

APPLICATION FORM INSTRUCTIONS FOR CYCLE 8 HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)

This application form is for Highway Safety Improvement Program (HSIP) Cycle 8 Call for Projects. Applicants should submit the applications to their respective Caltrans District Local Assistance Office, directed to the attention of the District Local Assistance Engineer (DLAE), by the designated **deadline, Friday, August 12, 2016**. Applications that are delivered after close of business on the due date or are postmarked later than the due date will not be accepted.

Applicants must download the PDF application form and other documents from the Division of Local Assistance HSIP website at: http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm. Applicants must prepare their electronic and hard-copy applications as defined in these instructions. Failure to follow this procedure will result in their application being rejected.

Application submittals must include:

1. Two original hard copies of the application and attachments. Both copies must include all appropriate signatures on the application and relevant attachments. The preferred paper size for all pages, maps, schematics, drawings, figures and photographs is 8-1/2" x 11" paper. 11" x 17" paper is acceptable for maps and plan sheets only.
2. One CD or flash drive including:
 - a. An electronic copy of the PDF application form saved using a file-name that matches the Application ID on the cover page of the final application. This file **MUST** be in the same file-format as the originally downloaded form to allow the data to be extracted. **This is NOT a scanned copy and thus does not contain any signatures or engineer's stamp.**
 - b. One PDF copy of the signed/stamped application and all attachments. This can be a scanned copy and the file size should be minimized.

Note: if one agency submits multiple applications, the agency may include all files in one CD/flash drive provided that the files for each application are in a different folder.

Important: Read the entire Application Instructions before attempting to prepare and submit the application. Applicants are expected to utilize and follow these instructions in a step-by-step process as they complete their application(s). **Completing an application without referencing to these instructions may result in an incomplete application or an application with fatal flaws that will be excluded from the ranking and selection process. Due to time constraints, the applicant will not be notified of Caltrans findings until after the selection process is complete. If an applicant has questions relating to potential fatal flaws in their application, they should seek assistance from their Caltrans DLAE before submitting their application.**

GENERAL PREPARATIONS

This document contains detailed instructions for filling in the application form. **Appendix A** provides specific instructions for construction cost estimate, overall project cost estimate, countermeasure benefits calculation and the Benefit/Cost Ratio (BCR) calculation as these components are inter-related in the application. **Appendix B** provides a list of countermeasures that may be used in the applications.

Applicants are expected to submit applications based on a data-driven, comprehensive safety evaluation of their agency's roadway infrastructure, traffic volumes and crash data. Prior to filling in the PDF application form, it is recommended that applicants complete some general preparations:

- 1) Read the Program Guidelines and other related documents (See DLA website, http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm)
- 2) Review Caltrans' Local Roadway Safety Manual for California's Local Road Owners. This manual should help applicants in selecting good safety projects to compete for federal HSIP funds. (See DLA website, http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm) Agencies may want to start their review of this manual with Appendix A.
- 3) Verify your agency is eligible to apply for HSIP funding. Review the HSIP guidelines related to eligibility and confirm your agency has no delivery flags on past HSIP/HR3 projects. (See DLA delivery status at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/delivery_status.htm)
- 4) Review Appendix A of this document to become familiar with the relationship between the construction cost estimate, the project cost estimate, and the calculations of the safety countermeasures and the Benefit/Cost Ratio (BCR).
- 5) Review application examples. In an effort to assist local agencies in identifying highly competitive safety projects and completing the application submittal process, several successful applications from the previous Call-for-Projects are posted at <http://www.dot.ca.gov/hq/LocalPrograms/HSIP/HSIPHR3Examples.pdf>.
- 6) Review the Engineer's Checklist; which must be completed by the licensed Engineer who is in "responsible charge" of the preparation of this HSIP application. This checklist has been developed to help ensure all of the primary elements of the application are included and the application is free of errors in the calculation of the BCR so the application can be accurately ranked in the statewide selection process. Engineers are encouraged to print the checklist and then review the corresponding checklist items as they work through these instructions and prepare the final application. (See DLA website, http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm)
- 7) Consider submitting additional applications in the HSIP Cycle 8 Call for Projects to support the agency's overall safety needs. Cycle 8 has a maximum HSIP funds per agency of \$10 Million.

APPLICATION SUMMARY (COVER SHEET)

This summary page/cover sheet is filled out automatically once the application is completed.

NOTE: The **Application ID** shown on this summary page is generated automatically based on the Caltrans District, the agency name, and the Application Number. This exact Application ID is to be used as the file name for saving the final PDF form and to enter this Application ID in the Excel Benefit Calculator.

I. BASIC PROJECT INFORMATION

Agency

From the drop-down list, **select** the agency name. Only **Type** the name if your agency is not in the list.

MPO

From the drop-down list, select the MPO (Metropolitan Planning Organization) that will be involved with the programming of the project in the FTIP. Select "Other" if not applicable. For information about MPOs, visit http://www.dot.ca.gov/hq/transprog/federal/mpo_ftip_links.htm.

Application Number

If multiple applications are submitted, **each application must have a unique number** (1, 2, 3, etc). As stated above, this number is used to generate a unique Application ID.

Contact Person Information

This information will be used to contact the agency relating to funding results and later for project delivery questions.

Project Location

Provide road name, intersection cross street names, and/or geographical references of where the project is located. Be brief (limited to 250 characters). Example: “*On Elm St. between Oak Ave. and Cherry Blvd.*” or “*The Intersection of Elm St. with Oak Ave.*” or “*Various locations along Oak Ave*” or “*Various locations throughout the County.*”

Project Description

Describe, in general, the types of work that are proposed for the project. Be brief (limited to 250 characters). Example: “*Install traffic signal; Construct curb, gutter, sidewalk, and curb ramps*” or “*Install traffic signs, stripes and pavement markings*”

Functional Classification

Visit California Road System (CRS) maps at http://www.dot.ca.gov/hq/tsip/hseb/crs_maps/ to determine the functional classification of the road(s) where **most** of the work will be constructed. Select the functional classification from the drop-down list.

CRS Map ID

Enter CRS Map ID (e. g. 08E14) from the CRS website.

Urban/Rural Area

Visit <http://earth.dot.ca.gov/> (Caltrans Earth; Layer: Boundaries → Urban Area) and determine that **most** of the proposed work is in urban or rural area. Select “Urban” or “Rural” from the drop-down list.

High-Risk-Rural-Roads (HR3) Eligibility

If the proposed work is **primarily (90% or more)** in rural area and associated with roads functionally classified as “Major Collector”, “Minor Collector” and/or “Local”, the project should be marked as HR3 eligible. Select “Yes” or “No” from the drop-down list.

Depending on the overall mix of applications submitted, HR3 eligible applications may be ranked and selected for funding separately using a lower B/C Ratio threshold giving them an advantage in receiving funding. HR3 eligible projects, when selected for funding, will be tracked separately due to special requirements.

If this project is NOT HR3 eligible, it is possible that part of the project is HR3 eligible. Provide an approximate total cost percentage that is HR3 eligible.

Work on the State Highway System

All projects that encroach within the State right-of-way must include written correspondence from Caltrans-District Traffic staff, even if it does not impact the existing roadway infrastructure. Failure to provide this documentation will result in the application being rejected from consideration. Joint funded projects must have a formal letter of support. Encroachment projects that are not seeking Caltrans joint funding still require a letter or email from Caltrans stating that Caltrans is in support, or is at least neutral to the proposed project, given the scope of the project shown in the application, and that Caltrans does not see issues that would prevent the proposed project from receiving an encroachment permit.

Note: For intersection improvements on state highways, an Intersection Control Evaluation (ICE) analysis and a cost sharing agreement with Caltrans are required. For more information regarding the ICE analysis, see Chapter 4C, Traffic Control Signal Needs Studies, of the California Manual on Uniform Traffic Control Devices (CA MUTCD).

Caltrans District Local Assistance Engineer (DLAE) will assist the applicants coordinating with Caltrans-District Traffic staff.

Set-aside for guardrail upgrades:

If this proposed project is competing for funding set-aside for guardrail upgrades, no Benefit/Cost Ratio (BCR) calculation is required. Note this funding set-aside is for upgrades of existing guardrails and end treatments, not for new guardrail installations. Bridge rail upgrades are not eligible as well.

The maximum HSIP amount per agency from this set-aside is \$600,000. The projects under this funding set-aside are eligible for 100% federal reimbursement ratio.

If “Yes” is selected from the dropdown list, the entire application should be for this set-aside only. Complete a separate application if your agency also has other locations to compete for the HSIP funds.

Set-aside for crosswalk enhancements at unsignalized locations and/or pedestrian countdown heads at signalized intersections:

If this proposed project is competing for funding set-aside for crosswalk enhancements at unsignalized locations and/or pedestrian countdown heads at signalized intersections, no crash data or Benefit/Cost Ratio (BCR) calculation is needed. **If this project is competing through normal BCR process, do not check this box.**

Crosswalk enhancements at unsignalized locations may include adding pedestrian signs, advanced yield lines with associated “Yield Here to Pedestrian” signs, high visibility crosswalk marking pattern (ladder style), etc. Examples are shown in CA MUTCD, Figure 3B-17.

The maximum HSIP amount per agency from this set-aside is \$250,000. The projects under this funding set-aside are eligible for 100% federal reimbursement ratio.

If “Yes” is selected from the dropdown list, the entire application should be for this set-aside only. Complete a separate application if your agency also has other locations to compete for the HSIP funds.

Additional Information

Most of the information requested in this session is required for Caltrans to meet its annual safety program reporting requirements to the FHWA. Responses to these questions will NOT be used in the scoring, ranking or selection process. The responses will be incorporated in statewide and national safety program assessments and used to determine the health of the overall program and potential areas of focus for future program improvements.

Spot vs. Systemic

The Local Roadway Safety Manual includes a detailed description of these two approaches. When more than one type of improvements is proposed in one application, applicants need to select a single “primary type”.

SHSP Challenge Area

The goal of this question is to tie the improvements to California’s Strategy Highway Safety Plan. Most projects should fall within one of the Challenge Areas. Visit <http://www.dot.ca.gov/trafficops/shsp/> for more details on the 15 California Challenge Areas.

Approximate percentage of project cost going to improvements related to motorized/non-motorized travel

Projects benefit a mix of roadway users and modes of travel. For statewide tracking purposes, Caltrans needs applicants to approximate the percent of the overall project costs going to improvements for motorized vs. non-motorized roadway users. Applicant need to make their best approximation of the percentages based on their estimated project costs and their primary goals and objectives for the project.

Is the project focused primarily on "intersection" or "roadway" improvement?

For FHWA reporting purposes, designate this project as either an "Intersection" or "Roadway" Improvement and then enter the number of intersections or roadway miles to be improved.

Posted Speed Limit (mph)

Input the highest posted speed within the project limits.

Annual Average Daily Traffic and Year Collected

Indicate the existing (or most current) Annual Average Daily Traffic (AADT) volume at the project location and the year the data were collected. If the proposed improvement is on a road segment, the AADT is the number of vehicles that use that section of roadway, in both directions, on an average day. If the proposed improvement is at an intersection, separate the AADT volumes approaching the intersection into Major Road and Minor Road. If the proposed improvements span a large distance and/or are spread out over several routes/locations, provide the range of AADT volumes with the high-end input in the "Major Road" field and the low-end input in the "Minor Road" field.

II. NARRATIVE QUESTIONS

These narrative questions are intended to provide additional project details for the application reviewers and project files. Application reviewers will use this information in their assessment of the application. If significant inconsistencies are found in the application information, Caltrans reviewers may conclude that the application includes one or more "fatal flaws" and the application will be dropped from further funding considerations.

Each narrative answer is limited to 5000 characters. The intent is to keep the answers short and to the point. Bulleted answers are acceptable. Applicants can type the answers directly into the fields or Cut and Paste text ("Ctrl + V" or right-click) from other documents.

III. PROJECT COST ESTIMATE

*Due to their interrelationship, the instructions for Engineer's Estimate (Construction), Project Cost Estimate, crash data, countermeasures and the Benefit/Cost Ratio (BCR) are presented in Appendix A. For instructions for "Project Cost Estimate" and "Benefit/Cost Calculation", please refer to **Appendix A: "Instructions for Project Cost Estimate and Benefit/Cost Ratio (BCR) Calculation"**.*

IV. BENEFIT/COST RATIO CALCULATION

*Due to their interrelationship, the instructions for Engineer's Estimate (Construction), Project Cost Estimate, crash data, countermeasures and the Benefit/Cost Ratio (BCR) are presented in Appendix A. For instructions for "Project Cost Estimate" and "Benefit/Cost Calculation", please refer to **Appendix A: "Instructions for Project Cost Estimate and Benefit/Cost Ratio (BCR) Calculation"**.*

V. IMPLEMENTATION SCHEDULE

Provide an estimated implementation schedule of the project based on a target date of 01/01/2017 as the project's amendment into the FTIP.

In order for the milestones to be calculated correctly, all fields need to be filled in. For steps that are not applicable, enter "0" in the boxes.

If the applicant expects an action, task, or delay not accounted for on this form, it is the applicant's responsibility to account for this duration under the "Other" fields.

It's important for the applicant to work closely with its internal environmental and project delivery staff before completing this form to ensure realistic durations are used. Caltrans recommends the applicant review and consider all aspects of the States' PES form to minimize the likelihood of the agency failing to meet the program's delivery requirements. This form is located at: <http://www.dot.ca.gov/hq/LocalPrograms/lam/forms/lapmforms.htm> (Exhibit 6-A).

The Agency must commit to the delivery schedule shown in the application, with the understanding that if the agency cannot meet the minimum delivery requirements for the program, they will risk not being eligible to apply for future safety funding in this program until the project's milestone flags are removed. The delivery requirements are located at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/delivery_status.htm.

If the proposed project involves lengthy delivery elements (i.e. right-of-way acquisition or environmental permits from regulatory agencies), Caltrans recommends the agency consider completing the PE-Phase of the project before applying for HSIP funding, re-scope the project to focus on low-impact improvements that can be constructed expeditiously, OR selecting a different project altogether that can be delivered on an expedited schedule. Agencies may choose to seek funding in the HSIP program with the understanding that there is a high risk that their project will miss the delivery requirements, be flagged, and the agency will be excluded from future HSIP funding until after the project's milestone flags are removed.

NOTE: This form is intended to be a tool for the applicant to create a reasonable project schedule in order to reduce the risk of the applicant/agency having a future delivery flag and becoming ineligible to apply for future funding. This information will not affect the ranking or selection of applications.

VI. APPLICATION ATTACHMENTS

Check all attachments included in this application. Many of the attachments are listed as “Required”. Failure to include the required attachments will result in the disqualification /rejection of the application.

1) Engineer’s Checklist (Required)

- a) Applicants must use Caltrans template at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm.
- b) The checklist is to be used by the engineer in “responsible charge” of the preparation of this HSIP application to ensure all of the primary elements of the application are included and the application is free of errors in the calculation of the Benefit/Cost Ratio (BCR).

2) _____ Vicinity map / Location map (Required)

- a) The application reviewers and the Program Managers must be able to quickly pinpoint the project's location in the state and local agency. This map needs to show where the project is located within the overall agency. It is not intended to show the specific project limits.

3) _____ Project maps/plan showing existing and proposed projects limits and conditions (Required)

- a) These plans need to show the limits of the propose improvements and that the proposed improvements are technically feasible and design standard are expected to be met including: lane widths, turning movements, lane transitions/off-sets sight distance, etc.
- b) The application reviewers must be able to confirm whether the proposed improvements fall within the existing right-of-way or they require new right-of-way acquisition. If the project encroaches on Caltrans’, Railroad, or other agencies’ right-of-way; include a copy of an email or letter of support from the owner.

4) _____ Pictures of existing condition (Required)

A minimum of two pictures per countermeasure, showing the existing safety conditions/concerns that will be altered by the proposed countermeasure and project.

5) _____ Collision Diagram(s) (Required)

- a) The application reviewers must be able to confirm that for each collision, there is a clear correlation between the specific countermeasure(s) it applies to, collision diagram, collision list and collision summary.
- b) When needed to clearly demonstrate the correlation between the crashes and multiple countermeasures, applicants should provide separate collision diagrams for each countermeasure and/or location.

6) _____ Collision List(s) (Required)

- a) Applicants must include a list of crashes (by location) that matches the crashes shown on the collision diagrams and applied to a countermeasure in the BCR calculation. This list is often a direct output from SWITRS, Crossroads, TIMS or other crash databases.
- b) If the output list includes crashes that were not appropriate to include in the project’s BCR calculation, these crashes must be crossed through or removed.
- c) This report/list must show the total number of crashes (not number of victims) summarized by crash severity.

7) _____ Collision Summary/Summaries (Required)

- a) Applicants must use Caltrans template at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm.
- b) There must be one Collision Summary per Benefit Calculation Run (**refer to Appendix A of this document**). This page summarized all the crashes being applied to the Crash Data Table in a Benefit Calculation Run. It allows the applicant and application reviewers to easily confirm the crashes for each individual Benefit Calculation Run match the corresponding collision diagram and collision list.
- c) The crash data in each Collision Summary must match the crashes in the Crash Data Table in the corresponding Benefit Calculation Run.

8) Detailed Engineer's Estimate (Required)

- a) Applicants must use Caltrans template at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm.
- b) Instructions for the completion of the estimate, including the details required for HISP applications, are included in Appendix A of this document.
- c) This page allows application reviewers to easily review how the total construction costs are split among countermeasures, other safety-related improvements and non-safety-related improvements. This split will be used as inputs in the BCR Calculation in Section IV of the application form.

9) Excel Benefit Calculator Printout(s) (Required)

- a) Applicants must use the Excel Benefit Calculator that can be downloaded at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm.
- b) The "Application ID" entered into the Excel Benefit Calculator must match the application ID on the cover sheet of the application.
- c) Include all printouts of the Benefit Calculation Runs and the Benefit Summary sheet (if there are multiple Benefit Calculation Runs);
- d) The benefits entered in Section IV of the application form must match the benefit calculation results / Benefit Summary sheet.

10) Warrant studies (Required when applicable)

- a) Required when the project includes an improvement that requires an engineering study to warrant the installation of certain traffic control devices, e.g., traffic signals, pedestrian signals, etc. When applications include traffic control features like these, it is the applicants' responsibility to ensure all requirements of the latest [CA MUTCD](#) are met. Failure to include required warrants completed per CA MUTCD will result in the project being disqualified. See the Engineer's Checklist for more details on Warrant Studies.

11) Letter/email of Support from Caltrans (Required when applicable)

- a) All projects that encroach within Caltrans' rights-of-way must have a letter or email from Caltrans conveying district Traffic Office's "support" or at least "neutral-support" for the project. Projects that do not contain documentation of Caltrans' position will be disqualified.
- b) All "joint funded" projects with Caltrans must have a letter of support from Caltrans indicating the project's scope, schedule, cost and cost sharing ratios. Applications for joint funded projects that do not contain a letter of support will be disqualified.
- c) For intersection improvements on state highways, an Intersection Control Evaluation (ICE) analysis and a cost sharing agreement with Caltrans are required. For more information regarding the ICE analysis, see Chapter 4C, Traffic Control Signal Needs Studies, of the California Manual on Uniform Traffic Control Devices (CA MUTCD).

12) Additional narration, documentation, letters of support, etc.

- a) These may be used to help illustrate the safety concerns within the project limits.
- b) These should be directly related to documenting the merits of the need, purpose and scope of the project.
- c) General documents and/or full reports should not be included.

APPENDIX A

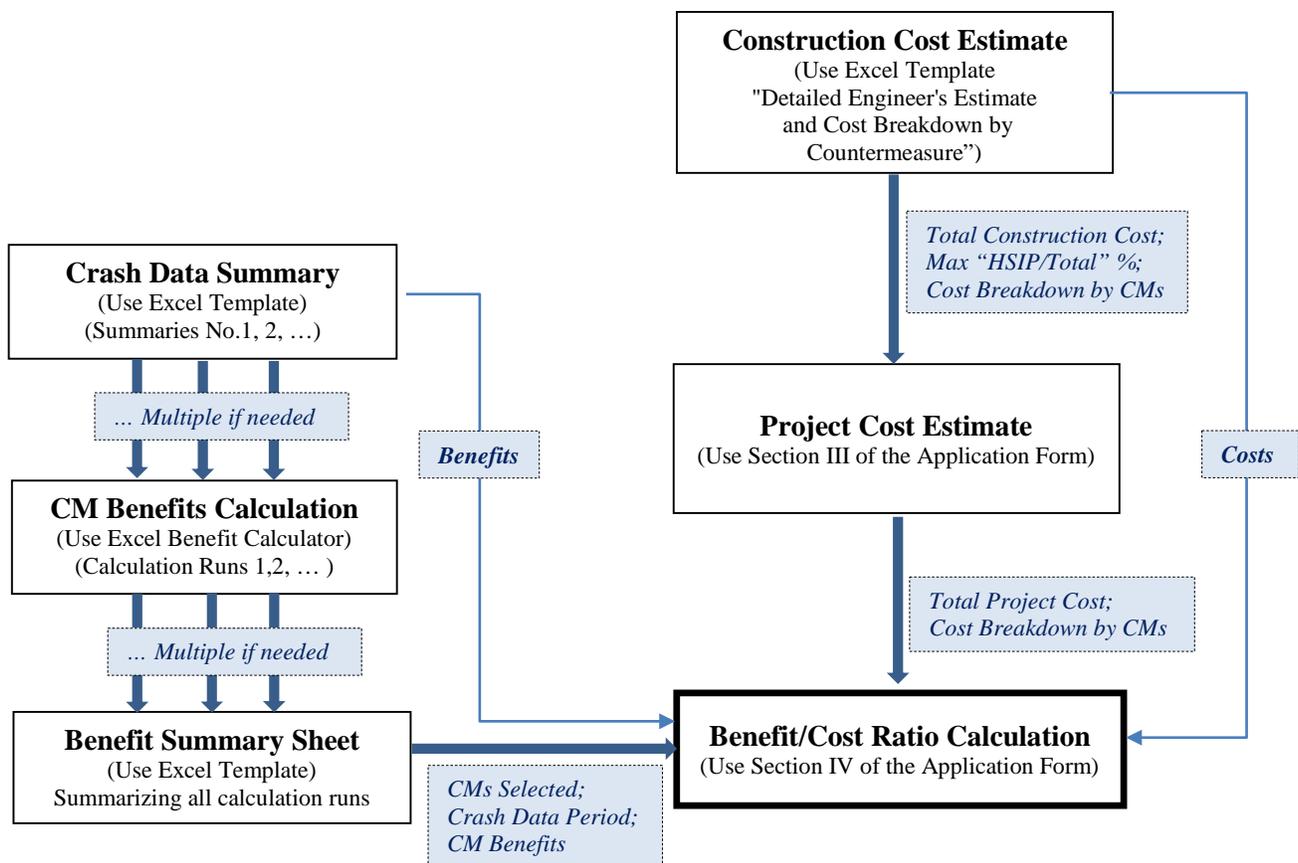
Instructions for Project Cost Estimate and Benefit/Cost Ratio (BCR) Calculation

The project applications for the federal Highway Safety Improvement Program (HSIP) funding are evaluated and prioritized primarily based on the Benefit/Cost Ratio (BCR). The BCR is required on the applications except for those applying for funding set-asides for guardrail upgrades or crosswalk enhancements/pedestrian countdown heads (see Section I of the application form). It is very important for the applicants to estimate the project costs and calculate the BCR accurately per the instructions. To better understand the concepts behind the analysis, the applicants are highly encouraged to review the Local Roadway Safety Manual.

These instructions are specifically for

- i) Construction cost estimate;
- ii) Project cost (all phases) estimate;
- iii) Countermeasure (CM) benefits calculation; and
- iv) The BCR calculation.

These steps are closely related as they lead to the BCR of a project. The below chart illustrates the flow of the steps, the tools to be used and the data that need to be transferred between them. These tools can be downloaded at DLA website http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm.



1. Construction Cost Estimate and Cost Breakdown by Countermeasures

Applicants are required to use the Excel template "Detailed Engineer's Estimate and Cost Breakdown by Countermeasure" for estimating the cost of construction items and distribute the construction costs among the countermeasures.

This template is for construction items only. The costs for other phases (PE, ROW, and CE) are NOT included in this form. They must go in Section III of the application form.

- This template contains formulas. The formula cells (grey/yellow background) are locked and read-only.
- In each line of the table, enter the construction item description, quantity, unit, unit cost, and the cost percentages that are directly attributed to each of the countermeasures (CMs) & "other safety-related" (the remaining percentage goes to "non-safety-related costs" automatically). These percentages will be used in calculating cost shares pertaining to each of up to three CMs, other safety-related costs and non-safety-related costs.

Only assign a percentage of a construction item to a CM if it is directly related to or is required to construct that CM. Unless a strong logical tie can be made to specific CMs, general construction items like "Mobilization" and "Traffic Control" should not be assigned to any CMs and should instead be split between "other safety-related" and "non-safety-related" based on the overall construction costs going to each of these.

- At the bottom of the table, an overall cost percentage will be calculated for each CM. For a CM to be used in B/C ratio calculation, the cost percentage of this CM must be at least 15%.

- **Construction Item Contingencies:**

In general, not all project construction costs are well defined at the time the HSIP applications are prepared. For this reason, applicants are allowed to include Construction Item Contingencies as a percentage of the known construction costs. These are the only project contingencies allowed in an HSIP application. When applicants calculate their Preliminary Engineering (PE) and Construction Engineering (CE) costs as a percentage of the Total Construction Cost, contingencies will automatically be built into the PE and CE costs.

- Up to three CMs may be selected from the dropdown lists. These should be the same CMs to be used in the BCR calculation. Only select the CMs with at least 15% of the construction cost.

The formulas will look up for the federal funding eligibility percentage of each selected CM from the CM list (forty (40) CMs - 100%, thirty-five (35) CMs - 90% and one (1) CM - 50%).

- **Maximum "HSIP/Total" percentage allowed for this project:**

= the smallest value of the federal funding eligibility percentages of the selected CMs – (the percentage of the non-safety related costs - 10%)

In other words, this percentage is equal to the smallest value of the federal funding eligibility percentages of the selected CMs unless the percentage of the non-safety related costs is more than 10%.

After the completion of the construction cost estimate, the following data must be transferred to Section III (Project Cost Estimate) of the application form:

- Total Construction Cost;
- Maximum "HSIP/Total" percentage allowed for this project;
- Cost breakdown (percentages for CM#1, CM#2, CM#3, other safety-related costs, and non-safety-related costs)

The cells with data to be transferred to Section III of the application form are yellow-highlighted.

2. PROJECT COST ESTIMATE

Section III of the application form is used for the overall project cost estimate including all applicable phases, i.e. Preliminary Engineering (PE), Right of Way (ROW), Construction (CON), and Construction Engineering (CE). All project costs (all phases and funding sources) must be accounted for in this section.

The costs included in the application represent the likely total project cost necessary to fully construct the proposed scope. If the proposed project is a piece of a larger construction project, the entire scope of the larger project must be identified and included in this section even if substantial elements are to be funded by other sources. The Total Project Cost from this section will be used in the later Benefit/Cost Ratio (BCR) calculation.

Before completing this section, the applicant must first complete the construction cost estimate. The following data must be transferred to this section from the construction cost estimate:

- *Total Construction Cost;*
- *Maximum "HSIP/Total" percentage allowed for this project;*
- *Cost breakdown (percentages for CM#1, CM#2, CM#3, other safety-related costs, and non-safety-related costs)*

All the grey fields contain formulas and are read-only.

For each line in the table, enter the total cost (rounded up to the nearest hundred dollars) and the desired HSIP/Total Cost ratio. The desired HSIP/Total ratio cannot be more than the Maximum "HSIP/Total" percentage allowed for this project that was transferred from the construction cost estimate. The amounts of Federal Funds and Local/Other Funds will be calculated by the form.

Check Box indicating Agency does NOT request federal funds for PE Phase:

If no federal funds for the PE Phase are requested, this Check Box will be checked automatically. This information will only be used for project delivery tracking. It will not affect the ranking or selection of applications.

Automatic Data Validation:

Once all costs and ratios are entered, click "Check Cost Estimate" button to perform the data validation based on the below criteria. If errors are detected, they will appear below the "Check Cost Estimate" button. Click it to check again each time after the costs have been revised. There should be no error messages with the final submittal of the application unless applicants have the approved exceptions (see items 1 and 5 below) from Caltrans. **Note:** this is a courtesy review. Not all errors can be detected. It is the applicant's responsibility to make sure all the above criteria are met.

- 1) "Federal Funds" for Preliminary Engineering may not exceed 25% of the Federal Construction Cost.

Exception: for low cost systematic projects such as Roadway Safety Signing Audits (RSSA), Caltrans anticipates approving PE costs over 25%. For more information on this type of project, see the example document at http://www.dot.ca.gov/hq/LocalPrograms/HSIP/apply_nowHSIP.htm. Exception, if applicable, should be obtained prior to submitting applications.

- 2) "Federal Funds" for Right of Way may not exceed 10% of the Federal Construction Cost.
- 3) "Federal Funds" for Construction Engineering may not exceed 15% of the Federal Construction Cost.
- 4) "Federal Funds" may not exceed \$10,000,000.
- 5) To maintain efficiencies in the overall Program and Project Management, the "Total Federal Funds" must be \$100,000 or more. If needed, agencies should consider extending the project limits and /or adding another safety improvement in order to increase both the total project Benefits and Costs.

Exception: Caltrans recognizes that for a few rural agencies with extremely small numbers of crashes, this \$100,000 minimum federal funding requirement may not be achievable without their applications having low B/C ratios, which may not be fundable. If an agency believes their jurisdiction falls into this category, they may

request an exception to this \$100,000 minimum federal funding requirement through their District Local Assistance Engineer. If the District and Headquarters staff supports this request, then their application will be accepted with less than \$100,000 in Total Federal Funds.

After the completion of the project cost estimate, the following data will be automatically transferred to Section IV (Benefit/Cost Ratio Calculation) of the application form:

- Total Project Cost;
- Cost breakdown (percentages for CM#1, CM#2, CM#3, other safety-related costs, and non-safety-related costs)

3. CALCULATION OF THE COUNTERMEASURE BENEFITS

The safety countermeasure (CM) benefits are calculated using the Excel "Benefit Calculator" that is macro-driven (Visual Basic script). After the users have entered the selected countermeasures and the corresponding Crash Data Table, the benefits are calculated automatically.

One project may have one or multiple benefit calculation runs using the "Benefit Calculator", depending on the project situation.

a) What is one benefit calculation run?

After all data are provided, perform the calculation, save the file and print out the results. This is counted as one benefit calculation run. To start a new calculation run, the existing data should be cleared, the data be re-entered, and the file be saved as a different name. For one calculation run, the data required are: 1) CMs utilized; 2) Crash data period; 3) a Crash Data Table. Additional information is needed if roundabouts are proposed.

A Crash Data Table is a summary table of crash data from one or multiple project locations. The table is composed of **multiple rows or datasets**, and each dataset is composed of crash numbers of different severities. The datasets are: "All", "Night", "Ped & Bike", "Emergency Vehicle", and "Animal". Each of the later datasets is a sub-dataset of the "All" dataset. Below is the structure of a Crash Data Table.

A Crash Data Table

Dataset/Sub-dataset	Fatality	Severe Injury	Injury - Other Visible	Injury - Complaint of Pain	Property Damage Only	Total
All	1	2	4	6	15	28
-Night	0	1	1	2	4	8
-Ped & Bike	1	1	1	5	4	12
-Emergency Vehicle						
-Animal						

A CM may apply to the "all" dataset, or only apply to one of the sub-datasets such as "Night", "Ped & Bike", "Emergency Vehicle" and "Animal". Refer to Appendix B for more information. Keep it in mind that within one calculation run, if multiple CMs are utilized, the Crash Modification Factors (CMFs) of the CMs are multiplicative. This is so because the crash reductions from the CMs are not simply additive as the subsequent CM only reduces the remaining crashes from the prior CM.

Example (a1):

One project utilizes two CMs, CM#1 and CM#2, with a Crash Reduction Factor (CRF) of 30% and 20%, respectively. Both CMs apply to the "all" crash dataset:

$$\text{CM\#1: CRF}_1=30\% \quad \text{so CMF}_1=1-\text{CRF}_1=70\%$$

$$\text{CM\#2: CRF}_2=20\% \quad \text{so CMF}_2=1-\text{CRF}_2=80\%$$

The combined CMF is $70\% * 80\% = 56\%$, and the combined CRF is $1-56\% = 44\%$. Note the combined CRF is less than the sum of the two CRFs (50%).

Example (a2):

Same as Example 1, except that CM #2 only applies to a sub-dataset - "ped & bike" crashes. The combined CRF will still be less than the sum of the two CRFs (50%). More accurately, depending on the percentage of "ped & bike" crashes, the combined CRF will be somewhere between 44% (when all crashes are of "ped & bike") and 30% (when no crashes are of "ped & bike").

b) Situations when only one benefit calculation run is needed for a project:

- 1) There is only one CM;
- 2) There are multiple CMs but all CMs are applied to all locations included in the project, therefore the project only includes one Crash Data Table, regardless of whether the CMs are applied to the same or different datasets in the Crash Data Table.

The below chart illustrates that a project will utilize 3 CMs at all project locations / areas. Therefore, only one Crash Data Table and one calculation is needed.

Group 1	
CM#1	
CM#2	
CM#3	
CM#1, CM#2 & CM#3	

Example (b):

A project includes 10 intersections. All intersections will utilize CMs “Improve Signal Hardware” and “Add Intersection Lighting”. The crash data of all 10 intersections must be combined into one single Crash Data Table. Note the two CMs are in fact applied to different datasets in the Crash Data Table: “All” dataset and “Night” sub-dataset.

c) Situations when multiple benefit calculation runs are needed for a project:

If one project include multiple locations, and different CM(s) are to be utilized in different groups of locations (and thus different Crash Data Tables), the Benefit Calculator should be run multiple times, once for each location group.

Criteria: Group the locations so that within each group, the same countermeasures apply to all locations and their crash data. For the application reviewers, the location groups should be further explained/described in more details in Question 3 (Crash Data Evaluation) of Section II of the application form.

The below chart illustrates that a project will utilize 3 CMs at different locations / areas. Per the above criteria, the project locations/areas should be divided into five groups, and thus five benefit calculation runs are needed.

Group 1	Group 2	Group 3	Group 4	Group 5
CM#1				
	CM#2			
		CM#3		
CM#1 Only	CM#1 & CM#2	CM#1, CM#2 & CM#3	CM#2 & CM#3	CM#2 Only

Example (c1):

A project has 5 road segments. 2 segments utilize CM “Install curve advance warning signs”. The other 3 utilize “Install edgeline rumble strips/stripes”. The crash data of the first 2 segments must be combined with one calculation run. The crash data of the remaining 3 segments must be combined with a new calculation. Print out the results of both runs.

Example (c2):

A project includes 10 locations. 6 locations will utilize CMs “Add Intersection Lighting” and “Improve Signal Hardware”, while the other 4 locations only utilize CM “Add Intersection Lighting”. Then the crash data of the first 6 locations must be combined as “Group #1” and the other 4 locations as “Group #2”. The Benefit Calculator will be run twice, for Group #1 and Group #2 respectively. Print out the results of both runs.

It is quite often that an HSIP project has multiple locations. The expectation is that in most cases one project includes locations with similar features, address similar safety issues and utilized the same countermeasure(s). Therefore, for most projects, the CMFs are multiplicative, the crash data of the locations can and should be combined into one Crash Data Table and the benefits can be calculated all at once.

When multiple benefit calculation runs are needed for one project, the benefits must be summed by CMs using the Benefit Summary spreadsheet (template provided) before they can be entered into Section IV of the application form for the BCR calculation. Print out the results of all calculation runs and the benefit summary sheet, and submit them as one of the attachments to the application.

Below are instructions for using the Excel Benefit Calculator. Pay attention to the paragraphs related to CMs and crash data.

APPLICATION ID:

Enter the same Application ID as in the application form (e.g. 03-Sacramento-1)

CALCULATION RUN NO:

Enter Calculation Run No. If the project has multiple runs, indicate the total number of runs, e.g. 1 of 2

COUNTERMEASURES UTILIZED:

Select up to 3 countermeasures (CMs) from the dropdown lists. At least one must be selected. Use CM#1 first then CM#2/CM#3.

If one of the “roundabout” CMs is selected (CMs S18, NS4A and NS4B), the below information is required as the benefit calculation formulas for roundabouts are different:

- Project location: “Urban” or “Rural” (select from dropdown list)
- Intersection type: “Full Intersection” or “T intersection” (select from dropdown list)
- Roundabout: “1 lane” or “2 lanes” (select from dropdown list)
- Average Daily Traffic (ADT), Major Road: ADT on the major road of the intersection
- Average Daily Traffic (ADT), Minor Road: ADT on the cross road of the intersection

Note: The benefit calculation formulas for roundabout CMs are different from those used for other CMs. You may see that the calculation results show a CRF of 0 for roundabouts. This is because the roundabout benefits may be from the reduction of crash severities, not just from the reduction of the number of crashes.

The available countermeasures are broken down into three groups (Signalized Intersection, Non-signalized Intersection, and Roadway Segment). Appendix B of this document provides a complete list of the countermeasures. Review **Section 4.0 and Appendix B of the California Local Roadway Safety Manual** before making the final selection of countermeasures to utilize in the BCR calculations. The detailed description of the countermeasures and guidance on how they can be applied will help applicants ensure they are utilizing the most appropriate countermeasures for their projects. Any single project may use up to three countermeasures.

For a CM to be used in the benefit calculation, the cost to implement each separate countermeasure must represent a **minimum of 15%** of the total construction cost, as shown in the Detailed Engineer's Estimate. For example: A

project proposing a new signal shall not include countermeasures for lighting, signing, striping, or minor median improvements as they are incidental elements of the new signal and do not represent stand-alone improvements.

Please pay attention to the specific rules and requirements pertaining to CMs S7, NS3, NS12, R9, R15, R16, R19, R20, and R21 (from Appendix B of the California Local Roadway Safety Manual):

1) S7, Convert signal to mast arm (from pedestal-mounted):

If CM S7 is part of a proposed project, CM S2 (“Improve signal hardware: lenses, back-plates, mounting, size, and number”) should not be selected as a separate CM since CM S7 should include the improvements as defined in CM S2.

2) NS3, Install signals:

All new signals must meet MUTCD "safety" warrants: 4, 5 or 7;
No other intersection CMs can be applied to the intersection crashes in conjunction with this CM.

3) NS12, Install raised median on approaches (NS.I.)

R9, Install raised median

All new raised medians must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface.

4) R15, Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes):

"Intersection" crashes can only be applied when they resulted from turning movements that had no designated turn lanes/phases in the existing condition and the Road Diet will provide turn lanes/phases for these movements. This CM does not apply to roadway sections that already included left turn lanes or two way left turn lanes before the lane reductions. New bike lanes are also expected to be part of these projects. Pre-approval from the HSIP program manager is needed for: 1) the use of this CM without removing a travel lane in each direction and/or without adding new bike lanes; and/or 2) if any pavement is planned to be removed for the purpose of adding landscaping, planter-boxes, or other non-roadway user features.

5) R16, Widen shoulder (paved)

R19, Improve horizontal alignment (flatten curves)

R20, Flatten crest vertical curve

R21, Improve horizontal and vertical alignments

These CMs are not eligible unless they are done as the last step of an "**incremental approach**". Applicants need to document that: 1) they have already pursued and installed lower cost and lower impact CMs (i.e. signing/striping upgrades to MUTCD standards/recommendations, rumble strips, improving pavement friction (High Friction Surface Treatment, or HFST), etc.), 2) they have already monitored the crash occurrences after these improvements were installed, and 3) the 'after' crash rate is still unacceptably high. This 'incremental approach' (or a special exception from the HSIP program manager) must be documented in Question 4 of the Narrative Questions in the application form and a summary of the 'before' and 'after' crash analysis must be attached to the application.

CRASH DATA:**IMPORTANT:**

Crash Data Summary - For each benefit calculation run, there must be a corresponding Crash Data Summary (using the template provided). Each run is tied to its Crash Data Summary - the crash numbers entered in the Crash Data Table in the Benefit Calculator must match the numbers in the Crash Data Summary.

1) Crash data time period:

The crash data time period must be **a minimum of 3 years and a maximum of 5 years** and the most recent available crash data must be used. Even though each benefit calculation run may have different crash data set, the crash data time period must be the same for all crashes used in a single application.

- 2) The crash data table includes multiple rows. Each row is for one of the 5 categories (dataset/sub-datasets): All; Night; Ped & Bike; Emergency Vehicle; and Animal. Depending on the selected countermeasure(s), different categories of the crash data are required (required rows are highlighted).
- 3) There are three sub-severities of injury crashes: “Severe Injury”, “Injury – Other Visible” and “Injury – Complaint of Pain”. **If the injury crashes in your agency’s crash database do not have more detailed sub-severities, all of the injury crashes must be entered as “Injury – Other Visible”.**
- 4) Every crash applied to the countermeasures is counted as one crash, regardless of the number of vehicles and the number of people involved in the crash. For example, if there is one crash which involved three vehicles and caused two injuries and one fatality, the crash would be tracked in the application as 1 fatal crash.
- 5) Crash Data Summary Sheets:

For each benefit calculation run, a Crash Data Summary Sheet (using the Excel “Crash Data Summary Sheet” template) is required. **When multiple benefit calculation runs are utilized, each run requires a separate Crash Data Summary Sheet.** For each calculation run, the crash data entered in the Benefit Calculator must match the Crash Data Summary Sheet for that run. This summary table must include the total crashes broken down by crash severity.

Applicants are required to provide Collision Diagrams and Collision Lists as supporting documents (attachments) to the application. The Collision Diagrams, the Collision Lists and Crash Data Summary Sheets should be organized so application reviewers can easily identify the entries in the Crash Data Summary Sheets in the corresponding Collision Diagrams and Collision Lists. Examples of collision diagrams and summary reports are provided at [the HSIP Call for Projects Page](#).

- 6) **All crashes applied to a given countermeasure must be within the countermeasures influence-area.** The following are some general criteria to guide the applicants in determining appropriate influence-areas for countermeasures. Before applying these general criteria, it is the applicant’s responsibility to ensure that they are reasonable for their particular application. (More guidance relating to each specific countermeasure is included in Section 4 and Appendix B of the California Local Roadway Safety Manual).
 - a) New Traffic Signals: All crashes within 250 feet of the new signal.
 - b) For intersection improvements, collisions that occurred within 250 feet of the intersection in all directions affected by the improvement may be used. If the distance to the nearest intersection is less than 500 feet, only those collisions that occurred from mid-block may be used.
 - c) Longitudinal Improvements (guardrail, raised median, turn pockets, etc): All crashes potentially effected by and within the limits of the improvement.
 - d) Signage, striping, delineators, or other warning devices: All crashes potentially effected by and/or within the limits of the driver's potential reaction to the improvements.
 - e) The influence-area may be extended beyond the physical improvements and/or the limits above if standard traffic engineering principles, as documented in Caltrans, American Association of State Highway and Transportation Officials (AASHTO) or FHWA publications, suggest it would be appropriate to do so. When

the influence-area of the project is not obvious and judgment has been used in identifying the influence-area, it is the applicant's responsibility to provide additional documentation showing the reasonableness of the judgment.

- 7) Do not include collisions unreported by law enforcement. Collision summary reports that corroborate the collision numbers must be attached to the application. Do not attach the actual collision reports prepared by the law enforcement officer. For applicants using TIMS Query & Map tool to analyze and summarize SWITRS crash data, applicants may find it necessary to add in known crashes that were not included in the TIMS summaries. These crashes may be added manually as long as the agency's safety managers include supporting documentation (shown on the collision diagram and summary report) and a comment and/or signature attesting to the source of these crashes and the accuracy of the total crash data.
- 8) The safety countermeasures constructed by the projects will not eliminate 100% of the safety risks and future crashes. This is especially true for lower-cost systemic improvements, such as signing and striping projects. Based on this, it is often reasonable for an agency to construct follow-up improvements along a corridor or at a location that has already had an HSIP project constructed. (Example: an agency has completed a striping upgrade project on a corridor. In a later HSIP cycle, the agency proposes a signing project on the same corridor based on an overlapping set of crashes.) For this reason, Caltrans allows agencies to reuse crashes in a current call for projects that have been used in a prior call for projects. It is the agency's responsibility to verify this and document it in the application in the Narrative Questions or separate backup calculation.

BENEFIT CALCULATION:

After the CMs are selected and crash data are entered, click the button to start the calculation. The benefits by CMs will be available at the bottom of the page. Save the file and print the results.

4. BENEFIT SUMMARY

This summary is only needed once per project for combining the benefits by CMs from different runs.

After all benefit calculation runs are performed, the results must be summarized in the Benefit Summary Sheet using the template provided. **It is only required when multiple benefit calculation runs are used.**

TRANSFER DATA TO SECTION IV OF THE APPLICATION FORM:

After the completion of the CM benefits calculation and the Benefit Summary as needed, the following data will be entered in Section IV (Benefit/Cost Ratio Calculation) of the application form:

- Benefits by CMs

5. CALCULATION OF THE BENEFIT/COST RATIO (BCR)

Section IV of the application form will calculate the Benefit/Cost Ratio (BCR) for the application.

After the completion of Section III of the application form (Project Cost Estimate), the following data will be automatically transferred to this section:

- *Total Project Cost;*
- *Cost breakdown (percentages for CM#1, CM#2, CM#3, other safety-related costs, and non-safety-related costs)*

The following data (from the calculation of the Countermeasure Benefits) must be entered in this section:

- *Benefits by CMs*

If multiple benefit calculation runs are used, combine the benefits by CMs from different runs before the data are transferred.

The BCR of the application as well as the BCRs of the individual CMs will be calculated automatically.

Please note:

- 1) **Agencies shall only submit applications with BCRs of 3.5 or greater.** Applications submitted with BCRs less than 3.5 will be rejected and not be evaluated.

Agencies experiencing difficulty developing applications with BCRs higher than 3.5 are encouraged to review Appendix A and Section 5.4 of the Local Roadway Safety Manual for California's Local Road Owners.

- 2) Only the Overall BCR for the project will be used to rate the project on a statewide basis.

Individual countermeasure's effectiveness: Each individual countermeasure's effectiveness is based on its individual benefit, cost and the resulting BCR. These individual BCRs are not used in the ranking or selection process and are provided for the applicant's information only. By approximating each individual countermeasures' effectiveness, the hope is that applicants will be able to select the most effective countermeasures for their projects and remove elements of the overall project that do not provide much safety benefits thus resulting in a higher overall BCR for the project.

APPENDIX B

List of Countermeasures (From Local Roadway Safety Manual – Section 4.2)

The list of countermeasures is from Section 4.2 of the Local Roadway Safety Manual. For the applicants' convenience, it is also provided here as Appendix B.

The countermeasures listed in the following three tables have been sorted into 3 categories: Signalized Intersection, Non-Signalized Intersection, and Roadway Segment. Pedestrian and bicycle related countermeasures have been included in each of these categories, as the consideration of non-motorized travel is important for all roadway classifications and locations. The countermeasures included in these tables are also included in the Excel Benefit Calculator. When selecting countermeasures and CMFs to apply to their specific safety needs, local agency safety practitioners should consider the **availability, applicability, and quality** of CMFs, as discussed in section 4.1 of the Local Roadway Safety Manual.

Only Crash Types, CRFs, Expected Lives, and Federal Funding Eligibility of the countermeasures for use in Caltrans local HSIP program are provided. Fields in the countermeasure tables are:

- **Crash Types** - “All”, “P & B” (Pedestrian and Bicycle), “Night”, “Emergency Vehicle”, or “Animal”.
- **CRF** - Crash Reduction Factor used for HSIP calls-for-projects.
- **Expected Life** - 10 years or 20 years.
- **Federal Funding Eligibility** – the maximum federal reimbursement ratio.
 - Forty (40) countermeasures: 100%
 - Thirty-five (35) countermeasures: 90%
 - One (1) countermeasure: 50% (CM No. S3: Improve signal timing, as this CM will improve the signal operation rather than merely the safety.)
- **Systemic Approach Opportunity** - Opportunity to Implement Using a Systemic Approach: “Very High”, “High”, “Medium” or “Low”.

For the countermeasures that are not eligible in Caltrans' local HSIP calls for projects, “NA” is placed in the above fields in the countermeasure tables.

Table 1. Countermeasures for Signalized Intersections

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity?
S1	Lighting	Add intersection lighting (S.I.)	Night	40%	20	100%	Medium
S2	Signal Mod.	Improve signal hardware: lenses, back-plates, mounting, size, and number	All	15%	10	100%	Very High
S3	Signal Mod.	Improve signal timing (coordination, phases, red, yellow, or operation)	All	15%	10	50%	Very High
S4	Signal Mod.	Provide Advanced Dilemma Zone Detection for high speed approaches	All	40%	10	100%	High
S5	Signal Mod.	Install emergency vehicle pre-emption systems	Emergency Vehicle	70%	10	100%	High
S6	Signal Mod.	Provide protected left turn phase (left turn lane already exists)	All	30%	20	100%	High
S7	Signal Mod.	Convert signal to mast arm (from pedestal-mounted)	All	30%	20	100%	Medium
S8	Operation/ Warning	Install raised pavement markers and striping (Through Intersection)	All	10%	10	100%	Very High
S9	Operation/ Warning	Install flashing beacons as advance warning (S.I.)	All	30%	10	100%	Medium
S10	Operation/ Warning	Install cameras to detect red light running	N/A	N/A	N/A	N/A	N/A
S11	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	Medium
S12	Geometric Mod.	Install raised median on approaches (S.I.)	All	25%	20	90%	Medium
S13	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns and u-turns (S.I.)	All	50%	20	90%	Medium
S14	Geometric Mod.	Install right turn lane (S.I.)	N/A	N/A	N/A	N/A	N/A
S15	Geometric Mod.	Install left turn lane (signal has no left turn phase – before and after)	N/A	N/A	N/A	N/A	N/A
S16	Geometric Mod.	Install left turn lane (signal has a left turn phase – before and after)	N/A	N/A	N/A	N/A	N/A
S17	Geometric Mod.	Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)	All	55%	20	90%	Low
S18	Geometric Mod.	Convert intersection to roundabout (from signal)	All	Varies	20	100%	Low
S19	Ped and Bike	Install pedestrian countdown signal heads	P & B	25%	20	100%	Very High
S20	Ped and Bike	Install pedestrian crossing (S.I.)	P & B	25%	20	100%	High
S21	Ped and Bike	Install advance stop bar before crosswalk (Bicycle Box)	P & B	15%	10	100%	Very High
S22	Ped and Bike	Install pedestrian overpass/underpass	N/A	N/A	N/A	N/A	N/A
S23	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low

Struck-through countermeasures are not eligible in the current HSIP call for projects.

Table 2. Countermeasures for Non-Signalized Intersections

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity?
NS1	Lighting	Add intersection lighting (NS.I.)	Night	40%	20	100%	Medium
NS2	Control	Convert to all-way STOP control (from 2-way or Yield control)	All	50%	10	100%	High
NS3	Control	Install signals	All	25%	20	100%	Low
NS4A	Control	Convert intersection to roundabout (from all way stop)	All	Varies	20	100%	Low
NS4B	Control	Convert intersection to roundabout (from stop or yield control on minor road)	All	Varies	20	100%	Low
NS5	Operation/ Warning	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	All	15%	10	100%	Very High
NS6	Operation/ Warning	Upgrade intersection pavement markings (NS.I.)	All	25%	10	100%	Very High
NS7	Operation/ Warning	Install Flashing Beacons at Stop-Controlled Intersections	All	15%	10	100%	High
NS8	Operation/ Warning	Install flashing beacons as advance warning (NS.I.)	All	30%	10	100%	High
NS9	Operation/ Warning	Install transverse rumble strips on approaches	All	20%	10	90%	High
NS10	Operation/ Warning	Improve sight distance to intersection (Clear Sight Triangles)	All	20%	10	90%	High
NS11	Geometric Mod.	Install splitter-islands on the minor road approaches	All	40%	20	90%	Medium
NS12	Geometric Mod.	Install raised median on approaches (NS.I.)	All	25%	20	90%	Medium
NS13	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)	All	50%	20	90%	Medium
NS14	Geometric Mod.	Install right-turn lane (NS.I.)	All	20%	20	90%	Low
NS15	Geometric Mod.	Install left-turn lane (where no left-turn lane exists)	All	35%	20	90%	Low
NS16	Ped and Bike	Install raised medians / refuge islands (NS.I.)	P & B	45%	20	90%	Medium
NS17	Ped and Bike	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	P & B	25%	10	100%	High
NS18	Ped and Bike	Install pedestrian crossing at uncontrolled locations (with enhanced safety features)	P & B	35%	20	100%	Medium
NS19	Ped and Bike	Install pedestrian signal or HAWK	P & B	55%	20	100%	Low
NS20	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	Medium

Table 3. Countermeasures for Roadways

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity?
R1	Lighting	Add segment lighting	Night	35%	20	100%	Medium
R2	Remove/ Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R3	Remove/ Shield Obstacles	Install Median Barrier	All	25%	20	100%	Medium
R4	Remove/ Shield Obstacles	Install Guardrail	All	25%	20	100%	High
R5	Remove/ Shield Obstacles	Install impact attenuators	All	25%	10	100%	High
R6	Remove/ Shield Obstacles	Flatten side slopes	All	30%	20	90%	Medium
R7	Remove/ Shield Obstacles	Flatten side slopes and remove guardrail	All	40%	20	90%	Medium
R8	Remove/ Shield Obstacles	Upgrade bridge railing	N/A	N/A	N/A	N/A	N/A
R9	Geometric Mod.	Install raised median	All	25%	20	90%	Medium
R10	Geometric Mod.	Install median (flush)	All	15%	20	90%	Medium
R11	Geometric Mod.	Install acceleration/ deceleration lanes	All	25%	20	90%	Low
R12	Geometric Mod.	Install climbing lane (where large difference between car and truck speed)	N/A	N/A	N/A	N/A	Low
R13	Geometric Mod.	Widen lane (initially less than 10 ft)	All	25%	20	90%	Medium
R14	Geometric Mod.	Add two-way left-turn lane (without reducing travel lanes)	All	30%	20	90%	Medium
R15	Geometric Mod.	Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes)	All	30%	20	90%	Medium
R16	Geometric Mod.	Widen shoulder (paved)	All	30%	20	90%	Medium
R17	Geometric Mod.	Widen shoulder (unpaved)	All	20%	20	90%	Medium
R18	Geometric Mod.	Pave existing shoulder	All	15%	20	90%	Medium
R19	Geometric Mod.	Improve horizontal alignment (flatten curves)	All	50%	20	90%	Low
R20	Geometric Mod.	Flatten crest vertical curve	All	25%	20	90%	Low
R21	Geometric Mod.	Improve horizontal and vertical alignments	All	60%	20	90%	Low
R22	Geometric Mod.	Improve curve superelevation	All	45%	20	90%	Medium
R23	Geometric Mod.	Convert from two-way to one-way traffic	All	35%	20	90%	Medium
R24	Geometric Mod.	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	High

Struck-through countermeasures are not eligible in the current HSIP call for projects.

Table 3. Countermeasures for Roadways (Continued)

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity?
R25	Geometric Mod.	Provide Tapered Edge for Pavement Edge Drop-off	N/A	N/A	N/A	N/A	N/A
R26	Operation/ Warning	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	All	15%	10	100%	Very High
R27	Operation/ Warning	Install chevron signs on horizontal curves	All	40%	10	100%	Very High
R28	Operation/ Warning	Install curve advance warning signs	All	25%	10	100%	Very High
R29	Operation/ Warning	Install curve advance warning signs (flashing beacon)	All	30%	10	100%	High
R30	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	10	100%	High
R31	Operation/ Warning	Install delineators, reflectors and/or object markers	All	15%	10	100%	Very High
R32	Operation/ Warning	Install edge-lines and centerlines	All	25%	10	100%	Very High
R33	Operation/ Warning	Install no-passing line	All	45%	10	100%	Very High
R34	Operation/ Warning	Install centerline rumble strips/stripes	All	20%	10	100%	High
R35	Operation/ Warning	Install edgeline rumble strips/stripes	All	15%	10	100%	High
R36	Ped and Bike	Install bike lanes	P & B	35%	20	90%	High
R37	Ped and Bike	Install sidewalk/pathway (to avoid walking along roadway)	P & B	80%	20	90%	Medium
R38	Ped & Bike	Install pedestrian crossing (with enhanced safety features)	P & B	30%	10	90%	Medium
R39	Ped and Bike	Install raised pedestrian crossing	P & B	35%	10	90%	Medium
R40	Animal	Install animal fencing	Animal	80%	20	90%	Medium
R41	Truck	Install truck escape ramp	N/A	N/A	N/A	N/A	N/A
R42	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low

Struck-through countermeasures are not eligible in the current HSIP call for projects.