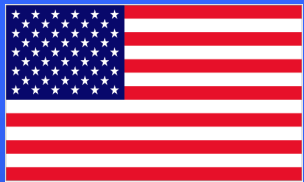


Summary of FHWA In-Place Recycling Activities

FHWA Efforts to Advance In-Place Recycling

2014 International and 7th Western States In-Place Recycling Conference



Lee Gallivan – FHWA

**Asphalt Materials Engineer
Office of Asset Management,
Pavement, Construction
Denver, Colorado**



2014 Theme:

Revitalizing In-Place Recycling Technologies: Gaps, Barriers, and a Path Forward.



Regional In-Place Recycling Conferences

- 1st - Salt Lake City, UT. - 2008
- 2nd - Minneapolis MN. – 2009
- 3rd - Harrisburg, PA. – 2010
- 4th - Atlanta, GA. – 2011
- 5th - Ontario, CA. – 2012
- 6th - Schaumburg, IL. - 2013
- 7th - Denver, CO. +International - 2014

Today's Outline



- **FHWA Recycling Policy**
- **FHWA Technical Asphalt Program**
- **Innovative Asphalt Program Technologies**
- **2014 BARM, NHI, TCCC, Pocket Guides, and TRB, but first...**
- **Thank you all for coming**

FHWA Recycling Policy – 3 E's

- **ENGINEERING**

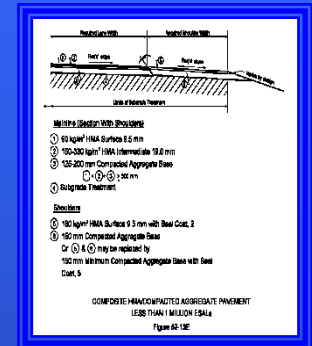
- Use Good Engineering Design to Design to Assure Long-Life Pavements

- **ECONOMICS**

- Use Life-Cycle Cost Analysis for Project Selection

- **ENVIRONMENT**

- Consider Recycling First
- Be Good Stewards of the Environment



Recycling Technologies

● RECYCLING

- Reclaimed Asphalt Pavement/Shingles
- Recycled Concrete Aggregate
- In-Place Recycling

● REUSE

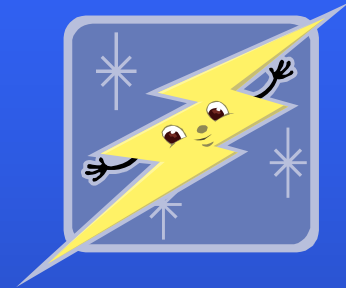
- Fly Ash/Coal Ash
- Rubber
- Shingles
- Slags
- Foundry Sand
- Concrete, etc.



FHWA

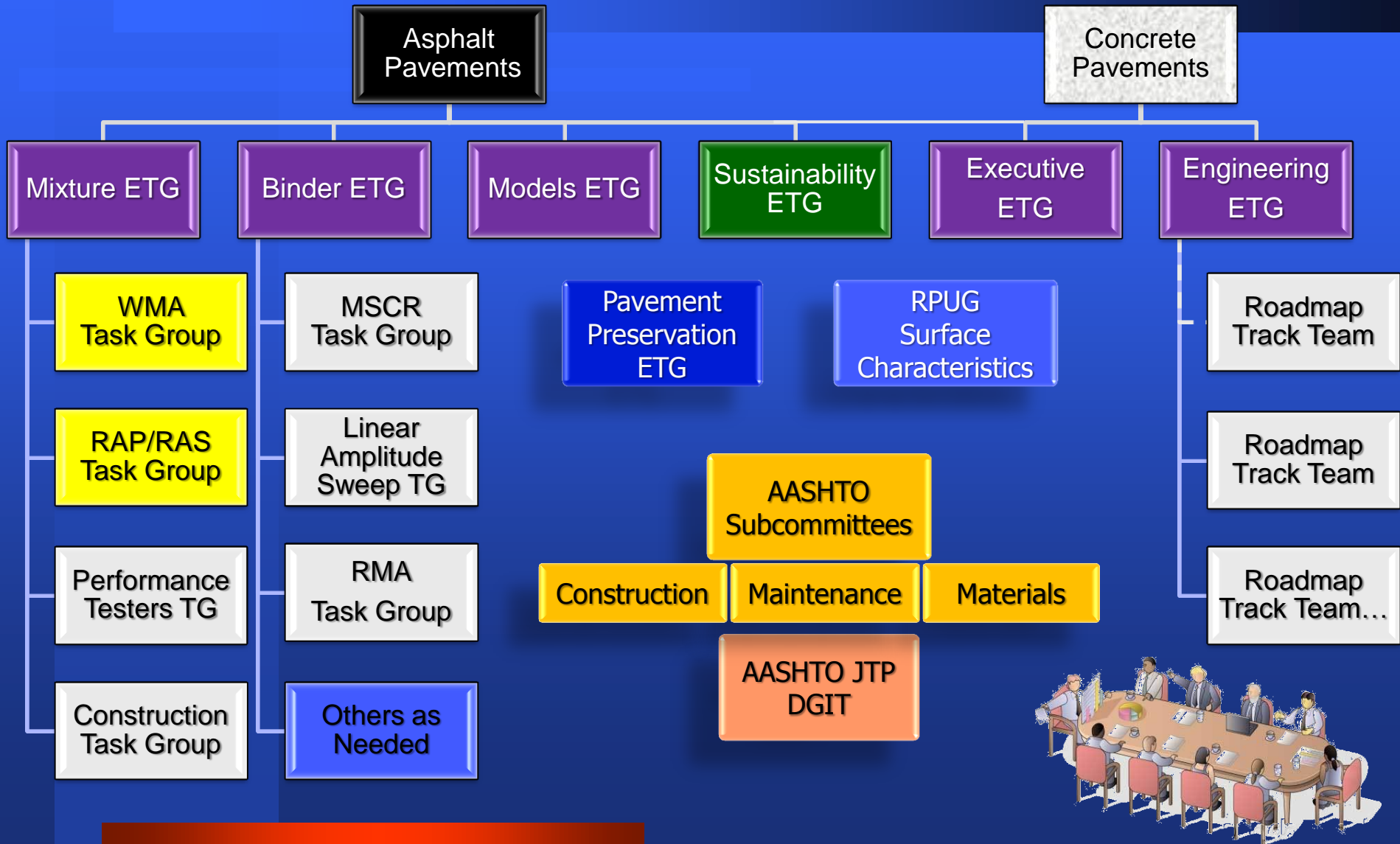
Stakeholder Engagement

- Asphalt Mixture and Binder ETG's
 - Warm Mix Asphalt TWG
 - Reclaimed Asphalt Pavement ETG
- Pavement Sustainability TWG
- Concrete Technical ETG
- AASHTO, TRB, SHRP, etc.



NOTE: WMA and RAP ETG's folded under the Asphalt Mixture ETG (Sep 2012)

Stakeholder Engagement in the FHWA Pavement & Materials Program



ETG Pavement Discussions

- **Concrete Strategies for Sustainability**
 - Mixture optimization
 - Darwin ME
 - Long-Life Designs
 - Surface Characteristics
 - RCA, Industrial By-Products, Two-Lift Paving

- **Asphalt Strategies for Sustainability**
 - WMA
 - RAP, RAS
 - Perpetual Pavement Thickness
 - **In-Place Recycling**



In-Place Recycling Program Technologies

Hot In-Place Recycling (HIR)

Cold Recycling (CR)

Full Depth Reclamation (FDR)



Hot In-Place Recycling (HIR)

- **Hot In-Place Recycling (HIR)** is a paving technique that sequential heating of the existing asphalt pavement followed by scarification or milling of the surface. Rejuvenating agents are added to the reclaimed mixture which is then repaved using conventional paving equipment. HIR is not a new technology as one of the first documented case of HIR recycling was reported **in the 1930's**.
- HIR is intended to address surface distresses in the pavement and typically is limited to **the top 1.5 - 2 inches** of the existing pavement. In some conditions, HIR may be used up to 3 inches
- HIR can be utilized in both rural or urban areas
- HIR is a accepted pavement preventative maintenance technique



HIR Advantages/Disadvantages

- **Advantages**

- Eliminate surface distresses – cracking, moderate rutting, shoving, and raveling
- Pavement gradation can be improved with the remixing operation
- Minimal trucking costs
- Pavement geometrics preserved or improved

- **Disadvantages**

- Better results if pavement is fairly consistent
- Need to be aware of crack sealant, rubber, and geotextiles in pavement
- Thermoplastic striping should be pre-milled in advance of the operation
- Large stone mixes not suitable candidate because of aggregate size

Cold Recycling (CR)

- **Cold Recycling (CR)** is a partial depth stabilization effort in which the asphalt existing pavement is milled up (without heat) and remixed with an additive and then repaved using conventional paving equipment. CR is not a new technology as one of the first documented case of CR recycling was reported in the **early 1900's**.
- CR is intended to address surface distresses in the asphalt pavement and typically is limited to the top **3 - 5 inches** of the existing pavement.
- CR Options include: **Cold In-Place (CIR)** or **Cold Central Plant Recycling (CCPR)** w/Surface Treatments or Overlay
- CR is a accepted pavement preventative maintenance or a minor rehabilitation technique



CR Advantages/Disadvantages

- **Advantages**

- Eliminate surface distresses – cracking, rutting, shoving, and raveling
- Pavement gradation can be improved with the remixing operation.
- Minimal trucking costs
- Pavement geometrics preserved or improved

- **Disadvantages**

- Better results if pavement is fairly consistent
- Need to be aware of crack sealant, rubber, and geotextiles in pavement
- Moisture content must be monitored
- Application of a surface course is typically required

Full Depth Reclamation (FDR)

- Full Depth Reclamation (FDR) is a roadway rehabilitation technique in which the existing asphalt pavement and a predetermined portion of the underlying materials is pulverized. The reclaimed material is remixed with an additive and then repaved using conventional paving equipment. FDR is not a new technology as one of the first documented case of recycling was reported **in the mid 1970's**.
- FDR extends the rehabilitation into the subbase/base for a couple of inches and is typically **6-12 inches (total) in depth**. FDR is for severely deteriorated roadways where full reconstruction is not an option
- FDR is a accepted pavement minor rehabilitation or reconstruction technique



FDR

Advantages/Disadvantages

- **Advantages**

- Eliminate all surface distresses – cracking, rutting, shoving, and raveling
- Pavement geometrics preserved or improved
- Less Expensive than full reconstruction

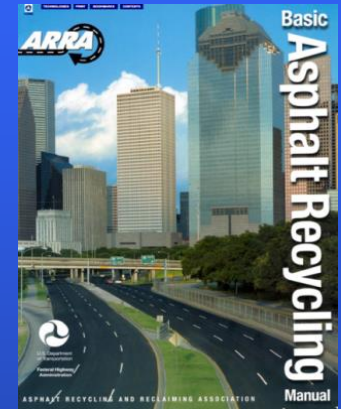
- **Disadvantages**

- Traffic Control is a requirement
- Need to be aware of crack sealant, rubber, and geotextiles in pavement
- Moisture content must be monitored
- Application of a surface course is typically required.
- Cure times of the new base is from 2 days to 2 weeks



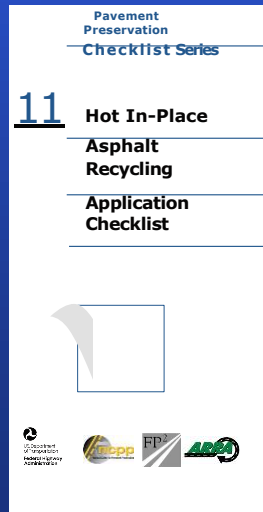
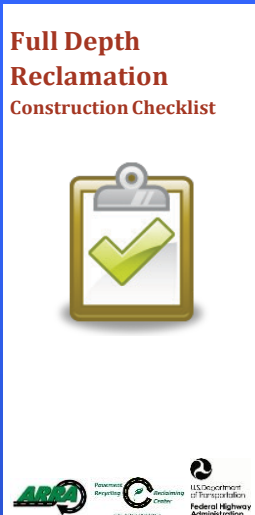
Recycled Program Technologies Guidance Documents

- **Basic Asphalt Recycling Manual -2001**
(FHWA and ARRA completed review and final editing. Will be released 2014)
- **FHWA-NHI Training Course # 131050**
(Asphalt Pavement In-Place Recycling Technologies)
 - Web Based Training
 - Instructor Lead Training (2-days)
 - **Released 08/29/12**



In-Place Recycling Construction Checklists

- * Full Depth Reclamation [FHWA-HIF-036](#)
- * Hot In-Place [FHWA-HIF-13-061](#)
- * Cold In-Place [FHWA-HIF-13-062](#)



- * Completed and posted on [ARRA](#), [FHWA](#) and [National Center for Pavement Preservation](#) websites

Don't forget about the **mobile app** for smart phones
"Pavement Preservation Checklists"

In-Place Recycling Benefits -

- Reduced costs ✓
- Reduction in User Delays ✓
- Shorter Construction Periods ✓
- Mitigation or elimination of existing pavement distresses ✓
- Improved roadway performance ✓
- No disturbance of subgrade (except FDR) ✓
- Preservation of the environment (reduced landfilling) ✓



National Legislation: Moving Ahead for Progress in the 21st Century (MAP-21)

- President signed into law P.L 112-141, *Moving Ahead for Progress in the Twenty First Century (MAP-21)*, on July 6, 2012. MAP-21 extended SAFETEA-LU for 2012-2014 fiscal years and expires on September 30, 2014.
- Bill extending MAP 21- to May 2015 sent to the President to sign last week.

Conclusion



- Over the last several years, agencies have seen increasing efforts to promote recycling and low-energy, environmentally friendly construction methods within the highway environment to address roadway conditions in a sustainable manner. As we face today's challenges of higher construction costs, reduced buying power, and deteriorating roadway conditions, we need to assess and modernize our approach to maintaining and managing our highway investments, and to start investigating more alternatives to optimize our return on these investments.

Conclusion – Con't



- In-Place Recycling of Hot Mix Asphalt Pavement is a cost effective proven technology that is underutilized by State and local governments in the United States.
- The last 35 years have seen a dramatic improvement in asphalt recycling and reclaiming equipment, and In-Place Recycling has developed into a feasible and economic alternative to traditional maintenance and rehabilitation alternatives.

Thank you...For More Information...

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The secret of a good ~~sermon~~/presentation is to have a good beginning and a good ending, and to have the two as close together as possible: George Burns

