



2023 CRUMB RUBBER REPORT

Cost Differential Analysis Between Asphalt Containing Crumb Rubber and Conventional Asphalt

Public Resources Code Section 42703

Prepared by



2024

[Blank page.]

CONTENTS

Summary	v
Crumb Rubber Usage Analysis	1
Cost Comparison Analysis	4
Findings	8
Policy and Guidelines	10
Crumb Rubber Calculation Method	14
Appendix Public Resources Code Section 42703	14

[Blank page.]

SUMMARY

Public Resources Code Section 42703, et seq., requires the California Department of Transportation (Caltrans) to meet specified usage amounts of crumb rubber modifier in asphalt pavement. The law also requires the Secretary of the California State Transportation Agency (CalSTA) to prepare an annual analysis comparing the cost differential between asphalt containing crumb rubber and conventional asphalt paving material. This report addresses these two statutory requirements.

Caltrans diverted an estimated 2.42 million waste tires from landfills and tire stockpiles and used an average of 11.37 pounds of crumb rubber modifier per metric ton of all asphalt pavement. However, for only the third time since the establishment of a statutory goal in 2007, Caltrans did not meet the required crumb rubber modifier usage amounts in the calendar year 2023. This usage fell short, by less than 2 percent, of meeting the statutory minimum requirement of 11.58 pounds of crumb rubber modifier per metric ton of the total asphalt paving materials used. Caltrans is actively working with the districts to ensure meeting the crumb rubber goal for 2024. In addition to increased monitoring and supplemental guidance, Caltrans also continues to actively research and investigate opportunities to increase the use of rubberized hot mix asphalt (RHMA).

Public Resources Code Section 42703, subdivision (c)(1)(C) also requires the CalSTA Secretary to prepare an analysis comparing the cost differential between asphalt with crumb rubber and conventional asphalt. To meet this requirement, this report compares the initial bid item costs per ton between asphalt with crumb rubber and conventional asphalt. Additionally, the report contains the findings of a study Caltrans completed that compared the performance and life expectancy between rubberized asphalt and conventional asphalt pavements. The report found that the performance and life expectancy of rubberized and conventional asphalt pavement depended on traffic loading, layer thickness, existing pavement condition, and geographic location. The study used metadata that was normalized by truck counts and concluded that across California, rubberized hot mix asphalt (RHMA) performs just as well or better than hot mix asphalt (HMA).

The crumb rubber modifier usage requirements involve four major pavement project categories: pavement preservation (maintenance), rehabilitation, capital preventive maintenance, and new capacity/safety/temporary detours. Based on 2023 project data, the average cost per metric ton of asphalt paving material containing crumb rubber was \$27.32 more expensive, or 24.23 percent higher, than the average cost of conventional asphalt. Specific to the four major pavement project categories, the cost differential between asphalt with crumb rubber and conventional asphalt are:

- pavement preservation (maintenance) projects cost 5.89 percent lower;
- rehabilitation projects cost 18.54 percent higher;
- capital preventive maintenance costs 34.76 percent higher; and
- new capacity/safety/temporary detour projects cost 16.97 percent higher.

CRUMB RUBBER USAGE ANALYSIS

Results of the statewide crumb rubber usage for calendar year 2023 are shown in Table 1 below. Data for this analysis were compiled from 447 construction paving projects. Chart 1 and Table 2 show the percent of asphalt containing crumb rubber modifier Caltrans used in each calendar year from 2000 to 2023.

TABLE 1 2023 Crumb Rubber Usage

Quantity of Asphalt Placed		
Total Asphalt	2,760,226	metric tons
Conventional Asphalt	1,870,294	metric tons
Asphalt Containing Crumb Rubber	889,932	metric tons
Percent of Asphalt Containing Crumb Rubber to Total Asphalt Paving	32.24	Percent
Crumb Rubber Placed	31,391,088	pounds
Pounds of Crumb Rubber modifier Per Metric Ton of Total Asphalt Placed (Calculated)	11.37	pounds

CHART 1. PERCENT OF ASPHALT CONTAINING CRUMB RUBBER MODIFIER USED BY CALTRANS

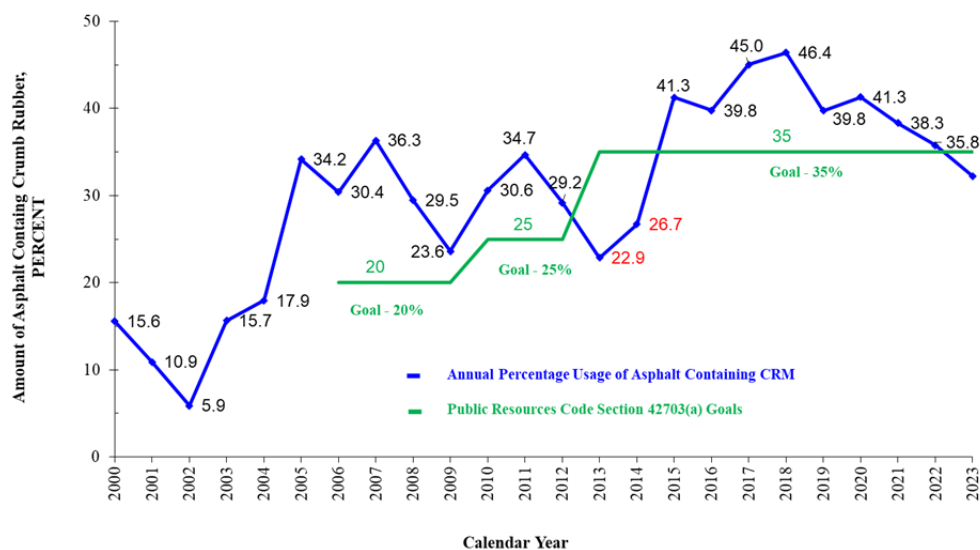


TABLE 2. PERCENT OF ASPHALT CONTAINING CRUMB RUBBER MODIFIER

2000: 15.6 percent	2008: 29.5 percent	2016: 39.8 percent
2001: 10.9 percent	2009: 23.6 percent	2017: 45.0 percent
2002: 5.9 percent	2010: 30.6 percent	2018: 46.4 percent
2003: 15.7 percent	2011: 34.7 percent	2019: 39.8 percent
2004: 17.9 percent	2012: 29.2 percent	2020: 41.3 percent
2005: 34.2 percent	2013: 22.9 percent	2021: 38.3 percent
2006: 30.4 percent	2014: 26.7 percent	2022: 35.8 percent
2007: 36.3 percent	2015: 41.3 percent	2023: 32.2 percent

Chart 1 and Table 2 demonstrate Caltrans' reporting compliance in Public Resources Code Section 42703, subdivision (a). The statutory goal, beginning in 2007, was 20 percent; in 2010, 25 percent; and since 2013, 35 percent.

Caltrans estimates that asphalt containing crumb rubber diverted more than 2.42 million waste tires from landfills and tire stockpiles in 2023. Of the approximately 2.76 million metric tons of paving asphalt Caltrans used in 2023, about 0.89 million metric tons contained crumb rubber, more than 32.2 percent of the total. Caltrans used a total of 31.39 million pounds of crumb rubber modifier in rubberized hot mix asphalt, or an average of 11.37 pounds per metric ton.

Table 3 (page 3) lists the breakdown of asphalt containing crumb rubber modifier usage in 2023 for the four major pavement project categories: pavement preservation (maintenance), capital preventive maintenance, rehabilitation, and new capacity/safety/temporary detours. (Descriptions of these categories can be found under Cost Comparison Analysis, page 4).

TABLE 3. AMOUNT OF ASPHALT PLACED IN 2023 BY PAVEMENT PROJECT TYPE

Pavement Category	Total Asphalt Used (Metric Tons)	Conventional Asphalt (Metric Tons)	Asphalt Containing crumb rubber modifier (Metric Tons)	Percent of Asphalt Containing crumb rubber modifier
Pavement preservation (maintenance)	516,486.67	169,515.45	346,971.22	67.18
Capital preventative maintenance	700,162.52	364,779.89	335,382.63	47.90
Rehabilitation	771,911.66	661,864.96	110,046.69	14.26
New capacity/safety/temporary detours	771,664.77	674,133.80	97,530.97	12.64
TOTAL	2,760,225.62	1,870,294.10	889,931.51	32.24

Caltrans' total usage of asphalt containing crumb rubber modifier did not meet statutory requirements in 2023. The amount of crumb rubber usage per metric ton of asphalt placed decreased from 2022 to 2023, and the total asphalt containing rubber declined from 960 thousand metric tons in 2022 to 890 thousand metric tons in 2023. This decline was due to various reasons, as outlined in the Findings starting on page 8.

Annual rubber usage for the following two pavement project categories declined: 1.) rehabilitation projects, declined by more than 60 thousand metric tons; and 2.) new capacity/safety/temporary detours projects declined by more than 40 thousand metric tons as compared to the previous year. On the other hand, there was an increase in rubber usage in two pavement project categories: 1.) pavement preservation (maintenance) projects, which increased by more than 9 thousand metric tons; and 2.) capital preventative maintenance, which increased by more than 30 thousand metric tons.

COST COMPARISON ANALYSIS

The cost comparison analysis in calendar year 2023 was divided into four major pavement project categories:

- A. Pavement preservation (maintenance).
- B. Capital preventive maintenance.
- C. Rehabilitation.
- D. New capacity/safety/temporary detours (such as lane additions, new road alignments, and safety and landscape projects).

Caltrans Division of Construction's Contract Administration System's Progress Payment Database was used to obtain the costs of various pavement projects and the total tonnage of materials.

The cost comparisons in this report were based on the following factors:

1. Cost per metric ton for asphalt material was calculated based on the tonnage and bid item cost.
2. Cost comparisons were completed for the following major categories of projects that utilize asphalt containing crumb rubber:
 - Pavement Preservation (Maintenance). Overlay strategies, compared and placed at the same 1-inch minimum thickness under the maintenance preservation program.
 - Capital Preventive Maintenance. Pavement thinner than rehabilitation strategies, and usually double the thickness of pavement preservation (maintenance) treatments, funded from the State Highway Operation and Protection Program (SHOPP).
 - Rehabilitation. Pavement rehabilitation projects funded from the SHOPP.
 - New Capacity/Safety/Temporary Detours. All other program projects not listed in the above categories (such as safety, landscape, the State Transportation Improvement Program, and protective betterment projects).

3. The life spans of rehabilitation strategies with asphalt containing crumb rubber and of conventional asphalt were considered the same for this analysis. As stated in this report, Caltrans completed a study that compared the performance and life expectancy between rubberized asphalt and conventional asphalt pavements. The report indicated that the performance and life expectancy of rubberized and conventional asphalt pavement depended on traffic loading, layer thickness, existing pavement condition, and geographic location. Given these variables, RHMA performs as well as or better than HMA throughout the state.

The current Caltrans Highway Design Manual recommends the placement of a minimum thickness of 0.15 foot layer of RHMA over a 0.10 foot layer of HMA for pavement smoothness and to improve ride quality. If the pavement shows greater distress, the RHMA layer may be placed at a 0.20 foot layer thickness.

With the increase in RHMA thickness to improve ride quality, there is limited performance data for these thicker RHMA layers, as these sections show little or no pavement distress. Caltrans may not have distress data for the sections placed in 2015 for several years or more. Pavements with RHMA surfaces placed before 2015 show the same or better performance as HMA surfaces, at a minimum, with some locations showing superior performance.

Caltrans use of RHMA has resulted in equal or better performance overall and has also managed to divert millions of waste tires from California landfills for over 22 years. Caltrans will continue using RHMA to support its goal to lead climate action and reduce greenhouse gas emissions from the transportation sector.

The asphalt life span was assumed to be three to five years for pavement preservation (maintenance) projects, five years to ten years for capital preventive maintenance projects, ten to twenty years for rehabilitation projects, and 20 to 40 years for new construction projects.

4. The maintenance strategies and treatments utilized for rubberized asphalt pavement and conventional asphalt are the same. Thus, the

pavement maintenance costs for asphalt containing crumb rubber and conventional asphalt are estimated to be similar.

Caltrans used progress payment data for projects in its cost comparison analysis. The results shown in Table 4 (below) are divided into the four major pavement project categories.

TABLE 4. 2023 COST COMPARISON IN DOLLARS PER METRIC TON

Type of Asphalt	Pavement Preservation (Maintenance)	Capital Preventive Maintenance	Rehabilitation	New Capacity/ Safety/ Temporary Detours	All Project Categories
Asphalt paving material containing crumb rubber	\$148.76	\$138.31	\$117.51	\$140.59	\$140.06
Conventional asphalt paving material	\$158.07	\$102.63	\$99.12	\$120.19	\$112.74
Cost Difference (Line 1 – Line 2)	-\$9.30	\$35.68	\$18.38	\$20.40	\$27.32
Cost Difference (Percentage)	-5.89%	34.76%	18.54%	16.97%	24.23%

The cost of asphalt containing crumb rubber per metric ton was on average \$27.32 more, or 24.23 percent higher than the cost of conventional asphalt. The following can be observed from Table 4:

- Pavement preservation (maintenance) projects had a cost difference of \$9.3 between the two types of asphalt, about 5.89 percent more for the cost of conventional asphalt.
- Capital preventive maintenance projects had a cost difference of \$35.68 between the two types of asphalt, about 34.76 percent more for the cost of asphalt containing crumb rubber.
- Rehabilitation projects had a cost difference of \$18.38 between the two types of asphalt, about 18.54 percent more for the cost of asphalt containing crumb rubber.

- New capacity/safety/temporary detours projects had a cost difference of \$20.40 between the two types of asphalt, about 16.97 percent more for the cost of asphalt containing crumb rubber.

Research undertaken in 2007 for Caltrans by the University of California Pavement Research Center (Jones, Harvey, Monismith, 2008-10-01 *Reflective Cracking Study: Summary Report*) concluded that asphalt pavement containing crumb rubber overlays can be cost-effective when used to resist reflective cracking. This research found that when used as thin overlays on cracked pavement, asphalt mixes containing rubber at half the thickness of conventional pavement performed better concerning reflective cracking than the full-thickness of conventional mix.

The 2007 research also found that some modified binder mixes (regardless of half or full thickness) showed an increased risk of rutting under slow-moving, heavy loads and hot conditions, compared with the full-thickness conventional overlay. Caltrans will continue to use sound engineering judgment to determine when and where asphalt containing crumb rubber is used.

While RHMA cost varied from -5.89 to 34.76 percent higher than that of conventional asphalt, it was placed up to 50 percent thinner than HMA per past guidance in the Highway Design Manual, thus the RHMA performance clearly shows its cost-effectiveness.

FINDINGS

In calendar year 2023:

1. Caltrans used an average of 11.37 pounds of crumb rubber modifier per metric ton of total asphalt paving materials, slightly below the Public Resources Code Section 42703(a)(3) requirement of 11.58 pounds of crumb rubber modifier per metric ton of total asphalt paving material used. Caltrans' use of asphalt containing crumb rubber was less than 35 percent of the total paving asphalt used.
2. Caltrans did not meet the required percentage of crumb rubber in 2023 by 2 percent. Caltrans' guidelines require that all asphalt paving projects use RHMA with the following specific exceptions, which may have contributed to limiting its use:
 - When HMA project quantities are 907.19 metric tons or less or stage-construction operations require less than 907.19 metric tons of HMA per stage. This is due to the increased costs associated with mobilizing an asphalt rubber blending plant.
 - When ambient temperatures at the time of RHMA placement will be below 45 degrees Fahrenheit.
 - Where the roadway elevation is above 3,000 feet.
 - When HMA is used as a concrete pavement asphalt base or bond-breaker.

In addition, other factors that may have contributed to the reduction of rubber usage percentage include the following:

- Local agencies not issuing permits unless rubber is removed from projects due to AB 1798, Salmon Act, Section 156.9(b)(1) and 6PPD concerns (6PPD being a chemical that prevents automotive tires from degrading but has been shown to be lethal to aquatic life).
- Stormwater restrictions in specific locations throughout the state.
- Carryover projects that have placed HMA in 2023 and topping with RHMA in 2024.
- Layer thickness limitation for RHMA due to stability concerns in major rehabilitation projects.

A considerable number of paving projects in 2023 were impacted by the exceptions and factors previously mentioned that resulted in the department being a couple of percentage points below the 35 percent goal in 2023.

Caltrans is actively working to meet the crumb rubber goal for 2024. This includes additional monitoring and guidance, as well as continuing to actively research and investigate opportunities to increase the use of RHMA.

3. Caltrans used rubberized asphalt concrete exclusively to attempt to comply with the requirements of Public Resources Code Section 42703 subdivision(b)(3).
4. The initial cost per metric ton of asphalt containing crumb rubber varies from -5.89 percent cheaper to 34.76 percent higher than the cost of conventional asphalt, depending on the project category. Research has verified that asphalt pavement containing crumb rubber overlays can be cost-effective when used to resist reflective cracking in asphalt overlays placed over flexible or concrete pavements.
5. Caltrans estimates using asphalt containing crumb rubber diverted more than 2.42 million waste tires from landfills and tire stockpiles during calendar year 2023. Information about additional waste tire applications used by Caltrans is available on the Internet at <https://dot.ca.gov/programs/maintenance/pavement/pavement-programming>.

POLICIES AND GUIDELINES

The goal of using rubber in hot-mix asphalt is to slow and minimize the development of pavement cracks, thereby extending the service life of asphalt pavements, and to divert waste tires to reduce tire fires. This policy is set forth in Caltrans' Highway Design Manual, Chapter 630, and relates to HMA specifically in the following excerpts:

- Index 631.3: "Gap graded HMA is used to meet Public Resources Code Section 42703 that specifies specific amounts of crumb rubber modifier (CRM) usage in HMA. To meet the Public Resources Code, regular asphalt binder is substituted with the asphalt rubber binder (that contains CRM) in pavement products to create rubberized HMA (RHMA) product."
- Index 631.3: "RHMA is commonly specified to retard reflection cracking, resist thermal stresses created by wide temperature fluctuations and add elasticity to a structural overlay."
- Index 633.1 (3): "The following [(d)] enhancements shall be incorporated into all flexible pavements designed using the empirical method with a design life greater than twenty years:"
- Index 633.1 (3) (d): "Use Rubberized Hot Mix Asphalt – Gap Graded (RHMA-G) (0.15 to 0.20 foot) or a Performance graded (PG)-Polymer Modified (PM) binder (minimum 0.20 foot) at the top of the surface layer. The rubberized or polymer-modified HMA must be substituted on an equal thickness basis."

Caltrans' asphalt pavement guidelines, such as the *Highway Design Manual*, were updated in 2017, to allow use of conventional asphalt by exception only, and in 2020, to include the stormwater treatment Best Management Practices for National Pollutant Discharge Elimination System compliance. Exceptions to using asphalt containing crumb rubber may be considered during construction to accommodate factors such as the availability of asphalt concrete, constructability, environmental

factors, and cost. Exceptions for use of conventional HMA are allowed in the following situations:

- When crumb rubber modifier project quantities are below 907.19 metric tons or stage construction operations require less than 907.19 metric tons per stage.
- When the ambient air temperature is below 45 degrees Fahrenheit.
- Where the roadway is above 3,000 feet in elevation.
- When placed as a concrete pavement asphalt base.
- When placed as a bond breaker between the asphalt and concrete pavement layers.
- When crumb rubber is not suitable due to environmental factors, such as a stormwater treatment Best Management Practices for National Pollutant Discharge Elimination System compliance.

CRUMB RUBBER CALCULATION METHOD

Public Resource Code Section 42703(a)(3) requires Caltrans, beginning January 1, 2013, to use an annual average of not less than 11.58 pounds of crumb rubber modifier per metric ton of the total amount of asphalt Caltrans uses in paving projects.

Public Resources Code Sections 42703 and 42801.7, give the terms “crumb rubber” and “crumb rubber modifier” the same meaning: rubber granules derived from a waste tire that are less than or equal to one-quarter inch or six millimeters in size. This report will follow this practice.

The method to determine the amount of crumb rubber modifier per metric ton of rubberized hot mix asphalt placed is based on the following assumptions:

1. Rubberized hot-mix asphalt binder consists of 18 percent to 22 percent crumb rubber modifier; calculations in this report used the middle of that range (20 percent) as an estimate.
2. The amount of asphalt binder in the asphalt paving material depends on the application, as follows:
 - a. Gap-graded RHMA contains 7.5 percent to 9 percent asphalt binder with crumb rubber modifier, based on average field mix designs; calculations in this report used 8 percent as an estimate.
 - b. Open-graded RHMA contains 7.5 percent to 10 percent asphalt binder with crumb rubber modifier, based on average field mix designs; calculations in this report used 8 percent as an estimate.
 - c. HMA terminal blend contains 5.2 percent to 6 percent asphalt binder with crumb rubber modifier, based on average field mix designs; calculations in this report used 5.2 percent as an estimate.

Using the above data, Caltrans calculated that RHMA had to account for 35 percent of the total asphalt paving materials Caltrans placed in calendar year 2023. Caltrans used this 35 percent target (see Table 5, page 13) as the factor for calculating, reporting, and monitoring crumb rubber modifier usage.

TABLE 5. CALCULATION FOR 35-PERCENT CRUMB RUBBER MODIFIER TARGET

Step	Description of Calculation Step	Calculation/ Result
1	Percentage of crumb rubber modifier in asphalt binder for rubberized hot mix asphalt (see <i>Crumb Rubber Usage Analysis Assumption #1</i>)	20%
2	Percentage of crumb rubber modifier asphalt binder in rubberized hot mix asphalt (see <i>Crumb Rubber Usage Analysis Assumptions #2a & #2b</i>)	8%
3	Number of pounds in 1 metric ton (<i>Equation</i>)	2204.63 lbs
4	Pounds of crumb rubber modifier in 1 metric ton of rubberized hot mix asphalt (<i>Step 1 x Step 2 x Step 3</i>)	35.27 lbs
5	Pounds of crumb rubber modifier in 1 metric ton of total paving asphalt used, statutorily required (<i>PRC §42703(a)(3)</i>)	11.58 lbs
6	Percentage of rubberized hot mix asphalt Caltrans needs to use of the total paving asphalt used statewide to meet the statutory requirement of 11.58 pounds of crumb rubber modifier in 1 metric ton (<i>Step 5 ÷ Step 4 x 100%</i>)	32.8%
7	Target percentage of rubberized hot mix asphalt chosen by Caltrans, of the total paving asphalt used statewide, to ensure the statutory requirement of 11.58 pounds of crumb rubber modifier per metric ton is met (<i>Rounded 32.8 percent up to 35 percent</i>)	35%

APPENDIX

PUBLIC RESOURCES CODE SECTION 42703

DIVISION 30. WASTE MANAGEMENT [40000–49620]

PART 3. STATE PROGRAMS [42000–42999]

CHAPTER 14. Paving Materials [42700–42705]

ARTICLE 1. Recycled Materials [42700–42704.5]

Section 42703.

- (a) Except as provided in subdivision (d), the Department of Transportation shall require the use of crumb rubber in lieu of other materials at the following levels for state highway construction or repair projects that use asphalt as a construction material:
- (1) On and after January 1, 2007, the Department of Transportation shall use, on an annual average, not less than 6.62 pounds of CRM per metric ton of the total amount of asphalt paving materials used.
 - (2) On and after January 1, 2010, the Department of Transportation shall use, on an annual average, not less than 8.27 pounds of CRM per metric ton of the total amount of asphalt paving materials used.
 - (3) On and after January 1, 2013, the Department of Transportation shall use, on an annual average, not less than 11.58 pounds of CRM per metric ton of the total amount of asphalt paving materials used.
- (b) (1) The annual average use of crumb rubber required in subdivision (a) shall be achieved on a statewide basis and shall not require the use of asphalt containing crumb rubber in each individual project or in a place where it is not feasible to use that material.
- (2) On and after January 1, 2007, and before January 1, 2015, not less than 50 percent of the asphalt pavement used to comply with the

- requirements of subdivision (a) shall be rubberized asphalt concrete.
- (3) On and after January 1, 2015, the Department of Transportation may use any material meeting the definition of asphalt containing crumb rubber, with respect to product type or specification, to comply with the requirements of subdivision (a).
- (c) (1) The Secretary of the Transportation Agency shall, on or before January 1 of each year, prepare an analysis comparing the cost differential between asphalt containing crumb rubber and conventional asphalt. The analysis shall include the cost of the quantity of asphalt product needed per lane mile paved and, at a minimum, shall include all the following:
- (A) The lifespan and duration of the asphalt materials.
 - (B) The maintenance cost of the asphalt materials and other potential cost savings to the department, including, but not limited to, reduced soundwall construction costs resulting from noise reduction qualities of rubberized asphalt concrete.
 - (C) The difference between each type or specification of asphalt containing crumb rubber, considering the cost-effectiveness of each type or specification separately in comparison to the cost-effectiveness of conventional asphalt paving materials.
- (2) Notwithstanding subdivision (a), if, after completing the analysis required by paragraph (1), the secretary determines that the cost of asphalt containing crumb rubber exceeds the cost of conventional asphalt, the Department of Transportation shall continue to meet the requirement specified in paragraph (1) of subdivision (a) and shall not implement the requirement specified in paragraph (2) of subdivision (a). If the secretary determines, pursuant to an analysis prepared pursuant to paragraph (1), that the cost of asphalt containing crumb rubber does not exceed the cost of conventional asphalt, the Department of Transportation shall implement paragraph (2) of subdivision (a) within one year of that determination, but not before January 1, 2010.
- (3) Notwithstanding subdivision (a), if the Department of Transportation delays the implementation of paragraph (2) of subdivision (a), the

Department of Transportation shall not implement the requirement of paragraph (3) of subdivision (a) until three years after the date the department implements paragraph (2) of subdivision (a).

- (d) For the purposes of complying with the requirements of subdivision (a), only crumb rubber manufactured in the United States that is derived from waste tires taken from vehicles owned and operated in the United States may be used.
- (e) The Department of Transportation and the board shall develop procedures for using crumb rubber and other derived tire products in other projects.
- (f) The Department of Transportation shall notify and confer with the East Bay Municipal Utility District before using asphalt containing crumb rubber on a state highway construction or repair project that overlays district infrastructure.
- (g) For purposes of this section the following definitions shall apply:
 - (1) "Asphalt containing crumb rubber" means any asphalt pavement construction, rehabilitation, or maintenance material that contains reclaimed tire rubber and that is specified for use by the Department of Transportation.
 - (2) "Crumb rubber" or "CRM" has the same meaning as defined in Section 42801.7.
 - (3) "Rubberized asphalt concrete" or "RAC" means a paving material that uses an asphalt rubber binder containing an amount of reclaimed tire rubber that is 15 percent or more by weight of the total blend, and that meets other specifications for both the physical properties of asphalt rubber and the application of asphalt rubber, as defined in the American Society for Testing and Materials (ASTM) Standard Specification for Asphalt-Rubber Binder.