

# Memorandum

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**To:** DEPUTY DISTRICT DIRECTORS, Construction  
DEPUTY DIVISION CHIEF, Structure Construction  
CONSTRUCTION MANAGERS  
SENIOR CONSTRUCTION ENGINEERS  
RESIDENT ENGINEERS

**Date:** July 15, 2013

**File:** Division of Construction  
CPD 13-4

**From:** MARK LEJA, Chief  
Division of Construction



**Subject: HOT MIX ASPHALT OPTIMUM BITUMEN CONTENT BASED ON TOTAL WEIGHT OF THE MIX**

The current hot mix asphalt (HMA) mix design procedures in California test methods determine the optimum bitumen content (OBC) for HMA as a percentage of the dry weight of aggregate. Caltrans has revised Hveem HMA mix design procedures contained in California tests to reflect the current nationwide standard practice and to include the latest technology changes in HMA, including performance graded binders, reclaimed asphalt pavement, rubberized HMA, and addition of antistrips to HMA. California Test 367 and 368 are used to determine the OBC of HMA, rubberized hot mix asphalt (RHMA), and open graded friction course (OGFC) mixes based on samples prepared under California Test 304. Revised California Test 304 includes a change to Hveem mix design procedure for the preparation of bituminous mixtures for testing. One of the changes in the procedure is that OBC for HMA is based on total weight of the mix. The implementation of OBC based on total weight of the HMA mix is only for projects under 2010 *Standard Specifications*.

Some HMA production plants do not have the capability to report the OBC as both a percentage of the dry weight of aggregate in the mix and as a percentage of the total weight of the mix. When an HMA production plant is modified to report OBC as percentage of the total weight of the mix, the contractor may request a change to allow projects under the 2006 *Standard Specifications* to report OBC as a percentage of the total weight of the mix. A contractor may also request a change to allow projects under 2006 *Standard Specifications* to report OBC as a percentage of the total weight of the mix to reduce potential difficulty and confusion if the HMA production plant is producing for different projects under different specifications.

This directive allows for a contractor's option to revise OBC from being based on dry weight of aggregate in the mix to OBC based on total weight of the mix on ongoing projects under 2006 *Standard Specifications*.

## Existing Procedure

The current California Test 367 or California Test 368 determines the OBC as a percentage of the dry weight of aggregate in the mix. The OBC is reported on the HMA mix design form, the job mix formula (JMF) form, and used for asphalt price adjustments. During HMA production, the OBC is reported as a percentage of the dry weight of aggregate in the mix.

### **New Procedure**

With the implementation of the 2010 *Standard Specifications*, the use of revised California Test 304 (2010) in preparing mix design samples for determination of the OBC under California Test 367 (2010) or California Test 368 (2010) will result in the OBC being determined as a percentage of the total weight of the mix. The OBC will be reported on the HMA mix design form and the JMF form. The reported OBC is used for asphalt price adjustments. During HMA production, the OBC will be reported as a percentage of the total weight of the mix.

### **Transition Period Procedure**

For contracts using the 2006 *Standard Specification*, the contractor can continue with OBC for HMA based on dry weight of aggregate until the completion of the contract or the contractor can request a revision to OBC based on total weight of HMA mix.

The 2006 *Standard Specifications* Section 6-3.01, "General," states that whenever a reference is made in the specifications to a California test by number, it means the California test in effect on the day the notice to contractors for the work is dated; therefore, a change order is necessary if a contractor requests a change in how the OBC is reported.

When the contractor requests to report the OBC in terms of total weight of HMA mix instead of the dry weight of aggregate for an approved JMF, at least 15 days before the proposed change the contractor must submit:

1. Revised JMF with OBC reported as a percentage of total weight of the mix on Form CEM-3511 (SS2010), "Contractor Job Mix Formula Proposal."
2. Original accepted JMF Form CEM-3511, "Contractor Job Mix Formula Proposal."
3. Original mix design for accepted JMF on Form CEM-3512, "Contractor Hot Mix Asphalt Design Data."
4. Original mix design verification for accepted JMF on Form CEM-3513, "Caltrans Hot Mix Asphalt Verification."

The resident engineer reviews the submittal and verifies that the OBC has not been changed from the original JMF when converted to OBC as a percentage of the total weight of the mix. The attached OBC conversion table shows OBC based on dry weight of aggregate versus OBC based on total weight of the mix determined using the following calculation:

$$OBC_{TWM} = \frac{OBC_{WDA}}{1 + OBC_{WDA}} \times 100$$

where:

$OBC_{TWM}$  is binder content expressed as percentage of total weight of mix

$OBC_{WDA}$  is binder content expressed as percentage of weight of dry aggregate

If the revised JMF OBC target value is acceptable based on the conversion from OBC based on dry weight of aggregate to OBC based on total weight of the mix, the resident engineer accepts the revised Form CEM-3511 (SS2010). The revised JMF will be based on the original Form CEM-3513 and will

have the same expiration date as the original Form CEM-3513 for the accepted JMF that is being revised.

The resident engineer will issue a contractor-requested change order authorizing the contractor to report OBC as a percentage of the total weight of the mix and replace the specification for compensation for asphalt price adjustments so that asphalt price adjustments are correct for the OBC based as a percentage of the total weight of the mix. In addition, the change order must include new tolerances for asphalt binder content as shown in the following table for various types of HMA:

HMA Type	Existing Asphalt Binder Content Tolerance Based on Percentage of Dry Weight of Aggregate	New Asphalt Binder Content Tolerance Based on Percentage of Total Weight of the Mix
A	±0.45	±0.40
B	±0.45	±0.40
C	±0.40	±0.30
RHMA-G	±0.50	±0.45
OGFC	±0.50	±0.45

For projects constructed under the Quality Control/Quality Assurance process, the change in the OBC reporting can only be implemented with a new lot. The HMA Pay Program used to calculate the pay factor should include the new tolerances for asphalt binder content. An updated HMA Pay Program calculator is available online at:

<http://www.dot.ca.gov/hq/construc/hma/>

There should be no cost or credit to the state for implementing this contractor-initiated change order. No extension of contract time should be included in the change order. A sample change order memorandum, sample change order, and Federal Highway Administration (FHWA) Form CA-358(c), "Record of Blanket Prior Approval for Major Contract Change Order," for revising the HMA OBC target value are attached to this directive. This directive serves as delegation of authority from the Division of Construction and the approval from FHWA of change orders when implemented under its requirements.

If you have questions or comments regarding this directive, please contact Kee Foo, Division of Maintenance, at [kee\\_foo@dot.ca.gov](mailto:kee_foo@dot.ca.gov) or (916) 274-6077, or Ebi Fini, Division of Construction, at [ebi\\_fini@dot.ca.gov](mailto:ebi_fini@dot.ca.gov) or (916) 227-5396.

- Attachments:
1. Optimum Binder Content Conversion Table
  2. Sample Change Order Memorandum
  3. Sample Change Order
  4. Change Order Specification Attachment "PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS"
  5. FHWA—Record of Blanket Prior Approval for Major Contract Change Order