KANSAS STATE UNIVERSITY | Salina

Concrete Paving Inspection Workbook

Certified Inspector Training Program

AD ASTRA PER ASPERA

Kansas Department of Transportation

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Concrete Paving Operations

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- Pavement Smoothness
- Pavement Thickness
- Spec Overview

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KDOT References/Resources

- 2015 Standard Specifications
- Project Plans
- Special Provisions
  - Project Specific Special Provisions
- Construction Manual
- Documentation Manual

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External References/Resources

- CP Tech Center
  - http://www.cptechcenter.org/
  - Concrete Pavement Construction Basics
  - Concrete Paving Training & Field Reference for Preventing Common Problems
  - Integrated Materials and Construction Practices for Concrete pavement
    - Glossary
    - Trouble shooting guide

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External References/Resources

- National Highway Institute (NHI)
  - National Highway Institute | Home (dot.gov) Free Web based courses
- American Concrete Pavement Association
  - http://www.acpa.org/
  - Youtube
  - Apps
  - Reference Materials (paid)

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Concrete - ?
Paving - ?
Hanson
http://www.flickr.com/photos/cogdog/187719933/

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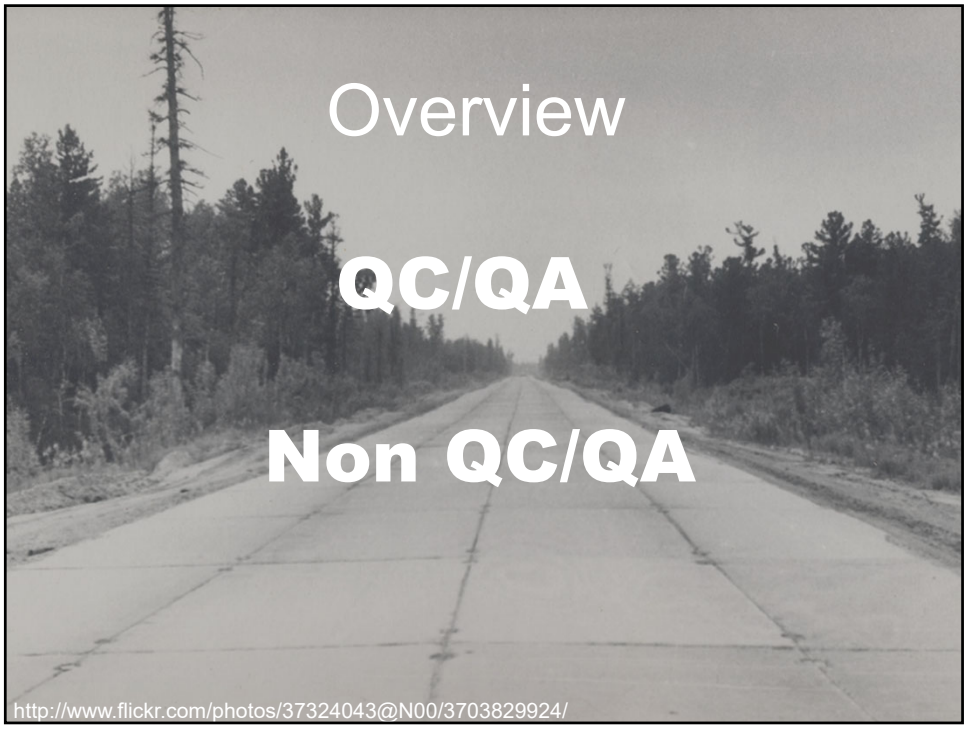
Overview
QC/QA
Non QC/QA
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Appendix A

SAMPLING AND TESTING FREQUENCY CHART
NON QUALITY CONTROL/QUALITY ASSURANCE SPECIFICATIONS

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)	TEST METHOD	AWP	CODE	VERIFICATION SAMPLES & TESTS (Note f)	CODE	ACCEPTANCE SAMPLES & TESTS
DIVISION 500 (See also Division 1100 regarding aggregates)							
PORTLAND CEMENT CONCRETE PAVEMENT Sec. 401, 403, 502 and 503	Mass per cubic foot (0.1 lb/ft3)	KT-20	ACC				As often as needed to control product. Min. of 1 set of tests per each half day and/or per 4000 yd^2.
	Temperature (1 °F)	KT-17	ACC				
	Slump (0.25 in)	KT-21	ACC				
	Air Content (0.25%)	KT-18 or KT-19	ACC		Determine the air loss due to paving		Refer to SS 2015 403.4. For all mainline paving, test the

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Appendix B

SAMPLING AND TESTING FREQUENCY CHART
CONTRACTOR QUALITY CONTROL TESTING

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)	TEST METHOD	CODE	QUALITY CONTROL BY CONTRACTOR	CODE	VERIFICATION BY KDOT
DIVISION 500 (continued)						
PORTLAND CEMENT CONCRETE PAVEMENT Sec. 501 & 503 (continued) **Concrete (continued)**	Air Content (0.25%)	KT-18 or KT-19	a	1 per 500 yd^3 or every 2 hours (mainline), every 4 hours (other slipformed pvmt), whichever is more frequent. Determine the air loss due to paving operations once in the AM and once in the PM. Determine the difference between the air content from concrete sampled before the paver, and concrete sampled behind the paver.		1 per day.
	Density of Fresh Concrete (0.1 lb/ft^3)	KT-38		Initially, 1 complete transverse profile, then 1 density per ½ day.		1 density per week.
	Beams (1 psi)	KT-22 & KT-23		1 set of 3 as required for opening to traffic.		1 set of 3 per week as required for opening to traffic.
	Cores (1 lbf, 0.01 in, 1 psi)	KT-49		As required in SS 2015 section 501.5g.		Thickness measurement and compression test – 1 per lot.

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Overview
Slip Form
501.4b or 502.3b
Fixed Form
501.4e or 502.3e
http://www.flickr.com/photos/37324043@N00/3703829924/

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12

13

14

15

Responsibility

- $$$
- Smooth, durable, according to plan
- Constructed efficiently, quickly, safely
- Quality

16

Fulfill these Responsibilities

- Familiar with Contract Documents
- Details
- Look ahead

17

Fulfill these Responsibilities

- Know who to talk to
- Ask questions & develop rapport
- Know your duties

18

Plans

- Review the plans thoroughly.
  - Typical sections
  - Plan and profile sheets
  - Detail sheets
    - Dowel jointed pavement
    - Joint layout
    - Transitions
  - Typical sheets relevant to paving

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Plans

- Pay particular attention to:
  - Superelevations (% super elevations, transitions in cross-slopes)
  - Ramp or intersection tie-ins (cross-slope, superelevations)
  - Transition points (superelevations)
  - Joint placement
  - Location and layout of reinforcing steel

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Pre-Paving

- 501.4
- 502.3

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Pre-Paving Checks

- Subgrade/Base preparation
  - Lines and grades of typical sections.
  - Remove any soft, non-compacting material
  - Remove any loose material.
  - Cut high areas/fill low areas.
  - Protect subgrade

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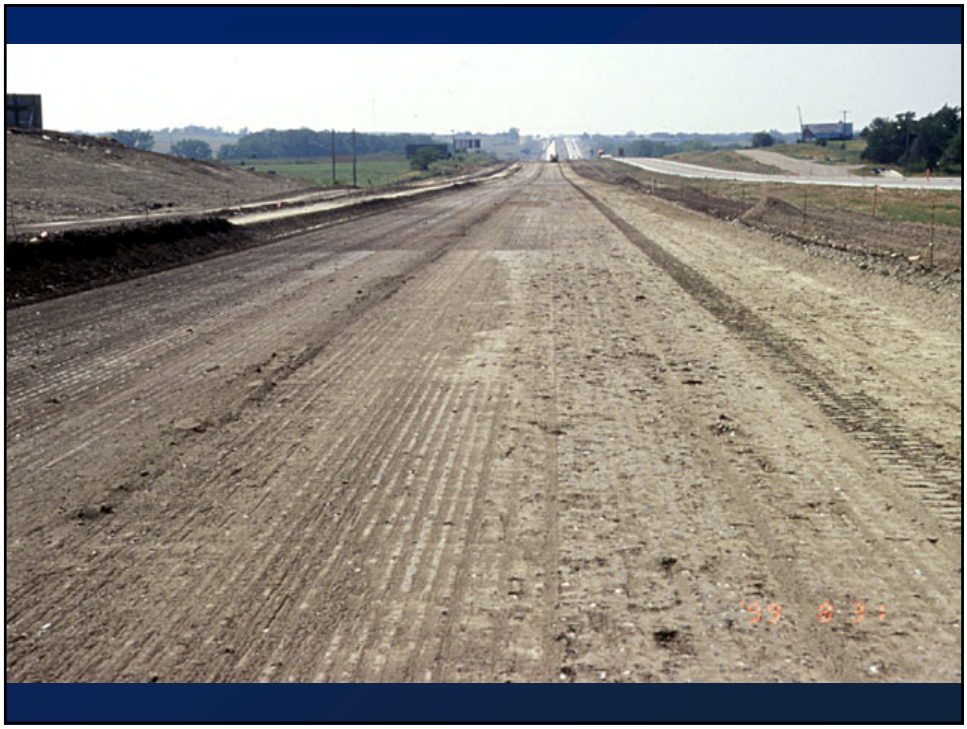

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Pre-Paving Checks

- Contractor's Equipment
  - Straight edges
  - Floats
  - Edgers
  - Backup vibrators
  - Temporary forming
  - Pavement bridge
  - White poly sheeting
  - Burlap
  - Insulated blankets

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Pre-Paving Checks

- Inspector's Equipment
  - 4-foot level
  - tape measure
  - folding rule
  - string line
  - Paint
  - station markers
  - field books
  - test equipment

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Various Contractor Tools

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Some Inspector Tools

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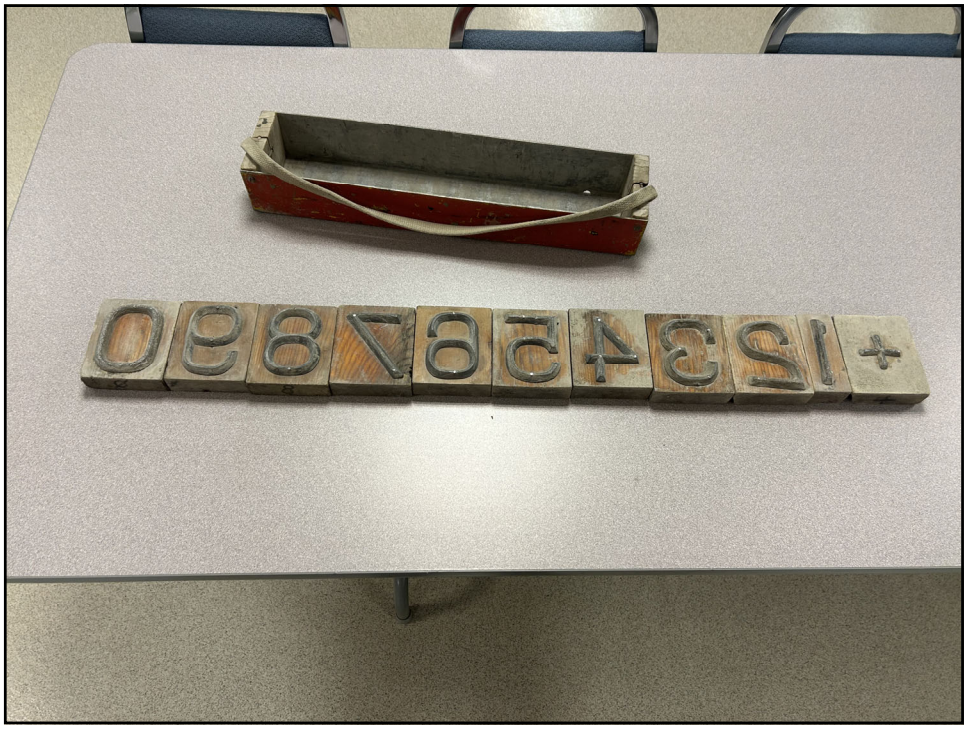

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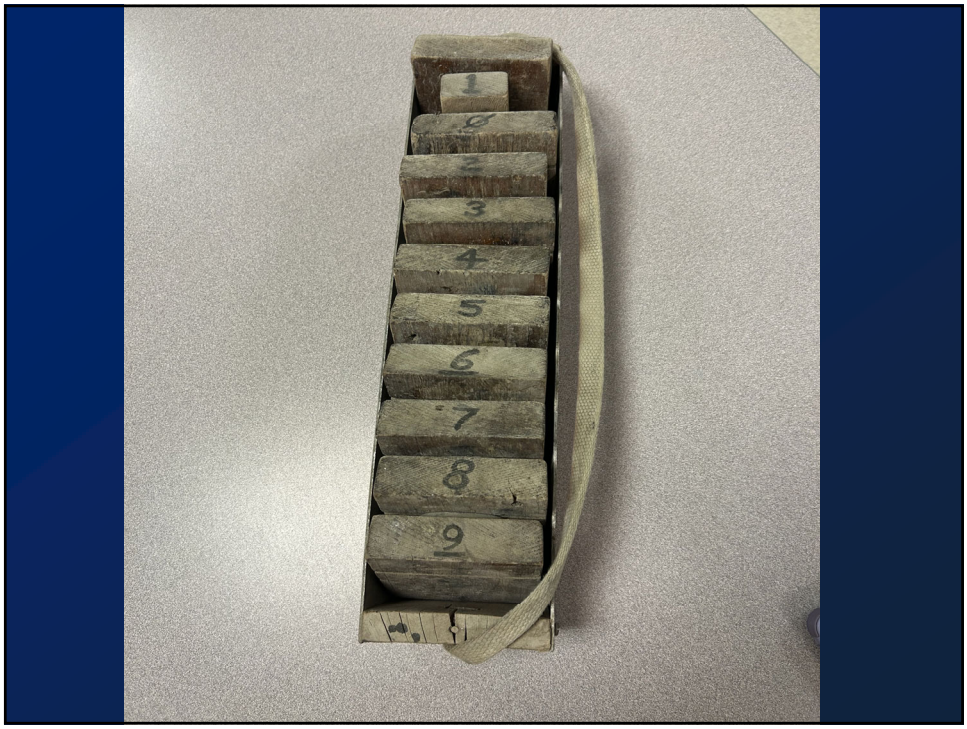

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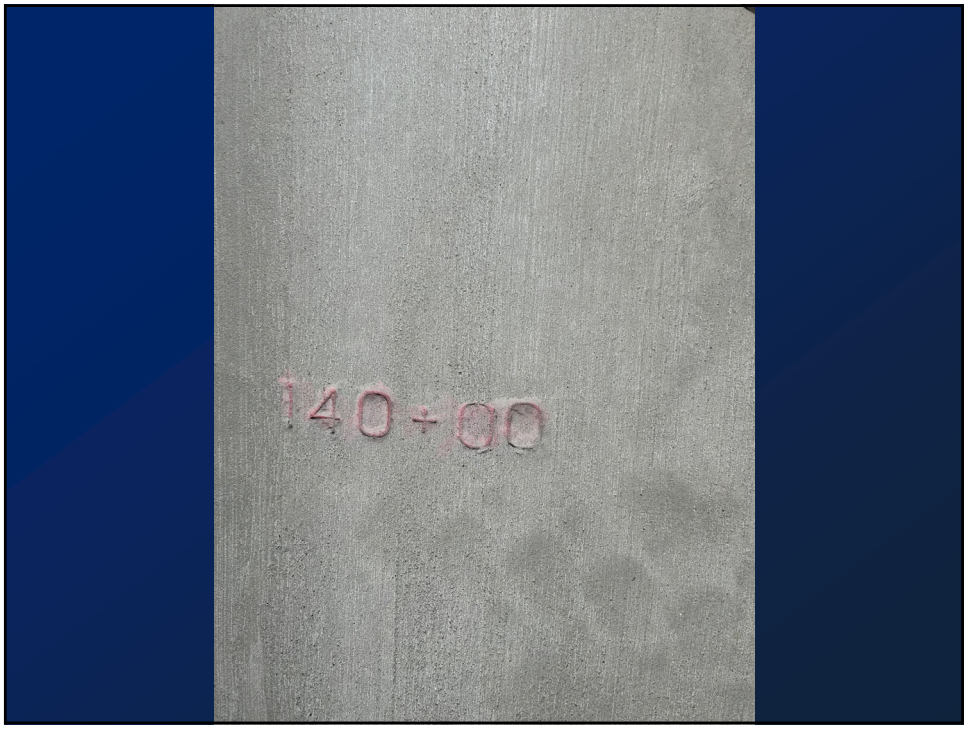

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Pre-Paving Checks

- Equipment (154)
  - Slip Form Paving
  - Fixed Form Paving

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Pre-paving Checks

Slip Form Equipment Checks

- Vibrators (properly spaced, clearance for reinforcement, good working order and proper frequency).
- Screed (proper crown (if required), good working order and alignment).
- Side Forms (proper depth, keyway location (if needed), and tie-bar spacing).
- Electronics (working properly).

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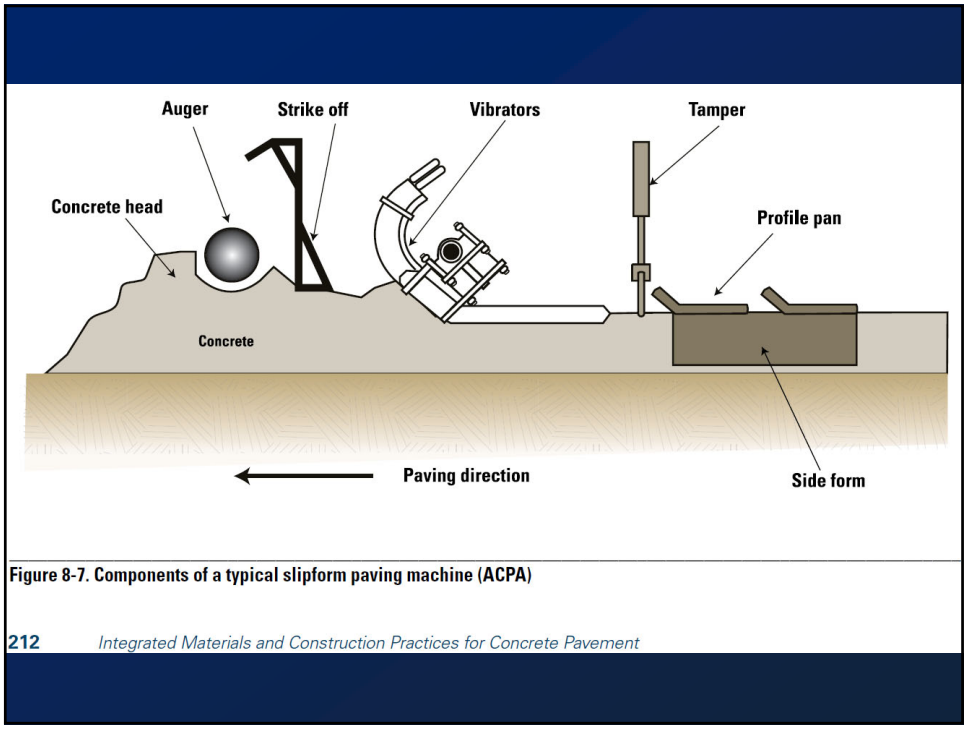

Figure 8-7. Components of a typical slipform paving machine (ACPA)

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Checking Hydraulic lines

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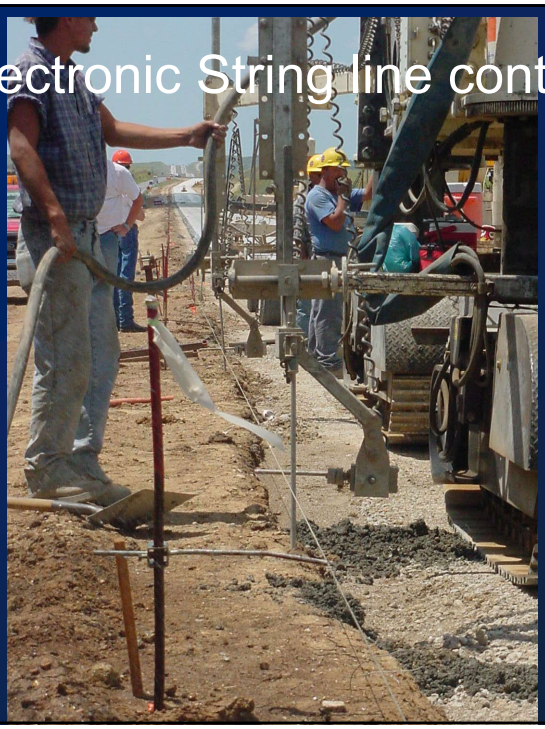
Electronic String line controls



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Pre-Paving Checks

- Fixed Form Paving
  - Clean, straight, and correct dimensions
    - Straightedge between form joints (forms shall not deviate from true line more than ¼ inch at any point).
  - Initial eyeball check for irregularities.
  - Width between side forms.
  - String line depth check

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Pre-Paving Checks

- Secure forms (minimum 3 pins per 10-foot section).
- Concrete Spreader (specs. sec. 154.4 (a))
  - **a. Concrete Spreader.** Use equipment to uniformly spread the concrete while maintaining a head of concrete.
  - The Engineer may waive the use of a self-propelled concrete spreader in areas of narrow or irregular dimensions.
- Finishing machine (specs. sec. 154.4 (b))
  - Proper Crown
  - Consolidation

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Properly pinned

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Roller Screed

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Self Propelled Roller Screed

49

Vibratory Truss Screed

50

Traveling Carriage Screed

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Traveling Carriage Screed (Up-Close)

52

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Pre-Paving Checks

- Be thoroughly familiar with the plan detail sheets
  - Joint spacing and location
  - Reinforcement ((specs. sec. 501.4(c) / 502.3(c))
  - Pavement thickness and width
  - Superelevations, transitions and ramp tie-ins

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Pre-Paving Checks

- Hold a field meeting (between key KDOT personnel and contractor personnel)
  - Discuss the paving operations
  - Discuss staking of the project
  - String line set as per staked
    - Vertical and horizontal offsets
    - Eyeball check for gross irregularities
    - Tautness

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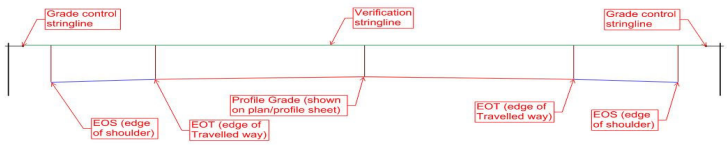
Paving Operations – X-Section Grade Checks with Stringline



GRADE X-SECTION CHECK - USING GRADE CONTROL STRINGLINE

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Pre-Paving Checks

- Reinforcement (keyways, tie bars, mesh, dowel bars, etc)
  - Correct size
  - Correct location
  - Vertical and horizontal location
  - Secure in place
  - Dowel bars
    - Bond breaker lightly but thoroughly applied
    - Must be properly aligned
    - Location Marked outside of pavement edge
    - Baskets pinned in place

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Quiz

- Name a responsibility of the inspector
- What are the 2 types of concrete paving?
- How many pins per 10-foot section are required?

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Dowel Bar Theory

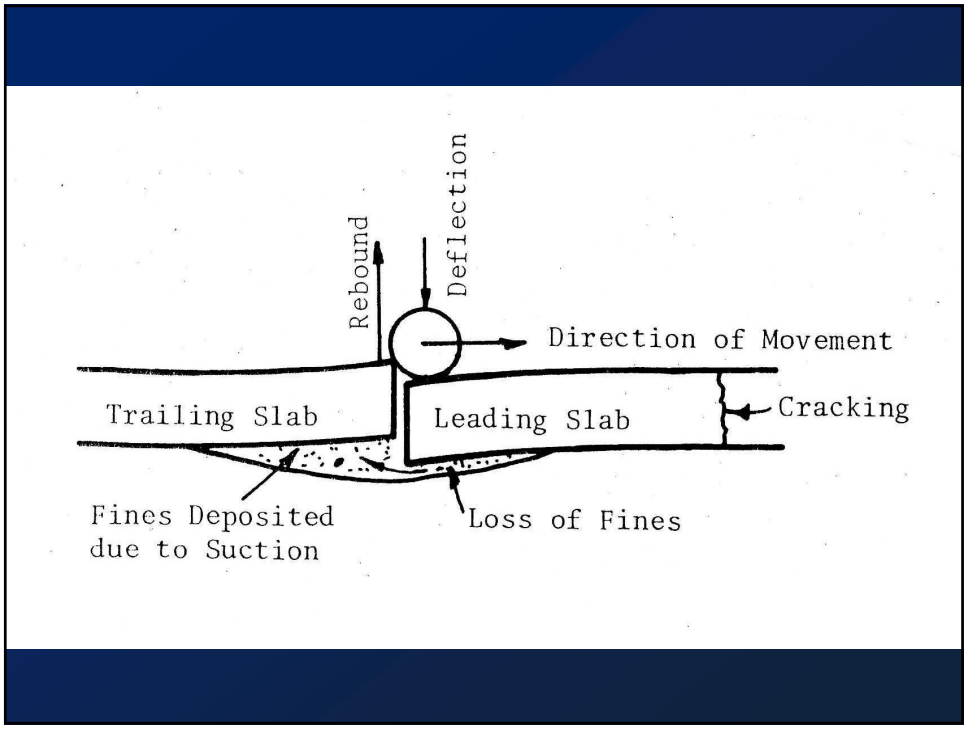
- Concrete pavement is divided into panels
  - Why?

63

Dowel Bar Theory

- What happens to the pavement strength at the cracks?

64



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Dowel Bar Theory

- How can this be avoided?

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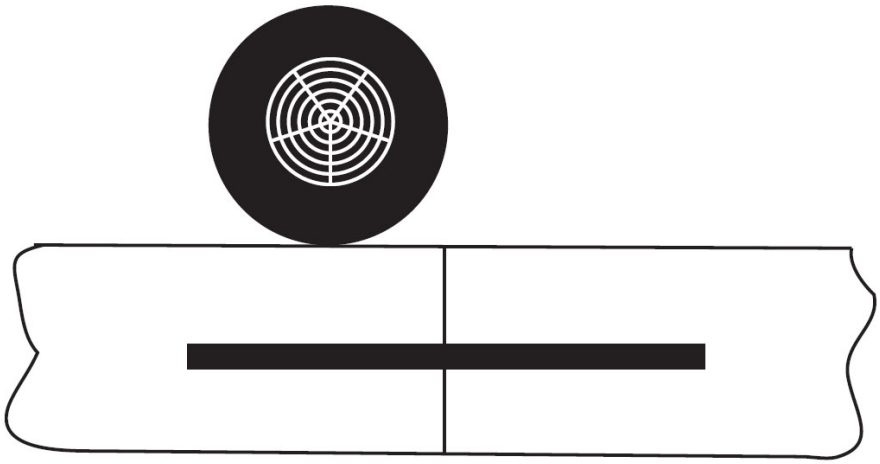

Dowels providing load transfer between pavement slabs

concrete paving workforce reference no. 3: concrete pavement joint sawing, cleaning, and sealing (CP Tech Center)

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Dowel Bar Theory

- What else happens at the joint?
- Expansion and Contraction
- Alignment of Dowels

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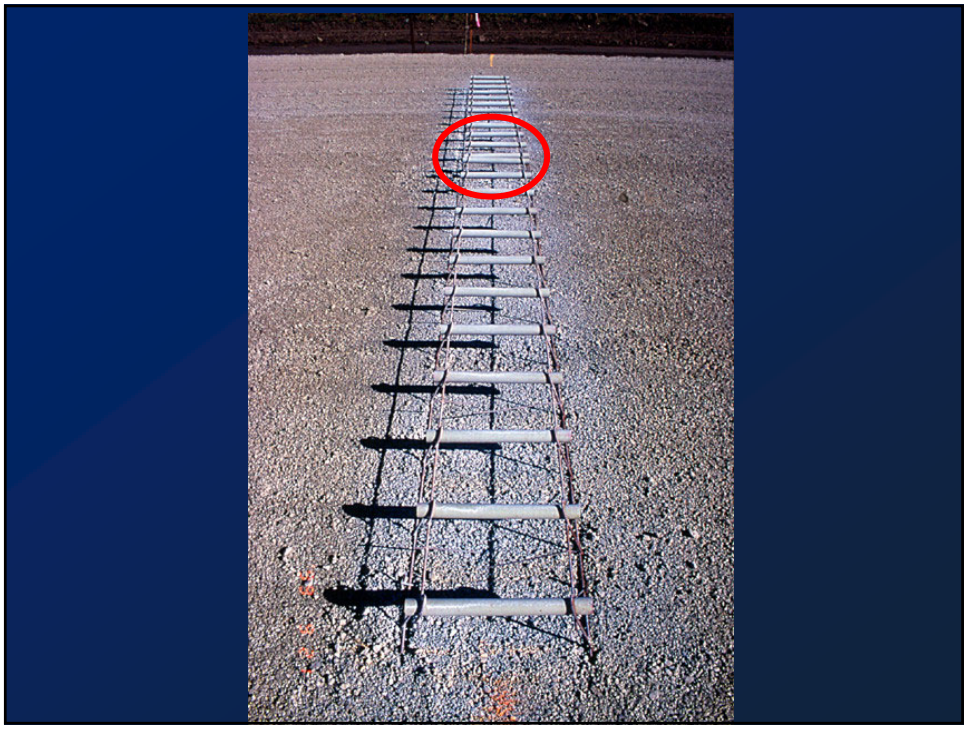

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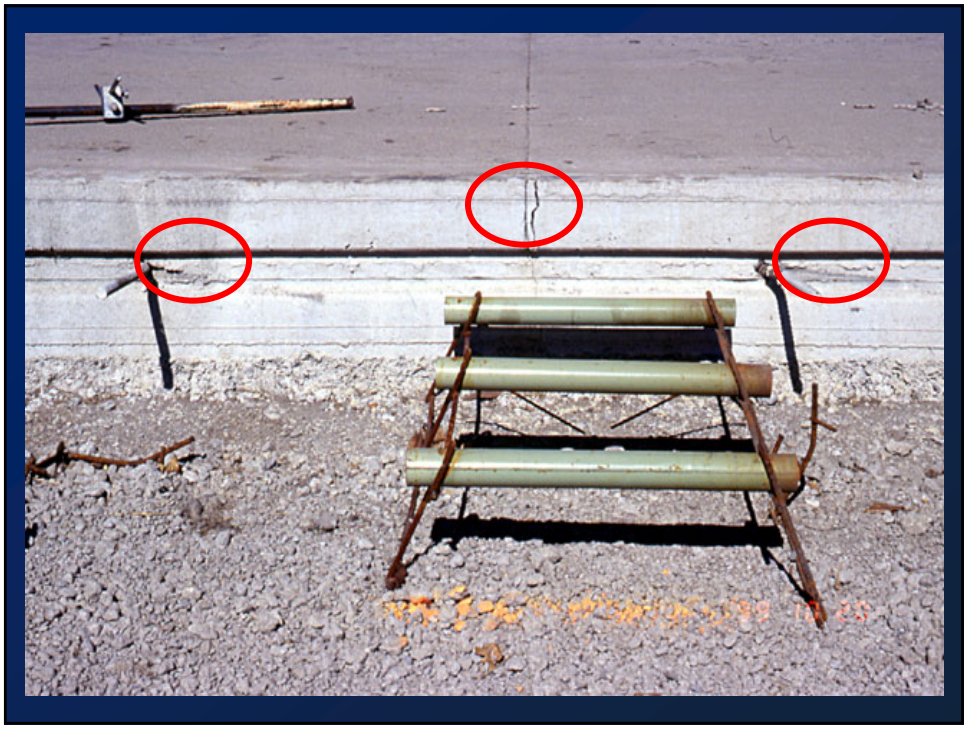

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Alignment

- Why check the alignment of the dowel baskets?

80

Alignment

- Failure of the pavement joint is guaranteed if the dowel basket is incorrectly placed. This check is very important!

81

Tie Bars

- Longitudinal joints
- Tie adjacent slabs
- Controls lateral movement & faulting

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Tie Bars

- Misalignment (tilting) not as critical
- Middle 1/3 of the slab thickness
- Often inserted during paving

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Paving Operations

- Safety
- Subgrade
- Reinforcing
- Concrete Delivery
- Testing
- Placement
- Consolidation

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Paving Operations

- Finishing
- Texturing
- Curing
- Cold Weather
- Sawing/Jointing

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Paving Operations - Safety

- Be Safety Conscious
  - Equipment
  - Distractions
  - Visibility

92

Paving Operations - Subgrade

- The First Day
  - Walk the grade out front throughout the day and subsequent days
    - Review subgrade
    - Review string line
    - Review reinforcement
    - Review of anything not looking correct

93

Paving Operations - Subgrade

94

Paving Operations - Subgrade

95

Paving Operations - Reinforcing

96

Paving Operations - Reinforcing

97

Paving Operations - Reinforcing

98

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Paving Operations - Delivery

Time Requirements - 401.8
Standard Specification

Variables			
Plant Type	**Delivery**	**Admixtures**	**Temp**
Batch	Agitating	Set retarder	Air
Central Mix	Non-Agitating	None	Concrete

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Paving Operations - Delivery

101

Paving Operations - Delivery

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Paving Operations - Delivery

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Paving Operations - Testing

- Concrete Consistency and Testing
  - Properties/Tests requirements and limitations (specs. sec. 400)
  - Testing Frequency (Construction Manual Part V)
    - Different For QC/QA and Non-QC/QA
    - Perform initial tests quickly
    - Make adjustments

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Paving Operations - Testing

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Paving Operations - Testing
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Paving Operations - Placement

Initial Concrete Placer / Spreader

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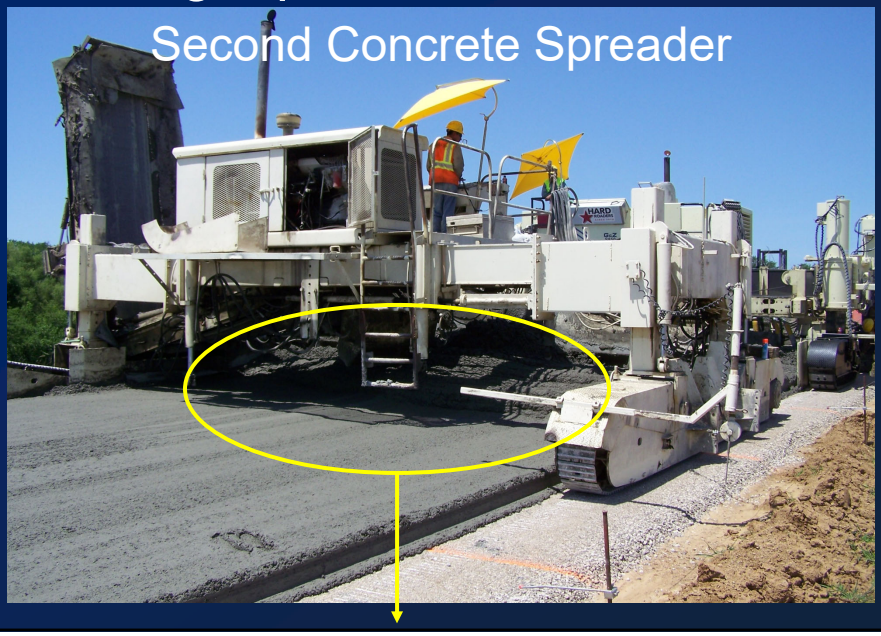
Paving Operations - Placement

Second Concrete Spreader



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Paving Operations - Placement

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Paving Operations - Placement

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Paving Operations - Placement

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Paving Operations - Placement

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Paving Operations - Placement

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Paving Operations - Placement
Keyway in top of slab

114

Paving Operations - Placement

115

Paving Operations - Placement

116

Paving Operations - Consolidation

- Consolidation – 154.2e
  - Uniform
  - 98% Density
  - Hand vibrators 5-15 seconds
  - Hand Vibrators immersed/withdrawn vertically - slowly

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Paving Operations - Consolidation

- Consolidation
  - Keep workers out of the concrete, if not necessary
    - Vibrate footprints
  - Even continuous amount of concrete above the vibrators
  - No vibrator contact with reinforcement, forms, etc.

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Paving Operations - Consolidation

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Paving Operations - Consolidation

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Paving Operations - Consolidation

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Paving Operations - Consolidation

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Paving Operations - Consolidation
Operator Keeping Burlap Drag Wet

123


Paving Operations - Consolidation

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Paving Operations - Consolidation

Contractor stabbing slab for depth

125

Paving Operations - Consolidation

Inspectors checking different parts of the paving train

126

Paving Operations - Consolidation

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Paving Operations - Finishing

- Finishing
  - Hand finishing should be kept to a minimum
  - Straightedge surface to remove high spots and locate low spots
    - Minimum 10 feet in length
    - Advance in successive stages of less than ½ the length of the straightedge
  - Remove surface irregularities
  - Repair edge slumps before concrete sets
    - Slumps in excess of .25 inch, excluding edge rounding
    - Discontinue paving if problems continue
  - Finish edge of pavement to the correct radius

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Paving Operations - Finishing

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Paving Operations - Finishing

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Paving Operations - Finishing

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Paving Operations - Finishing

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Paving Operations

- Finishing
- Texturing
- Curing
- Cold Weather
- Sawing/Jointing

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Paving Operations - Texturing

- Micro-texture
  - Damp burlap drag
  - Drug after surface moisture disappears
  - Full pavement width

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Paving Operations - Texturing

- Macro-Texture
  - Tining
    - Longitudinal unless otherwise noted
    - Proper spacing, width and depth
    - Correct time-not too wet, not too dry

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Paving Operations - Texturing

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Paving Operations - Texturing

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Paving Operations - Texturing

138

Paving Operations - Texturing

139

Paving Operations - Texturing

140

Paving Operations - Texturing

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Paving Operations - Texturing

142

Paving Operations - Curing

- Why cure?
- Curing preserves water for cement hydration, maximizing pavement strength and durability.
- Helps prevent the surface from drying out quicker than the rest of the slab, which could damage the surface, due to differential shrinkage.

143

Paving Operations - Curing

- Timing
- Walking/equipment not permitted on the surface
- This may be permitted once the pavement has cured sufficiently, and no damage is being done to the surface.

144

Paving Operations - Curing

- Acceptable curing material (Prequalified List (PQL)) – 501.4i(1)
  - White polyethylene sheeting
  - Curing blankets
  - Wet Burlap
  - White liquid membrane-forming compound
    - **Minimum** 1 gallon/ 150 square feet including the sides
    - Do not thin white membrane curing compound

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Paving Operations - Curing

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Paving Operations - Curing

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Paving Operations - Curing

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Paving Operations - Curing

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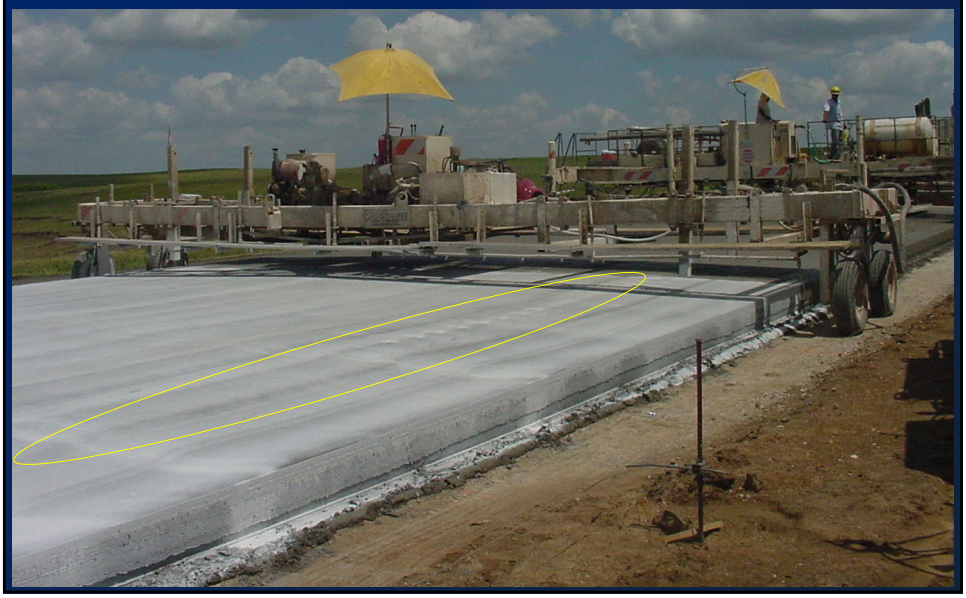
Paving Operations - Curing



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Paving Operations - Curing

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Paving Operations - Curing

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Paving Operations - Curing

153

Paving Operations - Curing

154

Paving Operations - Curing

- The white polyethylene sheet acts as a moisture barrier and reflects sunlight, which keeps the slab from overheating. **Do not use clear or black polyethylene sheeting, this material absorbs heat from sunlight.**

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Paving Operations - Curing

- Cure Period – 501.4i(3)a
  - Flexural strength ≥ 450 psi
  - 10-day cure period if flexural strength < 450 psi
  - 12 hours before removing forms.
    - Substitute cure material

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Class Exercise

- A Contractor slip form paved 1000 feet long by 24 feet wide by 12 inches deep.

  How much White Liquid Membrane-Forming Compound should be used for cure? Applied at 150 ft^2 per gallon.

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Solution

- 1000 feet X 24 feet = 24,000 ft^2
- 1000 feet X 2 sides X 1 foot = 2,000 ft^2

  26,000 ft^2

- 26,000 ft^2 / 150 ft^2 per gal. =173.33
- ~ 174 gallons

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Class Exercise

- A Contractor paved 2500 feet long by 22 feet wide by 11 inches deep in fixed forms.

  How much White Liquid Membrane-Forming Compound should be used for cure? Applied at 150 ft^2 per gallon.

159

Solution

- 2500 feet X 22 feet = 55,000 ft^2
- Nothing for the sides (forms) 0 ft^2

  55,000 ft^2

- 55,000 ft^2 / 150 ft^2 per gal. = 366.67
- ~ 367 gallons

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Video

- Concrete Paving Operations

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Paving Operations – Cold Weather

- Cold Weather Placement Limitations (specs. sec. 401.8(b))
  - Do not begin paving until air temp is 35° F and rising and is expected to exceed 40° F
  - Paving shall stop when the descending air temperature reaches 40° F
  - Do not place concrete on frozen sub grade or use frozen aggregates in concrete

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Paving Operations – Cold Weather

- Cold Weather Curing (specs. sec. 501.4(i) / 502.3(i))
  - Maintain a minimum surface temperature of 40° F for a minimum of 4 days after placement
  - Suitable blanketing material shall be close (such as straw, hay, burlap, concrete blankets, etc).
  - If the expected temperature is to drop below 35° F any time during the curing period precautions shall be taken.

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Paving Operations

- Finishing
- Texturing
- Curing
- Cold Weather
- Sawing/Jointing

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Paving Operations – Saw/Joint

- Different types of joints
  - Pressure Relief (Bridge Approach Pavement)
  - Contraction Joints
    - Sealed
    - Unsealed
  - Longitudinal Joints
  - Construction Joints

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

- Joints (specs. sec 500 and Plan Detail Sheets)
  - Create a plane of weakness in the fresh concrete before uncontrolled cracking occurs
  - Various methods, sawing is the most common
  - No wider than the initial saw cut (single pass) and to a depth of D/3 ± 1/4 inch.

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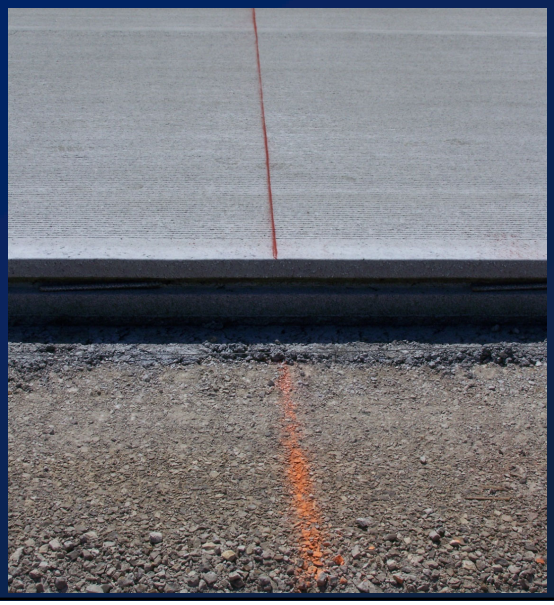
Paving Operations – Saw/Joint



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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

- Construct joints according to plans
- Two Stage Joints construction
- Repair or replace curing medium

175

Paving Operations – Saw/Joint

- First stage – Induced Plane of Weakness (Relief Cut)
  - Approximately 1/8 inch wide
  - Full depth shown in plans (D/3 ± ¼ inch)
  - Straight and in Correct location
  - Concrete Hard enough to prevent raveling
  - Before random cracking develops

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Paving Operations – Saw/Joint

- Second stage - Widening to full width
  - Concrete is at least 48 hours old
  - Delay longer if raveling occurs
  - Repair any damage to the cure material if curing is not complete
  - Repair any damage to sawed edges that would detrimentally affect the joint seal

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Paving Operations – Saw/Joint

- Cleaning joints
  - Clean the joint immediately after sawing the joint by flushing the joint with water under pressure and by use of other tools as necessary
  - Air compressors used for cleaning joints shall not have an air stream containing water or oil.
  - Before applying Hot or Cold joint sealant air blast the joint to remove incompressibles.
  - Before installing elastomeric joint seals, use water or sandblasting equipment for a final cleaning. Then immediately before sealing air blast the joint to remove any debris and visible water.

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

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Paving Operations – Saw/Joint

- Sealing joints
  - Location, size, configuration and acceptable joint sealant shall be shown on the plans.
  - Unless other wise shown on the plans or in the Contract seal joints as follows
    - **Transverse joints** shall be sealed with preformed elastomeric compression joint seals
    - **Longitudinal joints** shall be sealed with either cold applied chemically cured joint sealant or a hot type joint sealing compound.
  - Only one type of longitudinal joint sealant shall be used on a project, unless otherwise approved by the Engineer.

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Paving Operations – Saw/Joint

- Joints shall be sealed before opening to traffic. For construction traffic, the contractor shall protect the joint from foreign material getting into the unsealed joint by an approved method.
- Contractor shall have a technical representative of the joint sealant present during installation of the sealant. (may be waived by the Engineer)
  - Guidance on cleaning
  - Guidance on preparation
  - Guidance on installation

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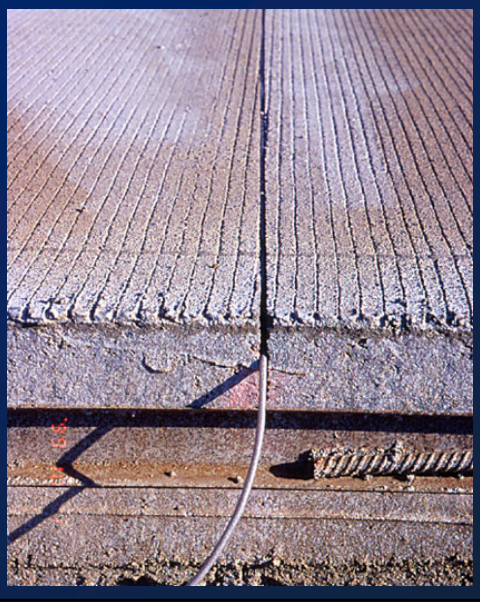
Paving Operations – Saw/Joint



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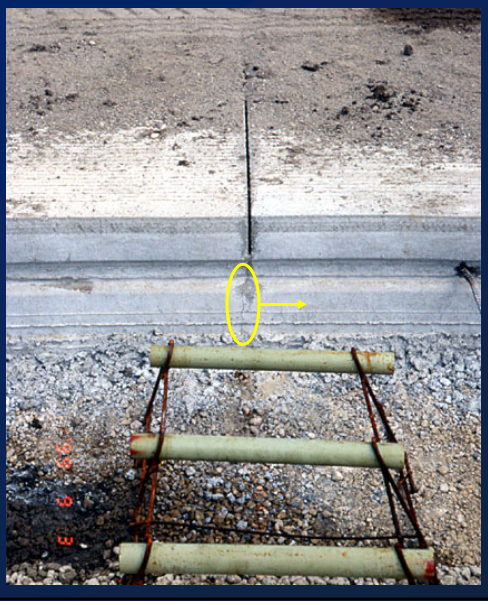
Paving Operations – Saw/Joint



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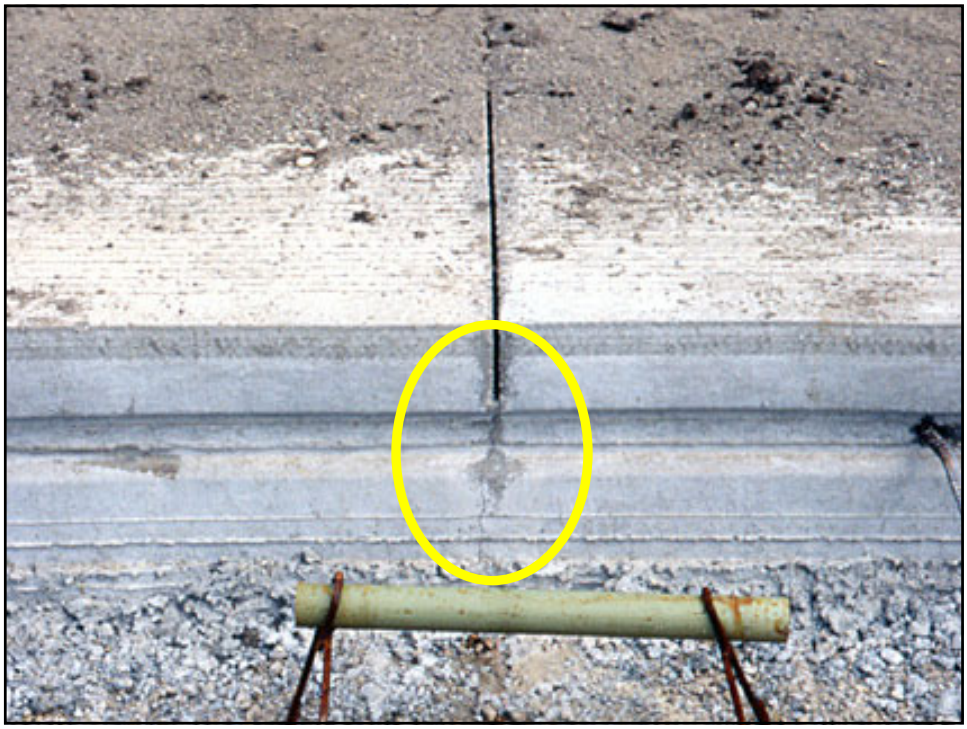


185

Paving Operations – Saw/Joint

- Cold Applied Chemically Cured Joint Sealant
  - Joints shall not be sealed until they are clean and dry.
  - Pavement has attained the age recommended by the manufacturer of the sealant.
  - Will not be done if the air temperature is less than 40° F or as specified in the manufacturer's publications.
  - When finished remove extra joint sealer from pavement surface
  - Do not allow traffic over sealed joints until they are tack free

186

Paving Operations – Saw/Joint

- Hot Applied Joint Sealing Compound
  - Joints shall not be sealed until clean and dry.
  - Pavement has attained the age recommended by the manufacturer of the sealant.
  - Must clean out the tank when changing brands or material exhibits undesirable characteristics.
  - When finished remove extra joint sealer from pavement surface
  - Do not allow traffic over sealed joints until they are tack free

187

Paving Operations – Saw/Joint

- Preformed Elastomeric Compression Joint Seals
  - Seal transverse joints full width with no splices. Unless required for phased construction.
    - If a splice is necessary, it should be at a longitudinal joint.
    - When sealing the longitudinal joint, encase the splice with sealant.

188

Paving Operations – Saw/Joint

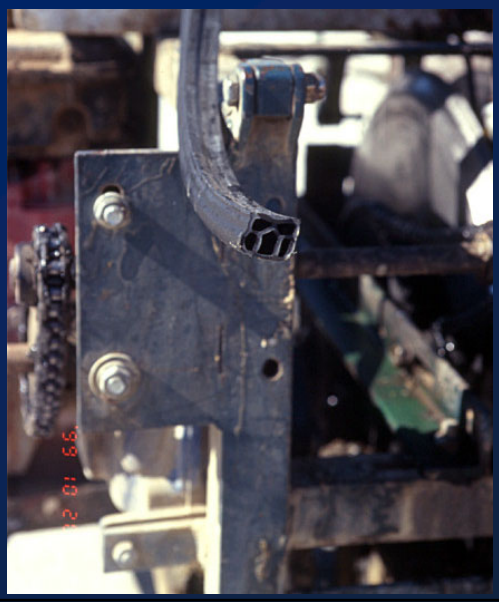
- Install with a machine designed to
  - Compress and install in a upright position
  - Does not cut, nick, distort, or damage the seal
- Installation of the seal will not stretch or compress the seal more than 3% of the length, unless stated in the manufacturer's written instructions.
  - The seal may remain in place if the stretching does not exceed 5% and the contractor is making a good faith effort to correct the problem.

189

Paving Operations – Saw/Joint

190

Paving Operations – Saw/Joint



191

Paving Operations – Saw/Joint

192

Paving Operations – Saw/Joint

193

Paving Operations – Saw/Joint

Sawed (non-sealed) Joints

- 1 cut
- 1/8” wide
- D/3 ± ¼”
- Clean
- Backer rod while under construction
- Seal joints sawed ≥ ¼” with Hot Applied Joint compound

194

Paving Operations – Joint Sealing

501.4g(9) or 502.3g(9)

- Transverse pavement joints – Seal with preformed elastomeric compression joint seals
- Longitudinal pavement joints - Full depth with either a cold applied chemically cured joint sealant or a hot joint sealing compound
- Use only 1 type of longitudinal joint sealant on a project
- Seal joints before opening to traffic

195

Paving Operations – Joint Sealing

501.4g(9) or 502.3g(9)

- Cold Applied Chemically Cured Joint Sealants
- Hot Applied Joint Sealing Compound
- Preformed Elastomeric Joint Seals

196

Paving Operations – Sawed (Non-Sealed) Joints

501.4g(9) or 502.3g(9)

- Saw joints 1/8 inch wide
- Joint depth D/3 +/- ¼ inch
- Immediately clean freshly cut joints with jet of water under pressure
- Repair curing membrane damaged during sawing and cleaning
- If joint sawed > 1/4" seal joint using Hot Applied Joint Sealing Compound

197

Defective Pavement Repair

- Each section of pavement must be inspected for defects.
  - Walking the slab is the most effective method.
  - Constant day-to-day visual observance/inspection.

198

Defective Pavement Repair

199

Defective Pavement Repair

200

Defective Pavement Repair

201

Defective Pavement Repair

- Each section of pavement with defects must be repaired by the contractor.
  - Repair depends on the type of pavement
    - Reinforced
    - Non-Reinforced
  - Repair also depends on the degree and location of the defect within a given pavement panel.
  - See 501.4(k) special provision for QC/QA
  - See 502.3(k) special provision for non-QC/QA

202

Defective Pavement Repair

- Spalls
  - Patch Size
  - Patch Location
  - Patch Material

203

Defective Pavement Repair

- New, Reinforced, Dowel Jointed
  - Transverse/Diagonal Cracks
    - Full Depth
  - Longitudinal Cracks

204

Defective Pavement Repair

- New Non-Reinforced Dowel Jointed & Mainline Plain PCCP
  - Transverse/Diagonal Cracks
    - Full Depth
    - Partial Depth
  - Longitudinal Cracks

205

Defective Pavement Repair

- Shoulder Plain PCCP
  - Transverse/Diagonal Cracks
  - Longitudinal Cracks

206

Pavement Thickness

- Tolerance In Pavement Thickness (Non QC/QA)
  - Constructed thickness will be determined by the average height measurement of the cores representing each pavement unit.
  - If pavement is less than the specified thickness treat it as specified in table 502-1
  - Pavement more than 1 inch deficient is to be removed (table 502-1)

207

Pavement Thickness

- Pavement Thickness (QC/QA)
  - Included in pay adjustment equations
  - Price adjustments are made for sections of pavement that are 1 inch deficient or less (table 502-2)

208

Pavement Thickness

209

Pavement Thickness

210

Pavement Thickness

211

Pavement Thickness

RECORD OF CORES TAKEN

Date	Location Sta	Dist to ℄	Plan Thickness	Actual Measured Thickness	Deficiency	Proportional Part of Contract price allowed	Remarks	Insp

212

Pavement Smoothness (503)

- Public Criticism
- Tied to Pay
- Profilograph
- 10 ft Straight Edge

213

Pavement Smoothness

- California type profilograph
  - Measures surface roughness
  - Contractor run machine
  - Certified Operator
  - Results within 2 working days

214

Pavement Smoothness

- Requirements vary depending on speed limit of the pavement being tested (table 503-1)
- If pavement fails to meet requirements corrective action must be taken (table 503-1)
  - Diamond grinding
  - Other approved profiling devices
  - Remove and replace entire thickness of pavement
- Grinding Requirements (Table 503-2)
- Re-profile after repairs are made
- Pay adjustments will be made off results of initial profile index (table 503-3)

215

Pavement Smoothness

- 10 ft Straight Edge
  - Areas not subject to profilograph
  - Engineer's discretion
  - 1/8 inch in variation
  - Correct > 1/8 inch tolerance
  - Retest after correction

216

Pavement Smoothness

- Pay Adjustments
  - Initial Reading
  - Continuously ground
  - Urban/Rural
  - Pavement Thickness after grind

217

Pavement Smoothness

218

Pavement Smoothness

219

Pavement Smoothness

220

Documentation

- Documentation Manual
  - http://www.ksdot.org/burconsmain/Connections/ConstManual/documentationtindex.asp
- Construction Checklist
  - http://www.ksdot.org/burconsmain/Connections/ConstManual/checklistindex.asp
  - Concrete Paving Diary Sample

221

Specifications

- 501 – QC/QA Paving
- 502 – Non-QC/QA Paving
- 503 – Pavement Smoothness
- 504 – Dowel Bar Retrofit-Repair New PCCP
- 505 – Tie Bar Insertion-Repair New PCCP

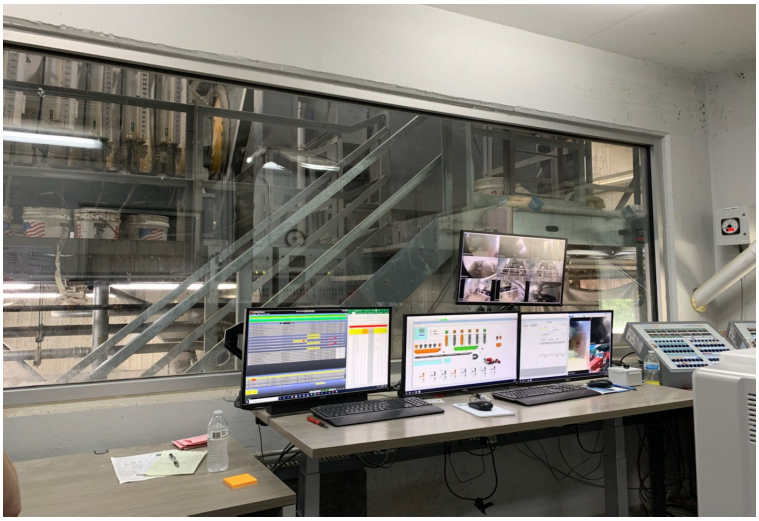
222

KDOT References/Resources

- 2015 Standard Specifications
- Project Plans
- Special Provisions
  - When there are some
- Construction Manual
- Documentation Manual

223

Concrete Batch Plant Inspection



1

Reference Materials

- 2015 Standard Specifications
- Division 150 (Equipment)
- Division 400 (Concrete)
  - SP 15-04003 On-Grade Concrete (replaces section 403)
  - SP 15-04005-R04 General Concrete (replaces section 401)
- Division 1116 (Aggregates for On Grade Concrete)
  - SP 15-11004 R02 (replaces section 1116)
- 2014 Construction Manual / 2022 Part V
- 4.06.05 Duties of a plant Inspector
- Appendixes A and B
- Documentation manual: http://www.ksdot.org/bureaus/burConsMain/Connections/ConstManual/documentationtindex.asp

2

Equipment Division 150

Section 152.1 Hauling Equipment

Aggregate hauling equipment: Use vehicles with bodies constructed and maintained to prevent loss of materials

3

4

Division 150 continued

Section 152.2 Weighing Equipment

Weighing equipment needs to be tested and certified by licensed service company at:

6 month intervals

After each setup and before being used on the project.

When the weighing devices are repaired; and at any other time deemed necessary by the engineer.

*Accurate to within 0.50%(per Errata Sheet) throughout the range of use

5

Finding Errata information

DIVISION 150 - EQUIPMENT

151 COMPACTION EQUIPMENT
152 HAULING AND WEIGHING EQUIPMENT
15-ER-1-R22 - ERRATA SHEET FOR STANDARD SPECIFICATION BOOK FOR STATE ROAD AND BRIDGE CONSTRUCTION, EDITION 2015
153 MIXING PLANT FOR STABILIZED BASE AND SHOULDERS
154 CONCRETE PAVEMENT AND CONCRETE STRUCTURE EQUIPMENT
15-ER-1-R22 - ERRATA SHEET FOR STANDARD SPECIFICATION BOOK FOR STATE ROAD AND BRIDGE CONSTRUCTION, EDITION 2015
155 ASPHALT SURFACING AND ASPHALT PAVEMENT RECYCLING EQUIPMENT
15-01501 - ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT
156 ROADSIDE IMPROVEMENT EQUIPMENT
157 OTHER EQUIPMENT
15-ER-1-R22 - ERRATA SHEET FOR STANDARD SPECIFICATION BOOK FOR STATE ROAD AND BRIDGE CONSTRUCTION, EDITION 2015

Return to Top

6

SECTION 152
HAULING AND WEIGHING EQUIPMENT

Page 150-4, subsection 152.2, second paragraph:

- The weighing devices shall be accurate to within 0.50% throughout the range of use.

SECTION 154
CONCRETE PAVEMENT AND CONCRETE STRUCTURE EQUIPMENT

Page 150-9, delete subsection 154.3 Subgrade Trimmers.

SECTION 155
ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

Page 150-14, delete subsection 155.6b.(2)(b) and replace with the following:

(b) Reclaimed Asphalt Pavement (RAP) Material Conveyor. If the plant is used for recycling, a dual weighing system is required to control delivery of virgin aggregate and RAP material to the drum. Equip the system with interlocking mechanisms that shall accurately deliver virgin aggregates and RAP material in proper proportions. Belt scales for the RAP material shall comply with **subsection 155.6b.(2)**.

SECTION 157
OTHER EQUIPMENT

Page 150-19, add the following:
157.4 SUBGRADE TRIMMERS

Use a standard manufacture rotary drum subgrade trimmer that is automatically controlled (from a reference system) in regard to both line and grade.

SECTION 205
EXCAVATION AND EMBANKMENT FOR HIGHWAYS

Page 200-18, subsection 205.4j., delete the tenth paragraph on the page (Where a grass median…) and replace with the following:

Where grass is to be planted, do not place any rock excavation material or shale in the top 18 inches of the area. Construct the top 18 inches with earthen material suitable for growth of vegetation.

SECTION 214
MECHANICALLY STABILIZED EARTH FILL

Page 200-29, subsection 214.2c. replace "ASTM A82" with " ASTM A1064" throughout entire subsection.

SECTION 501
PORTLAND CEMENT CONCRETE PAVEMENT

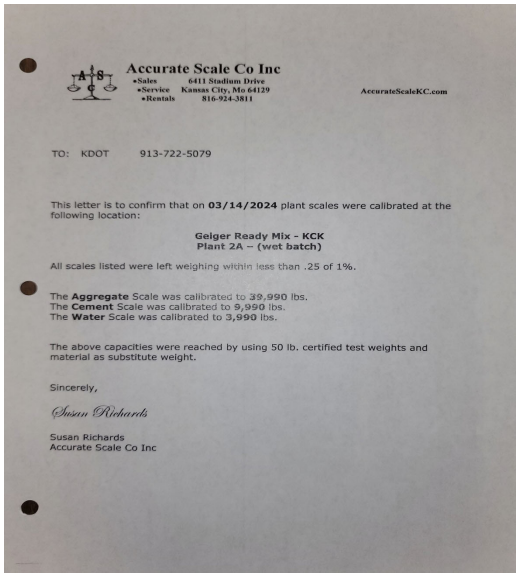
Page 500-4, subsection 501.3, delete third line and replace with the following:

Reinforcing Steel .....**DIV 1600/SEC 711**

Kansas Department of Transportation

7

Scale Certification



Accurate Scale Co Inc
•Sales 6411 Stadium Drive
•Service Kansas City, Mo 64129
•Rentals 816-924-3811
AccurateScaleKC.com

TO: KDOT 913-722-5079

This letter is to confirm that on **03/14/2024** plant scales were calibrated at the following location:

Geiger Ready Mix - KCK
Plant 2A – (wet batch)

All scales listed were left weighing within less than .25 of 1%.

The **Aggregate** Scale was calibrated to 39,990 lbs.
The **Cement** Scale was calibrated to 9,990 lbs.
The **Water** Scale was calibrated to 3,990 lbs.

The above capacities were reached by using 50 lb. certified test weights and material as substitute weight.

Sincerely,

Susan Richards

Susan Richards
Accurate Scale Co Inc

Kansas Department of Transportation

8

Water Calibration

Water can either be weighed or metered into the batch. Usually if it is weighed the scale company will calibrate it. If it is metered either the inspector or the scale company can certify the accuracy.

Water accuracy must be within 1% or less

- Sec 154.1b

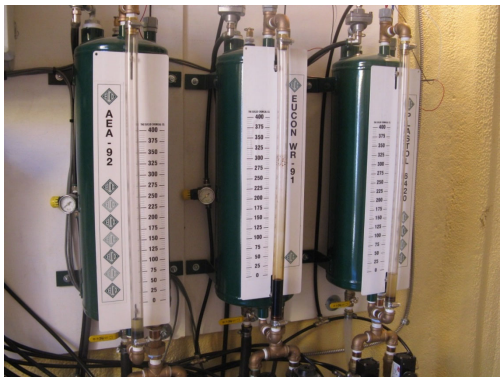
9

Admixture Measurement

- All admixtures being utilized must be calibrated every 6 months.
- Admixture calibration is similar to calibrating metered water.
- The computer batches a theoretical amount and the actual batched amount is compared.
- Admixtures need to be accurate to within 3%.

10

Admixture metering devices



11

Admixture dispensing

12

Admixture holding tanks

13

Division 150 Continued

Section 154.1 a/b
Concrete Batching and Mixing Equipment

Section 154.1 c
Truck Mixers and Agitators

14

DOT Form 618

This info is needed to obtain an AWP producer number for a new plant

Also used annually to reverify that the plant still conforms and hasn't changed anything

KANSAS DEPARTMENT OF TRANSPORTATION
REPORT ON SURVEY OF READY MIX CONCRETE PLANT

I. General Date _____

Name of Company _____ Location _____
Address _____ Owned By _____
_____ Phone No. _____
Date of Previous Inspection _____

II. Plant

Type of Plant Operation _____
Plant Make _____
Capacity of Plant _____ Cu. Yds. in _____ Hours, Based on _____ mile haul
Equipment for Cold Weather Concrete _____ Type _____
Provisions for time Marked Tickets _____ How _____
Facilities for Testing and Inspecting Materials _____
_____
Concrete Testing Equipment _____
_____

III. Cement - Fly Ash

Number of Seperate Storage Units for Cement _____ Type _____
Plant Equipment for Fly Ash _____ Type of Separate Storage Unit for Fly Ash _____
Type of Postive Lock-Out Device for Fly Ash _____
Scale Make _____ Type _____
Capacity _____ Smallest Scale Increment _____
Tare Adjustment _____ Accurate to 0.25% _____* Separate Hopper and Scales _____
Wind Protection _____ Hopper Vented and Sealed _____ Knife Edges Clean _____
Date of Latest Scale Certification _____ Over-Under Indicator in Operation _____
Discharges Competely _____ How Determined _____
Method Provided to Safely Obtain Sample from Stream _____

IV. Aggregates

Scale Make _____ Type _____
Capacity _____ Smallest Scale Increment _____
Tare Adjustment _____ Accurate to 0.25% _____* Separate Compartments _____
Date of Latest Scale Certification _____ Provisions for Removal of Overload _____
Wind Protection _____ Positive Control of Material into Weigh Hopper _____
Knife Edges Clean _____ Over-Under Indicator in Operation _____
Discharges Completely _____ How Determined _____
Method Provided to Safely Obtain Aggregate Sample From Stream _____
Method Used to Determine Aggregate Moistures _____
Method Used to Correct Batch to Batch Moisture Variations _____

V. Scales - General

500# of Test Weights Available _____ All Devices in View of Operator _____

Page 1

Revised 5-90 D.O.T. Form 618

15

VI. Water

Type of Measuring Device _____ Make _____
Measuring Device Automatic _____ Capacity _____
Equipment for Easy Calibration _____ How _____
Accurate to 1% _____* Water Source _____

VII Admixtures

Type of Measuring Device _____ Make _____
Measuring Device Automatic _____ Visual _____ Accuracy of Measurement 3% _____*
Admixture Type; (brand) AE _____, Other _____

VIII Mixer

Transit Mixers

Number	Make	Capacity	Counter in Place and Operable: Mixing	Agitating

Counter Type _____ Make _____
Manufacture's Metal Plates in Place _____, Clean and Readable _____
Manufacturers Literature Available _____; Hatch in Drum Periphery _____
Mixer Wash Water Handled Properly _____
Type of Calibrated Water Measuring Device _____ Accurate to 1% _____*

Central Mix

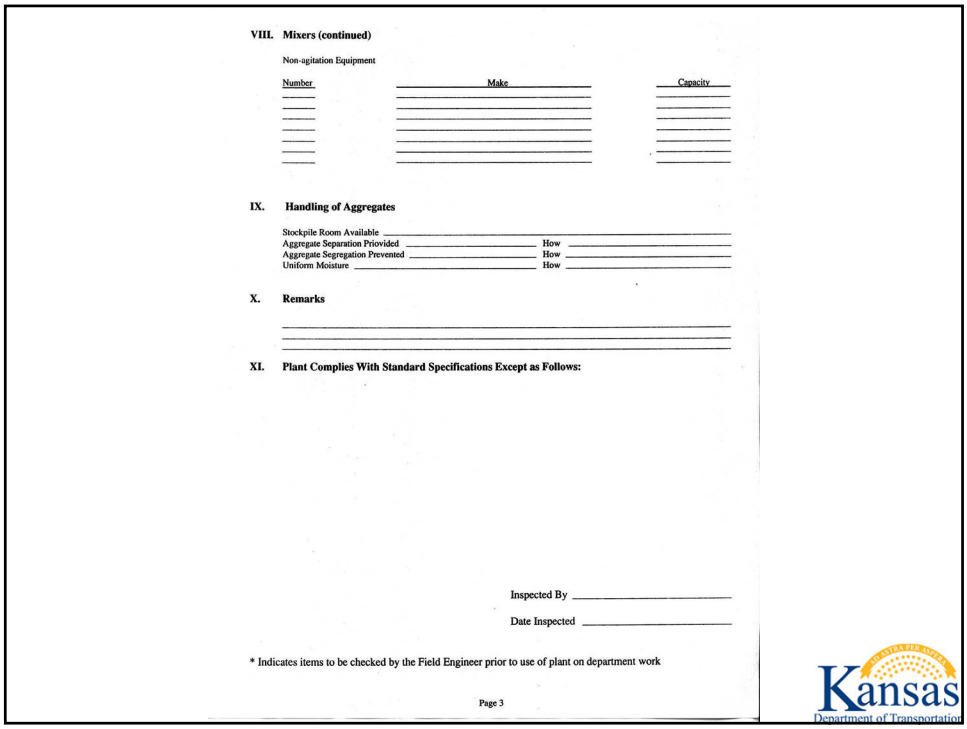
Manufacturer's Plate Attached _____ Drum Capacity _____ Drum Rotation Speed _____
Make _____ Timing Device _____ Automatic _____
Type of Timing Device _____
Discharges Completely _____ How Determined _____
Blades Clean _____ Discharge Boot in Good Condition _____

Agitation Equipment

Number	Make	Capacity

Page 2

16



VIII. Mixers (continued)

Non-agitation Equipment

Number	Make	Capacity

IX. Handling of Aggregates

Stockpile Room Available _____

Aggregate Separation Priovided _____ How _____

Aggregate Segregation Prevented _____ How _____

Uniform Moisture _____ How _____

X. Remarks

_____

_____

_____

XI. Plant Complies With Standard Specifications Except as Follows:

Inspected By _____

Date Inspected _____

* Indicates items to be checked by the Field Engineer prior to use of plant on department work

Page 3

17

Concrete Truck Checklist

Do non-agitating units(AKA dump trucks) have interior surfaces that are smooth and watertight, with rounded corners and have gates or other means to control the discharge from the truck?

Is the interior free from excessive accumulations of hardened concrete and from other obstructions or deterioration sufficient to interfere with the proper discharge of concrete and free from foreign materials?

18

Corners are trouble spots for build-up

19

Periodic cleanouts throughout the day are necessary to avoid buildup

20

Concrete Truck Checklist

Are paddles or blades of agitator delivery trucks free from build-up of mortar or concrete or is there excessive wear?

21

Free from excessive build-up

22

23

Concrete Truck Checklist

Check for the manufacturer's capacity plate on the ready mix trucks, which shows the volume of concrete which can be effectively mixed or agitated within the drum, and the recommended mixing and agitating speed.

24

Ready-Mix trucks should have a manufacturers plate

25

More typical manufacturers plate

26

Concrete Truck Inspection

Are pick-up and throw-over blades excessively worn, cracked or broken?

Is the drum equipped with a counter to record revolutions of the drum at mixing and agitating speeds?

27

Revolution counter

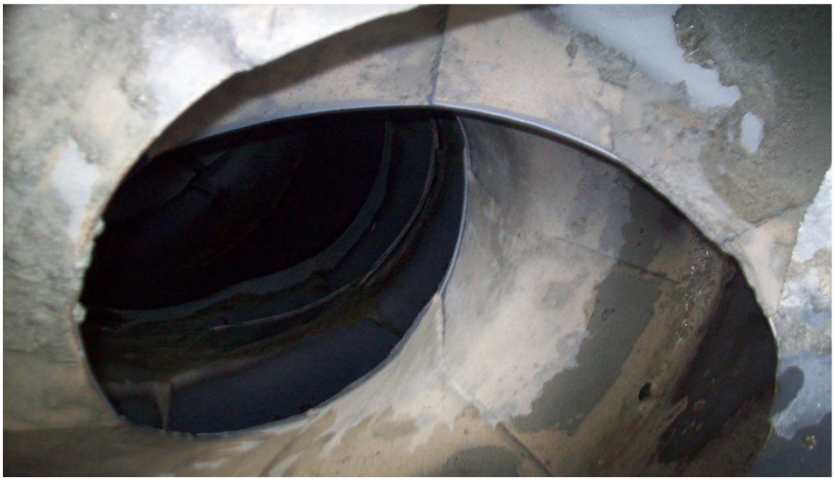
28

Concrete Truck Checklist

Are drums generally clean and free from excess mortar build-up or other obstructions that may impair mixing or discharge of fresh concrete?

29

Ready Mix Drum Interior



30

There are 2 Main Types of Concrete Plants

- Wet Batch / Plant Mixed
- 200 revs
- Dry Batch / Truck Mixed
- 300 revs

31

Central and On-Site Concrete Mixers (Wet Batch) Section 154.1b Page 150-6

Use standard manufacture concrete mixers capable of combining aggregate, cement (or fly ash) and water (and admixtures, if any) into a uniform mixture within the specified mixing period. Use mixers capable of discharging the concrete without segregating the mixture.

Additional requirements for central and on-site concrete mixers:

- A manufacturer's plate attached to the mixer listing the capacity of the drum (volume of mixed concrete) and the speed of rotation of the mixer drum or blades;
- A timing device that automatically locks the discharge lever when the drum is charged, and releases it at the end of the mixing period;
- A warning device, either audible or visible, that signals the release of the discharge lever (end of the mixing period);
- An automatic water-measuring device (measured either by weight or volume, accurate within 1% of the quantity required) capable of discharging the desired quantity of water into the mixer drum; and
- A semi-automatic, air-entraining agent measuring device capable of discharging the desired quantity of air-entraining agent into the flow (of the mixing water) of the water discharge line.

32

Truck Mixers and Agitators(**Dry Batch**)

Section 154.1c

- Truck Mixers. Use standard truck mixers capable of combining aggregate, cement/fly ash, and water and admixtures into a uniform mixture within the specified number of revolution (70 to 100) without segregating the mixture.
- Reguirements:
- A drum of appropriate size for the batched dry concrete
- A manufacturers plate attached listing mixing and agitating speeds and capacities.
- A revolution counter
- Truck Agitators. Use standard manufacture truck agitators capable of agitating and discharging the concrete without segregating the mixture.
- Requirements:
- A drum of appropriate size not to exceed 80% of gross volume of expected batch
- A manufacturers plate attached listing agitating speeds
- A revolution counter

- Routine cleaning is necessary to ensure consistent concrete

Kansas Department of Transportation

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34

Division 400

Section 401 General Concrete

Replaced by SP 15-04005 R04

Section 402 Structural Concrete

Section 403 On Grade Concrete

Replaced by SP 15-04003

35

Section 401

Special Provision 15-04005 R04 Sheet 1 and 2

Concrete Mix Design

Design concrete according to contract documents

Take full responsibility of actual proportions of the concrete mix

Provide aggregate gradations that comply with Division 1100

Submit all concrete mix designs to the engineer for review and approval. Submit completed volumetric mix designs on KDOT form 694 and all required attachments at least 60 days prior to placement of concrete. The engineer will provide an initial view of the design within 5 business days following submittal.

Once approved a concrete mix cannot be changed without resubmitting test data confirming continued compliance. A mix design will remain approved provided it has been appropriately tested and verified within the last 12 months.

36

15-04005 R04

Sheet 6 of 13 401.3 K(5)

- **Do not add water after plasticizer is added to the concrete mixture.**
- (5) **Field Adjustment to Admixtures.** Limited adjustments to the dosage rate of accelerators, set-retarders, water reducers, and air-entraining admixtures are permitted to compensate for environmental changes during placement without a new concrete mix design or trial batch. Test the concrete for temperature, air content, and slump whenever changes are made to the dosage rates to ensure continued compliance with the specifications. The allowable adjustments are based on the dose used in the Approved Concrete Mix Design and according to the following:
- **Do not exceed the accelerator dosage used in the Approved Concrete Mix Design.** The accelerator
- dosage may be reduced or eliminated as needed. Redosing accelerators is not permitted
- **The water reducer dosage used in the Approved Concrete Mix Design sets the minimum permitted dose**
- **for use in the field.** The water reducer dose may be increased from that shown in the Approved Concrete
- Mix Design provided that the slump does not to exceed the maximum designated slump. Slump
- reduction may be obtained by withholding a portion of the mix water as specified in **subsection 401.8a.**

- **Redosing of water reducers and air-entraining admixtures is permitted to control slump or air content in**
- **the field, when approved by the Engineer, time and temperature limits are not exceeded, and at least 30**
- **mixing revolutions remain before redosing.** Redose according to manufacturer's recommendations.

- **Set retarders may be added as needed during production.** Do not include set retarders in the Concrete
- submitted for Mix Design Approval. Redosing retarders is not permitted. Paperwork for submitted mix
- designs (Form 694) with no (zero) water reducer and/or set retarder in the original Concrete submitted
- for Mix Design Approval must show the manufacturer of the admixtures that may be included in the
- Project Concrete.

Kansas Department of Transportation

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Revised 03/14/2016

KANSAS DOT
CONCRETE MIX DESIGN

PRINT ALL REQUIRED PAGES

Project Number	46 KA 4291-01	Spec Max W/C	0.44	* Design Air	6.5%
Contract Number	510016135	* Design W/C	0.44	Design Slump	4
Concrete Class	GR 4.5 AE SA	Spec Min CF	517		
Concrete Producer	GEIGER READY MIX	* Design CF	564	(includes all cementitious)	
Aggregate Designation	MA-3	*Fields are required for batch calculcations.			

	Material Type or Name	Producer Name	Producer ID Number	Official Quality	Amount in Mix*	Specific Gravity
Aggregate No. 1	SCA-4	Martin Marietta Stamper Quarry	00803510	15-2654	58.0%	2.64
Aggregate No. 2	FAA Sand	Holliday Sand & Gravel Plant 3	00815412	13-1245	42.0%	2.61
Aggregate No. 3						
Aggregate No. 4						
Cement	Portland Type I/II	Buzzi Unicem, Cape Giradeau	00000103		80.0%	3.15
Other Cementitious No. 1	Class F Fly Ash	Ashgrove, Chanute KS (Durapoz F)	00003001		20.0%	2.80
Other Cementitious No. 2						
Water						
Air Entraining Admixture	Daravair 1400	Grace	701		8.46	
Admixture No. 1	Adva 140M	Grace	701		50.76	
Admixture No. 2	Daraset 200	Grace	701		2%	
Admixture No. 3						

* Amount in Mix column: Use whole number percentages (i.e. 40 or 15) for aggregates and cementitious materials; assume oz/cy for admixtures.

Note: Water adjustments should be made when admixtures are used at large dosages (i.e. dosages of accelerators, corrosion inhibitors, SRAs, etc.)

Mix Design Used Previous: Yes KDOT Mix Design Number 1PMC174 (if known) Date Last Used #######

Please include the following information along with this completed form:
- Materials Certifications
- Compressive Strength Results (KT-76)
- Permeability Test Results (KT-73, KT-79, or AASHTO T-277)
- Reactivity Test Results (ASTM C 1567, if SCMs are used)

Please fill in the table to the right with the test results, in addition to providing hard copies of the actual test reports

MIX DESIGN TEST RESULTS		
Air Content, %		5.10
Slump, in.		2.75
Compressive Strength (28 day)		7080.00
Only one of the three is required:	KT-73	
	KT-79	17.7
	AASHTO T-277	
ASTM C 1567 (if necessary)		0.02

CLICK TO SIGN Rusty Owings Geiger RM 913-555-5555 6/15/2016

NOTE: Please make sure that when this form is submitted to the construction or district office, ensure that all three (3) pages are included.

Printed on 6/15/2016 1 KDOT Form Number 694

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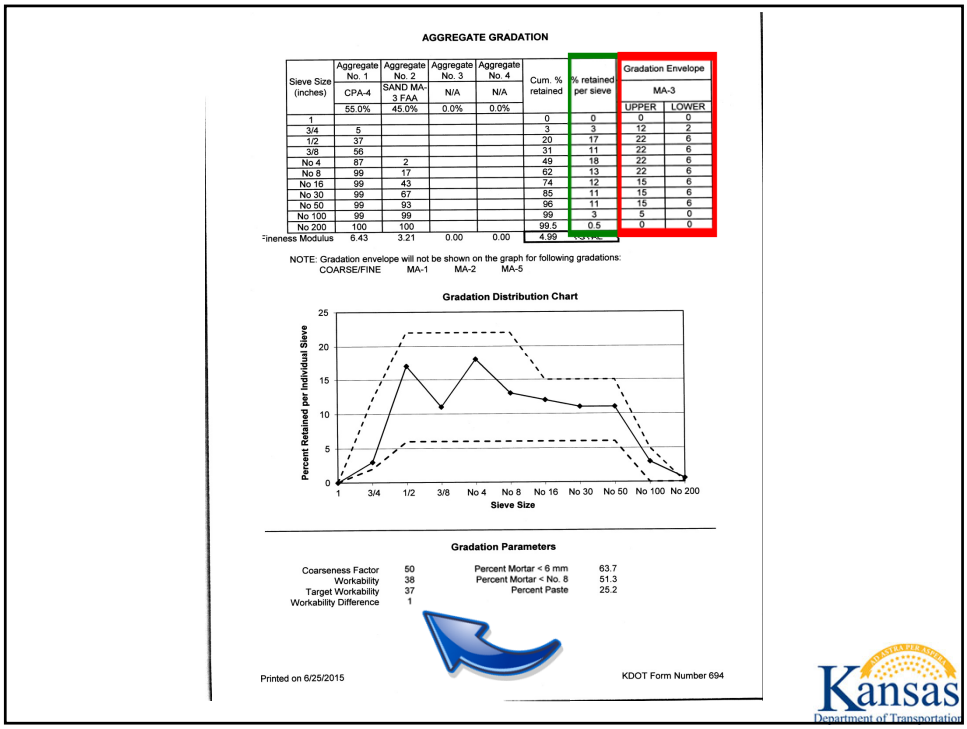

AGGREGATE GRADATION

Sieve Size (inches)	Aggregate No. 1 CPA-4	Aggregate No. 2 SAND MA-3 FAA	Aggregate No. 3 N/A	Aggregate No. 4 N/A	Cum. % retained	% retained per sieve	Gradation Envelope MA-3 UPPER	Gradation Envelope MA-3 LOWER
	55.0%	45.0%	0.0%	0.0%				
1					0	0	0	0
3/4	5				3	3	12	2
1/2	37				20	17	22	6
3/8	56				31	11	22	6
No 4	87	2			49	18	22	6
No 8	99	17			62	13	22	6
No 16	99	43			74	12	15	6
No 30	99	67			85	11	15	6
No 50	99	93			96	11	15	6
No 100	99	99			99	3	5	0
No 200	100	100			99.5	0.5	0	0
Fineness Modulus	6.43	3.21	0.00	0.00	4.99			

NOTE: Gradation envelope will not be shown on the graph for following gradations:
COARSE/FINE MA-1 MA-2 MA-5

Gradation Distribution Chart

Gradation Parameters

Coarseness Factor	50	Percent Mortar < 6 mm	63.7
Workability	38	Percent Mortar < No. 8	51.3
Target Workability	37	Percent Paste	25.2
Workability Difference	1		

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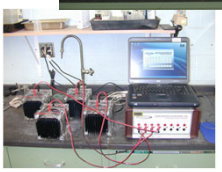
Test Data For Mix Design

- Test data from KT-73 tested at 28 days, KT-79 tested at 28 days or AASHTO T-277 tested at 56 days for all bridge overlays, Moderate Permeability Concrete, and any project with over 250 cubic yards of concrete (this includes structural concrete, on grade concrete etc.).
- Single point grading for the combined aggregates along with a plus/minus tolerance for each sieve.
- Laboratory 28 day compressive strength test results on a minimum of 1 set of 3 cylinders produced from the mix design with the highest water to cementitious ratio for the project, utilizing all actual materials proposed for use on the project at designated percentages.
- Historical mix production data for the plant producing concrete for the project to substantiate the standard deviation selected for use in subsection 401.3b.
- Mix designs will remain approved when verification testing for strength and permeability conducted within the last 12 months.
- Improvements in concrete strength, workability, durability and permeability are possible if the combined aggregate grading is optimized.
- With the exception of concrete for pavement as shown in **SECTION 403**, use the middle of the specified air content range of 6½ ± 1.5% for the design of air entrained concrete.
- Maximum air content is 10%. Take immediate steps to reduce the air content whenever the air content exceeds 8%.

40

PERMEABILITY

- KT-73 (Voids in Hardened Concrete aka Boil test) is the only one that actually tests permeability.
- AASHTO T277 (Rapid Chloride Permeability) and KT-79 (Surface Resistivity aka Resipod) are both electrical conductivity tests.



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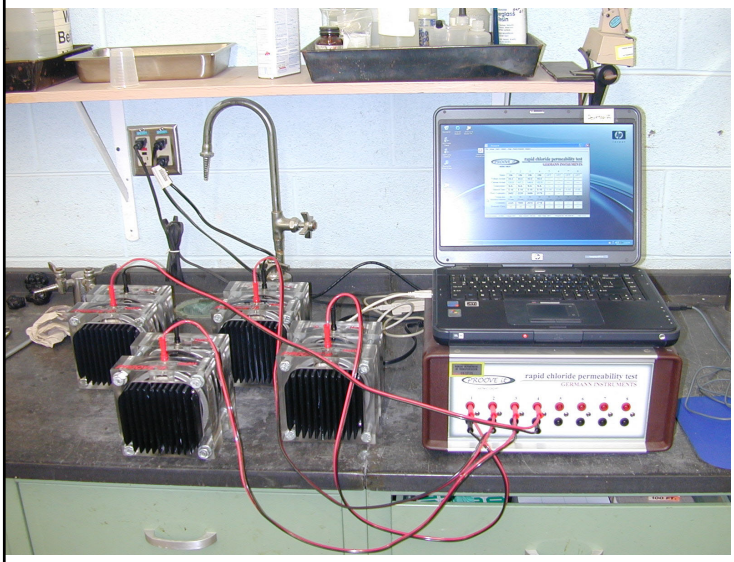
RCP EQUIPMENT



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SURFACE RESISTIVITY EQUIPMENT
RESIPOD (KT-79)

- Extension cable set

Mfgr: Proceq SA

43

BOIL TEST EQUIPMENT (KT-73)

44

2” samples from cylinders or cores for the voids in hardened concrete test (Boil Test)

45

TABLE 401-2: ALLOWABLE SUBSTITUTION RATE FOR SUPPLEMENTARY CEMENTITIOUS MATERIAL

Special Provision 15-04005-R04 Sheet 4

Material Substitution Rate*	
Slag Cement	40% Maximum
Fly Ash	25% Maximum
Blended SCM	25% Maximum
Natural Pozzolans	25% Maximum
Silica Fume	5% Max
Total Combined	50% max SCM

* Total Substitution Rate includes material in **pre-blended cements** and blended SCMs

46

TABLE 401-1: PORTLAND CEMENT & BLENDED HYDRAULIC CEMENT (15-04005-R04 Sheet 3)

Concrete for:	**Type of Cement Allowed**
On Grade Concrete	Type IP(x) Portland-Pozzolan Cement
	Type IS(x) Portland- Slag Cement
	Type IT(Ax)(By) Ternary Blended Cement
	Type 1L(x) Portland-Limestone Cement
	Type II Portland Cement
All Concrete other than On Grade Concrete.	
	Type I Portland Cement
	Type IP(x) Portland-Pozzolan Cement
	Type IS(x) Portland- Slag Cement
	Type IT(Ax)(By) Ternary Blended Cement
	Type 1L(x) Portland Limestone Cement
	Type II Portland Cement
High Early Strength Concrete	Type III Portland Cement
	Type I, IP(x), IS(x), IT(Ax)(By), 1L(x) or II Cement may be used if strength and time requirements are met.

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TABLE 401-3: CONCRETE STRENGTH REQUIREMENTS Specified 28 Day Compressive Strengths, minimum, psi *f'c*

Grade of Concrete:	**Non Air Entrained/Air Entrained Concrete**
Grade 7.0	7,000
Grade 6.0	6,000
Grade 5.0	5,000
Grade 4.5	4,500
Grade 4.0	4,000
Grade 3.5	3,500
Grade 3.0	3,000
Grade 2.5	2,500

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High Early Strength Concrete

Special Provision 15-04005-R04, Sheet 4

Design the high early strength concrete mix to comply with strength and time requirements specified in the Contract Documents.

Unless otherwise specified, design high early strength concrete for pavement at a minimum of 1 of the Contractor's standard deviations above 2400 psi (cylinders) at 24 hours.

Special Provision 15-08016 states:

- **j. Opening to Traffic.**
- When a minimum flexural strength of 380 psi or minimum compressive strength of 1800 psi is obtained from properly cured specimens.

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Calculation on water to withhold for Calcium Chloride Addition

$$1\% = \frac{32(\text{oz.}) \times \text{hundred weight of Cement}}{128(\text{oz.})}$$

$$2\% = \frac{64(\text{oz.}) \times \text{hundred weight of Cement}}{128(\text{oz.})}$$

Example for 1% for **564Lbs** of Cement

$$\frac{32 \times 5.64}{128} = 1.41 \text{ Gal/Per Yd.}$$

***Cement quantity is based on total cementitious for the particular mix**

50

Measurements for Proportioning Materials
Sec 401.4
Special Provision 15-04005-R04 sheet 6

Cement	0.5%
SCM (slag, silica, fly ash)	0.5%
Water	1.0%
Aggregates	0.5%
Admixtures	3.0%

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For Deliveries Made In Missouri: Notice to Owner

Failure of this contractor to pay those persons supplying material or services to complete this contract can result in the filing of a Mechanic's Lien on the property which is the subject of this contract pursuant to Chapter 429 RSMo. To avoid this result you may ask this contractor for "Lien Waivers" from all persons supplying material or services for the work described in this contract. Failure to secure lien waivers may result in your paying for labor and material twice.

For Deliveries Made In Kansas: Notice to Owner

Failure of this contractor to pay those persons supplying material or services to complete this contract can result in the filing of a Mechanic's Lien on the property which is the subject of this contract pursuant to K.S.A. 60-1103. To avoid this result you may ask this contractor for "Lien Waivers" from all persons supplying material or services for the work described in this contract. Failure to secure lien waivers may result in your paying for labor and material twice.

SUBTOTAL
TAX
TICKET TOTAL
PREVIOUS TOTAL

LOAD PLANT:Leavenworth, KS PLANT OPERATOR: Rick Snider

Slump		Water						Wat/Cem Ratio		Load T
Designed	Batched	In Truck	Adjust	Trim	Designed	Actual	To Add	Design	Actual	Weig
3 in	4 in	0.0 gl	0.0 gl	3.0 gal	145.3 gl	136.3 gl	9.0 gl	0.440	0.407	1940

Material	Specific Gravity	Quanities Design	Required	Batched	Absorption	Moisture	Variance	Water
BUZ_I/II	3.15	440 lb	2200 lb	2205 lb			0.23%	
DURAPOZ	2.6	110 lb	550 lb	585 lb			1.27% +	
COOPCPA4	2.69	1676 lb	8510 lb	8490 lb	0.01	1.55% A	-0.13%	16
MA3	2.62	1371 lb	7087 lb	7350 lb	0.00	3.39	3.71% +	29
WATER	1	242 lb	765 lb	765 lb			0.05%	92
AIR	0	.65 /C	17.88 oz	18.00 oz			0.70%	
ADVA140	0	5.00 /C	137.50 oz	137.00 oz			-0.36%	

Percentage

NOTES

DANGER M... IRRITATION TO EYES AND SKIN. READ THIS WARNING BEFORE USING.

Contains Portland Cement. Contact with wet (unhardened) concrete, mortar, cement or cement mixtures can cause skin irritation, severe chemical burns, or serious eye damage. Avoid contact with eyes and skin. Wear waterproof gloves, a fully buttoned long-sleeved shirt, full-length trousers, and tight fitting eye protection when working with these materials. If you have to stand in wet concrete, use waterproof boots that are tight at tops and high enough to keep concrete from flowing into them. If you are fini concrete, wear kneepads to protect knees. Wash wet concrete, mortar, cement, or cement mixtures from your skin with fresh, clean water immediately after contact. Indirect contact through clothing can be as serious as direct contact, so promptly rinse out concrete, mortar, cement or cement mixtures from clothing. Seek immediate medical attention if you have persistent or severe discomfort. In case of eye contact, flush with plenty of water for at least 15 minutes. Consult a physician immediately. KEEP OUT REACH OF CHILDREN.

USER AGREES TO CONVEY THIS WARNING TO ALL PERSONS WHO MAY PURCHASE, USE OR COME IN CONTACT WITH WET (UNHARDENED) CONCRETE, MORTAR, CEMENT, OR CEMENT MIXTURES

Pmt Amount Pmt Method DP Initials X

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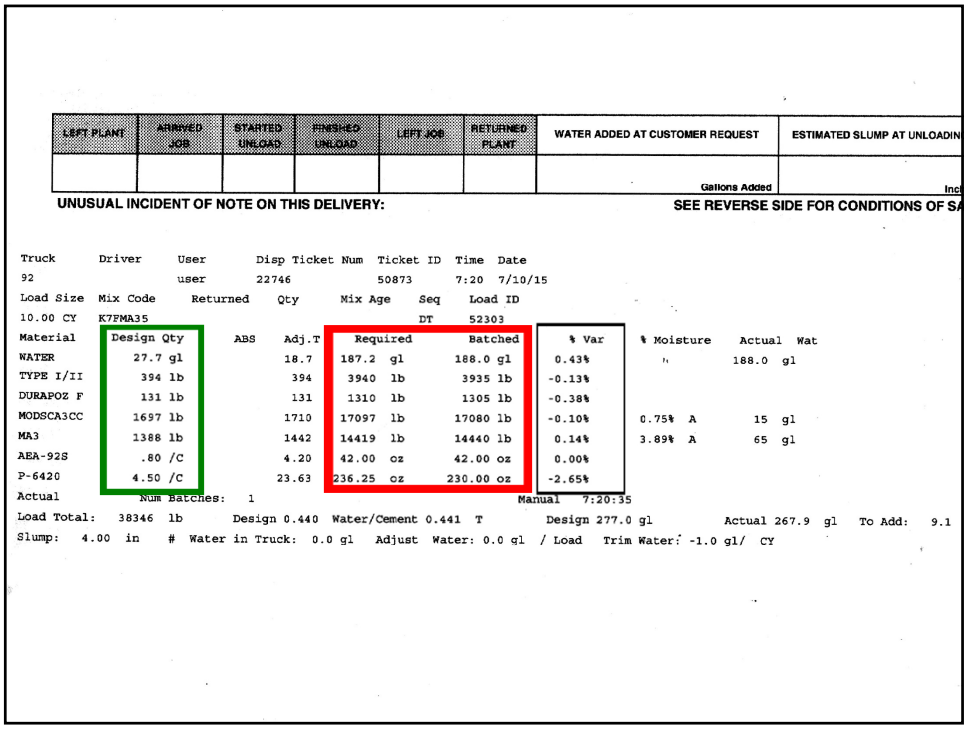

LEFT PLANT	ARRIVED JOB	STARTED UNLOAD	FINISHED UNLOAD	LEFT JOB	RETURNED PLANT	WATER ADDED AT CUSTOMER REQUEST	ESTIMATED SLUMP AT UNLOADIN
						Gallons Added	Inc

UNUSUAL INCIDENT OF NOTE ON THIS DELIVERY: SEE REVERSE SIDE FOR CONDITIONS OF SA

Truck	Driver	User	Disp Ticket Num	Ticket ID	Time	Date
92		user	22746	50873	7:20	7/10/15

Load Size	Mix Code	Returned	Qty	Mix Age	Seq	Load ID
10.00 CY	K7FMA35				DT	52303

Material	Design Qty	ABS	Adj.T	Required	Batched	% Var	% Moisture	Actual	Wat
WATER	27.7 gl		18.7	187.2 gl	188.0 gl	0.43%		188.0 gl	
TYPE I/II	394 lb		394	3940 lb	3935 lb	-0.13%			
DURAPOZ F	131 lb		131	1310 lb	1305 lb	-0.38%			
MODSCA3CC	1697 lb		1710	17097 lb	17080 lb	-0.10%	0.75% A	15 gl	
MA3	1388 lb		1442	14419 lb	14440 lb	0.14%	3.89% A	65 gl	
AEA-92S	.80 /C		4.20	42.00 oz	42.00 oz	0.00%			
P-6420	4.50 /C		23.63	236.25 oz	230.00 oz	-2.65%			

Actual Num Batches: 1 Manual 7:20:35

Load Total: 38346 lb Design 0.440 Water/Cement 0.441 T Design 277.0 gl Actual 267.9 gl To Add: 9.1

Slump: 4.00 in # Water in Truck: 0.0 gl Adjust Water: 0.0 gl / Load Trim Water: -1.0 gl/ CY

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Handling of Materials 15-04005-R04 Sheet 7 401.4c

1. Aggregate stockpiles should be marked with an “Approved Materials’ sign(specified in section 106.8) and limited to 250 ton or 500 ton for a mixed aggregate.
2. Do not use segregated aggregate
3. Cementitious material should be stored in a protected environment.
4. Provide aggregate with a moisture content +/-0.5% from the average of that day.

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55

56


3846
HM
MC GRN
3/4 "
CPA-4
JCA
3/4 "
4
41

57


2871
HM
STP
3/4 "
MO-D
3846
HM
MC GRN
3/4 "
CPA-4

58

59

60

61

62

63

64

65

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Certified Concrete

Special Provision 15-04005 R04 Sheet 9 : 401.7

If KDOT inspection forces are not available on a temporary basis, the Engineer may authorize the use of concrete from approved concrete plants.

The engineer **will not** authorize the use of certified concrete for major structures such as bridges, RCB box bridges, RCB culverts, permanent main line and ramp pavement or other structurally, critical items.

Each load of certified concrete must be accompanied by a ticket filled out appropriately by certified plant personnel.

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Mixing Delivery and Placement Limitations (SP 15-04005 R04/401.8)

- Batch the concrete in a central mix plant(wet plant), in a truck(dry batch), or in a drum mixer.
- Do not exceed the rated capacity of the mixer and operate at suggested mixing speeds.
- In a central mix(wet batch) or drum mixer mix the batch between 1 to 5 minutes at mixing speeds. Mixing time begins when all the materials except water are in the drum and ends when the discharge chute opens.
- In a truck mixer(**dry batch**), mix the batch between 70 and 100 revolutions. Do not exceed **300** revolutions with the exception of an additional 60 may be allowed when using plasticizers.

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Delivery continued

- If a truck mixer or agitator is used to deliver concrete from a central mix (**wet batch**) plant do not exceed **200** additional revolutions during delivery.
- When non agitating trucks are used to deliver concrete, place the concrete within 30 minutes of adding cement to water.
- Adding water to concrete after the initial mixing is prohibited, with this exception: If the concrete is delivered to the work site in a truck mixer, the Engineer will allow water (up to 2 gallons per cubic yard) be withheld from the mixture at the batch site, and if needed, added at the worksite to adjust the slump to specified requirements. **Water should not be withheld from non-agitating trucks since there is no way to add it back. W/C ratio should be adjusted**

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15-04005-R04 (Table 401-5 sheet 10) Time/Temp Placement

Less than 75 degrees Fahrenheit ambient temp and no retarder equals 1.5 hours to place concrete

Equal or greater than 75 degrees up to 90 degrees Fahrenheit ambient temp and no retarder equals 1 hour to place concrete.

Between 75 and 90 degrees Fahrenheit ambient temp **with** a set retarder equals 1.5 hours to place.

In all cases, if the concrete temperature at time of placement is 90 degrees Fahrenheit or above the concrete must be place within 45 minutes of adding cement to water.

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Temp based concrete placement

15-04005-R04 Sheet 10

TABLE 401-5: AMBIENT AIR TEMPERATURE AND AGITATED CONCRETE PLACEMENT TIME		
T = Ambient Air Temperature at Time of Batching (°F)	Time limit agitated concrete must be placed within, after the addition of cement to water (hours)	Admixtures
T < 75	1 ½	All Cases
75 ≤ T < 90	1	None
75 ≤ T < 90	1 ½	Set Retarder
T_c = Concrete Temperature at time of placement (°F)	Time limit agitated concrete must be placed within, after the addition of cement to water (hours)	Admixtures
$90 \leq T_c^*$	¾	All Cases
Other conditions contributing to quick stiffening of concrete	¾	All Cases

Air temp

Concrete temp

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Placing Concrete in Cold Weather Sheet 11(401-8b) (SP 15-04005-R04)

Placing Concrete in Cold Weather. Unless authorized by the Engineer, discontinue mixing and concreting operations when the descending ambient air temperature reaches 40°F. Do not begin concreting operations until an ascending ambient air temperature reaches 35°F and is expected to exceed 40ºF.

If the Engineer permits placing concrete during cold weather, aggregates may be heated by either steam or dry heat system before placing them in the mixer. Use an apparatus that heats the mass uniformly and is so arranged as to preclude the possible occurrence Fahrenheit e of overheated areas which might injure the materials. Do not heat aggregates directly by gas or oil flame or on sheet metal over fire. Aggregates that are heated in bins, by steam-coil or water-coil heating, or by other methods not detrimental to the aggregates may be used. The use of live steam on or through binned aggregates is prohibited. Unless otherwise authorized, maintain the temperature of the mixed concrete between 50 to 90°F at the time of placing. **Do not, under any circumstances, continue concrete operations if the ambient air temperature is less than 20°F.**

If the ambient air temperature is 35°F or less at the time the concrete is placed, the Engineer may require that the water and the aggregates be heated to between **70 and 150°F**.

Do not place concrete on frozen subgrade or use frozen aggregates in the concrete.

Make adjustments for potential longer set time and slower strength gain for concrete with SCMs.

Adjust minimum time requirements as stated in **SECTION 710** for concrete used in structures. For concrete paving, be aware of the effect that the use of SCMs (except silica fume) may have on the statistics and moving averages.

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From the SP 15-04005-R04 Sheet 11 401.8b Placement Limitations

(2) Placing Concrete in Cold Weather. Submit a cold weather concrete plan for approval to the Engineer prior to placing concrete in cold weather.

Unless authorized by the Engineer, discontinue mixing and concreting operations when the descending ambient air temperature reaches 40°F. Do not begin concreting operations until an ascending ambient air temperature reaches 35°F and is expected to exceed 40°F.

If the Engineer approves the cold weather concrete plan, aggregates may be heated by either steam or dry heat system before placing them in the mixer. Use an apparatus that heats the mass uniformly and is so arranged as to preclude the possible occurrence of overheated areas which might injure the materials. Do not heat aggregates directly by gas or oil flame or on sheet metal over fire. Aggregates that are heated in bins, by steam-coil or water-coil heating, or by other methods not detrimental to the aggregates may be used. The use of live steam on or through binned aggregates is prohibited. Unless otherwise authorized, maintain the temperature of the mixed concrete between 50 to 90°F at the time of placing. Do not, under any circumstances, continue concrete operations if the ambient air temperature is less than 20°F.

If the ambient air temperature is 35°F or less at the time the concrete is placed, the Engineer may require that the water and the aggregates be heated to between 70 and 150°F.

Do not place concrete on frozen subgrade or use frozen aggregates in the concrete.

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401 Appendix A (Sheet 12)

- One of the biggest attempts KDOT has implemented to improve the longevity of concrete is implement a permeability requirement.
- Water and chlorides permeate through the mortar and paste of concrete mixes. They do not readily pass through the larger aggregates. Permeability can be improved by decreasing the mortar and paste of the concrete mix and increasing the coarse aggregate portions.
- Lower W/C ratio, SCM's, Water Reducing ad-mixtures, and optimizing the gradation can all improve permeability

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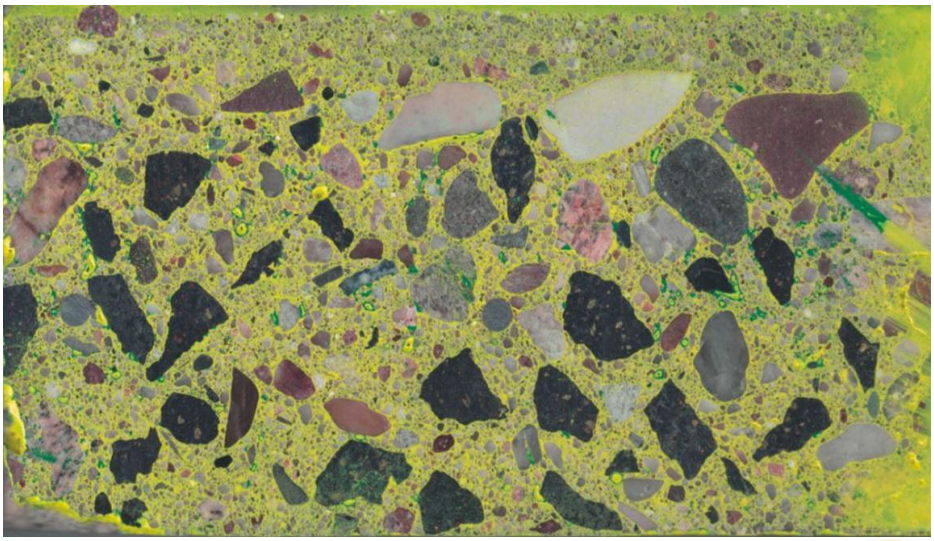
Cross Section of densely graded concrete



75

On-Grade Concrete Slump Requirements

Special Provision 15-04003 Sheet 3(f/Slump)

Design the concrete mixes for on grade concrete as specified in the Contract Documents.

Provide aggregates for on-grade concrete that meet requirements in Section 1116 for quality and gradation

Maximum design slump for slip form paving is 2.5 inches Slump should not exceed 5 inches for all other on-grade paving. Designated slump of **3 inches or less has a tolerance of +/- (¾ inch).** Designated slump **greater than 3 inches has a tolerance of +/- (25% of designated slump)**

Design using procedures in Section 401 and requirements specified in Tables 403-1 and 403-2

Permeability requirements do not apply for concrete patching material used when existing pavement is more then 10 years old.

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Table 403-1 Air-Entrained Concrete for Pavement (15-04003 sheet 2)

Cement per cu/yd
517 lb minimum
Water/Cement ratio
.45 maximum
Percent Air
See section 403.3
28 day Compressive Strength
4000 psi
Volume of Permeable Voids Maximum(Boil Test)
12.5%
or
Surface Resistivity Minimum(Resipod Test)
9.0
or
Rapid Chloride Permeability Maximum
3000 Coulombs

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Table 403-2 Air-Entrained Concrete for Shoulders (15-04003 sheet 2)

Cement per cu/yd.
480 lb. minimum
Water/Cement ratio
.45 maximum
Percent Air
See section 403.3
28 day Compressive Strength
4000 psi
Volume of Permeable Voids Maximum(Boil Test)
12.5%
or
Surface Resistivity Minimum(Resipod Test)
9.0
or
Rapid Chloride Permeability Maximum
3000 Coulombs

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403.3e-Design Air Content

15-04003 sheet 2

- Minimum air content for paving is 5% behind the paver with a maximum air void spacing(AVA) of 0.0100 inches behind the paver**. (The Target Air for paving must meet this)**
- Maximum air content 10% and steps should be taken when it hits 8% behind the paver.

79

Paving mixes must be prequalified using the AVA(KT-71) before production.

80

AVA Field sampling is behind the paver at the same time as an air content test(KT-18)

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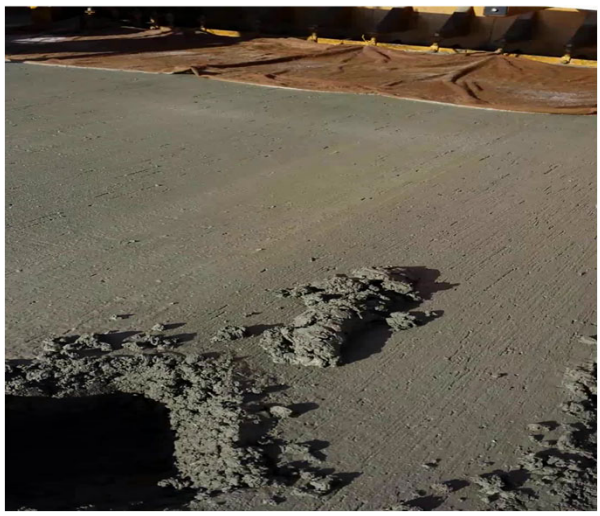
Mortar and paste sample behind the paver for AVA



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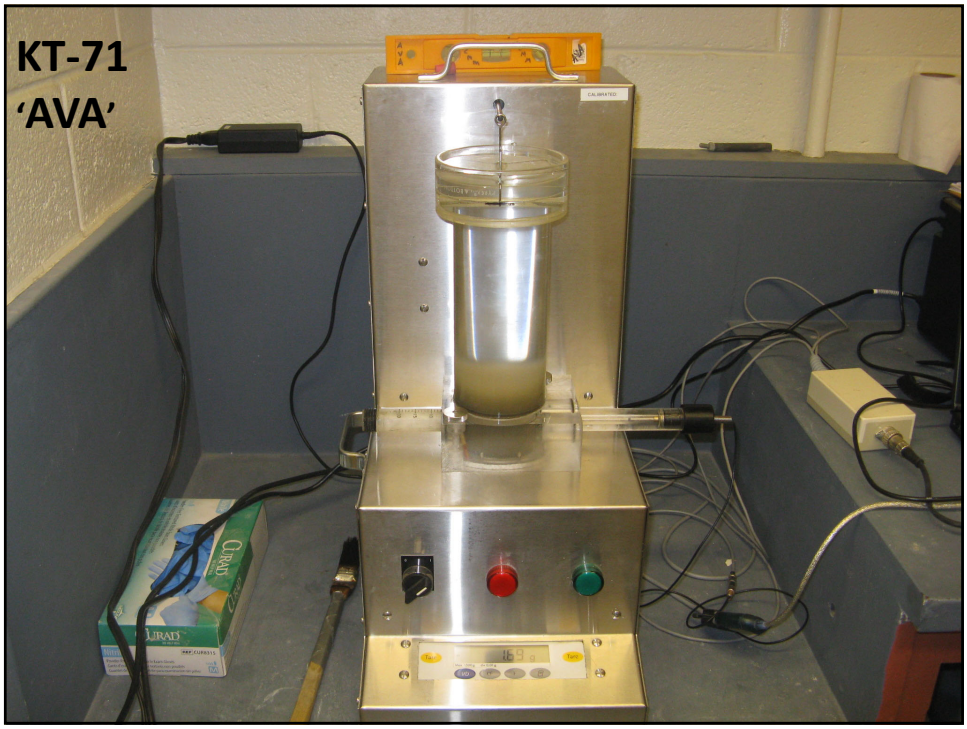
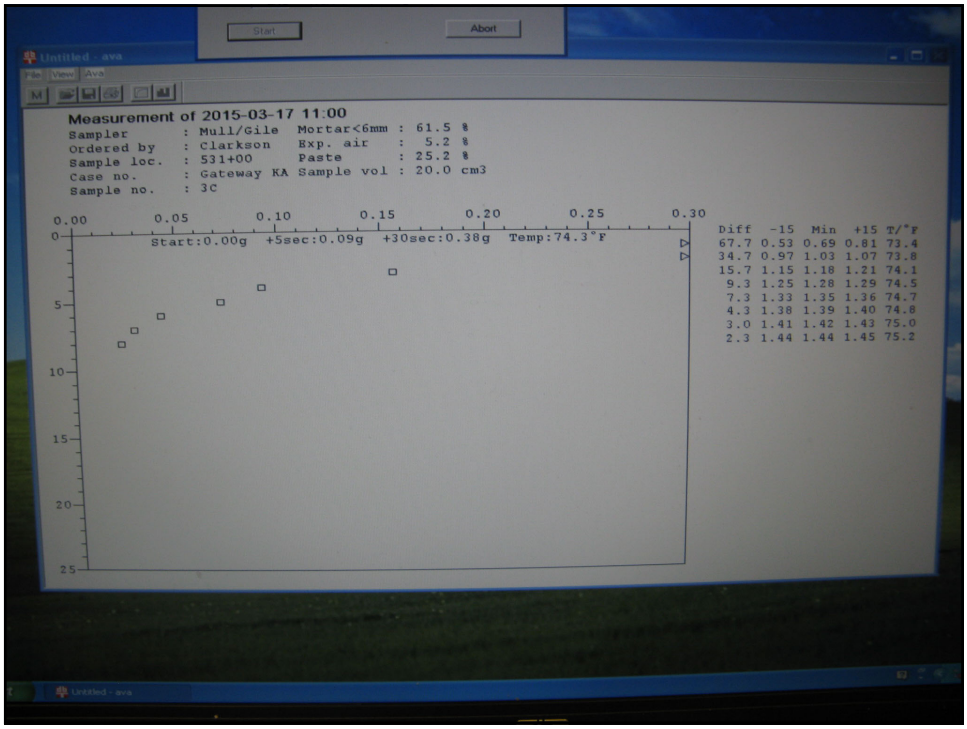

KT-71
'AVA'

83


Start
Abort
Untitled - ava
Measurement of 2015-03-17 11:00
Sampler : Mull/Gile Mortar<6mm : 61.5 %
Ordered by : Clarkson Exp. air : 5.2 %
Sample loc. : 531+00 Paste : 25.2 %
Case no. : Gateway KA Sample vol : 20.0 cm3
Sample no. : 3C
0.00 0.05 0.10 0.15 0.20 0.25 0.30
Start:0.00g +5sec:0.09g +30sec:0.38g Temp:74.3°F
Diff -15 Min +15 T/°F
67.7 0.53 0.69 0.81 73.4
34.7 0.97 1.03 1.07 73.8
15.7 1.15 1.18 1.21 74.1
9.3 1.25 1.28 1.29 74.5
7.3 1.33 1.35 1.36 74.7
4.3 1.38 1.39 1.40 74.8
3.0 1.41 1.42 1.43 75.0
2.3 1.44 1.44 1.45 75.2

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Department of Transportation
District 1, Area 3 – Metro Office
650 N. K-7 Highway
Bonner Springs, KS 66012-1736
Leroy J. Koehn, P.E., District Engineer

STATE OF KANSAS

GOVERNOR JEFF COLYER, M.D.
RICHARD CARLSON, SECRETARY

Phone: 913-942-3040
Construction Fax: 913-721-2873
Maintenance Fax: 913-721-5441
kdot@publicinfo@ks.gov
http://www.ksdot.org

September 27, 2018

Shane Clarkson
Clarkson Construction

Dear Mr. Clarkson,

KDOT completed an AVA test using KT-71 Air Void Analyzer for project KA 3993-01 and was tested on 9/28/2018 on I-435 WB. Using 1PMC202D mix, the concrete was produced with 13.7 oz/yd^3 of AEA, 14.0 oz/yd^3 of WR, 23.0 oz/yd^3 of P-6420, with a 0.41, WC. The slump was 1", the air content was 6.6% in front of the paver and 6.4% behind the paver by the pressure method (KT-18), and the unit weight was 143.84.

The following are results of our Air Void Analyzer testing:

Sample A was: 0.0063 in

Sample B was: 0.0057 in

Avg. spacing factor: 0.0060

Comparison: 0.0006

If you have any questions, please contact the undersigned.

David B. Johnson
Kansas City Metro Materials Supervisor
3101 South 24th Street
Kansas City, Kansas 66101
(913) 671-7532

Kansas
Department of Transportation

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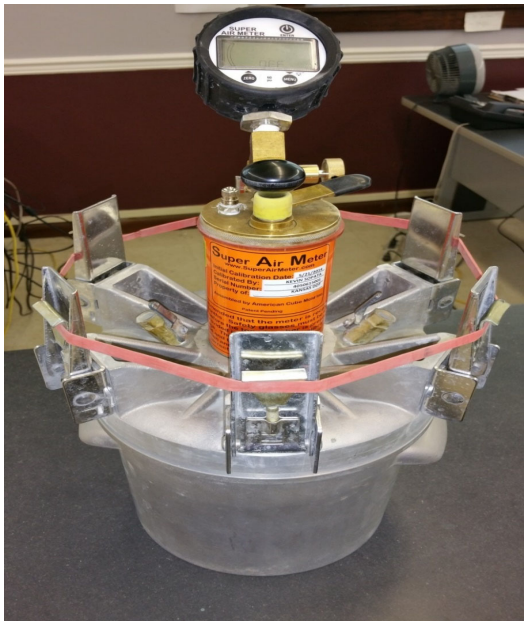
KT-86 'SAM'



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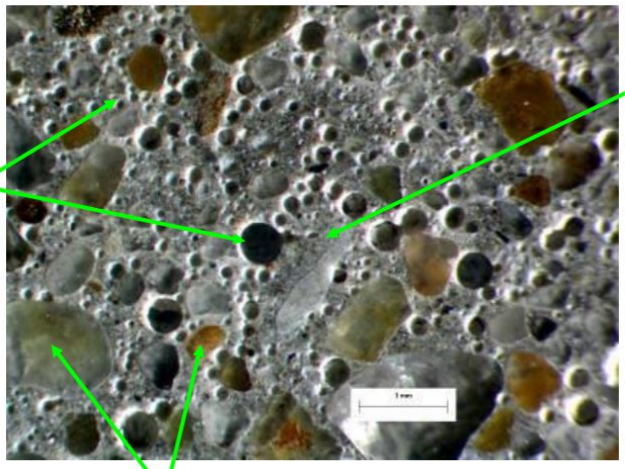
Paste, Aggregates, & Air



Air
Entrapped & Entrained

Paste
Cement (&SCM) & Water

Aggregates ***Rock & Sand***

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QC/QA vs non-QC/QA paving

Section 501 QC/QA and Section 502 non-QC/QA

You'll find whether it is a QC/QA job or not by looking in the contract line items. There will be a bid item for QC testing.

QC/QA projects require an F&T spreadsheet to be kept current tracking length and strength of cores. The spreadsheet can be found on the KDOT Materials and Research home page or the local construction office.

QC/QA projects will use Appendix B in the Construction Manual for testing frequencies.

The contractor is required to turn in a QC Plan for the concrete paving. 501.2 outlines what is required in the plan.

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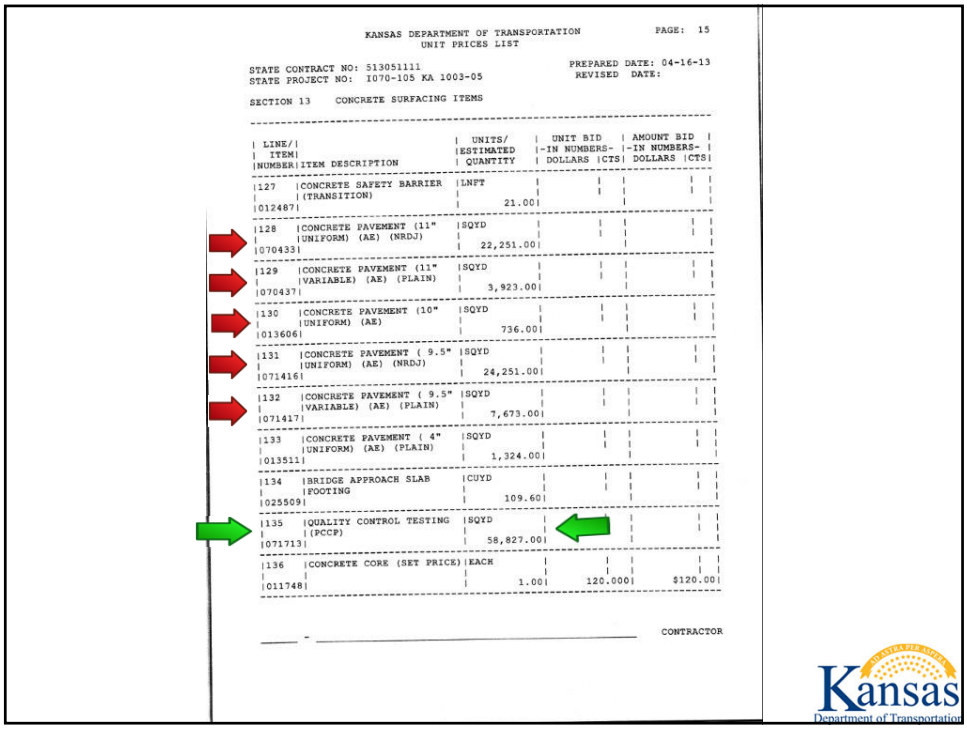

KANSAS DEPARTMENT OF TRANSPORTATION
UNIT PRICES LIST

PAGE: 15

STATE CONTRACT NO: 513051111
STATE PROJECT NO: I070-105 KA 1003-05

PREPARED DATE: 04-16-13
REVISED DATE:

SECTION 13 CONCRETE SURFACING ITEMS

LINE/ ITEM NUMBER	ITEM DESCRIPTION	UNITS/ ESTIMATED QUANTITY	UNIT BID -IN NUMBERS- DOLLARS	CTS	AMOUNT BID -IN NUMBERS- DOLLARS	CTS
127 012487	CONCRETE SAFETY BARRIER (TRANSITION)	LNFT 21.00				
128 070433	CONCRETE PAVEMENT (11" UNIFORM) (AE) (NRDJ)	SQYD 22,251.00				
129 070437	CONCRETE PAVEMENT (11" VARIABLE) (AE) (PLAIN)	SQYD 3,923.00				
130 013606	CONCRETE PAVEMENT (10" UNIFORM) (AE)	SQYD 736.00				
131 071416	CONCRETE PAVEMENT (9.5" UNIFORM) (AE) (NRDJ)	SQYD 24,251.00				
132 071417	CONCRETE PAVEMENT (9.5" VARIABLE) (AE) (PLAIN)	SQYD 7,673.00				
133 013511	CONCRETE PAVEMENT (4" UNIFORM) (AE) (PLAIN)	SQYD 1,324.00				
134 025509	BRIDGE APPROACH SLAB FOOTING	CUYD 109.60				
135 071713	QUALITY CONTROL TESTING (PCCP)	SQYD 58,827.00				
136 011748	CONCRETE CORE (SET PRICE)	EACH 1.00	120.000		$120.00	

CONTRACTOR

Kansas Department of Transportation

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SS2007 Section 501		Spec	07-05002-R01		
Lots:		Project #		Name of QC Tester	
Dates:		Contract #		Certification # of QC Tester	
Bid Item Description				Contract Line #'s	

Compressive Strength Correction									
Lot	Date	Contractor Compressive Strength (psi)	Contractor Capped Core Length (in)	Contractor Core Diameter (in)	Corrected Contractor Compressive Strength (psi)	KDOT Compressive Strength (psi)	KDOT Capped Core Length (in)	KDOT Core Diameter (in)	Corrected KDOT Compressive Strength (psi)
1A1									
1A2									
1B1									
1B2									
1C1									
1C2									
1D1									
1D2									
1E1									
1E2									
2A1									
2A2									
2B1									
2B2									
2C1									
2C2									
2D1									
2D2									
2E1									
2E2									
3A1									
3A2									
3B1									
3B2									
3C1									
3C2									
3D1									
3D2									
3E1									
3E2									
4A1									
4A2									
4B1									
4B2									
4C1									
4C2									
4D1									
4D2									
4E1									
4E2									
5A1									
5A2									
5B1									
5B2									
5C1									
5C2									
5D1									
5D2									
5E1									
5E2									
6A1									
6A2									

Kansas Department of Transportation

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Division 1100
Special Provision 15-11004-R02

Section 1116-Aggregates for On-grade Concrete

Starting with the 2015 Specification Manual there was a push to have KDOT approved mixes be optimized with the exception of grouts, flowable fills and pavement patching more than 10 years old

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Section 1116- Aggregates for On Grade Pavement

1116.2a lists the individual quality requirements for the on-grade aggregates

Simply put aggregates listed on the PQL for on-grade aggregate sources are approved for use and can be found here:

http://ksdot1.ksdot.org/burmatrres/pql/default.asp

Predominantly siliceous aggregate (**granite, quartzite, river products**) need to be on the wetting and drying list or will require SCM's (supplemental cementitious materials) to prevent ASR(alkali silica reaction) and require a mortar bar expansion test.

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PQL 3.4
for On-Grade Aggregate

LIST OF FREEZE/THAW RESISTANT COARSE AGGREGATE SOURCES FOR ON-GRADE CONCRETE (OGCA LIST)
[2015 – SS 1116](07-11004-R*)
PQL – 3.4 **REVISED – 08/24/16**

NOTE: At the time of use on the project, a current Official Quality for the specific beds listed must be on record, the date of "LAST TEST" must be within the preceding 18 months, and the date of "LAST INSPECTION" (where applicable) must be within the preceding 24 months. Contractors and producers are responsible to have test and inspection dates that meet these requirements.

SOURCES INSIDE THE STATE OF KANSAS

COUNTY	QUARRY NUMBER	PRODUCER	LOCATION (LEGAL DESCRIPTION)				GEOCLASS	BEDS	LAST TEST	LAST INSPECTION
Allen	4-001-01-LS	Nelson Quarries, Inc. CMS #00800101	SW ¼	S33	T24S	R19E	RYTN	1, 2, 3, 4	02/2016	05/2016
Coffey	4-016-09-LS	APAC Kansas CMS #00801935	NW ¼	S02	T21S	R13E	HRFD	2	05/2016	10/2015
Franklin	4-030-05-LS	Penny's Aggregates CMS #00800309	SE ¼	S23	T16S	R20E	STNR	1, 2, 3, 4	07/2015	10/2015
Finney	6-028-02-SG	Klotz Sand and Gravel CMS #00812605		S31	T24S	R31W	N/A	N/A	04/2016	N/A
Finney	6-028-03-SG	Huber Sand Co CMS #00812701		S21	T24S	R32W	N/A	N/A	05/2016	N/A
Ford	6-029-01-SG	Dodge City Sand CMS #00813102		S32	T26S	R25W	N/A	N/A	11/2015	N/A
Ford	6-029-02-SG	Dodge City Sand CMS #00813401		S20	T26S	R26W	N/A	N/A	02/2014	N/A
Ford	6-029-03-SG	Hard Rock Sand CMS #00809904		S02	T27S	R25W	N/A	N/A	10/2014	N/A
Greenwood	4-037-05-LS	Mid-States Materials CMS # 00800403	SW ¼	S33	T27S	R10E	WKRS/BLGM	1, 2, 3, 4, 5	05/2016	10/2015
Hamilton	6-038-01-SG	Klotz Sand and Gravel CMS #00814202	SW ¼	S18	T24S	R40W	N/A	N/A	11/2015	N/A
Hamilton	6-038-02-SG	Huber Sand Company CMS #00835801		S17	T24S	R40W	N/A	N/A	05/2016	N/A
Johnson	1-046-04-LS	Mid-States Materials CMS #00826101	NW ¼	S08	T15S	R22E	FRLY	9	05/2016	10/2015
Johnson	1-046-21-LS	Hunt Martin Materials CMS #00800319	S ½	S04	T13S	R22E	UFRLY	1	04/2016	01/2015

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Alkali Silica Reaction

Alkali (Cement) + Silica (many aggregates) + Water

=

'Potential' ASR Gel which can expand

=

causing

Cracking

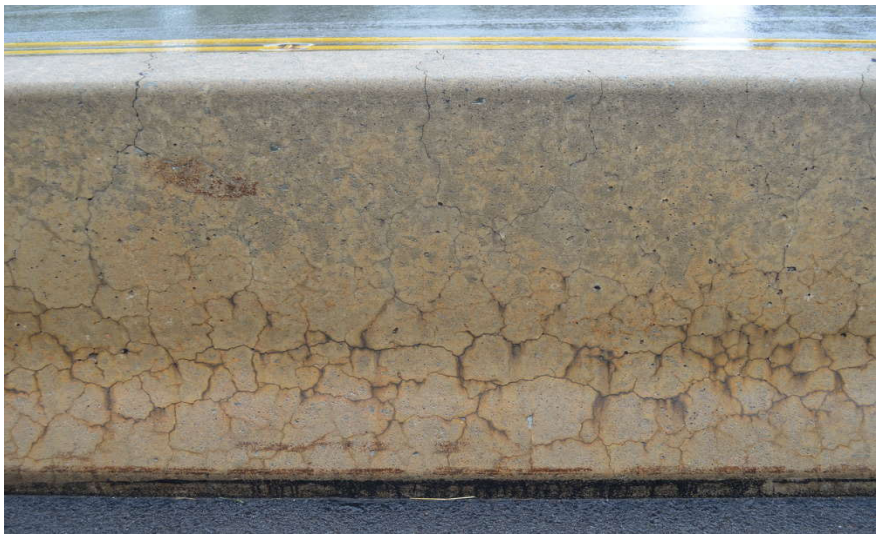
Which is no Bueno

94

ASR forming around aggregate

95

ASR affected barrier wall



96

white ASR calcium gel

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Special Provision 15-04005 R04, Sheet 5

j. Alkali Silica Reactivity. If the concrete mix design includes supplemental cementitious materials (SCMs), provide mortar expansion test results from ASTM C1567 as part of mix design approval unless meeting the minimum requirements shown in **TABLE 401-4**. Use the project's mix design concrete materials at their designated percentages. Provide a mix with a maximum expansion of 0.10% at 16 days after casting. Provide ASTM C1567 results on an annual basis.

TABLE 401-4: MINIMUM SCM CONTENT REQUIRED TO WAIVE ASTM C1567 TESTING

Type of Coarse Aggregate Sweetener (refer to TABLE 1102-2 or TABLE 1116-1)	Are the Fine and Intermediate (if used) Aggregate Sources on PQL 3.1?	Proportion Required by Percent Weight of Total Cementitious Material			
		Slag Cement	Class C Fly Ash	Class F Fly Ash	Silica Fume
Crushed Sandstone, Crushed Limestone, Crushed Dolomite, Siliceous Aggregate on PQL 3.1, or Siliceous Aggregate not on PQL 3.1	No	ASTM C1567 Testing Required		25%	Any*
Any combination of Crushed Limestone, Crushed Dolomite, Crushed Sandstone, and Siliceous Aggregate on PQL 3.1	Yes	Any*	15%	Any*	Any*

*Subject to the maximum allowable percentages in **TABLE 401-2**.

ASTM C1567 Testing can be waived for ternary (3 cementitious materials) mix designs with approval of the KDOT Bureau of Research.

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Appendix A concrete aggregate

SAMPLING AND TESTING FREQUENCY CHART
NON QUALITY CONTROL/QUALITY ASSURANCE SPECIFICATIONS

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)			CODE	VERIFICATION SAMPLES & TESTS (Note f)	CODE	ACCEPTANCE SAMPLES & TESTS
DIVISION 1100							
INDIVIDUAL AGGREGATE QUALITY (Applies to all aggregates)			VER		only ce		Prior approval required.
ON-GRADE CONCRETE (OGCA) Sec. 11			QPS		Se this		
AGGREGATE CONCRETE Sec. 1102, 11	Sieve Ana (1%, 0.1% fo sieve, of mass)	T-02	ACI VER	e	As needed t aggregate us accepted sto		250 TONS (250 Mg).
	Material Passing the μm) Sieve by the Wash (0.1% of mass)		ACI R	e			250 TONS (250 Mg).
	Unit Weight – lightweight aggregates only (0.1 lb [50 g] or 0.1% of mass)						
	y Lumps and Friable Particles in gate 0.01% of mass)	KT-07					
	Like Materials in	KT-08				e	
						e	
	C					e	
	Organic Impu					e	

20/27 Appendix A 2018 Revised 2018

Kansas Department of Transportation

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New 2022 Appendix A Concrete Aggregate(Sec 1100)
1 sample of each aggregate every 350 cubic yards

SAMPLING AND TESTING FREQUENCY CHART
NON QUALITY CONTROL/QUALITY ASSURANCE SPECIFICATIONS

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)	TEST METHOD	AWP	CODE	VERIFICATION SAMPLES & TESTS (Note f)	CODE	ACCEPTANCE SAMPLES & TESTS
DIVISION 800 Continued							
UNDERDRAIN AGGREGATE Continued	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-07				o	
	Shale or Shale-Like Materials in Aggregate (0.1 g or 0.01% of mass)	KT-08				o	
	Sticks in Aggregate (0.01% of mass)	KT-35				o	
DIVISION 1100							
INDIVIDUAL AGGREGATE QUALITY (Applies to all aggregates)			DFQ VER		Aggregate quality only - One sample per source per year per district.		Prior approval required.
ON-GRADE CONCRETE (OGCA) Sec. 1116			QPS		See 5.6 Sect. 5.4.4 of this manual.		
AGGREGATE FOR CONCRETE Sec. 1102, 1116	Sieve Analysis of Aggregate (1%, 0.1% for No. 200 sieve, of mass)	KT-02	VER	e	As needed to control aggregate used in accepted stockpiles	a	1 per 350 CY of combined aggregate.
	Unit Weight – lightweight aggregates only (0.1 lb or 0.1% of mass)	KT-05	VER			o	
	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-07				o	
	Shale or Shale-Like Materials in Aggregate (0.1 g or 0.01% of mass)	KT-08				o	
	Sticks in Aggregate (0.01% of mass)	KT-35				o	

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Appendix B concrete aggregate

SAMPLING AND TESTING FREQUENCY CHART
CONTRACTOR QUALITY CONTROL TESTING

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)	TEST METHOD	CODE	QUALITY CONTROL BY CONTRACTOR	CODE	VERIFICATION BY KDOT
DIVISION 300						
CEMENT TREATED (CTB) Sec. 306 & 1105			c	1 per day.		1 per week.
	ture Tests r 0.01% of mass)	K		4 per day per design.		1 per week.
	m³] or 0.1% of	KT-37 KT-20*		per day per design KT-20 option is only mitted in conjunction with a d mix.)		1 per project per design.
	Co (1 psi	KT-37		ecimen per sublot		1 specimen per lot.
Compl	Field Dens (0.1 lb/ft³ [1 kg optimum density)	KT-13 or KT-41		r day per design.		1 per week per design.
	Moisture Tests (0.1 g or 0.01% of mass)			per day per design.		1 per week per design.
DIVISION 50						
PORTLAND CE CONCRETE PAV Sec. 501 & 503	lysis of Aggre			1 per 500 TONS (500 Mg) of combined aggregate.		1 per project.
Individual Aggregates			c h			As required.

Page 1 of 14 Appendix B 2018 Revised 2018

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New 2022 Appendix B Concrete Aggregate(Sec 500)
1 sample of each aggregate every 350 cubic yards

SAMPLING AND TESTING FREQUENCY CHART
CONTRACTOR QUALITY CONTROL TESTING

CONSTRUCTION OR MATERIAL TYPE 2015 Std. Spec. (SS 2015)	TESTS REQUIRED (RECORDED TO)	TEST METHOD	CODE	QUALITY CONTROL BY CONTRACTOR	CODE	VERIFICATION BY KDOT
DIVISION 300						
CEMENT TREATED BASE (CTB) Sec. 306 & 1105	Sieve Analysis of Aggregate (1%, 0.1% for No. 200 sieve, of mass)	KT-02	c h	1 per day.		1 per week.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11 or KT-41		4 per day per design.		1 per week.
	Density (0.1 lb/ft³ or 0.1% of optimum density)	KT-37 or KT-20*		1 per day per design (* KT-20 option is only permitted in conjunction with a fluid mix.)		1 per project per design.
	Compressive Strength (1 psi)	KT-37		1 specimen per sublot		1 specimen per lot.
Completed Base	Field Density Tests (0.1 lb/ft³ or 0.1% of optimum density)	KT-13 or KT-41		4 per day per design.		1 per week per design.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11 or KT-41		4 per day per design.		1 per week per design.
DIVISION 500						
PORTLAND CEMENT CONCRETE PAVEMENT Sec. 501 & 503	Sieve Analysis of Aggregate (1%, 0.1% for No. 200 sieve, of mass)	KT-02	c h	1 per 350 CY of combined aggregate.		1 per project.
Individual Aggregates	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-07	c h			As required.

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Department of Transportation

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TABLE 1116-3: GRADING REQUIREMENTS FOR COARSE AGGREGATES									
Type	Composition	Percent Retained - Square Mesh Sieves							
		1 ½"	1"	¾"	½"	3/8"	No. 4	No. 8	No. 30
CPA-1	Crushed Gravel or Crushed Stone	0	0-10	14-35	-	50-75	-	95-100	-
CPA-3	Crushed Gravel or Crushed Stone	-	-	0	0-35	30-70	75-100	95-100	-
CPA-4	Crushed Gravel or Crushed Stone	-	0	0-20	-	-	-	95-100	-

TABLE 1116-4: GRADING REQUIREMENTS FOR FINE AGGREGATES FOR CONCRETE								
Type	Percent Retained-Square Mesh Sieves							
	⅜"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
FA-A	0	0-10	0-27	15-55	40-77	70-93	90-100	98-100

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1116.2b Mixed Aggregates

Similar to Structural Concrete the On-Grade Concrete is required to be optimized.

TABLE 1116-2: ALLOWABLE GRADING FOR MIXED AGGREGATES FOR CONCRETE													
Type	Usage	Percent Retained - Square Mesh Sieves											
		1 ½"	1"	¾"	½"	⅜"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
MA-3	Optimized All Concrete		0	2-12	Note[1]	Note[1]	Note[1]	Note[1]	Note[2]	Note[2]	Note[2]	95-100	98-100
MA-4	Optimized All Concrete[3]	0	2-12	Note[1]	Note[1]	Note[1]	Note[1]	Note[1]	Note[2]	Note[2]	Note[2]	95-100	98-100
MA-5	Optimized All Concrete		0	2-12	8 min	22-34		55-65		75 min		95-100	98-100
MA-7	Contractor Design KDOT Approved	Proposed Grading that does not correspond to other limits in this table but meet the requirements for concrete in **DIVISION 400 and/or DIVISION 500**.											98-100

[1] Retain a maximum of 22% and a minimum of 6% of the material on each individual sieve.
[2] Retain a maximum of 15% and a minimum of 6% of the material on each individual sieve.
[3] Maximum top size of Limestone is ¾".

(d) Optimization Requirements for all Gradations.
- Actual Workability must be within ± 5 of Target Workability.

Where: W_A = Actual Workability

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1116.2b Mixed Aggregates

Similar to Structural Concrete the On-Grade Concrete is required to be optimized.

15-11004-R02
Sheet 3 of 6

TABLE 1116-2: ALLOWABLE GRADING FOR MIXED AGGREGATES FOR CONCRETE

Type	Usage	Percent Retained - Square Mesh Sieves											
		1 ½"	1"	¾"	½"	⅜"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
MA-3	Optimized All Concrete		0	2-12	Note[3]	Note[1]	Note[1]	Note[1]	Note[2]	Note[2]	Note[2]	95-100[4]	98-100[5]
MA-4	Optimized All Concrete[3]	0	2-12	Note[1]	Note[1]	Note[1]	Note[1]	Note[1]	Note[2]	Note[2]	Note[2]	95-100[4]	98-100[5]
MA-5	Optimized All Concrete		0	2-12	8 min	22-34		55-65		75 min		95-100	98-100
MA-7	Contractor Design KDOT Approved[6]	±2	±2	±6	±6	±6	±5	±5	±4	±4	±4	95-100	98-100

[1] Retain a maximum of 22% and a minimum of 6% of the material on each individual sieve.
[2] Retain a maximum of 15% and a minimum of 6% of the material on each individual sieve.
[3] Maximum top size of Limestone is ¾".
[4] Retain a maximum of 7% on the No. 100 sieve
[5] Retain a maximum of 2% on the No. 200 sieve
[6] Tolerances from approved mix design gradation.

(b) Optimization Requirements for all Gradations, except MA-7.
- Actual Workability must be within ± 5 of Target Workability.

Where: W_A = Actual Workability
W_T = Target Workability
CF = Coarseness Factor

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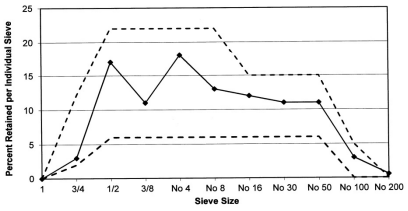
Form 694 can be used to calculate whether the combined individual aggregates meet the appropriate Mixed Aggregate Spec

AGGREGATE GRADATION

Sieve Size (inches)	Aggregate No. 1 CPA-4	Aggregate No. 2 SAND MA-3 FAA	Aggregate No. 3 N/A	Aggregate No. 4 N/A	Cum. % retained	% retained per sieve	Gradation Envelope MA-3 UPPER	Gradation Envelope MA-3 LOWER
	55.0%	45.0%	0.0%	0.0%				
1					0	0	0	0
3/4	5				3	3	12	2
1/2	37				20	17	22	6
3/8	56				31	11	22	6
No 4	87	2			49	18	22	6
No 8	99	17			62	13	22	6
No 16	99	43			74	12	15	6
No 30	99	67			85	11	15	6
No 50	99	93			96	11	15	6
No 100	99	99			99	3	5	0
No 200	100	100			99.5	0.5	0	0
Fineness Modulus	6.43	3.21	0.00	0.00	4.99			

NOTE: Gradation envelope will not be shown on the graph for following gradations:
COARSE/FINE MA-1 MA-2 MA-5

Gradation Distribution Chart



Gradation Parameters

Coarseness Factor	50	Percent Mortar < 6 mm	63.7
Workability	38	Percent Mortar < No. 8	51.3
Target Workability	37	Percent Paste	25.2
Workability Difference	1		

Printed on 6/25/2015

KDOT Form Number 694

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Revised 03/14/2016

KANSAS DOT CONCRETE MIX DESIGN

PRINT ALL REQUIRED PAGES

Project Number	46 KA 4291-01	Spec Max W/C	0.44	* Design Air	6.5%
Contract Number	510016135	* Design W/C	0.44	Design Slump	4
Concrete Class	GR 4.5 AE SA	Spec Min CF	517		
Concrete Producer	GEIGER READY MIX	* Design CF	564	(includes all cementitious)	
Aggregate Designation	MA-3	*Fields are required for batch calculations.			

	Material Type or Name	Producer		Official Quality	Amount in Mix*	Specific Gravity
		Name	ID Number			
Aggregate No. 1	SCA-4	Martin Marietta Stamper Quarry	00803510	15-2654	58.0%	2.64
Aggregate No. 2	FAA Sand	Holliday Sand & Gravel Plant 3	00815412	13-1245	42.0%	2.61
Aggregate No. 3						
Aggregate No. 4						
Cement	Portland Type I/II	Buzzi Unicem, Cape Giradeau	00000103		80.0%	3.15
Other Cementitious No. 1	Class F Fly Ash	Ashgrove, Chanute KS (Durapoz F)	00003001		20.0%	2.80
Other Cementitious No. 2						
Water						
Air Entraining Admixture	Daravair 1400	Grace	701		8.46	
Admixture No. 1	Adva 140M	Grace	701		50.76	
Admixture No. 2	Daraset 200	Grace	701		2%	
Admixture No. 3						

* Amount in Mix column: Use whole number percentages (i.e. 40 or 15) for aggregates and cementitious materials; assume oz/cy for admixtures.

Note: Water adjustments should be made when admixtures are used at large dosages (i.e. dosages of accelerators, corrosion inhibitors, SRAs, etc.)

Mix Design Used Previous: Yes KDOT Mix Design Number: 1PMC174 (if known) Date Last Used: #######

Please include the following information along with this completed form:
- Materials Certifications
- Compressive Strength Results (KT-76)
- Permeability Test Results (KT-73, KT-79, or AASHTO T-277)
- Reactivity Test Results (ASTM C 1567, if SCMs are used)

Please fill in the table to the right with the test results, in addition to providing hard copies of the actual test reports

MIX DESIGN TEST RESULTS		
Air Content, %		5.10
Slump, in.		2.75
Compressive Strength (28 day)		7080.00
Only one of the three is required:	KT-73	
	KT-79	17.7
	AASHTO T-277	
ASTM C 1567 (if necessary)		0.02

CLICK TO SIGN Rusty Owings Geiger RM 913-555-5555 6/15/2016

NOTE: Please make sure that when this form is submitted to the construction or district office, ensure that all three (3) pages are included.

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SAND-GRAVEL OR ROCK

Laboratory
Producer: MM Randolph Location
Contractor: Clarkson Destin.: COLA
Project: KA 1003-02 County
Type of Material: CPA-4 (SCA-4) . FA-A

SIEVE ANALYSIS-PERCENT RETAINED

Sample No.	5/8/17	LG	5/8/17	LG	Pan Sieve	Range
Pit or Car No.	Cab	LG	Cab	DBJ		
Sieves	6328.9		524.3			
50 (2")	6340.3	1.4	551.6	2.3		
37.5 (1½")						
25 (1")						
19 (¾")	728.3	11.7			6	3/12
12.5 (½")	9350.2	53.7			24	6/22
9.5 (⅜")	4726.2	75.7			12	6/22
4.75 (No. 4)	6029.1	96.6	2.8	0.5	11	6/22
2.36 (8)	6106.8	97.9	64.6	11.7	6	6/22
2.00 (10)						
1.18 (16)	6125.5	98.2	173.5	31.4	9	6/15
850 (20)						
600 (30)	6133.1	98.2	328.3	59.5	13	6/15
425 (40)	6135.5	98.3	407.8	73.9		
300 (50)	6137.6	98.4	473.0	85.7	12	6/15
180 (80)						
150 (100)	6142.2	98.4	538.0	97.5	5	0/17
75 (200)	6146.5	98.5	547.2	99.2	1.0	0/12
G.F. or Sieve Ratio						
% Wash	6147.3	1.5	548.8	0.5		
% Clay Lumps	6147.3	0	548.8	0		
% Shale						
% Soft Friable	5/8	09:45	5/8	09:45		
Tons	5/9	08:57	5/9	08:10		

Tested by Date
Remarks: 55 45

Rev. 9-95 D.O.T. Form No. 648A

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Handling of All Aggregates

(a) Segregation. Before acceptance testing, remix all aggregate segregated by transit or stockpiling.

(b) Stockpiling.

- Maintain separation between aggregates from different sources, with different gradings or with a significantly different specific gravity.
- Transport aggregate in a manner that promotes uniform grading.
- Do not use aggregates that have become mixed with earth or foreign material.
- Stockpile or bin all washed aggregate produced or handled by hydraulic methods for 12 hours (minimum) before batching. Rail shipment exceeding 12 hours is acceptable for binning provided the car bodies permit free drainage.
- Provide additional stockpiling or binning in cases of high or non-uniform moisture.

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4.06.05 DUTIES AND RESPONSIBILITIES OF THE CONCRETE PLANT INSPECTOR

The Inspector shall verify that the Contractor maintains proper control of materials and batching operations. The Inspector should be familiar with the requirements of the specifications for the type of testing needed; QC/QA or non-QC/QA. Duties will start at the time materials are being accumulated and continue until final records for the project are complete. Materials will be field tested at the concrete plant, which is a function of the Inspector.

The ready mix plant whether it be a permanent or mobile plant shall have a plant inspection completed and on file before any concrete batching is allowed. (Form 618)

Be familiar with specifications regarding the requirements of all equipment. See subsection 154-Concrete Pavement and Concrete Structure Equipment of the Standard Specifications. Prior to the start of batching operations, the Inspector must thoroughly check, verify calibrations, and verify that all equipment is of an approved design, and complies with the Standard Specifications.

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4.06.05 DUTIES AND RESPONSIBILITIES OF THE CONCRETE PLANT INSPECTOR

- The Inspector shall verify that the Contractor maintains proper control of materials and batching operations.
- Be familiar with specifications regarding the requirements of all equipment.
- The delivery of the concrete from the plant to the paver is a very important part of the overall operation of concrete paving.
- Accurate proportioning of aggregate and cement and/or fly ash.
- The Contractor will make free moisture tests at least twice daily (minimum of one in A.M. and one in P.M.) and more frequently if in the judgment of the Inspector there has been a change in moisture content. All tests will be recorded in a bound book and become property of KDOT upon completion of the project. The Inspector will observe the testing procedures. These tests are required so that batch weights may be adjusted, and to verify that the maximum water cement and/or fly ash ratio is not being exceeded.

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Quick rundown of a typical daily plant inspection

1. Prior to the use, inspect the trucks.
   A. manufacturers plate
   B. Check fins for concrete buildup, excessive wear
   C. Working rev counter
   D. Sight glasses
   E. Leaking water lines, valves
2. Arrive at the plant 30 or 40 minutes before batch time.
3. Upon arrival at the plant 1st check the stockpiles. Look for contamination, segregation, and approved stockpile signs. and start daily diary
   A. In cold weather make sure no frozen aggregate is being used
4. Check with the batch man to confirm what materials are being used so you can run a moisture test. Make sure you are current on tested material quantities.
5. Run the moisture tests using the oven or solution balance method. If the plant is using a sand probe it should be verified weekly with a compared moisture test.

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6. Find out what mix design is being used so you can calculate the batch weights adjusting for moisture.

A. Compare the plant's batch weights against the approved KDOT mix design to make sure that they match

7. Have the truck reverse its drum to remove any rinse water he was carrying

8. Have the driver re-zero his rev counter after loading

9. Check the actual batch weights to ensure they meet the tolerance specifications

10. At a dry batch plant the truck will need to get 70-100 mixing revs before leaving the yard

A. Except for withheld water no materials can be added to the mix without approval

11. At a wet batch plant the minimum mixing time is 60 seconds and maximum 5 minutes.

12. Ensure no extra water is added to the load as the driver washes down after loading

13. When the pour clears finish the daily diary and record materials used

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Documentation Manual

- Plant Dairies
- Materials Used/Tested
- Cement Received/Used
- Moistures
- Concrete Delivery Ticket
- Aggregate Gradations

http://www.ksdot.org/bureaus/burConsMain/specprov/specifications.asp

Kansas Department of Transportation

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Plant Diaries

- The date, temperature, and weather conditions.
- Your arrival time and scheduled pour time.
- Mix design number and moisture content of aggregates.
- Project number.
- The time and number of the first trucks departure.
- Record of any changes made to the mix and the reasons for changes.
- Record any test result that are known.
- Enter daily totals and your departure time.

The plant dairy will serve as your memory for any issues that arise in case there are problems that show up later.

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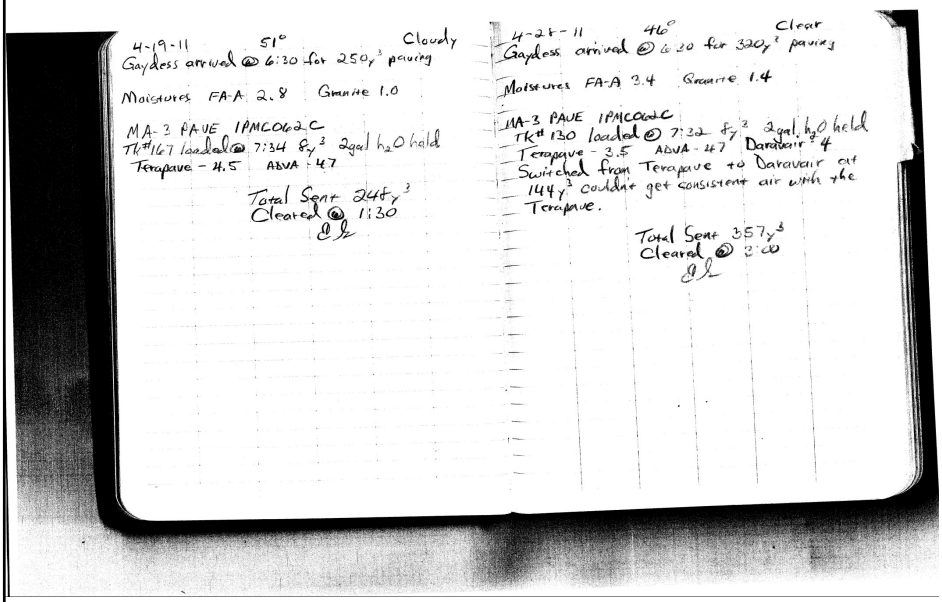

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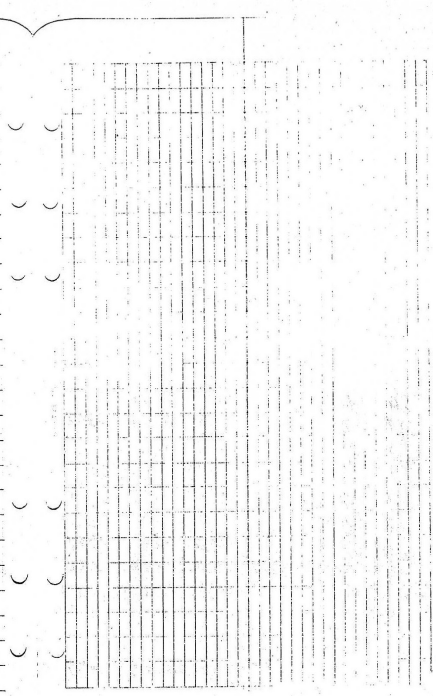
READY MIX TRUCK INSPECTION

TRUCK No:	29
Make	Rex
SN:	70XF7661
Manufacturers Recommended Cap.	Max 9 Cu. Yd MIN ½ Cu. Yd.
Cu. Yds Mixed for Testing	7
Theo Slump	2½"
Actual Beginning Slump	2¾"
Actual Mid Point Slump	2½"
Actual end of Load Slump	2¾"
Drum Condition	Clean
Water tank:	Clean
Water Valve	Tight
Rev Counter	Electronic Mech.
Agitate R.P.M.	2-4
Mixing	5-14
MFGS Plate	Yes
Accepted	Yes
Remarks	
Insp	JK



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Concrete Gradations per frequency

635-105 KA 5717-01

Mix 1PMC261A

Date	Yards batched	Accum	Remarks
4-15-24	72	72	
4-16-24	12	84	
5-1-24	123	207	
5-12-24	100	307	Test
5-15-24	165	472	
5-17-24	57	529	
5-22-24	150	679	Test

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Ashgrove F/II Cement

Date	Ton Used	Accum Used	Tons Cert.	Accum Cert.
4-2-15	159.53		162.98	
4-16-15	173.12	332.65	191.40	354.38
4-19-15	9.44	342.09	24.48	378.86
4-20-15	18.94	361.03	26.85	405.71

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Section 2001.5
Page 2000-3

UNIFORM STRAIGHT BILL OF LADING - SHORT FORM

W-BOL-MW (1108)

ASH GROVE CEMENT COMPANY

TICKET NO. 118041345

WARNING Cement can cause irritation or severe burns to skin and eyes with little or no warning. Wear protective boots, gloves, and eye protection. Avoid contact with eyes or skin whether direct or indirect through saturated clothing. In case of contact with skin or eyes, flush thoroughly with water. If irritation persists or burning develops, seek medical attention.

This product contains greater than 0.1% crystalline silica. Chronic over-exposure to airborne crystalline silica has been linked to lung problems, including cancer and silicosis. Avoid breathing dust, use a NIOSH approved dust respirator, and use only with adequate ventilation to keep dust levels below permissible exposure limits.

Buyer, by taking delivery, agrees to inform its employees, customers and other users of the warnings and hazards of improper use. Read and follow all precautions listed in the material safety data sheet, which is available upon request or at our website - www.ashgrove.com.

KEEP OUT OF REACH OF CHILDREN.

If this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign or stamp the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

ASH GROVE CEMENT

(Signature or stamp of consignor)

If charges are to be prepaid, write or stamp here "To be Prepaid" in space below.

FROM: ASH GROVE CEMENT COMPANY
AT: Kansas City
DESTINATION
Clarkson Construction Company
US 69 & College BLVD
Overland Park KS

Del. Date:
Ship Date at: 9/30/2011 Specified Weight: 0.00
Ship Time at:
Contact and Phone: ARMANDO 816-808-8389
Job # 69-46 K 8251-11

CUSTOMER NO. 1631502
DATE 9/30/2011
TIME 12:32:04PM
Time In: 12:27:53PM
CONT.# 509051021
P.O. 619002
RATE COLLECT
CARRIER/ROUTE 900
CUSTOMER PICK-UP

CONTROL NO 126221 - 00037

TONS	CODE	DESCRIPTION	EQUIP NO.	BIN #	GROSS	TARE	NET
27.45	13	Type I/II Bulk	7702	5	79,760	24,860	54,900

The Type I/II cement in this shipment was loaded from silo number 5 and complies with Kansas Highway Commission Specifications. Source of cement Ash Grove Chanute, KS, Ship from Kansas City, KS. By:

TEST

SPECIAL INSTRUCTIONS

135 to 69 South to College Blvd exit.
Go Right to Jobsite
Plant

Contractor's Cartage

DO NOT DIVERT WITHOUT CONSENT OF ASH GROVE CEMENT COMPANY

ASH GROVE CEMENT COMPANY Seller
Permanent post office address of Seller, Overland Park, KS

CUSTOMER PICK UP ONLY: This acknowledges receipt and title to the material described hereon, which is for use at the destination indicated above.

LOADED BY

PER

TIME USED BY CONSIGNEE FOR UNLOADING TRUCK, IN EXCESS OF TIME ALLOWED IN TARIFF, WILL BE ASSESSED AT THE APPLICABLE TARIFF RATES AND CHARGED TO CONSIGNEE. PRIOR TO SIGNING DELIVERY RECEIPT, VERIFY CONDITION OF SHIPMENT, TRUCK ARRIVAL, AND UNLOADING COMPLETED TIME. NO CLAIMS FOR SHORTAGE OF GOODS, LOSS OR DAMAGE WILL BE CONSIDERED UNLESS SUPPORTED BY DOCUMENTATION ACCEPTABLE TO SELLER.

RAIL-LOADED TO FULL VISIBLE CAPACITY

TRUCK LOADED PER DRIVER'S INSTRUCTIONS

ACCEPTED FOR CARRIER BY:

RECEIVED FOR CONSIGNEE BY

(ALL SALES SUBJECT TO THE TERMS AND CONDITION ON THE FRONT AND BACK SIDES.)

Kansas Department of Transportation

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RECORD OF MOISTURE TESTS - (CHECK TESTS AT CONCRETE PLANT)

Date	Time	Kind of Aggr.	Weight in Air (S)	Weight in Water (W_2)	Weight in Water (W_1)
9-28-82	8:00A	Sand	1000	600.4	617.1
9-28-82	8:30A	Rock	2000	1221.8	1226.8
9-28-82	1:00P	Sand	1000	601.0	617.1
9-28-82	2:00P	Rock	2000	1223.4	1226.8
9-29-82	8:15A	Sand	1000	600.0	617.1
9-29-82	9:15A	Rock	2000	1222.2	1226.8

W_1 minus W_2	% Moisture	Sample Taken From	Sp Gr.	Remarks	Insp
16.7	2.7	stockpile	2.60		JK
5.0	0.4	Bin	2.65		JK
16.1	2.6	Bin	2.60		JK
3.4	0.5	Bin	2.65		JK
17.1	2.8	Stockpile	2.60		JK
4.6	0.4	Stockpile	2.65		JK

The operational check recorded on this plate is for verification of the moisture deductions made by the concrete producer.

DIETZGEN NO. 3814-3

Kansas Department of Transportation

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CONCRETE DELIVERY TICKET 328350

Project 69-46 K8251-08
County SO
Type Work PAVE
Contractor Clarkson
Supplier Penny's Shawnee
Mix Design 1PAC 126B
Design ~~kg/m³~~ (lb/ft³) 148.18
Admixtures:
7 ~~g/m³~~ (oz/yd³) Airentraining Agent
47 ~~g/m³~~ (oz/yd³) 6420 Other (Type)

REQUIRED FOR CERTIFIED CONCRETE

Moist. Corr. FA 2.8 %; CA 0 %

Corrected Mass per Volume: kg/m³ (lb/yd³)

FA 1921 ; CA 1382 ; Water 188

Certified Batcher No.

5-97

Ready Mix Ticket No. 2168922
Date 10-1-15
Class Conc. MA3 Pave m³ (yd³) 8
Accumulated m³ (yd³) 8
Water Withheld ~~L/m³~~ (gal/yd³) 2
Water Replaced L/m³ (gal/yd³)
Truck No. 8212
Discharge Time
Loading Time 8:32
Total Time

Mixing ~~Revs.~~	Additional Mixing Revs.	Agitating Revs.
Final	Final	Final
Initial	Initial	Initial
Total 60 sec	Total	Total

Grand Total Revolutions
Plant Inspector Ed Caudess
Job Inspector

D.O.T. Form No. 229

Kansas Department of Transportation

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Aggregate moisture affects your concrete mixing water

A 1.2% difference in aggregate moisture can make a difference of almost 3 gallons per yard

123

Moisture test options

KT-11

or

KT-24

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Aggregate Moistures, Absorption, and Specific Gravities as of 3/21/17

Producer	Codes	Location	Date	Aggregate	Ledge	(w1)	Absorption%	SpGr	Sample I.D.
Hunt Martin Mtls	803501	DeSoto Ks	2/1/2017	SCA-3	ARGN	1238	1.9%	2.625	1032232
Hunt Martin Mtls	838701	Sweet Home Ark	3/20/2017	CPA-4	COCA	1255	0.8%	2.683	1032422
Granite Mtn 1/2	838701	Sweet Home Ark	2/1/2017	CPA-4	Granite	1233	0.7%	2.609	1032422
Granite Mountain 3/4	838701	Sweet Home, Ar	2/1/2017	CPA-4	Granite	1231	0.5%	2.615	1032424
Hunt Martin Mtls	803512	Stamper, MO	2/1/2017	SCA-4	BFLS	1242	1.5%	2.640	1032425
Penny's LeLoup	800309	LeLoup Ks	2/1/2017	OGCA	STNR	1229	2.1%	2.605	1032426
TR&G Trap Rock	845303	Ironton, MO	2/1/2017	OGCA	Granite	1241	0.5%	2.638	1032431
Mill Creek Granite 1/2	808701	Oklahoma,OK	2/1/2017	CPA-4	Granite	1260	0.5%	2.702	1032433
Mill Creek Granite	808701	Oklahoma,OK	2/1/2017	CPA-4	Granite	1258	0.5%	2.700	1032435
Holiday Sand #7	815301	Bonner Springs, Ks.	2/1/2017	Pea gravel	Ks. River	1230	1.2%	2.596	1032436
Holiday Sand #11	815404	Riverside Mo	2/1/2017	Pea gravel	Mo. River	1234	0.9%	2.609	1032439
Holiday Sand #3	815412	Bonner Springs, Ks	2/1/2017	FAA	KS, River	616	0.4%	2.602	1032440
Schaake DG	826802	Lawrence, KS	2/1/2017	FA-A	KS, River	615	0.3%	2.595	1032442

Needed for KT-24

Needed for KT-11

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KT-11 moisture

If you are using KT-11 you will run the moisture test and get your result.

After you have the result you will have to subtract the pre-known absorption from the result.

Example for Hunt SCA-4 in Stamper, MO

KT-11 result = 2.0%

Absorption for that particular aggregate = 1.5%

So your net free moisture result = .5%

126

KT-24 moisture

If you are using KT-24 you will run a 2000 gram sample and get a water weight

Example using the same Hunt SCA-4 Stamper rock

W1(known number)=1242

W2(today's moisture sample)=1236

You have a net result of 6 that you'll need to look up on Table 1

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Table 1
Determination of the Moisture Content of Concrete Aggregates by Displacement Method

% of Absorption or Moisture			% of Absorption or Moisture		
$W_1 - W_2$	S= 1000 g	S= 2000 g	$W_1 - W_2$	S= 1000 g	S= 2000 g
0	0.0	0.0			
1	0.2	0.1	21	3.4	1.7
2	0.3	0.2	22	3.5	1.8
3	0.5	0.2	23	3.7	1.8
4	0.6	0.3	24	3.9	2.0
5	0.8	0.4		4.0	2.0
6	1.0	0.5		4.2	2.1
7	1.1	0.6	27	4.3	2.2
8	1.3	0.6	28	4.5	2.2
9	1.4	0.7	29	4.7	2.4
10	1.6	0.8	30	4.8	2.4
11	1.8	0.9	31	5.0	2.5
12	1.9	1.0	32	5.1	2.6
13	2.1	1.0	33	5.3	2.6
14	2.2	1.1	34	5.5	2.8
15	2.4	1.2	35	5.6	2.8
16	2.6	1.3	36	5.8	2.9
17	2.7	1.4	37	5.9	3.0
18	2.9	1.4	38	6.1	3.0
19	3.1	1.6	39	6.3	3.2
20	3.2	1.6	40	6.4	3.2

W_1= Mass of 1000 or 2000 g saturated, surface dry sample immersed in water
W_2= Mass of 1000 or 2000 g saturated, test sample immersed in water

If W_2 is larger than W_1 the result would be negative and the aggregate would have 20 minute moisture absorption potential.

8. Report

8.1. Record the absorption or moisture to the nearest 0.01 percent. Report the absorption or moisture to the nearest 0.1 percent.

128

Correcting Batch Weights

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To:	David B Johnson					Project #:	I070-105 KA 1003-05		
	3101 S. 24th St					Contractor:	Clarkson Construction		
	Kansas City, KS 66106					For use in:	Drilled Shafts		
						Date:	8/20/2013		
						Sheet:	1 of 1		

We propose to furnish concrete for the above listed project using these mix design:

Designed Air @ 3.0 %

Matl Code: PCC000073

Class of Conc	Water Cmt Ratio	CMS Design #	Design Wt lb/ft3	Air Free Wt lb/ft3	Water lb/yd3	Cement/Fly Ash lb/yd3	Rock lb/yd3	Sand / Pea Grav lb/yd3
GR4.0 MA-5	0.42	1PMC060A	147.09	151.65	231	412/138	1554	1385/252
GR4.0 MA-5	0.40	1PMC060B	147.75	152.33	220	412/138	1568	1397/254
GR4.0 MA-5	0.38	1PMC060C	148.41	153.00	209	412/138	1582	1410/257

Supplier and Type of Cmnt:	Ashgrove Type I/II	Sp. Gr.:	3.15	Location:	Chanute, KS	
Supplier and Type of Flyash:	Ashgrove Type F	Sp. Gr.:	2.52	Location:	Chanute, KS	
Coarse Agg. Supplier:	Hunt Martin (Stamper)		Type:	SCA-3	Sp. Gr.:	2.64
Agg. Supp. Legal Descr:	S02, T52N, R34W, Platte Co, MO			Quality Lab #	12-3766 1-1	
Fine Agg. Supplier	Holliday Plant # 7		Type:	FA-A	Sp. Gr.:	2.61
Agg. Supp. Legal Descr:	S28,T11S,R23E,			Quality Lab #	07-2738 1-2	
Supplier and Type of Air-Entraining:	NA					
Supplier and Type of Admix. #1:	Euclid Plastol 6420					
Supplier and Type of Admix. #2:	Euclid WR-91					
Supplier and Type of Admix. #3:						
Water Source:				Lab No.:		

Special Aggregates: Class 1, Paving, Etc.:

Coarse Agg. Supplier:	Holliday Plant #11	Type:	Pea Gravel	Sp. Gr.:	2.62
Agg. Supp. Legal Descr:	S09,T50N,R33W		Quality Lab #	06-1367 1-6	
Status List:	Quarry # :	Bed Nos.:		Lab No.:	
Fine Agg. Supplier:		Type:		Sp. Gr.:	
Agg. Supp. Legal Descr:			Quality Lab #		

			JM for 8/20/2013	Area Materials Supervisor KC Metro Materials	
Company:	Fordyce Concrete				Bonner
Plant Loc.:	Central Ave, KC,KS	Number:	00600301		Fordyce
By:	Pat Barger				R/M

Mix meets Aggregates for Concrete NOT placed on Grade (Spec 07-11009)

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Example #1 (1PMC060A)

	Design Weight	Moisture Ran by plant or inspector	H20 Correction	Corrected Batch Weights
Rock	1554 lbs			
Rock				
Sand	1385 lbs			
Sand	252 lbs			
Cement	412 lbs			
Cement	138 lbs			
Water	231 lbs			

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EXAMPLE #1 (1PMC060A)

	Design Weight	Moisture Ran by plant or inspector	H_2O Correction	Corrected Batch Weights
Rock	1554 lbs	0.50%	+8 lbs	1562 lbs
Rock				
Sand	1385 lbs	3.00%	+42 lbs	1427 lbs
Sand	252 lbs	0.50%	+1 lbs	253 lbs
Cement	412 lbs			412 lbs
Cement	138 lbs			138 lbs
Water	231 lbs		-51 lbs	180 lbs
	3972 lbs			3972 lbs

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Example #2 (1PMC060B)

	Design Weight	Moisture Ran by plant or inspector	H20 Correction	Corrected Batch Weights
Rock	1568 lbs			
Rock				
Sand	1397 lbs			
Sand	254 lbs			
Cement	412 lbs			
Cement	138 lbs			
Water	220 lbs			
	3989 lbs			

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EXAMPLE #2 (1PMC060B)

	Design Weight	Moisture Ran by plant or inspector	H_2O Correction	Corrected Batch Weights
Rock	1568 lbs	-1.0%	-16 lbs	1552 lbs
Rock				
Sand	1397 lbs	1.50%	+21 lbs	1418 lbs
Sand	254 lbs	0.00%	0	254 lbs
Cement	412 lbs			412 lbs
Cement	138 lbs			138 lbs
Water	220 lbs		-5 lbs	215 lbs
	3989 lbs			3989 lbs

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The End

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