Setting Speed Limits:
Yesterday, Today and Tomorrow

Presented CTCDC Meeting 02/23/2006

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Forward:

Setting speed limits that meet the safety needs of the government, advances the publics' general welfare, reduces accidents and ensures motorists' due process is possible. The answer that will meet the safety needs of the state while providing due process is already the very foundation of our nation's traffic control laws. All we have to do is apply them. This paper will outline our governing traffic control law's foundation, *Best Practice*, and provide constructive guidance for the traffic engineers to make us all safer.

California has the opportunity here in adopting their MUTCD supplement, combined with their legacy speed trap law, to lead the nation in setting meaningful guidelines for proper engineering studies to be used to determine posted limits, and more importantly, reduce accident rates vis-à-vis better guidance to the practitioners.

The nexus for this paper was a comment made by a traffic engineer at the July 2005 meeting of the California Traffic Control Device Committee. He asked for an agenda item for the November meeting to review traffic-engineering requirements in regards to setting speed limits. The source of his consternation: his surveys had been found in violation of California's speed trap laws because he had not complied with its mandates.

Having reviewed the facts of this case that was overturned, notable was his lack of understanding of the governing law, its foundations and *Best Practice*. Irrespective of the fact he also violated California's speed trap law, he didn't appear to understand the very object of an engineering study, or how and why speed limits should be set. Even more disconcerting is the fact that this is not an isolated case, either. It's emblematic of the complete break down in *Best Practices*, here, and around the world. Simply stated, current practice meets neither the safety needs of the public nor due process.

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Primary Engineering Tenets and Rationales in regards to Speed Limits:

The following excerpt is from a speech given to engineers about their responsibilities in establishing proper and realistic speed limits. It is accredited to Mathew C Sielski, former International Institute of Transportation Engineers President (ITE), and bestowed the highest honor that the ITE can give for lifetime achievement to their profession. The often-quoted text below can be found in many state DOT handouts and websites.

> *One of the most important responsibilities of traffic engineers is the establishment of proper and realistic speed limits. Our profession has long recognized that most citizens will behave in a reasonable manner as they go about their daily activities.*
>
> *Thus, traffic laws that are based upon behavior of reasonable motorist are found to be successful. Laws that arbitrarily restrict the majority of motorist encourage wholesale violations, lack of public support, and usually fail to bring about desirable changes in driving behavior. This is especially true of speed limits.*
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> *Our profession, since the early 1930's, based its speed zoning techniques on several concepts deeply rooted in our American system of government and law, namely:*
>
> > *1. Driving behavior is an extension of our social attitude, and the majority of drivers respond in a safe and reasonable manner, as demonstrated by their good driving records.*
> > *2. The careful and competent actions of a reasonable person should be considered legal.*
> > *3. Laws are established for the protection of the public and the regulation of unreasonable behavior of an individual.*
> > *4. Laws cannot be effectively enforced without the consent and voluntary compliance of the public majority.*
>
> *Our profession also recognizes that an emotionally aroused public will reject these fundamentals and will rely on more comfortable and widely held misconceptions, such as:*
>
> > *1. Speed limit signs will slow the speed of traffic.*
> > *2. Speed limit signs will decrease accidents and increase safety.*
> > *3. Raising a posted speed limit will cause an increase in the speed of traffic.*
> > *4. Any posted speed limit must be safer than an unposted speed limit, regardless of the prevailing traffic and roadway conditions.*
>
> *Before and after studies have proven conclusively that these are definitely misconceptions. Unfortunately, in too many instances, influential pressures succeed in the application of such unrealistic regulations.*

The battle to control the setting of speed limits is literally killing us!

From an engineering perspective an "Engineering Study" is, in effect, a periodic safety audit of roadway or highway system, and the setting of reasonable speed limits is a byproduct of that process. Engineering studies have been required on all roadways open to public travel since 1988. The following sections will clearly explain the rationales behind setting speed limits and *Best Practice*. Before that though, we must make it clear regarding speed limits, this is not an intellectual debate per se, because this truly is a safety issue. Because the statutory minimum required establishing a speed limit is an engineering study, a safety review of a roadway system. They are not being done, and worse NHTSA has undertaken a successful campaign to eliminate their importance altogether. Public safety has clearly been sacrificed to special interests, and they are literally killings us by the thousands to maintain their power and financial base. Strong words. Yes! But true, and here are some of the facts for background.

Engineering studies create data. Data can be analyzed for voracity because they require an actual safety review of a roadway or roadway system. All traffic control decisions are to be based on this factual finding, applying nationally recognized Best Practices, and not local or state traditions. Every entity in the country has been certifying they have been doing engineering studies on every roadway and bike path open to public travel, since 1988, per federal safety laws, in order for the states to receive federal highway funds. That being said, many states do not do them at all, never have, and even the states that do them, they do not do them on the majority of their roads. The few studies that are done rarely are comprehensive, read never. The FHWA has a policy of no standards oversight or enforcement. Public entities do not like studies because they cost money, the special interest do not like them because they quantify what the public consensus' safe for conditions speeds, which are usually 10 to 15 mph over most posted limits.

We have the money to enforce the laws 24/7 365 days a year - never shown to reduce accidents as practiced. Conversely, we do not have the money to assure the governing law is complied with to establish the safety value to be posted. Why? This requires an engineer or his staff to take a few days every 5 years to look at traffic speeds, volumes, accident rates, and traffic control to make sure it is meeting the needs of traffic – the proven way to reduce accidents.

The Science of Traffic Engineering has been hijacked because its collective body of knowledge was seen as a direct threat to the special interests of a few. The engineers' lost their oversight authority and responsibility, and more significant because of the net results has been the publics' general welfare being sacrificed. The USDOT standards oversight consist of a wink here, a blind eye there, a removal a key safety standard to stop challenges of unsafe practices or to assure no standards could be enforced.

Consequently, 18 years after federal law mandated uniformity of all traffic control in the nation, regardless of jurisdiction or state lines, to be based on a actual review of the particular roadway being regulated, conducting true mandated comprehensive engineering studies are such rare events, they are virtually non-existent. This lack of leadership and guidance is not by accident either. It's the result of the USDOT's disdain for standards enforcement and complete indifference to the dire consequences these policies have inflicted on society. A dichotomy of purpose, between their charter that placed the Department of Transportation in the Presidents cabinet to oversee highway infrastructure and safety; compared to their actions to assure their own self interest first, then their special interest constituents and those that profit from these enterprises - to the detriment of the "general public welfare". When aggregated, the USDOT oversight of our highway safety standards has resulted in a human catastrophe.

Thus, the USDOT is directly responsible for tens of thousands of deaths as well as unimaginable mayhem and tragedy for the families of hundreds of thousands, and more. Of the 40,000 deaths a year on our roadways, at least a quarter of them are caused by the USDOT's negligent oversight. The shear numbers of unnecessarily killed and injured is just staggering. Nevertheless, when you look at each roadway and current practices, and extrapolate the results to a nation, it becomes an incontrovertible fact. USDOT policies are killing 10,000 plus men, women, and children a year!

Under the USDOT stewardship of our Nation's standard, despite the indisputable core tenets of the traffic engineering profession's body of knowledge, the setting of speed limits has digressed into a minimalist exercise to comply with substandard regulations; or an exercise in reverse engineering to sustain an otherwise unobtainable outcome; or an act of the omnipresent and growing practice of posting of arbitrary and capricious invented (unsafe) values.

Again, the shear numbers of unnecessary deaths and injuries are a national scandal, but this paper is about California, a state where the law purports to require engineering studies. Whereas, in fact, current practices have digressed in most cases into nothing more than a perfunctory shell of reverse engineering to support under posted limits, that masquerade as engineering studies. Every time an attorney sends us a study to review, it's the same. These purported studies fail to meet the safety needs of the public and deny due process. Universally, they are contrived to report lower than actual speeds via selective or inadequate data collection.

The MUTCD begins the definition of an engineering study as a comprehensive analysis, not a spot speed survey or a document that lists items required without an in-depth review or analysis. Most studies are taken from as little as a 10-minute sample of traffic or in an incredible manner where every key component of the processes is extremely susceptible to subjectivity or manipulation. This week's example of a purported study that was sent to us for review was from the City of Los Angeles. It was recertified in 2004, originally performed in 1997, and the reported accidents noted were from 1991-1993. Major Arterial, critical speeds from 50 vehicle samples taken from proscribed impeded flow points; one adjacent to school close to an intersection, and the other at a roadway choke point where it goes from 96 feet to 68 feet wide. The form did have a tally of speeds, but the math used to support the reported 85th percentile speed was creative math, because the tally sheet didn't support the lower number shown. In this section, the majority of the accidents were occurring at one intersection, whereas, all the accidents were attributed to speed over the entire section. What was done to mitigate for the accidents? Nothing! Their end work product resulted in a speed trap, while the unsafe conditions continue to kill and injure motorists more than a decade after they were documented to exist!

Current federal law presumes, and mandates, that an engineer oversee the process and that all roadways be periodically reviewed, whereas in fact, the overwhelming majority of our roadways have never had an engineering study. For smaller entities there is no traffic engineer to consult. Therefore, the state or local political entities just simply invent the value to post, and/or assign unqualified public works staff or the local police to determine what the posted limit should be, all are proscribed practices.

How does the FHWA plan on solving this wide spread non compliance, non enforcement and anarchy in uniform application and practices dilemma and known chief cause of accidents that are otherwise preventable? By removing the mandate and adding additional arbitrary and capricious categories of speed limit signs and all traffic control devices based on proscribed local political conjecture in the next MUTCD, again, to the peril of all.

Make no mistake about it, poor engineering practices and the lack of safety reviews is the greatest threat to motorists, not speed, drunk drivers, road rage etc, and these unsafe conditions couldn't exist, except with the full support of the USDOT.

> ***Study: Bad roadways big factor in traffic deaths***
> *http://www.cnn.com/2003/US/06/23/dangerous.roads/index.html*
> *From Kathleen Koch CNN Monday, June 23, 2003 Posted: 5:07 AM EDT (0907 GMT)*
>
> *WASHINGTON (CNN) -- A new study finds roadways -- not driver error or faulty vehicles – to be a significant factor in crashes that claimed more than 24,000 lives between 1998 and 2001.*

Some believe the Reader's Digest Magazine and AAA's numbers here cannot be supported because of the small sample size. (http://www.rd.com/content/openContent.do?contentId=17988) What aren't in dispute are the accident reductions that were obtained, and when this program was later expanded to other locations, the results were the same. More importantly, what the AAA of Michigan failed to realize, what they were observing was an omnipresent legacy of unsafe practices, no standards or access management oversight, or the mandated critical roadway safety audits being done. Nor did their estimates include whole categories of like unsafe practices that have become institutionalized.

Here, too, is a quote from a study that confirmed engineering remedies DO reduce accidents; notable because it is also missing-in-action in the federal reference knowledgebase as it did not support their "Stop Red Light Running" automated enforcement agenda. Automated enforcement demands that a traffic control deficiency be first quantified, then remain uncorrected. Such unsafe conditions become the financial viability foundation that the automated systems require to exist.

> ***BIG RESULTS FROM SIMPLE FIXES***
> *http://www.aaafoundation.org/pdf/NovDec99.pdf*
>
> *The program has produced astonishing results: During the first 27 months of the four demonstration projects in Detroit, crashes decreased by 47 percent, with a 50 percent reduction in injuries. "The interesting part of the program is that most of these very large crash reductions have been done with low-cost projects," Feber says. "You don't have to spend a million bucks."*

If we have hard data supporting the efficacy of engineering countermeasures, why aren't these successes being heralded? The answer is $afety, not safety.

It is absolutely inconceivable how the agency charged with championing *Best Practices* has undertaken the lead in a campaign to eliminate *Best Practice* altogether. The new MUTCD purports to authorize a complete cessation of studies and dissolution of standards mandates.

Regardless of the dedicated work of many FHWA engineers, or if you agree with our assertions or not, it is a moot point because the end effect is the same. Under the current FHWA's stewardship, our prior *Best Practice* standards have been decimated. It becomes an extremely deadly combination when added to the fact that most roadways in the country have never had a study in the first place. Especially since the overwhelming majority of what few studies that are done are not engineering studies at all as defined by the MUTCD.

1. Significant numbers are nothing more than contracted spot speed surveys of as few as 50 vehicles, over as little as a 10-minute period, and tallied with creative math
2. Reporting all vehicles speeds, rather than the mandated free flowing speeds
3. They use radar/lidar, which in and of itself has been documented to result in lower unrepresentative speeds being reported
4. Extremely subjective because the surveyor picks and chooses which vehicles to include. In court testimony it has become crystal clear they are instructed to chose locations and/or receive some other guidance not to count too many faster moving vehicles
5. Most common violation is they measure from proscribed locations: chokes points, stop signs and traffic signals, school zones when kids are out, intersections, curves, includes slower vehicles entering/exiting the stream, and use other locations chosen to preclude higher traffic speeds, etc.
6. They contain no review of hazards or efficacy or condition of existing traffic control devices.
7. No site-specific review of accidents, by location or cause, or no review whatsoever.
8. Conducted by laypersons, including police departments who also set the limits.

These are their safety audits, meant to comply with the law for the next 7-10 years, and this represents the *Best Practice* for our nation? Moreover, the few engineering studies (safety audits) that are being done apply both poor and/or unauthorized engineering and traffic control practices. Consequently, the only known remedy to preventable accidents is not part of our highway safety programs, anywhere.

More incredulous, of those accidents that are preventable, the overwhelming majority are clearly design problems. Under the new wording and focus within the USDOT and the NHTSA FARS (Federal Accident Reporting System) system, all accidents are attributed solely to driver error; with no mention, whatsoever, of engineering countermeasures or faults, which are the major cause.

When you state this in plain English it means that for almost two decades now the FHWA's inaction and gross oversight negligence has been directly responsible for in excess of 10,000 deaths a year and tens of thousand more injuries. Why? A significant portion of the answer is the politics behind sustaining an estimated 50,000,000 citations being issued each year to motorists that, according to FHWA itself, are driving safe for conditions! In the battle between the well being of special interests, government agencies and their funding vs. the lives of the people, the people have clearly lost!

The source of this ignorance is a concerted and very successful effort by the USDOT to intentionally dilute and undermine *Best Practice*, combined with a heretofore refusal to support their staff when they attempt to garner compliance.

Consequently, contemporary practitioners no longer have reliable knowledge resources to draw upon, nor guidance based on fact, or realize that the MUTCD is governing law in regards to traffic control. Even more incredulous, the FHWA/NHTSA went so far as to sponsor speed limit workshops around the country to discredit *Best Practices*. During these day-long events, no subject matter experts, whatsoever, on setting limits were presenters, nor did anyone mention that the MUTCD is controlling law at these conferences. No wonder practitioners and their political overseers wrongly believe their own personal opinion, or the local government, and/or state statutes are the final authority.

For safety and due process to be achieved, the following best practices are absolute requirements:

1. That all traffic control in the Nation has one appearance and expectation on all roads open to public travel regardless of jurisdiction type or classification
2. That all traffic control decisions be based only on nationally recognized fully vetted Best Practice
3. That this process is to be supervised by licensed professionals applying points 1 and 2 without exception
4. If the licensed practitioner has an idea for improving existing practice, there is procedure prescribed in the MUTCD to request permission from the FHWA HOTO to experiment and document the results
5. That periodic comprehensive reviews of all roadways shall be done to ascertain traffic volumes, speeds, accidents, roadway characteristics and the efficacy and condition of existing traffic controls; this shall be documented
6. This safety audit shall contain action items noting those areas or conditions that may need remedies to further improve flow, sight distances, volumes, guidance or hazard mitigation

Note: To further promote safety, Congress adopted 23 USC 409 so that this information could not be used in a tort action either; therefore, there is no credible impediment to documenting forthcoming suggestions or remedy solutions.

These are the very foundation to safer roads and reducing preventable accidents. With "The Highway Safety Act of 1966" Congress put into motion a highway safety plan that required all traffic control devices on public roadways in the nation be based on sound engineering principles and practices. Congress also required this safety plan to have a common "basis in fact" determination, appearance and application, regardless of state lines or classification of jurisdiction.

In this Act, Congress entrusted this solely to licensed traffic engineering professionals and their institutions. The prescribed process requires all changes in the law be an improvement in practice. It requires studies to test each thesis, peer review and verification before a standard, practice or procedure can be incorporated into Title 23 et al. It also requires that ALL traffic control device use be contingent upon full compliance with the Code of Federal Regulations and its National MUTCD, without exception! It is a single, universally applied engineering standard, with federal statutory requirements in appearance, application, procedure and practice.

These tenets of the engineering profession have been perverted to facilitate special interest or to deflect oversight responsibilities away from the FHWA. Over the last decade, the overseers of our nation's safety policies have systematically removed the very foundations of prior *Best Practice*. This purging of any and all roadway engineering countermeasures and safety mitigation based programs was included in the 1998 rewrite of the "Highway Safety Act of 1966", where the USDOT shifted the onus of highway accidents to the driver and away from poor engineering practices.

This attack on *Best Practice* by the USDOT has also uncovered some interesting facts. A recent USDOT sponsored/preordained study designed to undermine *Best Practice* and support for speed cameras, the Arizona DOT surveyed 50 states on their current speed limit setting practices. *(RE: Final Report 551: Actual Speeds on the Roads Compared to the Posted Limits October 2004)* Of the 48 that replied, no two had the same practice. Not one had complied with either *Best Practice* or the law. NONE!

The irony here is that this USDOT study quantified their own gross negligence and oversight failure. In 1988, the uniformity mandate expanded from look and shape of all traffic control devices to include application and expectation based solely on *Best Practice* for all traffic control on roadways and bicycle paths in the nation, regardless of state lines or jurisdiction. In this survey, the USDOT sponsored study couldn't even find two states that used the same procedures, let alone comply with the law. Even more incredulous, in another study 40 years after their mandate to bring the look and shape of all devices under one standard, noncompliant devices and errant practices are the norm. So much so, that a recent FHWA synopsis on device applications filled over a hundred pages with samples of noncompliant device use.

What you read here is largely applicable to California. After reviewing hundreds of studies, all have had serious problems regardless of entity type, including Caltrans, and virtually all could be and/or were successfully challenged in court. Moreover, none met the safety needs of the public. Worse, even the conscientious engineering practitioners who attempted to do the right thing, do not comply. For example, Oakland just spent over 250 thousand dollars bringing their surveys current. However, upon review, all can still be successfully challenged in court. It's the same in every jurisdiction we've examined across the country.

Here is an insightful comment from a discussion of design, operating and posted limits. It sums up current practice.

> ***2003 NCHRP Report 504 reports a new factor.***
> *… "To an open-ended question," respondent engineers placed "politics" way above the engineering factors as the number one reason for "deviation" from the 85 percentile operating speed.*
>
> *With this political reality of "politics" controlling sound engineering traffic engineering studies, compliance with the MUTCD becomes impossible."*

Just because the USDOT refuses to enforce its own standards and provides no real oversight, this doesn't prevent motorists from challenging illegally adopted traffic laws. A facsimile of an official traffic control device is unenforceable as a matter of law, absent the minimum statutory requirements to determine the safety value posted, or if it is based on an arbitrary and capricious value. In accidents where someone dies, it has become popular practice to charge motorists involved with either manslaughter or homicide. If this is the case, what should we do with public officials and/or employees that exceed their power and/or through expedience fail to perform their duties? If it's indisputable that properly done and applied safety audits (engineering studies) can substantially reduce accidents and we do not act when it's our professional duty and mandate to do so, aren't the resulting deaths and serious injuries negligent manslaughter, or homicide?

Can California turn back the clock and rescind its engineering requirements as was advocated at the CTCDC meeting? In a word, no, because the core components of California's speed trap law and the old Caltrans Traffic Manual's guidance have been included in the minimum federal safety requirements (*Best Practice*) - MUTCD.

If you want safer roadways and to ensure due process for the motorists, then conduct comprehensive engineering studies, because it is the only way you will ever be able to realize the long coveted safer roads and sustainable fair laws, as well!

There is hope! There are some engineers who will not be deterred by the gauntlet of pressure to deviate from their professional responsibilities. In doing so, these unheralded heroes make us all safer. Our honoree's (below) work habits and processes have made a significant difference. These practices need to be studied and shared as a foundation for all to benefit from. Celebrating the contribution of these dedicated individuals cannot be overstated.

Special Note of Honor: Jerry Gabriel P.E., Caltrans District 9 Operations Engineer. His dedication to his professional duties as an engineer comes first. Consequently, he has saved many lives and hundreds of injuries. Regardless of the posted limits, local political pressure, or if the rules require a study, Gabriel has made sure that all traffic control in his district meets the needs of traffic by reviewing all roadways as to prevailing speeds, sight distances, hazard mitigation and accident causes by location. He then applies prescribed remedies, tracks the results, and makes necessary adjustments as required. At every location where the indicated traffic control remedies have been applied, accident reductions have been dramatic! Gabriel is a model of what every engineer should aspire to be. Thank You, Jerry, for a job well done!

Legal Status of a Speed Limit Sign:

The Manual On Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration (FHWA), is the national standard for traffic control devices, signs, signals, markings, and other devices used to regulate, warn, or guide traffic. To implement the 1966 Highway Safety Act and laws related to federal aid highways, the Federal Highway Administration adopted regulations requiring that all traffic control devices on all streets open to the public conform to national standards prescribed in the MUTCD.

Whereas as a matter of law, a "Speed Limit Sign" is a federal device (federal designation R2-1) whose use by California and all political subdivisions therein is conditional upon compliance with governing law, and the minimum statutory requirements of Title 23, United States Code, Section 109(d) and Title 23, Code of Federal Regulations (CFR), Part 655.601 through 655.603, and its National Manual on Uniform Traffic Control Devices (MUTCD)[1], Speed Limit Sign; Section 2B.13[2].

Moreover 2B.13 contains a SHALL precondition 'after an engineering study' and it SHALL be done under the supervision of an engineer applying nationally recognized practices and standards that the engineer could cite as opposed to local or state legacy practices, and it SHALL be documented. An unambiguous mandate that the safety value posted on a speed limit sign have a uniformly determined factual foundation based on vetted *Best Practice*.

> ***Section 1A.13 in this Manual***
> ***"Standard:***
> *Unless otherwise defined herein, or in the other Parts of this Manual, definitions contained in the most recent edition of the "Uniform Vehicle Code," "AASHTO Transportation Glossary (Highway Definitions)," and other documents specified in Section 1A.11 are also incorporated and adopted by reference.*
> ***The following words and phrases, when used in this Manual, shall have the following meanings:"***
>
> ***"… 24. Engineering Study*** *- the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, 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 an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented."*

Under Title 23, since 1988, the safety value of the number posted on all posted speed limits required a supporting engineering study except those posted per Congress' National Maximum Speed Limit. In 1995, when Congress repealed the exceptions, all speed limit posting requirements returned to this 1988 extant law (Title 23), no exceptions.

> Sidebar: Notwithstanding, the USDOT (FHWA) instituted changes in the MUTCD to stop all challenges of noncompliant traffic control device use by removing all standard safeguards. Including to never require an engineering study (safety audit) of a roadway as

1 2003 Edition MUTCD, November 2003
2 MUTCD Section 2B.13 Speed Limit Sign (R2-1)

the foundation of traffic control decision, or for that matter, engineering judgment, ever, without review. In recent examples, they removed prior *Best Practice* standards for stop sign warrants, and signal timing efficacy standards that required them to meet the safety needs of traffic. Engineering studies and periodic safety audits of roadways were also removed as well as the newest initiative to end *Best Practice*, the elimination of engineering studies or judgment foundations for the installation of traffic controls devices. This shirking of their oversight responsibilities and deviant policies are directly responsible for thousands of deaths and tens of thousands of injuries each year. We hold, in time, the courts will overturn these changes as an egregious abuse of agency discretion (5 USC 706). All of these acts, and many more, are irrefutably known to be unsafe practice, and incompatible with Congress' mandate of one appearance, expectation and application based on vetted *Best Practice*.

These are funded mandates. California certifies compliance[3] in exchange for federal highways funds[4], therefore it cannot claim states rights[5] in their application.

Federal regulations require that all numeric values posted to speed limit signs must be based on a factual foundation before they can be codified into law. If the state is to post a numeric value, it must first be validated by a traffic engineering study and then be codified into law. Not the other way around. The state of California has skipped or circumvented the federal law requirements of engineering studies to post the correct legal speed limits and then codify the limits into law. Any invented value is arbitrary and capricious and unenforceable as a matter of law.

ARBITRARY:

1: depending on individual discretion (as of a judge) and not fixed by standards, rules, or law
2 a: not restrained or limited in the exercise of power
b: marked by or resulting from the unrestrained exercise of power
3 a: based on preference, bias, prejudice, or convenience rather than on reason or fact
b: existing or coming about seemingly at random or by chance or as an unreasonable act of individual will without regard for facts or applicable law

Example: Irvin v. Hobby, 131 F. Supp. 851 (1955) and Under section 706 of the Administrative Procedure Act, a court shall set aside an agency's action, findings, or conclusions determined upon review to be arbitrary.

CAPRICIOUS:

1: governed or characterized by impulse or whim: as
a: lacking a rational basis
b: likely to change suddenly
2: not supported by the weight of evidence or established rules of law

5 USC § 706. Scope of review

To the extent necessary to decision and when presented, the reviewing court shall decide all relevant questions of law, interpret constitutional and statutory provisions, and

3 US 23 cfr 630.112(a)
4 US 23 cfr 630.112(a)
5 Pennhurst v. Halderman, 451 U.S. 1, 17 (1981). Federal Power Commission v. Colorado Interstate Gas Co., 348 U.S. 492, 501-502 (1955).

determine the meaning or applicability of the terms of an agency action. The reviewing court shall—

(1) compel agency action unlawfully withheld or unreasonably delayed; and

(2) hold unlawful and set aside agency action, findings, and conclusions found to be—

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

(B) contrary to constitutional right, power, privilege, or immunity;

(C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;

(D) without observance of procedure required by law;

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or

(F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

In making the foregoing determinations, the court shall review the whole record or those parts of it cited by a party, and due account shall be taken of the rule of prejudicial error.

Government (prosecutors) must set an example of enforcing and obeying the laws. Case law to the same effect, e.g., *Service v Dulles, 354 US 363; 77 S Ct 1152; 1 L Ed 2d 1403 (1957)* and *Glus v Eastern District Terminal, 359 US 231, 232; 79 S Ct 760, 762; 3 L Ed 2d 770, 772 (1959)* which make clear that a plaintiff cannot rely on its own wrongdoing at the starting point of a process. This is a violation of due process and prosecutors have professional responsibility for due process of the law.

In addition, under the Commerce Clause, a state cannot adopt regulations substantially affecting interstate traffic without compelling research that supports that regulation. Therefore, a regulation adopted by the legislature or purported authorities to use a federal device, or a state or local statute that affects interstate commerce absent a sustainable foundation, is void. *450 U.S. 662; Kassel v. Consolidated Freightways Corp., No. 79-1320*

Further, *STATE OF NEVADA, PETITIONER V. SAMUEL K. SKINNER, SECRETARY OF TRANSPORTATION, ET AL. No. 89-696,* the 9th District affirmed federal supremacy over state statues regarding speed limits.

/9/ Petitioner cites two sources in support of its contention that regulation of highways is a "traditional State function." Its reliance on both is misplaced. Far from recognizing an exclusive state power over maximum rates of speed, the statute petitioner cites -- 23 U.S.C. 145 -- simply expresses Congress's decision to permit the States to determine which highway projects shall be federally funded. The statute thus emphasizes precisely the cooperative federal and state control over the highways on which the court of appeals relied; it is entirely consistent with Congress's determination in 23 U.S.C. 154 that federal funding would be available to a State only if it conformed to the 55/65 mph speed limits. See Pet. 11-12. Nor do the cases cited by petitioner (Pet. 12-13) that have adverted to the power of the States to regulate their own highways support petitioner's contention that States have exclusive constitutional power over their highways. Both cases cited by petitioner, Bibb v. Navajo Freight Lines, Inc., 359 U.S. 520, 523 (1959), and Raymond Motor Transp., Inc. v. Rice, 434 U.S. 429, 444 (1978), struck down state highway regulations under the dormant Commerce Clause. They thus necessarily establish that there is a substantial federal interest – exercisable by Congress if it chooses to do so -- in regulation of the nation's highways. See Pet. App. 24a.

The Supremacy Clause (Article VI, paragraph 2) of the Constitution of the United States provides:

"This Constitution, and the laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the authority of the United States, shall be Supreme Law of the land; and the Judges in every state shall be bound thereby, any thing in the Constitution or Laws of any state to the contrary notwithstanding."

The Supreme Court of the United States has described the preemptive effect of the Supremacy Clause as follows:

*"The Supremacy Clause of Article VI of the Constitution provides Congress with the power to pre-empt state law. Preemption occurs when Congress, in enacting a federal statute, expresses a clear intent to pre-empt state law, * * * when there is outright or actual conflict between federal and state law, * * * where compliance with both federal and state law is in effect physically impossible, * * * where there is implicit in federal law a barrier to state regulation, * * * where Congress has legislated comprehensively, thus occupying an entire field of regulation and leaving no room for the States to supplement federal law, * * * or where the state law stands as an obstacle to the accomplishment and execution of the full objectives of Congress." Louisiana Public Service Comm. v. FCC, 476 U.S. 355, 368-69, 106 S Ct 1890, 90 L Ed 2d 369 (1986).*

According to the Court, "[t]he underlying rationale of the pre-emption doctrine, as stated more than a century and a half ago, is that the Supremacy Clause invalidates state laws that 'interfere with, or are contrary to, the laws of congress.'" Chicago & N.W. Trans. Co. v. Kalo Brick & Tile, 450 U.S. 311, 317, 101 S Ct 1124, 67 L Ed 2d 258 (1981) (quoting Gibbons v. Ogden, 9 Wheat 1, 211, 6 L Ed 23 (1824)).

Speed Limit Sign Use in California – Noncompliant:

California practices DO NOT meet the safety needs of the public, nor do they protect motorists' due process. Under federal law, engineering studies have been required to be performed periodically on all roadways and bicycle paths open to public travel in the Nation since 1988. In engineering terms, an engineering study is synonymous with a safety audit of a particular section of highway.

Engineering studies, AKA 'speed surveys' as practiced in California, DO NOT meet the *Best Practice* requirements of federal law nor are they done on all roadways in the state. There is no such federal exemption for this practice nor can the FHWA authorize an exemption, either, even if they should purport to permit it in the MUTCD. To do so otherwise would return traffic control to unfounded local political conjecture or legislative whim. An act such as this is irreconcilable with their primary Congressional safety mandate of uniformity regardless of jurisdiction or state lines based on vetted *Best Practice*, and the Supreme Court rulings regarding factual foundations, and interstate vehicle regulations under the Commerce Clause.

It is critical that any regulation adopted by California require an engineering study to determine what the public's safe-for-condition speed is, and that it be quantified for the highest unencumbered speed sections of a roadway, at multiple representative locations, for each direction, independently.

These measurements then become the primary design criteria for all traffic control decisions. This process SHALL be documented under law, and this record shall also include a complete inventory of all traffic control devices, accident reports, and site inspection logs to determine if there are prevailing problems where the traffic control devices and/or sight distance are inadequate or there are too many entry points causing confusion, etc.

Signal timing is to be based on the prevailing approach speed - approximately 1 second of yellow for every 10 miles per hour of approach speed. Therefore, on its face, a posted limit 5 mph or more below the actual prevailing speed of traffic would result in signal timing that is inadequate to meet the needs of traffic, thereby giving the cross traffic a green when known entries are still occurring. Under the current practice, invented values that clearly do not represent prevailing approach speeds or are obtained from unrepresentative locations that are further rounded down are permitted. All of these purported permitted practices are both inadequate, and unsafe.

Worse, there is virtually no oversight on signal timing practices either. Each entity is left to their own devices regardless of how errant their practices have become. *Best Practice* demands that the engineer adjust the timing until they can meet the needs of traffic, and review the efficacy of timing periodically to assure it's meeting the traffics' needs. This is not practiced nor even acknowledged in California's guidelines, particularly at the for-profit red light camera locations. Again, California's signal timing practitioner guidance oversight fails both safety and due process.

Curve warning and passing exclusion zones must be based on the highest speed sections. The measured prevailing speed is supposed to determine the length of a no passing zone or if an advisory advance warning is needed. If the posted number is too low, the exclusion zone is shorter than what is required, or the warning is inadequate, if marked at all. Consequently, motorists are led to believe it is still safe to pass when it is no longer the case. A blind spot on a

vertical or horizontal curve may not get posted, or an entry point may have inadequate sight distance and is left that way.

Caltrans has also removed permissive passing for considerable distances where it is safe to pass causing motorists to become frustrated and ignore the traffic control devices, thereby leaving them on their own to determine when it is safe. Where in fact, passing then occurs where it is unsafe to do so. Inappropriate use of traffic control devices is explicitly prohibited in the MUTCD. Particularly since on these problematic high accident rate sections the traffic control devices were set for speeds unrepresentative of the actual speeds of traffic. This is the known primary contributor to high accident rates in the first place.

Likewise, homogenous results cannot expose any potential problems or hazard that may exist from a particular direction. When doing an evaluation of specific locations, all decisions should be based on the prevailing speed, by direction of travel rather than unrepresentative low speeds, invented values and conjecture, are an unsafe practice and why the surveys are required.

> *Example: Curve or signal at end of downhill or long section of roadway where approach speeds are high, as opposed to the opposite direction where they may be lower. If the true approach speeds are an unknown, safety will be compromised.*

The reported speed samples are not only totally inadequate and unrepresentative in California, they have never been measured on a significant percentage of their roads. When surveys are done, they have allowed spot samples done with either radar or lidar to suffice. The spot surveys using radar and lidar have long been known to cause speeds to be underreported and are extremely susceptible to subjectivity as to which vehicles the operators choose to monitor and include in the survey. It has also become painfully obvious during court testimony, that those charged with collecting the data are not trained in its use, or how cosine angles affect the displayed speeds, nor are their devices certified.

As you read through this section we're sure you've begun to understand why we are winning so many court cases across the country. Nobody is following the law, and each jurisdiction feels they are the exception. Well, the courts are ruling otherwise.

Conducting true engineering studies has its cost benefits, too. Congress, in 1998, passed 23 USC 409 to further support engineering studies/safety audits. It provides that during the process to evaluate a section of highway to improve its safety, none of the information can be used against the agency/public entity in a tort action[6]. Therefore this analysis can be frank, and include recommenced remedies without the fear of litigation. Because federal law requires an engineering study, these studies can qualify for this tort exemption if done properly in accordance with federal laws.

What the prior California Traffic Manual attempted to do was to give traffic-engineering practitioners sound guidance; guidance the federal MUTCD is clearly lacking. Another irreconcilable oversight deficiency by the FHWA in carrying out Congress' mandate of uniform appearance, application and expectation based on *Best Practice* regardless of state lines or jurisdiction.

6 Pierce County, Washington, Petitioner v. Ignacio Guillen, Legal Guardian of Jennifer Guillen and Alma Guillen, Minors, et al.

The California legislature needs someone to inform their legislative council that under Title 23, all traffic control laws must first meet the minimum statutory requirements of the MUTCD, and the US Supreme Court's interpretation of the Supremacy and Commerce Clauses on interstate traffic regulations. In addition, irrespective of the CTCDC, Caltrans is the ultimate custodian of *Best Practices* within California. Under Congress' mandate at the state level, Caltrans has been charged with compliance within the state because each time California receives a federal highway fund check, they certify that all roadways within the state are compliant with the MUTCD. The federal remedy to enforce practice compliance within California is to withhold federal highway funds regardless of the entity type or jurisdiction classification which has violated the law. Therefore, California should empower Caltrans with statewide compliance responsibility and provide them with the tools to reign in errant practices.

California legacy of mandated speed surveys on most roadways has set the foundation and climate to sustain meaningful practitioner guidance and compliance; the adoption of California's supplementary MUTCD can provide the platform for this needed reform.

85th Percentile, Human Nature, Posted Limits, Relative Risk and How they Relate

Basic Tenets of Speed Laws:

Laws protect the public by regulating unreasonable or unsafe actions. Actions of a reasonable person should be legal. Most people drive in a safe and reasonable manner. Laws cannot be effectively enforced without the public consent and voluntary compliance.

It's the responsibility of the highway agencies or local authority to post limits on the basis of an engineering study for that particular section of highway, and that they be set to indicate the maximum reasonable and safe speed during off peak free-flowing optimum conditions, where there has been found to be a need. Posted limits need be fair, be related to risk, be credible, and be accepted by drivers and not determined by the opinion of one or a few and only enforce control over unreasonable behavior.

When a speed limit is warranted, with few exceptions, they should be prima facie and/or variable. Prima facie and variable speed limits recognize that conditions vary during a day and subject the motorists to penalties only when their speed in excess of the limit is a hazard to others under the conditions then existing with due regard to actual hazards. Prima facie limits acknowledge that even when limits are set at reasonable levels, there is a band of speed greater than the limit that is safe and no one posted speed limit can represent the maximum safe speed for all conditions.

The setting of speed limits, while assuring both optimum public safety and fair laws, is a team effort. The team includes the science of traffic safety, represented here by *Best Practice*. The licensed practitioner, the traffic engineer, is charged with applying their professions' vetted knowledgebase to meet the needs of the traffic. The political body may ask the practitioner for solutions or action items to be reviewed. Upon review of the permitted solutions, the political body decides which prescribed solutions they would prefer to apply and then codifies them into law. Law enforcement enforces the laws and maintains order. Finally, the courts adjudicate the law and the due process of the citizens.

Federal law assigns the duty of determining what the safety value posted on a speed limit sign is to licensed engineering practitioners. There is no authority granted in Congress' safety mandate for a state to post an INVENTED NUMERIC on an official traffic control device. Any speed limit, whether the limit is established by legislative or administrative action must have a factual foundation. A political body cannot express an engineering opinion. Only a licensed engineer can after a finding-of-fact (engineering study), applying accepted national practices. Title 23 of the US Code requires uniform application of this National Standard (MUTCD) to be applied the same everywhere. Therefore, since 1988, only the application of recognized and accepted national practices is acceptable and the engineer must be able to articulate which national standards, research findings, or practices were used in the findings.

All accidents aren't preventable, but those that are, are predictable:

Preventable accidents also have common root causes that public policy can reduce.

Roadway Design and Engineering Practice: There is a direct correlation between accident rates and the roadway design and the application of traffic control devices to meet the needs of motorists, particularly at the flow conflict points and alignment changes. The methods used to warn for hazards and/or facilitate traffic egress, ingress or convergence is one of the most critical factors in reducing accidents. Notwithstanding, if these friction points are too close to each other, rates increase exponentially. Once the stream clears a flow conflict point the accident rate drops precipitously, and they become rare events for all causes. Therefore, the accident rate of a particular section of highway is determined by its design and the traffic engineering solutions applied to guide and facilitate the traffic's needs.

Engineering Studies (Safety Audits) and Federal Preemption: Title 23 and its MUTCD is a unique twist on federal preemption. Federal law requires a fair and factual review of a particular roadway because this is the only known way to provide optimum safety for the state and motorists alike. The local licensed traffic engineer is the professional that is assigned to evaluate the potential risk, and to apply those nationally recognized/vetted remedies that will safely guide the motorist with adequate advance notice and/or to mitigate the risk. It mandates each roadway be evaluated based on local conditions, as found.

Therefore, it is critical the survey determine what the public's safe-for-condition speed is. It must be measured and quantified for the highest, unencumbered speed sections of a roadway, at multiple representative locations, for each direction, independently. These measurements then become the primary design criteria for all traffic control decisions. The traffic engineer is required to do a complete inventory of all traffic control devices, collect all accident reports, do a site inspection to determine if there is prevailing problem where the traffic control devices and/or sight distances are inadequate and/or there are too many entry points causing confusion. This is how accident rates are reduced.

Speed Limits: The speed of traffic is self-regulating. The flow becomes uniform as congestion increases and the speed of traffic is not affected or influenced by 'Maximum' posted speed limits. Nor are the nature and type of accidents that do occur influenced by maximum limits. Where higher speeds are found, the higher speeds have been found to be, in fact, safe. Maximum speed limits have no effect on accidents or traffic speeds, whereas, correctly established 'Minimum Speed Limits' and 'Keep Right Except to Pass' guidance have been shown to reduce accident rates by reducing traffic stream friction.

The safest speed on interstates is the mean plus 12 mi/h, and the very fastest drivers risk is still less than those driving at or below current interstate speed limits. Once clear of urban areas, speed differential risk becomes negligible except for the slowest drivers.

Flow Management: Safety is found in flow management and assuring that motorists are informed in a timely manner as to the conditions ahead such as exits, hazards etc. – for the speeds they are driving! Flow conflict points and alignment changes are where the majority of preventable accidents occur. Examine all locations as to remedies to reduce flow friction and improve guidance and accidents WILL decrease dramatically.

Flow friction causes accidents and disrupts/reduces the throughput capacity of a highway. Slow driving as a safety strategy is a myth. Those that encourager this behavior make our roads less safe. Those that follow this ill-advised advice to drive significantly below the prevailing speed place themselves, and other road users, in eminent peril. Slow drivers have the highest accident-involvement rates; those that are traveling faster than the average have the lowest. This slow driving safety myth has infected the uninformed truck fleet owners who wrongly believe if they put speed governors on their fleets they will make them safer. Not only does the resulting increase in flow chaos cause more accidents, but on rural 2 lane roads, they become an extreme danger to all, including the trucks themselves. These slow moving trucks will dramatically increase the number of hazardous over-takings, while at the same time, make passing for their vehicles insanely unsafe, because the likelihood of a governed vehicle making a safe pass is dramatically reduced. Whereas, a truck moving with the flow of traffic has been shown to be the safest practice.

Engineering countermeasures represent the only true solution to preventable accidents because enforcement has proven to be ineffectual. A design error cannot be corrected with enforcement. The supervising engineer has a duty to correct a dangerous condition when that agency has actual or "constructive" notice of the hazard. At a minimum, they must quantify the nature of the hazard and place the indicated remedies on their agency's action list.

Facts: Those traveling faster than the average, regardless of roadway classification, have the lowest accidents rates. The insurance industry has found that high performance vehicles with 200 horsepower or more, when compared to those with 200 horsepower or less, have the lowest accident, injury and claim rates. The 85th percentile is the safest speed on low speed roads, when the 90th percentile exceeds 50 miles per hour it becomes the safest speed. Where the highest speeds are found, the public's consensus, by their collective actions, have found these higher speeds to be safe. What is more, FHWA research has found that the most limits are posted 10 to 15 below the safest speed and the primary target of enforcement are those that are otherwise driving safely.

Focusing our scarce resources on those that are the least likely to be involved in an accident, on our best roadways, is pure folly and will never reduce accident rates. By definition under normal conditions, to be speeding the driver's path has to be unencumbered or they are traveling with the flow; either situation exhibits the lowest risk behavior. Conversely, a slow moving vehicle creates flow conflict and chaos for its entire trip. Moreover, these uninformed or passive-aggressive drivers are clearly the highest risk to public safety. Begging the question, why do we target enforcement on the least likely to be involved and unsafe behavior lauded, and refuse to fund proper engineering studies or empower traffic-engineering practitioners to make us safer?

California's Interstate Safety and Flow Management Albatross: Legacy truck speed limits and the complete lack of meaningful slower traffic keep right laws are California's greatest obstacle to meaningful flow, capacity, and accident reductions. California has built an expansive network of conjoining two-lane-highways, AKA the interstate system (8 lane/4 each direction). Number 1 and 2 lanes are heavily occupied by motor vehicles and the less used number 3 and 4 lanes are primarily used by trucks and vehicles trying to pass the congested traffic in the number 1 and 2 lanes. There is no semblance of normal flow until the roadway exceeds 5 lanes in each direction. Even then, the faster moving vehicles have to constantly drop to the number 2, 3, 4 or 5 lanes to clear flow impediments. Or even worse, on the roadways with 3 or less lanes in one direction driving a motor vehicle becomes, a single file, exercise in patience. Passing on right, roadway capacity reductions, higher than what otherwise would be expected accident rates, and chaos, are byproducts of California's poor flow management policies.

The folly of the widely ignored ‘Slower Traffic Keep Right’ signs in California self-evident. Who does it apply to if a hundred percent of the traffic in the number 1 lane is exceeding the posted limit? No one! Whereas, ‘Keep Right Except to Pass’ conveys a clear message. It has had the desired affect everywhere it has been employed and applies to everyone regardless of speed. A simple change can dramatically improve flow and reduce flow chaos!

California’s legacy 55 mph truck limit is unsupported by all known research, particularly when compared to the current real world speeds being recorded on their roadways. By design, trucks and cars with trailers are regulated to maintain speeds up to 30 mph or more below the prevailing free-flowing speeds on most highways; hence the reluctance of any motorists to move right into the right 2 lanes. Why has no one challenged this? It could easily be found void in federal court when combining the tenets of the Highways Safety Act of 1966 et al, arbitrary and capricious case law, and the Commerce Clause.

Preventable accident reductions come from good stewardship of vetted *Best Practice*s and a mindful eye towards improved methods. Slow driving DOES NOT equate to safer driving, however, flow management, good guidance, yielding, and courtesy does! These factors should be the cornerstone of our safety programs.

Excerpts from salient examples between speed facts versus myths:

The following study from Nebraska clearly states the unintended, yet known, consequences of under posting speed limits where the traffic control devices and remedies are not based on true free flowing speeds.

Nebraska Department of Road, NDOR
University of Nebraska Lincoln,
Department of Civil Engineering College of Engineering and Technology:
Research Report No. TRP-02-26-92
Evaluation of Lower Speed Limits on Urban Highways:

"SAFETY EFFECTS
The results of the analysis of the accident experience in speed zones indicate that zones with posted speed limits equal to the reasonable speed limits proposed by the NDOT method of speed zoning are safer than zones posted with limits that are 5 and 10 mph below the reasonable speed limits. Speed zones with speed limits 5 mph below the reasonable speed limits were found to have 5 percent more accidents than zones with reasonable speed limits. Speed zones with speed limits 10 mph below the reasonable speed limits were found to have 10 percent more accidents than zones with reasonable speed limits. Therefore, the speed zones on state highways in urban areas should be posted with reasonable speed limits proposed by NDOR method in order to minimize the numbers of accidents in the speed zones. Speed limits lower than the reasonable speed limits should not be posted."

Chapter 8, California State Traffic Manual:
"Speed limits established on the basis of the 85th percentile conform to the consensus of those who drive highways as to what speed is reasonable and prudent, and are not dependant on the judgement of one or a few."

Chapter 8, California State Traffic Manual: (continued)
"Further studies have shown that establishing a speed limit at less than the 85th percentile (Critical Speed) generally results in an increase in accident rates."

Washington State DOT website:
"… people don't automatically drive faster when the speed limit is raised, speed limit signs will not automatically decrease accident rates nor increase safety, and highways with posted speed limits are not necessarily safer than highways without posted limits.

National Motorists Association, 2000, Montana Paradox
Summary of the effects of no daytime speed limits:

1. *Fatal accident rates on these highways reached an all time low in modern times*
2. *The frequency of multiple vehicle accidents dropped 5 percent on 2 lane highways with no posted limits*
3. *Seat belt usage rose to 88% percent with only a secondary enforcement law*
4. *Posted limits and their enforcement had either no effect or a negative effect on traffic safety*
5. *As predicted by the engineering models, traffic speeds did not significantly change and remained consistent with other western states with like conditions*

6. The people of Montana and its visitors continued to drive at speeds they were comfortable with which were often speeds lower than their counterparts on high density urban freeways with low posted limits

7. The theory behind posting speed limits on this classification of road is to reduce conflicts in traffic flow, thereby reducing accidents

MONTANA PARADOX: Is that the desired safety effect from posting speed limits was achieved by removing them.

Nationally accepted practices:

Are those practices that are articulated as standard or guidance within the national MUTCD or adopted by reference, therein. Adopted by reference are those that have been peer reviewed, accepted as guidance or recommended by AASHTO, FHWA and the ITE, etc. It is not the personal opinion of an engineer or local practice. The engineer's duty is to apply accepted national practice to the best of their ability and be able to articulate which practice was applied and why.

Davey L. Warren
Office of Safety and Traffic Operations R&D
Federal Highway Administration
NHTSA Speed Management Team

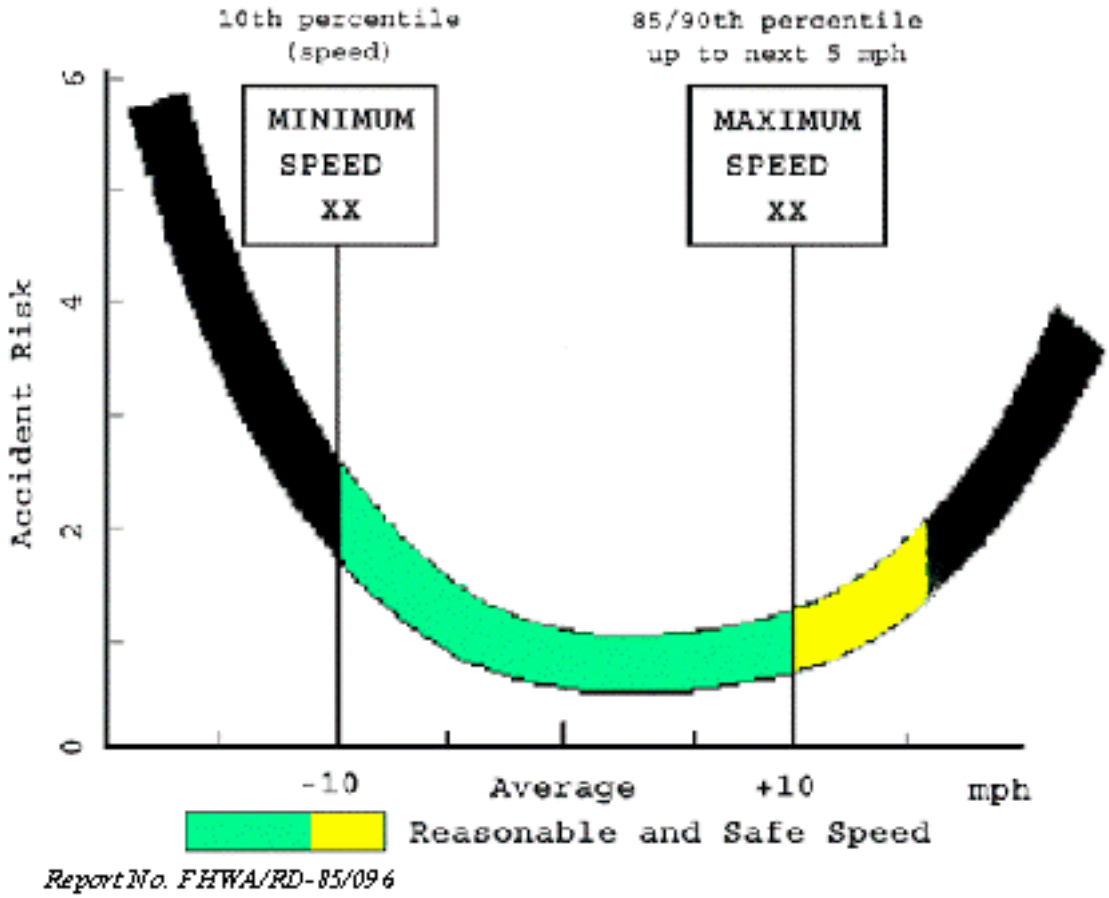
SPEED MANAGEMENT WORKSHOP
Excerpts;
Must be considered:
• Trucks 3 mph slower
• Speeds vary 4-8 mph over a 24-hr day

Recommended Practices:
• 24 hr free flow speed
• Round up
• 1/2 mile interval
• 500 ft from jct. & curves
• Dry roads, typical traffic
• No other adjustments

Federal Highway Administration
Report No. FHWA/RD-85/096 Technical Summary, "Synthesis of Speed Zoning Practice" which states:
"Based on the best available evidence, the speed limit should be set at the speed driven by 85 to 90 percent of the free-moving vehicles rounded up to the next 5 mph increment. This method results in speed limits that are not only acceptable to a majority of the motorists, but also fall within the speed range where accident risk is lowest."

"No other factors need to be considered since they are reflected in the drivers speed choice."

The following FHWA chart, which accompanied this summary, shows the reasonable and safe speed to be up to 16 miles per hour over the average speed. Most speed limits are posted below the average speed.



Report No. FHWA/RD-85/096

AASHTO

A 1969 "Resolution of the annual meeting of the American Association of State Highway Officials"

"The review of existing practices revealed that most of the member departments use, primarily, the 85th percentile speed. Some agencies use the 90th percentile speed, and of secondary consideration are such factors as design speed, geometric characteristics, accident experience, test run speed, pace, traffic volumes, development along the roadway, frequency of intersections, etc."

"On the basis of the forgoing review, the Subcommittee on Speed Zoning recommends to the AASHTO Operating Committee on Traffic for consideration as an AASHTO Policy on Speed Zoning that:

The 85th percentile speed is to be given primary consideration in speed zones below 50 miles per hour, and the 90th percentile speed is to be given primary consideration in establishing speed zones of 50 miles per hour or above. To achieve the optimum in safety, it is desirable to secure a speed distribution with a skewness index approaching unity"

Institute Of Transportation Engineers; (urban highways)
ITE Committee 4M-25, Speed Zone Guidelines:
"Thus, the overriding basis (from a safety perspective) for speed zoning should be that the creation of the zone, and the speed limit posted results in an increase in the percentage of motorists driving at or near the 85th percentile speed."

"A third rationale is the need for consistency between the speed limit and other traffic control devices. Signal timing and sight distance requirements, for example, are based on the prevailing speed. If these values are based on a speed limit that does not reflect the prevailing speed of traffic, safety may be compromised."
ITE Committee 4M-25, Speed Zone Guidelines: (continued)

"2. The speed limit within a speed zone shall be set at the nearest 5 mph increment to the 85th percentile of free flowing traffic or the upper limit of the pace of the 10 mph pace."
"In no case should the speed limit be set below the 67th percentile speed of free flowing traffic."

1990 ITE PUB# PP-020 (sponsored by FHWA and AASHTO)
"It would be premature to draw any firm conclusions since the research is still underway. However the findings to date suggest that, on average, current speed limits are set too low to be accepted as reasonable by the vast majority of the drivers. Only about 1 in 10 speed zones has better than 50 percent compliance. The posted limits make technical violators out of motorists driving at reasonable and safe speeds.

For the traffic law system to minimize accident risk, then speed limits need to be properly set to define maximum safe speed. Our studies show that most speed zones are posted 8 to 12 mi/h below the prevailing travel speed and 15 mi/h or more below the maximum safe speed. Increasing speed limits to more realistic levels will not result in higher speeds but would increase voluntary compliance and target enforcement at the occasional violator and high risk driver.

One way for restoring the informational value of speed limits requires that we do a better job of engineering speed limits. Hopefully, the result of this research will provide engineers with the knowledge and tools needed to set maximum safe speed limits that are defensible and accepted by the public and the courts."

Traffic Control Devices Handbook, 1983, FHWA, "Notice of Defect"
"An agency has a duty to correct a dangerous condition when that agency has actual or "constructive" notice of the hazard."

In an interview in the June/July, 1999 issue of LANDLINE, the magazine of O.O.I.D.A., Julie Cirillo, new program manager at the FHWA Office of Motor Carriers and Highway Safety, said,

" . . . The more you have differential speed the more you have accidents."

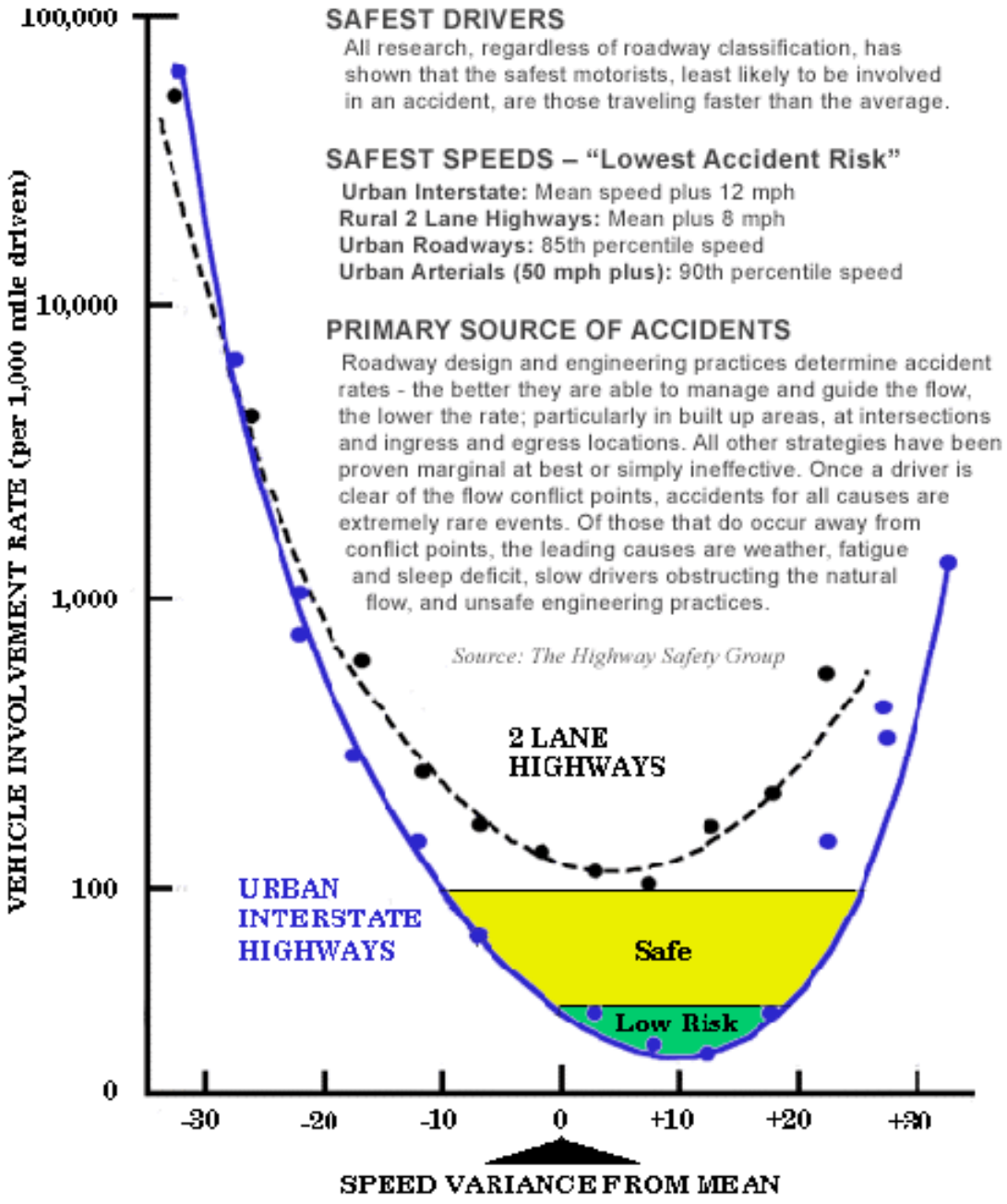
". . . We have fallen into a situation where for a variety of reasons we are setting speed limits that are not realistic. They are setting speed limits that are too low. We're legislating them, and once you legislate speed limits, invariably the speed limit is at about the 50th percentile. So, here you have a traffic regulation that's enforceable by law and half of the people are exceeding it when you put it in place. That makes no sense to us. So, what we're

trying to do is get the states to agree that they will set speed limits in accordance with the 85th percentile, which is where most people travel. Most people are sane. Most people will not put themselves in undue hazard. . . . "

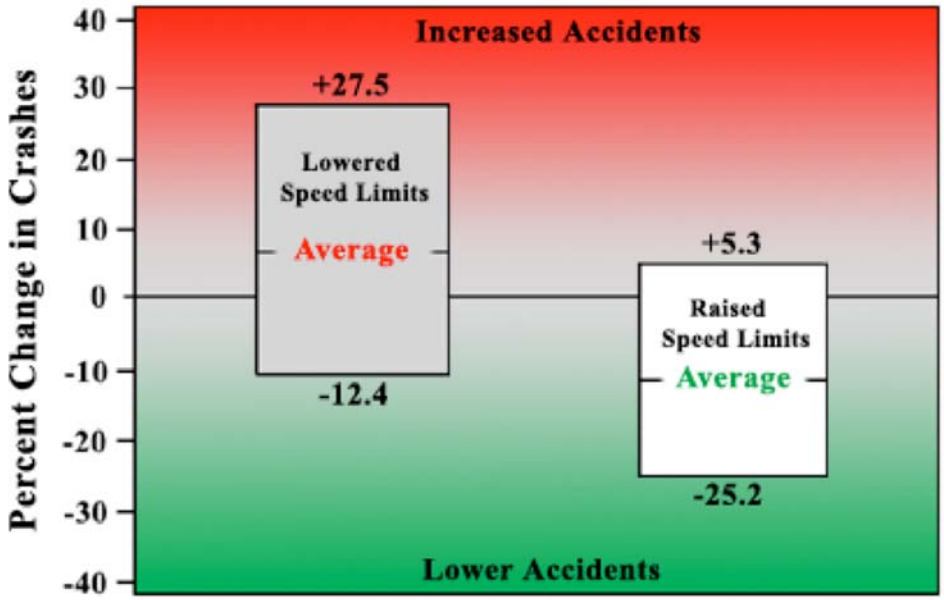
". . . We have deteriorated the value of speed limits and now find the disregard for speed limits is spilling over into other traffic-control devices -- disregard of red lights, disregard of stop signs.

If we have any hope of moving the population back to where it ought to be, we have to set reasonable speed limits."

All the charts and slides here are from FHWA studies or Speed Limit Workshops, and ALL dramatically illustrate the disparity between public policy and widely held myths about the safety effects of speed and the actual research findings on best practice for setting speed limits and relative risk.



55: A Decade of Experience, TRB Special Report #204



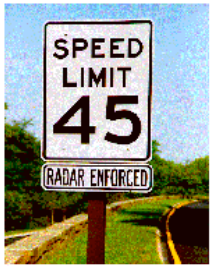
Effects of Raising and Lowering Limits on Crashes

Report No. FHWA-RD-92-084

NEVADA SPEED MANAGEMENT WORKSHOP

Reno, NV

April 4, 1996



Davey L. Warren

Office of Safety and Traffic Operations R&D

Federal Highway Administration

Requirements of Speed Limits

- Be fair
- Be related to risk
- Be credible and accepted by drivers
- Enforce control over unreasonable behavior

Speed Limit Laws

BASIC SPEED RULE -Driver must travel at a speed that is reasonable and proper for conditions and not endanger others or crash.

SPEED ZONING -Gives highway agency or localities authority to post limits higher or lower based on an *engineering study,* and to set them to indicate the *maximum reasonable and safe speed.*

Speed Laws

PRIMA FACIE LIMIT	*ABSOLUTE LIMIT*
■ Exceeding limit is evidence of traveling at unsafe speed ■ Recognizes no one speed is safe for all conditions ■ Post for prevailing conditions	■ Illegal to exceed ■ Reasonable and safe speed not relevant ■ Easier to enforce ■ Not fair unless speed limit set for optimal conditions

■ Check against traps

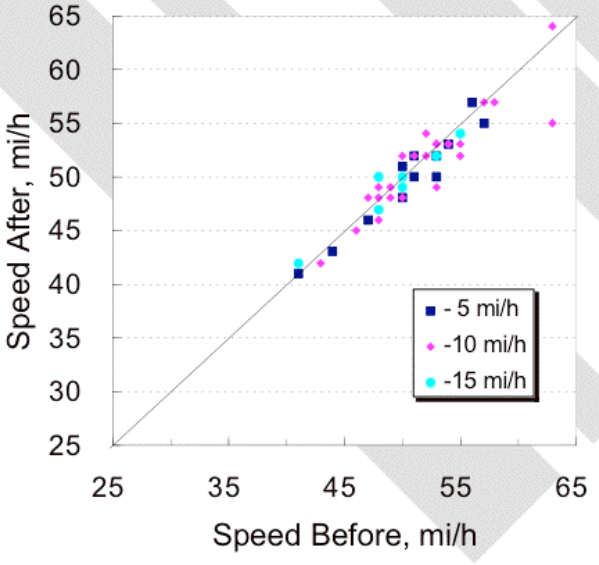
Minimum Design Speed

- All geometric elements must meet or exceed
- Only when constrained by terrain or development is minimum used
- Maximum safe speed for worst driver under bad road conditions
- Reaction time of drunk drivers, stopping with bald tires on slippery road, average comfort level of blind folded passengers in 1930 vintage car

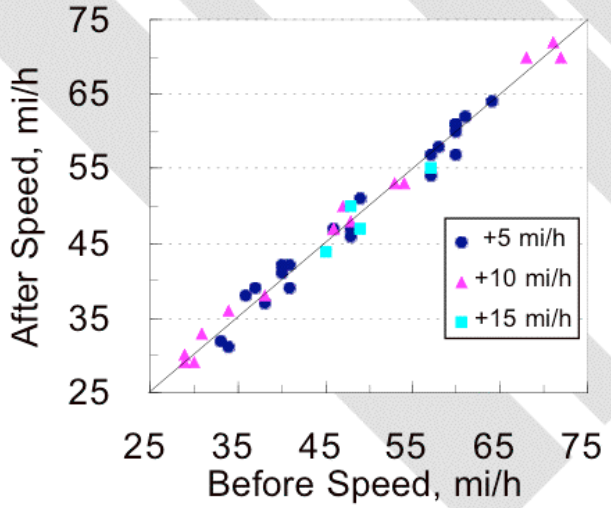
What We've Learned

- Most speed limits set unreasonably low
  - *Make technical violators out of large percent of motorists driving at safe speed*
- Current speed limits do not reflect accident risk
  - *Inconsistent with traffic law system*
  - *Misallocates enforcement resources*
- Most motorists drive at a speed road and traffic permits regardless of posted speed
  - *Don't automatically drive 5 mph over limit*
- Speed limits have lost their informational value
  - Engineering of credible limits which are appropriate and enforceable the key to managing risk

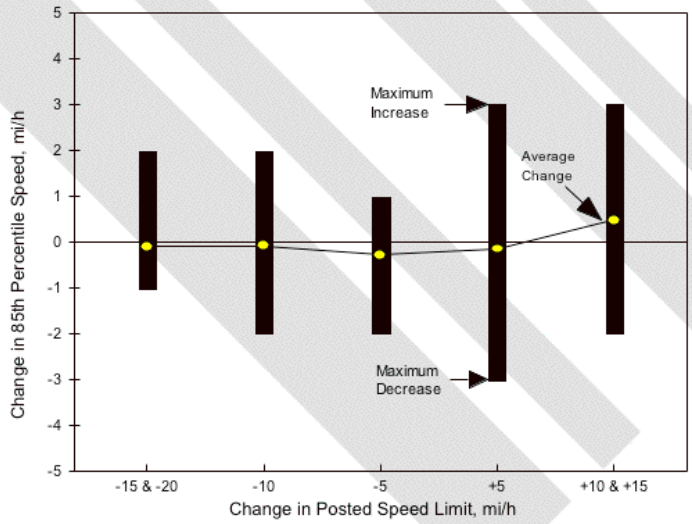
Lowering limit doesn't slow traffic



Raising limit has little effect on prevailing speed of traffic

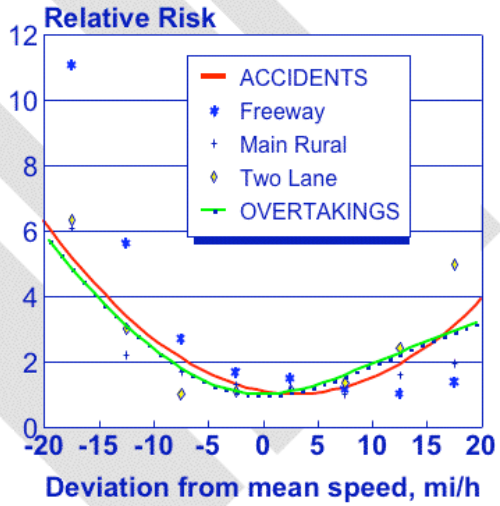


Little or no change in behavior

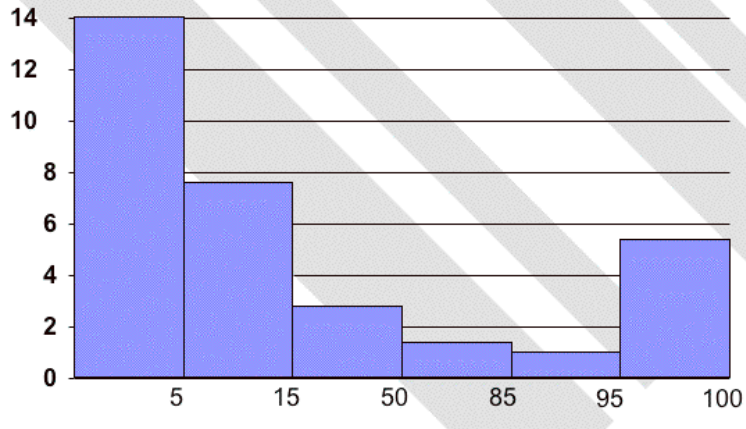


Speed and Accident Risk

- Safest near mean speed of traffic
- Roads with highest speeds are safest
- Limit should be set at upper end of low risk band



Accident Risk in Built-up Areas



Design Speed vs Maximum Curve Speed

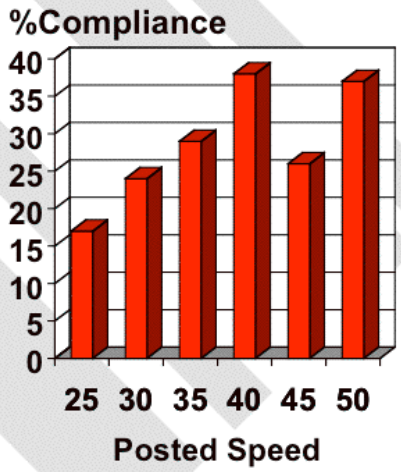
Design Speed	Min. E	Tolerable Lateral Gs	Min. Radius	Impending Skid (wet)	Impending Skid (dry)	Rollover Car
40 mi/h	0.06	0.15	509’	63.3 mi/h	87.5 mi/h	98.1 mi/h
70 mi/h	0.06	0.10	2,083’	120.7 mi/h	177.0 mi/h	198.4 mi/h

Car: f(dry) = 0.65

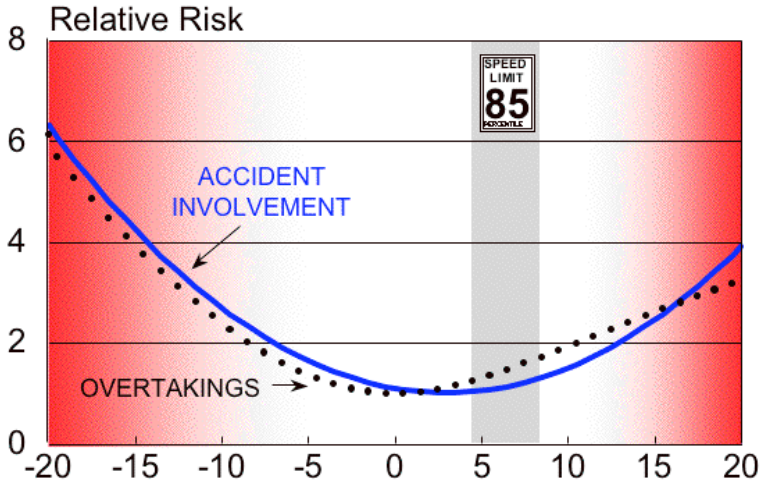
Source: FHWA-RD-89-226

Driver Acceptance

- 30% nationwide
- Range from 3-100%
- Worse with low limit
- Better in west/midwest
- Better w/prima facie
- Only 1 speed zone in 10 better than 50 percent compliance



Speed of traffic best indicator of reasonable and safe speed



Recommended Procedure

- 24hr free flow speed
- Round up
- 1/2 mile interval
- 500ft from jct. & curves
- Dry roads, typical traffic
- *No other adjustments*

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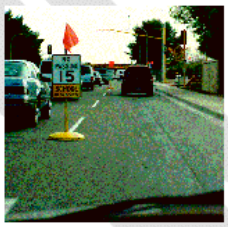
Special Zones



- School zone -
  - Base on average speeds when children present
  - Restrict to 15 -30 minutes periods when kids present
- Work zones
  - Base on average speed during good conditions
  - Use warning sign for hidden hazards & post advisory speed at average speed of traffic when hazard exits
  - Vary limit based on speeds when work in progress

Best Practice in Setting Speed Limits:

For a better understanding of what standards are to be applied, using those practices that have been fully vetted and are recognized by the FHWA as *Best Practice*, BHSPI has assembled this guidance for traffic engineering practitioners, and the courts, too.

Best Highway Safety Practices Institute; supplement to 2B.13

2003 MUTCD: Section 2B.13, Speed Limit Sign (R2-1)

Standard:

After an engineering study has been made in accordance with established traffic engineering practices to determine the safety value of the number posted, the Speed Limit (R2-1) sign (see Figure 2B-1) shall display the prima facie limit established by law, ordinance, regulation, or as adopted by the authorized agency. The speed limits shown shall be in multiples of 10 km/h or 5 mph.

Guidance:
At least once every 5 years States and local agencies should reevaluate their baseline safety audits on all roadways, or when a segment has undergone a significant change in traffic, roadway characteristics or surrounding land use since the last review, or if an engineering defect or high accident location becomes known, or a review is duly requested.

No more than three speed limits should be displayed on any one Speed Limit sign or assembly.

When a speed limit is to be posted, it should be within 10 km/h or 5 mph of the 85th percentile speed of free-flowing traffic.

The prevailing speed of free-flowing traffic shall be used as the primary design criteria for traffic control: signal timing, exclusion zones, sight distance, passing lanes, curve warnings, sign size, etc.

Criteria to be given primary consideration:

a) Free flowing: minimum 4 second headway, no vehicle queues, 500‘ from flow impediments and no vehicles impeded within zone, or enforcement prior to or during the survey.

b) Contiguous sections: Minimize speed limit changes. Set limits at average of the upper end of measured sections.

c) Measurement method: Not apparent to vehicles being monitored, measuring

24 hours of free-flowing traffic speed, making sure off peak and any known extra ordinary conditions are also documented.

Radar/Lidar is OK for spot surveys and quality control but it does not satisfy the requirements of an engineering study/safety audit because the results can be influenced by subjectivity. Samples are too small, their use is known to reduce registered speeds, and their inherent cosine angle error factor has also been known to be problematic.

d) Vehicle classification: The data must be separated by vehicle classification, thereby if during the safety review of the roadway special conditions become apparent, then there is a factual foundation from which to make those engineering judgments to meet these special needs.

e) Speed limit signs will not automatically decrease accident rates nor increase safety, and they should be used only where an engineering study has found them to be warranted.

The 85th percentile speed is also the safest speed in engineering terms, and the engineering study documents the publics' consensus as to what is that safety value. This method results in speed limits that are not only acceptable to a majority of the motorists but also fall within the speed range where accident risk is lowest. No other factors need be considered since they are reflected in the drivers' speed choice.

Speed limits should not to be lowered for conditions readily apparent, nor be used as intersection, curve or hazard warning devices. If there are unusual hazards not readily apparent to drivers, then a warning sign should be installed giving the nature of the hazard and supplemented with a realistic advisory speed if necessary.

Option:
Factors that may be considered when establishing speed limits are 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;

f) Low volume roads: If a neighborhood or business district or county road within a limited geographical region et al has uniform geometric conditions and low traffic volumes, then representative measurements may be applied universally on all like roadways therein. This exception is not applicable to primary feeders and arterials;

g) But in no case on urban roadways or in built up areas shall it be posted below the 67th percentile or the mean of the pace speed; except in special speed zones.

h) The establishment of limited application Special Speed Zones.

1. Residential Areas: Post at 85% rounded down to nearest 5 mph increment. If lower limit is desired, you must change the road environment - road humps, traffic circles, etc. Confine engineering counter measures to small area.

2. School Zones: Base on average speeds when children present. Restrict to 15 -30 minute periods when children are present.

3. Work Zones: Base on average speed during good conditions. Use warning sign for hidden hazards & post advisory speed at average speed of traffic when hazard exits. Vary limit based on speeds when work in progress. To be covered or removed when hazard ceases to exist.

3. Truck Limits: No separate limits, not to exceed 75 mph maximum. Exceptions, special limits on downhill sections or grades determined by that location's experience or design features. Generally it should begin at onset of the grade and shall end when the grade no longer presents a runaway vehicle threat. Ideally on grades trucks should be restricted to special slow vehicle lanes and on all other highways the right two lanes except in convergence zones, or when directed otherwise by traffic control devices. Also there are special limits needed on some bridges where weight is a factor, post accordingly.

Two types of Speed Limit signs may be used: one to designate passenger car speeds, including any nighttime information or minimum speed limit that might apply, and the other to show any special speed limits for trucks and other vehicles.

A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is shown at the proper times.

A changeable message sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit sign.

Guidance:

People don't automatically drive faster when the speed limit is raised. Speed limit signs will not automatically decrease accident rates nor increase safety, and highways with posted speed limits are not necessarily safer than highways without posted limits.

If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX km/h (MPH) or such similar legend should be shown. The color of the changeable message legend should be a yellow legend on a black background or the reverse of these colors.

Support:

Advisory Speed signs are discussed in Sections 2C.36 and 2C.46 and Temporary Traffic Control Zone Speed signs are discussed in Part 6.

Best Highway Safety Practices Institute – MUTCD supplement 1A.13

New Definitions:

Prima Facie: *Prima facie limits recognize that conditions vary during a day and no one posted speed limit can represent the maximum safe speed for all conditions, and they subject motorists to penalties only when their speed in excess of the limit is a hazard to others under the conditions then existing with regard to actual hazards.*

Prevailing Speed: *The prevailing speed is the highest 2 hr period of free-flowing traffic over a 24 hr day rounded up to the next 5 mph increment. To meet the safety needs of traffic the prevailing speed shall be documented and used as the primary design criteria for traffic control.*

Special Speed Zone: *Special Speed Zones shall be set using engineering judgment from an engineering study to meet specific conditions present at a particular location; notwithstanding, uniformity in expectations within a region should be given primary consideration, and this shall be documented. Special speed zones should be limited to special need locations: hospital, school and work zones, alleys, boardwalks, bike paths, parks, pedestrian malls, special events etc., and are to be removed when the special conditions cease to exist.*

Established Traffic Engineering Practices: *Nationally recognized vetted practices and guidance per standards, practices and research by organizations recognized by reference in the MUTCD, Section 1A.11 Relation to Other Publications*

Traffic Engineer: *Licensed Professional Engineer or Professional Traffic Operations Engineer (PE or PTOE). The licensed engineering practitioner responsible for operational safety and design functionality of a roadway, and has final authority over all elements that could affect either roadway operation or safety and access management within a roadway right of way. All traffic control or design elements in a roadway right of way shall be approved by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer.*

Access Management: *Roadway master access plan; all access and control decisions shall give deference to primary roadway function/classification by limiting access, number of*

conflict areas, points and movements, favor through movements, while provide supporting ancillary street and circulation system.

***Safety Audit**: Element of master engineering study of roadway or route or low volume roadway network with like geometric and design features; includes master access management plan, inventory of all traffic control devices by location and condition; geometric features; accidents by cause and location; prevailing, mean and pace speeds charted for each section of the roadway - half-mile intervals in built up areas or representative locations in rural areas; traffic volumes, vehicle classifications, patterns and projections; potential hazards, recommended remedies, findings et al; this shall be documented and incorporated into agency action agendas.*

***Notice of Defect:** An agency has a duty to correct a dangerous condition when that agency has actual or "constructive" notice of the hazard.*