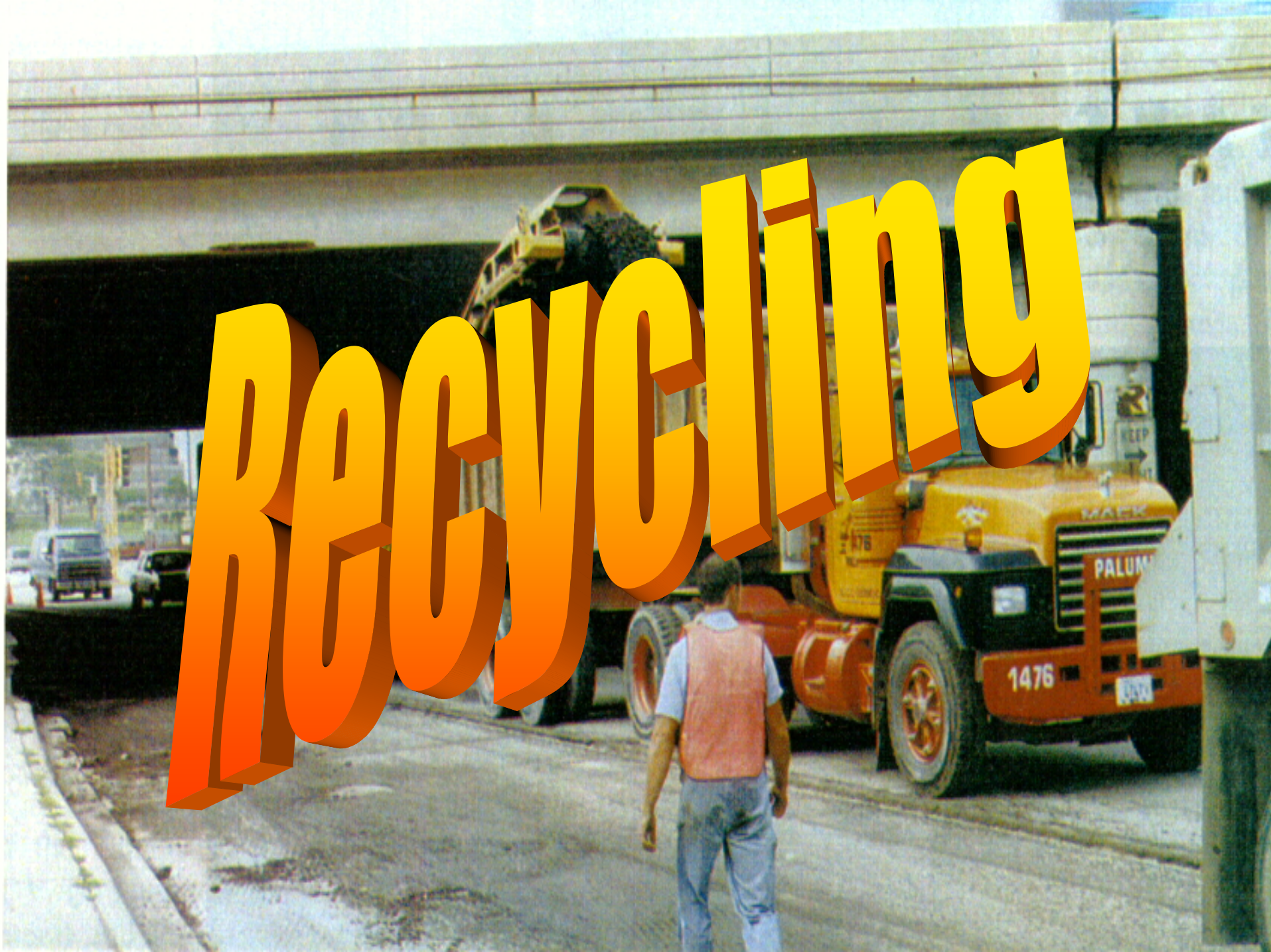


The Key AC Emphasis Areas for the Future

John D'Angelo
Office of Pavement Technology

Recycling





Key Points Of FHWA Recycling Policy

- Recycled materials should get first consideration in overall materials selection.
- Recycling can offer engineering, economic and environmental benefits.
- Engineering and environmental properties are important.
- Life Cycle Cost benefits assessment is warranted.
- Restrictions prohibiting recycled material that are without technical basis should be removed.



Barriers & Challenges

- **AASHTO Specifications**
- **Recognized as beneficial not waste**
- **Suppliers and users – full agreement**
- **Research needs addressed**
- **Case Studies**



FHWA Plan on Current Status of Pavement Recycling

- Do an analysis of the current market and practices to determine appropriate level of FHWA activities in pavement recycling.
 - Where are the issues?
 - Construction processing, Workability, durability,



FHWA Plan on Current Status of Pavement Recycling

- **Re-emphasize FHWA recycling policy**
 - Develop “Pavement Recycling Notebook”
 - Support and tools for Divisions, RC and State DOT’s
 - Point out economic & engineering reasons for recycling (materials & technology)
 - Emphasize need to increase recycling and assist DOT to establish goals and provide technical support



FHWA Plan on Current Status of Pavement Recycling

- **What work being done**
 - A RAP Technical Working Group has been established.
 - This group includes government, industry and academia.
 - They will be used to guide the many activities to be accomplished.
 - pavement evaluation

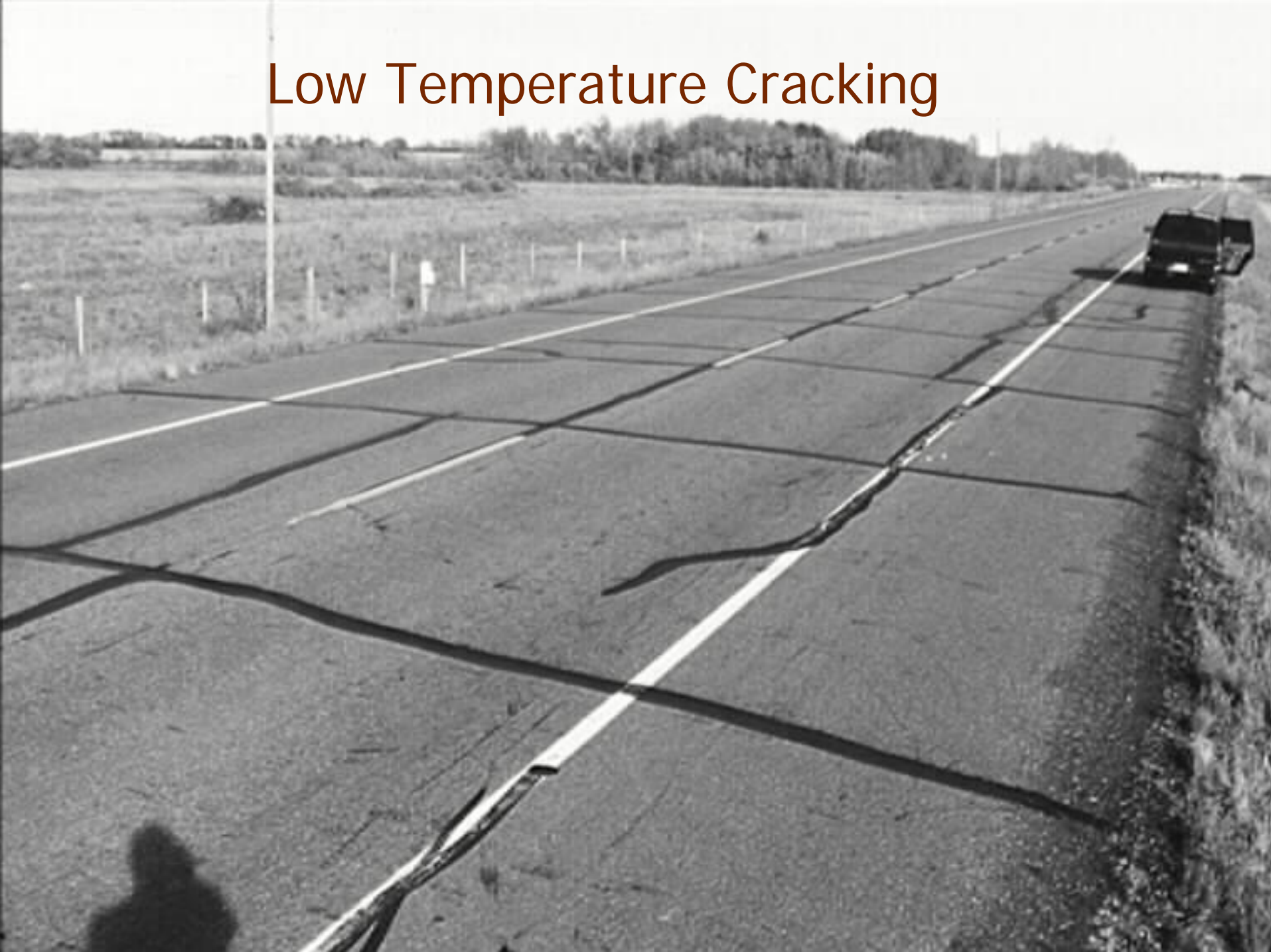


Rutting

Fatigue Cracking



Low Temperature Cracking



Moisture Damage



2/24/97



FHWA Plan on Current Status of Pavement Recycling

- The RAP materials has to be evaluated to determine how best to maximize its use.
 - Guidelines and Recommendations will be developed and made available.



Mix design



FHWA Plan on Current Status of Pavement Recycling

- Work with NAPA on development of updated design recommendations to maximize RAP use.
- NCHRP 9-46 - Improved Mix Design, Evaluation, and Materials Management Practices for Hot Mix Asphalt with High Reclaimed Asphalt Pavement Content.

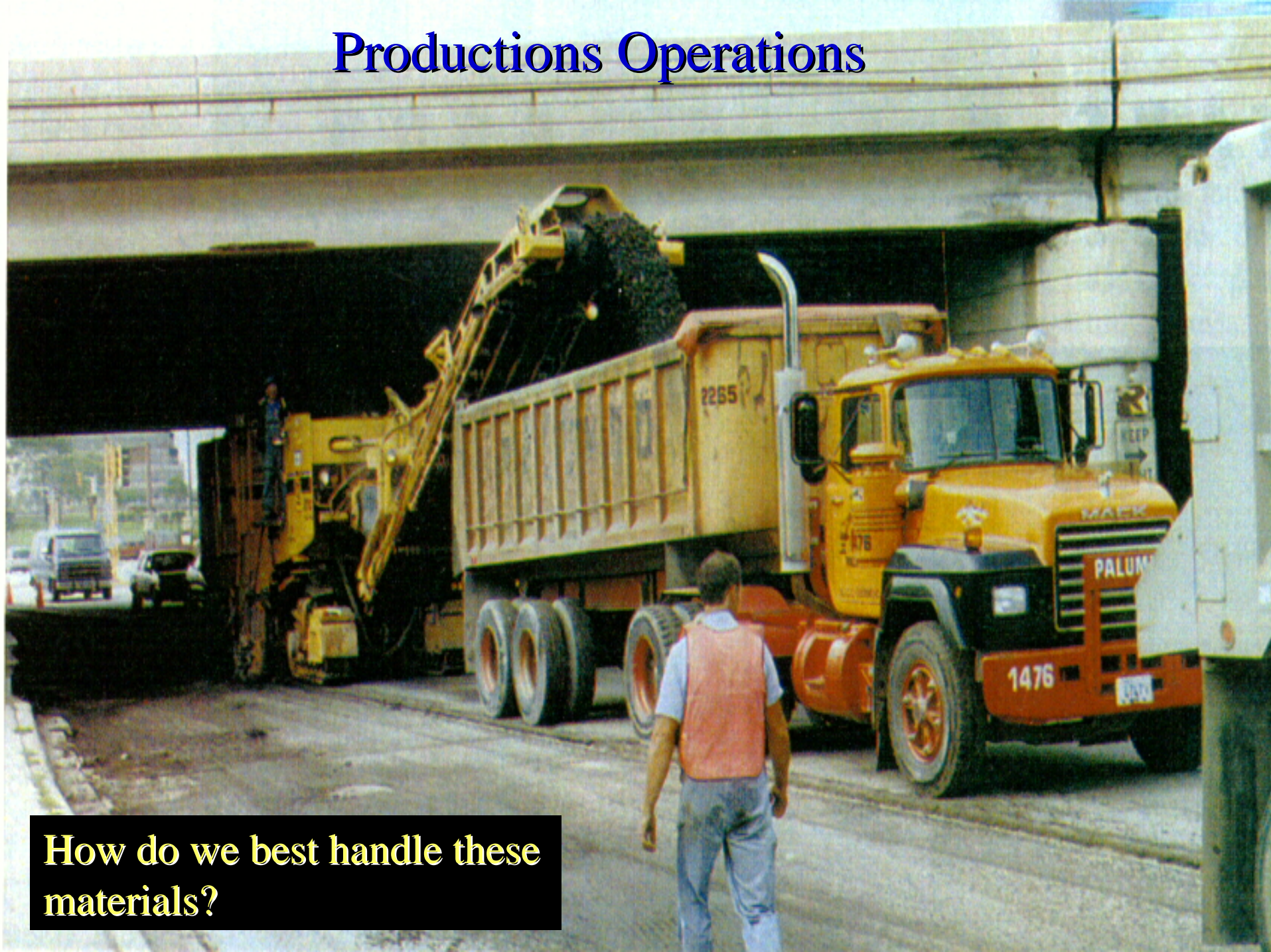


FHWA Plan on Current Status of Pavement Recycling

- Determination of long term performance Characteristics
 - Fatigue Properties
 - Low Temp Cracking
 - Quality Characteristics
- HMA Performance Tester



Productions Operations



How do we best handle these materials?

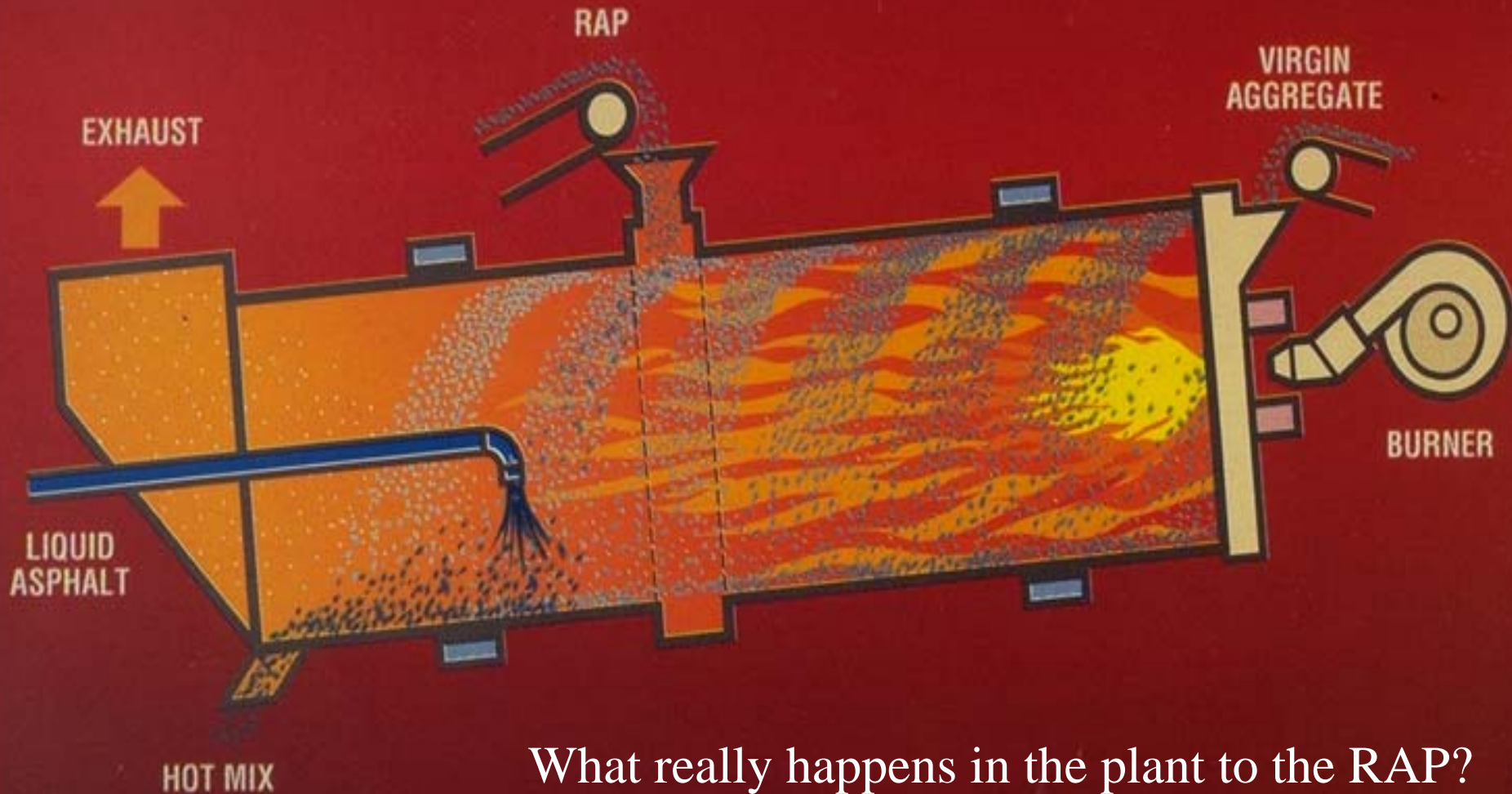
Mix Plant Operations



Do we need crushing and screening of RAP?



Drum Plant



What really happens in the plant to the RAP?
How does the RAP blend with the new binder
and agg?



What really happens in the plant to the RAP?
How does the RAP blend with the new binder
and agg?



FHWA Plan on Current Status of Pavement Recycling

- **Significant work is planned for the future.**
 - **Many of the questions about RAP should have answers.**

Construction



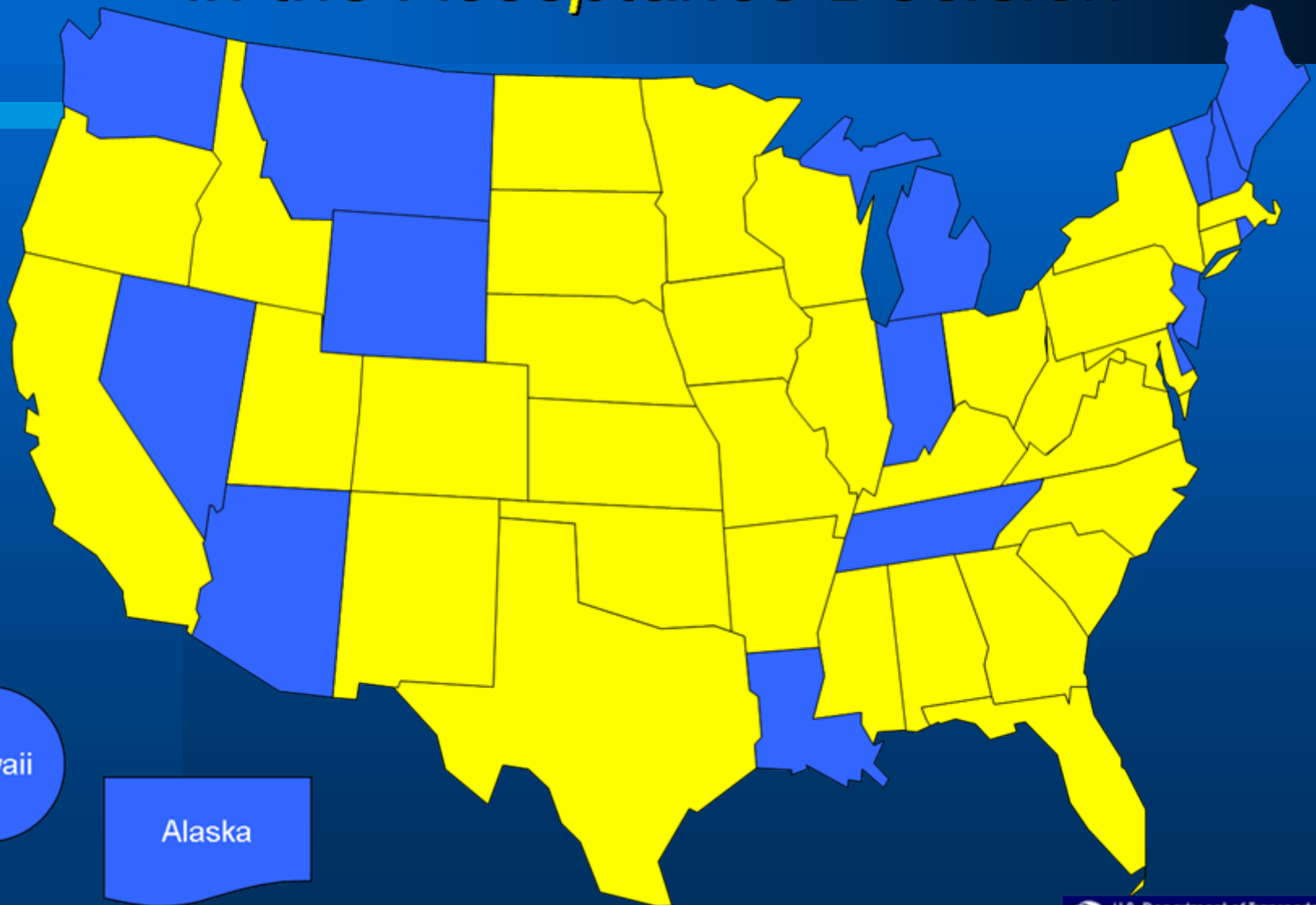


Quality Assurance Program

- **Acceptance Program**
 - State's Verification Testing
 - Inspection
 - May use Contractor test results
 - Dispute resolution
- **Qualified Technicians**
- **Accredited / Qualified Labs**
- **Independent Assurance Program**
- **Materials Certification**



33 States using Contractor Test Results in the Acceptance Decision



Hawaii

Alaska



Where We Are Now ...

- **Not enough State Verification Testing**
- **Not enough State personnel**
- **Reluctance to spend money on construction engineering – not even for consultants**
- **Ineffective validation procedures**
- **Increasing volume of projects/workload**



Resources

- **FHWA-RD-02-095**
“Optimal Procedures for Quality Assurance Specifications”
- **FHWA-HRT-04-046**
“Evaluation of Procedures for Quality Assurance Specifications”

(Burati, Weed, Hughes, Hill)





Resources

- **NHI Course 134042: Materials Control and Acceptance - Quality Assurance**
- **FHWA Basic PWL Workshop**
- **SPECRISK software (mid 2007)**
- **NHI Course 134059: Quality Assurance Specification Development and Validation Course (end 2008)**
- **2003-2005 Summary Report**
- **www.fhwa.dot.gov/pavement/materials/stewardreview2006.cfm**



Evolution...



QA Specs

Performance Specs

Design Build
Warrant Maintain





Where We Are Going ...

Long Term

- Domestic Scan of other industries
- Move toward Quality Management Systems by all contractors and suppliers
 - Beyond ISO 9000 – sector specific requirement
 - Aerospace – AS9100
 - Automotive – ISO/TS16949
- Quality Based Selection and Procurement
- Design Build Warrant Maintain



Design Build Warrant Maintain

- The Final QA?

- **Long Term Warranty**
 - Performance based contract
 - Guarantees product integrity
 - Contractor responsible for repair of defects or replacement
- **Warranty Period**
 - Pre specified for repair defects
- **Present Warranty workshops to states.**



... and beyond!

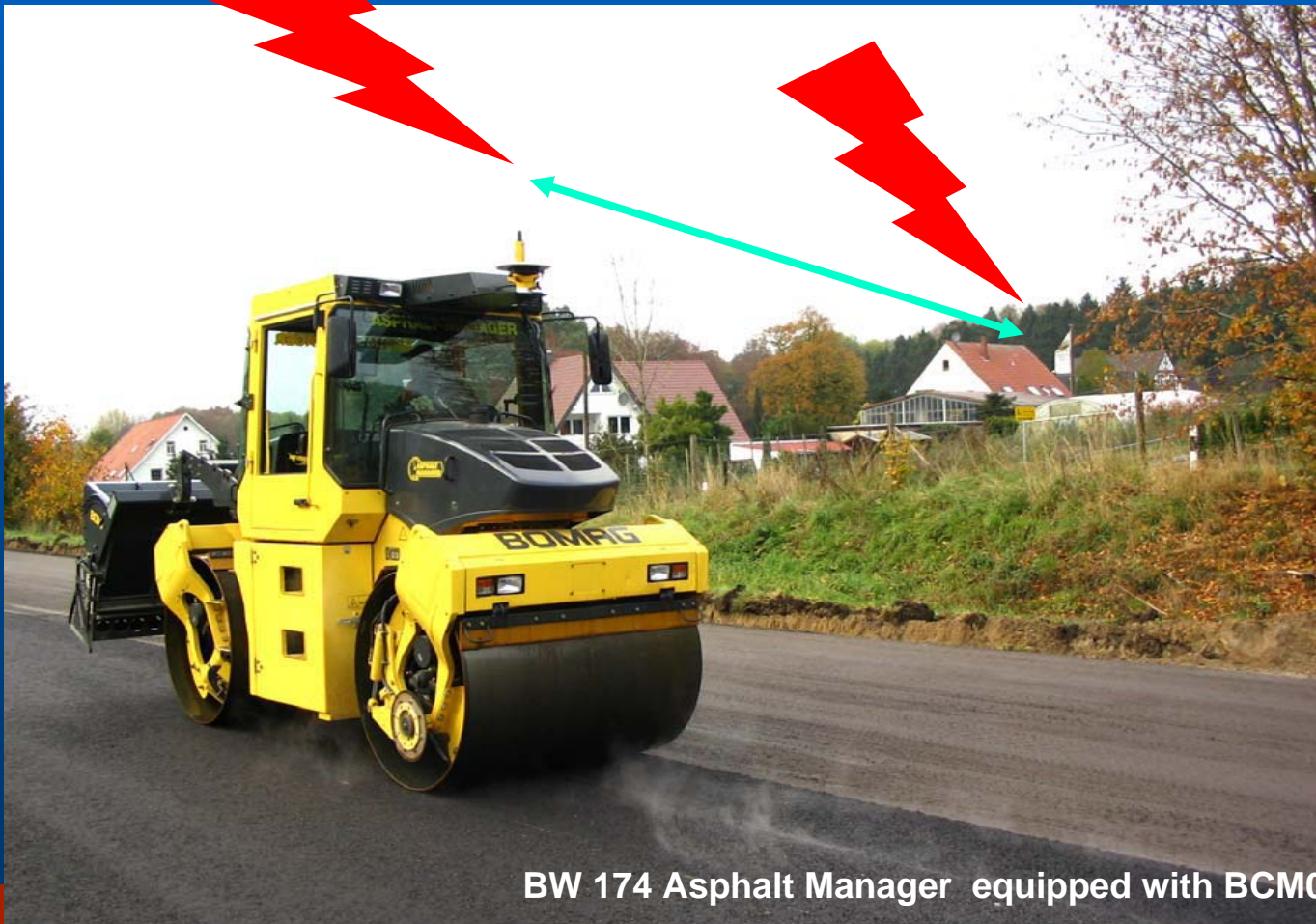
- **Cannot continue on same path of regulate and enforce**
- **Cannot continue to police contractors trying to catch them in the act**
 - **System needed to match contractor's priorities in-line with agency's**
 - **Quality and long term performance**



Intelligent Compaction

GPS antenna

GPS reference station (Trimble)



BW 174 Asphalt Manager equipped with BCM05 and GPS

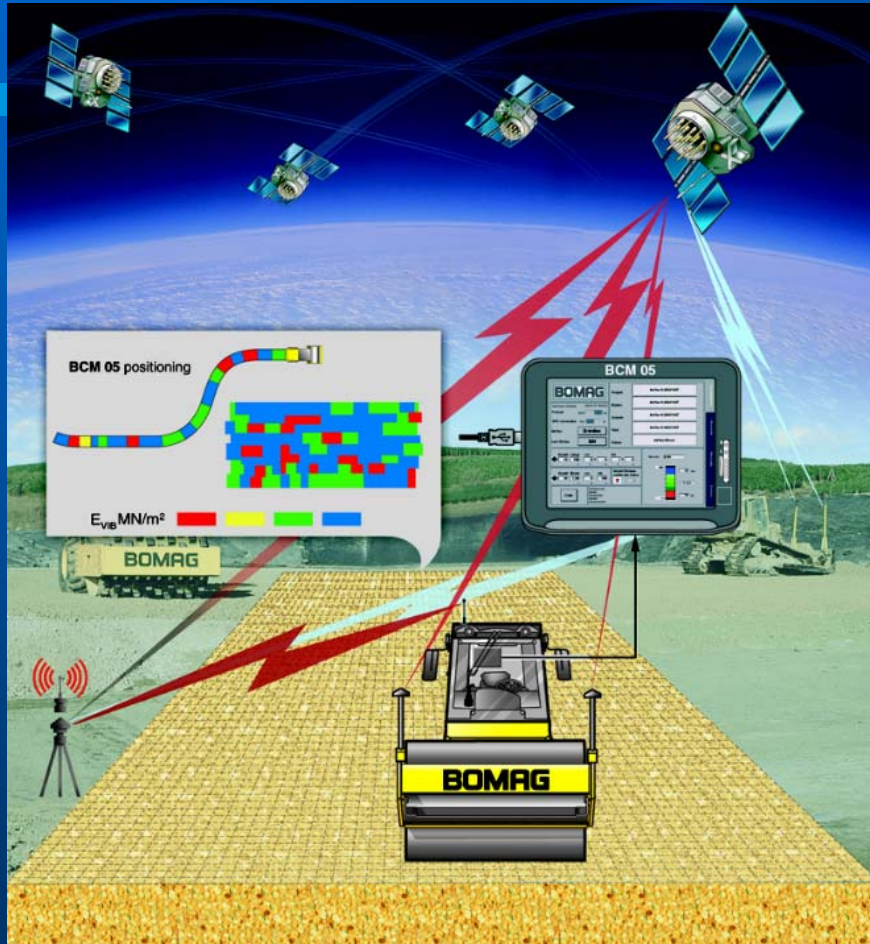


What is intelligent compaction?

- **Automatic adjustable compaction equipment**
- **Usage of Continuous Compaction Control, CCC**
- **Selection of the most suitable equipment**



GPS / positioning with reference station

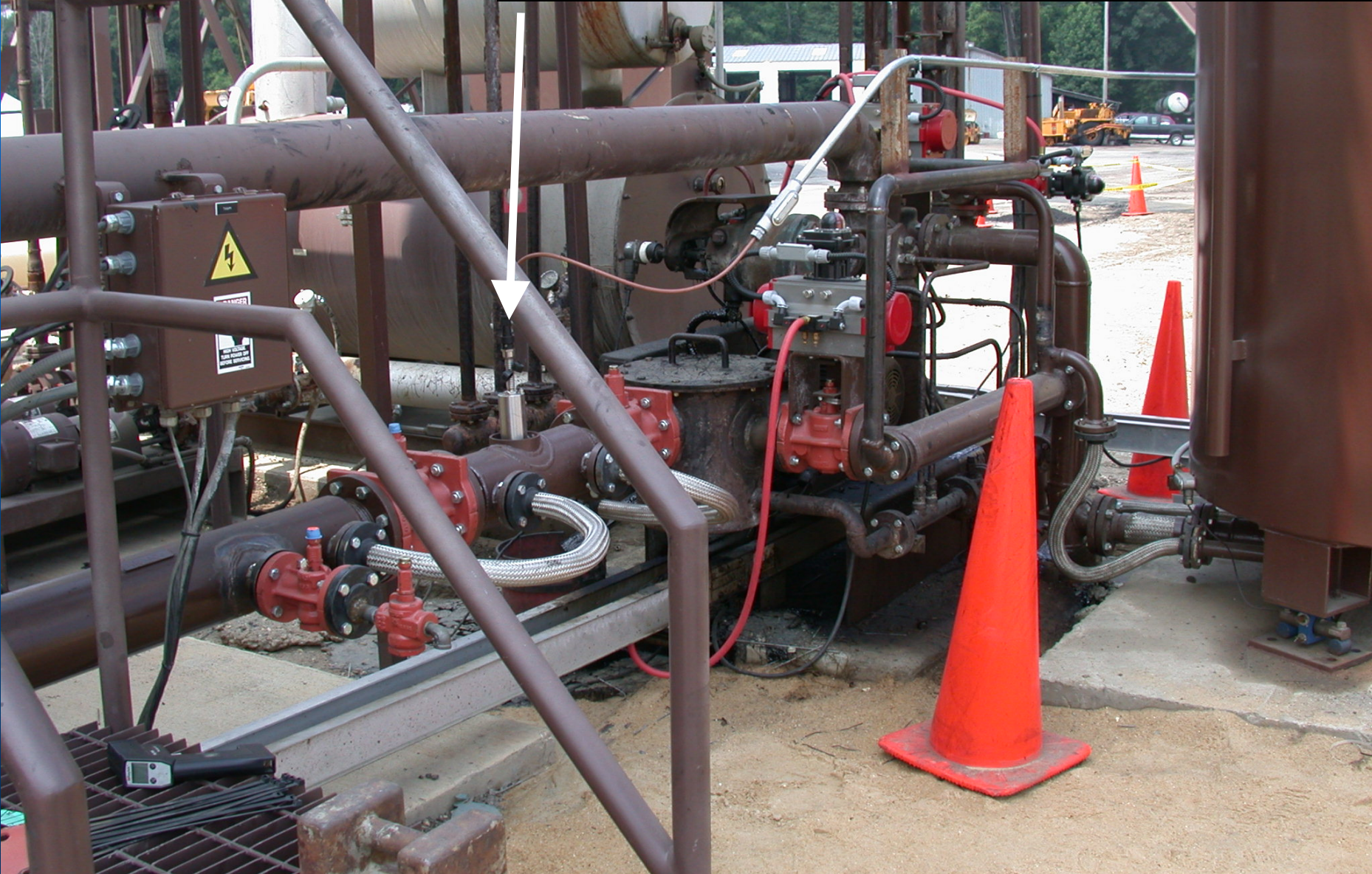




At the mix plant are there other process that can be part of a QA program?



In line viscometer for verification of binder







QA of the Future

- **The QA will all be tied to Internet.**
 - Direct down load of info to the owner.
 - Posting of data immediately to all parties.
 - Faster review and resolution of discrepancies.