

***Rapid Asphalt
Production/Construction ~~Controls~~
Feedback – PCF
Part 3 - e-Circular***

**May 1, 2017
Iowa State University
Ames, IA**

ETG Construction Task Force

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Production/Construction Feedback

- PCF – controls and devices designed to provide rapid feedback to the user to improve the *density* and hence the performance of asphalt pavements.

Production/Construction Feedback

- **Areas of concern:**
 - Design
 - Materials
 - Specifications
 - Construction
 - Aggregate moisture
 - Asphalt Sampling
 - Compaction

PCF

Area of concern:

- **Pavement Dsn**
- **Thickness**
- **Mix design**
 - BMD
 - Conventional
- **Aggregate Structure**

PCF

Area of concern:

Does the mix design take into account:

- **Pavement Thickness**
- **Aggregate Structure**
 - A. NMAS**
 - B. Fine**
 - C. Coarse**
 - D. Gap Graded Mixes**
 - i. SMA**
 - ii. OGFC/Porous**
- **Assumption: density measured by Gmb**

PCF

Area of concern: Does the (project) density specification take into account:

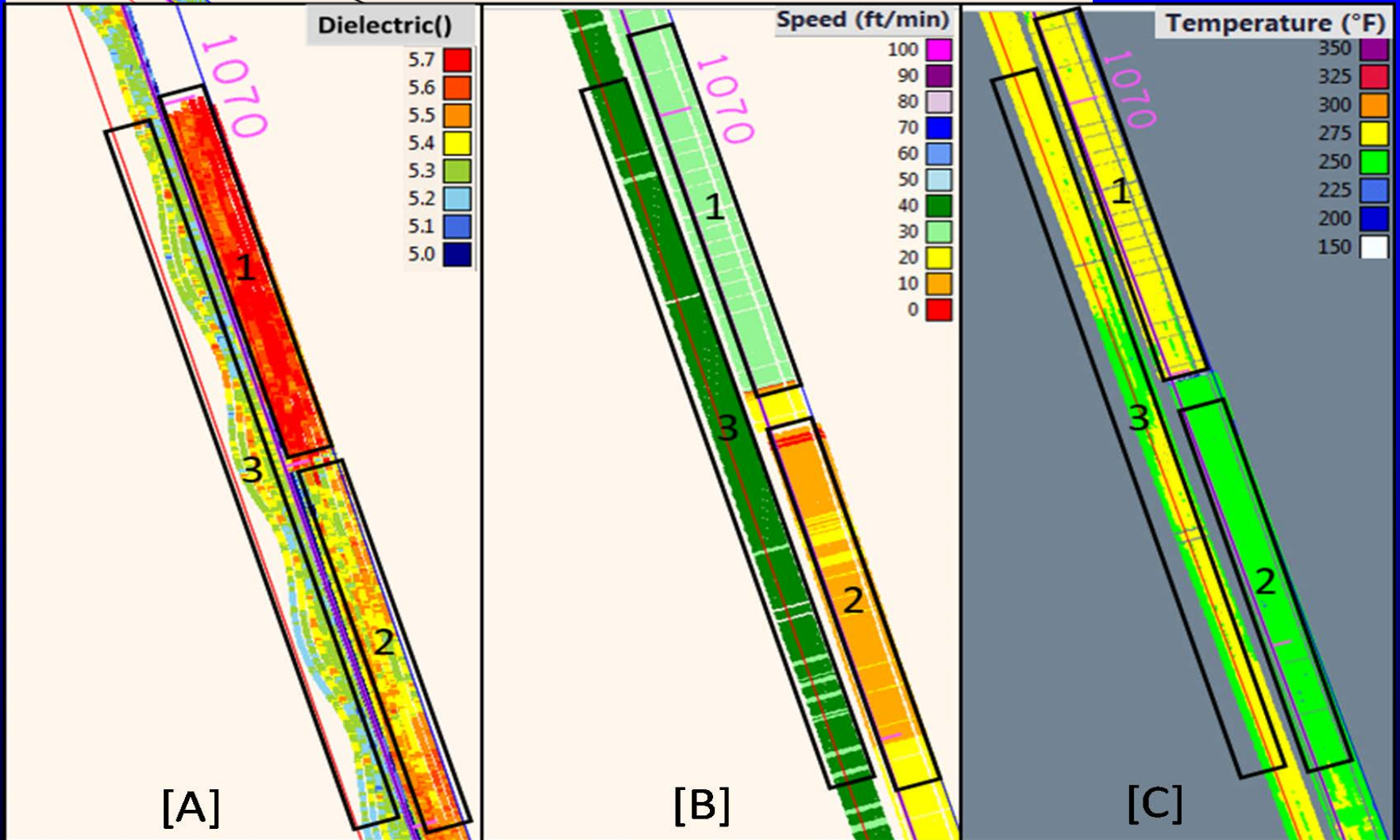
- **Pavement Thickness**
- **Subgrade**
 - drainage
 - soft spots
 - repairs
- **If an overlay**
 - drainage
 - pavement condition
 - soft spots/cracks
 - repairs

PCF

Area of concern: Does the (project) density specifications account for:

- **Best practices**
- **Impediments to implementation**

RDM Data



PCF – e-circular 1st Draft

- **Executive Summary-**
- **Introduction-**
 - **Why compaction is so important**
- **Mix Designs-**
 - **Balanced Mix Designs as a start**
 - **Use of RAP, RAS, RMA**
 - **Understanding Volumetrics the good/bad/or ugly**

PCF

- **Next steps**

- **Review of Utah Density Specification**

- **Review of FHWA Density Initiative projects**

- **Outline of Compaction Improvement**

- **E-circular**

- » **Executive summary**

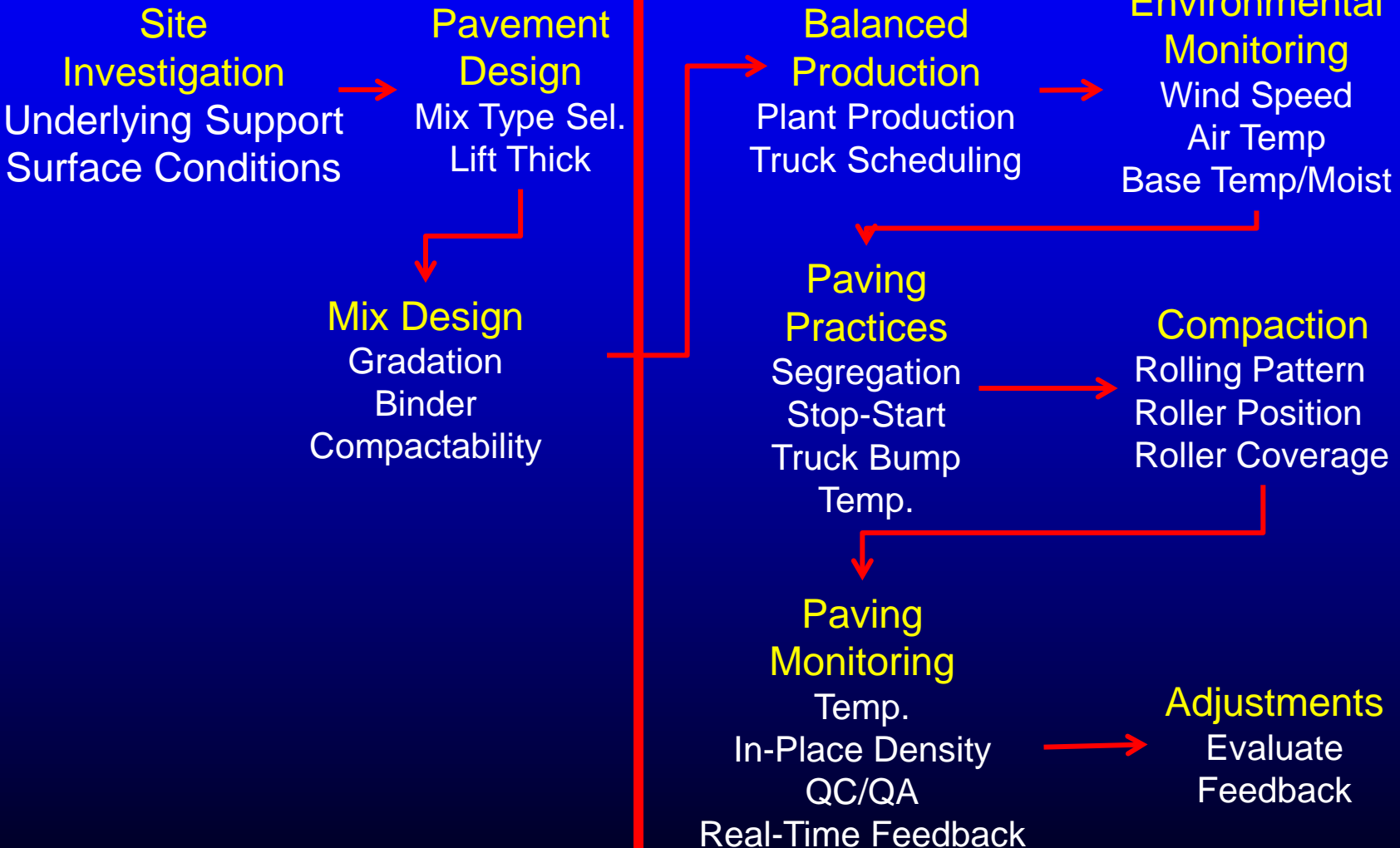
- » **Review of topics**

- » **Prepare e-circular over the next 12months.**

Compaction Improvement

Pre-Construction

Construction





Utah DOT HMA In-place Density Specification

Howard Anderson
Utah DOT Asphalt Engineer

FHWA Asphalt Mixture & Construction ETG
Iowa State University, Ames, Iowa

May 2, 2017

UDOT Specifications

- **January 2017**

Utah Department of Transportation



2017 Standard Specifications

For Road and Bridge Construction

January 1, 2017

Definitions

- **Longitudinal Joint – Any new asphalt lift abutting an existing paving lift, exceeding 200 feet in length and excluding intersections. This includes joints created by echelon paving and new asphalt placed against a milled asphalt edge.**
- **Overband – an 8 inch protective asphalt coating sealing the longitudinal joint of final riding surface, as proposed by the contractor and approved by the Engineer**

Definitions

- **Thin Overlay Pavement – An overlay where the sum of the thickness of the HMA lifts is less than two inches**
- **Production Day – A 24 hour period in which HMA is being placed**
- **Lot – The number of tons of HMA placed in a Production Day**

Specification Highlights

- **Both Mat and Long Joint Density**
- **Thin Lifts Treated Separately**
- **Density based on Cores and G_{mm}**
- **Joint Layout Plan 10 days Prior to Paving**
- **Lot = One day's paving, minimum 4 samples**
- **Targets & Limits (Table 2)**
- **PWL / Pay Factor**
 - **\$/ton Incentive or Disincentive**
 - **Payment is Step Function (Table 1)**
 - » **Incentive/Disincentive = \$0.00/ton for PWL 88-91%**

In-place Density

- **Mat**

- Cores taken with 2 contract days of paving
- Move 1ft from edge
- G_{mm} of Lot

- **Long Joint**

- May remove joint edges (3" confined, 6" unconfined) with payment
- Cores taken with 2 contract days of paving
- G_{mm} of mat averages

Specification Limits

- **Mat**

- Target = 93.5%
- LL = 91.5%
- UL = 97.5%

- **Long Joint**

- Target = 91.5%
- LL = 89.5%
- UL = 97.5%

Table 2

Upper and Lower Limit Determination	
Parameter	UL and LL
$\frac{3}{4}$ inch sieve for 1 inch HMA $\frac{1}{2}$ inch sieve for $\frac{3}{4}$ inch HMA $\frac{3}{8}$ inch sieve for $\frac{1}{2}$ inch HMA No. 4 sieve for $\frac{3}{8}$ inch HMA	Target Value \pm 6.0%
No. 8 sieve	Target Value \pm 5.0%
No. 50 sieve	Target Value \pm 3.0%
No. 200 sieve	Target Value \pm 2.0%
Asphalt Binder Content	Target Value \pm 0.35%
Mat Density	Lower Limit Target Value - 2.0% Upper Limit Target Value + 4.0%
Longitudinal Joint Density	Lower Limit Target Value - 2.0% Upper Limit Target Value + 6.0%

Incentive Disincentive

- If mat density PWL $\leq 88\%$, No %AC & gradation Incentive
- \$/ton
- R&R
- Accept in-place option, 35% penalty bid price.

Table 1

Incentive/Disincentive for Asphalt Binder Content, and Mat Density	
PT Based on Min. Four Samples	Incentive/Disincentive (Dollars/Ton)
>99	2.00
96-99	1.50
92-95	1.00
88-91	0.00
84-87	-0.26
80-83	-0.60
76-79	-0.93
72-75	-1.27
68-71	-1.60
64-67	-1.93
60-63	-2.27
<60	Reject
Incentive/Disincentive for Gradation	
PT Based on Min. Four Samples	Incentive/Disincentive (Dollars/Ton)
>99	2.00
96-99	1.50
92-95	1.00
88-91	0.00
84-87	-0.26
80-83	-0.60
76-79	-0.93
72-75	-1.27
68-71	-1.60
64-67	-1.93
60-63	-2.27
56-59	-5.00
52-55	-10.00
<52	Reject
Incentive/Disincentive for Longitudinal Joint Density	
PT Based on Min Four Samples	Incentive/Disincentive (Dollars/Ton)
>99	2.00
96-99	1.50
92-95	1.00
88-91	0.00
84-87	-0.26
80-83	-0.60
76-79	-0.93
72-75	-1.27
68-71	-1.60
64-67	-1.93
60-63	-2.27
56-59	-2.60
52-55	-5.00
<52	The \$5 penalty and Overband Longitudinal Joint if Final Surface Lift

Old Contractor Perspective

- **Easily Understood Specification**
- **Forces Paving Planning (Joint Layout 10 days Prior)**
- **Includes Dispute Resolution**
- **Industry Heard in Specification Development/Revisions**

Dispute Resolution

- 02741 HMA
- 02744 SMA

SECTION 01456

MATERIALS DISPUTE RESOLUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedures for disputing acceptance or verification test results for the following materials on Department projects:
 - 1. Section 02056 – Embankment, Borrow, and Backfill
 - 2. Section 02721 – Untreated Base Course
 - 3. Section 02735 – Microsurfacing
 - 4. Section 02741 – Hot Mix Asphalt
 - 5. Section 02743 – Hot Mix Asphalt – Bike and Pedestrian Paths
 - 6. Section 02744 – Stone Matrix Asphalt
 - 7. Section 02745 – Asphalt Material
 - 8. Section 02752 – Portland Cement Concrete Pavement
 - 9. Section 02785 – Chip Seal Coat
 - 10. Section 02786 – Open-Graded Surface Course
 - 11. Section 02787 – Bonded Wearing Course
 - 12. Section 03055 – Portland Cement Concrete
 - 13. Section 03310 – Structural Concrete

- B. Procedures for requesting that rejected, non-conforming material be allowed to remain in place.

Dispute Resolution

- **Dispute Acceptance or Verification Test Results**
- **Submit Dispute within:**
 - 1 Week of receiving test results
 - 24 Hours before performing work
- **Include engineering analysis, statistical analysis, QC test results, ...**
- **If Merit Found by UDOT 3 potential avenues**
 - Test and Calculation Procedure Review
 - Validation Testing As Appropriate
 - Third Party Testing As Appropriate

If Merit Found

- **Test and Calculation Procedure Review**
 - **No Significant Errors: Evaluate Lot with Original Test Results**
 - **If Significant Errors: Go to Validation or 3rd Party Testing**
- **Validation Testing As Appropriate**
- **Third Party Testing As Appropriate**

Validation Testing

- **Performed by UDOT**
 - In UDOT Central or Region Materials Lab
- **Use Material Remaining from Original UDOT Test**
 - All sublots re-tested
- **Retest Results Validate or Invalidate Original UDOT Test Results**
 - Validated if Within $2 \times \sigma$ of Original Results
- **Validation Tests May NOT be Used for Acceptance**
- **If Validated, Use Original Acceptance Test Results**
- **If Not Validated, Eliminate Invalidated Test Results and tRe**

Dispute Resolution

- **Request to Allow Rejected Material to Remain In-place**
- **Submit Request within:**
 - 1 Week of receiving test results
 - 24 Hours before performing work
- **Include engineering analysis – Expected Service Life vs. Design Life**

Thank You & Feedback

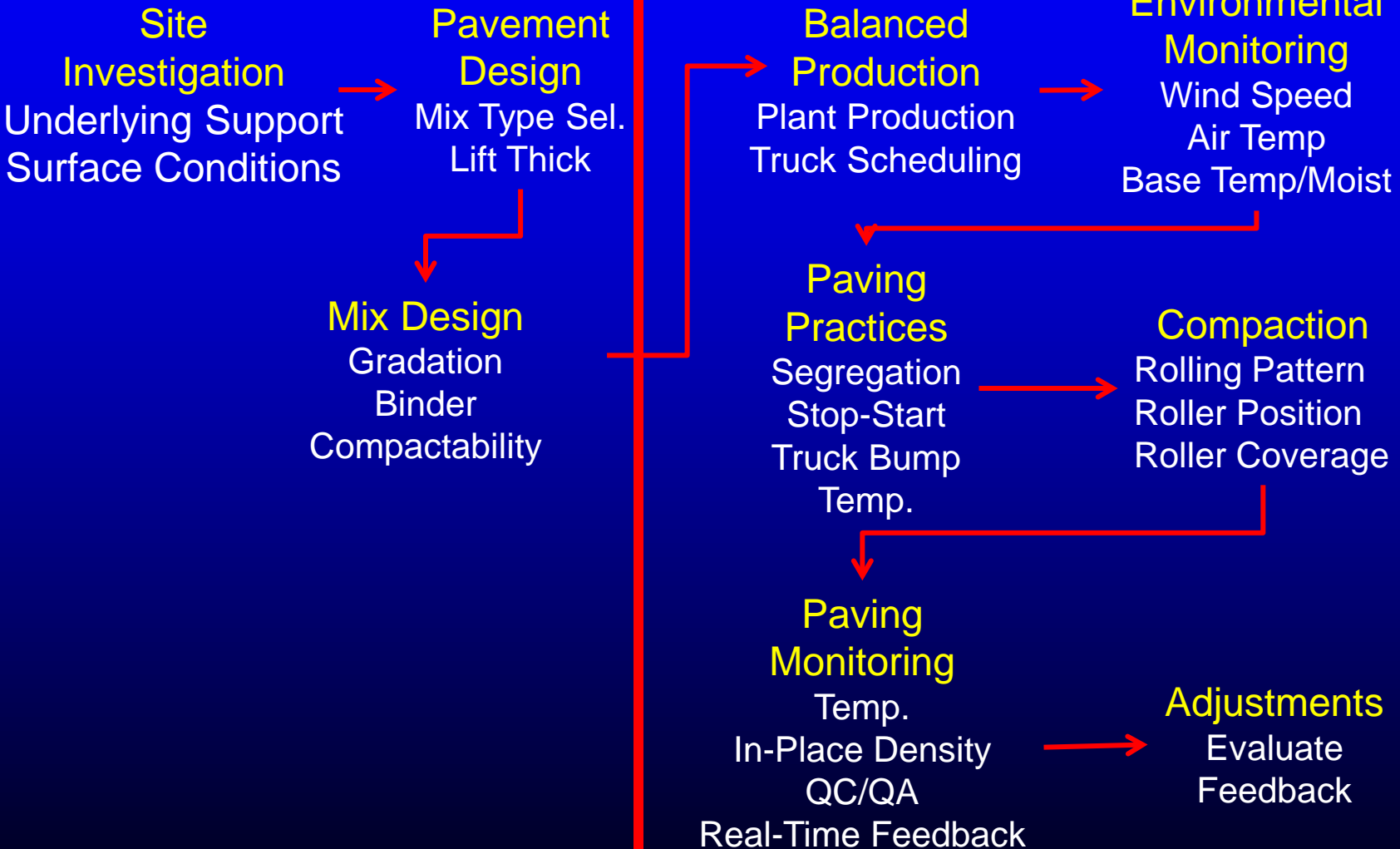
- Questions
- Suggestions
- Thoughts



Compaction Improvement

Pre-Construction

Construction





IICTG 2017 Conference

Sept. 26-28, 2017

Minneapolis, MN USA

- Integrated Intelligent Construction solutions
- Intelligent Compaction
- Paver-Mounted Thermal Profiling
- Continuous Asphalt Density Measurement
- 3D Modeling and Automated Machine Guidance



Association of Asphalt Paving Technologists

2018 - Jacksonville, FL
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