

# **MOTOR VEHICLE SAFETY AT TEMPORARY CONSTRUCTION OR REPAIR SITES ON HIGHWAYS**

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## INTRODUCTORY NOTE

Informational materials on motor vehicle safety in areas undergoing temporary road construction and repair operations were collected by the library in response to questions from users.

Our intention is simply to indicate the dimensions of the problem of accidents involving vehicles passing through construction areas. The particular items selected constitute a representative sample rather than an exhaustive collection of information in this area.

Library and highway department people in several states furnished many of the references and materials for this treatment of a current highway safety problem. Some of the abstracts presented were obtained from a computer search of HRIS files, Highway Research Board, Washington, D.C.

Thanks are owing to all of those who so generously helped.

D. Munro

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## I. STATISTICAL INFORMATION

Statistics of accidents occurring at road construction and repair sites are apparently not collected on a national basis. Accident report forms in use generally do not provide a separate category for these accidents.

We found, however, that Texas, Virginia, and Wyoming publish this information for accidents within their borders. It is likely that other states also have some figures on this subject, which a more extensive search could reveal.

### A. TEXAS: Rural Motor Vehicle Accidents at Areas Under Construction\*

<u>Year</u>	<u>Fatal Accidents</u>	<u>Nonfatal Accidents</u>
1960	60	1664
1961	49	1598
1962	50	1450
1963	56	1517
1964	53	2131
1965	30	2033
1966	53	2341
1967	54	2650

\*Source: Texas Department of Public Safety, Austin, Texas

B. VIRGINIA: Accidents at Areas Under Construction\*

<u>Year</u>	<u>All Accidents</u>	<u>Fatal Accidents</u>	<u>Personal Injury</u>	<u>Property Damage</u>
1960	574	4	n.a.	n.a.
1961	881	5	217	659
1962	971	15	247	709
1963	1109	7	272	830
1964	1319	9	307	1003
1965	1814	16	383	1415
1966	1763	13	394	1356
1967	1734	9	417	1308

\*Source: Virginia Traffic Crash Facts, plus information from the Virginia State Police Headquarters, Richmond, Virginia.

C. WYOMING: Accidents at Areas Under Construction\*

<u>Year</u>	<u>Total Number of Accidents</u>	<u>Injuries</u>	<u>Fatalities</u>
1962	127	76	3
1963	108	54	4
1964	n.a.	n.a.	n.a.
1965	100	91	3
1966	118	86	6

\*Source: The Wyoming "1965 Construction Area Motor Vehicle Accidents" (discontinued after 1966). Among the materials surveyed, this one presents the most elaborate analysis of accidents at construction sites. It compares districts, gives descriptions of the accidents, and concludes that 32% of the accidents occurred entering or leaving detours with 13 such accidents assigned the cause: "Failed to make curve onto detour--overturned".

## II. ANNOTATED SUBJECT MATERIALS

### A. BIBLIOGRAPHY:

1. NCHRP Project 20-5. Topic No.1. Information sources. Documents. Washington. Highway Research Board, (1968) 20p.

Lists many articles, state, local, and association publications on vehicle safety at construction and repair sites, along with other materials of interest to the project.

### B. STANDARDS AND SPECIFICATIONS BY NATIONALLY RECOGNIZED AUTHORITIES:

1. Manual on uniform traffic control devices for streets and highways. Washington, Bureau of Public Roads, 1961, p. 263-309.

Signing standards and devices for all types of traffic control for road construction and maintenance operations, with typical applications. Many states have incorporated this Bureau of Public Roads manual into law almost verbatim.

2. Guide specification for highway construction. Washington, American Association of State Highway Officials, 1968, p. 11,12,21.

Statement by the American Association of State Highway Officials, for the guidance of state highway officials in rewriting or revising standard specifications. Sets forth the duties of the contractor at construction sites.

3. Highway design and operational practices related to highway safety. (Washington), AASHO Traffic Safety Committee, February, 1967. p. 63-67.

The "Yellow Book" of AASHO emphasizes detour problems, the need for advance warning, proper signing standards, and planned traffic management.

4. Highway safety program standard 4.4.12. Federal Highway Administration, National Highway Safety Bureau. June 27, 1967, p. 20-21.  
"Highway design, construction and maintenance."

Standard for state and local programs in construction safety, implementing the National Highway Safety Act of 1966.

C. STATE AND MUNICIPAL LAWS, STANDARDS, AND REGULATIONS FOR SAFETY AT TEMPORARY CONSTRUCTION AND REPAIR SITES:

1. Alaska. Alaska laws and traffic regulations relating to motor vehicles. . . . 1961 ed.  
Section 80, p.5: Persons working on the highways; exceptions.
2. California. Vehicle Code. 1965 as amended. Sacramento. Department of Motor Vehicles.  
p. 236, 21370: Regulation of traffic construction zone.  
p. 238, 21406: Contractor's warning devices.  
p. 263, 22362: Speed limits where persons at work.
3. Cincinnati, Ohio. Traffic regulations. 1964.  
p. 28, Section 502-24. Regulation of traffic by City Manager in connection with street construction.
4. Louisiana. Laws relating to motor vehicles. . . .as of January 1, 1965. January, 1965.  
p. 12-13, Section 23: Persons and vehicles working on highways; exceptions.  
p. 43, Section 236: Privately owned signs on public rights of way prohibited. Exceptions. Authority of Municipalities and Departments of Highways.  
(Exception is made for contractors and permit holders to place authorized temporary signs to warn the traveling public of dangers arising from work being done.)  
p. 43-44, Section 237: Barricades, signs and signals, prohibition against tampering with and violating instructions; exceptions.
5. Michigan. Michigan manual of uniform traffic control devices. 1963 edition. Lansing, Michigan State Highway Department, 1963.  
p. 233-273, Part II: Traffic controls for highway, utility and other construction and maintenance operations.
6. Michigan. 1967 Standard specifications for road and

bridge construction. Lansing...1967.

p. 549-563, Section 631.01-11: Maintaining traffic.

(Duties of contractor and Highway Department in maintenance, control and protection of traffic.)

7. North Dakota. Highway and motor vehicle laws...1961.
  - p. 43, Section 24-03-05: Closing of roads  
Penalty for passing over road or removing barricade.
  - p. 44, Section 24-03-08: Warning signs of road construction.
  - Section 24-03-10: Public officers.  
(requires placement of warning signs at construction, improvement, or repair sites.)
  - p. 44-45, Section 24-03-11: Penalty for failure to erect warning signs.  
(at work sites on public roads, culverts, or bridges.)

North Dakota. 1965 Cumulative supplement.

p. 7, Section 24-03-09: Warning signs of road construction.

Section 24-03-10: Public officers. Failure to place signs.

8. Oregon. Manual on uniform traffic control devices for streets and highways. Salem, Oregon. Oregon State Highway Commission, n.d.
  - p. 259-82: Traffic controls for highway construction and maintenance operations.
9. Vancouver, British Columbia. Traffic control manual for work on city streets. City Engineering Department, 1961.
  - p. 1-2: Introduction.
  - p. 3-10: Authority and responsibility.
  - p. 11-13: General procedure.
  - p. 14-25: Equipment, personnel and their use.
  - p. 26: Illustrations of traffic control methods.

D. SELECTED ARTICLES ON VEHICLE SAFETY AT TEMPORARY CONSTRUCTION AND REPAIR SITES

1. Goodwin, C.A. "Construction and driver safety."  
American Road Builder, 36: May, 1959, p. 16-17.

Most frequent types of accidents in construction areas;  
requirements for alternate routes; maintaining and



relocating signs; proper lighting; enforcement; safety during job shutdown.

2. Goodwin, C.A. "It pays to minimize traffic hazards during road construction." Public Works 94:No.10, October 1963, p. 126-8, 200, 202, 204.

Rerouting traffic at construction sites; conformity with applicable regulations; traffic control; signs, barricades, applications of controls, systematic maintenance of signs and protective equipment; enforcement; claims control.

3. Goodwin, C.A. "Ways to safeguard the motorists in areas of construction." Traffic Quarterly 9: October, 1955, p. 543-562.

Accident causes at construction and maintenance operations; closed roadways and detours; major and minor road repairs with traffic maintained, rural and urban repairs; protection layout patterns; installation of control devices; maintenance applications of procedures; completion or suspension of a project - precautions against accidents.

4. Guilmartin, J.L. "Accident prevention program pays off for Connecticut State Highway Department." Better Roads, 35: January, 1965, p. 8-12.

Reduction of employee injury rates by the Department and private contractors involves investigations of accidents, driver training, vehicle inspection of highway department vehicles, an accident review board to determine responsibility for accidents, meetings to inculcate safe driving, and a safety manual of regulations and information.

Safety activities of the department in teaching employees proper methods for construction safety; and control of traffic through maintenance and construction projects.

Some material on training employees in safe practices at construction sites.

5. "Environmental failure," a case report. In: Harvard Medical School. Research on fatal highway collisions. Papers 1962-3, p. 199-220, 1963.

Depth study of head-on collision at a construction area with one fatality and four injured. Includes a psychiatric interview of a surviving driver and an automotive engineering report on both vehicles. Suggestions are included in the summary as to the cause of the accident, and prevention of similiar accidents.

6. McGarry, T.F. "Checklist for safety at highway worksites." Constructor. 48: November, 1966, p. 38-40.

Lists types of road work in order of relative hazard to traffic. Examples are given of safety shortcomings by contractors in the course of road construction. Measures advocated by the Bureau of Public Roads to lessen dangers at work sites are listed.

Traffic control and safety measures are urged as legitimate items in construction contracts.

7. McGarry, T.F. "Worksite safety." American Road Builder. 43: December, 1966, p. 8,9,24.

An improved accident records system will give better insight into worksite area accidents; relative dangers of different road work types; factors contributing heavily to accidents. A long list of items to be considered when maintaining traffic through construction areas is included (p.24). Minimizing danger and inconvenience to the public is stressed.

8. Parker, S.A. "Standardization of warning signs, barricades, and lights." National Safety Council Transactions. 6: 1956, p. 19-23.

Survey of practices by the states in traffic control devices for protection of workmen on the highway and drivers using the road. Refers to a number of standards and state authority publications on this subject.

9. "...Road officials eye safety standards." Engineering News-Record. 177: September 29, 1966, p. 33-34.

News article on state practices and studies on road work site safety.

10. Perini, A.L. "Construction and Public Safety."

American Road Builder, 41: August 1964, p. 10-12.

Safety responsibilities of the highway contractor and the public. Public information, planning, knowledge of hazards, control of equipment, and protection of children are important considerations. Duties of the public are emphasized.

11. Porter, H. "Let's stop confusing the driver." Traffic Safety. 67: June, 1967, p. 8-9, 34.

Construction zone protection is often makeshift, incomplete, inadequate and confusing. Several instances of negligence in signing, routing traffic, and maintaining signals are noted, some of which resulted in costly damage awards against local governments. Federal government standards are an additional reason to improve construction and maintenance zone vehicle safety.

12. "Public protection at street openings." Public Works. 98: January, 1967, p. 60-146.

Mandatory regulations and an illustrated manual are presented and discussed for temporary traffic control during surface or sub-surface repairs to New York City streets. The stated purposes of the manual are: (1) to provide for an orderly safe flow of traffic, (2) to minimize congestion, (3) to protect motorists, pedestrians, and workmen from accident hazards, and (4) to insure that access for emergency vehicles is provided. Among the devices which are treated in detail in the manual are traffic cones, barricades, hazard warning lights, flags, signs, hazard markers and delineators. For major construction operations of long duration, Class I barricades are required, Class II units are acceptable for small, temporary operations where hazards are limited. Class I barricades must consist of three 2x6- or 2x8-inch wood rails no longer than eight feet, spaced approximately 20 inches on centers, with the upper edge of the top rail approximately five feet above the roadway. Class II barricades may consist of a single rail of the same depth and width and may be ten feet long. It is permissible to use steel or aluminum rails in either type. A guard rail type barricade is permissible to protect manholes. Portable flashing beacons are to be employed as warning in advance of the work area and to mark

severe or unexpected obstructions in or near the road. A number of standard signs are illustrated in the manual. They feature clear and concise symbols and legends which are designed for quick comprehension and response by the motorist. (HRIS Selections.)

13. Schlums, J. "Road defects as causes of accidents and proof of this in accident investigation." Strassen Und Tiefbau (Germany), 20: January, 1966, p. 40-47. January, 1966.

Section 330 of STGB (Strafgesetzbuch) reads "Any person who in the management or carrying out of construction work performs any act contrary to the generally recognized rules of the art so that danger to others results shall be liable to a fine or to imprisonment for up to one year." It is therefore the responsibility of the engineer to observe correct methods of road construction. Further, dangerous conditions which from the engineering point of view are not acceptable or practical must be drawn attention to in other ways, e.g. the provision of road signs, lighting, winter services, etc. Early warning of danger spots is of the greatest importance. The particular distance of the warning signs depends on the condition of the road surface, whether there is anything on the road (e.g. leaves) wetness, and other factors affecting the braking distance. Road Research Laboratory (UK) (HRIS Selections).

14. "State agency combats threat of accidents." Low Bidder. 34: October, 1966, p. 9.

The activity of the New York Division of Industrial Safety Service of the State Department of Labor in connection with heavy construction is described. Their scope of activity includes not only building sites but also road construction projects: mines, tunnels and quarries, demolition sites, bridges, and ski tows and aerial tramways. They inspect thousands of construction sites and enforce the labor laws and the rules of the industrial code. They also have responsibility for enforcing safety rules for transportation and use of explosives. The Bureau also has a program of safety consultation which seeks to go beyond the code requirements to determine the causes of accidents, and to educate contractors, unions and individual workers on the importance of safety equipment and safe work methods and habits. (HRIS Selections.)

15. Ward, D.P. "When you drive 'at your own risk.'" Cook County Highways. July, 1961, p. 4,6.

"It is well for motorists to know that in Illinois a county is not liable for damage caused by negligence where a highway is under construction or repair and signs are posted notifying the public of this fact." Applicable laws are cited.

E. CURRENT PROJECTS TO IMPROVE VEHICLE SAFETY AT WORK SITES ON ROADS (HRIS SELECTIONS)

1. Accidents involving construction zones, detours, and temporary connections on full freeways.

Res. Agy.: California Division of Highways  
Headquarters, Traffic Department

Sponsor: California Division of Highways  
Bureau of Public Roads /US/  
Traffic Systems.

Investigator: Tamburri, T.N.  
Theobald, D.J.  
Smith, R.N.

Started Oct. 64 Status: Active Sept. 1967 Est.  
Comp. Cost Est. 1,300 Curr. yr. 1,500 Total  
Dec. 1968.

Project Nos.

41-621263

4841345

HPRI (5) -B-1-3

The effect of different traffic control devices and roadway standards on accident occurrences and severity is being determined. The study will be limited to detours, temporary connections, and construction zones. Accidents will be plotted on the construction plans to determine the effect of different design treatments on accident rates and severities. Other accident information will be coded from the accident reports to locate areas of difficulty in driver response to control devices or roadway features. It is planned to obtain from state construction personnel additional accident information not available on the accident reports. (HRIS Selections.)

2. Interstate system accident research, Study 1.

Res. Agy.: Massachusetts Institute of Technology

Sponsor: Massachusetts Department of Public Works  
Bureau of Public Roads /US/  
Traffic Systems.

Started Cy66    Status: Programmed Cy66    Est. Compl.:  
Cost Est.            500 Curr Yr.            3,500 Total

Project Nos.

4514012

HPR-1/1/

The accident experience on the interstate highway system and on older parallel existing routes is being determined so that the actual safety benefits resulting from construction of the interstate system can be evaluated on a continuing basis. (HRIS Selections.)

