Traffic Engineering

What? Why? How?

Arizona Highway Department

Traffic Engineering Division

TRAFFIC ENGINEERING
WHAT? WHY? HOW?

ARIZONA HIGHWAY DEPARTMENT
TRAFFIC ENGINEERING DIVISION

ARIZONA HIGHWAY COMMISSION

Forrest C. Braden	Chairman
Bus Mead	Vice-Chairman
Ed C. Locklear	Member
Peter B. Wilharm	Member
Dan C. McKinney	Member
Justin Herman	State Highway Director
William N. Price	State Highway Engineer

David L. Kennison
Acting Traffic Civil Engineer

Ronald D. Midkiff
Traffic Designer

February 1968

LITHOGRAPHED BY ARIZONA HIGHWAY DEPARTMENT
REPRODUCTION DIVISION

Arizona State Highway Commission

Phoenix, Arizona

Dear Fellow Arizonan:

Vital to the motoring safety and mobility of Arizona's people is a well-engineered system of highways and traffic controls. To meet the continuing growth of our State, a vigorous traffic engineering program must be carried on to insure that highway facilities will be as safe and efficient as modern traffic controls and regulations will allow.

This booklet has been prepared to help you better understand the role that traffic engineering plays in contributing to the safe and orderly movement of traffic upon the highways and streets of our State.

JUSTIN HERMAN
State Highway Director

TABLE OF CONTENTS

WHAT IS TRAFFIC ENGINEERING?

Traffic Engineering is the application of engineering principles to achieve safe, efficient, and convenient traffic operation. Traffic Engineering deals with the movement of motor vehicles and the methods used to direct them to their destination.

From a scientific standpoint, traffic engineering applies the physical laws of motion to the motor vehicle, the roadway, and the driver, while bringing into play a knowledge of psychology and the habits of the motoring public.

WHY IS TRAFFIC ENGINEERING ESSENTIAL?

Many persons still wonder why a traffic problem is so difficult that an engineer should be called upon for a solution. Why not just install a traffic signal, or lower the speed limit, or erect more signs?

One of the greatest obstacles a professional traffic engineer faces in applying sound principles of traffic engineering is the fact that "everyone is a traffic expert!" The unfortunate result of this attitude of expertise is the creation of traffic hazards when false theories of individuals or groups are put into effect.

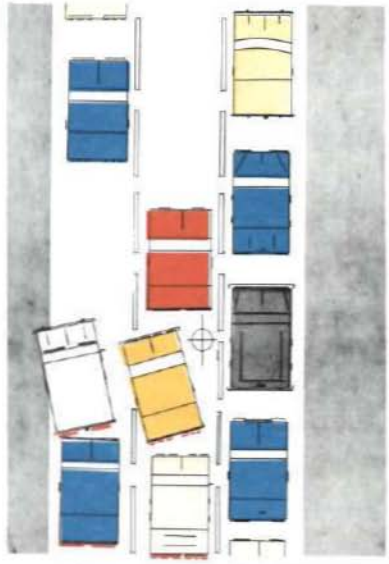
Whenever unnecessary or excessive traffic controls are installed, hazardous traffic conditions usually result.

HOW DOES THE TRAFFIC ENGINEER SOLVE TRAFFIC PROBLEMS?

The role of the traffic engineer may be compared to that of the medical profession in protecting the public. As a trained professional he looks at the symptoms, and in order to make a competent diagnosis he makes traffic counts, analyzes accident statistics, studies speed data, examines roadway conditions, conducts research, and studies what other professionals are doing and the results they have achieved.

Just as the doctor's decision is accepted in matters regarding health, even though the medicine may be bitter or the needle painful, so should the decision of the professional traffic engineer be given the prime consideration.

HOW DOES THE TRAFFIC ENGINEER PROMOTE SAFER TRAFFIC CONDITION?



Experience has shown that disrupting the smooth flow of traffic will increase the probability of accidents.

Erratic traffic operation may be created by vehicles stopping or slowing in the roadway, passing and weaving maneuvers, or driver surprise elements. For example, unwarranted traffic signals, unreasonably low speed limits, and too many signs cause driver confusion and indecision.

Slower speed doesn't always mean safer traffic operation. The chances of a driver becoming involved in an accident are least when he is traveling at the average speed of traffic.

WHAT ARE TRAFFIC CONTROL DEVICES?

Traffic Control devices are all signs, signals, markings, and devices placed on, or adjacent to, a street or highway by a public body having authority to regulate, warn, or guide traffic.

WHAT IS MEANT BY UNIFORMITY OF TRAFFIC CONTROL DEVICES?

Uniformity means treating similar situations in the same way. This simplifies the task of the driver because it aids in instant recognition and understanding.

Uniformity aids police, courts and road users by giving everyone the same interpretation. It aids public highway officials through economy in manufacture, installation, maintenance, and administration.

The "Manual on Uniform Traffic Control Devices" is the publication that sets forth the basic principles which govern the design and usage of traffic control devices. The Manual was

prepared by a National Committee which included state, county, and municipal representation.

The standards in this Manual with certain exceptions have been adopted for use in Arizona and apply to all streets and highways regardless of the governmental agency having jurisdiction.

HOW ARE SPEED LIMITS DETERMINED?

Legal speed limits are established by Arizona law and may be changed only when justified on the basis of an engineering study.

A widely accepted principle is to set speed limits as near as practicable to the speed below which 85% of the vehicles are traveling on the highway. Experience has shown that approximately 85% of the motorists drive at a speed that is reasonable and prudent.

Speed limits thus established encourage voluntary compliance because they appear reasonable to the public. Those 15% of drivers who will not comply with reasonable speed limits are the drivers who are subject to enforcement action.

WHAT EFFECT DO POSTED SPEED LIMITS HAVE ON ACTUAL TRAFFIC SPEEDS?

Very little effect. There is a common belief among laymen, and even by some officials, that the mere posting of speed limit signs will cause drivers to react accordingly. This is not true and is why posted speed limits must be realistic to receive compliance.

Unrealistically low speed limits will invite violation by responsible drivers. Enforcement of unreasonably low limits sets up the so-called "speed trap," which results in poor public relations.

The posting of **proper** speed limits has the beneficial effects of smoothing traffic flow and aiding effective law enforcement.

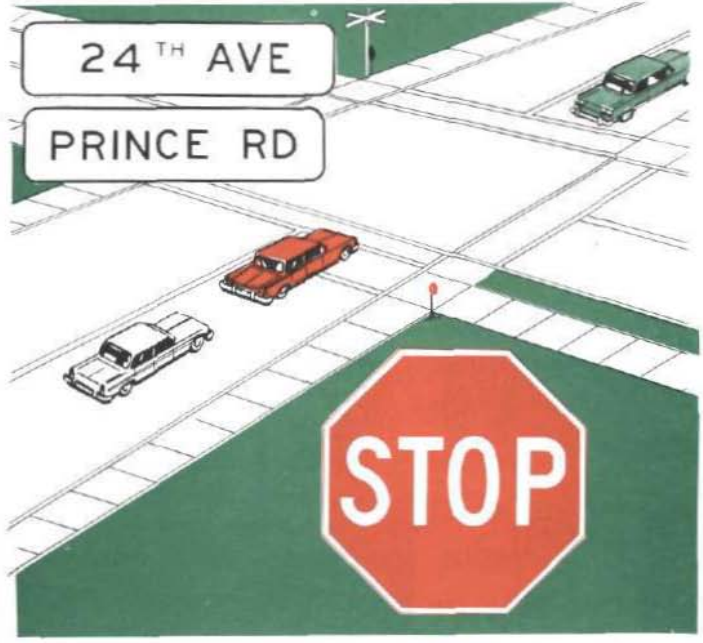
WHEN SHOULD TRAFFIC SIGNALS BE INSTALLED?

Traffic signals should be installed when they will alleviate more problems than they will create. An unwarranted traffic signal can result in increased delay, congestion, and accidents.

Another common belief is that traffic signals are the answer to all traffic problems at intersections. If this were true, no traffic engineer in his right mind would deny a request for a signal.

However, a traffic signal only functions by stopping traffic, and any time a motor vehicle is stopped in the road an accident potential is created. It does not matter whether the stop is caused by a flat tire, a left turn into a driveway, or by a traffic signal — the possibility exists that a following motorist will not notice the stopped vehicle until it is too late.

What motorist has not experienced that sickening feeling that occurs when a traffic signal suddenly turns amber a few hundred feet in front of him? Who has not experienced the aggravat-



ing hopelessness of waiting in a long line of cars for a traffic signal to change, moving ahead a few feet, and then having the signal turn red again?

Our whole economy is geared to the basic objective of keeping vehicles moving and every traffic signal installed on a highway detracts from this movement.

WHAT IS THE PRIMARY PURPOSE OF GUIDE SIGNS?

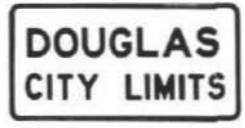
The principle purpose of guide signs is to direct motorists to their destinations by the best route. However, it is not feasible to install signs listing all of the possible destinations that may be reached from the highway.

Drivers must be expected to make reasonable preparation for locating their destination and to have information that is readily available on road maps.

ROUTE MARKERS

DIRECTION SIGNS

INFORMATIONAL SIGNS



HOW ARE GUIDE SIGN MESSAGES DETERMINED?

Simplicity and clarity are necessary because drivers of moving vehicles are unable to read lengthy or complicated messages on signs. For this reason, the number of lines on a sign is kept to a minimum, and in no case exceeds three.

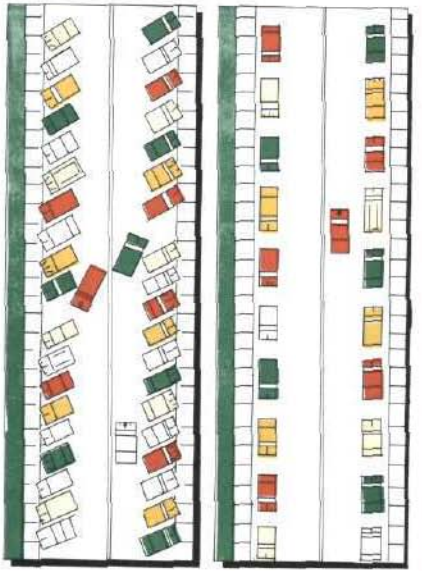
On freeways, high traffic speeds demand that the number of signs be limited to those absolutely essential for the guidance of the motorist.

Freeway exits are identified by the route number or by the name of the intersecting road. Certain additional messages may be provided where justified, although in urban areas no other

places are normally shown except airports having regularly scheduled commercial air travel.

In rural areas signs may be installed to direct motorists to services such as roadside rests, gas, food, and lodging.

IS ANGLE CURB PARKING A VANISHING CUSTOM?



Yes. As the automobile has replaced the horse and buggy, parallel curb parking has replaced angle curb parking. In the early days of the horse-drawn vehicle and the Model T, the custom was to park at the "hitching post" at an angle to the curb. In many communities this traditional custom remains, though horses have disappeared from the local traffic scene.

No one questions the fact that angle curb parking accommodates more vehicles than parallel curb parking, but it does so at the expense of street space and the movement of traffic.

Angle of Parking at Curb	Width of Street Used When Parked	Width Needed for Parking Plus Maneuvering
Parallel	8.0 ft.	20.0 ft.
45 degrees	19.1 ft.	33.1 ft.
60 degrees	20.4 ft.	39.4 ft.
90 degrees	19.0 ft.	45.0 ft.

For example, if 45° angle parking exists on both sides, a street as wide as 70 feet will be congested with not even a single lane of traffic moving freely in either direction when cars are maneuvering into parking stalls on both sides at once. Few cities have streets of 70 feet width or more; therefore, continuance of angle parking on through arteries is rarely justified.

Angle parking is considerably more hazardous to pedestrians and motorists because it involves backing into approaching traffic.

WHAT DO ARIZONA LAWS SAY ABOUT ANGLE PARKING?

Section 28-874 of the Arizona Revised Statutes states:

(a) "Except as otherwise provided in this section every vehicle stopped or parked upon a roadway where there are adjacent curbs shall be so stopped or parked with the right-hand wheels of the vehicle parallel to and within eighteen inches of the right-hand curb."

(b) "Local authorities may by ordinance permit angle parking on any roadway, except that angle parking shall not be permitted on any federal-aid or State highway unless the commission has determined by resolution or order entered in its minutes that the roadway is of sufficient width to permit angle parking without interfering with the free movement of traffic."

WHY PARALLEL CURB PARKING?

A legal responsibility.

Fewer fatalities, injuries, accidents regardless of street width.

More street space for moving vehicles.

Modern and orderly appearance of business area.

Less encroachment on sidewalks.

Less interference with emergency vehicles.

More convenient and safer for vehicle passengers.

Better sight distance at intersections and crosswalks.

Better visibility of street and highway signs.

DOES PROHIBITION OF ALL CURB PARKING HELP TRAFFIC MOVEMENT?

Prohibition of all crub parking, where rigidly enforced, provides greatly increased capacity and safety.

The removal of curb parking and the installation of a painted median island with left turn bays on a section of U. S. 80 in Yuma reduced accidents by 40%.

Curb parking prohibition can do more than any other traffic regulation to increase the capacity of a street for traffic movement.