High PWL Airfield Asphalt:

"Be Consistent"

Presented by:
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The Less-Than-12-Step-Plan to Quality Airfield Asphalt

- Our comments concern FAA spec P-401 asphalt, both “traditional” and SuperPave
- These quality assurance steps start well before asphalt is made or laid
- Developed not only from FAA guidelines, but from over 100 total years of experience in airport paving
- And over 100 total years of seeing the same mistakes over and over……..

The results of low quality asphalt……

Step 1: “Use a new & current mix design.”

- **Mix design** is documentation the contractor provides you before production
- It states the type and proportion of materials to be used in the asphalt
- Ensure the contractor provides a **new** design (not an outdated markup of an old mix)
- Ensure the contractor has on-site, at his plant, the materials he plans to use

Step 2: “Weather matters.”

- The time of year paving will commence is of extreme importance
- Winter temperatures and frequent rain can severely limit or halt production
- Strive to have laydown occur in the driest summer months, preferably July-September, possibly October

Step 3: “Can you physically do it?”

- Can you get the asphalt to the site?
  - Is your Design Aircraft a dump truck?
  - Ensure haul routes are appropriate for the time of year

Off-Pavement Haul Route

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Step 3: “Can you physically do it?”

- Is the base course or pavement sufficiently strong to allow the contractor to achieve compaction? (proof roll)
- Design grades of less than 1% will frequently “birdbath”.

Slight Grades = Drainage Problems

Step 4: “Are you on crack?”

- Overlays: Paving lane cracks, existing joints and other cracks will reflect without proper treatment.
- Crack treatment methods include sealing with joint or crack sealant, sand/asphalt mixes or repair membranes

Step 4: “Are you on crack?”

- Some crack treatments are temperature-sensitive and will “boil out” under the heat of asphalt laydown

Step 5: “Lay down and roll.”

- Watch the mat as it exits the paver; note consistency of thickness and surface.

Step 5: “Lay down and roll.”

- Rolling is key: It’s the last time you have input on the finished product.
- Rolling equipment must be consistent – same number of vibratory/static passes, same direction, same roller.
- Rolling patterns must be consistent in time after laydown and direction

Step 5 continued…..

- Watch for striations (small tears) in pavement surface; these are signs of over-rolling, subgrade problems or “shoving” by the roller
- Substandard rolling results in pavement that doesn’t meet density requirements, and reduced pay to the contractor.

Step 6: “Testing = how much payment.”

- Testing is performed on **air voids, flow, stability, mat density, joint density, thickness, smoothness** and **grade** for acceptance and pay percentages.
- Tests are performed on a **per lot** basis. A lot is:
  - one day's production not to exceed 2,000 tons, or
  - a half day's production where a day's production is expected to consist of between 2,000 and 4,000 tons
- The contractor cuts pavement cores to be tested at the lab by the Owner.

Step 6: Testing (continued…..)

- Joint density cores must be taken within 1” of the centerline of the joint (sawcutting paving lanes gives the best results).
- **Air voids, mat density, and joint density** are the input parameters for Payment Within Limits (PWL) calculations.

Step 6: Testing (continued…..)

- “Payment within limits (PWL) considers the variability (standard deviation) of the material and the testing procedures, as well as the average value of the test results, to calculate the percentage of material that is above the lower specification tolerance limit (L) or below the upper specification tolerance limit (U).”
- Large deviations in test results, although averaging in the acceptable range, may produce low payment values.

Asphalt PWL Calculation Example

AIRPORT: Springfield Municipal
AIP NO.: 3-05-0065-07

SUMMARY OF ASPHALT TEST RESULTS

DATE: 3/7/2007 LOT NO.: 4
TYPE: P-401 Surface TONS: 2000

			U=	16	5
L=	96.3	93.3	1800	8	2

Sublot #	Mat Density %	Joint Density %	Stability	Flow	Air Voids %
1	96.8	95.8	2603	12	5.1
2	96.1	94.9	2608	12	4.8
3	94.8	97.0	2777	12	3.9
4	93.4	93.9	2920	10	4.8
5					
6					
7					
8					
AVG (x):	95.275	95.4	2727	11.5	4.65

$d1^2$	2.326	0.16	15376	0.25	0.202
$d2^2$	0.681	0.25	14161	0.25	0.022
$d3^2$	0.226	2.56	2500	0.25	0.563
$d4^2$	3.516	2.25	37249	2.25	0.022
$d5^2$					
$d6^2$					
$d7^2$					
$d8^2$					

Sn=	1.5	1.319	151.971	1	0.519
Ql=	-0.683	1.592	6.100	3.500	5.106
			Qu=	4.5	0.674
N=	4	4	4	4	4
			PL=	100	100
			PU=	100	73
PWL=	28	100	100	100	73

PAY: PWL of 28 = 50% % PAY

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Top Half = Test Results

Sublot #	Mat Density %	Joint Density %	Stability	Flow	Air Voids %
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PAY: PWL of 28

Bottom Half = Fancy Math

Asphalt PWL = Payment %

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5PWL + 55
55 – 74	1.4PWL – 12
Below 55	Reject

P-401 Asphalt Summary:

- Use a new and current mix design.
- Strive for summer weather.
- Ensure your haul routes and existing pavement can take it.
- Crack sealing methods are crucial.
- Roll it consistently.
- Testing = payment; be prepared!

Quality P-501 Concrete:

“Be Prepared”

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P-501 Portland Cement Concrete Pavement:

- Consists of sand, aggregate, cement, water and additives
- Proportions of each are extremely critical
- PCC usually has a higher initial cost, but a lower lifetime cost
- Will provide many decades of use with minimal maintenance if properly placed

Preparation before = $$$ down the road

- Example:
  - 17 inch thick PCC surface pavement
  - Standard rate of production from a paving machine
  - 2008 unit price for finished concrete
- **How much $$$$ per hour is going down?**

$50,000 per hour

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“Use a new & current mix design.”

- **Mix design** is documentation the contractor provides you before production, states the type and proportion of materials to be used in the concrete
- Ensure the contractor provides a **new** design and has on-site, at his plant, the materials he plans to use
- The quality of concrete is more susceptible to aggregate variations than asphalt

GRADATION FOR COARSE AGGREGATE						
		Percentage by Weight Passing Sieves				
Sieve Designations (square openings)		From 2" to No. 4		From 1-1/2" to No. 4		From 1" to No. 4
		#3	#57	#4	#67	#57
in.	mm	2"-1"	1"-No.4	1-1/2"-3/4"	3/4"-No.4	1"-No.4
2-1/2	63	100	---	---	---	---
2	50.8	90-100	---	100	---	---
1-1/2	38.1	35-70	100	90-100	---	100
1	25.0	0-15	95-100	20-55	100	95-100
3/4	19.0	---	---	0-15	90-100	---
1/2	12.5	0-5	25-60	---	---	25-60
3/8	9.5	---	---	0-5	20-55	---
No. 4	4.75	---	0-10	---	0-10	0-10
No. 8	2.36	---	0-5	---	0-5	0-5

Check your aggregate source.

- Alkali-silica reactive (ASR) aggregates becoming a common problem.
- They can “explode” the pavement from the inside.
- New testing requirements and solutions available.

Placement plan / methods are the key.

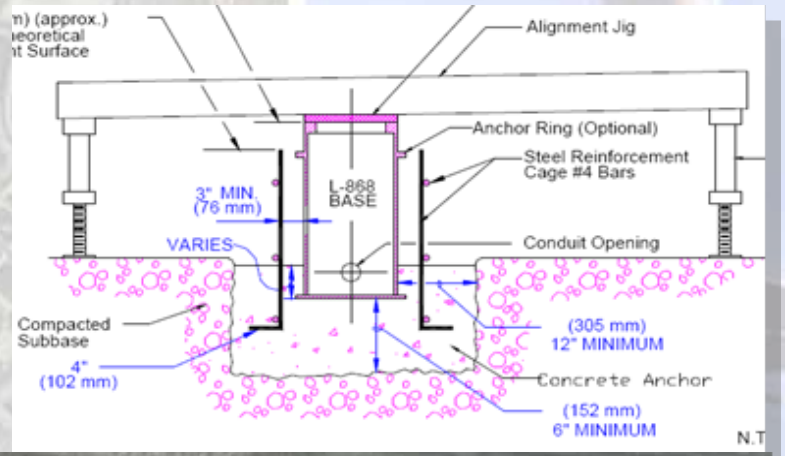
- Paving lane widths, numbers and cure time all affect design and affect construction progress.
- Make all paving lanes standard width so equipment can remain in one set-up.
- Schedule “pulls” so that equipment can use adjacent lanes for subsequent work.

Steel and concrete work together.

- Standard reinforcement usually poses no significant problems during paving.
- Dowels can be inserted during paving....
- ....or after with drilled and epoxied installations.

In-pavement lighting shines……

- In-pavement light cans must “take the punishment” of paving operations.
- Can installations must be prepped and stabilized for final PCC course.



Environmental conditions matter.

- Concrete pavement placement is especially weather-sensitive.
- Cold-weather ops:
  - 40°F for a few days prior
  - 35°F and rising when placed
  - Keep at 50°F while curing
- Hot weather ops:
  - Use ice or chill mix water
  - Can use hydrogen cooling for slip formed work
- Curing compound required

Beams: Where the money comes from.

- P-501 calls for testing beams rather than cylinders
- Beams react similarly to working pavement; tensile strength is measured
- Beams are high maintenance:
  - Don’t move for 24 hours
  - Don’t bounce in back of truck
  - Store & cure in water baths or field-cure in sand

Contractor Quality Control

- Will have examples of QC plans and testing results here
- Can add PWL info (like asphalt) if needed and investigate payment options

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