STATE OF CALIFORNIA• DEPARTMENT OF TRANSPORTATION

# POLICY DIRECTIVE

TR-0011 (REV 9/2006)

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| **TRAFFIC OPERATIONS POLICY DIRECTIVE** | **13-02** | **1 of 10** |
| DENNIS T. AGAR, Chief<br>Division of Traffic Operations | DATE ISSUED:<br>**August 23, 2013** | EFFECTIVE DATE:<br>**August 30, 2013** |

SUBJECT:

**Intersection Control Evaluation (ICE)**

DISTRIBUTION

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- ☒ All Deputy District Directors - Traffic Operations
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  www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_mutcd.htm
- ☐ Headquarters Division Chiefs for:

| | |
|---|---|
| DOES THIS DIRECTIVE AFFECT OR SUPERSEDE ANOTHER DOCUMENT? ☒YES ☐NO | IF YES, DESCRIBE: **Design Information Bulletin 80-01 and California MUTCD** |
| WILL THIS DIRECTIVE BE INCORPORATED IN THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES ☒YES ☐NO | IF YES, DESCRIBE: **After formal evaluation (within 3 years)** |

## DIRECTIVE

This directive updates the evaluation procedures used to:

- Justify the installation of traffic signal systems, yield-control (roundabouts), and multi-way stop control at state highway intersections and interchanges.
- Identify effective intersection traffic control strategies and alternative treatments, strategies and configurations for particular conditions.
- Estimate the relative effectiveness, impacts and utility of specific control strategies.

The engineer must evaluate impacts to all intersection traffic. In order to identify the most effective and comprehensive access alternatives, the engineer must consider various strategies, treatments, configurations and countermeasures. The fundamental objective is to balance the needs of all modes and users with system performance goals and the highway facility context.

The need for, use of, and form of intersection traffic control shall be, as follows:

- Determined in consideration of the technical findings and recommendations generated by the evaluation procedures and engineering studies required or referenced by this directive.
- Determined in consideration of project development process input, and the technical advice provided through consultations with the District ICE Coordinator, District functional unit personnel, and ICE Technical Assistance Program (TAP) personnel. The RESOURCES section and Appendix B provide information on the roles of the District ICE Coordinator and ICE TAP.
- Approved or concurred in writing by the District Traffic Operations functional manager responsible for operating and managing the performance of specific State highway segments, corridors and intersections.

Appendix A illustrates the intersection traffic control evaluation (ICE) framework, process steps, activities and outcomes that will guide and support performance-based engineering and investment decisions. Appendix A also outlines the general sequence of evaluation activities and how they are integral to the broader transportation planning, project identification and project development processes.

## IMPLEMENTATION

**This directive shall be applied to access-related investment proposals initiated after the effective date, unless the sponsor of an ongoing project elects to apply some or all of the updated evaluation process to their project.**

The procedural and engineering study requirements, recommendations, guidance and references specified in this directive apply to all processes that identify or propose highway infrastructure investment proposals. These include, but are not limited to:

- Local community planning.
- Local development review.
- State highway corridor planning.
- The traffic investigation function.
- Project initiation processes.

This directive applies to:

- Encroachment permit proposals to construct new, or expand existing intersections.
- Project identification and initiation efforts proposing:
    a. New highway facilities.
    b. New intersections and interchanges on existing highways.
    c. Existing intersection and interchange capacity expansion.
    d. New or expanded access to mitigate traffic impacts generated by development.
- Traffic signal, multi-way stop control, and yield-controlled roundabout proposals.
- Expansion or modification proposals for existing signalized intersections, roundabouts and traffic circles.

## KEY PROCESS CHANGES AND REQUIREMENTS

1. Proposals to employ full control at state highway intersections (i.e. to control all approaching traffic via use of signal, stop or yield control) must consider all three intersection control strategies and the supporting design configurations during the ICE screening process.
2. Engineering recommendations must consider the safety performance characteristics of intersection control strategies, and safety performance analysis findings for specific proposals.
3. The districts are authorized to implement yield-controlled roundabouts and single point interchanges as specified herein.

## EVALUATION AND STUDY PROCEDURES

As illustrated in Appendix A, a two-step evaluation process supports the timely and efficient selection of intersection traffic control strategies and access configurations for particular intersections.

### STEP ONE: Access Strategy and Configuration Assessment/Screening

The objective of Step One evaluation activities is to identify access solution concepts meriting further consideration. This approach focuses the expenditure of engineering resources on access strategies and configurations that should meet the transportation purpose and need consistent with system performance goals, the project context (including the needs and values of local communities), and financial constraints.

The assessment effort should produce a concept-level understanding of the highway infrastructure work needed for each intersection control strategy meeting the aforementioned screening objectives. This normally requires a planning-level capacity analysis to identify the preliminary size or footprint of the intersection. The footprint is usually based on the number and length of the approach lanes for a specific control strategy during the project design period or service life. The preliminary footprint evaluation determines if specific strategies are context-appropriate and practical to implement.

The assessment effort should rely upon the following:

- Consultation with project sponsor to understand the purpose and need for an access-related investment proposal.
- List of Access Strategies and Configurations presented in the ICE Process Informational Guide.
- General or planning-level traffic analysis.
- Application of the screening criteria presented in the ICE Process Informational Guide.
- Technical knowledge of intersection traffic control performance characteristics and applications.
- Engineering judgment based on knowledge and experience gained from the operation of state highway intersections.
- Technical consultations with and recommended by the District ICE Coordinator.

The technical findings and recommendations generated by assessment/screening activities shall be documented as outlined in the ICE Process Informational Guide. Recommendations should also be incorporated into the appropriate engineering documents (e.g., plans and/or reports).

**STEP TWO: Engineering Analysis**

The evaluation of access alternatives continues during the appropriate project development process phase (e.g. Project Approval and Environmental Document).

Step Two evaluation activities include, but are not limited to:

- Intersection traffic control warrant studies (if required pursuant to the CA MUTCD, and not performed during Step One).
- Project alternative capacity, operational and safety analysis.
- Design performance checks focused on accommodating the design vehicle, pedestrians and bicyclists.
- Economic analysis based on project cost estimates, including life-cycle cost considerations.
- Consultations with and recommended by the District ICE Coordinator, functional unit personnel, and ICE Technical Assistance Program (TAP) personnel.

The result of Step Two activities is an engineering estimate and comparison of the system performance impacts, benefits, and costs expected over the design or service life of each control strategy and the No Build or Control scenario. Traffic analysis will produce performance impacts and benefits estimates related to:

- Intersection control delay and/or highway segment travel time.
- Collision frequency and severity.

Prior to completing Step 2, the District ICE Coordinator and/or designated functional unit and ICE TAP personnel shall be consulted to evaluate:

- Complex, non-standard, or non-conforming features to identify potentially significant performance impacts that cannot be avoided or mitigated.
- Preliminary plan alternatives to ensure that critical design features and traffic elements are included, and that performance analysis findings reflect omitted or non-conforming features.
- Step Two recommendations and findings to ensure that decision-makers are advised of potential risks, performance deficiencies, mitigation strategies, and improvement concepts needed beyond the service life of specific alternatives.

The technical findings and recommendations generated by Step Two evaluation activities shall be documented as recommended in the ICE Process Information Guide. Recommendations should be incorporated into the appropriate engineering documents (e.g. reports and preliminary plan drawings).

Preliminary and/or intermediate consultations are encouraged for complex, innovative or non-conforming proposals to minimize the potential for significant or unexpected findings just prior to completing a project development phase or milestone.

In some cases, a traffic sensitivity analysis may be required to estimate the service life of investment proposals that meet the project purpose and need, but do not require a 20-year design life. These include operational, safety and traffic impact mitigation proposals regardless of funding source. A service life estimate for each strategy is needed to facilitate life-cycle analyses to inform decision-makers of:

- Performance benefits.
- The ratio of benefits versus costs for the estimated service life.
- Costs associated with the safety and operational performance expected at and beyond the service life.
- The future improvement concept needed to extend the service life.

## DELEGATION

The authority to recommend the use of the single point interchange and yield-controlled roundabouts for particular intersections and interchanges is hereby delegated from the HQ Traffic Operations Liaison Engineers to the District Traffic Operations engineers responsible for the operation and performance of specific state highways and intersections. This transfer of authority is conditioned upon compliance with the engineering study, consultation and documentation requirements contained in and referenced by this directive.

The HQ Conceptual Approval process for roundabouts is hereby replaced by the procedural requirements of this directive. In particular, the assessment/screening process (ICE Step One) will identify access strategies and configurations that are both viable and practical to implement, subject to further technical studies.

For additional information on roles and responsibilities, see Appendix B and/or contact the HQ Traffic Liaisons or District ICE Coordinators.

## BACKGROUND

This directive establishes an integrated, systematic and performance-based approach to engineering and investment decisions affecting state highway intersections and interchanges, primarily through the consideration and evaluation of the following:

- Alternative intersection control practices, access configurations and management strategies.
- The context of the proposed project and highway facility, including the operating speed and speed differential among highway system users.
- The needs of drivers, pedestrians, bicyclists and commercial vehicle operators, including those with disabilities.
- The costs and cost savings related to project implementation, estimated system performance benefits and impacts, and life-cycle economic analysis.

All intersections and service interchanges are operated under some form of stop, signal or yield control.

Intersection investment decisions will be guided and supported by:

- Life-cycle cost analysis supporting highway infrastructure investment decisions (project development, capital, and maintenance and operations costs).
- Performance analysis tools capable of determining the viability and relative effectiveness of intersection traffic control and management strategies.
- Comparative analysis among viable intersection control strategies

Current traffic control policy requires warrant and engineering studies to justify the control of major through traffic movements at particular locations. The California Manual of Uniform Traffic Control Devices (CA MUTCD) emphasizes consideration of less restrictive measures or strategies before recommending the installation of a traffic signal system.

The decision to control or regulate the flow of through traffic movements:

- Requires initial and ongoing investments for the implementation, maintenance and operation of an intersection control device or system.
- Directly affects operational and safety performance in terms of changes to the level of intersection control delay, travel time, and collision frequency and severity.

Since multiple traffic control, management strategies and configurations may be appropriate for prevailing and/or expected traffic demands and operating conditions at particular locations, it is important to estimate the performance impacts and benefits for each strategy. These estimates should reflect the expected increase or reduction in control delay, travel time and collisions. These findings provide decision-makers with the expected return on investment or cost-effectiveness of each alternative strategy.

## RESOURCES

Links to technical publications and websites containing technical and informational guidance, training material, and contact information for District ICE Coordinators and the ICE Technical Assistance Program can be found at the Intersection Control Evaluation (ICE) TOPD website, at <http://onramp/hq/traffops/ICE.html>.

## DEFINITIONS:

When used in this Traffic Operations Policy Directive, the intent of the text is defined as follows:

1.) Procedural Requirement – a statement of required action. The text for all procedural requirements are indicated by the word "must" or "shall" and are enclosed within a box.

| Example of a procedural requirement. |
|---|

2.) Standard – a statement of required, mandatory, or specifically prohibited practice. All standards text appears in **bold** type. The verb **"shall"** is typically used. Standards are sometimes modified by Options.

3.) Guidance – a statement of recommended, but not mandatory practice or procedure in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements text appears in underline type. The verb "should" is typically used. Guidance statements are sometimes modified by Options.

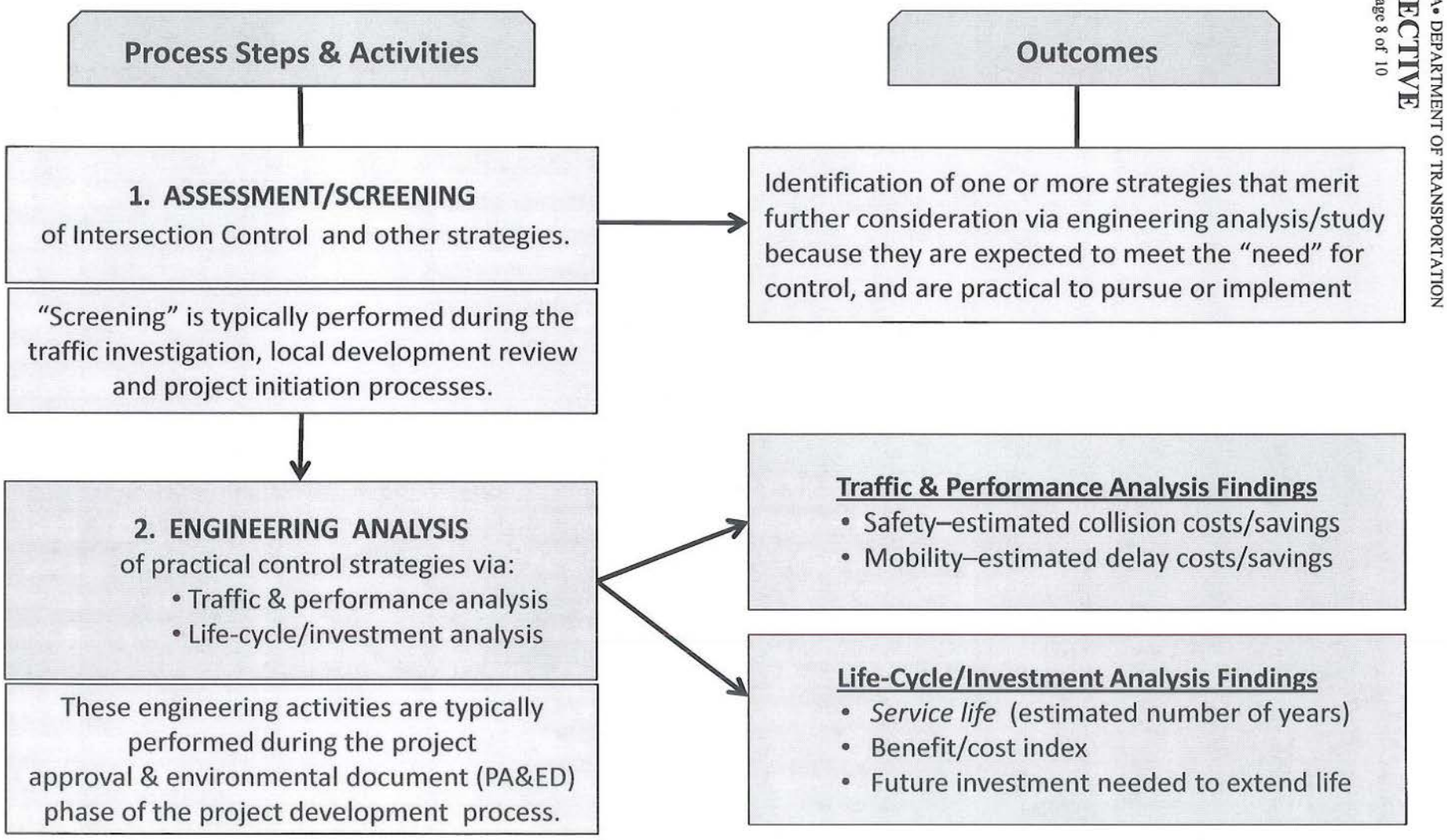
4.) Option – a statement of practice that is a permissive condition and carries no requirement or recommendation. Options may contain allowable modifications to a Standard or Guidance. All Option statements text appears in normal type. The verb "may" is typically used.

5.) Support – an informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements text appears in normal type. The verbs "shall," "should," and "may" are not used in Support statements.

## ATTACHMENTS:

Appendix A – Diagram of ICE Process Steps, Activities, and Outcomes
Appendix B – Roles and Responsibilities for Implementation of the ICE TOPD

# Appendix A: ICE Process Steps, Activities & Outcomes



## APPENDIX B –Responsibilities for Implementation of the ICE TOPD

In general, the Division of Traffic Operations is responsible for operating the State Highway System, including intersections and interchanges. Therefore, intersection control evaluation procedures and engineering study for particular locations must be performed, coordinated and/or reviewed under the direction of the appropriate District Traffic Operations functional manager. These are usually the engineering managers who are responsible for the traffic investigation function; and, the performance of signal and multi-way stop control warrant analysis, and other intersection-related traffic studies.

When triggered by, and performed during the project planning process (that is, project initiation and/or project approval), the completion of ICE process steps and activities should be coordinated by the responsible-charge project engineer or manager.

A summary of the findings and recommendations from ICE process steps should be prepared by, or reviewed and concurred by the appropriate Division of Traffic Operations engineer. Other documentation (including calculation worksheets) should be incorporated into the project's Traffic Analysis Report. See the ICE Process Informational Guide for a sample template and information on how to present the summary of technical findings and recommendations.

The consistent and efficient implementation of this directive will be facilitated by the following individuals, activities, and services, as follows:

1. Each district will designate a Traffic Operations functional manager or engineering specialist to serve as the single point-of-contact and general resource to District, HQ, and external personnel who are responsible for implementing and supporting ICE and related activities. These District ICE Coordinators will perform and/or ensure that the following roles and services are provided upon request:

    - Resources—individuals who provide general information, guidance, and referrals on procedural and engineering study requirements.

    - Internal Consultants—individuals capable of providing technical recommendations and/or referrals to the appropriate functional managers and ICE Technical Assistance Program specialists on specific proposals and requests; see below for additional information.

    - Liaisons with HQ on various implementation, training, and policy evaluation activities.

    The districts may designate various personnel to support and/or perform the above roles and services.

2. The HQ Divisions of Traffic Operations and Design will establish, maintain and manage an ICE TAP to perform the following services:

- Provide, collect, and transfer technical information, knowledge and expertise on intersection traffic control strategies and access configurations as well as the application of ICE process steps, activities, and analytical tools to location-specific investment proposals.

- Support the evaluation of complex, non-conforming and innovative proposals through consultation and/or peer review by appropriately qualified personnel from around the state and nation (in collaboration with the Federal Highway Administration Peer-to-Peer Program for Intersections and/or Resource Center specialists).

The TAP manager(s) will schedule monthly meetings with the District ICE Coordinators to identify, discuss, and pursue process adjustments and technical training to address implementation issues and challenges.