
Asphalt Research Consortium

Overview

Work Areas

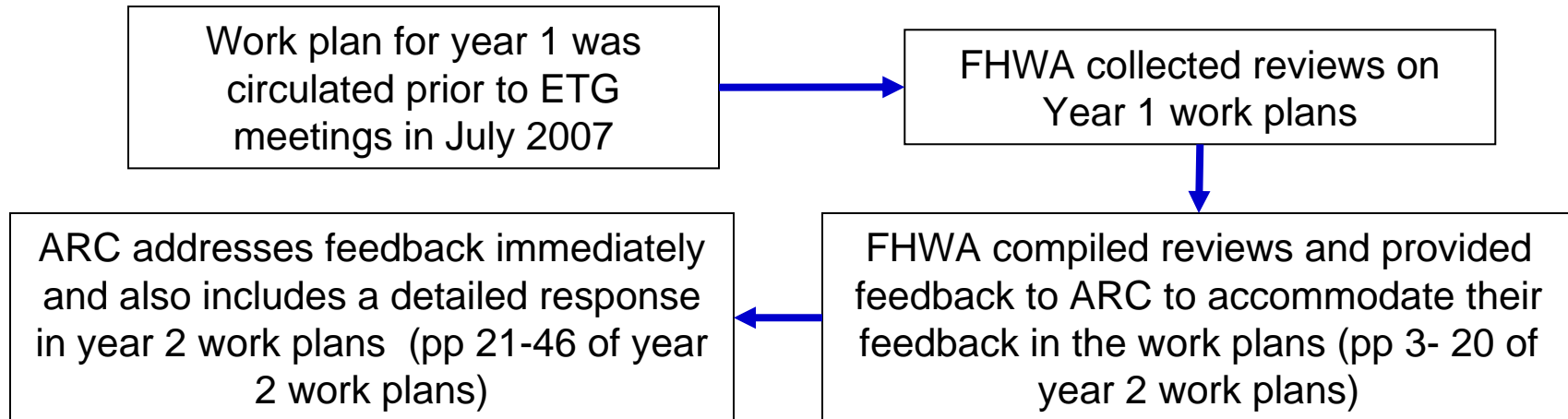
- Moisture Damage
 - Fatigue
 - Engineered Materials
 - Vehicle Pavement Interaction
 - Technology Development
 - Technology Transfer
 - Validation
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Overview of Work Plan Development

Philosophy for developing work plans:

- Use the overall goal of each work area to layout the overall research strategy and work plan for the 5 year duration
 - Identify areas that start in year 1 and provide more details
 - Use FHWA reviews and findings from year 1 to revise work plans for year 2
 - Keep the work plan as a living document through the course of this project
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Overview of Review Process



The following slides address some of the common concerns that appear in the reviews

Overall

How is work being coordinated within ARC to ensure synergy and avoid duplication

- Program Area coordinators review all work plans in the Program Area
 - ARC Advisory Board review
 - Co-AOTR review
 - Stakeholder review
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Overall

How is material usage organized for the ARC

- Material availability for validation work based on test sections will be coordinated individually by each ARC member and the agency responsible for the test section
 - ARC will identify and develop a library of “core” materials for research
 - The core materials will be selected to represent a diverse range of properties as well to span across various geographic regions within the US
 - The experiment design for various tasks by different ARC members will incorporate the applicable core materials
 - However, the experiment designs will not be limited to the core materials due to differences in hypothesis for different tasks
 - The proposed core materials are included in year 2 work plans
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Overall

How is ARC proceeding with the research without finalizing core materials?

- Most of the year 1 and 2 activities are related to method development based on the use of limited materials and with limited laboratory validation
 - It is anticipated that the core materials will be finalized and collected by the middle of year 2, by which time the research will transition from method development to larger experiment designs and laboratory validation
 - It is anticipated that by the end of the research project, the properties of the core materials and corresponding mixtures will be extensively documented
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Engineered Materials & Vehicle Pavement Interaction

How is work in ARC different from work in other projects related to Warm mix and RAP

The team will coordinate with current work underway as much as possible. This is expected to reduce or eliminate the extent of overlap.

In the area of Warm Mix, the consortium research team has contacted the NCHRP research teams for:

- NCHRP 09-43. Mix Design Practices for Warm Mix Asphalt
- NCHRP 09-47. Engineering Properties, Emissions, and Field Performance of Warm Mix Asphalt Technologies

Work done in consortium is complimentary and addresses other aspects such as impact of warm mix on rheology

Engineered Materials & Vehicle Pavement Interaction

How is work in ARC different from work in other projects related to Warm mix and RAP

In the area of Recycled Asphalts, the consortium research team has contacted the NCHRP research team for:

- NCHRP 09-46. Improved Mix Design,
- Evaluation, and Materials Management Practices for Hot Mix Asphalt with High Reclaimed Asphalt Pavement Content.

NCAT and UNR are currently working on a

- joint subtask to evaluate the impact of extraction method on the properties of RAP aggregates
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Technology Development and Validation

How are early technology development products identified

- Inputs in the form of summary description of potential products were solicited from ARC members, ETGs, and FHWA
 - The research for these products is typically matured but need development for further implementation
 - The products are not necessarily restricted to research findings from previous studies conducted by ARC members
 - A detailed description will be presented later
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Moisture Damage and Fatigue

Is plastic deformation a part of the work plan?

- Work plan does not treat permanent deformation as a solved problem
 - Specific work element examples: F3c-2 and E1b-1
 - The effect of mixture susceptibility to permanent deformation due to growth of micro cracks in addition to the classical viscoplastic deformation is also included
 - Preliminary results on plasticity model are included in the last quarterly report (and will be briefly presented later today)
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Moisture Damage and Fatigue

Details on the modeling in moisture damage and fatigue work area

- Each work area (moisture damage and fatigue) has two elements of modeling,
 - a computational micro structure model to evaluate material behavior and
 - a continuum model for determine material response within a pavement structure
 - In some cases more than one approach is used in each category in order to,
 - cross verify results and
 - offset any potential limitations in one approach by the other
 - Specific details for each model are a work in progress and will be included from time to time in the quarterly report (eg; previous quarterly report included details on a viscoplastic model and a cohesive zone model)
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Moisture Damage and Fatigue

Ability of moisture damage models to accommodate different mechanisms

Moisture damage is due to the combined effect of several mechanisms controlled by different material properties:

- Interfacial damage – Work of adhesion
 - Degradation of mechanical properties of the mastic
 - Mastic erosion due to water flow
- } loss of cohesive strength as a function of moisture content

Moisture transport through mix micro structure, binder and mastic films controls the rate of damage

Current modeling effort is based in individual mechanisms

Eventually, these will be consolidated into a model that supports these mechanisms and predicts the most critical mechanism for a given mixture
