

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 1, 1978

Forwarded to:

Honorable Wayne A. Whitham
Secretary of Transportation
Commonwealth of Virginia
1221 East Broad Street
Richmond, Virginia 23219

} SAFETY RECOMMENDATION(S)

H-78-56 through 60

About 2:19 p.m. on July 21, 1977, a dump truck loaded with 17 tons of stone was eastbound on U.S. Route 50 near Chantilly, Virginia, when it violated a red traffic signal at an intersection and struck a northbound automobile on Virginia Route 28. The automobile's four occupants were killed.

U.S. Route 50 is a heavily traveled, 4-lane, divided highway, and is a major truck route. The speed limit in both directions is reduced from 55 mph to 45 mph through the intersection with Virginia Route 28, which is a 2-lane, undivided highway with a speed limit of 55 mph through this area. The intersection is signalized with overhead, 12-inch signals mounted on spanwire. Single-point vehicle detection is provided on each through approach and in the left-turn slots on U.S. Route 50. The actuated controller is capable of varying the cycle length and green and red intervals within the cycle in response to traffic demand. Clearance is provided on U.S. Route 50 by a 6-second yellow interval.

The 18-year-old truckdriver had been issued a chauffeur's license "Class A" endorsement 5 weeks before the accident. With this license and endorsement he is allowed to drive for an employer in intrastate commerce and to drive a vehicle with three or more axles with an actual weight of more than 40,000 pounds. The loaded dump truck was in this category. Virginia law allows persons to drive such vehicles if they are 16 years old or older, possess an operator's license, and obtain a Class A endorsement.

To drive for hire or for an employer, one must be at least 18 years old, possess a chauffeur's license, and have the Class A endorsement. To obtain the Class A endorsement, the applicant must take a road test in the type of vehicle he will drive, or submit a statement in the application that he has driven at least 500 miles in the type of vehicle he expects

to drive. Nothing prevents a person who obtains a Class A endorsement from driving a truck different from the one in which he was tested. The truckdriver had not taken a road test for the Class A endorsement, but had submitted a statement in his application saying that he had driven such a vehicle at least 500 miles. It is doubtful that the driver could have accumulated the heavy vehicle experience he claimed since Virginia does not issue a learner's permit to drive heavy trucks and he did not drive such a vehicle on his previous job.

The truckdriver was familiar with the intersection. During his 1-month employment driving dump trucks, he had passed through the intersection several times each working day. On the day of the accident he had made at least five eastbound trips through the intersection. On this trip he was following another driver who was employed by the same employer. The other driver had preceded him through the intersection at the start of the green interval.

The driver of the dump truck involved in the accident stated that the green interval had remained on for only a short time, and that he thought the signal was malfunctioning. A timing check after the accident showed that the shortest green interval possible for through traffic on U.S. Route 50 was 15 1/2 seconds; the longest was 58 seconds. The yellow clearance interval was 6 seconds.

Before this accident, the Virginia Department of Highways and Transportation and the Fairfax County Police Department had received complaints that the traffic signal was "malfunctioning." Extensive tests by the highway department showed no mechanical or electrical malfunctions. It is possible that the variable length of the green interval on U.S. Route 50, which could vary between 15 1/2 and 58 seconds for through traffic, and the variable cycle length could have caused some motorists to think that the signal was malfunctioning. As the green intervals shortened, the cycle length shortened and more green-to-yellow-to-red changes occurred in any given time period. Such changes often cause driver indecision and may lead to "maladaptive" behavior, such as running a red light. ^{1/} Therefore, although short cycle lengths may provide efficient operation, it is not always desirable from a safety aspect to have short cycle lengths at high-speed, isolated intersections using single-point detection.

If lengthening the green intervals is not desired, the safety problem associated with their use can be alleviated by placing additional detectors farther from the intersection (multi-point detection). By

^{1/} "Vehicle Detector Placement for High-Speed, Isolated Traffic-Actuated Intersection Control," Report No. FHWA-RD-77-31, Vol. 1, Executive Summary, p. 2.

detecting a vehicle early on its approach, strategies can be used to allow the signal to remain on green until the vehicle passes through the intersection.

The length of the yellow clearance interval also may affect a driver's behavior as he is confronted with the indication. The driver must either decide to continue through the intersection or stop before entering. He will go through the yellow if he feels he can "make it." His behavior primarily depends on his approach speed, his distance from the intersection, State law, and his aggressiveness. ^{2/}

The Manual on Uniform Traffic Control Devices recommends a range of 3 to 6 seconds for the yellow clearance interval. It also allows the use of short, all-way red clearances. Recent research, however, indicates that long yellow clearances may be hazardous because many drivers will drive through the yellow when they could have comfortably stopped. ^{3/} The research also indicates that the use of shorter yellow clearance intervals with second or all-way red clearances generally will reduce accidents at hazardous locations because it reduces the abuse of the yellow clearance interval and decreases the number of vehicles entering on red after the signal for the cross street has turned to green. This is especially important where trucks are involved, since it has been found that drivers of heavy vehicles are more apt than other drivers to make stopping judgment errors when confronted with a yellow indication. ^{4/}

Therefore, the National Transportation Safety Board recommends:

-- to the Virginia Division of Motor Vehicles:

Seek a change in the driver license legislation to require an applicant for a Class A endorsement to take a road test in the type of vehicle he will drive, by deleting the provision that allows the applicant to obtain the endorsement by stating in his application that he has driven at least 500 miles in the vehicle of the classification which he intends to operate and for which he seeks to be licensed. (Class II, Priority Action)
(H-78-56)

^{2/} William L. Williams, "Driver Behavior During the Yellow Signal Interval," Federal Highway Administration, Presentation to the Transportation Research Board, January 1977.

^{3/} Tammen, Johnson, Kinzel and Mimiaga, "Clearance Intervals -- A Literature Review and Appraisal," Federal Highway Administration, Contract DOT FH-11-8783, March 1977.

^{4/} Ibid.

-- to the Virginia Department of Highways and Transportation:

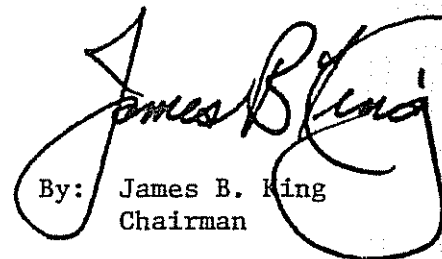
Analyze the green interval settings for the signals at this intersection to assure that the allotted times adequately consider the high speed of the approaches, the heavy truck traffic, and the roadway geometrics. Make any changes necessary and report its findings to the National Transportation Safety Board. (Class II, Priority Action) (H-78-57)

Provide second or all-way red clearance intervals after the expiration of the yellow clearance intervals for through traffic on U.S. Route 50 and Virginia State Route 28 to provide more positive intersection clearance. The lengths of the yellow and all-red intervals should be set in accordance with the latest research data available within the guidelines promulgated in the Manual on Uniform Traffic Control Devices. Make any changes necessary and report its actions to the National Transportation Safety Board. (Class II, Priority Action) (H-78-58)

Investigate the feasibility of using multi-point detection at this location and, if found desirable, install the necessary equipment. (Class II, Priority Action) (H-78-59)

Analyze the safety and operating characteristics of other signalized intersections under its jurisdiction to determine if the above recommendations have Statewide applicability and to make changes as necessary to insure safer operation. (Class II, Priority Action) (H-78-60)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendations.


By: James B. King
Chairman