100	106	100%	2321.61	$ 85.00	$ 197,336.85	$ 90.10	$ 11,840.21	100	100	10.7	10.7
Lot #4 (6/2/17)	100	106	100	100	100	106	100%		$ 85.00	$ -	$ 90.10	$ -	100	100	11.5	11
Lot #5 (6/3/17)	100	106	100	100	100	106	100%	2956.72	$ 85.00	$ 251,321.20	$ 90.10	$ 15,079.27	100	100	10.8	12.6
Lot #6 (6/3/17)	100	106	100	100	100	106	100%		$ 85.00	$ -	$ 90.10	$ -	100	100	11.1	10.5
Lot #7 (6/5/17)	100	106	100	100	100	106	100%	414.95	$ 85.00	$ 35,270.75	$ 90.10	$ 2,116.25	100	100	11.9	11.5
Lot #8 (6/6/17)	100	106	100	100	100	106	100%	245.94	$ 85.00	$ 20,904.90	$ 90.10	$ 1,254.29	100	100	10	12.1
Lot #8 (6/7/17)	100	106	100	100	100	106	100%	436.49	$ 85.00	$ 37,101.65	$ 90.10	$ 2,226.10	100	100		
Lot #9 (6/8/17)	100	106	100	100	100	106	100%	3574.4	$ 85.00	$ 303,824.00	$ 90.10	$ 18,229.44	100	100	9.9	10.6
Lot #10 (6/8/17)	100	106	100	100	100	106	100%						100	100	11.7	11.6
Lot #11 (6/9/17)	100	106	100	100	92	102	100%	3675.8	$ 85.00	$ 312,443.00	$ 90.10	$ 18,746.58	100	100	11.3	10.2
Lot #12 (6/9/17)	100	106	100	100	100	106	100%						100	100	11.4	10.7
Lot #13 (6/12/17)	100	106	100	100	100	106	100%	949.68	$ 85.00	$ 80,722.80	$ 90.10	$ 4,843.37	100	100	10.5	10.7
								68.76	$ 85.00	$ 5,844.60	$ 90.10	$ 350.68				
								49.41	$ 85.00	$ 4,199.85	$ 90.10	$ 251.99				

BASIS OF PAYMENT

Contract Pay Factor Limitation
100%

P-401 - B	PWL		PWL					Bonus (PWL x Bid Price)						Film Thickness	
DATE:	Mat Density	PAY FACTOR%	Joint Desity	PAY FACTOR %	Air Voids	PAY FACTOR %	Pay Factors	Lot Tonnage	Bid Price	Pay (100%)	Pay (106%)	Bank	Stability	Flow	Test #1	Test #2
Lot #1 (6/10/2017)	100	106	100	100	100	106	100%	340.55	$ 95.00	$ 32,352.25	$ 100.70	$ 1,941.14	100	100	14	13.6
Lot #2 (6/13/2017)	100	106	100	100	100	106	100%	1741.75	$ 95.00	$ 165,466.25	$ 100.70	$ 9,927.98	100	100	14.2	12
Lot #2 (6/13/2017)								22.46	$ 95.00	$ 2,133.70	$ 100.70	$ 128.02				
Lot #3 (6/14/17)	100	106	100	100	100	106	100%	1547.26	$ 95.00	$ 146,989.70	$ 100.70	$ 8,819.38	100	100	12.5	11.8
Lot #4 (6/15/17)	100	106	100	100	100	106	100%	200.14	$ 95.00	$ 19,013.30	$ 100.70	$ 1,140.80			13.3	11.6
Lot #4 (6/15/17)							100%	1382.49	$ 95.00	$ 131,336.55	$ 100.70	$ 7,880.19				
Lot #5 (6/18/17)	100	106	100	100	100	106	100%	514.49	$ 95.00	$ 48,876.55	$ 100.70	$ 2,932.59	100	100	12.1	13.5
Lot #5 (6/18/17)								291.64	$ 95.00	$ 27,705.80	$ 100.70	$ 1,662.35				
Lot #6 (6/21/17)	100	106	100	100	100	106	100%	2095.39	$ 95.00	$ 199,062.05	$ 100.70	$ 11,943.72	100	100	13.6	12.9
Lot #7 (6/22/17)	100	106	100	100	100	106	100%	1121.65	$ 95.00	$ 106,556.75	$ 100.70	$ 6,393.41	100	100	11.9	13.1
Lot #8 (6/22/17)	100	106	100	100	100	106	100%	818.39	$ 95.00	$ 77,747.05	$ 100.70	$ 4,664.82	100	100	12.4	13.7
Lot #8 (6/28/17)									$ 95.00	$ -	$ 100.70	$ -				
Lot #9 (7/5/17)	100	106	100	100	100	106	100%	183.09	$ 95.00	$ 17,393.55	$ 100.70	$ 1,043.61	100	100	12.1	13.3
Lot #9 (7/6/17)								1544.88	$ 95.00	$ 146,763.60	$ 100.70	$ 8,805.82				
Lot #10(7/7/17)	100	106	89	100	100	106	100%	156.89	$ 95.00	$ 14,904.55	$ 100.70	$ 894.27	100	100	13.5	13.5
Lot #10(7/8/17)								1628.84	$ 95.00	$ 154,739.80	$ 100.70	$ 9,284.39				
Lot #10(7/10/17)								110.55	No Bonus Blast Pad							
Lot #11(7/12/17)	100	106	100	100	100	106	100%	294.29	$ 95.00	$ 27,957.55	$ 100.70	$ 1,677.45	100	100	15.1	14.2
Lot #11(7/14/17)								266.78	No Bonus Blast Pad							
Lot #11(7/16/17)								1103.08	$ 95.00	$ 104,792.60	$ 100.70	$ 6,287.56				
Lot #12(7/17/17)	100	106	100	100	100	106	100%	1253.92	$ 95.00	$ 119,122.40	$ 100.70	$ 7,147.34	100	100	12.7	13.7
Lot #13(7/18/17)	100	106	100	100	100	106	100%		$ 95.00	$ -	$ 100.70	$ -	100	100	12.7	12.3
Lot #14(7/18/17)	100	106	N/A	100	100	106	100%	4096.50	$ 95.00	$ 389,167.50	$ 100.70	$ 23,350.05	100	100	11.7	13.4
Lot #15(7/19/17)	100	106	100	100	100	106	100%	3775.91	$ 95.00	$ 358,711.45	$ 100.70	$ 21,522.69	100	100	10.6	11.6
Lot #16(7/19/17)	100	106	100	100	100	106	100%						100	100	11.6	13.2
Lot #17(7/20/17)	100	106	100	100	100	106	100%	1777.55	$ 95.00	$ 168,867.25	$ 100.70	$ 10,132.04	100	100	11.9	11.6
Lot #18(7/21/17)	100	106	N/A	100	100	106	100%	3485.24	$ 95.00	$ 331,097.80	$ 100.70	$ 19,865.87	100	100	11.2	10.6
Lot #19(7/21/17)	100	106	N/A	100	100	106	100%						100	100	11.6	12.8
Lot #20(7/24-25/17)	100	106	100	100	100	106	100%	416.23	$ 95.00	$ 39,541.85	$ 100.70	$ 2,372.51	100	100	11.4	12.2
								714.27	$ 95.00	$ 67,855.65	$ 100.70	$ 4,071.34				
Lot #21(7/26/17)	100	106	100	100	100	106	100%	3107.21	$ 95.00	$ 295,184.95	$ 100.70	$ 17,711.10	100	100	12.7	13.2
Lot #22(7/26/17)	100	106	100	100	100	106	100%						100	100	14.9	12.9
Lot #23(7/27/17)	100	106	100	100	100	106	100%	60.68	$ 95.00	$ 5,764.60	$ 100.70	$ 345.88	100	100	13.9	14.5
Lot #23(7/28/17)								1898.78	$ 95.00	$ 180,384.10	$ 100.70	$ 10,823.05				
Lot #24(7/31/17)	100	106	100	100	100	106	100%	321.11	$ 95.00	$ 30,505.45	$ 100.70	$ 1,830.33	100	100	14.8	16.9
Lot #24(8/2/17)					100			1418.59	$ 95.00	$ 134,766.05	$ 100.70	$ 8,085.96	100	100		
												$ 212,685.64				

BASIS OF PAYMENT

- Profilograph Roughness
  - Engineer to include as required for the project

- AC 150/5370-10H has removed the Profile Index Smoothness Pay Factor

- Payment for sublots that do not meet grade for over 25% of the sublot shall not be more than 95%

BASIS OF PAYMENT

PI SUMMARY TABLE RUNWAY 14/32 (STA 0+00 to 71+30)

Client:	Union Concrete	Location:	BUF R/W 14-32 (St 0+00 to 71+30)
Project:	BNIA RUNWAY 14/32 REHABILITATION	Technican:	Jon Valle
Device:	ICC Lightweight Profiler	Date:	8/21/17

Lanes	Width	AVE PI (in/mi)												
LL 15 FT		2.6	3.4	0.6	4.6	1.2	4.4	3.2	6.4	1.1	3.5	0.0	*5.1*	*11.9*
LL 1 FT		6.7	3.9	1.5	0.7	0.5	10.1	7.4	4.2	2.1	6.1	1.1	*1.6*	*5.2*
Runway centerline		Profile direction →							RW 5/23 UNPAVED					
RL 1 FT		8.5	0.2	0.0	0.2	0.6	0.0	6.3	3.5	0.4	0.6	0.2	*0.0*	*6.3*
RL 15 FT		4.9	0.2	0.0	0.0	0.0	0.6	6.3	6.3	0.7	1.0	0.2	*0.0*	*8.3*
		528 ft.	528 ft.	528 ft.	528 ft.	528 ft.	528 ft.	667 ft.	528 ft.	528 ft.	528 ft.	528 ft.	528 ft.	355 ft.
0+00	5+28	10+56	15+84	21+12	26+40	31+68	38+35	41+35	46+63	51+91	57+19	62+49	67+75	71+30

KEY	0 ≤ PI < 7	7 ≤ PI <15	AVE PI ≥ 15

NOTES: PI values are the average of three passes in each paved lane. Italicized PI values at end for runway were recalculated after removal of light bars in pavement.

FINAL TEST RESULTS SUMMARY AND FAA REPORTING

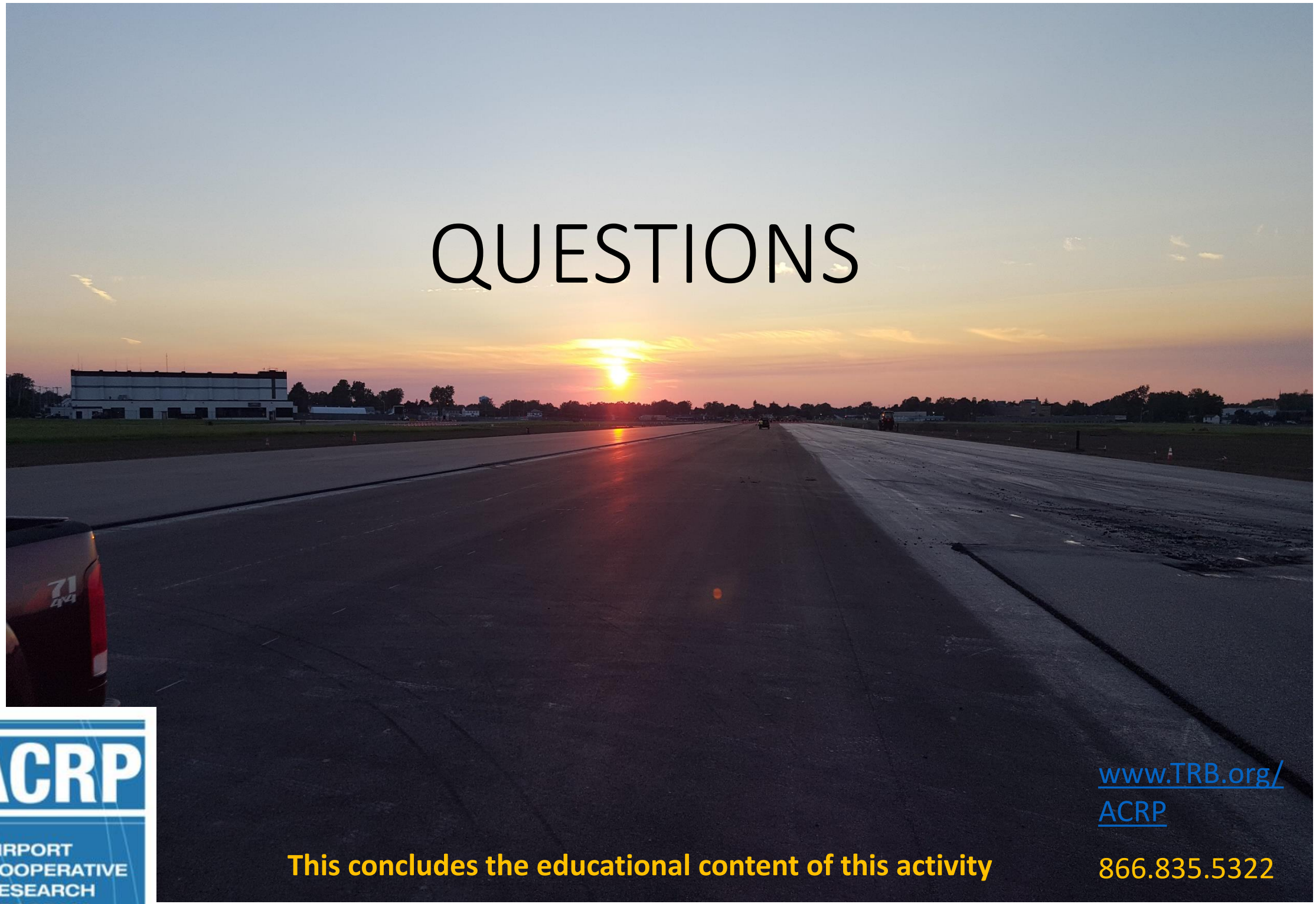
NIAGARA FALLS INTERNATIONAL AIRPORT
RUNWAY 6 - 24 SAFETY AREA IMPROVEMENT PROJECT
NFTA PROJECT No. 12NA0502
FAA AIP No. 3-36-0086-37-10

P-401-8.1 SUMMARY

DATE PLACED	I.R. NO.	LOT NO.	TONNAGE PLACED	TONNAGE PAID	STABILITY FLOW (PWL)	MAT DENSITY (PWL)	JOINT DENSITY (PWL)	AIR VOIDS	PAY FACTOR	ITEM P-401 EXPLANATION
9/20/2011	237	1	243.76	243.76	100.00%	100.00%	100.00%	100.00%	103%	Bituminous Surface Course on Bituminous Base Course -Test Strip #4 - Passed
9/21/2011	240	2	1,180.83	1,180.83	100.00%	100.00%	0.00%	100.00%	101%	Bituminous Surface Course on Bituminous Base Course - Production Lot Pay Factor reduced 5% due to Joint Density PWL of 0
9/22/2011	243	3	227.44	227.44	100.00%	100.00%	77.00%	100.00%	103%	Bituminous Surface Course on Bituminous Base Course - Production (Rain interrupted placement, N=3 utilized)
9/28/2011	257	4	362.18	362.18	100.00%	97.00%	34.00%	100.00%	101%	Bituminous Surface Course on Bituminous Base Course - Production Pavement Lot Resampled for Mat Density Lot Pay Factor reduced 5% due to Joint Density PWL of 34%
10/10/2011	283	5	1,569.42	1,569.42	100.00%	100.00%	100.00%	100.00%	103%	Bituminous Surface Course on Bituminous Base Course - Production
10/11/2011	284	6	668.56	668.56	100.00%	100.00%	89.00%	84.00%	97%	Bituminous Surface Course on Bituminous Base Course - Production Smoothness Criteria not achieved (RW 6-24 Sta 49+55 +/-) Lot Pay Factor reduced due to Air Voids PWL of 84%
10/24/2011	316	7	106.46	0.00	N/A	N/A	N/A	N/A	N/A	Bituminous Surface Course - No payment made. Contractor repair of area failing to meet smoothness acceptance criteria. Plant testing only.

AC 150/5370-10H

- KEY MODIFICATIONS TO NOTE
  - Control Strip
  - Asphalt Pavement Analyzer testing
  - Density for mat & joint relative to Theoretical Maximum Density (TMD)
  - Smoothness testing now part of the Contractor Quality Control Plan



ACRP
AIRPORT COOPERATIVE RESEARCH PROGRAM