

2014

California Manual for Setting Speed Limits



Division of Traffic Operations
California Department of Transportation


Memorandum

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To: DISTRICT DIRECTORS
DEPUTY DISTRICT DIRECTORS
Maintenance, Operations and Construction

Date: May 9, 2014

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From: 
DENNIS T. AGAR, Chief
Division of Traffic Operations

Subject: CALIFORNIA MANUAL FOR SETTING SPEED LIMITS

The California Department of Transportation (Caltrans) is pleased to present the *2014 California Manual for Setting Speed Limits*. This unique manual provides clear, concise, and applicable guidance on setting and posting proper speed limits on California roadways. This comprehensive guide will improve the uniformity of speed limits throughout California and enhance the safety of all California highway users: drivers, bicyclists, workers, and pedestrians alike.

This manual focuses on the details of the speed limit setting procedure, and explains how to apply applicable sections of the California Vehicle Code, and finally, how and when to perform an Engineering and Traffic Survey. This manual will help both law enforcement and public officials understand both theory and applicable laws involved in setting California speed limits. The California Manual for Setting Speed Limits is also model for other states.

I gratefully acknowledge all Caltrans staff, project partners and consultants that participated in developing the *2014 California Manual for Setting Speed Limits*. For more information, contact Devinder Singh at (916) 654-4715, or by email at <devinder.singh@dot.ca.gov>.

Attachment

- (1) 2014 California Manual for Setting Speed Limits

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Disclaimer

This manual (Manual) does not constitute a standard, specification, or regulation. This Manual is not intended to replace the existing Caltrans mandatory or advisory standards and is not intended to be a substitute for engineering knowledge, experience or judgment. This Manual promotes better access to helpful information and concepts from various agencies and organizations. Caltrans acknowledges the existence of other practices and provides this Manual for reference and direction for those responsible for making professional engineering or other design decisions.

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Chapter 1 INTRODUCTION

1.1 Overview

1.1.1 Purpose of this Manual

The specific purpose of this manual is to set forth a uniform procedure for setting speed limits in California. This manual provides information on applying various sections of the California Vehicle Code (CVC), determining the need for an Engineering and Traffic Survey (E&TS), describes the elements and data needed for the E&TS, determining the appropriate speed limit for any California street or highway, and includes procedures for documenting the final outcome with the court system and law enforcement agencies.

1.1.2 Users of this Manual

This manual is intended for use by public agencies or their consultants for setting speed limits that are not determined by statute or legislation. Law enforcement personnel, court officials, and the public may use the manual to understand both theory and applicable laws involved in setting California speed limits. Users will also find references and codes that apply to statutory speed limits.

1.1.3 Responsibilities

The California State Legislature sets in place the regulations for California speed limits and the CVC places these regulations into language used primarily for enforcement purposes.

The need for an E&TS and its definition are located in the CVC Sections 627 and 40802; CVC Section 627 empowers Caltrans to establish procedures for an E&TS. Various jurisdictions have responsibility for roadways throughout California, including the responsibility to set speed limits on these roadways according to the standards and procedures established by Caltrans. Those procedures are described in detail in this manual.

1.2 General Concepts

The setting of speed limits requires a rational and defensible procedure to maintain the confidence of the public and legal systems. By following a uniform procedure, agencies can establish speed limits that are uniform throughout the state and avoid influence from political pressure or emotional perceptions.

CVC Section 22349 sets a maximum speed limit for all California roadways, which is 55 mph on two lane undivided roadways and 65 mph on all other roadways. Any deviation of speed limits upward or downward from these limits must be justified by an E&TS. An undivided highway is one which has not been divided into two or more roadways by means of intermittent barriers or by means of a dividing section of not less than two feet in width, either unpaved or delineated by curbs, double-parallel lines, or other markings on the roadway.

Speed limit determinations rely on the premise that a reasonable speed limit is one that conforms to the actual behavior of the majority of drivers; one will be able to select a speed limit that is both reasonable and effective by measuring drivers' speeds. Speed limits set by E&TS are normally set near the 85th percentile speed. The 85th percentile speed is the speed at or below which 85 percent of the traffic is moving, and statistically represents one standard deviation above the average speed.

Studies of the effects of establishing, raising and lowering speed limits include federal studies FHWA-RD-92-084 and FHWA-RD-98-154 (summaries can be found in Appendix D.1 and the full reports can be found at the FHWA web site). These studies demonstrate that the most effective attribute in establishing the speed limit is to determine the 85th percentile speed and set the posted speed close to that value. The empirical data in these studies demonstrates that setting the speed limit too high or too low can increase collisions. Speed limits that are set near the 85th percentile speed of free flowing traffic are safer and produce less variance in vehicle speeds. Because of this, the 85th percentile is used to establish the upper limit of operating speeds that are considered reasonable and prudent.

In addition, setting the speed limit arbitrarily low often makes violators of a disproportionate number of drivers, does not facilitate the orderly movement of traffic, and requires constant enforcement to maintain compliance.

Regardless of the posted speed limit, the majority of drivers will continue to drive at speeds at which they feel comfortable. The question then arises, “Why do we even need to post speed limit signs?” In part, posting speed limit signs:

- Provides feedback to the driver, letting them know if they are in the majority of drivers who consider their speed safe and reasonable.
- Allows for fair enforcement for those drivers who are going exceedingly faster or slower than the speed the majority of drivers consider safe and reasonable.
- Determines many other design criteria such as clear recovery zone distance, yellow light timing, taper lengths for any type of lane closure or construction, set-back-detectors, size of signs, and other roadway features.

1.2.1 Basic Speed Law

The basic speed law is found in CVC Section 22350. It reads: “No person shall drive a vehicle upon a highway at a speed greater than is reasonable or prudent having due regard for weather, visibility, the traffic on, and the surface and width of, the highway, and in no event at a speed which endangers the safety of persons or property.” In other words, a driver violates the basic speed law if he or she is driving at unsafe speeds, even if that speed is lower than the posted regulatory speed limit sign.

1.2.2 Prima Facie Speed Limits by Statute

CVC Section 22352 sets the prima facie speed limits in California. The term “prima facie”, as used in the CVC, is a speed limit that applies when no other specific speed limit is posted. It is a Latin term meaning “at first face” or “at first appearance”. It sets two speed limits covering six classes of location. The first speed limit is 15 mph; and it is applicable to uncontrolled railway crossings; blind, uncontrolled intersections; and alleyways. The second speed limit is 25 mph; and it is applicable to business and residential areas without other posted speed limits; school zones, and areas immediately around senior centers.

1.2.3 Speed Limits Requiring an Engineering and Traffic Survey

When an engineering and traffic survey (E&TS) shows that the statutory or prima facie speed limits are not applicable for the existing conditions, the speed limits can be altered with the posting of a different speed limit, which must be determined according to the findings of the E&TS. Section 22356 of the CVC addresses increasing freeway speeds to 70 mph. CVC Section 22354 covers decreasing highway speeds from 65 mph and CVC Section 22358 addresses decreasing local speed limits. The CVC does not address decreasing the speed limit below 55 mph on undivided highways; however, the CA MUTCD states that speed zones (other than statutory speed limits) shall only be established on the basis of an E&TS that has been performed in accordance with traffic engineering practices. Even though it is not codified in the CVC, Caltrans has established the practice of using an E&TS for any reduction below a statutory 55 mph speed limit. Law enforcement agencies and courts are accustomed to seeing surveys for these areas and it may be difficult to defend a speed violation citation without one.

1.2.4 Authority to Set Speed Limits

Caltrans has authority to set speed limits on the State Highway System. Roadways outside of the state highway system fall under the responsibility of the respective city or county. Some roadways may fall under the jurisdiction of National Parks, tribal governments, or private properties. Although not mandated, the CA MUTCD should be followed by these jurisdictions as well.

1.2.5 Speed Traps

The CVC prohibits the use of speed traps (Section 40801) as well as the use of any evidence obtained by use of a speed trap (Section 40803) for the purpose of prosecution.

A speed trap as defined in CVC Section 40802 is either:

- A section of highway marked so that an officer can calculate speed based on the time it takes a vehicle to travel the marked distance.
- The use of radar or other electronic devices that measure the speed of a moving object on a section of highway which does not have a current E&TS as required under CVC.

1.3 Factors Affecting Driver Speeds

Many factors influence drivers and their perception of the safe speed at which to operate a vehicle. These factors should be considered as a whole because it is not practical to consider each individually.

1.3.1 Design and Physical Characteristics of the Roadway

The design and physical characteristics of the roadway place limitations on the safe operating speed of vehicles. These characteristics include:

- Roadway geometrics, shoulder condition, grade, alignment, and sight distance.
- Roadside development, zoning, and environment.
- Parking practices and pedestrian activity.
- Driveway density.
- Intersections.
- Rural, residential or developed areas.

Horizontal and vertical alignment may restrict operating speeds for a short highway segment. In such circumstances, an advisory speed may be posted to inform drivers of a recommended operating speed. A recommended speed for a horizontal curve can be measured and checked by the use of a ball bank indicator or digital inclinometer (see CA MUTCD, Chapter 2C). If needed, an advisory speed sign may be posted in advance of a curve. See the *Highway Design Manual (HDM)* or *American Association of State Highway and Transportation Officials Policy on Geometric Design of Highways and Streets* for recommended geometric criteria for specific design speeds.

The effects of lane width, condition of roadway surface, type and width of shoulders, frequency of intersections, and roadside development on speed are not so easily measured. As a general rule, the appropriate speeds for these factors are measured by spot speed surveys of vehicles using the roadway.

1.3.2 The Vehicle

The mechanical condition of vehicles and their characteristics for accelerating, decelerating, stopping, and turning affect operating speeds under various conditions. The body roll angle of different vehicles also affects the operating speed on curves. Braking capabilities of various vehicles, such as passenger cars, buses, and various truck-trailer combinations, are different enough that it would generally not be practical to post recommended speeds for each group based on their operating characteristics.

The general practice is to post speeds representing the majority of vehicles using the highway and posting a lower speed limit for vehicles that are heavier and may require more time to stop for emergency situations (for example, semi trucks and vehicles towing trailers).

1.3.3 The Driver

The ability of drivers varies from the inexperienced to the professional driver. It would not be wise to post safe speeds for drivers at either of the two extremes of abilities, so the selection of speeds to be posted is aimed at the ability and performance of all drivers as measured by spot speed surveys.

Calculations to determine critical approach speeds toward traffic control signals, crosswalks, and locations with limited sight distance use an average driver's perception-reaction time.

1.3.4 Traffic

The presence of other vehicles on the highway, including those that may be entering, crossing, making turns, or on-street parking, can affect speeds.

Posted speed limits should be based on off-peak hour traffic under free-flow conditions on an average weekday for the purpose of the procedures outlined herein. During congested times, drivers will adjust their speeds in accordance with the basic speed law, and are operating their vehicles at slower speeds, compared to free-flow conditions.

Lowering the posted speed limit during congested periods places unnecessary limitations on vehicles during uncongested times. According to Missouri Department of Transportation study RI08-025, variable speed limits based on time of day are confusing to the driver and are difficult to enforce (See Appendix Section D.1).

1.3.5 Weather and Visibility

Posted speed limits are applicable under good weather conditions and dry pavement. CVC Sections 22350 and 22363 allow temporary posting of lower speed limits for snow or ice conditions on a highway.

Except in cases where the posted speed limit is the statewide maximum legal limit, speeds are posted on the basis of daylight speed values determined under good weather conditions. On highways that fall under their respective jurisdiction, Caltrans and local authorities may determine and declare a prima facie speed limit of 40, 35, 30, or 25 miles per hour, whichever is found most appropriate and is reasonable and safe based on the prevailing snow or ice conditions upon such highway or any portion thereof.

1.3.6 Other Roadway Users

The frequency of pedestrians is likewise an important factor, particularly at intersections with limited sight distance and in areas with crosswalks with no intersection traffic controls.

The presence of bicycle traffic and the width of available shoulder or designated bicycle lanes is also an important factor. In areas with high bicycle and pedestrian use, drivers should adjust their speeds to anticipate both expected and unexpected movements into moving traffic. These speeds should be reflected in the measured speeds during a spot speed survey.

1.3.7 Vehicle Operating Speeds

Drivers adjust their vehicle speed to the readily apparent conditions present on any particular roadway. The spot speed survey measures prevailing speeds and is a way to determine how drivers are reacting to roadway conditions readily apparent to them.

Chapter 2 REGULATORY AND ADVISORY SPEEDS

2.1 Overview

When an E&TS indicates the statutory or prima facie speed limits are not applicable for the existing conditions, the maximum speed limits should be adjusted according to the E&TS findings. Any changes to the statutory or prima facie speed limits will result in a speed zone posted with signs showing the speed that applies in that zone.

The types of speed zones are as follows:

- Regulatory
- Advisory
- Temporary Traffic Control Advisory and Regulatory Speeds (Construction Zones)
- School
- Truck
- Private Facilities
- Special Weather Conditions
- Variable

Each type of zone is discussed in this chapter.

2.2 Regulatory Speed Zones Established by an Engineering and Traffic Survey

2.2.1 Regulatory Speeds

Regulatory speed zones established by E&TS should be applied to locations and sections of highways where the statutory or prima facie speed limits are not appropriate for local conditions.

Roadway safety is the primary consideration in establishing speed limits. Although not an exhaustive list, the following factors affecting roadway safety should be evaluated when establishing regulatory speeds:

- Advisory Speeds
- Hidden driveways and other roadside developments
- High driveway density
- Collision history within the zone
- Shoulder width and condition

Signs for regulatory speed zones shall be from the R2-1 series shown in the CA MUTCD and shall be of the appropriate size, text, and color.

Figure 2-1: Speed Limit Sign



R2-1

Appendices A-7 and A-8 illustrate the typical location and frequency of signs for regulatory speed zones. Distances shown between speed limit signs are examples and may differ, based on local conditions. Posted regulatory speed limits are based on the 85th percentile speed, as described in Section 3.2.6.

2.2.2 Highway Approaches to Incorporated Municipalities

Speed zoning on highway approaches to municipalities is applied near cities and towns where built-up businesses and residence areas require speeds below the statutory speed limit for safe operation. Stepping down from the maximum speed limit should be supported by the changes in driver behavior as reflected by the measured 85th percentile speed determined by a spot speed survey. Stepping down from highway speed to a reduced speed limit can be done in 5 to 10 mph increments as discussed in Section 3.4.

Figure 2-2: Reduced Speed Ahead Advisory Signs



W3-5



W3-5a

2.2.3 Minimum Speeds

CVC Section 22400 states that no person shall drive upon a highway at such a slow speed as to impede or block the normal and reasonable movement of traffic unless the reduced speed is necessary for safe vehicle operation, because of a grade, or in compliance with law. It also states that no person shall bring a vehicle to a complete stop upon a highway so as to impede or block the normal and reasonable movement of traffic unless the stop is necessary for safe operation or in compliance with law.

Signs used for a minimum speed limit may be placed when slow speeds on any part of a state highway consistently impede the normal and reasonable movement of traffic as determined by an E&TS. The use of minimum speed limits is not commonly practiced in California.

2.2.4 Signs within Cities and Towns

Caltrans may erect and maintain reduced speed limit signs on state highways within the incorporated limits of cities and towns based on the results of an E&TS.

2.2.5 Advisory Speeds

Advisory speeds are recommended speeds for curves, intersections, or other locations where physical conditions of the roadway restrict operating speeds to less than the maximum legal speed or posted speed limit. The figure below illustrates warning signs with advisory speeds.

Figure 2-3: Advisory Signs



2.2.6 Regulatory Versus Advisory Speeds

Advisory speeds are determined primarily by the physical and design characteristics of the roadway. They advise the driver of a roadway condition more comfortably traversed at a speed lower than the posted speed limit. They are posted slightly in advance of the pertinent roadway condition and are only relevant to that condition.

Regulatory speeds, although influenced by physical and design factors, are primarily determined by existing free flow traffic speeds and maximum speed limit laws.

From an enforcement standpoint, when a regulatory speed zone is established and signs are posted, the speed values shown on the signs are the maximum lawful speed.

An advisory speed sign advises drivers of speeds recommended for certain roadway conditions, such as horizontal curves. A driver may be cited for exceeding the posted advisory speed if they encounter, or create, a problem when exceeding the advisory speed. The basic speed law may have been violated and a citation could be the result of ignoring the posted advisory speed. However, a driver may not be cited solely for exceeding the posted value of an advisory speed sign.

2.2.7 Advisory Speeds in Regulatory Speed Zones

Advisory speeds may be posted within regulatory speed zones to notify drivers of a recommended operating speed to negotiate existing roadway features. Refer to CA MUTCD Chapter 2C -- WARNING SIGNS AND OBJECT MARKERS for applications using advisory speeds.

If an advisory speed is located within a regulatory speed zone, it is not necessary to lower the regulatory speed to conform to the advisory speed. When posting signs for the regulatory speed zone, avoid placing the regulatory speed limit signs too close to the advisory speed limit sign to avoid driver confusion. Regulatory speed signs should not be placed between an advisory speed sign and the location where the advisory speed applies.

An advisory speed within a regulatory speed zone should not be posted for a value higher than the posted speed of the regulatory speed zone. If drivers are regularly driving faster than the regulatory speed, it may be necessary to use an advisory speed that is the same value as the regulatory speed and an E&TS may be necessary to evaluate the regulatory speed zone.

2.3 Temporary Traffic Control Advisory and Regulatory Speeds

Temporary Traffic Control (TTC) speed zones are temporary speed zones used in TTC zones while construction, utility work, traffic incident management or highway maintenance operations are underway. TTC zones can be regulatory or advisory. Refer to CA MUTCD Part 6 for temporary traffic control elements for use during highway construction or work zones.

TTC zones should be designed to allow traffic to travel at existing prevailing speeds. Reduced speed limits should be used only in the specific portion of a TTC zone where conditions or restrictive features so justify. Frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can reasonably safely travel through the TTC zone with a speed limit reduction of no more than 10 mph.

A reduction of more than 10 mph in the speed limit may be justified when personnel and/or equipment are not separated from vehicle traffic by a concrete barrier, or when required by restrictive features in the TTC zone. Where separations of personnel or restrictive features justify a speed reduction of more than 10 mph, additional driver notification should be provided.

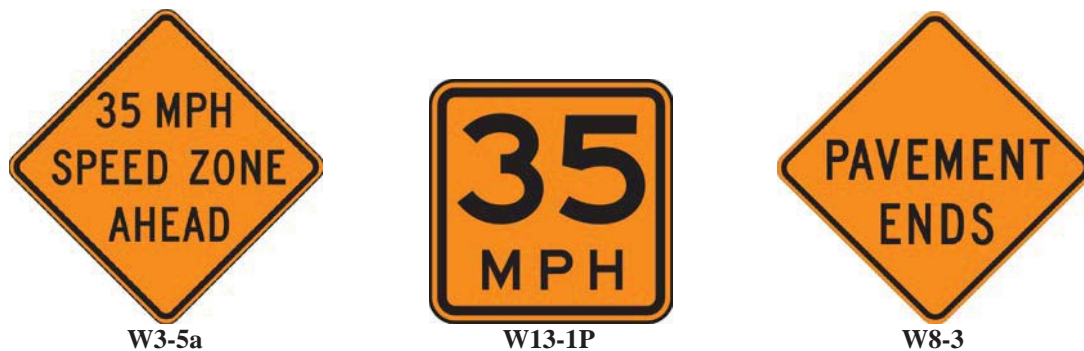
The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC advance warning devices should be used, such as changeable message signs and advisory radio broadcasting. Advance notification or messages need to be clear. Avoid “REDUCED SPEED AHEAD” or “SLOW DOWN” messages without additional information, such as the value of the speed limit or the reason for the slowing of traffic. CA MUTCD Section 2B.13 contains information regarding the design of portable changeable message signs that are used to display speed limits that change based on operational conditions, or are used to display the drivers’ approaching speed.

2.3.1 Advisory Temporary Traffic Control Speeds

Advisory speed plates (W13-1P) in conjunction with warning signs are preferable to regulatory speed signs. The advisory speed can be altered as needed by conditions, and several different advisory speeds can be used for varying conditions throughout the project. The advisory speed plates are intended to supplement warning signs to decrease speed at a particular location.

To preserve its effectiveness, the W13-1P should not be used unless an immediate condition exists applicable to all motorists. At no time should the W13-1P be used by itself as a general application of a slower speed limit in any part of a TTC zone. A reduced speed limit ahead sign, W3-5a, should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph or where engineering judgment indicates the need for advance notice to comply with the posted speed limit.

Figure 2-4: Temporary Traffic Control Advisory Signs



2.3.2 Regulatory Temporary Traffic Control Speeds

Regulatory temporary traffic control speed zones are established within TTC areas where a reduced speed is necessary. The use of regulatory speed zone signing tends to be more effective when law enforcement is present.

CVC Section 21367 gives the agency that has jurisdiction over a highway the authority to regulate the speed of traffic whenever the traffic would endanger the safety of workers or the work would interfere with or endanger the movement of traffic through the area, through warning signs, lights, appropriate control devices, or by a person or persons; CVC Section 22362 states that it is a violation of the basic speed law to exceed such regulations.

The need for a reduced speed limit within a construction TTC zone should be a decision made during the project development process. The details of sign placement, hours of operation, and the recommended posted speed should be included in the Transportation Management Plan (TMP) and traffic handling plans for the project. The need to reduce a construction zone speed limit must be documented in writing and approved by the District Traffic Operations Engineer and put in place as described below. The documented approval takes the place of an E&TS and speed zone orders normally issued for regulatory speed zones.

The need for a reduced speed limit within a maintenance TTC zone should be determined in advance of planned maintenance activities. Regulatory signs lowering the speed limit by up to 10 mph may be placed in work zones not protected by a positive barrier and involve workers on foot or on equipment. Signs shall be placed at a height and in a location so that motorists can clearly see the reduced speed limit. See CA MUTCD for sign location, mounting height, and lateral offset requirements. The need to reduce a maintenance work zone speed limit must be documented in writing, approved by the District Traffic Operations Engineer, and put in place as described below.

TTC zone speed limits should be reduced in stages if a reduction of 15 mph or more is required. When the overall reduction is 15 mph or more, the first stage of the sequence should be a reduction of 10 mph, the final stage reduction should be 10 mph or 5 mph, as necessary. Speed limit signs should be placed at frequent intervals to remind drivers of the temporary change from the regular posted speed limit.

For example, if the project falls within an established 55 mph zone, and a 40 mph speed limit is necessary, it may be posted only if the approaching speed limits are lowered in two stages (first to a 45 mph speed limit, and then a 40 mph speed limit).

The lowest value allowed for a reduced work zone speed limit is 25 mph. Refer to CVC Section 22362.

When lowering speed limits on freeways that normally have a 65 or 70 mph regulatory speed limit, consider the amount of truck traffic and number of lanes available for use. If only one lane is available, 55 mph may be the appropriate speed limit to reduce the variance in speeds between trucks and other vehicles.

Speed Limit and End Zone signs should be installed at locations jointly agreed upon by the traffic engineering staff and field personnel. Speed restriction signs shall be posted only in areas and at times when the traveling public is affected by operations. As the work progresses, signs shall be covered or moved as appropriate.

Signs shall be used only during working hours and removed or covered during non-working hours, unless the movement of traffic through the TTC zone is affected during non-working hours. If obstructions such as lane shifts or concrete barriers adjacent to traveled way are present throughout the project duration, the signs would not need to be covered or removed. This also applies in situations where the work changes the highway configuration, curvature or elevation, making it necessary to post a reduced speed limit.

Signs shall be removed immediately following completion of the work or change in conditions for which they were installed. When the work is completed or the construction speed restriction is no longer necessary, the TTC speed zone orders shall be revoked.

Additional law enforcement personnel can be used in the area of the reduced work zone speed limit to help improve driver compliance. To enhance a sign's conspicuity, a flashing beacon can be added to a speed limit sign. See CA MUTCD Section 4L for guidance.

Figure 2-5: Temporary Traffic Control Regulatory Signs



2.3.3 Request for Construction Regulatory Temporary Traffic Control Speed Zones

When a project engineer or resident engineer desires construction speed zoning for projects or portions of a project, the project or resident engineer should submit a “Request for Temporary Traffic Control Speed Zone” memo with the plans, specifications, and estimates (PS& E) to the Traffic Operations Division (District Traffic Branch Chief or County or City equivalent) for review and processing. A sample PS&E memo is provided in Appendix Section B.1.

The justification for the reduced speed limit shall be documented in writing, and does not require a detailed E&TS with spot speed surveys. TTC speed limits do not fall under the definition of the Speed Trap and can be enforced with radar or lidar (light radar) without a formal E&TS. Orders for TTC speed zones are ordinarily issued for the entire length of the project. This avoids the necessity and resulting delay of obtaining a new order each time the speed restriction signs require relocation to fit the conditions. However, it is not the intention that the entire project length be posted for the duration of the contract.

The District Traffic Branch Chief shall respond, via memo, to the request for the TTC speed zone. This memo will be placed in the project history file as justification for a reduced regulatory speed for the TTC zone.

2.3.4 Request for Maintenance Regulatory Temporary Traffic Control Speed Zones

When a maintenance region manager, superintendent or supervisor desires work zone speed limit reduction of more than 10 mph, the maintenance manager, superintendent or supervisor should submit a “Request for Temporary Traffic Control Speed Zone” memo with the work plans or description to the Traffic Operations Division (District Traffic Branch Chief or County or City equivalent) for review and processing. The request will be approved and documented in the same manner as described for a construction speed limit reduction. A reduction of 10 mph or more must be approved on a case by case basis by the Maintenance Area Superintendent.

2.3.5 Part time Speed Reductions

If the reduced speed limits are not necessary for the safe movement of traffic during certain operations or days and hours when the work is not in progress, the regulatory TTC speed limit signs must be made inoperative by one of the following methods:

- Moving the signs to the edge of the right-of-way, facing them away from the roadway.
- Covering the signs when the reduced speed limits are not necessary.

Leaving speed limit signs in place when not needed has adverse effects; for example:

- Drivers ignore the signs, making a disproportionate number of drivers violators of the law
- Respect for all speed limit signs is lessened
- The law abiding driver becomes a traffic hazard by observing the reduced speed

2.3.6 Signs Installed by the Contractor

Even though a contractor may furnish and/or install speed limit signs on a construction project, the resident engineer must ensure the contractor does not erect signs of their own design and/or speed limits of their choosing. Except under the immediate direction of the resident engineer, the contractor has no authority over the design or location of speed limit signs. The resident engineer should consult District Traffic Operations if any questions arise.

2.4 School Speed Zones

CVC Section 22352 establishes the prima facie speed limit at 25 mph in a school zone when children are present. 25 mph speed limits should be used for school zones when approaching or passing a school building or the grounds thereof, contiguous to a highway, and posted with a standard "SCHOOL" warning sign. Reduced speed limits for school zones are in effect when children are present. “When Children Are Present” is defined in CVC Section 22352 as “while children are going to or leaving the school, during school hours or during the noon recess period.” The prima facie limit shall also apply when approaching or passing any school grounds which are not separated from the highway by a fence, gate, or other physical barrier while the grounds are in use by children and the highway is posted with a standard "SCHOOL" warning sign.

Pedestrian crossing activity is the primary basis for reduced school speed zones. However, irregular traffic and other pedestrian movements when children are being dropped off and picked up from school must be considered.

2.4.1 Planning for School Areas

Agencies should make certain that all applicable traffic control devices are utilized to prevent conflicts in school areas. Maintaining contact with school officials can help agencies become aware of proposed building programs or other issues at an early stage so that solutions will be more promptly implemented. When proposed building plans are known, it may be possible to offer suggestions on access points that will prevent future conflicts. Also the installation of needed safety and traffic control devices can be scheduled to be in place when needed.

An E&TS should be conducted to determine the location of the reduced school speed limit and to determine which streets will be affected. Spot speed surveys are not necessary to reduce the speed limit near schools. The location and types of other traffic control devices need to be determined as well.

2.4.2 School Zones under Local Authority

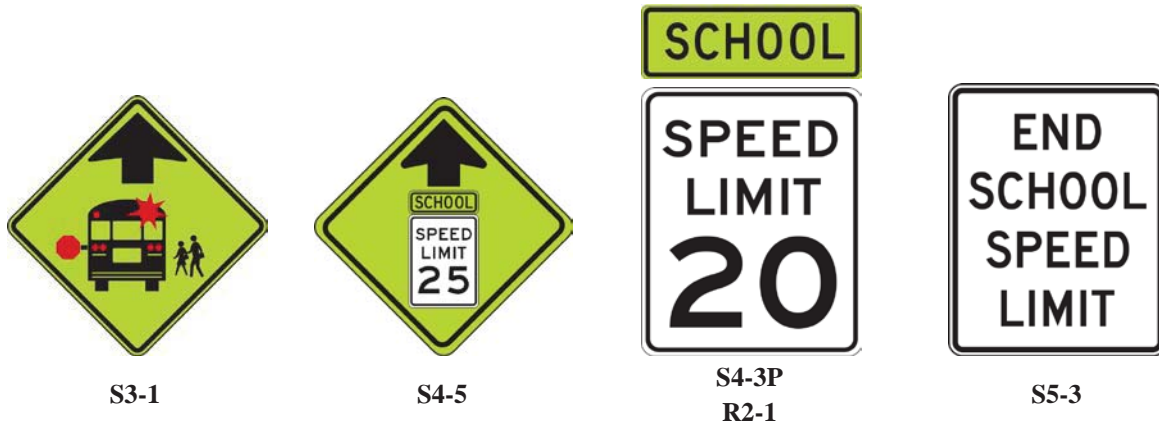
A local authority may determine upon the basis of an E&TS that the prima facie speed limit of 25 miles per hour established by CVC Section 22352 is not reasonable or safe. The local authority may, by ordinance or resolution, determine and declare a prima facie speed limit of 20 or 15 miles per hour, as justified by the survey.

Such ordinance or resolution shall not be effective until the erection of appropriate signs giving notice of the speed limit upon the highway and, in the case of a state highway, until the ordinance is approved by Caltrans and the installation of appropriate signs. School zone speed limits of 20 or 15 mph may only be enacted under conditions specified in CVC Section 22358.4 and may only be applied when there is a maximum of one lane in each direction and the prima facie speed limit is 30 mph or less immediately before and after the school zone.

2.4.3 Signs for School Areas

See CA MUTCD Part 7, Traffic Controls for School Areas for a complete discussion of school area traffic control and CA MUTCD Part 4 for Flashing Beacons in School Areas. CA MUTCD figures 7B-5(CA), 7B-102(CA), 7B-103(CA), and 7B-104(CA) show examples of how speed limit signs for school zones are set.

Figure 2-6: Signs for School Areas



2.4.4 Intervals of Operation

Generally, the speed limit indicated on the school sign assembly is in effect only while children are going to or leaving the school either during school hours or during the noon recess period. The intervals of operation of any flashing beacons on the school zone speed limit assembly may be extended or revised for school events as mutually agreed upon by the school district and the entity responsible for the flashing beacons' operation. In this case, the flashing beacons should only be operated when there is an increase in vehicular activity and pedestrian traffic in and around the roadway associated with the school event.

The “WHEN FLASHING” and specific time period messages shall not be used in school areas in California, as they are not supported by CVC 22352. Hence, the Specific Time Period Plaque (S4-1P), “WHEN FLASHING” (S4-4P) and “SCHOOL SPEED LIMIT 20 WHEN FLASHING” (S5-1) signs shall not be used in California.

The “WHEN FLASHING” and specific time period messages are misleading because they suggest that the speed limit is applicable only when the flashing beacons are in operation or during the specified time period. The prima facie speed limit of 25 mph is in effect based on the presence of children per CVC 22352, not on the flashing beacons' operation or during a specific time period.

The non-use of “WHEN FLASHING” message also addresses the situation when children are present but the flashing beacons are inoperative for any reason. The absence of “WHEN FLASHING” message does not alter the warrants, use, or effectiveness of a flashing yellow beacon.

2.5 Reduced Truck Speed Limit on Descending Grades

Highways with lengthy descending grades with a recorded history or complaints of runaway larger vehicles may be a candidate location for posting truck speed limit signs for trucks travelling downhill. Avoid posting signs on descending grades of less than 1 mile since the deceleration of vehicles due to braking action generally provides sufficient control on these short descending grades. A truck is defined in CVC Section 22406 (a) as a motortruck or truck tractor having three or more axles or any motortruck or truck tractor drawing any other vehicle. Vehicles which meet this description and have a manufacturer's gross vehicle weight rating of 10,000 pounds or more are subject to a truck speed limit.

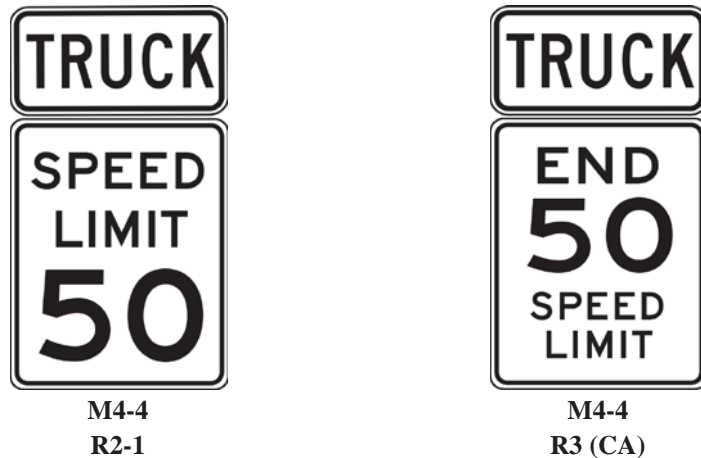
To establish a downhill truck speed limit, a strip map is needed to show the length and gradient of the highway's vertical alignment. Speed data of vehicles with three axles or more, collected on the downgrade, is used to establish the 85th percentile for truck speeds.

Speed data for truck speed limits should be presented on the same form used for other speed surveys. An analysis of reported collisions involving trucks using these descending grade road sections is needed. Determine the 85th percentile speed and the 10 mph pace. The 10 mph pace is the 10 mph increment of speed containing the largest number of vehicles. The truck speed limit should be set at the nearest 5 mph increment to the 85th percentile, to indicate a reasonable speed at which trucks should travel down the grade. The CVC does not address zoning for truck speed on downgrades. Downgrade zoning for trucks does not fall under the speed trap section of the CVC Section 40802 when set by E&TS.

The agency responsible for the highway shall issue a standard speed zone order that documents the need and location of the lower truck speed limit. Posting of the regulation will be by placement of a standard Speed Limit (R2-1) sign with a TRUCK (M4-4) plate. Truck speed zones should be evaluated every ten years, but this is not a requirement for using radar for speed enforcement.

A standard End Speed Limit (R3 (CA)) sign with TRUCK (M4-4) plate shall be posted at the end of the truck speed zone where appropriate.

Figure 2-7: Truck Plaque with Speed Limit Signs



2.6 Private Roads

The CA MUTCD standard and Caltrans standards and specifications for traffic control devices shall not be applicable to privately owned and maintained roads or commercial establishments, unless the particular city or county enacts an ordinance or resolution to this effect. Refer to CVC Sections 21100, 21100.1, 21107, 21107.5, 21107.6, and 21107.7.

Private roads are roads separated from access by the general public by physical barriers and do not have to meet the speed zone criteria of this manual.

Indian Reservation Roads are public roads that provide access to, from and within Indian reservations, Indian trust land, and restricted Indian land. Tribal governments have control over these roads and have authority to set and enforce speed limits on their roads.

Privately maintained roads that are open to the general public are subject to the conditions of this manual. Publicly maintained roads found in parks and universities are subject to the conditions of this manual.

Privately owned parking areas, including the driving aisles within those parking areas, that are privately owned shall not be considered to be “open to public travel” for purposes of CA MUTCD applicability. All publicly owned parking areas and only those privately owned parking areas where the particular city or county has enacted a resolution to this effect, including the driving aisles within those parking areas shall be subject to CA MUTCD applicability.

2.7 Variable Speed Limits

On occasion, the establishment of variable speed limits may facilitate the safe and orderly movement of traffic on a freeway segment. Caltrans determines, based upon an E&TS, whether to implement variable speed limits. By CVC 22355, Caltrans may erect, regulate, and control signs upon the state highway designed to permit display of different speeds at various times of the day or night. These signs need not conform to Standard Plans and Specifications but shall be of sufficient size and clarity to give sufficient notice to drivers of applicable speed limit(s).

2.8 Setting a Speed Limit at 70 mph

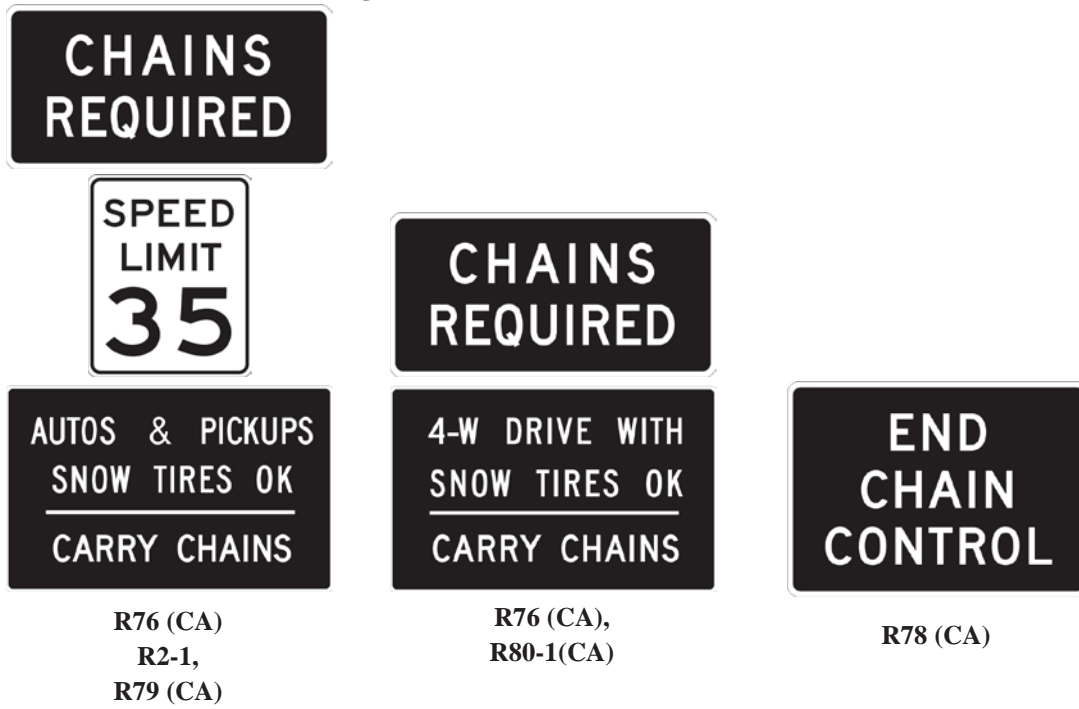
Section 22356 of the CVC addresses increasing freeway speeds to 70 mph. When an E&TS demonstrates that a speed greater than 65 mph on an existing facility subject to a 65 mph maximum speed limit would facilitate the orderly movement of traffic and would be reasonable and safe, the speed limit may be raised to 70 mph. On a new facility constructed to appropriate design standards, Caltrans may declare a maximum speed limit of 70 mph. Before posting a 70 mph speed limit, the California Highway Patrol (CHP) must agree with the proposed posting and provide approval in writing. See Chapter 4, section 4.4 regarding placement of R2-1 and R6-3(CA) and R6-4(CA) signs giving maximum statewide speed limits for various types of vehicles where speeds greater than 55 mph are posted.

2.9 Special Weather Conditions

Speeds will normally be selected and posted for good weather conditions and dry pavement. California law, however, also provides for the posting of speeds for snow or ice conditions on a highway. Refer to CVC Section 22350 and 22363.

Caltrans, with respect to state highways, or a local authority with respect to highways under its jurisdiction, may determine and declare a prima facie speed limit of 40, 35, 30, or 25 miles per hour, whichever is most appropriate and is reasonable and safe based on the prevailing snow or ice conditions upon such highway or any portion thereof. Signs may be placed and removed as needed as snow or ice conditions vary.

Figure 2-8: Chain Control Assemblies



Chapter 3 ENGINEERING AND TRAFFIC SURVEYS (E&TS)

3.1 Overview

In order for the court systems and the public to accept and respect the responsible public agencies' posting and enforcement of posted speed limits, an E&TS must incorporate sound, repeatable methods conforming to the CVC and engineering principles. The following information assists public agencies with conducting and implementing an E&TS, meeting these purposes.

3.1.1 Scope of Survey

In accordance with CVC Section 627, an E&TS consists of engineering measurements of the prevailing free flow speeds in the proposed roadway segment, a review of the collision history, and a review of roadside conditions. Residential and business density as well as pedestrian and bicyclist safety should also be considered. The E&TS should document compliance with the conditions of CVC Section 627 and identify conditions not readily apparent to a motorist.

3.1.2 Components of an E&TS

The documentation of the findings of the survey consists of three elements:

1. A Strip Map with a schematic plan drawing of the roadway showing the results of the speed measurements, collision data, and related physical information.
2. Justification memo, a discussion of the roadway characteristics, 85th percentile speeds, collision data, non-apparent conditions, and a summary with a recommended speed limit. See appendix B.8.
3. Order or ordinance documenting the speed limit. An E&TS may have any number of speed zones on the strip map, but each speed zone should have a separate justification and order.

3.2 Data Collection and Analysis

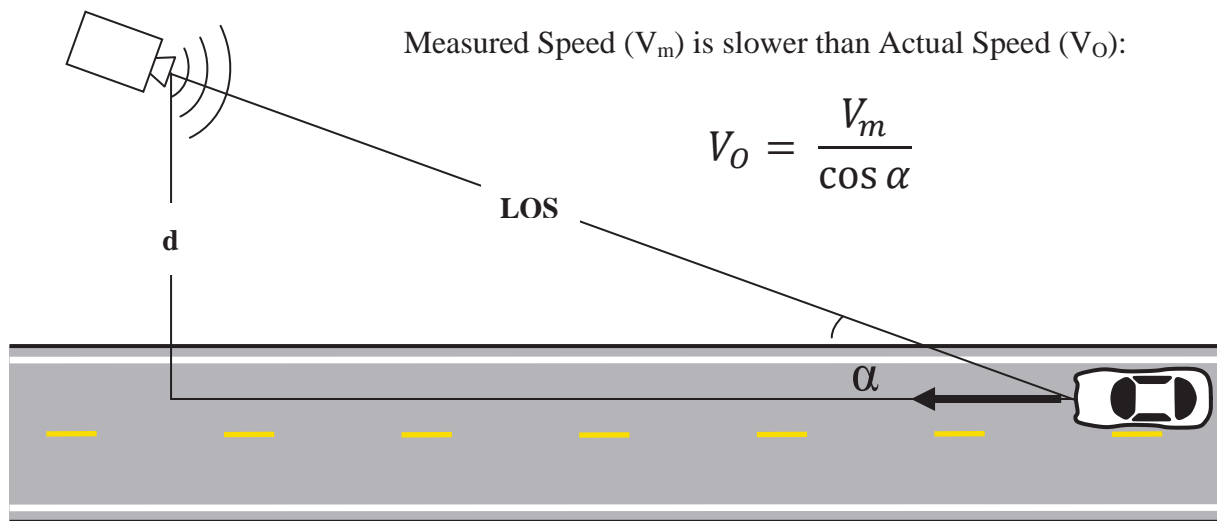
3.2.1 Equipment

Proper equipment is essential for an accurate measurement of the free flow state of vehicles, including:

- An unmarked, plain colored vehicle. If the vehicle has amber flashing lights, the lights must be off and inside the vehicle so as to not affect the speed of traffic. No other special equipment can be attached to the outside of the vehicle. Marked police vehicles cannot be used.
- Portable Radar or Lidar. The accuracy of the equipment should be verified in a manner to assure the engineer vehicle speeds are being accurately measured to within 3 mph.

- Radar or Lidar equipment must be calibrated in the same manner as the equipment used by law enforcement personnel. Equipment should be calibrated at a minimum of every three years.
- Pneumatic hoses or other roadway automated equipment can only be used to assist trained personnel. As automated equipment cannot determine which vehicles are in a state of free flow, trained personnel must eliminate the recordings of non-free flow vehicles from the automated equipment’s data.
- Basic equipment training, understanding of the cosine effect, and knowledge of which cars to use for the Speed Survey Sheet are required.

Figure 3-1: The Cosine Effect



The cosine effect shows that the speed measured by the radar (or other device), V_m , can be an inaccurate measurement of the vehicle’s actual speed, V_o , depending on the angle, α , between the radar’s line of sight (LOS) and the vehicle’s direction of travel. One can minimize the difference between V_m and V_o by minimizing the perpendicular distance, d , between the radar and the vehicle’s direction of travel.

3.2.2 Location of Speed Measurements

Locations to take speed measurements should be chosen to provide true free flow speeds. Avoid uncharacteristic locations of the represented segment. Other areas to avoid include intersections with signal or stop control, roadway narrowing for a short period, intersections and driveways with high turning/cross movements, and any location affected by emergency personnel, roadwork or law enforcement presence. Since radar detectors are readily available and in use, a check for radar emitting devices (many stores use radar detection to open doors) may be necessary to find locations with true free flow speeds. In order to obtain true free flow speeds, any radar feedback signs, photo enforcement signs, cameras or other automated systems designed to affect or monitor the speed of traffic should be turned off and covered or removed at least two weeks prior to the day of speed data collection.

3.2.3 Selecting Vehicles Under Free Flow Conditions

The intent of the speed measurements is to determine the actual speed of unimpeded traffic. Free flow is a condition of traffic where a vehicle's speed is not influenced by anything other than the roadway geometry. Some of the conditions that exist in a free flow state are:

- Minimum 5 second gap between vehicles. The Highway Capacity Manual defines delay as a percentage of vehicle headways less than or equal to 5 seconds.
- Appropriate distance for the vehicle to reach a steady velocity not influenced by start-up or slow-down speeds due to traffic signals, stop signs, or other traffic control devices.
- Not influenced by slow vehicles such as trucks or buses.
- Not influenced by enforcement or the perception of enforcement, construction or lane closures, inclement weather or special event traffic.

3.2.4 Measuring Vehicle Speeds

Prevailing speeds collected during the spot speed survey are used to determine the 85th percentile speed. It is important to obtain an accurate measurement of free flow traffic speed to provide consistency for law enforcement and the court system. Guidelines for a spot speed survey include:

- Choose survey locations as necessary to represent the roadside development, pedestrian and bicycle traffic, and other physical conditions for the entire posted speed limit area.
- In urban areas, survey locations should be at 0.25 mile intervals or as necessary to ensure accurate representation of the speed patterns. Choose locations midway between traffic signals or 0.2 miles away from signals, whichever is less. If signals are so close together that free flow is never reached, the prima facie speed limits for a business or residential district may apply.
- In rural areas, survey locations may be further than 0.25 miles apart, as long as the roadside development, pedestrian and bicycle traffic, and other physical conditions remain consistent. It may be only necessary to survey at the beginning, middle and end of a zone.
- Record prevailing speeds where the speeds are representative of the entire speed zone section. If speeds vary on a given route, more than one speed zone section is required.
- Measure the prevailing speed of 100 vehicles in each location.
- Do not combine data from multiple locations to reach 100 vehicles.
- Read speeds directly from the radar device or other electronic speed measuring devices.
- Measure prevailing speeds in both directions for all types of roadways.
- Take speed measurements during any daytime period with free flowing traffic.
- Take speed measurements under dry conditions and clear visibility.
- The surveyor and equipment cannot be in a location that will affect the traffic speeds before the speed is measured. An unmarked car is necessary to avoid the

appearance of law enforcement. The appearance of law enforcement will alter the speed of vehicles and free flow conditions will not exist.

- In order for the sample to represent the actual traffic flow, the minimum sample should be 100 vehicles in each survey. In no case should the sample contain less than 50 vehicles. On very low volume roadways, use of devices capable of accurately distinguishing and measuring the speed of free flow traffic may be appropriate.
- Do not identify speeds of vehicles with more than two axles or towing a trailer.
- Do not take speed measurements with radar or Lidar in areas affected by changes in the roadway horizontal or vertical alignments (i.e., curves or steep grades).

3.2.5 Recording Measured Speeds

Recording the prevailing speeds of traffic is a critical part of the E&TS and is used to determine the 85th percentile speed. Law enforcement, the public, and other engineers must be able to review the data after it was taken to verify its integrity. See Appendix Sections A.1.1 - A.1.3 for suggested forms.

Speed Zone Survey Sheets should include the following:

- Printed name of recorder.
- Location (city, street name, post mile).
- Weather.
- Posted speed.
- Divided or undivided.
- Begin time / end time.
- Roadside development.
- Conditions not readily apparent to the driver.
- Summary of total number of free-flow vehicles used.
- Clear and easily understandable graphic representation of the 85th percentile speed. The speed zone survey sheet will provide a graphical representation of the vehicle speeds surveyed.

3.2.6 Calculating 85th Percentile Speed

If 100 vehicle speeds are plotted, the 85th percentile speed is determined by looking at the speed of the 15th vehicle down from the top speed. Fifteen percent of the vehicles are travelling faster than this speed, and eighty five percent are travelling at or below this speed. If less than 100 vehicles are counted, the 85th percentile speed must be determined by calculating 85 percent of the number of vehicles counted and determining the vehicles' 85th percentile speed. For example if 70 vehicles were counted, $0.85 \times 70 = 59.5$. The speed of vehicle 60 represents the 85th percentile. Examples are shown in Appendix A on the Speed Zone Survey Sheet examples.

3.2.7 Collision Analysis

Collision data should be reported as actual collisions per million vehicle miles (acc/mvm) and average acc/mvm. Actual rates should use the most recent three years available or the most

recent data available for the latest roadway reconfiguration. Average rates should be based on the type of roadway being studied.

Statewide collision rates are found in a Caltrans Table B. According to Highway Safety Improvement Program (HSIP) Guidelines, Table B is an on-demand report that summarizes collisions and volume data, and calculates collision rates for a given time period for a highway segment, ramp or intersection location. The District traffic operations personnel can run Table B reports. An example of a Table B report is included in Appendix A.4.

Higher than average collision rates need investigation to determine if they are related to the posted speed. Collision reports indicating speeding as a cause should be investigated to determine if CVC Section 22350 Basic Speed Law (also referred to as driving too fast for conditions) is the cited section. This section does not necessarily indicate that the posted speed limit was violated; many collisions occur at intersections and in stop and go traffic at speeds much lower than the posted limit.

Summarize the collision history and review for speed related issues. TASAS Selective Record Retrieval (TSAR) reports are on-demand reports that list the details of collision records and a summary of the results. A TSAR report may facilitate collision analysis. A TSAR report example is included in Appendix Section A.4. Using collision rates to justify a change of speed limits requires an analysis showing that the proposed speed change would reduce the collision rate or severity. Collision rates may not be used to lower the speed limit an additional 5 mph if the speed limit has already been lowered 5 mph for non-apparent conditions. Other appropriate counter measures should also be considered to reduce collision rates.

3.2.8 Evaluating Existing Conditions

The speed zone segment should be reviewed to determine local land uses, traffic control devices, number of lanes, striping details, existing posted signs and existing posted speed limits. Traffic should be observed to determine areas of conflicts, high pedestrian/bicycle movements and other driver behaviors.

Conditions not readily apparent to the motorist is a condition which, if the motorist were aware, they would adjust their speed accordingly. Motorists are aware of the width, curvature, grade, and surface conditions. CVC Section 22358.5 specifically prohibits downward speed zoning for these conditions and any other conditions readily apparent to the driver. Special events, construction, or congestion are also apparent when present. The basic speed law CVC Section 22350 is sufficient regulation for such conditions. If readily apparent conditions are of great concern, advisory speed signs may be posted for specific roadway conditions. See Section 2 for a full discussion on advisory speed signs.

Non-apparent conditions include those high volume traffic generators (vehicular, bicycle or pedestrian) not visible and access points that are not visible to the motorist. Warning signs can be placed for such conditions however, this is not always adequate. Every attempt should be made to make the motorist aware of non-apparent conditions before a decision is made to lower

the speed limit. Non-apparent conditions may not be used to lower the speed limit an additional 5 mph if the speed limit is also being lowered for a higher than average collision rate.

3.3 Developing Strip Maps

3.3.1 Strip Map Example

See Appendix Section A.2 for an example of a strip map showing the roadway under review for a particular E&TS.

85th percentile speeds are recorded on the strip map at speed survey locations. As the goal is to measure free flow traffic, not every point on a roadway can be used to measure the 85th percentile speeds. However, the points where the data is taken are connected by lines on the strip map to graphically represent the progression of speed. These lines do not indicate actual 85th percentile speeds.

3.3.2 Scale for Strip Maps

The scale is left at the engineer's discretion and is meant to be schematic in nature rather than show a high level of detail of the roadway features. An aerial photograph can be used with speed zone details shown as an overlay.

3.3.3 Information to Include on the Strip Map

- A north arrow.
- Post Mile or other distance measurement.
- Limits of the proposed speed zones for each direction of travel.
- Roads and road names, number and width of lanes.
- Appropriate notations showing type of roadside zoning and development, such as "scattered business," "solid residential," etc. Schools adjacent to the highway are shown, but other buildings need not be plotted unless they are a factor in the speed recommendation or the point of termination of a speed zone.
- Important traffic generators, such as factories, shopping centers/malls etc.
- Uncontrolled marked pedestrian crossings including school crosswalks.
- Railroad crossings – show number of tracks.
- Collision rates for the zones involved.
- Average daily traffic volume.
- Location of traffic signals, signs, striping details, and markings. Signs should include all regulatory signs, advisory curve warning signs, and school signs. Guide signs may be shown to indicate city limits.
- Distinction between divided and undivided sections of the roadway.
- Areas where CVC 22352 Prima Facie by Statute speeds are being used.
- Plotted 85th percentile and lower limit of pace speeds at locations taken showing speed profile.
- City and County jurisdictional boundaries.

3.4 Speed Zone Design

3.4.1 Zone Length

The length of any section of roadway set for a particular speed zone should be as long as possible and consistent with changes in roadway conditions, roadside development, and land use. Speed zone or speed limit changes need to be coordinated with changes in roadway conditions, roadside development, and land use. Speed zones of less than 0.5 miles should be avoided. Create separate speed zones at City, County or other jurisdictional boundaries with a consistent speed limit across the boundary.

Speed zone transitions can be accomplished in one of two ways. Speed limits can be stepped down in 5 or 10 mph increments or changed abruptly with “speed zone ahead” warnings. If stepped down, the speed limit changes should be supported by the E&TS and be set near the 85th percentile speed. If the transition is accomplished by changing abruptly from highway speed to city speed, place “speed zone ahead” warning signs in advance of the change. Table 2C-4 in the CA MUTCD should be used to determine the minimum distance for placing warning signs advance of the lower speed zone (see Appendix A.3). Upward speed transitions are signed in accordance with the downward zoning on the opposing traffic lanes. Either speeds are increased incrementally to match the downward increments or signed “end speed zone” followed by the posted highway speed limit.

Example 1:

Based on observed 85th percentile speeds, a speed zone on a two-lane conventional highway through a town starts with a 55 mph zone (length 0.6 miles), followed by a 45 mph zone (length 0.5 miles), and then by a 35 mph zone (length 0.5 miles).

Example 2:

A divided freeway with a posted speed limit of 65 mph approaches a City with cross traffic and signalized intersections. The 85th percentile speeds within the City indicate a posted speed limit of 40 mph. Since it may be very difficult to establish 0.5 miles or longer speed zones with 5-10 mph reductions based on observed speeds on this approach, a “40 Zone Ahead” sign should be installed at an appropriate distance before the first “Speed Limit 40” sign.

See Appendix Section A.7 for general illustrations.

3.4.2 Directional Differences

The 85th percentile speeds may differ considerably by direction at some locations. Such conditions are usually caused by relatively heavy development on one side of the road. Next to the development, motorists will tend to drive slower.

On divided highways with independent alignments, the zone speeds should conform to the 85th percentile speed in each direction, even though this may require zoning for different speeds in opposite directions.

On undivided roadways, and divided roadways without independent alignments, the zones in opposite directions should be the same for clarity for the driver and law enforcement purposes. If there is a difference between the 85th percentile speeds of 5 mph or more in the opposing directions, the data from both directions can be averaged to obtain one 85th percentile or the higher 85th percentile may be used to set the limit.

3.4.3 Variation from the 85th Percentile

Speed limits are established at or near the 85th percentile speed. Speed limits higher than the 85th percentile are not generally considered reasonable and prudent. Speed limits below the 85th percentile do not ordinarily facilitate the orderly movement of traffic and require constant enforcement to maintain compliance. Speed limits established on the basis of the 85th percentile conform to the consensus of motorists of the reasonable and prudent speed, rather than the judgment of one or a few individuals. The majority of drivers comply with the basic speed law. Speed limits set at or near the 85th percentile provide law enforcement officers with a limit to cite drivers who do not conform to what the majority considers reasonable and prudent. Further studies such as FHWA-RD-92-084 and FHWA-RD-98-154 show that establishing a speed limit at less than the 85th percentile generally results in an increase in collision rates.

3.4.4 Applying a 5 Mile Per Hour Reduction

When a speed limit is to be posted, it shall be established at the nearest 5 mph increment to the 85th percentile speed of free-flowing traffic, rounding as standard mathematics directs. Under some circumstances, the posted speed may be reduced by 5 mph from the nearest 5 mph increment of the 85th percentile speed.

If a 5 mph reduction is justified, the E&TS shall document in writing the conditions and justification for the lower speed limit and be approved by a registered Civil or Traffic Engineer. The reasons for the lower speed limit shall be in compliance with CVC Section 22358.

The following examples are provided to explain the application of these speed limit criteria:

1. If the 85th percentile speed in a speed survey for a location was 37 mph, then the speed limit would be established at 35 mph since it is the closest 5 mph increment to the 37 mph speed. The 35 mph established speed limit can be reduced by 5 mph to 30 mph if the conditions and justification for using this lower speed limit are documented in the E&TS and approved by a registered Civil or Traffic Engineer.
2. If the 85th percentile speed in a speed survey for a location was 33 mph, then the speed limit would be established at 35 mph since it is the closest 5 mph increment to the 33 mph speed. The 35 mph established speed limit can be reduced by 5 mph to 30 mph if the conditions and justification for using this lower speed limit are documented in the E&TS and approved by a registered Civil or Traffic Engineer.

CVC 21400 allows for setting the speed limit at the 5 mph increment below the 85th percentile even if mathematical rounding would require the speed to be posted above the 85th percentile. If this option is used, then the additional 5 mph reduction cannot be used. In effect, this law allows an engineer to round down to the nearest increment of the 85th instead of up. The engineer cannot then take a further reduction.

When roadside development results in traffic conflicts and conditions which are not readily apparent to drivers, speed limits somewhat below the 85th percentile may be justified; however, speed limits shall not be lowered more than 5mph less than the nearest increment to the 85th percentile speed. The factors justifying a reduction below the nearest increment to the 85th percentile speed are the same factors mentioned above. Whenever such factors are considered to establish the speed limit, they should be documented on the speed zone survey or the accompanying engineering report. Generally, collision history is the most decisive evidence of conditions not readily apparent to the driver.

3.4.5 Trial Runs

A “trial run” is a drive through the speed zoned section of a roadway at the chosen speed(s) confirming if the speed(s) are appropriate for the area. After the 85th percentile speeds and zone lengths have been selected, several trial runs may be made through the area in both directions driving at the selected speeds. This should show any irregularities in the zoning which may need adjustment.

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Chapter 4 LOCATION OF REGULATORY SPEED LIMIT SIGNS

4.1 Speed Limit: R2-1

The R2-1 sign shall be used to give notice of the speed limit except as provided under Prima Facie Speed Limits in CVC Section 22352. R2-1 speed limit signs shall be placed at the beginning of all restricted speed zones. Where speed zones are longer than one mile, intermediate signs may be placed at approximate one mile intervals. Additional signs within the same zone should be considered at major intersections or at locations where significant volumes of traffic enter the highway. For three or more lanes in each direction, two signs may be used: one in the median and one on the shoulder, facing the same direction (dual installation).

Freeways with a speed limit of 65 mph or 70 mph shall be posted as follows:

- At the segment entrance, R2-1 signs shall be installed to the right of traffic off the right shoulder.
- R2-1 signs shall also be installed off the right shoulder, throughout the segment, at a maximum of 25 mile intervals. The 25 mile interval may be modified to include locations following entrance ramps. (R4-3) signs may be installed at locations where there is a tendency of the motorists to drive in the left-hand lane(s) below the normal speed of traffic.
- The R6-3(CA) sign shall be installed approximately 750 feet following each R2-1 sign.
- Both at the beginning and throughout each 60, 65 or 70 mph segment.
- The R6-4(CA) sign shall be installed approximately 750 feet following each R6-3(CA) sign.
- Signs shall be placed in protected locations.
- At the end of the 65/70 mph segment, R2-1 signs with the appropriate number for the next speed limit shall be installed off the right shoulder.

Freeway segments with an approved 55 mph speed limit shall be posted as follows:

- The beginning of the segment shall be posted with an R2-1 sign installed on the right shoulder and in the median, if it is of sufficient width to permit sign maintenance without lane closures.
- Subsequent signs should then be posted on the right shoulder, on approximate three-mile intervals, with no more than three interchanges between signs. At the end of the segment, an R2-1 sign with the appropriate number for the next speed limit should be posted on the right shoulder.

Conventional highways with 55 mph to 65 mph speed limits should be posted as follows:

- The beginning of the segment shall be posted with an R2-1 sign installed on the right shoulder.

- Subsequent signs should then be posted on approximate five-to-ten-mile intervals and immediately after locations where significant volumes of traffic enter the segment. At the end of the segment, an R2-1 sign with the appropriate number for the next speed limit should be posted on the right shoulder.

See Appendix Section A.7 for illustrations of regulatory sign placement. Pavement markings with appropriate numerals (see CA MUTCD Section 3B.19) may be used to supplement speed limit signs.

Figure 4-1: Speed Limit Sign



R2-1

4.2 Speed Zone Ahead: R2-4 (CA)

The R2-4(CA) sign should be used to inform the motorist of a reduced speed zone. The R2-4(CA) sign shall always be followed by a R2-1 sign installed at the beginning of the zone where the reduced speed limit applies.

Figure 4-2: Reduced Speed Zone Ahead



R2-4

4.3 End Speed Limit: R3 (CA)

The R3 (CA) signs may be placed at the end of reduced speed zones. The R3 (CA) sign shall only be used to mark the end of a speed zone. When used, an R2-1 should be placed within a reasonable distance of the R3 (CA), based on engineering judgment, to remind drivers of the speed limit of the facility. The R3 (CA) sign shall not be used for a change in speed limits within a reduced zone. The R3 (CA) sign may be used with the TRUCK (M4-4) plaque to mark the end of truck speed zones on descending grades. An illustration of the locations of regulatory speed limit signs within a transition zone is provided in Appendix A.8.

Figure 4-3: End Speed Limit

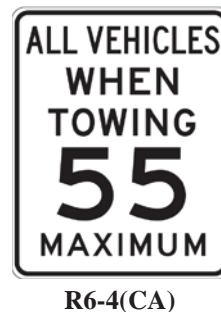


4.4 Speed Limit, Trucks, & All Vehicles When Towing: R2-1, R6-3 (CA) and R6-4 (CA)

The R2-1 and R6-3(CA) and R6-4(CA) signs giving maximum statewide speed limits for various types of vehicles shall be installed on all State highways near the points of entrance into California. These signs should be placed in a location to be most effectively viewed by the approaching motorists.

When used, the R6-3(CA) sign shall be installed approximately 750 ft following each R2-1 sign. The R6-4(CA) sign shall be installed approximately 750 ft following the R6-3(CA) sign. The R6-3(CA) and R6-4(CA) signs should be placed on highway segments where speeds in excess of 55 mph are permitted. Refer to CVC Section 22406 for types of vehicles subject to the 55 mph maximum speed limit.

Figure 4-4: Trucks 3 Axles or More and All Vehicles When Towing Signs



4.5 Special Enforcement Signs

4.5.1 Speed Enforced By Radar: R48 (CA)

The R48 (CA) sign may be used where the California Highway Patrol has received authority to use radar and requests such signs. Where radar enforcement is in effect, one sign should be used in each direction at the beginning of the segment of roadway, and at intervening major route intersections. The R48 (CA) sign is a stand-alone sign intended to alert motorists that speed is enforced by radar on a particular segment of roadway.

Figure 4-5: Speed Enforced By Radar



R48 (CA)

4.5.2 Radar Enforced: R48-1(CA)

The R48-1(CA) sign may be used in combination with the Speed Limit (R2-1) sign on any roadway where law enforcement has the authority to use radar. Where radar enforcement is in effect, the R48-1(CA) sign should be placed below the R2-1 sign at the beginning of the segment of roadway and at intervening major intersections.

Figure 4-6: Radar Enforced



R48-1(CA)

4.5.3 Speed Enforced By Aircraft: R48-2(CA)

The R48-2(CA) sign may be placed, when requested by the California Highway Patrol, on sections of highway regularly patrolled by aircraft. The R48-2(CA) sign shall be used for both directions of travel. The R48-2(CA) sign should be placed at the beginning of the section and spaced at 25-mile intervals.

Figure 4-7: Speed Enforced By Aircraft



R48-2(CA)

Chapter 5 RENEWAL OF ENGINEERING AND TRAFFIC SURVEYS

5.1 Overview

According to CVC Section 40802, an E&TS is valid for five years. However, under specific conditions stated in CVC Section 40802, the E&TS may be valid for seven or ten years. Once a speed zone is established at a statutory maximum speed limit (CVC Section 22349) or higher, no further studies are required, as the CVC requires an E&TS for speed zone reductions only. The completion date for the E&TS is when the approving authority signs the E&TS or orders. This date does not have to match the date the strip map was stamped or the date of the justification memo accompanying the E&TS.

5.2 Frequency of Rechecks

According to CVC Section 40802, “Speed Traps,” are sections of highway for which the speed limit has not been justified by an E&TS within five years, and the enforcement of the speed limit involves either timing vehicles between a set distance of roadway or using radar or any other electronic device that measures the speed of moving objects.

The renewal time may be extended to seven years when using radar and all of the following criteria are met:

- The citing officer has successfully completed a minimum of 24 hours of certified radar operator course training.
- The radar used to measure the speed meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration, and has been calibrated within three years of the alleged violation.

The renewal time may be extended to seven years when using laser or other electronic devices (other than radar) and all of the following criteria are met:

- The citing officer has successfully completed a minimum of 24 hours of certified operator course training.
- The citing officer has successfully completed a minimum of 2 hours of additional approved certified training.
- The device used to measure the speed meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration, and has been calibrated within three years of the alleged violation.

The renewal time provision for an E&TS may be extended to ten years if a registered engineer determines that all of the above conditions are met and no significant changes in roadway or traffic conditions have occurred, including major changes in adjacent property or land use, roadway width, or traffic volume.

5.3 Procedure for 7 to 10 Year Extensions

After a registered engineer determines an existing E&TS qualifies for an extension from seven to ten years, the engineer should write a memo to amend the existing E&TS and transmit to the local court and law enforcement agencies, describing the conditions that have led to the decision. The engineer should also send a letter notifying the local authorities involved, including the CHP area commander, Public Works Director, City Engineer etc. A sample of such memos and letters are provided in Appendix B.

5.4 Renewal before Expiration

The 85th percentile speed through a highway section could be impacted by physical changes to the roadway, such as increasing or reducing the number of travel lanes, installing traffic signals, altering roadside development, and significant changes in traffic volume. When these changes have occurred, the existing E&TS may need to be reassessed before the renewal period is expired.

For example, a section of a two-lane conventional highway was upgraded to a divided, four-lane highway. This section is about 2 miles long, is preceded by a reduced speed zone (less than 55 mph), and followed by a 55 mph two-lane conventional highway section. In this situation, Section 22349 (a) of CVC applies, stating “except as provided in Section 22356, no person shall drive a vehicle upon a highway at a speed greater than 65 miles per hour.” However, before posting this new speed limit, the engineer should conduct a speed survey to confirm the prior 55 mph speed limit is no longer appropriate. The engineer should write a memo to the District Director, describing the conditions that have led to the decision of raising the speed limit. The District Director should then issue an order authorizing the increased speed limit. The engineer should then send a letter notifying the local authorities involved, including the CHP area commander, Public Works Director, City Engineer etc.

Chapter 6

SPEED ZONE APPROVAL AND DISTRIBUTION

6.1 Overview

Once the draft E&TS is ready, law enforcement and other affected engineering agencies should be contacted to discuss the findings. If the findings indicate a need to raise or lower the posted speed, a letter should be sent to local officials to allow for a public hearing, and finally orders written for the new zone. If there is no proposed change to the speed limit, notification and the new E&TS is sent to law enforcement and courts. Section 6.2 details the approval process.

6.1.1 Differences between State and Local Jurisdictions

An E&TS is necessary for non-State highways except those covered by Prima Facie Speed Limits in CVC Section 22352. Reductions from 65 mph need to be done by local ordinance based on the results of the E&TS. Local governments are not subject to the local hearing provisions of CVC Section 22354.5.

6.2 Approval Process

6.2.1 Consultation with local California Highway Patrol and Other Agencies

Whenever Caltrans determines the need to raise or lower a speed limit, it must consult the CHP and take into consideration their recommendations according to CVC Section 22354.5. Local law enforcement and city and county engineers should also be contacted to discuss the findings of the E&TS. These discussions are valuable to gain local insight regarding non-apparent conditions, accident data, and level of opposition to change. In addition, these discussions can help in locating the beginning and ending of individual zones. Driving the section of road proposed for a speed change with local personnel is a good method to understand local concerns at each particular section of a zone.

6.2.2 Local Government Notification and Public Hearing

CVC Section 22354.5 allows a public hearing to be conducted by a city council or county board of supervisors when Caltrans proposes changing a speed limit on a State highway, and that Caltrans shall take into consideration the results of the meeting. A letter should be mailed to the local city to notify them of the changes under consideration. It is important that the letter inform the city or county of the locations of the proposed changes, the opportunity to hold a hearing, that the hearing will be run by the city or county and that Caltrans would like to attend to answer questions. The letter should provide the option to hold or not hold a public meeting and a date after which Caltrans will proceed if no reply is received. See sample letter in Appendix Section B.

6.2.3 Attend Public Hearing

The public hearing should be attended by someone with knowledge of speed zoning practices and the particular zones being discussed. This person needs to be able to tactfully answer questions and describe the benefits of proper speed zoning.

6.2.4 Reassess Proposed Speed Limit Change

Once the public hearing is concluded, the results should be considered and any new concerns or non-apparent conditions investigated. Collision data and non-apparent conditions may be used to justify a 5 mph reduction. However, once the first reduction is taken, additional conditions do not justify additional reductions. Public and political opinions are not reasons to change the results of an E&TS and cannot be used as justification to reduce a speed limit.

6.2.5 Prepare New Speed Zone Orders

Orders are written when Caltrans reduces the speed limit from 55 mph for undivided highways or 65 mph for divided highways. Orders must be rewritten and signed for every new or updated E&TS when the speed limit is set below the statutory or prima facie maximum. Orders should be rewritten at least every 10 years, or when an E&TS must be redone. See sample order in Appendix B.3.1. If the proposed zone is 70 mph, CHP concurrence is required per CVC Section 22356. See sample order in Appendix B.3.2. Similarly, CVC Section 22358 requires local jurisdictions to pass an ordinance for speed zones established by E&TS.

6.2.6 Determine Need for New Advisory Speed Signing

Higher speed limits may result in a need to re-evaluate advisory speeds on curves or other locations without speed advisory signs.

6.2.7 Determine Need for Signal Loop Detection to be Adjusted

Advance signal detection loops are placed in accordance with the approach speed. Increases in posted speed may require new detector loops to be placed to meet the newly posted speeds or the 85th percentile speed, whichever is greater.

6.2.8 Determine Need for Yellow Change Interval Timing to be Adjusted

Yellow change intervals are based on approach speed. The CA MUTCD guidance states that the minimum yellow change interval shall be in accordance with Table 4D-102(CA). The posted speed limit, or the prima facie speed limit established by the CVC shall be used for determination of the minimum yellow change interval for the through traffic movement. As an option, the minimum yellow change interval for the through movement and the protected left-turn or protected right-turn may be increased based on a field review or by using appropriate judgment. That judgment may be based on numerous factors, including, but not limited to, 85th percentile speed, intersection geometry, and field observation of traffic behavior.

6.2.9 Study Completion

For State highways, an E&TS should be presented as a memo to the District Director or Deputy District Director for operations depending on delegation. Local agencies will direct their reports to the county board of supervisors or the appropriate city councils. The E&TS should include as a minimum; a strip map, a summary of findings with a discussion of non-apparent

conditions, collision review and recommendations, and a copy of the declaration or order to be signed. The local agencies would substitute a proposed ordinance for the declaration. In addition, any proposed speed limit change based on non-apparent conditions requires documentation by a licensed engineer on the memo to the Director accompanying the engineering report. The completion date for the E&TS is when the orders are signed. This date does not have to match the date the strip map was stamped or the date of the justification memo accompanying the E&TS.

6.2.10 Transmittal Memo

For state highways, a transmittal letter to the District Director or Deputy District Director for Operations, should be prepared to transmit the E&TS for signature of the speed zone orders and final review of the proposed speed limit. The transmittal letter should include the results of the public hearing and the discussions with the CHP/local law enforcement and local agencies. See appendix B.4 for a sample transmittal memo.

6.2.11 Sign Installation Orders

Sign installation orders need to be prepared to change the speed limit signs and curve advisory signs. This is also a good opportunity to place signs for any other conditions/concerns discovered in the process.

If no changes are needed to an existing zone, the E&TS goes directly to the signing authority with new orders and then to distribution.

6.3 Distribution

6.3.1 Regular Distribution

Mail a copy of the completed E&TS to CHP or local law enforcement agency, local authorities and court systems as needed. See sample transmittal letter in Appendix Section B.5.

6.3.2 Public Request

The public routinely requests a copy of the latest “speed survey” for a particular section of roadway. All requests should be made via a public records act request form. See TOPD 11-05 for the release of records policy. These requests are generally of three types.

The first type is for a speed zone established under CVC Section 22354. Adhering to the rules set forth in TOPD 11-05, ask whether the requestor is only interested in contesting a traffic citation. If the requestor is contesting a traffic citation, the E&TS may be sent out with a cover letter (Appendix Section B.6). If the requestor is filing a claim against the State, you should contact your district claims office immediately for further direction.

The second type of request is for an E&TS for sections of roadway operated under the Maximum Speed Limit Section (22349) of the CVC. If the requestor insists on a letter after being informed that an E&TS is not required for this section of roadway, you may use the sample letter shown in Appendix Section B.7.

The third type involves legal action against the State. If the requestor is filing a claim against the State, contact your district claims office immediately for further direction.

A.1.3 – Vehicle Speed Survey Template

VEHICLE SPEED SURVEY SHEET

City: _____ Date: _____ Post Mile: _____
 Location: _____ Weather: _____ Posted Speed: _____
 Recorder Name: _____ Begin Time: _____ End Time: _____

mph	Number of Vehicles																				Total	Cumulative Total			
				5				10																	
55																									
54																									
53																									
52																									
51																									
50																									
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22																									
21																									

Roadside Type/Development: _____

Number of Free Flow Vehicles Counted: _____ # to count up: _____
 85th percentile calculation: Total (____) times 0.85 = _____

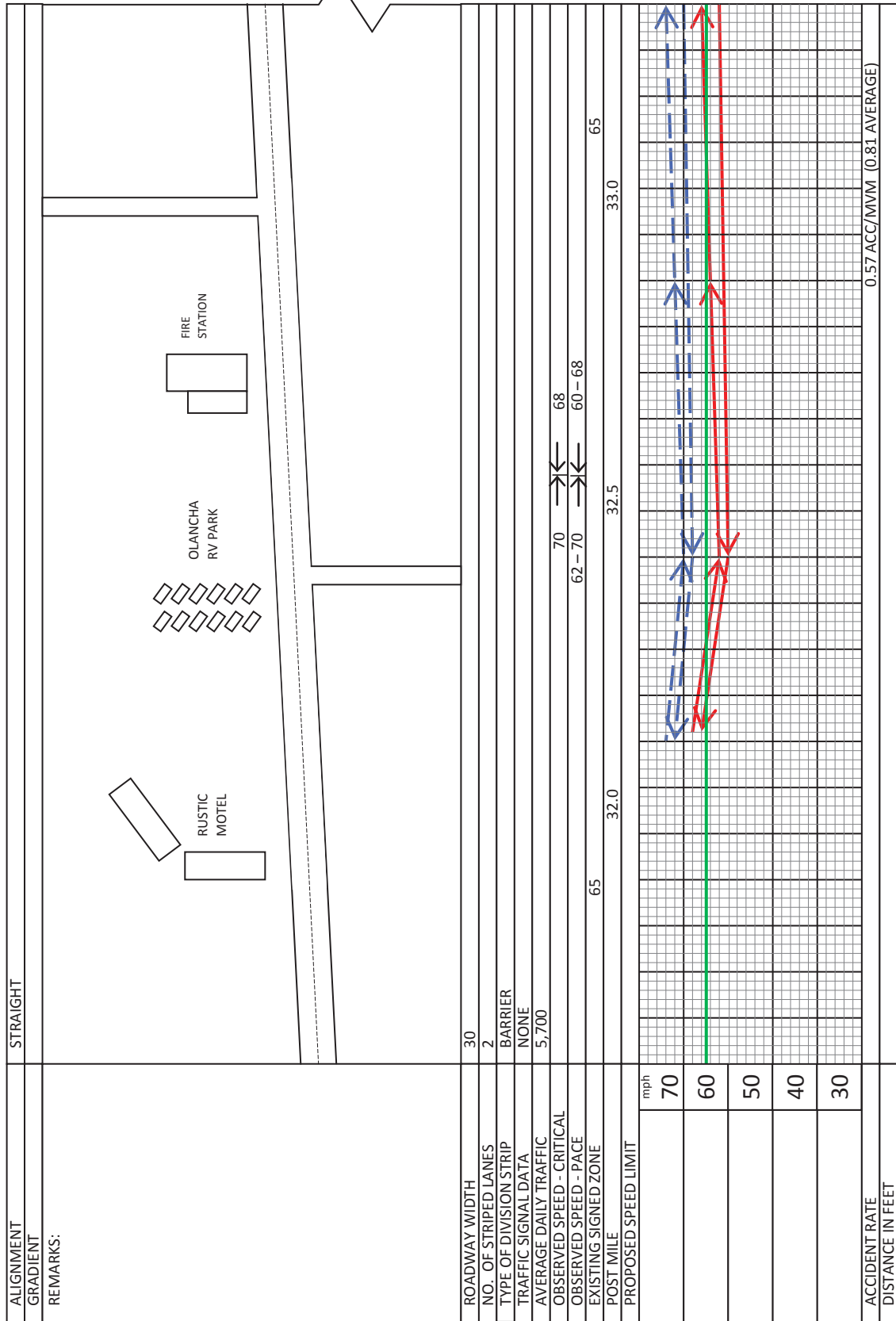
This vehicle's speed was: _____ mph
Number of all vehicles at this speed: _____

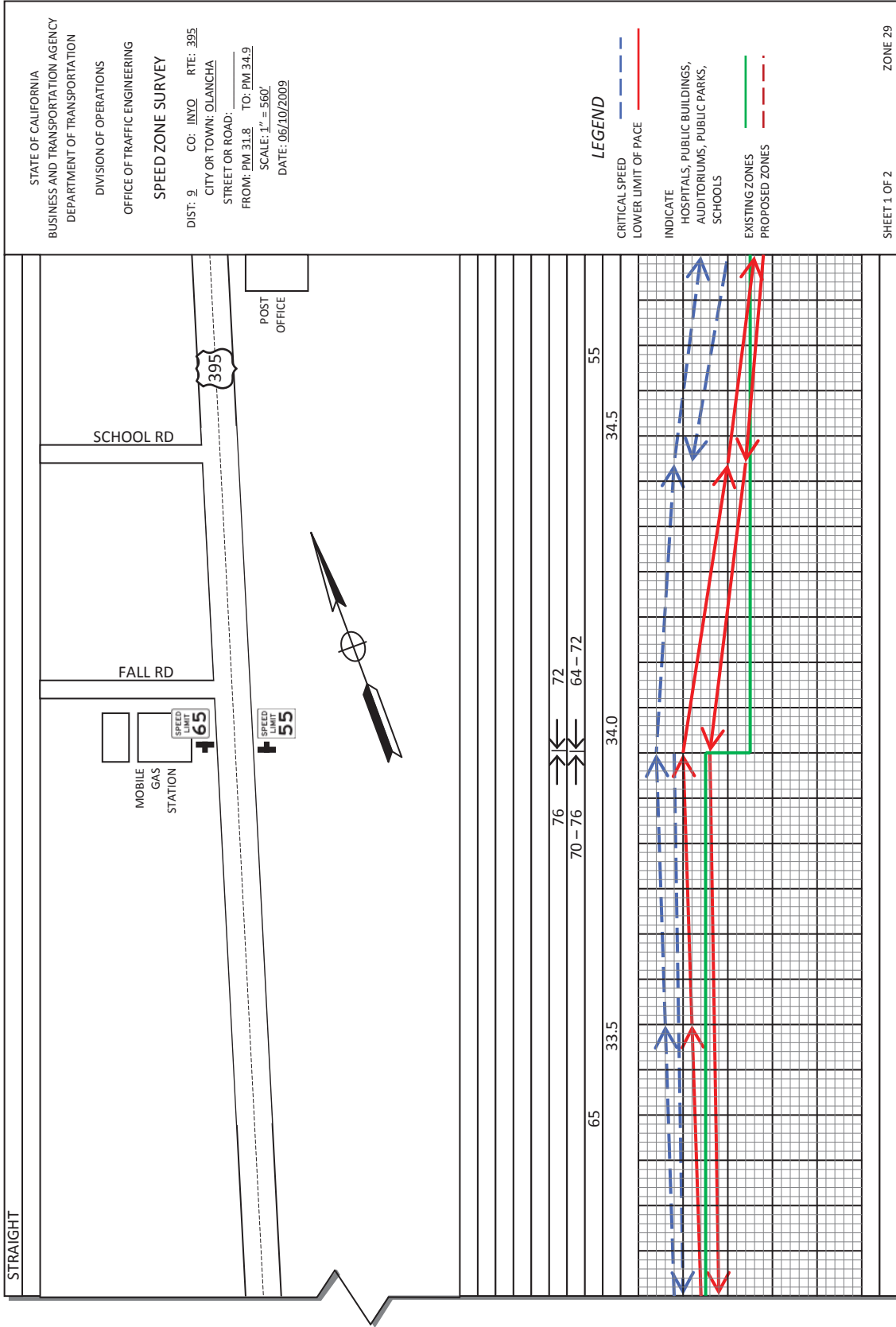
Signed: _____ Date: _____ Title: _____

Note: You may find the original excel spreadsheet on the HQ Traffic Engineering Website.

A.2 – Sample Strip Map

Note: This scaled figure represents an 11 in X 36 in size sheet.





A.3 – Table 2C.4: California Manual for Uniform Traffic Control Devices Guidelines for Advance Placement of Warning Signs

Posted or 85th Percentile Speed	Advance Placement Distance ¹								
	Condition A: Speed reduction and lane changing in heavy traffic ²	Condition B: Deceleration to the listed advisory speed (mph) for the condition							
		0 ³	10 ⁴	20 ⁴	30 ⁴	40 ⁴	50 ⁴	60 ⁴	70 ⁴
20 mph	225 ft	100 ft ⁶	N/A ⁵	—	—	—	—	—	—
25 mph	325 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—
30 mph	460 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—
35 mph	565 ft	100 ft ⁶	N/A ⁵	N/A ⁵	N/A ⁵	—	—	—	—
40 mph	670 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—	—
45 mph	775 ft	175 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft ⁶	—	—	—
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A ⁵	—	—
60 mph	1,100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft ⁶	—	—
65 mph	1,200 ft	475 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft ⁶	—
70 mph	1,250 ft	550 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	—
75 mph	1,350 ft	650 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft ⁶

¹The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

²Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

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TASAS SELECTIVE RECORD RETRIEVAL
TSAR - ACCIDENT SUMMARY

<-- PRIMARY COLLISION FACTOR -->		<--- TYPE OF COLLISION --->		<--- ROADWAY CONDITION --->	
NUMBER	PCT CODE	NUMBER	PCT CODE	NUMBER	PCT CODE
1	6.3	1	6.3	0	0.0
0	0.0	2	12.5	0	0.0
0	0.0	10	62.5	0	0.0
3	18.8	0	0.0	0	0.0
10	62.5	2	12.5	0	0.0
2	12.5	0	0.0	0	0.0
0	0.0	0	0.0	0	0.0
0	0.0	1	6.3	15	93.8
0	0.0	0	0.0	1	6.3
0	0.0	0	0.0	0	0.0
0	0.0				

<----- WEATHER ----->		<----- LIGHTING ----->		<----- ROAD SURFACE ----->	
NUMBER	PCT CODE	NUMBER	PCT CODE	NUMBER	PCT CODE
15	93.8	15	93.8	15	93.8
1	6.3	0	0.0	0	0.0
0	0.0	0	0.0	0	0.0
0	0.0	0	0.0	0	0.0
0	0.0	0	0.0	1	6.3
0	0.0	1	6.3	0	0.0
0	0.0	0	0.0		
0	0.0				

<----- RIGHT OF WAY CONTROL ----->		<----- HIGHWAY GROUP ----->		<-- INTERSECTION/RAMP ACCIDENT LOCATION -->	
NUMBER	PCT CODE	NUMBER	PCT CODE	NUMBER	PCT CODE
0	0.0	0	0.0	0	0.0
0	0.0	0	0.0	1	6.3
0	0.0	16	100.0	0	0.0
16	****	0	0.0	0	0.0
0	0.0			0	0.0
0	0.0			15	93.8

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Page#3

TASAS SELECTIVE RECORD RETRIEVAL
TSAR - PARTY SUMMARY

PARTY TYPE ----->		MOVEMENT PRECEDING COLLISION ->		OTHER ASSOCIATED FACTORS ----->	
NUMBER	PCT CODE	NUMBER	PCT CODE	#1 NUMBER	#2 NUMBER
14	87.5 A-PASNGR CAR/STA WAGON	3	18.8 A-STOPPED	0	0.0
0	0.0 B-PASNGR CAR W/TRAILER	12	75.0 B-PROCEEDED STRAIGHT	0	0.0
0	0.0 C-MOTORCYCLE	0	0.0 C-RAN OFF ROAD	0	0.0
7	43.8 D-PICKUP/PANEL TRUCK	0	0.0 D-WAKING RIGHT TURN	1	6.3
0	0.0 E-PICKUP/PANEL W/TRAILER	0	0.0 E-WAKING LEFT TURN	1	6.3
0	0.0 F-TRUCK/TRUCK TRACTOR	0	0.0 F-WAKING U TURN	1	6.3
2	12.5 G-TRUCK/TRACTOR & 1 TRAILER (INATTN)	1	6.3 G-BACKING	0	0.0
0	0.0 2-TRUCK/TRACTOR & 2 TRAILER	2	12.5 H-SLOWING, STOPPING	0	0.0
0	0.0 3-TRUCK/TRACTOR & 3 TRAILER	0	0.0 I-PASS OTHER VEHICLE	0	0.0
0	0.0 4-SINGLE UNIT TANKER	2	12.5 J-CHANGING LANES	0	0.0
0	0.0 5-TRUCK/TRA & 1 TANK TRALR	0	0.0 K-PARKING	0	0.0
0	0.0 6-TRUCK/TRA & 2 TANK TRALR	0	0.0 L-ENTER FROM SHLDR	2	12.5
0	0.0 H-SCHOOL BUS	0	0.0 M-OTHER UNSAFE TURN	3	18.8
0	0.0 I-OTHER BUS	0	0.0 N-CROSS INTO OPP LN	0	0.0
1	6.3 J-EMERGENCY VEHICLE	0	0.0 O-PARKED	0	0.0
0	0.0 K-HIGHWAY CONST EQUP	0	0.0 P-MERGING	0	0.0
0	0.0 L-BICYCLE	0	0.0 Q-TRAVEL WRONG WAY	0	0.0
0	0.0 M-OTHER-MOTOR VEH	4	25.0 R-OTHER	0	0.0
1	6.3 N-OTHER-NON-MOTOR VEH	0	0.0 <-NOT STATED	0	0.0
0	0.0 O-SPILLED LOADS	0	0.0	13	81.3
0	0.0 P-DISENGAGED TOW	0	0.0	0	0.0
0	0.0 Q-UNINVOLVED VEHICLE	0	0.0 PEDESTRIAN	0	0.0
0	0.0 R-MOPED	0	0.0	0	0.0
0	0.0 T-TRAIN	0	0.0 2-XING XWALK - INTRST	0	0.0
0	0.0 U-PEDESTRIAN	0	0.0 3-XING XWALK - NOT INTR	0	0.0
0	0.0 V-DISMOUNT PEDESTRIAN	0	0.0 4-XING NOT XWALK	0	0.0
0	0.0 W-ANIMAL - LIVESTOCK	0	0.0 5-ROADWAY - INCL SHLDR	0	0.0
0	0.0 X-ANIMAL - DEER	0	0.0 6-NOT IN ROADWAY	0	0.0
0	0.0 Z-ANIMAL - OTHER	0	0.0 7-APRH-LEAVE SCHL BUS	1	6.3
0	0.0	0	0.0 - INVALID CODES	0	0.0

<----- DIRECTION OF TRAVEL -----> <----- SPECIAL INFORMATION -----> * INATTENTION CODES EFF. 01-01-01

NUMBER	PCT CODE	NUMBER	PCT CODE
0	0.0 N-N, NE, NW BOUND	0	0.0 A-HAZARDOUS MATERIALS
0	0.0 S-S, SE, SW BOUND	1	6.3 B-CELL PHONE IN USE*
12	75.0 E-EASTBOUND	13	81.3 C-CELL PHONE NOT IN USE*
4	25.0 W-WESTBOUND	0	0.0 D-CELL PHONE NONE/UNKNOWN*
0	0.0 <-NOT STATED	4	25.0 <-NOT STATED
0	0.0 --DOES NOT APPLY	0	0.0 --DOES NOT APPLY
0	0.0 -INVALID CODES	0	0.0 -INVALID CODES

TASAS SELECTIVE RECORD RETRIEVAL
TSAR - PARTY SUMMARY

06/21/2007
02:16 PM

PRIMARY			OBJECT STRUCK			OTHERS			LOCATION OF COLLISION		
NUMBER	PCT	CODE	NUMBER	PCT	CODE	NUMBER	PCT	CODE	NUMBER	PCT	CODE
0	0.0	01-SIDE OF BRIDGE RAILING	0	0.0	01-SIDE OF BRIDGE RAILING	0	0.0	0	0.0	0	A-BEYOND MEDIAN OR STRIPE-LEFT
0	0.0	02-END OF BRIDGE RAILING	0	0.0	02-END OF BRIDGE RAILING	0	0.0	0	12.5	0	B-BEYOND SHLDER DRIVERS LEFT
0	0.0	03-PIER, COLUMN, ABUTMENT	0	0.0	03-PIER, COLUMN, ABUTMENT	0	0.0	0	0.0	0	C-LEFT SHOULDER AREA
0	0.0	04-BOTTOM OF STRUCTURE	0	0.0	04-BOTTOM OF STRUCTURE	0	0.0	0	31.3	0	D-LEFT LANE
0	0.0	05-BRIDGE END POST IN GORE	0	0.0	05-BRIDGE END POST IN GORE	0	0.0	4	37.5	4	E-INTERIOR LANES
0	0.0	06-END OF GUARD RAIL	0	0.0	06-END OF GUARD RAIL	0	0.0	1	6.3	1	F-RIGHT LANE
0	0.0	07-BRIDGE APPROACH GUARD RAIL	0	0.0	07-BRIDGE APPROACH GUARD RAIL	0	0.0	0	0.0	0	G-RIGHT SHOULDER AREA
0	0.0	10-LIGHT OR SIGNAL POLE	0	0.0	10-LIGHT OR SIGNAL POLE	0	0.0	0	0.0	0	H-BEYOND SHLDER DRIVERS RIGHT
0	0.0	11-UTILITY POLE	0	0.0	11-UTILITY POLE	0	0.0	0	0.0	0	I-GORE AREA
0	0.0	12-POLE (TYPE NOT STATED)	0	0.0	12-POLE (TYPE NOT STATED)	0	0.0	0	0.0	0	J-OTHER
2	12.5	13-TRAFFIC SIGN/SIGN POST	0	0.0	13-TRAFFIC SIGN/SIGN POST	0	0.0	0	0.0	0	V-HOV LANE(S)
0	0.0	14-OTHER SIGNS NOT TRAFFIC	0	0.0	14-OTHER SIGNS NOT TRAFFIC	0	0.0	0	0.0	0	W-HOV LANE BUFFER AREA
0	0.0	15-GUARDRAIL	0	0.0	15-GUARDRAIL	0	0.0	0	0.0	0	<-NOT STATED
2	12.5	16-MEDIAN BARRIER	0	0.0	16-MEDIAN BARRIER	0	0.0	0	0.0	0	<-NOT STATED
0	0.0	17-WALL (EXCEPT SOUND WALL)	0	0.0	17-WALL (EXCEPT SOUND WALL)	3	18.8	16	100.0	16	--DOES NOT APPLY
0	0.0	18-DIKE OR CURB	0	0.0	18-DIKE OR CURB	0	0.0	0	0.0	0	-INVALID CODES
0	0.0	19-TRAFFIC ISLAND	0	0.0	19-TRAFFIC ISLAND	0	0.0	0	0.0	0	
0	0.0	20-RAISED BARS	0	0.0	20-RAISED BARS	0	0.0	0	0.0	0	
0	0.0	21-CONCRETE OBJ (HDWL, D.I.)	0	0.0	21-CONCRETE OBJ (HDWL, D.I.)	0	0.0	0	0.0	0	
0	0.0	22-GUIDEPOST, CULVERT, PM	0	0.0	22-GUIDEPOST, CULVERT, PM	0	0.0	0	0.0	0	
0	0.0	23-CUT SLOPE OR EMBANKMENT	0	0.0	23-CUT SLOPE OR EMBANKMENT	0	0.0	0	0.0	0	
0	0.0	24-OVER EMBANKMENT	0	0.0	24-OVER EMBANKMENT	0	0.0	0	0.0	0	
0	0.0	25-IN WATER	0	0.0	25-IN WATER	0	0.0	0	0.0	0	
0	0.0	26-DRAINAGE DITCH	0	0.0	26-DRAINAGE DITCH	0	0.0	0	0.0	0	
0	0.0	27-FENCE	0	0.0	27-FENCE	0	0.0	0	0.0	0	
0	0.0	28-TREES	1	6.3	28-TREES	1	6.3	0	0.0	0	A-HAD NOT BEEN DRINKING
0	0.0	29-PLANTS	0	0.0	29-PLANTS	0	0.0	0	0.0	0	B-HBD - UNDER INFLUENCE
0	0.0	30-SOUND WALL	0	0.0	30-SOUND WALL	0	0.0	0	0.0	0	C-HBD - NOT UNDER INFLUENCE
0	0.0	40-NATURAL MATRL ON ROAD	0	0.0	40-NATURAL MATRL ON ROAD	0	0.0	0	0.0	0	D-HBD - IMPAIRMENT UNKNOWN
0	0.0	41-TEMP BARRICADES, CONES	0	0.0	41-TEMP BARRICADES, CONES	0	0.0	0	0.0	0	E-UNDER DRUG INFLUENCE
0	0.0	42-OTHER OBJECT ON ROAD	0	0.0	42-OTHER OBJECT ON ROAD	0	0.0	1	6.3	1	F-OTHER PHYSICAL IMPAIRMENT
0	0.0	43-OTHER OBJECT OFF ROAD	0	0.0	43-OTHER OBJECT OFF ROAD	0	0.0	0	0.0	0	G-IMPAIRMENT NOT KNOWN
0	0.0	44-OVERTURNED	1	6.3	44-OVERTURNED	1	6.3	0	0.0	0	H-NOT APPLICABLE
0	0.0	45-CRASH CUSHION (SAND)	0	0.0	45-CRASH CUSHION (SAND)	0	0.0	0	0.0	0	I-FATIGUE
0	0.0	46-CRASH CUSHION (OTHER)	0	0.0	46-CRASH CUSHION (OTHER)	0	0.0	1	6.3	1	< NOT STATED
0	0.0	51-CALL BOX	0	0.0	51-CALL BOX	0	0.0	15	93.8	15	--DOES NOT APPLY
0	0.0	98-UNKNOWN OBJECT STRUCK	0	0.0	98-UNKNOWN OBJECT STRUCK	0	0.0	0	0.0	0	-INVALID CODES
0	0.0	99- NO OBJECT INVOLVED	0	0.0	99- NO OBJECT INVOLVED	0	0.0	0	0.0	0	
12	75.0	V1 THRU V9 VEHICLE 1 TO 9	3	18.8	V1 THRU V9 VEHICLE 1 TO 9	3	18.8	0	0.0	0	
0	0.0	<< NOT STATED	0	0.0	<< NOT STATED	0	0.0	0	0.0	0	
3	18.8	-- DOES NOT APPLY	16	100.0	-- DOES NOT APPLY	16	100.0	0	0.0	0	
0	0.0	- INVALID CODES	0	0.0	- INVALID CODES	0	0.0	0	0.0	0	

A.6 – Example Table B Report

Page 1

California Department of Transportation
Table B - Selective Accident Rate Calculation

Location Description	Rate Group (RUS)	No. of Accidents / Significances				ADT Total MV+ or MVM	Actual		Accident Rates Average										
		Tot Fat	Inj F+I	Multi Veh	Wet Dark		Inj X-St	Fat	F+I	Tot Fat	F+I								
51 SHA 005 001.000 - 51 SHA 555 0.500MI H 54 4 0 2 2 2 1 2 0 57.0 10.4 0.000 .19 .39 0.019 .26 .60																			
0001-0001 2006-01-01 2006-12-31 12mo. R																			

Page 1

Table B Accident Records

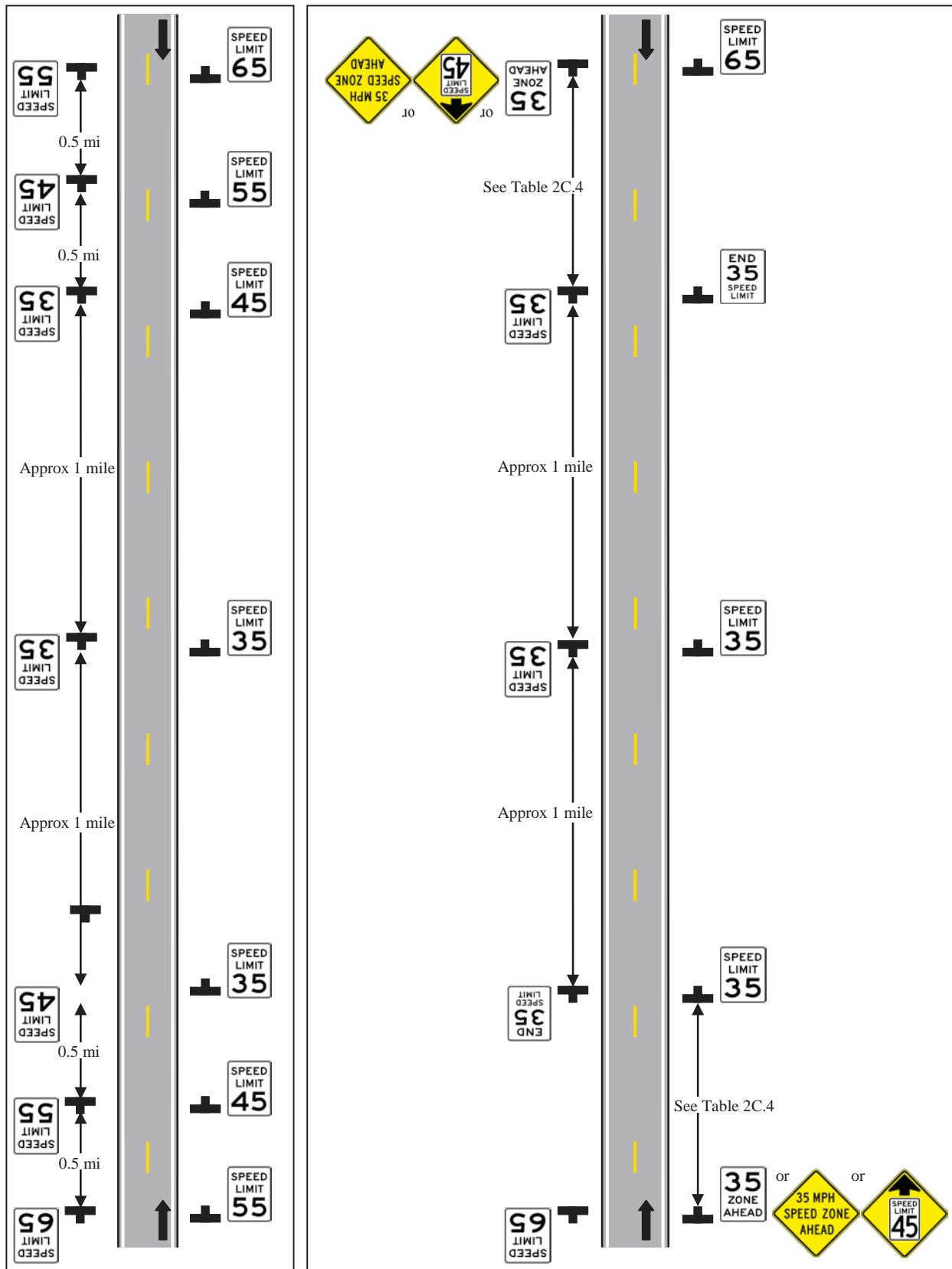
REQUEST- & LINE	ARS	P MILE	POST P T L H Y MM-DD-YY	ISD ACCIDENT FROA DATE	COMMON TIME ACCIDENT HHMM	ENVIR COND	PENR	RTNO	RTO MTR	PERSON	ADT	Total	Actual	Accident Rates
1 1 51 SHA 555		001.020	H - S 1 03-27-06	2122 925215730	5 B D B H D B 02	A S 1 C 00 00	V2F 16B	---	N< B A<					
1 1 51 SHA 555		001.020	H - S 5 12-01-06	1420 925214561	5 C A B H D F 01	G S 1 C 00 01	44F	---	N< B A<					
1 1 51 SHA 555		001.030	H - N 2 08-08-06	0359 925215175	5 A D A H D C 03	G N 1 C 00 00	V2F	---	N< B A<					
1 1 51 SHA 555		001.050	H - N 4 10-12-06	2125 925213432	5 A D A D A E 02	A N 1 C 00 01	01B V2D V4D	---	N< 5 A<					

A.7 – Regulatory Speed Zone Sign Placement



* Optional – place on left shoulder only where the median is of sufficient width to permit sign maintenance without lane closures

A.8 – Transition Zones



Appendix B – Sample Letters

B.1 – Sample Request for Temporary Traffic Control Speed Zone

Memorandum *Flex your Power!*

To: TRAFFIC OPERATIONS BRANCH CHIEF

Date: MMDD, YYYY

From: DESIGN ENGINEER PE or RESIDENT ENGINEER PE

Design Branch XX or Construction Office XX

Signature

Subject: Request for Regulatory Speed Zone for Construction Project 0000001234

To be used when the speed reduction is necessary only while workers are present. In accordance with the California Vehicle Code (CVC) Section 22362, a speed reduction of xx mph will facilitate construction and provide protection for workers while at work in the State right of way. The reduced speed limit shall be in effect only during working hours and signs will be covered when work is not in progress. The current posted speed limit in this segment is xx mph and the reduced limit will be xx mph.

To be used when the speed reduction is in effect full time due to roadway configuration. In accordance with the California Vehicle Code (CVC) Section 21367, a speed reduction of xx mph will facilitate construction and provide protection for workers and the public while the stage construction is in place. The roadway configuration will be modified in the following ways during stage x: (provide justification such as the following) a lane shift of 2 lanes will be in place, k-rail will be in place on both sides of the lane and the lane width will be reduced to 10 feet. The reduced speed limit shall be in effect only during stage x and signs will be removed when work is complete. The current posted speed limit in this segment is xx and the reduced limit will be xx mph.

Attachments: Plans, Specification and Estimate

B.2 – Sample Notification to Board of Supervisors/Public Hearing

MMDD, YYYY

Board of Supervisors
Abcd County
154 Main Avenue
Anywhere, CA XXXXX

Dear Board of Supervisors:

This letter is notification that the results of the Engineering and Traffic Survey performed by Caltrans indicate that the existing 45 mph speed zone on State Highway xx from P.M. XX.XX (a point approximately XXX feet north of ABC Drive) to P.M. XX.XX (a point approximately xxx feet north of DEF Road) should be raised to 55 mph.

As required by Section 22354.5 of the Vehicle Code, this letter serves as notice to allow you the opportunity to conduct a public hearing on the proposed speed limit increase, if you so desire. If you choose to have a public hearing, we will try to be available to attend the meeting to answer any questions which may arise concerning the proposed speed zone change. It is not our intent to make a formal presentation or run the hearing, if held.

Please check the appropriate statement on the bottom of this page and sign, date, and return this letter to the address by MMDD,YYYY. If we have not heard from you by MMDD,YYYY, we will assume no public hearing will take place and we will proceed with finalizing the changes in the existing speed zone.

If you have any questions, or would like to discuss the information gathered during the Engineering and Traffic Survey, we would be happy to meet with you at your convenience. You may contact me at (xxx) xxx-xxxx.

Sincerely,

Name here,
Title

_____ A public hearing is not necessary.

_____ Abcd County will conduct a public hearing for the segment referenced above. The public hearing will be held on date at time at address.

B.3.1 – Sample Order 1: Decreasing 55mph Speed Limit on State Highway

The California Department of Transportation, having determined upon the basis of an Engineering and Traffic Survey, that a speed limit of 55 miles per hour is more than reasonable and safe upon the portion of the State Highway hereinafter described, and that the speed limit hereinafter specified lower than 55 miles per hour is appropriate to facilitate the orderly movement of traffic and is reasonable and safe thereon; it is accordingly, **ORDERED**, that a speed limit of 40 miles per hour be and the same is hereby determined and declared on and for State Highway Route Dist-Co-Rte, beginning at P.M. XX.XX, a point approximately XX feet north of junction of SR-XXX & SR-ZZZ, and extending to P.M. XX.XX, a point XX miles north of ABC Street, a total distance of XX miles.

IT IS FURTHER ORDERED that appropriate signs giving notice of said speed limit be erected upon said State Highway to indicate the change in speed limit and that said speed limit shall be effective upon the erection of such signs.

This order is made pursuant to the current delegations of authority from the Director of Transportation to the District Director of Transportation to the undersigned Deputy District Director.

Any previous orders restricting speed limits on the above-described portions of said State Highway are herewith revoked.

Dated: _____

Name: _____

Deputy District Director

Maintenance & Traffic Operations

B.3.2 – Sample Order 2: Increasing 65mph Speed Limit on State Highway

The California Department of Transportation, pursuant to the provisions of Section 22356, of the California Vehicle Code, having determined, after consultation with California Highway Patrol and upon the basis of engineering and traffic surveys, that a speed limit of 70 miles per hour would facilitate the orderly movement of vehicular traffic and is reasonable and safe upon the Interstate Highway as described below, which Interstate highway segment is freeway, such determination is full consistent with, and in full compliance with Federal law; it is accordingly **ORDERED**, that a speed limit of 70 miles per hour be and the same is hereby determined and declared on and for State Highway Route Dist-Co-Rte beginning at Post Mile XX.XX, a point approximately XX feet west of the ABC Bridge(Br # xx-xxx) , to Post Mile XX.XX, a point approximately XX feet east of ABC Road, a total distance of XX miles.

IT IS FURTHER ORDERED that as agreed upon by Caltrans District xx and California Highway Patrol, appropriate signs giving notice of said speed limit be erected upon the so described Interstate above to indicate the change in speed limit and that such speed limit shall be effective upon the erection of such signs.

Any previous orders restricting speed limits on the above-described portions of said State Highway are herewith revoked.

Dated: _____

XXXXXXXXXXXX

Director

Department of Transportation District - xx

Endorsement

Pursuant to the provisions of Section 22356 of the California Vehicle Code, the department of California Highway Patrol acknowledges consultation with the California Department of Transportation and approval the maximum speed of 70 miles per hour contained in this order.

XXXXXXXX

DATE

Chief

California Highway Patrol

XXXXXX Division.

B.4 – Sample Transmittal Memo to Deputy Director

To: Name
Deputy District Director
Maintenance & Traffic Operations

Date: MMDD, YYYY

File: Dist-Co - Rte P.M. 7.01/7.61
Increase from 45 mph to 55 mph.

Dist-Co - Rte P.M. 5.41/7.01
Shorten 45 mph speed zone limit.

From: Name
Title

Subject: Increase Speed Limit on SR XXX north of Town

Attached, for your consideration, are orders to increase the existing speed limit of 45 mph to 55 mph on State Route XXX north of Town from PM XX.XX to XX.XX and to update the shortened 45 mph speed zone limit. In accordance with Section 22354.5(a) of the California Vehicle Code, consultation of this proposal was made with the California Highway Patrol and no objections were received. In accordance with Section 22354.5(b) of the California Vehicle Code, we sent a letter to the ABC County Board of Supervisors notifying them of this proposal on MMM DD, YYYY. This Board of Supervisors sent us a reply on MMM DD, YYYY indicating that they will not be holding a public hearing on this issue.

Approval of the attached new Orders is recommended. Please return the signed Order to the Traffic Operations Branch for further processing.

APPROVAL RECOMMENDED:

NAME

Title
Attachment

B.5 – Sample Transmittal Letter to California Highway Patrol

MMDD,YYYY

Dist.-Co-R -XX
30 mph Speed Zone
Town

Lieutenant name
California Highway Patrol
100 Abc Way
Town, CA XXXXX

Dear Lieutenant Name:

Enclosed for your information and files are three copies of the latest signed speed zone survey sheets, order sheets, and speed zone justification sheets on SR XXX in City of town in CCC County.

The following 30 mph zone is valid and the old order will continue in effect until the dates as follows:

Route XXX – P.M. XX.XX – XX.XX (30 mph) MMDD,YYYY

Where radar is used for enforcement, these engineering and traffic surveys satisfy the requirement for a seven-year review.

If you have any additional questions or concerns about these speed zones, please call Name at (XXX) XXX-XXXX.

Sincerely,

Name
Title

B.6 – Sample Cover Letter for Speed Survey to Public Person(s)

MMDD,YYYY

Dist- Co-Rte
PM –XX.XX-XX.XX
Various speed zones
Oak Bluff to Becket

Mr. Joe Public
P.O.BOX 1234
Becket CA -XXXXX

Dear Mr. Public:

This letter is in regard to your request regarding the speed survey on SR-XX at ABC Road. I am enclosing a copy of the speed survey for SR-XX in B Town.

If you have any additional questions or concerns about this speed survey, please call Name at (XXX) XXX-XXXX.

Sincerely,

Name
Title

B.7 – Sample Response Letter for Non-E&TS Area

MMDD, YYYY

Mr. XXX

Street address

City State and Zip Code

Dear Mr. XXX:

This letter is in response to your request for the engineering and traffic survey for the portion of US 395 north of Walker in Mono County California. My understanding is you were interested in the area about 5 miles north of the town of Walker.

In accordance with the California Vehicle Code (CVC) Section 22349, the maximum speed limit on two lane undivided conventional highways in the State of California is 55 miles per hour. The speed limit on this portion of US 395 is 55 miles per hour. Since the speed limit is set at the maximum speed allowed by the CVC, no speed survey is needed to support the speed limit.

Sincerely,

Signature

Title

Attachment California Vehicle Code Section 22349

B.8.1 – Justification Memo Sample 1

Memorandum *Flex your power!*

To: XXX
District Director or Deputy District Director
Caltrans District X

Date: MMDD, YYYY

From: XXX
District X Traffic Operations Engineer
Traffic Operations

Signature

Subject: US 395 Speed Limit

In accordance with the California Vehicle Code (CVC) sections 22348-22366, the 2006 California Manual on Uniform Traffic Control Devices (MUTCD) and Caltrans Policy Directive 09-04, an engineering and traffic survey was conducted from postmile (PM) 113.35 to PM 118.49, in and near Bishop, on US 395 in Inyo County in October 2009.

The MUTCD and Caltrans Policy Directive 09-04 recommend setting a speed limit at the nearest 5 mph increment to the 85th percentile speed of free flowing traffic. The MUTCD and Caltrans Policy Directive 09-04 also allow for speed limit reduction below the 85th percentile, where an engineering study indicates the need for a reduction in speed to match existing conditions with the traffic safety needs of the community and such reduction will facilitate the safe and orderly flow of traffic.

Other factors that may be considered when establishing speed limits include the following:

- A. Road characteristics, shoulder condition, grade, alignment, and sight distance;
- B. The pace speed;
- C. Roadside development and environment;
- D. Parking practices and pedestrian activity; and
- E. Reported crash experience for at least a 12-month period.

The following addresses Page 3 of 6 from the October 2009 speed study. The limits of page 3 are from Short Street (PM 115.34) to the US 395/US 6 junction (PM 116.35)

The northbound 85th percentile speed averages 30 mph. The northbound pace speed in this area averages 24-33 mph. The southbound 85th percentile speed averages 31 mph. The southbound pace speed in this area averages 23-32 mph. The annual average daily traffic count is 15,500. The current posted speed limit is within the current pace speed.

The current roadway consists of two 12-foot lanes in each direction separated by a 12-foot two way left turn lane and 2-4 foot shoulders with no parking allowed on either side of the road. There are at least 60 driveways and 11 intersections between Short Street (PM 115.34) and the US 395/US 6 junction. Many of these intersections are tee intersections and are not readily apparent to a driver. Each tee intersection has 11 conflict points and each 4-way intersection has 32 conflict points in a 5-lane cross-section.

The most recent 36-month accident history shows 24 total accidents. The total accident rate is slightly lower than the statewide average for this type of facility. Three of the 24 accidents involved a pedestrian being struck. One involved a motorcycle being struck. "Speeding" was the primary collision factor (PCF) in 54.2% of accidents. "Failure to Yield" was the PCF for 20.8% of collisions and "Other Violations" was the PCF in 16.7% of accidents. The most common type of accident is "Rear End" with 58.3%. The next most common is "Broadside" and "Auto/Pedestrian" with 12.5% each. 66.7% of accidents occur on the northbound side, 33.3% occur on the southbound side. In general, lower speed collisions are less severe than higher speed collisions. Higher speeds increase stopping distances and the energy that is dissipated in an accident. Higher speeds could raise the severity of the collisions occurring in this area. A 1999 study by the National Highway Traffic Safety Administration states the following; "...higher vehicle speeds are strongly associated with both a greater likelihood of pedestrian crash occurrence and more serious resulting pedestrian injury. It was estimated that only 5 percent of pedestrians would die when struck by a vehicle traveling at 20 miles per hour or less. This compares with fatality rates of 40, 80, and nearly 100 percent for striking speeds of 30, 40, and 50 miles per hour or more respectively."

After evaluating current critical and pace speeds it is recommended that a 25 mph speed limit be implemented to be in concurrence with section 2B.13 of the MUTCD. The 25 mph speed limit was obtained by a 5 mph reduction of the critical speed of 30mph due to the number of access points, reported collision experience, and pedestrian activity as described in Section 2B.13 of the MUTCD. This recommendation was discussed with the California Highway Patrol and they are in concurrence with this recommendation.

c: CHP
 File

B.8.2 – Justification Memo Sample 2

M e m o r a n d u m *Flex your power!*

To: **XXXXXX**
District Director OR Deputy District Director
Caltrans District X

Date: MMDD, YYYY

From: XXXXX
District X Traffic Operations Engineer
Traffic Operations

SIGNATURE

Subject: US 395 Speed Limit

In accordance with the California Vehicle Code (CVC) sections 22348-22366, the 2006 California Manual on Uniform Traffic Control Devices and Caltrans Policy Directive 09-04, an engineering and traffic survey was conducted from postmile (PM) 113.35 to PM 118.49, in and near Bishop, on US 395 in Inyo County in October 2009.

The following addresses Page 1 of 6 from the October 2009 speed study. The limits of page 1 are from the 65 mile per hour sign just south of Golf Club Drive (PM 113.35) to Schober Lane (PM 114.38.) This area is the transition zone from 65 mph to 45 mph.

The current roadside development on the east side of US 395 is rural residential and ranch land. The west side of US 395 is the Bishop Country Club Golf Course. The most recent 36-month accident history shows seven total accidents. The accident rate is lower than the statewide average for this type of facility. “Failure to Yield” and “Improper Turn” were the most common primary collision factors.

It is Caltrans practice to step down speed limits approaching lower speed zones in 1500 to 2500 foot intervals and 5 to 10 mph increments. This transition zone meets these criteria.

c: CHP
 File

B.9 – Letter to CHP Extending Survey to 10 Years

STATE OF CALIFORNIA----- CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION

DISTRICT 9

RIGHT CLICK [HERE] FOR ADDRESSES

PHONE (559) XXX-XXXX

FAX (559) XXX-XXXX

TTY 711

www.dot.ca.gov

Flex your power!

Be energy efficient!

MMDD, YYYY

Lieutenant name
California Highway Patrol
100 Abc Way
Town, CA XXXXX

Dear Lieutenant Name:

This letter is to inform you that the Traffic Operations Office of Caltrans District X has reviewed the speed zone survey for Highway XX from Postmile XX to XX, Zone #XX in and near the city of XXXXXX.

This letter documents the extension of the E&TS to 10 years. It has been determined that no significant changes have occurred within the limits of the Speed Zone. The existing 30 mph zone is valid and the old order will continue in effect until the dates as follows: Route XXX – P.M. R17.81 – R22.22 (30 mph) April 15, 2017. If you have any additional questions or concerns about this speed zone, please call Name at (XXX) XXXXXXXX.

Sincerely,

Name
Title

Appendix C – Glossary

When used in this manual, the following terms have the meanings shown below.

Advisory Speeds

Advisory speeds are determined primarily by physical and design characteristics of the roadway and/or a Ball-banking test. The setting of regulatory speeds, while also affected by physical and design factors, is determined in large part by existing free flow traffic speeds. Advisory speeds give motorists an advance warning of roadway design speeds. It is not a Prima Facie speed limit, is not an enforceable speed limit and is not based on the 85th percentile speed. R2-1 signs are not used to display the Advisory speed, typically W1 thru W4 warning signs are used.

Business District

Section 235 states that a business district is that portion of a highway and the property contiguous thereto (a) upon one side of which highway, for a distance of 600 feet, 50 percent or more of the contiguous property fronting thereon is occupied by buildings in use for business, or (b) upon both sides of which highway, collectively, for a distance of 300 feet, 50 percent or more of the contiguous property fronting thereon is so occupied. A business district may be longer than the distances specified in this section if the above ratio of buildings in use for business to the length of the highway exists.

In determining whether a highway is within a business or residence district, the following limitations shall apply and shall qualify the definitions in Sections 235 and 515:

- (a) No building shall be regarded unless its entrance faces the highway and the front of the building is within 75 feet of the roadway.
- (b) Where a highway is physically divided into two or more roadways only those buildings facing each roadway separately shall be regarded for the purpose of determining whether the roadway is within a district.
- (c) All churches, apartments, hotels, multiple dwelling houses, clubs, and public buildings, other than schools, shall be deemed to be business structures.
- (d) A highway or portion of a highway shall not be deemed to be within a district regardless of the number of buildings upon the contiguous property if there is no right of access to the highway by vehicles from the contiguous property.

Construction Zone

When authorized work is done in the roadway, ramps or recovery zone that affects motorists.

Decision Zone

On a high-speed approach to a signalized intersection (over 35mph), there is a length of roadway in advance of the intersection, commonly referred to as the “decision zone”, wherein drivers may be indecisive and respond differently to the onset of the yellow signal indication. When in the zone at the onset of yellow, some drivers may stop abruptly while others may decide not to stop, and perhaps even accelerate through the intersection. Such variation in driver behavior is conducive to the occurrence of collisions on the intersection approach. In some cases, drivers’ decisions to proceed through the intersection at the onset of yellow may cause a collision with vehicles on conflicting phases.

The most common locations for this area are:

1. When a poor or non-compliant E&TS is performed
2. When a speed is reduced well below the 85th percentile
3. When the posted speed is below the 50th percentile

The yellow interval in traffic signal timing is designed to allow drivers to decide either to stop or to drive through the intersection before the following red interval begins. When the speed and the location of the vehicle is such that the driver cannot stop and also cannot drive through in time, the vehicle is said to be in a dilemma zone. For a fixed speed v , there is a minimum distance before the vehicle can stop (the stopping sight distance), and there is a maximum distance that the vehicle can travel through during the yellow interval (the clearing distance). If the vehicle’s current distance to the intersection is shorter than the stopping sight distance but longer than the clearing distance, then it is in the dilemma zone. The greater the difference between the stopping sight distance and the clearing distance, the bigger the dilemma zone. See FHWA studies OH-2001/12 and Federal House of the Majority Leader Report from 2001.

Divided Highway

The definition of divided highway must be inferred from CVC Section 21651(a). It states: “Whenever a highway has been divided into two or more roadways by means of intermittent barriers or by means of a dividing section of not less than two feet in width, either unpaved or delineated by curbs, double-parallel lines, or other markings on the roadway...”

Engineer

A Professional Civil or Traffic Engineer licensed in the State of California and recognized by the California Department of Consumer Affairs.

Engineering Judgment

The evaluation of available pertinent information, and the application of appropriate principles, experience, education, discretion, Standards, Guidance, and practices for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by a Professional Civil Engineer Licensed in the State of California or by an individual working under the supervision of a Professional Engineer, through the application of procedures and criteria established by the engineer.

Engineering Study

The comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, engineering judgment, experience, education, discretion, Standards, Guidance, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study shall be performed by a Professional Engineer, or by an individual working under the supervision of a Professional Engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.

Engineering and Traffic Survey or E&TS

The complete package includes:

- (1) A cover sheet / title page.
- (2) A signature / P.E. stamp / acceptance with the effective date.
- (3) Justification / summary of finding including the consultation of local law enforcement and engineering officials.
- (4) Raw accident data such as TSAR or Table B summary page for a 3 year history for comparison with average or similar intersections.
- (5) Vehicle Speed Survey sheets for each area.
- (6) A declaration or order or ordinance approving the lowering from 55mph or 65mph (State roads) or raising from 25mph (local and county streets).
- (7) The Strip map.

These are the minimum documents in an E&TS. For a public document requests or when someone is contesting a ticket, the accident data can be omitted if the speed limit was not reduced because of accident data. See TOPD 11-05 for the release of records policy.

Free Flow

A condition of traffic where a vehicle's speed is not being influenced by anything other than the geometry of the roadway. Some of the conditions that exist in a Free Flow state are:

- Minimum 5 second gap between vehicles as the Highway Capacity manual defines delay as a percentage of vehicle headways less than or equal to 5 seconds.
- Appropriate distance for the vehicle to reach a steady velocity not influenced by start-up or slow-down speeds due to traffic signals, stop signs, or other traffic control devices.
- Not influenced by slow vehicles such as trucks or busses.
- Not influenced by enforcement or the perception of enforcement.
- Not influenced by construction or closures.
- Not influenced by inclement weather conditions.
- Not influence by a special event or the effects of that special event.

Prevailing speeds

The free flow speeds of vehicles on a roadway commonly collected in a Spot Speed Survey and used to determine the 85th percentile speed.

Prima Facie

A speed limit is Prima Facie when predetermined by statute, zoning, and local ordinance for areas such as schools, police, and fire stations; or once an agency has completed an E&TS and determined that 65 mph/55 mph is not safe and reasonable for the orderly movement of traffic, has determined an appropriate speed, and that appropriate speed has been posted on a R2-1 sign in the appropriate location. All speed limits in compliance with the CVC, established standards and procedures, and posted on regulatory signing (R2-1), are Prima Facie. A sign displaying a speed limit that has not been established by ordinance, code, or statute, nor has been reduced from the maximum speed by a proper and complete E&TS, is neither Prima Facie nor is it an official traffic control device.

Residence District

CVC Section 515 states a residence district is that portion of a highway and the property contiguous thereto, other than a business district, (a) upon one side of which highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures, or (b) upon both sides of which highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures. A residence district may be longer than one-quarter of a mile if the above ratio of separate dwelling houses or business structures to the length of the highway exists. All churches, apartments, hotels, multiple dwelling houses, clubs, and public buildings, other than schools, shall be deemed to be business structures.

Restricted Speed Zone

A length of roadway that has a speed limit set by E&TS below the statutory or prima facie maximum.

Roadside development

The area directly adjacent to the roadway. Examples are parks, residential or business districts, etc. These areas are typically zoned by local agencies. Studies such as FHWA—RD-98-154 show roadside development is the second most important factor when setting speed limits, behind only the 85th percentile speed.

Speed

The term “speed” is used in a number of applications:

- (a) Advisory Speed - a recommended speed for all vehicles operating on a section of highway based on the highway design, operating characteristics, and (noun) conditions.
- (b) Average Speed - the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.
- (c) Design Speed - a selected speed used to determine the various geometric design features of a roadway.
- (d) 85th Percentile Speed - the speed at or below which 85 percent of Free Flow vehicles travel. 85th percentile speed is always expressed as a whole number without decimal. The 85th percentile speed is recognized as a “safe and reasonable speed” for motorists to be traveling in normal conditions. May also be referred to as critical speed.
- (e) Operating Speed - the speed at which a typical vehicle or the overall traffic operates. Operating speed might be defined with speed values such as the average, pace, critical or 85th percentile speeds.
- (f) Pace Speed - the 10 mph increment of speed containing the largest number of vehicles.
- (g) Posted Speed - the speed limit shown on Speed Limit signs (R2-1).
- (h) Statutory Speed - a speed limit established by legislative action that typically is applicable for highways with specified design, functional, jurisdictional, and/or location characteristic and is not necessarily shown on Speed Limit signs.

Speed Limit

The maximum or posted speed allowed on a section of highway as established by law.

Speed Zone

A length of roadway selected for the measurement of free flow vehicles based on similar roadside development, number of lanes, zoning, and other common features. Usually includes one speed limit for a particular length of roadway.

Spot Speed Survey

The part of the E&TS that specifically refers to the measurement and collection of vehicle speeds of free flow traffic at a specific location.

Strip map

A plan view, aerial photo, or schematic drawing of the speed zone area with a legend and a profile plot of the 85th percentile, the lower end of the pace, the existing and proposed speed zones. The strip map should also include local land uses, major traffic generators, traffic control devices, number of lanes, type and width of division strip, existing regulatory and warning signs, roadway width, traffic volumes and accident rates.

Undivided Highway

CVC Section 22349 states “A two-lane, undivided highway is a highway with not more than one through lane of travel in each direction. Passing lanes may not be considered when determining the number of through lanes.”

Appendix D – References

D.1 – Federal Studies Summaries

D.1.1 – PUBLICATION NO. FHWA-RD-98-154 July 1998

There is evidence that crash risk is lowest near the average speed of traffic and increases for vehicles traveling much faster or slower than average. The occurrence of a large number of crashes involving turning maneuver partly explains the increased risk for motorists traveling slower than average and confirms the importance of safety programs involving turn lanes, access control, grade separation, and other measures to reduce conflicts resulting from large differences in travel speeds.

When the consequences of crashes are taken into account, the risk of being involved in an injury crash is lowest for vehicles that travel near the median speed or slower and increases exponentially for motorists traveling much faster

In general, changing speed limits on low and moderate speed roads appears to have little or no effect on speed and thus little or no effect on crashes. This suggests that drivers travel at speeds they feel are reasonable and safe for the road and traffic regardless of the posted limit.

In a survey of speed zoning practices, Parker (1985) found that all states and most local agencies consider the speed of traffic in setting speed limits. The primary factors considered in engineering studies to set speed limits were, in order of their importance:

- 85th percentile speed.
- Type and amount of roadside development.
- Accident experience.
- Adjacent Limits.
- 10 mph pace (i.e., speed range that contains the largest percentage of vehicles).
- Horizontal and vertical alignment.
- Design speed.
- Average test run speed.
- Pedestrians.

D.1.2 – Report No. FHWA-RD-92-084 October 1992

U.S. Department of Transportation Research, Development, and Technology

Federal Highway Administration Turner-Fairbank Highway Research Center

6300 Georgetown Pike

McLean, Virginia 22101-2296

The objectives of this research was to determine the effects of raising and lowering posted speed limits on driver behavior and accidents for non-limited access rural and urban highways. Speed and accident data were collected in 22 States at 100 sites before and after speed limits were altered. Before and after data were also collected simultaneously at comparison sites where speed limits were not changed to control for the time trends. Repeated measurements were made at 14 sites to examine short - and long-term effects of speed limit changes.

The results of the study indicated that lowering posted speed limits by as much as 20 mi/h (32 km/h), or raising speed limits by as much as 15 mi/h (24 km/h) had little effect on motorist' speed. The majority of motorist did not drive 5 mi/h (8 km/h) above the posted speed limits when speed limits were raised, nor did they reduce their speed by 5 or 10 mi/h (8 or 16 km/h) when speed limits are lowered. Data collected at the study sites indicated that the majority of speed limits are posed below the average speed of traffic. Lowering speed limits below the 50th percentile does not reduce accidents, but does significantly increase driver violations of the speed limit. Conversely, raising the posted speed limits did not increase speeds or accidents.

One primary reason for setting speed limits lower than speed considered safe and reasonable by the majority of motorists is based on the belief that lower speed limits reduced seeds and accidents. Also it has been frequently suggested that most motorists drive 5 to 10 mph (8 to 16 km/h) over the posted speed limit, so lower limits should be established to account for this condition.

Conversely, it is believed that raising the speed limit increases speeds and accidents. For example, following a severe accident, one of the most frequent requests made to highway jurisdictions is to lower the speed limit. These requests are founded on public knowledge that accident severity increases with increasing vehicle speed because in a collision, the amount of kinetic energy dissipated is proportional to the square of the velocity. Simply stated, when a vehicle is involved in a crash the higher the vehicle speed, the greater the chance of being seriously injured or killed. However, as noted by a number of researchers, the potential for being involved in an accident is highest when traveling at speed much lower or much higher than the majority of motorists.

D.2 – Missouri Department of Transportation Study RI08-025

The RI08-025 study determined that although the variable speed limits had helped to reduce some congestion and crashes, enforcement had been minimal and the public was either angry or confused about the potential of enforcement.

The complete study is available at the following location:
<http://library.modot.mo.gov/RDT/reports/Ri08025/or11014rpt.pdf>

D.3 – California Department of Motor Vehicles Driver Hand Book

The California Driver Handbook is available at the following location:
<http://www.dmv.ca.gov/pubs/pubs.htm>

D.4 – Automobile Club of Southern California

The AAA brochure Effective Speed Zoning is available at the following location:
www.AAA.com/roadahead

D.5 – Institute of Transportation Engineers

ITE information on Speed Zoning can be found at this location:
http://www.ite.org/standards/speed_zoning.pdf

D.6 – Transportation Research Board

The TRB has published numerous studies on speed zoning and speed limits. TRB documents can be viewed by searching the TRB this location: <http://www.trb.org/Main/Home.aspx>

D.7 – California Manual on Uniform Traffic Control Devices

The California Manual on Uniform Traffic Control Devices can be found at this location:
<http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/>

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Appendix E – California Vehicle Code Sections

This list includes section titles of CVC which relate to speed limits and speed limit signs.

CVC Section 235: Business District

CVC Section 240: Business and residence Districts: Determination

CVC Section 440: Official Traffic Control Device

CVC Section 515: Residence District

CVC Section 627: Engineering and Traffic Survey

CVC Section 21100: Local Regulation Scope

CVC Section 21100.5: Local Regulation Scope: City on a Natural Island

CVC Section 21107.9: Local Regulation within Mobilehome Parks

CVC Section 21115: Local Regulation Regarding the Use of Golf Carts on Highways

CVC Section 21350: Placement of Traffic Control Devices by Department of Transportation

CVC Section 21351: Placement of Traffic Control Devices by Local Authorities

CVS Section 21351.3: Use of Units of Measurement by Local Regulation

CVC Section 21353: Local Regulation Affecting State Highway Traffic

CVC Section 21357: Speed Signs for Business or Residence Districts

CVC Section 21358: Speed Signs at District Boundaries

CVC Section 21359: Speed Signs for Special Areas

CVC Section 21367: Traffic Control: Highway Construction

CVC Section 21369: Speed Signs Ratified

CVC Section 21370: Regulation of Traffic: Construction Zone

CVC Section 21400: Department of Transportation General Practices Regarding Traffic Control Devices

CVC Section 22348: Excessive Speed and Designated Lane Use

CVC Section 22349: Maximum Speed Limit

CVC Section 22350: Basic Speed Law

CVC Section 22351: Speed Law Violations

CVC Section 22352: Prima Facie Speed Limits

CVC Section 22353: City of Norco: Equestrian Safety

CVC Section 22354: Decrease of State Highway Speed Limits

CVC Section 22354.5: Speed Limit Change: Consultation and Consideration Requirements

CVC Section 22355: Variable Speed Limits

CVC Section 22356: Increase of Freeway Speed Limit to 70 Miles Per Hour

CVC Section 22357: Increase of Local Speed Limits to 65 Miles Per Hour

CVC Section 22357.1: Decrease Near Children's Playgrounds

CVC Section 22358: Decrease of Local Speed Limits

CVC Section 22358.3: Decrease on Narrow Street

CVC Section 22358.4: Decrease of Local Limits Near Schools or Senior Centers

CVC Section 22358.5: Downward Speed Zoning

CVC Section 22359: Boundary Line Streets

CVC Section 22360: Maximum Speed Limit on Local Highway Linking Districts

CVC Section 22361: Multiple-Lane Highways

CVC Section 22362: Speed Limit Where Persons at Work

CVC Section 22363: Restrictions Because of Snow or Ice Conditions

CVC Section 22364: Lane Speed Limits

CVC Section 22365: Prima Facie Speed Limit: South Coast Air Quality Management District:
Local Ordinances

CVC Section 22366: Notice of Authorization to Increase Maximum Speed Limit

CVC Section 22400: Minimum Speed Law

CVC Section 22401: Traffic Signals

CVC Section 22402: Bridges and Structures

CVC Section 22403: Local Bridges and Structures

CVC Section 22404: Revision of Speed Limit on Bridges and Structures

CVC Section 22405: Violations on Bridges and Structures

CVC Section 22406: Maximum Speed for Designated Vehicles

CVC Section 22406.1: Commercial Motor Vehicle Driver: Penalties

CVC Section 22406.5: Tank Vehicle Driver Penalties

CVC Section 22407: Decreasing Truck Speed Limit

CVC Section 22409: Solid Tire

CVC Section 22410: Metal Tires

CVC Section 22411: Maximum Speed for Motorized Scooters

CVC Section 22413: Decreasing Speed Limit on Grades

CVC Section 38310: Speed Laws for Off-Highway Vehicles

CVC Section 40800: Vehicle and Uniform Used by Officers

CVC Section 40801: Speed Trap Prohibition

CVC Section 40802: Speed Traps

CVC Section 40803: Speed Trap Evidence

CVC Section 40804: Testimony Based on Speed Trap

CVC Section 40805: Admission of Speed Trap Evidence

CVC Section 40806: Police Reports

CVC Section 40807: Use of Evidence Regarding Departmental Action

CVC Section 40808: Speed Trap Evidence

CVC Section 41100: Speed Restriction Signs

CVC Section 41101: Official Signs and Traffic Control Devices