Recycled Materials Resource Center

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Recycled Materials Resource Center

NCC Meeting, April 9th, 2008

Recycled Materials Resource Center

- Partner laboratory of FHWA
- Founded in 1998, renewed in 2007
- Dedicated to the appropriate use of recycled materials in the highway environment
- Focus on research and outreach efforts
- Product driven center

RMRC Research

- 39 research projects completed to date
- **Project 1:** Mitigating Alkali Silicate Reaction in Recycled Concrete
- **Project 2:** Using Lithium to Mitigate ASR in RCA Concrete
- **Project 38**: Recycled Concrete Aggregate Concrete Pavement Performance Survey Outreach for the Federal Highway Administration National Review

www.recycledmaterials.org

RMRC Outreach

- Hosted an international conference on recycled materials, next conference is in the works
- Developed more than 10 standards for AASHTO
- Developed and sponsored 4 regional workshops that covered the whole US.
- Working with the US EPA, FHWA and others to promote the Green Highways Initiative

Earth Day Webinar

Putting Earth Day into Practice on our Nation's Roads and Highways: The Recycled Materials Resource Center

Earth Day - April 22, 2008
11:00 am to 12:00 pm EST

https://www.nhi.fhwa.dot.gov/resources/webconference/web_conf_learner_reg.aspx?webConfID=13933

Project 1/2 - Mitigation Practices for Alkali Silicate Reaction (ASR) in Recycled Concrete

Partners: Penn DOT, Maine DOT, Wyoming DOT, FMC Lithium Corporation

Principal Investigator: Dr. David Gress, UNH

Project stats: Phase 1 - Two Years (Aug. 2000 – Aug. 2002)
Phase 2 - Two Years (Sept. 2002 – Aug. 2004)

Phase 1 Approach:

- Develop new detection method
- Develop methods to poison or accelerate ASR
- Develop recycling method

Phase 2 Approach:

- Explore large scale tests
- Expand lithium nitrate technique to include external application

Project 1/2 Cont.

- Used ASR distressed pavement from I-95
- Evaluated class F fly ash, silica fume, ground granulated blast furnace slag (GGBFS), low alkali cement, and lithium nitrate
- Used modified ASTM C 1260 as a screening tool
- Used ASTM C 1293 to evaluate the effectiveness of each amendment
- Natural Blue Rock was used as a control

Project 1/2 Continued

- New PCC with RCA from distressed concrete did contribute to ASR
- Found that most amendments worked for RCA and Blue Rock, but required higher dosage
- Lithium nitrate seemed to halt ASR when sprayed on blocks

www.recycledmaterials.org/Research/past/P1&2/p1final.pdf

www.recycledmaterials.org/Research/past/P1&2/p2final.pdf

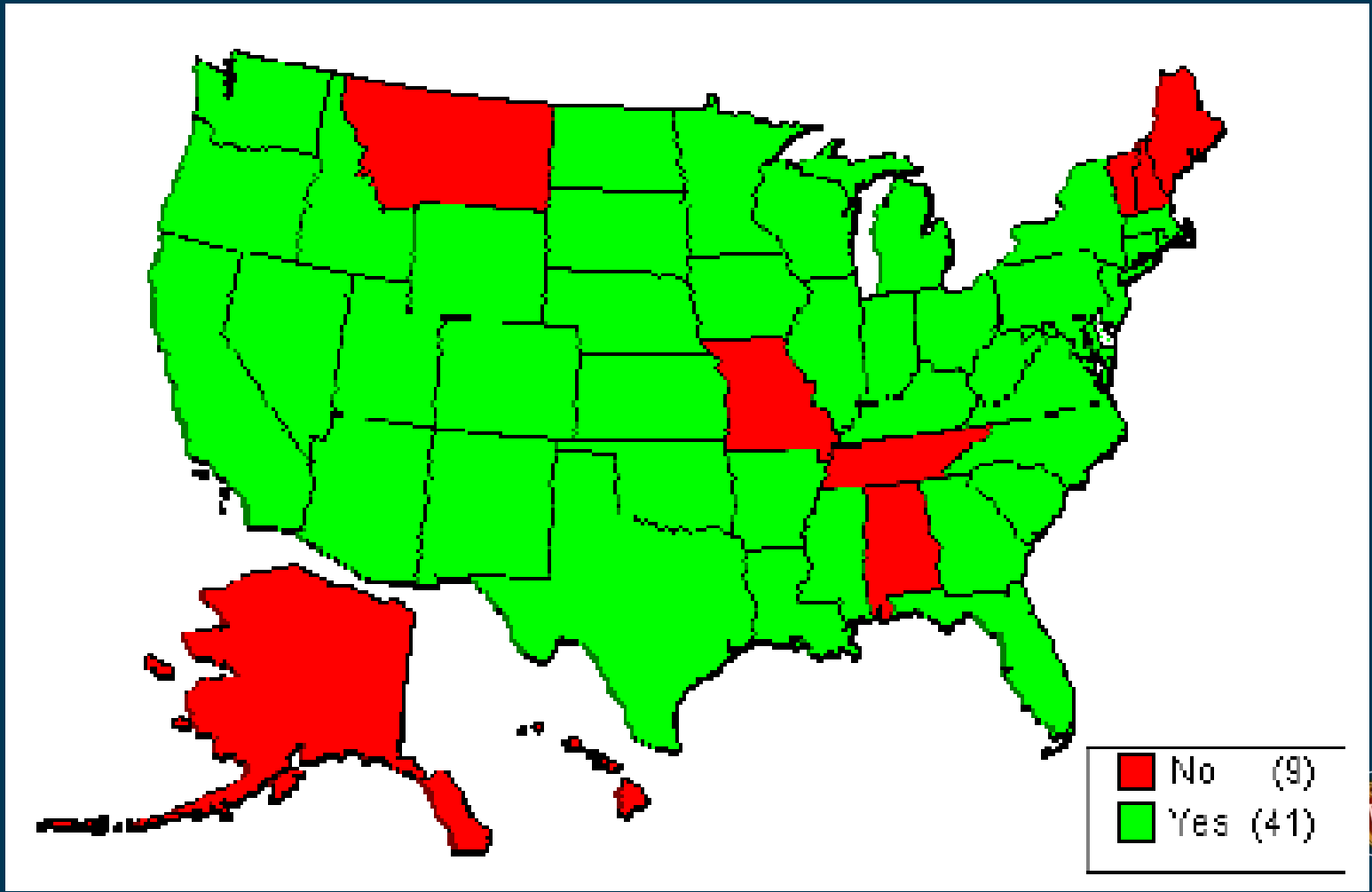
Transportation Applications of Recycled Concrete Aggregate

U.S. Department of Transportation
Federal Highway Administration

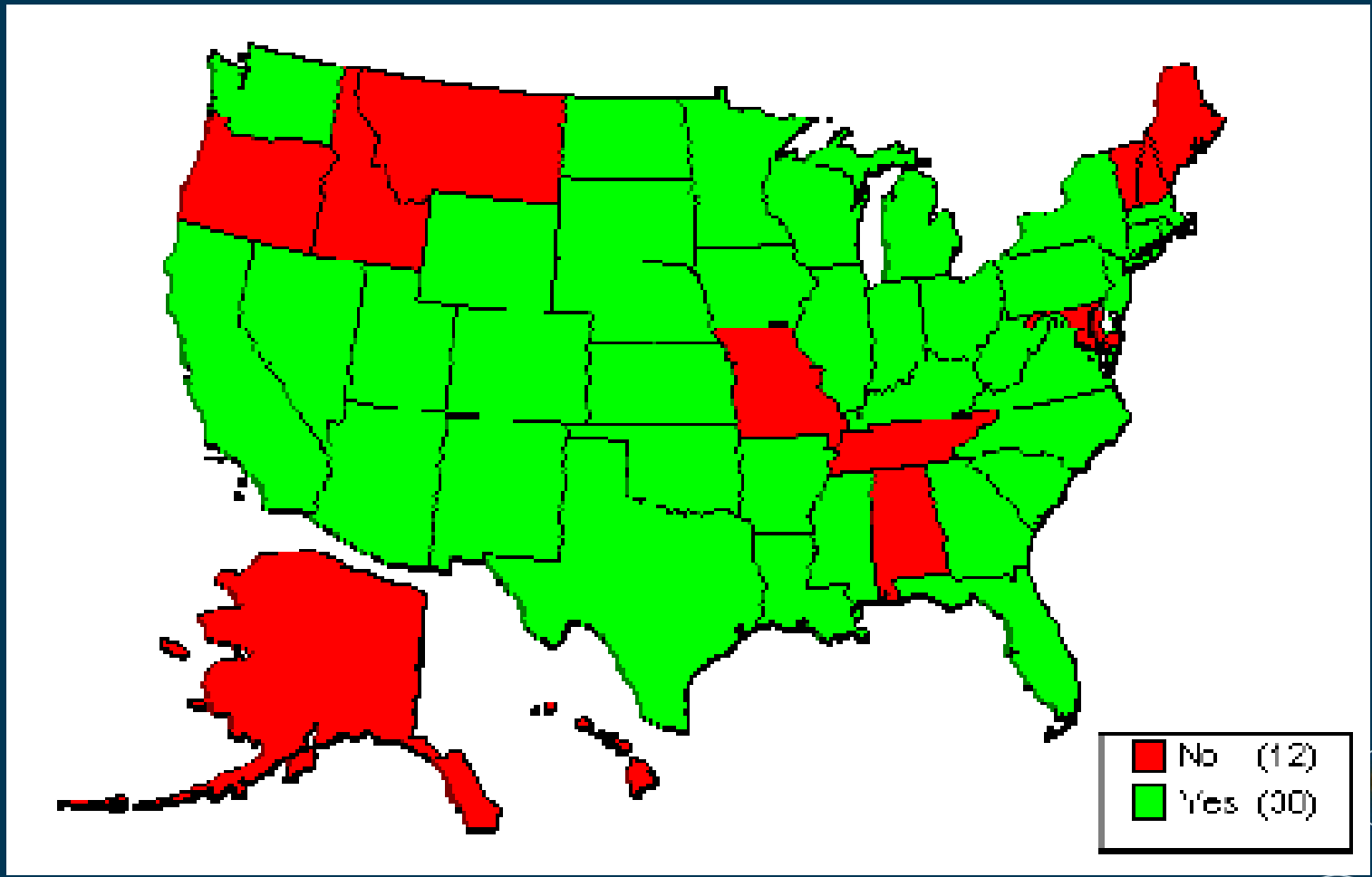
Transportation Applications Of Recycled Concrete Aggregate

FHWA State of the Practice National Review
September 2004

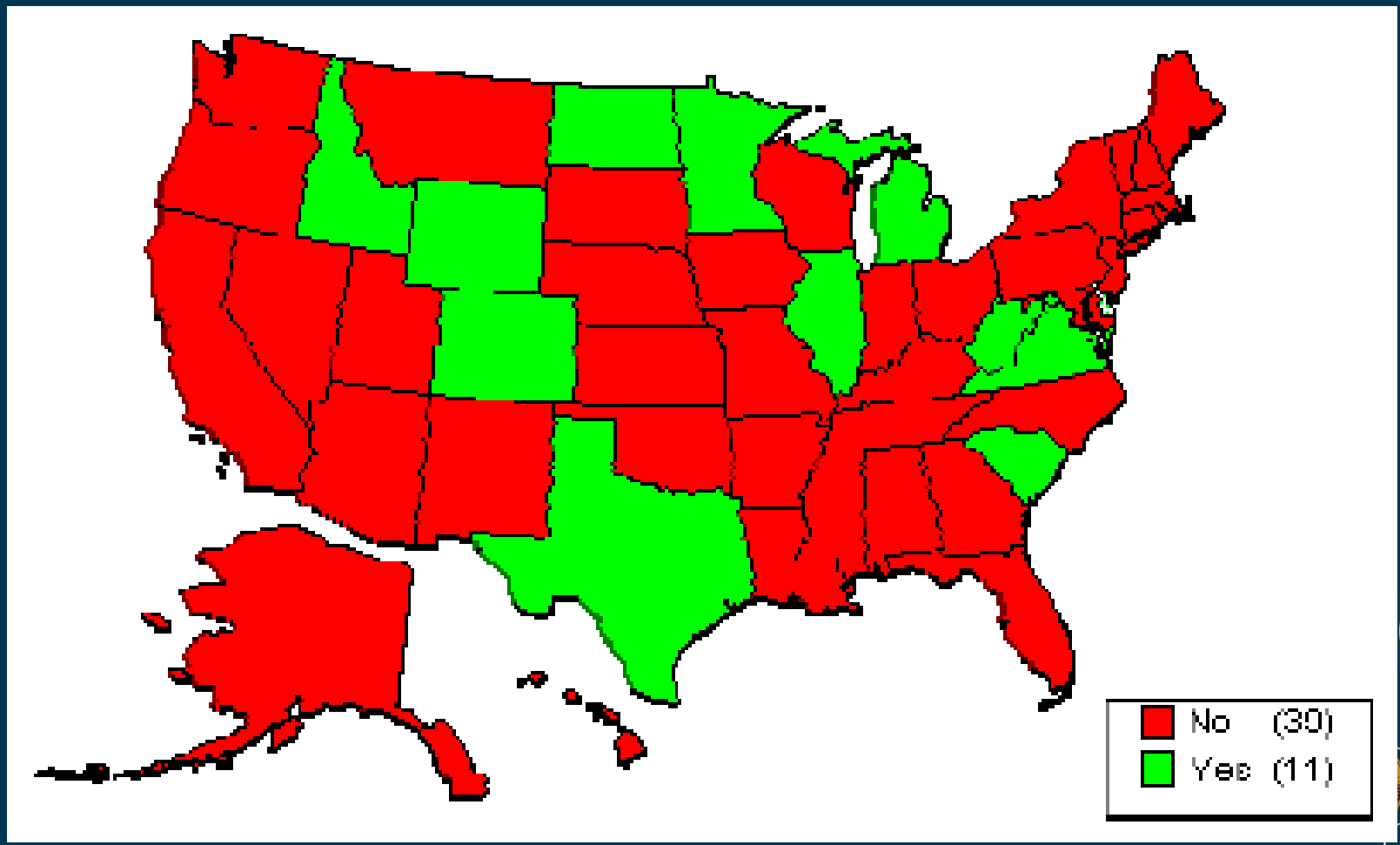
RCA as Aggregate



RCA in Aggregate Base



RCA as Aggregate for PCC



Project 38 RCA Concrete Pavement Survey Outreach

- Dr. Gress served on FHWA survey on the use of recycled concrete
- Conducted forensic study of pavements that used RCA
- Found that RCA can be used to make durable PCC pavements
- Also found ASR, which suggests that ASR distressed aggregate can be used in PCC pavements
- However…

Guidance Documents

IMCPCP (HIF-07-004) pg. 44

The recycled aggregate should be taken from a pavement that is known not to have experienced materials-related problems.

Guidance Documents

SAMARIS SAM-06DE05 pg. 129-130

…recycled aggregates from concrete pavements can be used with the exception of those originated by freeze-thaw causes, alkali/aggregate reactions, sulfate attacks or the action of ice melting salts.

What to do?

- Scrap the guidance documents?
- Only used non-distressed aggregate in new PCC?
- Just use distressed aggregate in unbound applications?

- What is the best value?

What is the Cost?

- Is the cost in dollars per lane mile?
  - What about maintenance?
  - What about environmental effects?

- How does cost play in project bidding?
  - Where is incentive in low bid process?
  - How do other partners factor into awarding projects (Green Highways)?

What is the Incentive?

- What is the incentive to use RCA?
- Right now, incentive points to unbound applications.
- However, aggregate supply, costs and other factors (mandates?) may come into play.

Research

- Need to do research now to be prepared for the future
- Look at ASR, D cracking, mix design (water demand), old mortar fraction, etc.
- Also look at life cycle cost analysis to understand true project costs.

Project 23 LCA Tool PaLATE

- LCA tool specifically designed to compare natural versus recycled material aggregates
- Considers maintenance as well as construction costs
- Also considers environmental effects
- Can help define “true” cost of a project

Pooled Fund Study

Recycled Materials Resource Center

www.pooledfund.org

Questions & Complaints

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