Pavement & Materials Partnering Committee
Work Product Scoping Document
Revised
Unique Concrete Mix Design Identification
November 28, 2018

Task Group

Concrete Task Group

Problem Process

☒ Annual
☐ Expedited
☐ Emerging Initiative

Title

Unique Concrete Mix Design Identification

Statement of Effort/Improvement

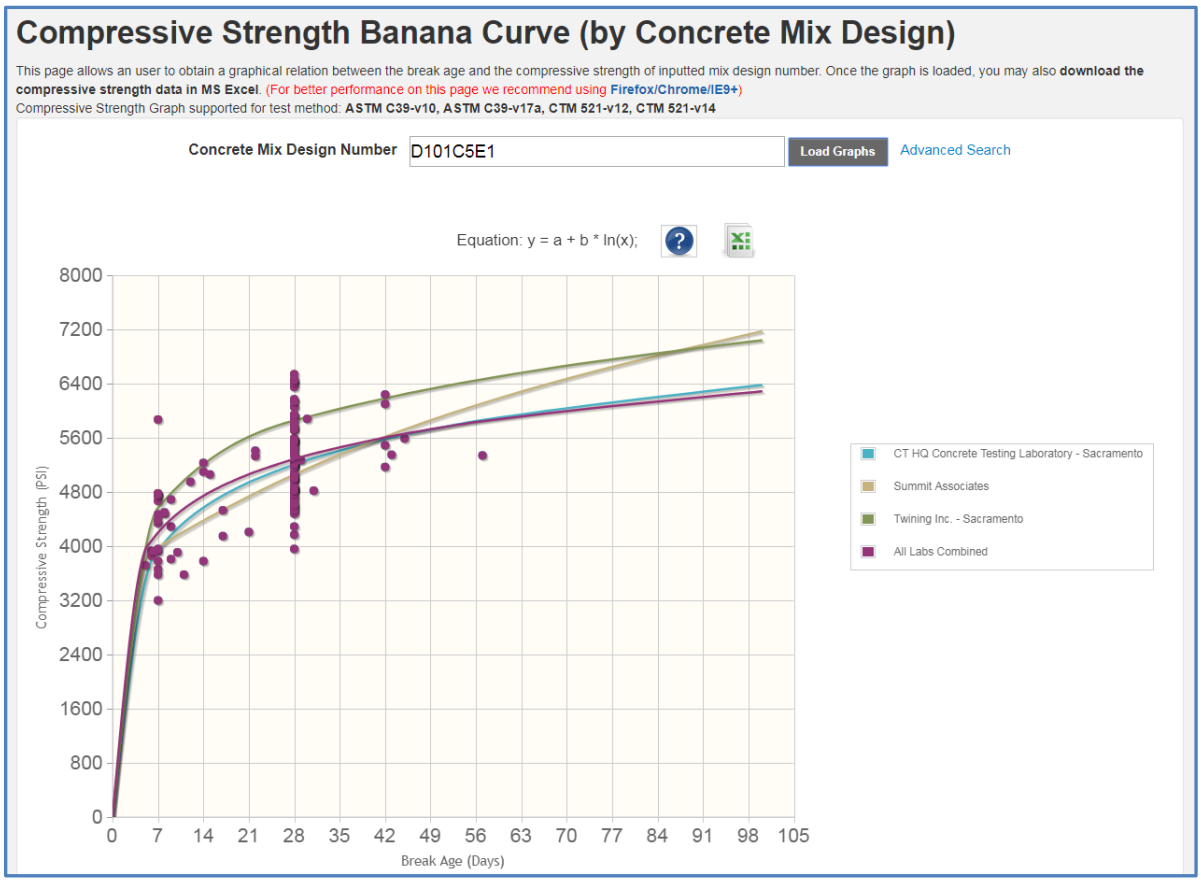
Concrete mix design testing data will be required by the specifications. The Department utilizes a database called the Data Interchange for Materials Engineering (DIME) to input and store this data. DIME data requires the mix design identification and currently there is no assurance that a mix design identification represents a unique mix design formula (proportion and source of materials). Historically, there have been different mix formulas labeled with identical mix design identification. This effort will identify and quantify the factors that require new mix design identification which allows for efficient tracking of mix design test data.

Purpose

A specification will be developed utilizing best industry practices such as with Environmental Product Declarations (EPDs) and Material Plant Quality Plan (MPQP) guidance that will indicate and quantify the factors that require a new mix design identification. The specification will provide Department staff with the assurance that when a mix design and its associated identification is referenced, the mix design formula will be the same or reasonably close to a mix design with the same mix design identification. The specification will provide the Department the information to reliably track the historical performance of concrete mix designs and allow collaboration between related efforts such as EPDs and QC/QA specifications.

Background

With a unique mix identification that consistently represents a specific mix design formula, test results may be directly compared to assess the performance of that mix. While the Data Interchange for Materials Engineering (DIME) graph below is intended to predict performance of a mix, it is not currently recommended because there is no guarantee that each use of mix identification D101C5E1 represents the same mix design formula that was sampled and tested over a span of 3.5 years. Minimal progress was made on a similar 2016 effort and those findings will be shared with the current working group to continue development of the specification.



Per the Standard Specifications, the contractor is required to submit certified test data or trial batch test reports representing the mix design proposed for use in the work. Generally, test data and test reports do not contain information on the proportion or source of materials used. However, with proportion or source of materials change limits required by the Specifications, the Engineer is assured that historical test results can be referenced to submitted test reports with the same mix design identification, reducing the time needed for test data searches or new trial batches.

Additionally, Caltrans' planned use for EPDs will require suppliers to provide declarations on a per mix basis. An underlying requirement of the EPD is that it must contain the environmental impacts associated with a specific mix design and more accurately, that it must characterize the impacts of each individual component. Developing a specification to assure that a mix design identification consistently represents the same mix design formula correlates with satisfying the EPD reporting requirements for specific concrete mix designs.

Approach

1. Street Ready Assurance

   Through specification language, communication to Caltrans and Industry partners that adherence to mix parameter limits of components and proportions will be used in determining uniqueness of a mix design identification.

2. Performance Tracking/Management

   It is anticipated that Industry will have multiple-project usage linked to a single mix design formula with its corresponding identification. QC and QA test data input into DIME along with a mix design identification developed using the specification requirements will provide the ability to connect those mix design formulas to DIME to review past mix design performance data. DIME test data is currently available publicly.

3. Consistently Implemented

   The specification will include allowable limits to changes in mix design components and proportions to ensure that if any parameters are not met, Industry will be required to create a new mix design identification.

4. Pilot Projects (if anticipated)

   N/A

5. Research Needs (if necessary)

   N/A

Team Members

CT/Industry	Division/Firm Name	Member Name
CT Chair	Materials Engineering and Testing Services	Brett Soldano
CT	Office of Concrete Pavement	David Lim
CT	Structure Construction	Tom Collins
CT	SP&I - Structure Specifications and Research Development	Jeff Goronea, as needed (spec development only)

Industry Lead	California-Nevada Cement Association	Nathan Forrest
Industry	Boral	Ken Sears
Industry	National Ready Mix	Subhada Gadkar
Industry	Private Consultant (formerly Graniterock)	Michael Taylor

Objectives/Deliverables/Due Dates

Description:

The objective of this project is to develop a specification that identifies and quantifies the factors that would require a new mix design identification for the Department to adequately perform QA on their products. The following deliverables are necessary to meet the objective:

1. Address previously identified obstacles, capture best-worst case scenarios, and recommend adoptable Quality Management processes to prevent poor outcome.

2. Caltrans proposes business practice and process for industry acceptance

3. Develop and publish specification updates.

Furthermore, a specification with the factors for new mix identification will not only ensure that efficient QA can be provided, but a mix design's environmental impacts will be adequately captured.

Details:

Milestones	**Name - Responsible Party**	**Due Date (Start/Complete)**
Work plan	Brett Soldano/Nathan Forrest	December 2018/January 2019
1. Re-address obstacles, capture best-worst case scenarios, recommend QM process to achieve outcomes	Tom Collins/Ken Sears	January 2019/April 2019
2. Caltrans propose practice/process for Industry acceptance	Brett Soldano/Subhada Ghadkar	April 2019/June 2019

3. Develop and publish specification to support business practice/process	Jeff Goronea/Michael Taylor	June 2019/October 2019
Implementation	Brett Soldano/Nathan Forrest	November 2019

*Some milestones listed above may not be necessary

Resources to Develop and Implement

	Caltrans Hours		**Industry Hours**	
	FY 18/19	**FY 19/20**	**FY 18/19**	**FY 19/20**
Development (work plan, process map, Specification development)	255	145	64	36
Implementation, training and guidance	0	200	0	100
Long Term Performance	0	100	0	100

Benefits

- Reliability of mix design information to ensure that the identification represents one mix design formula and its historical performance based on test data
- Ability to leverage historical mix design test data for use on multiple projects, saving time and mix design verification resources
- Ensure that EPDs for concrete mix designs adequately capture environmental impacts of specific mix characteristics

Estimated Impact to Caltrans and Contractor

- May be difficult for Industry adoption, may present needed changes in business practices for some ready-mix producers
- Specification change will be necessary

Impediments to Completion of Deliverables

- Lack of coordination and contribution of working group members to capture potential benefits or failure mechanisms
- Caltrans and Industry cannot come to consensus on parameters that define a change to a concrete mix design (i.e. what factors and range of modifications would a require a new mix design identification)

Recommendation and Approval

This scoping document for *Unique Concrete Mix Design Identification* was prepared by the *Materials & QA Subtask Group* to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials Partnering Committee Charter. The Subtask Group members have determined the scope, resources required and timeline for delivery of this project to attempt to ensure that the deliverables are achievable. A signature here indicates that each Task Group and PMPC Executive Committee is committed to providing the resources to support this effort within the prescribed timeframes. Furthermore, it is everyone's responsibility to ensure that the final effort/improvement will be:

1) Street-Ready,
2) Monitored and reported for performance,
3) Successfully implemented statewide as appropriate.

Scoping Document Recommendation and Industry Concurrence by (name and date):

Caltrans Name (Recommendation)	Date	Industry Name (Concurrence)	Date
Keith Hoffman, Caltrans Task Group Chair	11/30/18	Kirk McDonald, Industry Task Group Lead	11/30/18
Kuo-Wei Lee, Caltrans Task Group Member	11/30/18	Mark Hill, Industry Task Group Co-Member	11-30-18
Blair Anderson, Caltrans Task Group Member	11/30/18		

Scoping Document Approval and Industry Concurrence by (name and date):

Caltrans Name (Approval)	Date	Industry Name (Concurrence)	Date
Sergio Aceves, Caltrans PMPC Executive Committee - Chair	12/11/18	Russ Snyder, Industry PMPC Executive Committee - Member	
Ray Hopkins. Caltrans PMPC Executive Committee - Member	12/6/18	Charley Rea, Industry PMPC Executive Committee - Member	12/6/18
Tom Ostrom, Caltrans PMPC Executive Committee - Member	12/6/18		
Dan Speer, Caltrans PMPC Executive Committee - Member	12/6/18		

Approval Date: _____