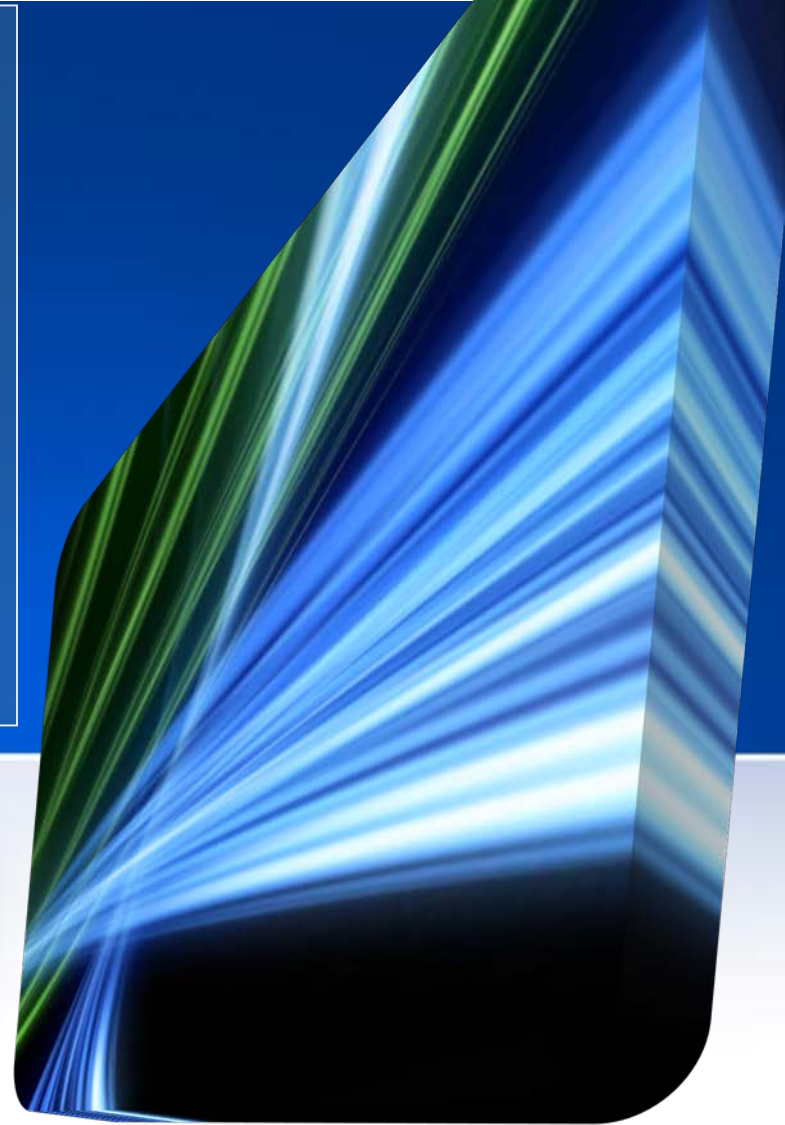


2014 Nebraska Blended Cements Specification



Spring 2014
Jacksonville, Florida



Presented by:
Lieska Halsey
Research Engineer

HISTORY



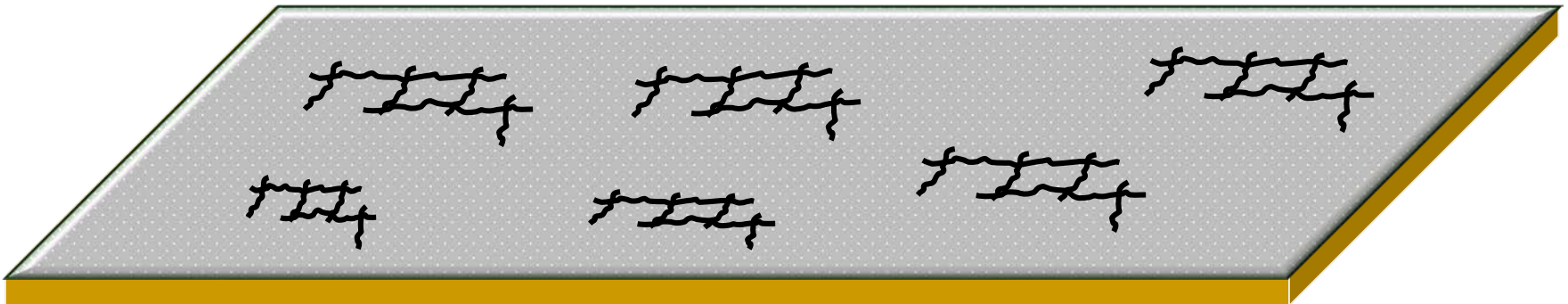
Designs PCC Pavement to Last
50 Years



HISTORY



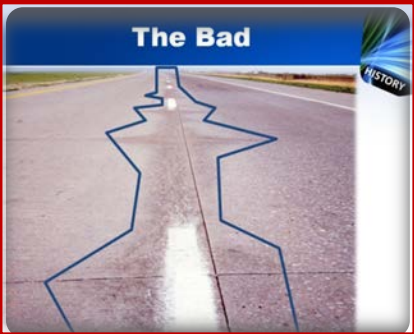
Began to notice pavements
less than 10 years old
displaying severe
deterioration



The Good



The Bad



The UGLY



**Concrete never
deteriorates from a single
cause usually there are
multiple causes.**

Bryant Maher



The Bad Projects:

Severe Early Deterioration

Poor Air System

Segregation

Poor Drainage

No Load Transfer

**Type I/II Cement with 17%
Class C Fly Ash
Replacement**





The Better Projects:

No Early Deterioration

Moderate Air System

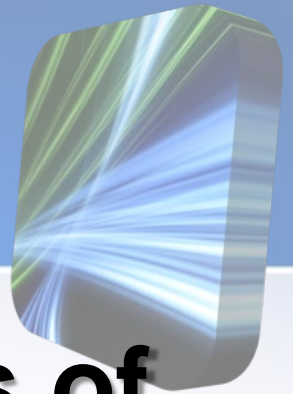
Poor Drainage

Non Doweled Pavement

IPN or IPF Cement



Short Term Action:



Eliminate the known causes of premature deterioration

Long Term Plan:

A comprehensive look at
Concrete Pavement Design, Concrete
Mix Design, Specifications,
and QA/QC activities

Pavement Design



- Provide a Solid Sub-Base
- Provide Good Drainage
- Widen Slabs to Reduce Deterioration at Concrete to Asphalt Joint
- Provide Load Transfer at Joints
- Reduce Tire Noise

Mix Design



- Mitigate ASR
- Pursue Supplementary Cementitious Material (SCM) combinations that are effective against ASR and improve permeability
- Achieve Good Air System
- Curing
- Optimization of Aggregate Gradations

QA/QC Procedures



Plant Certification Program

- Portable and Stationary Plant Inspection
- Concrete Plant Technician
 - Since August 2013, Contractor is responsible for batching the concrete.

Technician Certification Program

- ACI Training
- Pavement Smoothness Program
- Portland Cement Sampler
- Maturity Method Field Monitoring

Material Verification Procedures

- Random sampling for blended/interground cement
 - QA of Interground and Blended Cements (oxides ratio) for ASR verification
- Random sampling for aggregates

SHORT TERM ACTION



LONG TERM PLAN





Current Challenges

Challenges Today

Future Changes

Fly Ash Quality



**Final
Intergrated/
Blended
Cement**



ASR

**Incompatible
admixtures
combinations**



**Final Adequate
Air System**

Nebraska's Initiatives

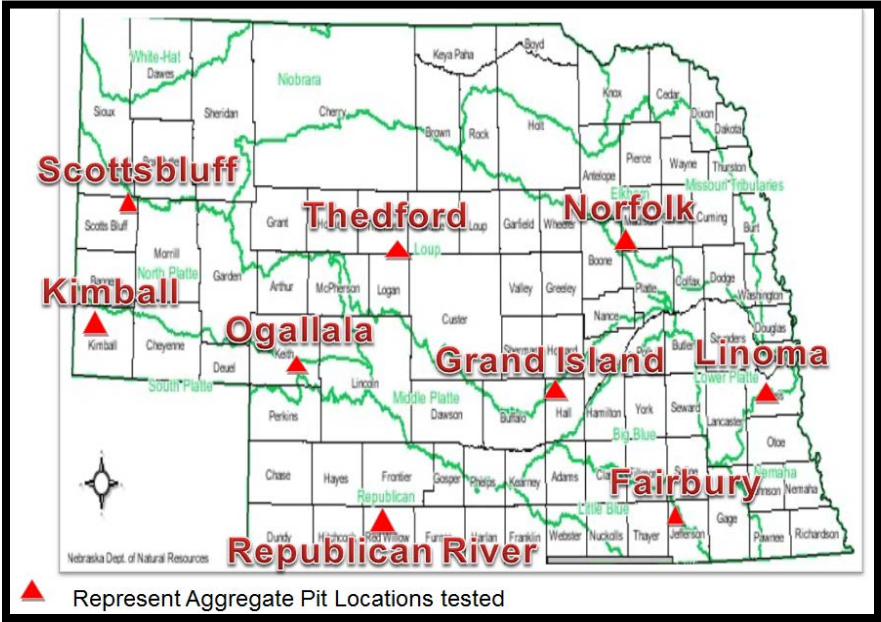
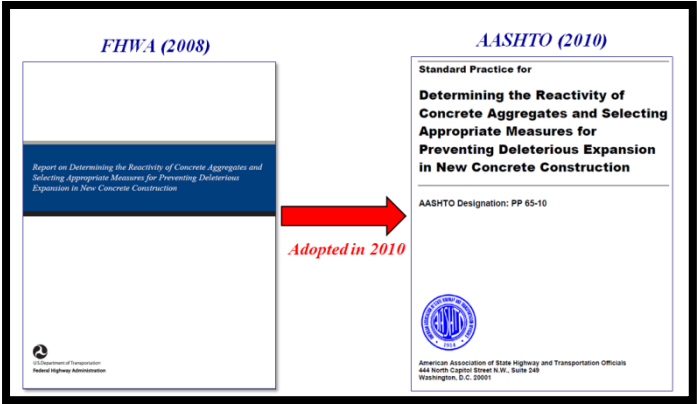
Interground/Blended Cement Specifications



Reasons for Change

- **EPA Regulations (Impact on the Future Fly Ash Sources Class F Ash)**
- **NDOR's Evaluation of Statewide Aggregate Reactivity**

Nebraska's Evaluation of Statewide Aggregate Reactivity



**Republican River
Indianola's Aggregate
Non- Approved Aggregate**

		(Table 6-AASHTO PP 65-10)	Type I/II Cement Low Alkalinity	
Aggregate Type Location	Description of Agg. Reactivity	Mim. Replacement Level of SCM	Mim. Replacement Level of SCM Mitigate ASR	Nebraska's Spec Since Late 2004 IP with 25% Class F
Platte River Grand Island	Moderate Reactive	20	15	✓
Dry Pit Kimball	Highly Reactive	25	20	✓
Republican River Indianola	Very Highly Reactive	35	25	✗
North Platte River Scottsbluff	Highly Reactive	25	20	✓
South Platte River Ogallala	Moderate Reactive	20	15	✓
Middle Loup River Thedford	Highly Reactive	25	20	✓
Little Blue River Fairbury	Moderate Reactive	20	15	✓
Elkhorn River Norfolk	Very Highly Reactive	35	25	✓
Platte River Linoma	Highly Reactive	25	20	✓



New Interground/Blended Cement Approval Process

For Concrete Applications:

- **NDOR will no longer maintain Supplemental Cementitious Materials (SCM's) on the Approved Product List (APL) for the following products:**
 - Fly Ash (C&F), Calcined Clays (N-Pozzolan), and Slag
- **NDOR will allow the use of ASTM C 1697-Standard Specification for Blended Supplementary Cementitious Materials**
- **NDOR will allow the use IP and IT cement in accordance with ASTM C595**



Supplier Approval Process for Blended SCM's

Supplier when using ASTM C 1697

- **The supplier will report Chemical Composition for the final SCM's**
 - **NDOR verify the chemical composition of the final blend**
 - **The Final SCM's blend shall be reported by the classification of SCM's final Blended SCM_b**

For Example :

A binary mixture SCM_b-65F/35C

65% class F and 35% C fly ash



Supplier Acceptance Requirements

Interground/Blended Cement

- **The supplier shall conform to ASTM C 595**
 - NDOR verify the chemical composition of the final Interground/Blended Cement
 - NDOR will pre-establish a $(\text{CaO}/\text{SiO}_2)$ ratio
- **Supplier would provide Alkali Silica Reaction (ASR) testing**
 - (ASTM C 1567 less than 0.10% @ 28 days)
 - Platte River and Norfolk aggregate
 - NDOR verify ASTM C 1567
- **Total Cement Replacement with SCM's**
 - 20% min
 - 40% max



Project Level Quality Assurance

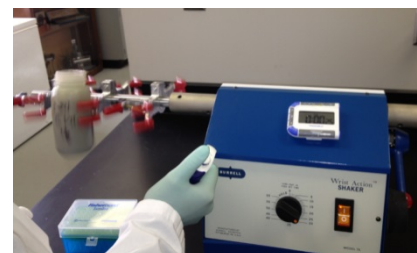
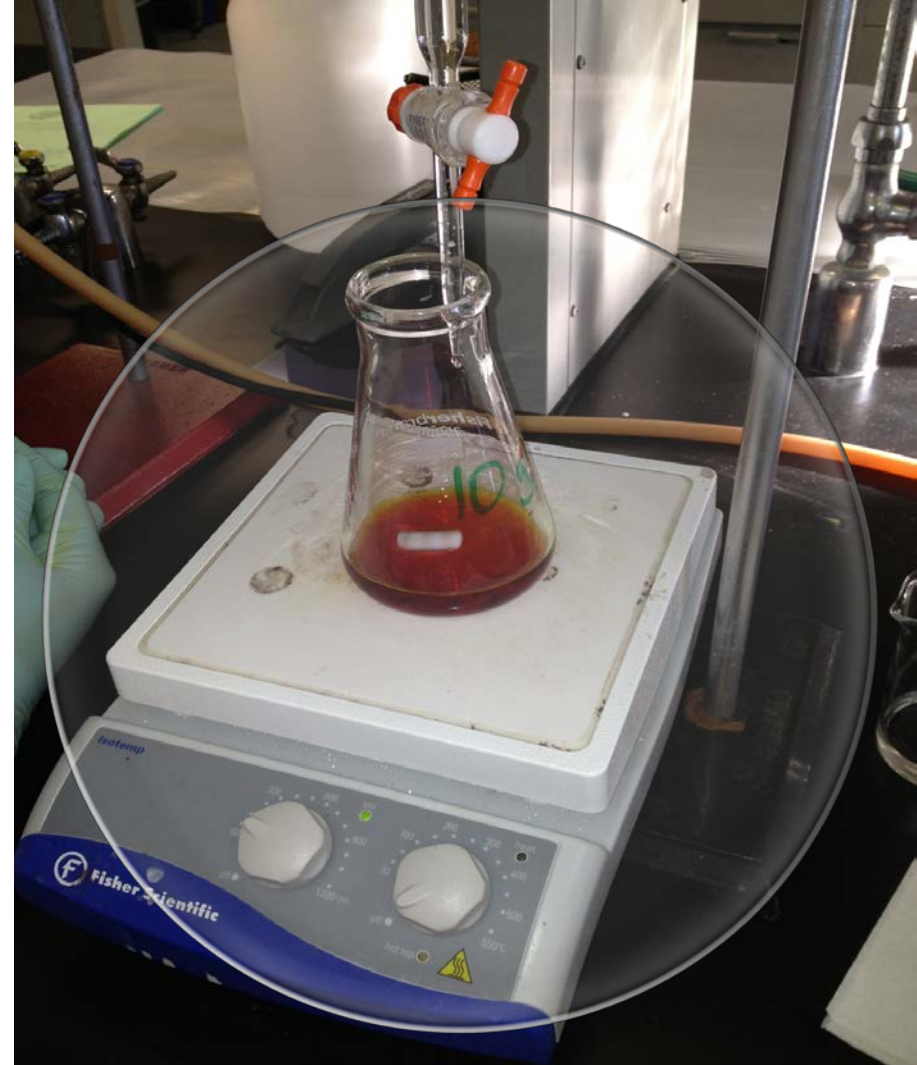
- **Prior to any concrete production, the cement type and aggregate source shall be approved.**
 - Platte River Aggregate
 - Elkhorn River Aggregate
- **Cement shall be Sampled and Tested**
 - 750 tons
 - NDOR will verify pre-established
 - (oxide ratio)

Nebraska will start an
extensive evaluation during
2014 construction season

Performing Forensic Testing

- In-house Evaluation toward the Proposed test by AASTHO M 295.
 - Foam Index
 - Fly Ash Iodine Number
 - Air Entraining Admixture Absorption

*All These Test are to evaluate the
influence of Carbon on Air Entraining*



**Nebraska in 2014 will
continue the In-House
Research**

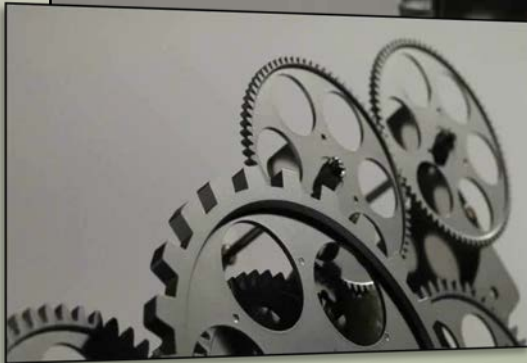
**AASHTO Provisional
Standard:**

**Potential Alkali Reactivity of
Aggregates and Effectiveness
of ASR Mitigation Measures
(Miniature Concrete Prism
Test, MCPT)**



Test #3 Specimens Condition @ 84 days





INDUSTRY