

TRUCK SAFETY REGULATION, INSPECTION AND
ENFORCEMENT IN VIRGINIA

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ABSTRACT

In response to a request from the Director of the Virginia Department of Transportation Safety an evaluation of the state and federal regulations, inspection programs and enforcement activities regarding truck safety was carried out.

The purpose of the study was to assess the nature and scope of current regulatory activities; to compare and contrast state and federal approaches; and to ascertain whether or not a problem exists with state regulations, inspections, and enforcement and, if so, to suggest remedial measures.

The study was carried out with guidance provided by a project advisory group consisting of representatives of the Department of Highways and Transportation, Division of Motor Vehicles, Department of State Police, Department of Health, Office of Energy and Emergency Services, State Corporation Commission, Port Authority, Division of Legislative Services, Office of the Attorney General, U. S. Bureau of Motor Carrier Safety, National Transportation Safety Board, and the Virginia Highway Users Association.

The evaluation included a review of relevant literature, a questionnaire survey of other states, site visits and observations of SCC and BMCS on-road safety inspections, a review and comparison of state and federal laws and regulations, and an analysis of available data concerning truck accidents.

Analysis of the information obtained led to the conclusion that some revisions to the regulatory provisions governing the trucking industry and the transportation of hazardous materials are warranted.

Recommendations for the revision of Virginia's regulations and administrative programs are offered.

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SUMMARY OF FINDINGS

1. National accident data reveal an increasing incidence of accidents and fatalities involving heavy trucks. These statistics are of concern to traffic safety officials not only because they reflect an increasing hazard to truck drivers, but also because truck accidents have a severe impact upon the safety of people using noncommercial vehicles on the highways. Legislators and administrators in the federal government are placing high priorities on measures to lessen the incidence and severity of truck accidents. In Virginia, transportation officials should give close consideration to similar measures.
2. While it cannot be fully documented that truck accidents are a serious problem at this time, there are indications that there is a problem in terms of the number of accidents per vehicle, and there are indications that the problem is worsening at a rapid rate.
3. Considerably more and better data on truck accidents are needed on both the state and national levels to enable an accurate definition of the problem created by truck accidents.
4. The Federal Motor Carrier Safety Regulations (FMCSR) require, among other things, that drivers subject to the Regulations be 21 years old and pass a road test administered by the motor carrier employing them or by a "competent" designated person. In Virginia, the minimum age for obtaining a chauffeur's license is 18, and an applicant who wishes to operate "any vehicle or combination of vehicles having three or more axles with an actual gross weight in excess of forty thousand pounds" must submit to and pass a road test using the type of vehicle for which he seeks a license. The road test is waived for any applicant who states that he has driven at least 500 miles in a vehicle of the type he intends to operate. Studies suggest that a significant relationship exists between truck driver inexperience and accident involvement. Data indicate that there is a disproportionately great involvement in truck accidents of drivers with less than 1 year's experience with their employers. A study not yet published has tentatively found that truck drivers in the 18-to-21-year-old age group have a substantially higher rate of accident involvement than 25 to 40 year-old drivers. The BMCS, in response to pressure to lower the minimum age of interstate drivers from 21 to 18, recently conducted a review of available literature on this issue. The review concluded that the 21 year-old minimum was justified, since persons under 21 lack the skill, judgement and maturity necessary to properly handle the demands of truck operation.

5. The FMCSR require that truck drivers use the seat belts installed in their vehicles. The Virginia Code does not, and further provides that "failure to use such safety lap belts ... shall not be deemed to be negligence."
6. Those carriers subject to the FMCSR must file a comprehensive accident report form after an accident involving death, injury, or property damage amounting to at least \$2,000. In Virginia, there are extensive requirements for the reporting of accidents by drivers to the State Police and to the DMV and by the State Police to the DMV. The report forms used by the State Police do not adequately provide for the inclusion of information relevant to truck safety.
7. The FMCSR limit most truck drivers to a maximum of 10 hours of "driving time" after they have accumulated a minimum of 8 hours "off-duty". To aid in the enforcement of this requirement, the FMCSR require the driver to maintain a daily log. The Virginia Code prohibits the driving of any motor vehicle for more than 13 hours in any period of 24 hours. Data on traffic safety indicate that driver fatigue is a factor in many truck accidents.
8. Unlike the FMCSR, the Virginia Code does not require a special written test for truck drivers. Applicants for a chauffeur's license take the same test concerning the rules of the road in Virginia as do applicants for an operator's license. The Virginia Code does not require truck drivers to make a pre-trip inspection of the vehicle, as do the FMCSR. The Code does prohibit the operation of defective equipment on the highways.
9. In their specifications on equipment there are several differences between the FMCSR and the Virginia Code. The Virginia Code has less stringent braking distance standards and front tire tread requirements than do the FMCSR. In addition, Virginia has not established safety standards governing tire loads and pressures for the most common sizes of tires used by interstate motor carriers, while the federal rules include extensive provisions.
10. A significant amount of hazardous material is transported by truck on Virginia highways. Because of the great potential for injury and destruction arising from accidents involving these substances, preventive safety measures are of the utmost importance. Regulations which might seem overly extensive if applied to the transportation of other commodities are prudent in the case of hazardous materials. Regulations on the transport of hazardous material must seek to prevent accidents and reduce the destruction resulting from accidents which do occur.

11. There are detailed federal regulations governing the transportation of hazardous materials in interstate commerce, and they preempt any inconsistent and less rigorous Virginia requirements. However, it is possible that hazardous materials are being transported on Virginia highways by carriers or vehicles not subject to federal regulations. In general, the federal hazardous material cargo, vehicle and driver regulations are more thorough and safety-oriented than comparable Virginia regulations. The Commonwealth regulations exempt flammable liquids and do not cover certain dangerous substances regulated by the federal government. Virginia regulations on containers and placards lack the detail of and are in places inconsistent with their federal counterparts. Also the Commonwealth authorizes much lighter penalties for violations of regulations on the transport of hazardous materials than does the federal government.
12. A number of states have programs for regulating the transport of hazardous materials, and more may institute them in the immediate future as several states are studying the problems associated with the transportation of these materials.
13. Both the Commonwealth of Virginia (SCC) and the federal government (BMCS) conduct individual and cooperative truck safety inspection programs.
14. Most states have a truck weighing program, but the effectiveness of these programs varies widely. Based on an analysis of the data presented in this report, Virginia has one of the premier programs in the country.
15. Data on truck types and weights indicate that:
 - (a) Tractor trailers make up 8.5% of all vehicles on all highway systems and 10.5% of those on the interstate system.
 - (b) For single-unit trucks, dump trucks carry the heaviest loads; for tractor trailer combinations, dump trucks and petroleum tankers carry the heaviest loads.
 - (c) Regardless of truck classification, compliance with Virginia truck weight laws is greater on interstate roads than on the other road systems.

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CONCLUSIONS

Safety in truck transportation is of much concern to individuals at numerous levels of government and private industry. In Virginia, available data indicate a need for close scrutiny of the involvement of trucks in traffic crashes. In addition, it has been determined that certain revisions to the regulations governing the trucking industry and the transportation of hazardous materials by truck are warranted.

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RECOMMENDATIONS

1. Coordination is necessary between the states and federal government, among the various state agencies, and within the several federal agencies in the collection, recording, and classification of data on truck accidents.
2. Traffic safety officials need to cooperate with the State Police and the DMV to develop a supplementary truck accident report form to aid in gathering essential information. The BMCS, which is presently revising its standard truck accident form, can aid in the development of a comprehensive and detailed truck accident reporting system for the Commonwealth.
3. Data indicate that driver inexperience is a causative factor in many truck accidents. Virginia should eliminate or qualify the "500 mile waiver" of the road test for applicants seeking licenses to operate vehicles or vehicle combinations with three or more axles and a gross weight in excess of 40,000 pounds. The state should consider raising the minimum age requirement for a chauffeur's license to 21.
4. The state should repeal that portion of the Code which holds that failure to use seat belts is not to be deemed negligence. The provision implicitly condones the failure to use these safety devices and precludes any party from claiming and establishing negligent nonuse of seat belts.
5. In light of the role that driver fatigue plays in causing accidents, it is recommended that the state enact an hours-of-service regulation applicable to truck drivers. The regulation should reduce the number of allowable consecutive hours of driving, limit the number of allowable driving hours per week, and prescribe daily and weekly limits for "on-duty" time. Driver logs should also be required to permit enforcement of this provision and reduce, if possible, the incidences in which fatigue plays a role in truck accidents.
6. In order to effectively enforce regulations affecting driver fatigue and those of equipment defects, the SCC, State Police and other authorized law enforcement personnel should be allowed to declare fatigued drivers and defective vehicles "out of service."
7. The Commonwealth should revise and update the SCC regulations governing the transportation of hazardous materials by truck. The federal hazardous materials regulations should be carefully reviewed and those which are most efficacious in ensuring safe transportation of dangerous articles and can be practically enforced by state officials should be adopted. In the

requirements on driving, handling and transporting cargo, the federal and Virginia regulations are so similar that little practical change would result from adoption of the federal provisions. In other areas the federal regulations are more comprehensive and safety-oriented. Among the most glaring deficiencies in Virginia regulations are the following.

- (a) The Commonwealth presently exempts flammable liquids. These substances are at least as hazardous as other regulated materials, and for safety considerations cannot rationally be excluded. At the federal level, no such exemption exists.
 - (b) Etiologic, or disease-producing, agents are not covered by Virginia regulations on hazardous materials, probably because they were not recognized to pose sufficient danger when the regulations were enacted in 1958. These substances are included in the federal regulations.
 - (c) The Commonwealth presently requires only that containers for hazardous material be of "sufficient" size and strength for the commodity. Virginia should consider adopting more detailed standards for these containers, including cargo tanks. Effective containment of dangerous materials is of prime importance in limiting the severity of damage resulting from accidents. The federal regulations provide extensive specifications for containers. Virginia could merely require that all containers, whether transported interstate or intrastate, satisfy the federal specifications.
 - (d) The Virginia placarding scheme offers less information than, and is in places inconsistent with, its federal counterpart. Placards are essential in helping to identify the contents of the involved vehicles at the scene of an accident. The federal regulations divide hazardous materials into 17 categories while Virginia provides only 7; this more detailed federal description better aids emergency response personnel in taking measures to restrict accident damage.
8. Certain other changes, commented upon below, may facilitate the implementation of whatever regulations on hazardous materials the Commonwealth ultimately decides will provide optimum safety.

- (a) The Commonwealth might consider increasing the authorized penalties for violations of the regulations on hazardous materials. The present maximum civil (\$1,000) and first-offense criminal (\$100) penalties may be so small that the risk of their imposition is an economically rational alternative. The mere availability, however, of sanctions as great as the federal civil (\$10,000) and criminal (\$25,000 and/or 5 years' incarceration) penalties may produce a deterrent effect, and would certainly give the regulatory mandate greater force than it has at present.
- (b) Virginia should consider developing a list of hazardous materials. At present, with only broad definitions covering hazardous materials, an immediate answer is not always available on whether a substance in question is regulated. The list need not be as comprehensive as that set forth in the federal regulations (specifying some 1,200 substances); instead, it should detail those hazardous materials regularly transported in Virginia, and become a workable tool for inspection, enforcement and emergency personnel.

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TRUCK SAFETY REGULATION, INSPECTION AND ENFORCEMENT IN VIRGINIA

INTRODUCTION

In recent months the federal government has paid great attention to the safety aspects of heavy truck transportation. This attention is the product of concern over statistics showing a significant involvement of heavy trucks in traffic accidents and fatalities. Efforts are being made both in Congress and the federal regulatory agencies to minimize the hazards of truck transportation.

For example, a 1977 report to Congress by the Comptroller General of the United States General Accounting Office (GAO) (1) concluded that the federal motor carrier safety program had not measureably improved in the ten years following transfer of responsibility to the Bureau of Motor Carrier Safety (BMCS) within the Department of Transportation (DOT). The report stated that despite a general improvement in traffic fatality rates, 45,000 persons had died on the highway in 1975, with 20% of these deaths having resulted from truck and bus accidents. The GAO study noted that BMCS manpower limitations allowed inspection of less than 1% of interstate drivers and vehicles. The GAO recommended an increase in BMCS resources for safety activities, an improved system of identifying those motor carriers with the poorest safety records, increased effectiveness in actions against violators of safety regulations, and a program of financial incentives to encourage states to enforce state laws and regulations similar to the federal provisions for motor carrier safety. Undoubtedly, the GAO study helped to focus attention on heavy truck safety.

In the spring of 1978, Senator Percy introduced S.2970, the Truck Safety Act of 1978, (2) designed "to promote and protect the American public from the hazards of unsafe commercial motor vehicle operations, to provide drivers of commercial motor vehicles with safe and healthy working conditions, and to insure prompt and continuous compliance by all persons subject to this Act...." (3) The bill seeks to greatly enhance the effectiveness and efficiency of the DOT in ensuring truck safety by expanding the scope of violations for which civil fines may be imposed, raising

the maximum fines for serious violations, including those by drivers of light trucks within the scope of federal safety regulations, and authorizing the DOT to regulate working conditions and operating practices of motor carriers to ensure safe truck maintenance. (4)

A second pending Senate bill, the "Trucking Competition and Safety Act of 1979" (5) (S.1400), introduced in June by Senator Kennedy, seeks to deregulate the trucking industry. Title II of the bill focuses on commercial truck safety. The bill is premised upon findings —

1. that the level of highway fatalities and injuries related to commercial motor vehicle operations is unnecessary, unacceptably high, and must be reduced;
2. that the level of property damage ... (is also) ... unnecessary, unacceptably high, and must be reduced;
3. that the present level of fatalities, injuries, and property damage related to commercial motor vehicle operations has a detrimental effect on the economy, as well as on the public safety and welfare; and
4. that more comprehensive regulation of commercial vehicle safety and strengthened enforcement would reduce the level of fatalities, injuries and property damage.... (6)

These findings were based upon statistics showing "significant noncompliance with present federal commercial motor vehicle safety rules and a steady, significant increase in accident rates for many regulated vehicles." Increases in motor carrier accidents and truck driver fatalities, a climb in truck accident fatalities at double the rate of increase of truck miles traveled, and heavy property losses were cited. (7) The bill seeks "to reverse this safety trend" (8) by stiffening penalties for safety violations and expanding the role of the DOT to decide a motor carrier's fitness to haul freight.

Legislation has also been introduced in the House and Senate to set national truck weight and length limits. A GAO study determined that "excessive truck weight is a major cause of highway damage," (9) citing statistics indicating that 22% of loaded tractor trailers exceed state weight limits. The GAO study did not deal directly with the relationship between truck weights and accidents. However, the study did survey state enforcement efforts, and concluded that enforcement of weight laws is generally lacking because of inadequate penalties and insufficient resources. (10)

Recent accidents have publicized the need to examine the transportation of hazardous materials. The February 1978 disasters in Waverly, Tennessee (15 people killed and 48 injured when a tank car carrying liquefied petroleum gas exploded following a derailment), and Youngstown, Florida (8 killed and 158 injured by toxic gas when a tank car carrying chlorine punctured during a derailment), led to a March 1979 Library of Congress study⁽¹¹⁾ for the Senate Committee on Commerce, Science and Transportation on federal regulation of the transportation of hazardous materials. The study presented DOT statistics showing that the bulk of deaths, injuries and property damage caused by accidents involving hazardous materials in recent years have resulted from private and for-hire truck transportation.⁽¹²⁾

The National Highway Traffic Safety Administration (NHTSA) of the DOT is placing special emphasis on heavy truck safety. The NHTSA is concerned over "the alarming increase in fatalities among occupants of heavy duty trucks since 1975" and has made truck safety one of its top priorities.⁽¹³⁾ In publicizing a September 1979 public meeting on truck safety, the NHTSA presented the following national statistics which suggest a significant problem worthy of attention.

- Traffic accidents involving heavy trucks claimed an estimated 4,624 lives nationwide in 1978, a 40% increase since 1975.
- In 1978, heavy-truck-related deaths accounted for 1 out of every 10 persons killed on the nation's highways.
- Almost 30% of the increase in deaths in automobile accidents between 1975 and 1978 was attributable to fatalities occurring in crashes with heavy trucks.
- Between 1975 and 1977, fatalities in heavy trucks rose more than twice as fast as the number of miles traveled by such vehicles.⁽¹⁴⁾

This increased concern over accidents involving heavy trucks has been expressed not only by federal officials, but also by members of the Virginia General Assembly. In March 1979, after discussion with state and federal officials, John T. Hanna, Director of the Commonwealth's Department of Transportation Safety, requested that Virginia truck regulation, inspection, and enforcement be analyzed.

PURPOSE

Concern has been expressed at numerous levels of government over the involvement of trucks in highway traffic crashes. In the recent past, the United States Congress and other concerned parties have posed questions concerning the effects of overweight and unsuitably equipped commercial carriers on the traffic safety environment and structural engineering components of the nation's roadway network.

In the Commonwealth of Virginia, a number of traffic safety officials have also expressed a desire to learn of the nature of truck accidents on the state's highway system. Consequently, this study was designed to determine if a problem exists. If a problem was identified, then the study design called for a determination of its magnitude and the adequacy of existing statutes, policies, rules, regulations, programs and activities for dealing with the problem. Additionally, the study would seek to recommend countermeasures to be utilized to reduce the number and severity of truck accidents.

METHODOLOGY

Advisory Group

A study of heavy truck safety involves far more than the compilation of accident statistics. Included in the issues to be considered were economic factors such as time, taxation, availability of transportation, road maintenance, vehicle manufacture, and driver livelihood; legal issues such as size and weight limits, interstate commerce, safety regulations, and driver licensing; and environmental issues such as noise and air pollution. Because of the complex nature of these issues, the research group sought the advice and guidance of numerous agencies.

The following organizations were invited to appoint representatives to an advisory group formed for the study: Office of the Secretary of Transportation, Department of Transportation Safety, Department of Highways and Transportation, Office of the Attorney General, the State Corporation Commission, Department of State Police, Division of Motor Vehicles, Health Department, Office of Energy and Emergency Services, Port Authority, Legislative Services, the Bureau of Motor Carrier Safety, the National Transportation Safety Board, and the Virginia Highway Users Association. Occasional meetings of the advisory group were held throughout the course of the study.

Literature Review

As a starting point, abstracts were obtained from the Highway Research Information Service (HRIS), and study team members identified a number of papers concerned with safety problems in the heavy truck industry. The papers reported on numerous studies related to a broad range of safety factors including truck weight and size, safety equipment, driving time and driver experience, pavement condition, and the presence of hazardous materials. Literature sources included federal and state agencies, the trucking industry, the insurance industry, private and university research groups, and congressional and legislative hearings.

Compilation and Analysis of Accident data

In compiling and analyzing the data, the primary goal was to obtain a workable summary of truck data for Virginia and to compare the experience in Virginia to that in other states and across the nation. Publications used included Virginia Truck Weight Studies, Virginia Average Daily Traffic Volumes, Virginia State Police Crash Facts, the National Truck Characteristics Report, Motor Vehicle Manufacturers Association Facts and Figures, the BMCS's Accidents of Motor Carriers of Property, and the Fatal Accident Report Systems (FARS) report on Heavy Trucks.

In addition an analysis was made of statistics on accidents involving heavy trucks from the reports of the Virginia Department of Transportation Safety's Crash Investigation Team. Since 1971, the Crash Investigation Team has conducted in-depth investigations of selected accidents occurring in Virginia to identify human errors, vehicle defects, and highway safety defects that contribute to or cause crashes.

Review of Regulations on the Trucking Industry

The trucking industry is governed by numerous regulations covering both economic matters and safety. This study concerned itself solely with the latter, especially the regulations on weight and size limits, safety equipment, and the transport of hazardous materials.

The review of the regulations was initiated by examining the provisions of the Virginia Code concerned with truck transportation. These pertained principally to truck weight and size and safety standards.

Since most trucking companies operate across state lines, the federal government has a strong interest in regulating the trucking industry. Consequently, it was necessary to examine federal truck regulations and their interaction with state regulations. Examined as a part of this review were the Interstate Commerce Act and regulations of the Interstate Commerce Commission, the Noise Control Act, the Explosives and other Dangerous Articles Act, the Transportation of Hazardous Materials Act, and the Federal Motor Carrier Safety Rules contained in Title 49 of the Code of Federal Regulations.

Because of the special dangers posed by the transportation of hazardous materials, the study devoted special attention to this aspect of trucking activities.

The initial step was to compose a generic definition of the term "hazardous material" through reference to the definitions contained in federal and state codes.

Subsequently, the regulations contained in the Virginia Code were compared with the regulations in Title 49 of the Code of Federal Regulations. These regulations covered rules applicable to the vehicle transporting the materials, the loading of the cargo, and the driver.

Survey of Existing Programs

The study team examined programs aimed at enforcing the regulations on truck weights, safety and the transport of hazardous materials. Activities of Virginia agencies, the federal government, and other states were examined. Emphasis was placed upon operations in Virginia, with the researchers reviewing the roles of the Department of Highways and Transportation, State Corporation Commission, and State Police in enforcing state laws. As part of this review, visits were made to the permanent weigh stations at Troutville, Stephens City, and Dumfries to observe operations.

Because BMCS is the federal agency responsible for enforcing truck safety standards, a visit was also made to observe its activities at the Troutville weigh station. In addition to assessing the BMCS's role in Virginia, its nationwide operations were examined.

To gather information on the activities of other states a questionnaire was sent out to the other 49 states and the District of Columbia. This questionnaire requested information on truck weight limits, safety, and the transport of hazardous materials.

In addition to providing data on the kinds of enforcement activities conducted by other states, the questionnaire enabled the study team to determine the relative effectiveness of state truck weighing programs. This was done by developing indices which compared the number of trucks weighed in a state to a proxy value for the amount of truck traffic in a state.

Recommendations

With the information developed in the previously described activities in hand, the study team formulated recommendations for improving Virginia's truck safety program.

LITERATURE REVIEW

In 1976, over 4,000 people were killed in the U. S. in motor vehicle accidents that involved heavy trucks. This number represents a 15.7% increase over the number killed in 1975, and accounted for 8.9% of all traffic fatalities.(15) Accidents involving trucks result in twice the number of fatalities per accident than accidents involving only passenger cars. Though the proportion of heavy trucks in the vehicle population is small, their exposure is disproportionately great and their increasing involvement in fatal traffic accidents is a safety concern of great importance.(16)

The continuing concern of legislators and traffic safety officials over the safety record of large trucks has led to numerous federal and state laws and regulations governing nearly every aspect of truck travel, and additional measures are constantly being proposed. An example of the latter is a bill introduced in 1979 by Senator Edward M. Kennedy which would require tractor lengths of at least 15 feet. The bill was in part a response to a recommendation by researchers who believe that it would reduce the high casualty rate in frontal collisions.(17)

Economic factors, however, militate against increased regulation of the industry. Large trucks are more efficient long-distance haulers than are small trucks. This has become increasingly significant in light of the recent energy crisis and rising fuel costs. The "Commercial Vehicle Post - 1980 Goals Study" reviewed trucking industry economics in some detail and recommended that longer, wider and heavier trucks be not only permitted but encouraged.(18) Representatives of the industry have argued that regulations such as the 15-foot requirement for tractors would have an inflationary impact on the economy by reducing truck capacity and increasing fuel consumption.

In order to determine the proper balance between the economic factors and the safety concerns, the scope of the truck safety problem must be ascertained. The purpose of this section is to briefly describe some of the literature examining the various aspects of truck safety.

General Accident Experience

The most frequent accident involving tractor trailers is a collision between such a unit and a passenger car; this is followed by single-vehicle accidents and collisions with other commercial vehicles.(19) Collisions of heavy trucks with passenger cars have been found to be especially dangerous for automobile occupants. Because of the relative size and weight of heavy trucks, multi-vehicle crashes involving them are significantly more likely to result in at least one fatality than are accidents involving only cars.(20) A 1975 study by the Highway Safety Research Center at the University of North Carolina concluded that the mortality rate in car-truck accidents was 14 times as great as that for car-car accidents.(21) One study found that in all car-truck accidents in the BMCS files for 1973 and 1974, only 4.7% of the fatalities were truck occupants.(22) Moreover, the BMCS classified accidents as having either no car occupant fatalities or at least one fatality and thus removed the effect of very severe accidents involving multiple fatalities. Overall, there was an average of 1.29 fatalities among car occupants for each fatal accident.

Only 20% of the people killed from all heavy truck accidents are truck occupants.(23) The remaining 80% are occupants of passenger cars, pedestrians, and bystanders. This characteristic of truck accidents — their disproportionate impact on other users of our nation's roadways — suggests the need for a special sensitivity to issues of trucking safety.

One particular type of car-truck accident that has received much publicity is the underride accident that occurs when an automobile hits the rear or side of a truck or tractor trailer and slides under the trailer. In such accidents the trailer intrudes into the passenger compartment of the automobile, often causing death or serious injury to the occupants. These accidents have been found to result in significantly more high-severity injuries to the car occupants than have other kinds of accidents.(24) The BMCS has a rear-end protection standard that applies to trucks and tractor trailers in interstate commerce. Essentially, the standard requires that the maximum distance between the ground and the bottom of the truck or a protective device attached to its

rear be no more than 30 inches.⁽²⁵⁾ Many researchers, particularly those at the Insurance Institute for Highway Safety, feel that this standard does not provide adequate protection for car occupants because there are no crash protection performance criteria.⁽²⁶⁾

A study of the fatal car-truck accidents that occurred in Michigan from 1972 through 1976 and in Texas for 1975 and 1976 found that 18.1% of them involved underride.⁽²⁷⁾ The report stated that "perhaps the most interesting finding ... is that, given a rear-end car-into-truck fatal collision, underride was present in 87 of 94 cases, or 93%." It also stated that underride occurred in 75% of the side impact car-into-truck fatal accidents. The authors made a calculated estimate that there were 456 fatal underrides per year nationwide. The study concluded, as did a similar study of Maryland fatal truck accidents,⁽²⁸⁾ that improved underride devices could significantly reduce the problem of fatal car-into-truck accidents. Since such an extremely high percentage of car-into-truck fatalities are attributable to underride, adequate rear-end protection could greatly enhance truck safety.

As described above, multi-vehicle crashes involving heavy trucks are particularly hazardous for occupants of the other vehicle. Single-vehicle truck crashes are particularly hazardous for the truck occupants. Approximately 800 occupants of heavy trucks were reported as sustaining serious or fatal injury in 1975. Nearly 50% of the fatalities occurred when a heavy truck hit a roadside object or ran off the road, and another 25% occurred when two heavy trucks collided.⁽²⁹⁾ Another study found that the tractor trailer driver was rarely killed in a multi-vehicle accident unless the other vehicle was also a tractor trailer or heavy truck.⁽³⁰⁾ Thus, the single-vehicle crash is generally the most dangerous crash for truck occupants. This is especially disturbing because it has been found that large trucks are more likely to be involved in single-vehicle crashes than are cars or small trucks.⁽³¹⁾

One of the principal reasons for the increased likelihood and severity of injuries to truck occupants in single-vehicle crashes is that there has been no increase in the designed-in crush space between the occupant compartment and the vehicle's front as truck lengths have increased. The large cargo mass behind the truck occupant leads to increased forward forces acting on the compartment in front-end crashes. As a result, front-end crashes have been found to be the most dangerous type of crash for trucks.⁽³²⁾ Increased tractor length might significantly help to attenuate the crash forces in frontal collisions. This was the idea behind the legislation proposed by Senator Kennedy and referred to above.

Accident Causation

Human error is the primary cause of accidents involving heavy trucks. A study conducted by the University of Southern California in conjunction with the California Highway Patrol analyzed 2,923 accidents involving 3,124 commercial vehicles.(33) In 45.7% of the 3,124 vehicles, the driver was found to be at fault. Among the causes of accidents, driving at an unsafe speed (26.0% of all accidents) and unsafe lane changes (16.0% of all accidents) were the most prevalent.

One driver factor that has received attention in the literature is driver fatigue. The BMCS has standards regulating the driving hours and on duty hours of truck drivers, but these are often ignored. A study conducted by the DOT in 1972 found that after 4 hours behind the wheel, truck drivers began making a significant number of errors and suffering a significant decline in alertness.(34) It was found that after 7 hours of driving, the frequency of accidents increased disproportionately. It should also be noted that driving time is only one factor associated with driver fatigue. Irregular scheduling, the use of sleeper operations and diurnal variations also have been found to contribute to fatigue.(35)

Another problem often cited in studies on commercial vehicle accidents is mechanical failure. The California study found that vehicle equipment was at fault in 10.8% of the cases, but in only 6.0% of the cases were equipment violations cited by the reporting officer. Other studies have generally found that 6% to 7% of the truck accident reports have noted vehicle defects as a causative factor.(36),(37) However, one study, which analyzed over 3,000 accidents involving large trucks in Texas during 1973, found that 13.8% of the single-vehicle truck accidents involved a defect while only 4.0% of the trucks in multi-vehicle accidents were defective.(38) In addition, it found that vehicle defects in accident-involved trucks are generally associated with older vehicles. This study found that approximately 70.0% of all accidents related to vehicle defects were attributable to brakes, tires and wheel failures, with brakes being the most frequently listed defect.

Although brakes have been cited as primary accident-causing factors in over 3% of the accidents involving trucks, many researchers believe that the inadequate braking ability of trucks is a contributing factor in many more accidents. For example, in the California study the inadequacy of braking functions was noted in over 50% of the 3,124 commercial vehicles involved in accidents.(39) Similarly, the investigators in a study which

examined fatal truck accidents in Maryland felt that 63% of the multi-vehicle accidents examined involved configurations in which the braking ability of the tractor trailer may likely have played a role.(40)

The influence of a truck's braking ability on accident causation is evidenced by the results of a study which examined the effects of the 55 mph speed limit on front-to-rear crashes involving cars and trucks.(41) The results showed a substantial reduction in such crashes on high speed roads, most likely due to the reduction in speed differentials between cars and trucks. Despite the overall reduction, however, there was a significant increase in the proportion of front-to-rear crashes in which the truck was the striking vehicle. The authors believe that this was probably the result of braking inadequacies in the tractor trailers and the inability of large trucks to respond to sudden braking maneuvers by preceding cars.

One question that has been answered in the literature is whether proper commercial vehicle inspections and maintenance procedures have an impact on highway safety. McDole and O'Day evaluated accident data from the BMCS and other sources and conducted interviews with drivers of trucks that had been involved in accidents attributed to defective equipment.(42) They concluded that there was an identifiable relationship between good inspection and maintenance practices and a reduction in defect-related accidents, with the effective maintenance practices usually being associated with the large firms who view their actions in this regard as largely of economic benefit. The poor maintenance practices were most likely to be associated with smaller firms or individual owners who were not willing to commit the resources necessary to perform adequate maintenance and inspection. McDole and O'Day recommended that the BMCS regulations be amended to require (1) that vehicles receive thorough pre-trip inspections, and (2) that evidence of inspection and maintenance activities be kept on the truck.

An additional factor in commercial vehicle accidents is the incidence of jackknifing. Jackknifing occurs when the tractor and trailer do not maintain their alignment. In the California study, 3.4% of the commercial vehicles jackknifed prior to the accident and 3.9% jackknifed afterwards.(43) A study in Maryland found that jackknifing was most likely to occur prior to an accident as a result of braking on wet pavement.(44) In the California study, vehicle dimensions were identified as significant factors in a relatively small percentage of accidents.

This review of the literature regarding commercial vehicle accidents is of necessity selective. There is an enormous body of research dealing with the myriad aspects of commercial vehicle

safety. The increasing incidence of fatalities in truck accidents is indeed a multifaceted problem. It has been found to be a problem which has a great impact on the rest of the vehicle population, and for that reason alone truck safety concerns deserve the utmost scrutiny. The safety of the individual drivers who spend their working lives on the road is another important concern. For these reasons the magnitude of the commercial vehicle accident problem in Virginia is of tremendous interest to the Department of Transportation Safety.

ACCIDENT ANALYSIS

The purpose of this section of the report is twofold. First, accident data are examined to show the number and nature of truck accidents in Virginia and for the nation as a whole. Second, comparisons are made as a basis for stating whether truck accident experiences in the state constitute a significant safety hazard, one serious enough to require the investment of additional time and effort in the state's highway safety program. Presented are:

1. Comparisons of truck and passenger car accident statistics to show whether truck crashes are overrepresented in relation to the vehicle mix.
2. Comparisons of Virginia's truck accident experiences with those of surrounding states and the nation to show if Virginia's truck accident problem is more serious than the norm.
3. Comparisons of truck accident statistics over time to determine if the problem is becoming more or less serious.

It should be noted that because of considerable limitations in the available data, not all of the above comparisons are made in relation to each accident-related variable.

Sources of Data

The accident data presented in this section were drawn from a number of sources. The bulk of the national data on truck accidents came from the BMCS and apply only to carriers subject to the Department of Transportation Act. It should be noted that these data apply to only a portion of the carriers in the nation. Thus, the accident data supplied by the BMCS vastly underestimate the frequency of truck accidents. Virginia truck and passenger car accident figures came from the Crash Facts published by the Virginia Department of State Police and are a considerably more accurate estimate of the actual truck accident environment.

Exposure data were also drawn from various sources. Vehicle registrations nationwide were provided by the Motor Vehicle Manufacturer's publication Facts and Figures, as were national volume figures, expressed in billion vehicle miles of travel. Virginia volume data, expressed in million vehicle miles of travel, were drawn from the Virginia truck weight studies and were used as exposure variables along with average daily traffic volumes. The

information on Virginia registrations was obtained from DMV annual reports.

In relation to vehicle exposure nationwide, there were significant increases in registrations over time; passenger car registrations increased over 8% and truck registrations increased just slightly over 20%. This difference in the national growth of truck and passenger vehicle registrations is significant at the .01 level (see Exhibit 1). The Virginia figures for truck registrations must be viewed with caution. First, the data are on a fiscal rather than calendar year basis; second, in January 1975, the state went to the International Registry Plan; and third, since 1975 pickups have been classified as passenger cars. The combination of these three factors causes an unusual variability in the truck registration figures over the last five years.

Exhibit 1

TOTAL VEHICLE REGISTRATION

U. S.

<u>Year</u>	<u>Trucks</u>	<u>Passenger Cars</u>
1977	29,562,485	113,696,111
1976	27,778,881	110,188,640
1975	25,780,619	106,718,739
1974	24,630,157	104,856,341
% Change	+20.02	+8.43

$$\chi^2 = 131,339, \text{ df} = 3$$

$$p < .01$$

Virginia

<u>Year</u>	<u>Trucks</u>	<u>Passenger Cars</u>
77-78	308,498	3,099,837
76-77	167,454	3,028,543
75-76	174,866	3,094,210
74-75	214,537	2,679,119
% Change	+43.80	+15.70

Vehicle miles of travel have also increased considerably for both passenger cars and trucks nationwide over the same period of time. While passenger car travel made up the bulk of the total vehicle mileage for each year, the increase in truck mileage was greater than that for passenger cars (see Exhibit 2).

Exhibit 2

MILES OF TRAVEL (IN BILLIONS) — U. S.

<u>Year</u>	<u>Passenger Cars</u>	<u>All Trucks</u>	<u>Single-Unit Trucks</u>	<u>Combination Trucks</u>
1977	1,118.6	329.5	266.0	63.5
1976	1,075.8	308.0	248.8	59.2
1975	1,028.1	274.5	218.9	55.6
1974	990.7	267.5	211.5	56.0
% Change	+12.91%	+23.17%	+25.76%	+13.39%

It can also be noted that while passenger car travel made up the bulk of the total vehicle mileage for each given year, the average number of miles driven in each individual vehicle was much greater for trucks than for passenger cars (see Exhibit 3).

Virginia exposure data, expressed as average daily traffic, also reflect national trends, with passenger cars making up the bulk of the vehicle population but with truck traffic increasing at a much greater rate than passenger car traffic (see Exhibit 4).

Exhibit 3

ANNUAL MILES TRAVELED — U. S.

<u>Year</u>	<u>Passenger Cars</u>	<u>Single-Unit Trucks</u>	<u>Combination Trucks</u>	<u>All Trucks</u>
1977	9,839	9,400	50,206	11,145
1976	9,763	9,369	48,297	11,086
1975	9,634	8,882	49,125	10,648
1974	9,448	8,981	51,667	10,861
% Change	+4.12	+4.66	-2.82	+2.61

Exhibit 4

VEHICLE MILES OF TRAVEL PER 24 HOURS IN VIRGINIA
ALL ROAD SYSTEMS

<u>Vehicle Type</u>	<u>Number</u>	<u>1977</u>	<u>%</u>	<u>Number</u>	<u>1976</u>	<u>%</u>	<u>Number</u>	<u>1975</u>	<u>%</u>
Total Trucks	13,676,342	25.1	12,224,707	23.7	11,062,333	22.7			
Trailer Trucks	3,671,776	6.7	3,254,550	6.3	2,958,409	6.1			
Single-Unit Trucks	10,004,566	18.4	8,970,157	17.4	8,103,924	16.7			
Passenger Cars	40,622,240	74.5	39,140,902	75.8	37,374,271	76.8			

Data on Truck Accidents

The first task in determining the nature of the truck accident problem was to ascertain the frequency and characteristics of truck accidents in the United States and in Virginia. Unfortunately, this proved considerably more difficult than was initially expected. As mentioned earlier, nationwide accident data for all trucks do not exist; however, approximations provided by the BMCS appear in Exhibit 5. Among the sample of truck accidents reported to the BMCS in 1977, there were over 2,900 truck-related fatalities and 31,698 injuries.

Exhibit 5

1977 TRUCK ACCIDENT INFORMATION -- U. S.

	<u>Fatalities</u>	<u>Injuries</u>	<u>Total</u>
Frequency	2,983	31,698	29,936
Rate per billion vehicle miles of travel	9.05	96.20	90.85
Severity index (frequency per 100 accidents)	9.96	105.88	—

Data on truck accidents in Virginia were much more complete, covering all of the reporting population (see Exhibit 6). In 1977, there were 348 fatal crashes, and 9,541 injury crashes (the incompleteness of the national data is confirmed by the fact that there were fewer total crashes nationwide than in Virginia). Because of the limitations in national data and the fact that Virginia data were expressed as crashes and national data were expressed in persons killed and injured, no comparisons between national and statewide data were possible. The reader is cautioned against any interpolation from the data.

Exhibit 6

1977 TRUCK ACCIDENT INFORMATION — VIRGINIA

	<u>Fatal Crashes</u>	<u>Injury Crashes</u>	<u>Total Crashes</u>
Frequency	348	9,451	37,901
Rate per million vehicle miles of travel	25.44	690.86	2188.3
Severity index (frequency per 100 accidents)	0.91	24.93	—

It should be noted that there are several characteristics of truck accidents which could be used to generate countermeasures, provided that a significant truck accident problem can be documented. First, new drivers are more likely to be involved in truck accidents than drivers with more experience (see Exhibit 24 on page 50). Additionally, the frequency of accidents has increased more over the recent past for these new drivers than for any other experience group. The bulk of truck collisions in Virginia involved passenger vehicles, with accidents involving two commercial trucks ranking second (see Exhibit 7). The bulk of the noncollision, single-vehicle truck accidents involved either running off the road or overturning in the roadway (see Exhibit 8).

Exhibit 7

PERCENT OF TRUCK ACCIDENTS BY COLLISION OBJECT

	<u>Pedestrian</u>	<u>Motorcycle/Bicycle</u>	<u>Automobile</u>	<u>Commercial Truck</u>	<u>Fixed Object</u>
<u>1977</u>					
Fatalities	5.8	3.0	64.4	13.1	4.1
Injuries	1.4	1.1	67.6	15.6	4.8
Accidents	1.9	1.5	59.2	17.6	10.2
<u>1976</u>					
Fatalities	7.8	3.6	65.0	11.0	2.8
Injuries	1.4	1.3	68.1	15.0	4.9
Accidents	2.4	1.7	59.5	17.5	10.5
<u>1975</u>					
Fatalities	6.1	4.0	65.5	12.1	4.0
Injuries	1.3	1.5	68.0	14.7	4.6
Accidents	2.1	2.0	59.9	16.7	10.5

Source: Bureau of Motor Carrier Safety, Accidents of Motor Carriers of Property

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Exhibit 8 .

PERCENT OF NON-COLLISION TRUCK ACCIDENTS

	<u>Cargo Shift</u>	<u>Fixed</u>	<u>Jackknife</u>	<u>Overturn</u>	<u>Ran Off Road</u>
<u>1977</u>					
Fatalities	0.8	1.4	3.3	31.2	60.4
Injuries	0.9	1.0	17.2	36.0	40.5
Accidents	1.2	3.2	18.7	33.0	38.0
<u>1976</u>					
Fatalities	0.9	6.0	2.8	23.0	64.7
Injuries	0.9	0.9	12.3	30.6	52.5
Accidents	1.3	3.5	13.2	27.8	49.9
<u>1975</u>					
Fatalities	0.4	1.2	7.0	20.9	56.6
Injuries	1.5	0.8	15.8	29.7	44.9
Accidents	1.6	3.6	18.8	27.4	40.8

Source: Bureau of Motor Carrier Safety, Accidents of Motor Carriers of Property

Comparisons of Truck and Passenger Vehicle Accidents

It was initially believed that national data could be used to generate norms from which the severity of Virginia's truck accident problem could be assessed. Since data limitations precluded this possibility, other comparisons had to be made. It was speculated that since time and effort were being spent to reduce the number and severity of passenger car accidents, similar time and effort should be devoted to reducing truck accidents, if the truck accident problem was at least as serious as that for passenger vehicles. Consequently, truck accident data for Virginia were compared with figures for passenger cars.

As shown in Exhibit 9, there were considerably more passenger vehicle-related crashes in 1977 than truck crashes. This was to be expected, since there were more passenger cars and more passenger car mileage was logged annually. However, the severity distributions for the two types, which are independent of exposure, differ significantly. A higher percentage of truck accidents are likely to be fatal or to involve property damage only, which indicates that truck accidents tend to fall in the extremes in relation to severity.

Exhibit 9

NUMBER OF 1977 VIRGINIA CRASHES BY SEVERITY AND VEHICLE TYPE

<u>Type Crash</u>	<u>Passenger Car</u>		<u>Truck</u>	
	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>
Fatal Crash	1,006	0.5	348	0.91
Injury Crash	52,865	26.0	9,451	24.93
Other	149,227	73.5	28,102	74.14
Total	203,098	100	37,901	100

$$X^2 = 118.37, df = 3$$

$$p < .01$$

When these accident figures are viewed in relation to exposure, similar results are found. The accident rates per million vehicle miles of travel appear in Exhibit 10, which shows fatal crash rates being slightly higher for trucks and injury and total crash rates being much higher for passenger cars. These data would indicate that while trucks are more likely than passenger cars to be involved in fatal crashes, their likelihood of being involved in a nonfatal crash is less. On the other hand, when accident data are viewed in relation to numbers of registered vehicles, different results are found (see Exhibit 11). Trucks are found to have much higher crash rates per vehicle than passenger cars, although the distributions of these crashes by severity are not significantly different. Overall, when looking at accident data controlled for exposure, one finds that the average truck will have more accidents per year than the average car, but will have fewer crashes per mile of travel. Thus, there is conflicting information as to whether the truck accident problem is more serious than that for passenger cars.

Exhibit 10

1977 VIRGINIA CRASH RATES PER MVMT BY VEHICLE TYPE

<u>Type Crash</u>	<u>Passenger Car</u>	<u>Truck</u>
Fatal Crash	24.77	25.44
Injury Crash	1301.39	691.06
Total	4999.70	2771.35

$$\chi^2 = 5.704, df = 2$$

$$p < .06$$

Exhibit 11

1977 VIRGINIA CRASH RATES PER 1,000 REGISTERED VEHICLES
BY VEHICLE TYPE

<u>Type Crash</u>	<u>Passenger Car</u>	<u>Truck</u>
Fatal Crash	0.33	2.08
Injury Crash	17.46	56.44
Total	67.06	226.34

$\chi^2 = 0.137, df = 2$

N. S.

Virginia's Truck Accident Data Compared with Those
of Neighboring States

Since it was not possible to conclusively assess the severity of Virginia's truck accident problem in relation to that of other types of vehicles, an assessment had to be made in another way. Data were obtained on the frequency and severity of truck crashes in states surrounding Virginia (see Exhibit 12). The data indicate that, in terms of fatalities and injuries per accident, Virginia's accident experiences are similar to those of most of its neighbors, with the exception of West Virginia, which had an unusually low severity index. With respect to the distribution of serious and fatal injuries, significant differences were found. Truck accidents in Virginia were found to involve a lower percentage of fatalities than were those for any other state except Maryland. This finding would tend to indicate, although inconclusively, that truck accidents may be less severe in Virginia than in surrounding states.

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Exhibit 12

TRUCK ACCIDENT SEVERITY FOR VIRGINIA, ITS
NEIGHBORING STATES, AND THE U. S. - 1977

	<u>Virginia</u>	<u>North Carolina</u>	<u>West Virginia</u>	<u>Maryland</u>	<u>U. S.</u>
Fatalities	72	113	37	35	2,981
Injuries	879	927	324	659	31,696
Total Crashes	753	819	397	539	29,935
Fatalities and Injuries per Accident	1.26	1.27	0.91	1.28	1.16

$$\chi^2 = 20.51, df = 4$$

$$p < .01$$

Analysis of Truck Accident Trends

Up to now, all of the reliable data available on truck accidents have yielded little conclusive evidence as to whether Virginia has a truck accident problem sufficiently serious to warrant a full-scale countermeasure attack. In further search of such evidence showing changes over time in truck accident trends, data for Virginia and the nation were examined. The reader is cautioned that the analysis was of limited value, since only 3 years of accident data were employed.

As shown in Exhibit 13, there were increases in all truck accident categories when rates were compared on the basis of million vehicle miles of travel (MVMT). These increases were significant at the .01 level. While there were some increases in passenger car accident rates over the same time period, these changes were extremely small and were not significant (see Exhibit 14).

Exhibit 13

VIRGINIA CRASH RATES FOR TRUCKS PER MVMT — 1975-1977

<u>Type Crash</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Percent Change</u>
Fatal Crashes	23.87	21.92	25.44	+6.57
Injury Crashes	636.23	628.22	691.06	+8.62
Total Crashes	2,549.63	2,501.10	2,771.35	+8.70

Exhibit 14

VIRGINIA CRASH RATES FOR PASSENGER CARS PER MVMT — 1975-1977

<u>Type Crash</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Percent Change</u>
Fatal Crashes	24.64	23.02	24.77	+0.53
Injury Crashes	1,277.44	1,274.73	1,301.39	+1.88
Total Crashes	4,996.25	4,804.37	4,999.70	+0.07

The severity indexes for trucks (the number of fatal and injury crashes per 100 total crashes) were also compared for the 1975 through 1977 period in Virginia (see Exhibit 15). These figures show a slight drop in the number of fatal crashes per 100 total crashes and no change in the number of injury crashes.

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Exhibit 15

VIRGINIA SEVERITY INDEX FOR TRUCK CRASHES — 1975 to 1977
(FREQUENCY PER 100 CRASHES)

<u>Type Crash</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Percent Change</u>
Fatal Crashes	0.94	0.88	0.92	-2.13
Injury Crashes	24.95	25.12	24.94	NC

Using national data on truck accidents supplied by the BMCS, changes nationwide were documented. The reader is again reminded that the BMCS data cover only a portion of the truck population and thereby underestimate the frequency of truck accidents and very likely overestimate the percentage increase over time. While there was an 11% increase in the fatality rate for BMCS carriers, there was no significant difference for the injury rate (see Exhibit 16).

Exhibit 16

NATIONAL CRASH RATES FOR TRUCKS PER BVMT — 1975-1977

<u>Type Crash</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Percent Change</u>
Fatalities	8.13	8.18	9.05	+11.41
Injuries	96.08	86.99	96.20	+0.12
Total Crashes	88.43	83.33	90.85	+2.74

Finally, the national truck severity index was compared for the 3-year period from 1975 to 1977. The figures in Exhibit 17 show that there was an increase of 8.26% in the rate of fatalities and a 2.54% drop in the rate of injuries per 100 crashes.

Exhibit 17

NATIONAL SEVERITY INDEX FOR TRUCK CRASHES — 1975-1977
(FREQUENCY PER 100 CRASHES)

<u>Type Crash</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Percent Change</u>
Fatalities	9.20	9.82	9.96	+8.26
Injuries	108.65	104.39	105.89	-2.54

From this trend analysis, several conclusions can be drawn. First, Virginia's truck accident rates increased significantly over the period 1975-1977. Second, increases in truck crash rates far exceeded those for passenger cars. This would indicate that should these trends continue, Virginia could experience a significant increase in the severity of its truck accident problem. Third, fatalities are increasing at a rate greater than that for injuries or total crashes in the nation.

Summary

Little can be concluded from this analysis due to the general inadequacy of the data available for truck accidents. While it is difficult to describe the nature of Virginia's truck accident problem in relation to national norms, some characteristics of truck accidents indicate that these accidents could be amenable to highway safety countermeasures. For instance, less experienced drivers have more truck accidents than more experienced ones, and the crash rate for new drivers is increasing more rapidly than that for any other experience group. Thus, education and training oriented countermeasures could be expected to benefit this "at risk", new driver group.

As compared to passenger car accidents, conflicting assessments of the severity of truck accidents were found. While there were fewer truck accidents per mile (on an annual basis), there were more truck accidents per registered vehicle. Thus, the severity of the problem could be judged as being either significant or insignificant, depending on the outlook of the reader. For example, those persons interested in individual vehicle inspection and regulation would judge the problem to be severe, whereas someone rank-ordering the state's transportation safety problems on an annual basis might be tempted to judge the problem as one requiring little attention. In addition, Virginia does not appear to have a more serious truck accident problem than its neighboring states. Finally, it was determined that Virginia's truck accident problem expressed as crash rates is increasing much more rapidly than the truck problem nationally and much more rapidly than the passenger car problem in the state.

From these data, only two conclusions can be drawn:

1. While a serious truck accident problem cannot be fully documented at this time, there are indications of the existence of a problem, at least on a vehicle-by-vehicle basis, and there are indications that the problem is worsening at a rapid rate.
2. Considerably more and better truck accident data are needed on both the state and national levels to enable an accurate description of the truck accident problem.

ANALYSIS OF CRASH INVESTIGATION TEAM REPORTS

Since 1971 the Virginia Department of Transportation Safety's Crash Investigation Team has investigated selected accidents. The Team's objective is to identify all factors contributing to the cause of a crash by an intensive study that seeks human error, vehicle and system design defects, or a combination of these factors. The team, formed in cooperation with the State Police, Department of Highways and Transportation, and Virginia Commonwealth University, includes a state trooper, a traffic engineer, and a behavioral specialist.

What follows is an analysis of 37 Crash Team investigations of accidents involving heavy trucks. The analysis focuses on characteristics of the accident location and the truck involved, and the actions and condition of the truck driver. Since the accidents selected for investigation by the Crash Team do not

constitute a random sample of all truck accidents in Virginia, conclusions about these accidents do not necessarily hold for all truck accidents. Exhibits 18-23 present a summary of the findings of the Crash Team.

A vast majority, 86.5%, of the accidents involved more than one vehicle. Six of the accidents studied, 16.2%, involved more than one truck. A fairly high percentage of the investigated accidents, roughly 20%, involved a shipment of hazardous materials (see Exhibit 18).

Exhibit 18

TYPE OF ACCIDENT

<u>Type</u>	<u>Number</u>	<u>Percent of Total</u>
Multi - Vehicle	32	86.5
Single - Vehicle	5	13.5
Total	37	100.0
Multi - truck	6	16.2
Involving Hazardous Materials	8	21.6
Fatal	24	64.9

Almost two-thirds of the accidents involved at least one fatality. However, truck drivers were killed in only 3 (12.5%) of the fatal accidents. One of the truck driver fatalities occurred in a collision with a train, another occurred in a collision with a fixed object, and the third resulted from an accident involving a gasoline tanker. Consequently, the ratio of accidents fatal to truck occupants and accidents fatal to other persons is quite low, 1:7, in the investigated accidents (see Exhibit 19).

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Exhibit 19

FATAL ACCIDENT CHARACTERISTICS

	<u>Number^a</u>	<u>Percent of Total</u>
<u>Fatal Accidents</u>	24	100.0
Accidents In Which:		
Truck Occupant Killed	3	12.5
Other Person Killed	21	87.5
<u>Type of Road^b</u>		
Interstate	3	12.5
4-Lane (Not Including Int.)	12	50.0
3-Lane	2	8.3
2-Lane	13	54.2
Accident Occurred at Intersection	12	50.0

^aNumber of accidents, not fatalities.

^bSum is greater than 100% due to intersections.

As for the physical characteristics of the road and location of the accident, a substantial portion, almost 80%, took place in rural areas. Over 80% of the accidents occurred during daylight hours and almost 90% occurred dry roads. The weather was clear when over two-thirds of the crashes occurred. Therefore, it would seem that inclement weather and adverse road conditions did not play a significant role in these accidents.

Almost 80% of the truck accidents occurred on straight stretches of road and 70% took place on level stretches. A substantial portion of the accidents, roughly one-third, occurred

at intersections; however one-half of the fatal accidents occurred at intersections. These findings suggest that crashes involving heavy trucks at intersections tend to be more severe than those happening elsewhere.

Approximately one-fourth of the accidents occurred on interstate highways, while both 2-lane and other 4-lane roads were the scene of greater than 40% of the accidents. In addition, only one-eighth of the fatal accidents occurred on interstate roads. Consequently, it appears that heavy truck accidents may be both less likely to occur and less severe on interstate than on other type roads (see Exhibit 20).

Exhibit 20

PHYSICAL CHARACTERISTICS

<u>Type of Area</u>	<u>Number</u>	<u>Percent of Total</u>
Rural	29	78.4
Residential	3	8.1
Urban or Commercial	5	13.5
<u>Light Conditions</u>		
Day	31	83.8
Night	5	13.5
Dusk	1	2.7
<u>Weather Conditions</u>		
Clear	26	70.3
Cloudy	8	21.6
Precipitation	3	8.1
<u>Road Conditions</u>		
Dry	33	89.2
Wet	4	10.8

Exhibit 20 (Cont.)

<u>Road Characteristics</u>	<u>Number</u>	<u>Percent of Total</u>
Straight	29	78.4
Curve	8	21.6
Level	26	70.3
Grade	11	29.7
Intersection	12	32.4
Bridge	2	5.4
Construction Area	3	8.1
<u>Type of Road^a</u>		
Interstate	9	24.3
4-Lane (Not Including Int.)	17	45.9
3-Lane	2	5.4
2-Lane	16	43.2

^aSum is greater than 100% (37 accidents) due to intersections.

Seventy percent of these heavy truck accidents involved tractor trailers, while both dump trucks and single-unit trucks were involved in one-fifth of the accidents. Of these trucks, 85% were company-owned while 15% were owner-operated vehicles (see Exhibit 21).

TRUCK CHARACTERISTICS

<u>Kind of Truck^a</u>	<u>Number</u>	<u>Percent of Total</u>
Tractor Trailer	26	70.3
Dump	8	21.6
Single-Unit	7	18.9
Company-Owned	31	83.8
Owner-Operated	6	16.2

Avg. Age of Truck 4.2 Yrs.

Avg. Age of Truck Driver 36.9 Yrs.

^aSum is greater than 100% due to multi-truck accidents.

In its investigations the Crash Team cited a wide variety of causal factors. In general, the Team found the truck to be primarily at fault in slightly over 45% of the accidents, while error on the part of the truck driver or a defect in the truck played a contributory role in three-fourths of the accidents. Sixty-five percent of the accidents involved an error made by the driver of or a defect in another vehicle involved in the collision.

The Crash Team cited a traffic violation by the truck driver more frequently than any other contributory factor. In 40% of the crashes investigated the truck driver had committed infractions such as speeding, running a red light or stop sign, and violations of other warning signs. Additionally, almost 40% of the accidents involved truck drivers with previous records of traffic violations, some of them very extensive. Thus, it appears that improper driving practices on the part of truck drivers are a major factor in truck accidents.

Supporting this finding is the fact that almost one-fifth of the accidents involved drivers with little experience in driving trucks or the particular kind of truck that they were driving. Some of the operators had been driving for as little as 6 weeks when a crash occurred.

Other truck driver-related causal factors cited by the Crash Team included unfamiliarity with the road and failure to take evasive action. And in 1 out of 4 accidents the team identified an overtired driver as a causal factor. All of these factors demonstrate the important role that driver error plays in accident causation.

The Team also identified causal factors associated with the condition of the vehicle, though it did not cite them as frequently as the driver-related causes. These included defective brakes and tires, improper loading, overloading, and the lack of under-ride protection on tractor trailers (see Exhibit 22).

Exhibit 22

CAUSATION

	<u>Number</u>	<u>Percent of Total</u>
Truck Primarily At Fault	17	45.9
Other Vehicle Primarily at Fault	20	54.1
Driver Error or Vehicle Defect Involved:		
Truck	28	75.7
Other Vehicle	24	64.9
Causal Factors:		
Traffic Violation By Truck	15	40.5
Overtired Driver	9	24.3
Truck Driver With Little Experience	7	18.9
Improper Loading or Overloading	4	10.8
Lack of Underride Protection	4	10.8

Exhibit 22 (Cont.)

	<u>Number</u>	<u>Percent of Total</u>
Causal Factors Cont.:		
Truck Driver Unfamiliar With Road	4	10.8
Truck Driver Failed to Take Evasive Action	4	10.8
Mechanical Defect in Truck	3	8.1
Truck Driver With Previous Driving Record	14	37.8

The recommendations made by the Crash Team reflected the importance of driver-related causal factors, as over 80% of the investigations recommended programs aimed at increasing awareness of the needs of the driving task. The reports on almost 30% of the investigations contained proposals pertaining to the need to keep poor drivers off the road. These included better cooperation between states in keeping truck drivers with bad driving records off the highways. Better cooperation is needed because a driver may have licenses in more than one state and thus may still drive if one state suspends the license it issued to him.

The Team also frequently recommended the installation of improved warning signs or traffic control systems at accident locations and, in over one-third of the crashes, the Team suggested a redesign of the vehicle. These proposals included better protection for the occupants of the truck, and for those of other vehicles, as in the case of underride protection on trucks.

Other recommendations included structural changes in roads, strict enforcement of existing traffic laws, and extended training of emergency personnel (see Exhibit 23).

Exhibit 23

RECOMMENDATIONS

	<u>Number</u>	<u>Percent of Total</u>
Improved Driver Education	31	83.8
Improved Warning Signs or Traffic Control System	17	45.9
Vehicle Redesign	14	37.8
Remove Poor Drivers From Highways	11	29.7
Strict Enforcement of Existing Laws	7	18.9
Extended Training of Emergency Personnel	7	18.9
Structural Highway Changes	5	13.5

Due to the nature of the accident sample, no conclusive findings applicable to all truck accidents can be made. Nevertheless, certain items stand out. One is the high number and high severity of accidents occurring at intersections. Another is the low number of truck driver fatalities relative to other fatalities. Finally, the high percentage of accidents in which an error by the truck driver contributed to the crash suggests that some method of improving driving skills or removing problem drivers from the road is necessary.

REGULATORY PROVISIONS GOVERNING THE TRUCKING INDUSTRY

RegulationsMotor Carriers in General

The State Corporation Commission (SCC) is vested with the authority of supervising, regulating and controlling all public service companies doing business in Virginia under §§12.1-12 and 56-35 of the Virginia Code. This supervisory control over the operation of public service companies includes the authority to

regulate and supervise the transportation of passengers or property for compensation by motor carriers, unless the carrier is specifically exempt. Common carriers* and restricted common carriers** are required to secure from the Commission certificates of public convenience and necessity before they can operate in Virginia (§56-278). Contract carriers *** are required to secure from the Commission permits authorizing them to engage in business in the State (§56-288). Commission approval is necessary for any transfer or assignment of a certificate or permit (§56-291.10).

Before a motor vehicle may be operated for compensation on any highway in Virginia, the owner or operator must be issued a warrant or exemption card and a classification plate (§56-304). For vehicles used solely in interstate commerce, the motor carrier must secure a stamp or decal from the SCC (§56-304). Motor carriers for compensation, and even some private carriers, must also secure from the Commission a vehicle registration card and an identification marker or stamp (§56.304.1). If authority to operate the motor vehicle is required from the Interstate Commerce Commission (ICC), such authority must be obtained before a warrant, exemption card, registration card or stamp will be issued by the SCC (§56-304.6:1).

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- * The term "common carrier by motor vehicle" means any person who undertakes to transport passengers or property for the general public by motor vehicle for compensation over the highways of the state, §56.273(d).
 - ** The term "restricted common carrier by motor vehicle" means any person who undertakes to transport passengers or property of any restricted class or classes by motor vehicle for compensation, §56.273(e).
 - *** The term "contract carrier by motor vehicle" means any person, not included within the definition of common carrier and restricted common carrier who, under special and individual contracts or agreements, transports property by motor vehicle for compensation, §56-273 (f).

The following types of commercial vehicles are required to be registered with and display the authority issued by the SCC:

1. All three axle trucks
2. All tractor, road tractors, and tractor trucks
3. All vehicles having a seating capacity of more than seven passengers when operated for hire in interstate commerce and not licensed in Virginia
4. All Virginia licensed 2-axle trucks operated for hire when used to transport non-exempt commodities
5. All Virginia licensed vehicles when used to transport passengers for hire (§56-304.1 and 56-304.2)

In addition to the requirements mentioned above, every common carrier or restricted common carrier of property or passengers by motor vehicle is required to provide safe and adequate service, equipment, and facilities for the transportation of property or passengers (§56-306). Finally, the Commission has the authority to approve and alter rates of common carriers and restricted common carriers, to require refunds of excess charges, to establish through routes and joint rates, and to approve changes in schedules (§56-310).

The SCC, pursuant to §56-334, has appointed 30 investigators who are engaged primarily in the enforcement of SCC rules and regulations under Title 56 of the Virginia Code. They also enforce the aviation rules and regulations under Title 5.1 and, collaterally, the highway laws under Title 46.1. The state is organized into 5 areas by the enforcement division of the SCC. Each area is headed by a supervisor who oversees the activities of the investigators in his area. The investigators perform the following tasks:

1. Visiting the place of business of motor vehicle carriers in order to revoke any insurance authority or other operating authority that has expired or has been cancelled by the Commission and not voluntarily relinquished
2. Conducting patrol activities and monitoring vehicle movement, which includes stopping and investigating any vehicle thought not to be in compliance with SCC rules and regulations and issuing summonses for any violation, including safety equipment violations, coming to their attention

3. Conducting scheduled vehicle checks at permanent scales during day and evening hours
4. Doing paper work such as filling out activity reports.

These activities are performed during the week and sometimes on weekends. In addition, the investigators are subject to call on any time. They do not work directly with the State Police, whose activities are outlined below, but they do have contact with the police when working at the weigh stations.

Another general power of the Commission involves the investigation and reporting of accidents. Under §56-332 of the Code, it has the authority to require every motor carrier doing business in Virginia to report to it all accidents resulting in injury to persons, equipment, highway or property of any kind. In addition, under the regulations promulgated by the Commission, every motor carrier must make available to the Commission upon request all records and information which pertain to any accident. Under current practice, however, motor carriers are not required to file accident reports with the Commission, in order to avoid the duplication of record keeping by the DMV. Motor carriers also have a duty to afford reasonable assistance in the investigation of any accident.

All weight and size limitations (length, width, and height) and equipment requirements are specified in the Virginia Code and apply to all vehicles travelling on Virginia highways, whether they are licensed in Virginia or in another state. Hauling or moving permits must be secured from the Department of Highways & Transportation for the operation of any vehicle or vehicle combination in excess of the statutory size and weight limits. The data collected from all weighing operations are analyzed by the Department and used in preparing monthly and annual reports. These data are presented later in this report.

Transportation of Hazardous Materials

Under the rules and regulations promulgated by the SCC in 1958*, it is unlawful to transport within Virginia by motor vehicle any dangerous article** except as in the manner prescribed by the regulations. However, exemptions are permitted under the regulations for the transportation of dangerous articles in interstate commerce which are packed, marked, labelled and accompanied by shipping papers in conformity with the regulations of the

* Rules and Regulations Governing the Operation of Motor Vehicles Transporting Explosives and Other Dangerous Articles. Commonwealth of Virginia, State Corporation. February 1, 1958.

** The term "dangerous articles" means explosives, flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gases, poisonous substances and radioactive materials. All of these terms are defined in the regulations.

Interstate Commerce Commission* and the transportation of articles that are exempt under federal regulations. In addition, certain explosives specified in the regulations may not be transported without written authorization from the SCC.

The central purpose of the regulations is to prescribe the conditions under which dangerous articles must be loaded, transported, and unloaded. In general, these conditions are designed to ensure that dangerous articles are handled and transported in Virginia in a manner that is safe to both the public and the motor carrier. In addition to the requirements listed below, motor carriers of dangerous articles must abide by all other laws and rules regulating transportation in Virginia. Among the requirements listed in the regulations are the following:**

1. Every motor vehicle transporting dangerous articles must be marked or placarded on the rear and each side (some trucks must also be marked on the front) with words indicating the contents or the characteristics of the vehicle as specified in the regulations.
2. Dangerous articles must be packed or carried in adequately marked containers sufficient in size, strength, and composition for the transportation of the commodity (compliance with federal regulations is sufficient).
3. Motor vehicles used for transporting dangerous articles must be strong enough to carry the load and in first-class condition.
4. All electrical wiring must be completely insulated and securely fastened to prevent short-circuiting.
5. Smoking is prohibited in or about any motor vehicle handling dangerous articles.
6. Extreme care must be taken in loading and unloading any dangerous article and in the use of tools for loading or unloading.

* This should be the Department of Transportation (DOT) since the authority over the transportation of hazardous materials was transferred from the ICC to the DOT in 1966.

** This listing is only a sample of the regulations governing the transportation of dangerous articles.

7. Reasonable care should be taken to prevent undue rise in temperature of the containers and their contents during transit.
8. Containers must be braced in a manner that minimizes movement during transit.
9. The driver of a vehicle transporting dangerous articles must stop the vehicle before crossing any railroad track.
10. Each truck used in the transportation of dangerous articles must be equipped with at least one approved fire extinguisher.
11. No motor vehicle transporting dangerous articles may operate within 300 feet of another vehicle travelling in the same direction on the highways.
12. The driver of a motor vehicle containing dangerous articles operating through or within a city or town must comply with all ordinances of the city or town pertaining to the transportation of dangerous articles.

In addition to stating the conditions under which dangerous articles must be transported, the regulations impose an affirmative duty on the owner and lessee of a motor vehicle used for transporting dangerous articles to see that the motor vehicle is inspected before each trip to determine that —

1. fire extinguishers are filled and in working order;
2. electrical wiring is completely insulated and firmly secured;
3. chassis, engine, pan and bottom of body are clean and free from surplus oil and grease;
4. fuel tank and feed line have no leaks;
5. brakes and steering apparatus are in good condition;
6. the motor vehicle is in proper condition for handling dangerous articles.

The regulations also require that the driver of a motor vehicle used in the transportation of dangerous articles be experienced and reliable, meet the qualifications for obtaining a chauffeur's license in Virginia, and be familiar with the rules of the road and the safety rules for the handling and transportation of explosives and dangerous articles.

Federal Regulations

In 1967 the BMCS was established as a part of the Federal Highway Administration (FHWA). The primary function of the BMCS is to reduce commercial vehicle accidents and attendant fatalities, injuries and property losses. To encourage the safe operation of commercial vehicles, the Bureau also initiates research and development projects within the FHWA.

The jurisdiction of the BMCS derives primarily from three pieces of legislation. The following is a discussion of their scope and content.

The Interstate Commerce Act

The most important of the three to be discussed, this Act vested in the ICC many safety-related functions. In 1966, the Department of Transportation Act transferred these functions to the DOT, and subsequent delegations of authority assigned them to the Bureau. Since its passage in Congress in 1887, the Act has been substantially altered by a number of subsequent amendments, the most recent of which was a comprehensive revision which became effective in 1978.

In 1935, Congress passed Part II of the Interstate Commerce Act, also known as the Motor Carrier Act. It provides the authority under which most of the Bureau's activities are conducted. The purpose of Part II was to bring interstate transportation by motor carrier into one national system governed by a unified and comprehensive set of legal obligations, with the ultimate view of protecting the public from unregulated competition. To help achieve this result, Part II authorized the ICC to regulate, among other matters, the qualifications and hours of service of employees and to ensure the safety of operations and equipment of common, contract, and private carriers of property engaged in interstate and foreign commerce. The Act provides the authority to promulgate regulations (e.g., the FMCSR), conduct research, and hold hearings in furtherance of the purposes of the Act.

The Interstate Commerce Act contains additional sections describing the procedures to be followed when motor carriers are under investigation or are found to be operating unlawfully. One subsection is particularly important, for it defines the inspection authority under which the Bureau conducts many of its investigations. As the language of the Act demonstrates, the investigatory power is broad.

The Commission, or any employee designated by the Commission, may on demand and display of proper credentials —

1. Inspect and examine the lands, buildings, and equipment of a carrier, broker, or lessor; and
2. Inspect and copy any record of —
 - (A) A carrier, broker, lessor, or association;
 - (B) A person controlling, controlled by, or under common control with a carrier if the Commission considers inspection relevant to that person's relation to, or transaction with, that carrier ..., (49 U.S.C. § 11144).

The investigatory power is reinforced by additional provisions describing penal sanctions applicable to carriers who fail to comply with the terms of the Act. Penalties may be assessed for such offenses as the transportation of passengers without charge, record keeping and reporting violations, the evasion of regulations, and disobedience of subpoenas.

The Noise Control Act

The Noise Control Act, 42 U.S.C. § 4917, empowers the Secretary of Transportation to promulgate regulations governing noise emissions from commercial motor vehicles operated by carriers in interstate commerce. An example of such regulations is found at 49 CFR 325, "Compliance With Interstate Motor Carrier Noise Emission Standards." These regulations describe procedures to be used by the BMCS in examining and testing motor vehicles to ascertain whether they comply with the Interstate Motor Carrier Noise Emission Standards of the Environmental Protection Agency (EPA). They address various aspects of noise emissions, including the types of measurement systems to be used in determining levels of sound, specifications regarding the most desirable site characteristics and ambient conditions, the placing of microphones, and the evaluation of tires and exhaust systems.

As did the Interstate Commerce Act, the Noise Control Act created inspection and enforcement powers within the DOT. The regulations describe these powers in detail, including mandatory provisions that "A motor carrier ... must, at any time, submit a motor vehicle used in its operation for inspection, examination, and testing..." (49 CFR 325.13).

The Act also directs the Administrator of the EPA and the Secretary of Transportation to cooperate in the promulgation of regulations. Furthermore, the regulations must reflect "the

degree of noise reduction achievable through the application of the best available technology, taking into account the cost of compliance" (42 U.S.C. § 4917). The role of the Administrator focuses, of course, on environmental issues, while the Secretary is directed "to assure appropriate consideration for safety and technological availability." Id.

The Hazardous Materials Transportation Act

This Act, 49 U.S.C. § 1809, consolidated the general responsibility to supervise the issuance and enforcement of regulations regarding the transportation of hazardous materials in commerce in the Materials Transportation Bureau (MTB) within the DOT. The BMCS, however, along with other administrative bodies, such as the Federal Aviation Administration and the Coast Guard, retained primary responsibility for originating regulations and carrying out the inspection, enforcement, and training functions related to its particular mode.

The BMCS is charged with the enforcement of extensive regulations promulgated under the authority granted by the Act to the Secretary of Transportation (49CFR 107-173, and 177-178). Because of their length, the following discussion of their scope and content will be limited.

Part 107 deals with a variety of procedural matters. Subpart A, for example, governs the establishment of jurisdiction over non-residents of the United States, the issuance of subpoenas, the payment of witness fees, the creation of a public docket room in the MTB, and the definitions of key terms.

Subparts B and C set forth additional procedures to be followed in the granting of exemptions from the regulations and in the evaluation of requests by states or political subdivisions concerning the pre-emptive effect of the Hazardous Materials Transportation Act on state and local laws.

Enforcement is dealt with in Subpart D. Its provisions assign the responsibility for enforcement of the regulations in the various modes, and outline the procedure for the issuance of compliance orders and injunctions. Civil and criminal penalties are also provided for, with subsections describing the proper steps for prosecution, hearings, appeals, and the assessment of maximum penalties.

The regulations contained in Part 170 have been temporarily suspended pending revision.

Various topics are covered in Part 171, including changes in specifications for tank cars, requirements governing the packing and transportation of bombs, depth charges, torpedoes, and the like, the filing of hazardous materials incident reports, and the "rules of construction" to be used in the interpretation of the regulations.

The most significant subsection of Part 172 contains a highly detailed Hazardous Materials Table, divided according to descriptions and shipping names of hazardous materials, hazard class (e.g., corrosive, flammable, explosives, etc.), labels required, packaging requirements, maximum quantity per package, and specifications governing water shipments. Additional subsections of Part 172 deal with marking requirements, authorized abbreviations, the packaging of radioactive materials, the marking of tank cars, and general labelling and placarding requirements. Illustrations of the proper labels for materials such as poison gas, oxidizers, flammable solids and biomedical agents are also included.

The purpose of Part 173 is to prescribe certain requirements governing the preparation of hazardous materials for shipment by the various modes of transportation. The subsections outline the procedure for loading and unloading transport vehicles, set forth the standard requirements for all packages, and describe the shipper's responsibility to determine that shipments are made in proper containers. Additional provisions define the various classes of explosives, flammable and corrosive substances, poisonous materials, etc., while others describe the placards that must be displayed during transportation.

Part 177 is addressed specifically to carriage by public highway, and includes sections on export and import shipments, Canadian shipments, forbidden hazardous materials, loading and unloading, and regulations applicable to the transportation of hazardous materials by motor vehicles carrying passengers. A brief chart describes hazardous materials that must not be loaded, transported, or stored together. Other subsections describe the procedure to be followed when accidents occur involving shipments of hazardous materials.

Finally, Part 178 gives the specifications required for various types of shipping containers, such as metal barrels, drums, kegs, cylinders, trunks, and bags. Parts and dimensions are dealt with in great detail, and a number of illustrations are included to aid enforcement and compliance.

Regulation UpdateFederal and State Codes

Organization

The FMCSR, 49 CFR §§386-398, set the boundaries for the inspection and enforcement activities of the BMCS. These regulations, divided into twelve subparts and hundreds of sections, provide a comprehensive set of definitions, standards, and procedures for all aspects of motor carrier safety on interstates and other federal highways. Drivers and trucks subject to the FMCSR include trucks that haul (1) cargo from overseas, (2) property from state to state, (3) cargo across a border, and (4) loads of interstate cargo moving within one state. The titles of the major subparts of these regulations are as follows:

- 386 Rules of Practice for Motor Carrier Safety Proceedings
- 388 Cooperative Agreements with the States
- 389 Rule-Making Procedures
- 390 FMCSR — General
- 391 Qualifications of Drivers
- 392 Driving of Motor Vehicles
- 393 Parts and Accessories Necessary for Safe Operation
- 394 Notification, Reporting and Recording of Accidents
- 395 Hours of Service for Drivers
- 396 Inspection, Repair, and Maintenance
- 397 Transportation of Hazardous Materials
- 398 Transportation of Migrant Workers

These sections are followed by a number of appendices and supplemented by an interpretive handbook.

Although a number of states have adopted the FMCSR in whole or in part, no such action has been taken by the Commonwealth of Virginia. Neither has any special section of the Code of Virginia

been developed to deal specifically with motor carrier safety. Instead the Code has evolved to address all vehicle safety in a topical fashion. For example, 46.1-278 addresses the topic "Within what distances brakes should stop a vehicle." Clause (a) establishes the state's standard for passenger vehicles, clause (b) the standard for buses, trucks, and tractor trucks, (c) for antique vehicles, (d) combinations of vehicles, and (e) motorcycles. While numerous aspects of the Federal Rules are paralleled by parts of the Virginia Code, the Code's approach makes it more difficult to assess the state's standards for motor carrier safety. One consequence may be greater difficulty in educating motor carriers and those responsible for the investigation and enforcement of motor carrier safety standards. Although outright adoption of the FMCSR may not be necessary, some consolidation or reorganization of those sections affecting motor carrier safety may be helpful.

Code Differences

As noted previously, the FMCSR and the Code of Virginia share many motor carrier safety standards. The material below is chiefly a discussion of the significant differences between the two sets of law. It dispenses with the procedural aspects of the FMCSR that deal with rules of practice, hearings and rulemaking (§§386, 388, 389), and focuses on some of the substantive regulations that affect the daily road operations of the trucking industry. The material is divided into six general areas of significant regulatory activity. Some of the differences between the two bodies of law have prompted some of our recommendations that the Virginia provisions be altered. There are other differences which are noted, the significance of which cannot be fully understood without obtaining considerably more and better truck accident data. Finally, some of the material does not dwell on differences, but is largely descriptive of the regulatory practices of the BMCS and deemed to be pertinent to this report.

Qualifications of Drivers - The FMCSR require that drivers be 21 years old, able to read and speak enough English to understand highway signs and communicate with officials, and able to operate a vehicle safely. In addition to the application process and the review of the driver's operating record (motor carriers must inquire at the appropriate state agency for the applicant's driving record over the previous 3 years), the driver qualification procedures include three features: a road test, a written examination, and a physical examination.

The FMCSR road test (49 CFR §391.31) is not a specific test over a set course of predetermined duration. The test, which may be administered by the motor carrier or by a "competent" designated person, must be of sufficient duration and complexity so that the driver can demonstrate his ability to (1) perform the pretrip inspection, (2) couple and uncouple combination units, (3) place the vehicle in operation, (4) use all vehicle controls and emergency equipment, (5) drive the vehicle in traffic, (6) turn the vehicle, (7) brake the vehicle and slow it by means other than braking, and (8) back and park the vehicle.

The written examination consists of 66 questions that measure a driver's knowledge of those aspects of commercial vehicle safety embodied in the FMCSR. Safety includes both operating procedures and condition of the vehicle. The policy behind the test is to instruct drivers rather than to rate them as qualified or unqualified. The BMCS has not established a "passing score" and the "certificate of written examination" (49 CFR §391.35(g)) does not indicate any score. The test "is an instructional tool only, and a person's qualifications to drive a motor vehicle... are not affected by his performance on the examination." (CFR § 391.35(b)). At the completion of the test, the examiner will inform the driver of the correct answers. Motor carriers can use test results as a guide for additional driver training and instruction.

To satisfy the requirements of the FMCSR, drivers must pass a physical examination conducted by a licensed medical doctor at least once every 2 years. The procedures for this exam, are outlined in (49 CFR §391.43). Grounds for failing applicants include: (1) impairment of hands or feet that might interfere with safe driving; (2) a diagnosis of diabetes that requires insulin for control; (3) a variety of cardiovascular problems; (4) a respiratory dysfunction, blood pressure condition, arthritis, neuromuscular disease, or other condition that might impair the ability to drive; and (5) conditions that might cause a loss of consciousness. Drivers must also pass a hearing test, be free from drug or alcohol problems, and satisfy the following minimum visual standards: 20/40 acuity in each eye without corrective lenses or at least 20/40 with correction, field of vision of at least 70° in each eye, and ability to recognize the colors of signals. Special waiver procedures are available for drivers who are unable to satisfy certain physical standards set forth in the FMCSR.

The Virginia provisions in this area differ in several respects from the FMCSR. The minimum age in the FMCSR is 21, while the minimum age for obtaining a chauffeur's license in Virginia is only 18 (§46.1-357). The Virginia Code does not set forth specific

road test requirements for the chauffeur's license. Sections 46.1-369 and 46.1-373 do require that applicants who wish to operate "any vehicle or combination of vehicles having three or more axles with an actual gross weight in excess of forty thousand pounds" must submit to and pass an examination using the type of vehicle for which the applicant seeks a license. These tests are administered by local DMV examiners. Although local officers spend most of their time examining operators of passenger vehicles, DMV personnel do receive in-service training from truck company officials on how to conduct road tests for truck license applicants. Virginia waives the road test for any applicant who states "in his application ... that he has driven at least five hundred miles in the vehicle of the classification which he intends to operate...." There are no provisions in the Code that indicate how drivers can accumulate 500 miles of driving time. Apparently, the waiver is available to those who have been licensed by other states, participated in motor carrier training programs, or obtained learner permits and driven under the supervision of a licensed chauffeur. It is also important to note that the FMCSR do not contain the 40,000 lb. gross vehicle weight (GVW) standard mentioned in the Virginia Code. The FMCSR require road tests for drivers of all vehicles weighing more than 10,000 lb. GVW. Exemptions from the road test requirement are available for drivers of lightweight vehicles, certain farm vehicles and certain vehicles used in intracity operations.

With regard to Virginia's lower minimum age requirement, the research conducted in connection with this report by the Highway and Transportation Research Council has not isolated any statistics that indicate that Virginia truck drivers under 21 have a higher accident rate than older drivers. However, data indicate (see Exhibit 24) that there is a disproportionate involvement in accidents of drivers with less than one year's experience with their employer. To some extent these data suggest that driver inexperience is a causative factor in many truck accidents. It is also significant that the BMCS in 1975 considered and decided against reducing the FMCSR minimum age to 18. It concluded that the available data indicated that persons under 21 lack the maturity, judgement and skill to be heavy truck drivers, given the demands of commercial vehicle operation. In addition, researchers at the University of North Carolina recently conducted a study, the results of which will be published in the near future, which found that young truck drivers have a significantly higher rate of accident involvement than middle-aged drivers. Finally, the NTSB recommended in 1978 that Virginia eliminate the "500 mile waiver," and also expressed concern about Virginia's minimum age requirement of 18 years. The recommendations were the result of an investigation of a Virginia accident in which an 18-year-old truck driver killed four people.

Exhibit 24

NUMBER OF INVOLVEMENTS BY DRIVER EXPERIENCE

<u>Driver Experience</u>	<u>1977</u>	<u>1976</u>	<u>1975</u>	<u>Percent Change 1975-1977</u>
0 - 1	14,182	10,603	9,357	+51.6
2 - 4	6,198	6,488	6,397	- 3.1
5 - 9	4,830	4,024	3,969	+21.7
10 - 14	2,190	1,952	1,819	+20.4
15 - 19	1,131	1,141	1,219	- 7.2
20 +	<u>2,032</u>	<u>1,795</u>	<u>1,958</u>	<u>+ 3.8</u>
Total	30,563	26,003	24,719	+23.6

Source: Bureau of Motor Carrier Safety, Accidents of Motor Carriers of Property

Because youth and inexperience have been demonstrated to be causative factors in a disproportionate number of truck accidents, it is recommended that Virginia eliminate or qualify the "500 mile waiver" of the road test for license applicants who wish to operate vehicles or vehicle combinations with three or more axles and a GVW in excess of 40,000 lb. For the same reasons, consideration should be given to raising the minimum age requirement to 21.

The Code of Virginia and the DMV make no provisions for special written tests for truck drivers. Applicants for chauffeur's licenses take the same test concerning the rules of the road in Virginia as do applicants for an operator's license. It may be useful for Virginia to administer this exam or an equivalent "truck exam" to applicants for chauffeur's licenses. Unfortunately, there is no information at hand as to the educational effectiveness of this test. Until further data become available, it cannot be concluded that the benefits to be gained from requiring this test would outweigh the costs of administering it.

Virginia requires minimal visual standards similar to those of the FMCSR. Section 46.1-357.2 requires 20/40 acuity in each eye and a horizontal field of 140°. These requirements are identical to those of the FMCSR. As in other areas, the Virginia Code does not list in detail those physical problems which the FMCSR stipulates as a barrier to driver licensing. However, §46.1-361 gives the DMV the power to refuse to issue a license to a person "afflicted with ... such physical or mental disability or disease as will serve to prevent such person from exercising reasonable and ordinary control over a motor vehicle...." Several other sections give the Division authority to refuse licenses to drunkards, drug addicts, idiots, persons who have committed certain offenses and persons who have made false statements on applications.

In conclusion, it appears that Virginia's laws, though not as specific as the federal regulations, do impose substantially similar requirements on those who wish to drive trucks in commerce. The most serious differences are Virginia's "500 mile waiver" provision and lower minimum age. Although more explicit data regarding the effects of driver inexperience would be helpful, there is already a sufficient basis for recommending that the waiver provision be removed or qualified and that consideration be given to raising the minimum age for obtaining a chauffeur's license. As indicated above, further data are necessary in order to determine whether Virginia should require a separate written test designed for truck drivers.

Driving of Motor Vehicles — The federal rules governing the operation of trucks in traffic and the laws of Virginia that regulate traffic are identical or nearly identical on many points. Exhibit 25 is a cross reference for §392 of the FMCSR and the Virginia Code.

Exhibit 25

VIRGINIA AND FEDERAL REGULATIONS GOVERNING TRUCK OPERATIONS

<u>Federal</u>	<u>Virginia</u>
392.3 Ill or fatigued operator	
392.4 Narcotics, amphetamines, etc.	18.2-266 through 273
392.5 Intoxicating liquor	
392.6 Schedules to conform to speed limit	46.1-193 Maximum and minimum speed limits

Exhibit 25 (Cont.)

<u>Federal</u>	<u>Virginia</u>
392.7 Equipment, inspection and use	46.1-308, 308.1, 308.2 Illegal use of defective or unsafe equipment
392.8 Emergency equipment, inspection and use	
392.9 Safe loading	46.1-303 Construction must prevent escape of contents; 46.1-304 Fastening loads of logs, barrels, etc.
392.10 Railroad crossing; stopping required	46.1-245 Drivers of certain vehicles are required to stop, look and listen at railway crossings and cross without shifting gears
392.11 Railroad grade crossings, slowing required	
392.14 Hazardous conditions	
392.15 Required and prohibited use of turn signals	46.1-216 Signals required on starting, backing, stopping or turning 217 - How such signals given 218 - Change of course after giving signal 219 - Duty of drivers receiving signals 220 - Signals prior to moving standing vehicles into traffic
392.16 Use of seat belts	46.1-309.1 Safety lap belts a combination of lap belts and shoulder harness to be installed in certain motor vehicles
392.20 Unattended vehicles; precautions	
392.21 Stopped vehicles not to interfere with other traffic	46.1-255 Flares and other signals when vehicle disabled in highway after dark 46.1-256 When red reflector flares or red lanterns are required
392.24 Emergency signals; flame-producing	

Exhibit 25 (Cont.)

<u>Federal</u>	<u>Virginia</u>
392.25 Emergency signals; dangerous cargoes	46.1-257 When red flags are required
392.30 Lighted lamps; moving vehicles	46.1-268 When lights to be lighted; number of lights to be lighted at any time; use of warning lights 269-271, 272 When dimming headlights, etc. required. 273-276 - Lights on parked vehicles
392.33 Observed lamps or reflectors	
392.40-Accidents and license 42 revocation; duties of driver	46.176 Duty of driver to stop, etc. in event of accident; duty of occupant; reports additional to other accident reports required by title
392.40-Fueling precautions 52	
392.60-Prohibited practices; 68 hitch hikers, unauth- orized drivers, closed vehicles, sleeper berths, carbon monoxide, etc.	46.1-234 Soliciting rides

A significant difference between Virginia law and federal regulations relates to seat belt use. Section 392.16 of the FMCSR requires actual use by truck drivers of the seat belts installed in vehicles. The Virginia Code, while it is fairly thorough in requiring seat belt installation (§46.1-309.1), implies that the seat belts do not have to be used. Section 46.1-309.1(b) states that "Failure to use such safety lap belts or a combination of lap belts and shoulder straps or harnesses after installation shall not be deemed to be negligence." Nowhere does the Code describe a penalty for failure to use a seat belt.

The Virginia Code provision which states that failure to use seat belts shall not be deemed negligence should be repealed. The provision implicitly condones the failure to use these safety devices, in contravention of what is widely believed to be a basic tenet of traffic safety. Moreover, it unjustly precludes any party from claiming and establishing negligent nonuse of seat belts.

The Virginia Code also lacks parallels to what the FMCSR describe as "Prohibited Practices." In the area of hitch hiking, for example, the FMCSR ban drivers from carrying riders "unless specifically authorized in writing to do so by the motor carrier ..." (§392.60). Virginia Code §46.1-234 forbids pedestrians from standing or stopping "in any roadway or street for the purpose of soliciting rides." While there is no policy against truckers within the state carrying riders, it is not at this time clear that a safety problem exists in this area and that a prevention program or law is needed.

The inspection provision of §392 of the FMCSR emphasizes the pre-trip inspection and examination by the driver of critical safety components before driving on the highways. Although the Virginia Code contains provisions requiring inspections and establishing equipment standards, it does not explicitly require a pre-trip inspection. Sections 46.1-351 and 315.2 pertain to the 6-month motor vehicle inspection program. Perhaps more relevant is §46.1-308.1, "Illegal use of defective or unsafe equipment," which makes it unlawful to operate defective equipment on the highways. While a policy of pre-trip inspection is implicit in this section of the Code, state officials have no grounds on which to enforce such a day-to-day accident prevention program. Federal regulations, in contrast, require some record keeping of pre-trip procedures. These provisions, found in §396 of the FMCSR, are discussed in the subsection entitled "Inspection, Repair and Maintenance".

Parts and Accessories — Section 393 of the FMCSR, "Parts and Accessories Necessary For Safe Operation," establishes the framework for deciding whether a commercial vehicle is a safe vehicle. The section describes the scope of the safety checks of vehicles conducted by inspectors from the BMCS. Once again, the Virginia Code, under Title 46.1, parallels many of the regulations of section 393. Exhibit 26 cross references §393 and the Virginia Code.

Exhibit 26

FEDERAL AND VIRGINIA REGULATIONS ON PARTS AND ACCESSORIES

<u>Federal</u>	<u>Virginia</u>
393.11-393.33 Light devices, reflectors, and electrical equipment	46.1-259 to 267.1 Lighting equipment
393.40-393.52 Brakes	46.1-277-281.1 Brakes
393.60-393.63 Glazing and window construction	46.1-291 to 294
393.65-393.69 Fuel Systems	Rule 9 (Petroleum tank truck cameras)
393.70-393.71 Coupling devices and towing methods	
393.75 Tires	46.1-295 to 297
.76 Sleeper berths	
.77 Heaters	
.78 Windshield wipers	46.1-292
.79 Defrosting	
.80 Mirrors	46.1-289
.82 Speedometer	46.1-193 et. seq.
.83 Exhaust system locations	46.1-301-302
.84 Floors	
.86 Rear end protection	46.1-290
.87 Flags on projecting loads	46.1-300
.88 Television receivers	46.1-202

Exhibit 26 (Cont.)

	<u>Federal</u>	<u>Virginia</u>
.93	Seat belts	46.1-202
.94	Emergency equipment	46.1-255-257
393.100-106	Protection against shifting or falling cargo	46.1-303-304
393.81	Steering Horns	46.1-282, 282.1 46.1-283

One difference between Virginia law and the federal regulations is contained in the section on brakes. Both codes gauge braking distance on a clean, level stretch of highway at a speed of 20 miles per hour. Virginia law requires buses, trucks and tractor trucks to stop within 40 feet. (§46.1-278(b)). All combinations of vehicles are allowed a 50-foot stopping distance. (§46.1-278 (e)). Presumably, this includes the typical 4- or 5-axle semitrailer rig that carries the bulk of commercial loads on the highways. In contrast, the FMCSR allow a maximum 40-foot stopping distance for "...combinations of property carrying vehicles." (49 CFR 393.52(d)). Furthermore, the FMCSR allow only 25 feet for single-unit trucks of 10,000 lb. or less, and only 35 feet for single units exceeding 10,000 lb.

Whether the discrepancies in the maximum allowable stopping distances are a significant truck safety problem in Virginia has not been determined by this study. There is a need to determine whether inadequate braking capability is a major factor in truck accidents within the state. Also, many trucks traveling in Virginia are subject to FMCSR standards and are presumably in compliance with them.

Federal regulations require a tire tread depth of 4/32 of an inch on the front wheels and 2/32 of an inch on all other wheels (393.756); Virginia requires a 2/32 inch depth on all wheels, with no higher requirement for the front wheels. The federal rules also contain extensive provisions governing tire loads and pressures for the most common sizes of tires used by interstate motor carriers. Virginia has not established any safety standards in this area. This omission may require attention since it is the load on the individual tire which contributes to tire blowouts.

The blowout can significantly influence truck stability and also endanger any other vehicles that are in close proximity to the exploding tire. Whether the difference between allowable tread depths and the absence of Virginia Code provisions governing tire loads and pressures are causes for concern remains to be determined. More comprehensive truck accident data are necessary before recommendations in this area can be considered.

A final positive note is that the SCC truck safety enforcement teams are familiar with the FMCSR and use these rules along with the inspection techniques of the BMCS as the basis for their truck safety enforcement program. However, considering the small size of the BMCS enforcement division, and considering the need for cooperation between federal and state agencies in the area of interstate transportation safety, it is sometimes frustrating and counterproductive that state inspectors cannot cite what are sometimes obvious violations of federal safety law.

Reporting Accidents — Federal accident report requirements are set forth in §394 of the FMCSR. Motor carriers subject to the Department of Transportation Act must report accidents involving death, injury, or property damage amounting to at least \$2,000. Carriers must report fatal accidents immediately and submit information on other reportable accidents within 15 days. Section 394.13 also requires all motor carriers to maintain an accident register containing pertinent information "with respect to each reportable accident in the motor carrier's operation." Records must contain accidents occurring within the last 3 years.

Title 46.1, Chapter 6 of the Virginia Code, also known as the Motor Vehicle Safety Responsibility Act, contains extensive provisions for reporting and recording accidents in the Commonwealth of Virginia. The basic report requirements are contained in §§46.1-399, 400 and 401. Section 46.1-399 requires that all accidents resulting in a death or personal injury be reported immediately to the State Police. Under §46.1-400, drivers involved in accidents resulting in death, injury or property damage of at least \$350 must submit a report to DMV within 5 days. The State Police must report accidents to the DMV within 24 hours of investigating an accident according to section 46.1-401. Also, under §56-332, the SCC has the authority to require motor carriers to file with it reports of "all accidents resulting in injury to persons, equipment, highway or property of any kind...". Currently, however, the Motor Carrier Division of the SCC does not require motor carriers to file accident reports.

There are significant differences between the accident report forms used by the Virginia State Police and the forms required by the BMCS. The Virginia State Police use a general field note form for investigations of all types of accidents, regardless of the vehicles involved. While this form enables troopers to

conveniently report an enormous amount of information on driver behavior, road and weather conditions, and vehicle condition and maneuvers, it does not adequately provide for information relevant to truck safety. For example, there are no places on the form to mention particular types of trucks, cargo carried and cargo spillage. There is no convenient way of identifying peculiar truck accidents such as jackknifing, separation of units, or cargo shifting. These characteristics of the Virginia accident report form make it difficult to collect and organize essential information on truck accidents within the state. As a result, significant features of truck operations in Virginia are difficult to examine, making it difficult for officials and private parties within the state to evaluate truck activities and improve safety.

The BMCS has designed Form MCS-50-T so that motor carriers can report, on a regular basis, accidents involving property-carrying vehicles. Section 10 of the form provides an extensive checklist on which the carrier can describe the type of accident. For example, sections 10-D and 10-E provide an opportunity to describe accidents commonly associated with trucks. Section 11 provides for a detailed summary of the driver's experience and physical condition. Sections 12 and 13 allow for a detailed breakdown of accidents by truck type and truck size.

A possible means of improving the truck accident report system in Virginia may be for the SCC to invoke its authority under §56.332. It could require those carriers which are required to submit reports to the BMCS to submit a copy to the SCC. In order to establish a complete compilation of truck accident data, the SCC would need to develop a supplementary report system for those carriers that are not obligated to report to the BMCS.

Another possible solution to the problem, and the one recommended, is a cooperative effort by the DMV and the State Police to develop a supplementary accident form. For instance, a notation of the presence and/or spillage of hazardous cargo might be especially helpful to other emergency groups and safety officials (Dr. D. Price of Virginia Tech has recommended this change). The cooperation of the State Police in similar endeavors has proven very valuable in the past. It is believed that a form could be designed which would facilitate a complete yet expeditious compilation of essential information pertaining to truck accidents in the Commonwealth.

Hours of Service - Under Part 395 of the FMCSR, the BMCS limits most truck drivers to a maximum of 10 hours of "driving time" after accumulating a minimum of 8 hours "off-duty." Additionally, the rules will not permit truck operators to drive at

all if they have been "on-duty" 15 hours following their 8 off-duty hours. On a weekly basis, the regulations limit the on-duty time of most drivers to no more than 60 hours in any 7 consecutive days. There is an exception for those carriers that operate every day of the week; their drivers can legally remain on duty for 70 hours in any period of 8 consecutive days.

As the previous paragraph indicates, there are several types of time in a truck driver's day. These "times" are defined in the 49 CFR §395 as follows:

Driving Time: "...all time spent at the driving controls of a motor vehicle in operation."

On-Duty Time: "All time from the time a driver begins to work or is required to be in readiness to work until the time he is relieved from work and all responsibility for performing work." Illustrations of "on-duty time" contained in The Interstate Truck Driver's Handbook indicate that a driver is on-duty when he is driving, waiting to be dispatched, inspecting his truck, in the cab (although not driving), loading or unloading or supervising these activities, submitting or obtaining receipts, rendering assistance or providing information after an accident, repairing a broken down truck, or performing any other work for a motor carrier. (DOT 1976).

Sleeper Berth Time: Time spent at rest in the sleeping compartment of a truck while another driver operates the vehicle. Time resting in the right-hand seat of the cab is not sleeper berth time. Drivers of trucks equipped with sleeper berths are allowed to accumulate their 8 off-duty hours in 2 rest periods. Each period must be at least 2 hours long.

Off-Duty Time: "...periods of time when the driver is not on duty, not required to be in readiness to work, or is not under any responsibility for performing work." Sleeper berth time is a special form of off-duty time.

Since accident records indicate that driver fatigue and driver error induced by fatigue are significant contributors to truck accidents, hours of service limits are an important method of improving truck safety. Unfortunately, the very nature of trucking makes it difficult to enforce hours of service rules. A great many truck drivers operate alone. Many drivers are paid by the load and many loads, especially those consisting of produce and other agricultural cargo, require speedy delivery over great distances. Consequently, many drivers, including a great number of independent drivers, are subject to economic forces that

encourage hours-of-service violations. Since it is often only the lone driver who really knows how many hours have been driven or how many on-duty hours have been accumulated, violations are difficult to detect. Consequently, economic pressures often override safety compliance.

The primary tool the BMCS uses to encourage hours-of-service compliance is the Driver's Daily Log; 49 CFR §395.8 requires that all drivers governed by the rules maintain a daily log. Logs must be kept for every day, including off-days and vacation, and drivers must account for all 24 hours of the day. Logs are filed each day at the driver's home terminal or the motor carrier's principal place of business. "Failure to make logs, failure to make required entries ... falsification of entries or failure to preserve logs shall make both the driver and the carrier liable to prosecution." (49 CFR §395.8(a)).

Checks of driver's logs are made during BMCS inspections of motor carrier offices and during field checks of trucks. If a BMCS inspector finds a driver in violation of the hours-of-service rules, the driver is placed "out-of-service." Out-of-service drivers must go off-duty until they come into compliance with the hours limitations. Drivers who do not have driver's logs are placed out-of-service for 8 consecutive hours.

Finally, it should be noted that there are several exceptions to the basic log, driving, and on-duty rules. Drivers exempt from the log requirement include (a) regularly employed drivers who operate within a 50-mile radius and who have available accurate records of their hours of work; and (b) operators of 2-axle, lightweight vehicles (GVW of less than 10,000 lb.) who do not transport passengers or hazardous materials. Operators exempt from the basic 10-hour driving rule are drivers described by category (b) above. Alaskan drivers can operate a vehicle for 15 hours because of the special conditions in that state, and all drivers overtaken by adverse conditions (e.g., snow, sleet, fog, highways covered by ice or snow, and other unusual road and traffic conditions), can drive an additional 2 hours past the maximum in order to complete a run or reach a place of safety. Drivers "engaged solely in making deliveries for retail stores during the period from December 10 to December 25" are also exempt from the 10-hour rule (49 CFR §395.3(c)). Exemptions from the daily and weekly on-duty rules are available for (a) a driver salesman who does not drive more than 40 hours in a week, (b) retail store delivery drivers between December 10 and December 25, and (c) certain gas and oil industry drivers. Alaskan drivers can accumulate 70 on-duty hours in 7 consecutive days or 80 on-duty hours in 8 consecutive days.

Virginia has a law that makes it "unlawful for any person to drive any motor vehicle ... for more than thirteen hours in any period of twenty-four hours." (§46.1-201). This statute also covers drivers who have accumulated part of their 13 hours of driving time in another state.

Virginia has no special requirements for truck drivers similar to the logkeeping requirements of the FMCSR. Also, it is not apparent that any state officials have the authority to place drivers out-of-service for violating the 13-hour limit. Although SCC safety investigators can inspect driver logs, they cannot penalize drivers for violations. In Virginia courts, the 13-hour rule has apparently been invoked only as a factor to be considered in determining driver negligence after a crash. (see: Mobley v. Pendleton, 212 Va. 408, 184 S.E. 2d 798 (1971), Chick Transit Corp. v. Edenton, 170 Va. 361, 196 S.E. 648 (1938), Masters v. Cardi, 186 Va. 261, 42 S.E. 2d 203 (1947)). No record was found of an attempt to prosecute for a 13-hour violation by itself.

Numerous studies have been conducted to determine the role that driver fatigue plays in traffic accidents and most have shown that it plays a significant role. Federal statistics covering major truck accidents indicate that between 1973 and 1976 fatigue was a significant factor in about one-third of the crashes. Other studies show that driver error raises dramatically after 4 hours behind the wheel. After 7 hours of driving, the frequency of accidents increases substantially.

The BMCS has demonstrated concern about the problem of driver fatigue by recently strengthening field inspectors' power to place drivers out-of-service for log-book violations. Before June 1979, only drivers whose logs indicated a maximum driving time or maximum on-duty violation were placed out-of-service. Drivers who had out-of-date logs or who had no logs were merely cited. Consequently, it is believed that a significant number of fatigued drivers were permitted to continue driving. Since June 1979, inspectors have been able to ground drivers for failing to maintain or use logs. Drivers whose logs are current except for the day of inspection and the previous day are permitted to update the log after it is inspected.

Another modification in BMCS hours-of-service enforcement was made indirectly by the publication in February 1978 of a policy statement for 49 CFR §392.6, "Schedules to conform with speed limits." §392.6 forbids motor carriers from writing time schedules so that drivers must violate either the speed limit or the hours-of-service regulations in order to make deliveries "on-time." The BMCS memorandum indicates that safety inspectors are now able to interpret this regulation in terms of "maximum driving distance." Trips over 500 miles are considered prima facie evidence of either a speed-or hours-of-service violation.

Trips of 450-500 miles are considered questionable. Although specific penalties are not described, the memorandum does threaten appropriate measures for noncompliance. This policy statement should help to eliminate the opportunity for motor carriers to pressure drivers to exceed the maximum allowable hours of service.

In light of the role that fatigue plays in causing accidents, it is recommended that the Commonwealth enact an hours-of-service provision applicable to truck drivers. Under current law truck drivers may drive for 13 hours a day, which results in a legal limit of 91 hours of driving time in any 7 consecutive days. There is no limitation on the number of hours during which the truck driver is working but not actually driving — the time which the BMCS includes in its definition of "on-duty" time. The provision should reduce the number of allowable driving hours per week and prescribe an upper limit on the amount of time a truck driver may remain "on-duty." It is recommended that the limits be defined not only in terms of 24-hour and/or weekly periods, but also with reference to rest periods. This merely acknowledges the fact that it is not necessarily objectionable that truck drivers may drive for 13 hours in a 24-hour period, but that in view of the data regarding fatigue it is certainly objectionable to permit 13 consecutive hours of driving and an unlimited number of other "on-duty" hours. The FMCSR would provide at least a helpful model, if not the precise provisions, for the development of these limits.

In order to facilitate enforcement of its hours of service requirements, Virginia should also require that truck drivers keep daily logs of their work. Moreover, in order to make enforcement effective both in this area and in the area of equipment defects, the SCC, State Police, and other law enforcement agencies should be authorized to declare fatigued drivers "out-of-service."

Inspection, Repair, and Maintenance — Title 46 of the Virginia Code contains provisions which define the scope of the state's semiannual automobile inspection program. This program applies to trucks as well as all other motor vehicles. Under §46.1-318, special provision is made so that "common carriers, operating under certificates from the State Corporation Commission, who desire to do so may install or use with the approval of the Superintendent of State Police private inspection stations for the inspection and correction of their equipment." Other than the 6-month program, Virginia has no special requirement for the inspection of motor carrier vehicles.

The FMCSR require that motor carriers "systematically inspect, repair and maintain" their motor vehicles. (49 CFR §396.3(a)). Maintenance records must be kept while the motor carrier uses the vehicle and for 18 months thereafter (§396.3(d)). The FMCSR require that vehicles be in "safe and proper operating condition

at all times," (§396.3(a)), but the regulations do not establish time tables for the performance of particular maintenance procedures. Motor carriers are to use their own discretion and follow manufacturer's guidelines in constructing vehicle maintenance programs.

The FMCSR also require drivers to complete written reports on the condition of their vehicles at the end of each day's work. According to §396.11, these reports are to include comments on brakes, steering, lights, tires, horn, windshield wipers, mirror, coupling devices, wheels and rims, and equipment. Drivers must submit this report to the motor carrier and keep a "legible copy of the last vehicle inspection report" in the truck.

In-Field Safety Checks - Both federal and state officials conduct on-the-road safety checks of motor carrier vehicles. The primary purpose of the federal inspections is to establish that motor carriers and drivers are complying with the provisions of the FMCSR. BMCS inspectors are authorized to perform these checks by 49 CFR §396.9. Just as BMCS officials can ground a driver for violation of the regulations under §395, under §396 inspectors can "declare and mark 'out-of-service' any motor vehicle which by reason of its mechanical condition or loading would likely cause an accident or a breakdown." (§396.9(c) (1)). Vehicles declared out-of-service cannot be driven until appropriate repairs are performed.

As previously mentioned, state safety inspections are conducted by SCC investigators and State Police. Since April 1979, a special team of SCC investigators has been performing these safety operations throughout the state, usually at weigh stations on highways used heavily by trucks. These inspections are modeled on the procedures of the BMCS. The primary difference is that the SCC investigators lack the authority to declare unsafe vehicles out-of-service. SCC officials can cite drivers and carriers for safety violations. This usually results in a fine and sometimes a court appearance. However, it does not remove the unsafe vehicle from the road. Because it would enhance truck safety in Virginia, it is recommended that the SCC and other authorized law enforcement units be granted the authority to declare "out-of-service" vehicles which have been found upon inspection to be unsafe. In addition to removing unsafe vehicles from the road, this authority would have a deterrent effect on potential violators of truck safety standards.

Definitional Dilemma

Definitions of the term "Hazardous Material" (HM) generally tend toward extremes of either vagueness or specificity. Ideally, a compact HM definition could be fashioned that would indicate whether a substance in question is hazardous or not. In practice, however, it is difficult to develop general criteria to fit all dangerous substances. For example, the annual introduction into commerce of chemicals alone accounts for 500 new substances⁽⁴⁵⁾ of varying characteristics and potentials for harm. The definition must anticipate these substances and also apply to those already known. Because of the concern for identification and regulation of all applicable HMs, the definition becomes either exceedingly specific, resembling more and more a mere listing of materials and their traits, or increasingly generalized in order to account for all possibilities. The present federal and state approaches to defining HM attempt to solve this dilemma.

Defining Hazardous Materials

The broad federal definition of HM in the Hazardous Materials Transportation Act focuses not on the means by which harm occurs, but rather on the fact that it does occur: "'hazardous material' means a substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce."⁽⁴⁶⁾ This definition does not attempt to provide a functional guideline for determining whether a substance is harmful; whether the risk is "unreasonable" is determined by the Secretary of Transportation through the Hazardous Materials Regulations authorized by the Act.⁽⁴⁷⁾ The present regulations contain a list of some 1,200 substances judged to be capable of posing an unreasonable risk.⁽⁴⁸⁾ This list includes those hazardous materials which are (or were) frequently transported. The list is used to determine whether the substance in question is a regulated material, and to give the shipper guidance in labelling his containers.

This broad definition offers some help in determining what is a HM. The term "unreasonable risk" suggests that classifications cannot be based on groundless, irrational, or remote reasonings. It implies that the Secretary must balance safety and other interests in determining whether a substance is a HM. The requirement that the substance be of a quantity and form that may pose a risk further limits the classification. This requirement is phrased in

the conjunctive — quantity and form — and thus precludes classifications based on the nature of the substance without regard to the amount transported, and vice versa.

Federal and Virginia Definitions

A most helpful descriptive middle ground exists in the eight basic categories into which the federal regulations divided the previously mentioned list of 1,200 substances. Hazardous materials are classified here according to the manner in which they cause harm. These categories define the HMs presently regulated and are employed in part in the Virginia definition of dangerous articles.⁽⁴⁹⁾ These categories are discussed below.

Explosives

Explosives are defined virtually identically in the federal⁽⁵⁰⁾ and Virginia⁽⁵¹⁾ regulations as any chemical compound or chemical-mechanical mixture primarily designed to produce an explosion (as distinguished from materials which may explode but whose primary purpose is not to create an explosion, e.g., compressed gases). An explosion is defined as a substantially instantaneous release of gas and heat capable of destroying persons or property. Federal regulations specify testing conditions for classifying a substance as an explosive.⁽⁵²⁾

Flammable/Combustible/Pyrophoric Liquids

These materials are defined generally as liquids which produce flammable vapors with a flash point (the temperature at which the vapors ignite) below a certain temperature. Federal regulations distinguish between "flammable liquids"⁽⁵³⁾ and "combustible liquids,"⁽⁵⁴⁾ with the former having a flash point of 100°F (37.8°C) or less, and the latter one between 100°F (37.8°C) and 200°F (93.3°C). The Virginia regulations define flammable liquids⁽⁵⁵⁾ only as those having a flash point of 80°F (26.7°C) or less and the determination is made by a testing method different from that specified in federal regulations.⁽⁵⁶⁾ Pyrophoric liquids, also not recognized under Virginia regulations, are defined as liquids which ignite spontaneously in dry or moist air at or below 130°F (54.4°C).⁽⁵⁷⁾

Flammable Solids

The federal⁽⁵⁸⁾ and Virginia⁽⁵⁹⁾ definitions of flammable solids are identical. Both describe these materials as substances other than explosives which under conditions normally incident to

transportation are liable to ignite through friction, heat retained from manufacturing, spontaneous chemical reaction, or absorption of water. The federal definition further characterizes these substances as being readily capable of ignition and, when set afire, of burning so vigorously and persistently as to create a serious transportation hazard.

Corrosive Materials/Liquids

Although Virginia regulations mention corrosive liquids,⁽⁶⁰⁾ the substances in the federal definition⁽⁶¹⁾ generally are liquids or solids which cause destruction of skin tissue or property by chemical action. They are commonly acids or alkalis, and are recognized by Virginia regulations as being liable to cause a fire when in contact with organic matter or certain chemicals. Virginia regulations specify a "severe" degree of destruction of skin tissue and a "material" degree of damage to property. Federal regulations give testing procedures for tissue and property damage.⁽⁶²⁾

Compressed Gasses

These gasses are defined identically in Virginia⁽⁶³⁾ and federal⁽⁶⁴⁾ regulations as materials having, in the container, an absolute pressure (a pressure measurement compensating for atmospheric pressure) of 40 psi (.28 MPa) at 70°F (21.1°C) and/or 104 psi (.72 MPa) at 130°F (54.4°C), or any flammable material having a Reid vapor pressure (a pressure measurement following ASTM Standard D-323) greater than 40 psi (.28 MPa) at 100°F (37.8°C).

Poisonous Materials

Federal regulations⁽⁶⁵⁾ divide poisons into three classes according to the degree of danger they pose. The federal Class A Poison definition⁽⁶⁶⁾ is identical to the first clause of the Virginia definition of poisonous materials,⁽⁶⁷⁾ which describes these as liquids and gasses of such nature that when mixed with air a very small amount is dangerous to life. The federal Class B Poison designation⁽⁶⁸⁾ corresponds to the third clause of the Virginia definition, which includes liquids and solids known or presumed to present a hazard to health during transportation. These poisons are absorbed orally or through the skin. The federal regulations specify methods for determining the degree of toxicity tolerated. The federal class of irritating materials⁽⁶⁹⁾ is the counterpart of the second clause of the Virginia definition. Irritating materials are liquids or solids other than the above substances which when exposed to fire or air emit dangerous or

intensely irritating fumes. An additional federal poisonous material classification, Etiological Agents, is not recognized by Virginia. Etiological agents are defined⁽⁷⁰⁾ as viable microorganisms or their toxins capable of causing human disease. The category is limited to a list of substances appearing elsewhere in the regulations.⁽⁷¹⁾

Oxidizing Materials

Defined virtually identically in the federal⁽⁷²⁾ and Virginia⁽⁷³⁾ regulations as any substance such as a chlorate, permanganate, peroxide, or nitrate which yields oxygen to stimulate the combustion of organic (carbon containing) matter. The federal regulation also includes nitro carbo nitrate and specifies "perioxide" as "inorganic peroxide." Organic peroxides are defined in a subsequent section⁽⁷⁴⁾ as carbon containing compounds with the bivalent - O - O - structures.

Radioactive Materials

The federal⁽⁷⁵⁾ and Virginia⁽⁷⁶⁾ regulations are identical in their definitions of radioactive materials. They define these substances as any material or combination of materials that spontaneously emits ionizing radiation. The federal regulations define the minimum specific activity for classification as a HM to be 0.002 microcuries per gram, and further distinguish fissile materials (substances capable of undergoing fission) from non-fissile materials.⁽⁷⁷⁾

Summary

In summary, the HMs presently regulated comprise a large group of substances variously characterized as -

1. explosives that release gas or heat sufficient to injure persons or property;
2. flammables that ignite at certain vapor pressures spontaneously with air under normal transportation conditions, by absorbing water, through retained heat, by friction, or by contact with certain organic substances;
3. corrosive agents that cause serious tissue or property damage through chemical action;

4. compressed gasses existing at certain pressures within a container; poisonous or radioactive materials that pose a serious threat to life by exposure;
5. materials of a form and quantity sufficient to create an unreasonable risk to health or property;
6. materials sufficiently dangerous to life or property to make regulation reasonable; and
7. materials transported in commerce.

Federal and Virginia Regulation

Virginia and federal regulations governing the transportation of hazardous materials are contained in Appendix A. The following section of text describes similarities and differences in state and federal regulations on cargoes, vehicles, and drivers.

Scope of Regulations

The federal regulations apply to hazardous materials transported from a point within a state to a point outside the state, or in a manner affecting interstate commerce. Virginia regulations apply to the movement of such substances only within the territorial limits of the Commonwealth. Federal regulations preempt inconsistent state requirements, except where the Secretary of Transportation determines upon application by a state that the state's requirements afford an equal or greater degree of protection and do not unreasonably burden commerce. Virginia's regulations may be more restrictive than their federal counterparts, but not to the extent of unreasonably burdening commerce, which is ultimately a matter of judicial interpretation. Accordingly, Virginia exempts from its regulations (except those requiring the driver to obey Virginia rules and officers' directions concerning tunnels and bridges) substances transported in interstate commerce which are packed, labelled, and accompanied by shipping papers in conformity with federal regulations, and also those substances declared exempt from federal regulations by the DOT.

Virginia exempts U. S. military forces, state militia, and Virginia fire and police departments from all HM regulations except those requiring the driver to obey state rules and officers' directions concerning tunnels and bridges. Federal regulations require compliance with HM rules except for radioactive materials shipped for national security purposes and supervised and escorted

by the Nuclear Regulatory Commission (NRC) or the Department of Defense (DOD). Exemption from federal labelling requirements is afforded to carload or truckload shipments of ammunition for the DOD when loaded and unloaded by the shipper or DOD, and also to packages of HM which are loaded and unloaded under the supervision of and escorted by DOD personnel.

Virginia also exempts flammable liquids from its HM regulations, stating that they "... may be transported in any manner." Va. Code §18.2-275. This exemption does not extend to petroleum products transported by tank truck, which are regulated under separate SCC rules. No similar sweeping exemption exists in the federal regulations.

Both federal and Virginia regulations prohibit shipment or transportation of HM not in conformity with applicable regulations. Virginia prohibits the act of shipping or transporting HM in non-compliance with its regulations; the federal prohibition applies to persons offering or accepting nonconforming HM for transportation. Federal regulations also prohibit a person from representing, marking, certifying, or selling a package or container as complying with the regulations unless it is in such compliance.

Both Virginia and federal regulations provide for the imposition of civil sanctions for violations of HM regulations. The Virginia SCC is authorized to levy a fine of not more than \$1,000 for judgements entered after hearing on notice. The federal DOT may impose fines not exceeding \$10,000 for knowing violations of HM regulations and procedures. This penalty also applies to knowing violations of federal procedures relating to packages and containers. Each day of a continuing violation of federal regulations constitutes a separate offense.

Criminal sanctions are available under both regulatory schemes. Any violation of the Virginia regulations constitutes a Class 4 misdemeanor punishable by a fine not exceeding \$100; subsequent violation is a Class 2 misdemeanor punishable by a jail term not exceeding 6 months and/or a fine of not more than \$500. Criminal sanctions leading to a fine of up to \$25,000 and/or imprisonment for a term not exceeding 5 years may be imposed for willful violations of federal regulations.

Authority for Enforcement and Inspection

The enforcement of Virginia regulations is granted by statute to the SCC and the Department of State Police, together with all Commonwealth law enforcement and peace officers. Enforcement in

the federal regulatory scheme falls to the FHWA with respect to transportation or shipment of HM by highway vehicles (which includes inspections of manufacturers, carriers, and shippers) and the MTB in all other aspects. The MTB exercises its enforcement responsibility through the Office of Hazardous Materials Operations, which conducts inspections of container manufacturers and intermodal shipments. In addition, the Bureau of Explosives, an industry agency of longstanding association with the DOT, conducts inspections of manufacturers, carriers, and shippers of HM.

Cargo Regulations

Virginia and federal regulations prohibit the transportation of HM in certain situations. Under the Virginia rules explosives cannot be transported in vehicles licensed as, or customarily used as, passenger vehicles, unless written permission is obtained from the State Police. Additional authorization is required from local officials if the movement is intracity. Virginia allows other HM, including small arms ammunition, to be carried in passenger vehicles, so long as the total amount does not exceed 100 lb. Federal regulations prohibit the transportation of HM (except small arms ammunition, emergency shipments of drugs, chemicals, hospital supplies, and shipments of munitions accompanying the military) on vehicles carrying passengers for hire, unless no other practical means of transportation is available. Under all conditions, explosives may not be transported in the passenger space of the vehicle, and the total weight allowed on the vehicle cannot exceed 100 lb. of explosives, 10 lb. of explosive samples for laboratory examination, or 200 blasting caps. Federal regulations contain no notification requirements.

Both sets of regulations prohibit transportation of certain combinations of HM. Virginia prohibits any combination of explosives (other than small arms ammunition), poisonous gas, or radioactive materials greater than 500 lb. gross weight. Explosives and blasting caps may not be carried together in Virginia. Federal regulations list 22 categories of HM at 49 CFR §177.848 and specify permissible and prohibited combinations thereof. No prohibition exists in these regulations against the poisonous gas-radioactive materials combination forbidden by Virginia regulations. Blasting caps, when packed according to certain specifications, are allowed in combination with explosives under the federal rules.

Sensitive explosives, such as those containing ammonium chlorate, liquid explosives, compounds which explode when subjected to 48 hours of 167°F (75°C) temperatures, leaking explosives, condemned or leaking dynamite which has been repacked, specified types

of fireworks, new explosives, and loaded firearms are generally prohibited for transportation under both regulatory schemes. Authorization from the Virginia SCC may be obtained to suspend these restrictions for intrastate transportation. In addition, the federal rules permit the transportation of desensitized liquid explosives which meet certain criteria, and condemned or leaking dynamite which has been repacked under the inspection and written authorization of the Bureau of Explosives.

Cargoes of HM must be loaded, transported, and unloaded in conformity with the applicable Virginia and federal regulations. Federal law defers generally to state and local rules when they are equally or more restrictive than their federal counterparts (so long as they do not conflict or unreasonably burden commerce). Along these lines, Virginia prohibits the loading of motor tank trucks transporting petroleum products in excess of applicable state weight laws. There is no comparable federal regulation. The Commonwealth also forbids the use of radio transmitting equipment when carrying explosive devices which may be triggered by radio waves, the placement (except when contained in the bed body of the vehicle) of HM within 15 feet of the exhaust, and the loading or transport of explosives in the cab of a truck or tractor. Virginia mandates that petroleum products may not be loaded in excess of 99.25% of the cargo tank's shell capacity. Federal regulations apply to all flammable liquids and require that the amount loaded provide sufficient space in the cargo tank to prevent leakage or distortion resulting from expansion caused by rising temperatures - a minimum outage allowance of 10% of tank capacity. Federal regulations warn that during transfer special care must be taken to avoid wetting substances which may become hazardous when exposed to water (some flammable solids and oxidizing materials). This rule applies to all such dangerous articles under the Virginia regulations.

Because HM must receive special treatment during all phases of transportation, the identification of cargo contents is required under both Virginia and federal rules. The Commonwealth provides that packages and containers of HM must be marked to indicate their contents. In Virginia, if the entire cargo is comprised of the same type of HM, only the vehicle need be marked or placarded, as appropriate, to indicate its contents. Federal regulations generally require all individual containers to be marked. Exact wording for the containers' contents is specified in a list of some 1,200 substances at 49 CFR §172.101. The federal labelling regulations are detailed and exempt only military ammunition shipments, supervised and escorted military HM shipments, tanks of compressed gas labelled in accordance with other specifications, and certain minimum-hazard regulated substances. No exemption is granted for cargoes comprised of the same type of HM.

Virginia's labelling regulations, discussed above, are the Commonwealth's only requirements for the identification of individual containers. Federal identification requirements are more detailed in application, broader in scope, and include additional placarding provisions. Placards, described in greater detail in the section on Vehicle Regulations, provide a one- or two-word identification of the category of HM transported, and are most commonly used on trailers or cargo tanks to identify the type of HM carried. Placards are also required on individual containers of over 640 feet.

Several requirements are stated identically under the federal and Virginia rules. No HM may be loaded or unloaded from a motor vehicle unless the handbrake is set and all reasonable precautions are taken to prevent movement of the vehicle. Reasonable care must also be taken to prevent an undue rise in the temperature of the cargo during transit. Tampering with any container is prohibited, as is discharging a container en route, or before removal from the vehicle. Articles or materials likely to damage the cargo are forbidden unless properly segregated or separated by bulkhead. Similarly, containers of explosives, flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gasses, and poisonous liquids or gasses must be loaded and braced to prevent relative motion or damage to valves and fittings during transit. Tools likely to damage the effectiveness of container closures are prohibited in the loading or unloading of HM, as are bale hooks, metal tools, and the practices of throwing or dropping containers of explosives. Special care is also required to prevent packages of explosives from catching fire from sparks or hot gasses from the vehicle exhaust.

Both federal and Virginia rules require that cargo tanks be attended when being loaded and unloaded. The more detailed federal rules specify the limits of the carrier's obligation during these procedures. Under federal regulations, explosives may not be loaded or unloaded while the engine of the vehicle is running. Virginia requires the same for the loading and unloading of HM, except that engine operation is allowed when necessary for this procedure. This exception also applies to petroleum products under Virginia rules, and to flammable liquids and flammable compressed gasses under the federal rules. Virginia requires that all HM cargo be contained entirely within the body of the vehicle during transport. Federal regulations make the same restriction for explosives, which must be transported in a closed-body truck or covered by a tarpaulin, and give specific instructions for the transport of blasting caps and liquid explosives. Virginia and federal regulations alike contain restrictions on the loading capacity of cargo tanks, except when the amount of HM contained is less than 1,000 lb. Containers with a volume less than 640 cubic feet must also be placarded unless marked according to federal labelling requirements.

Vehicle Regulations

Hazardous materials regulations extend beyond practices and prescriptions pertaining to the substances carried; the vehicles transporting hazardous materials are also regulated. Both Virginia and the federal government have requirements prescribing the vehicle's condition. Virginia mandates that a motor vehicle carrying HM must be strong enough to bear the load and must be in first-class condition. Motor tank trucks must be maintained in a safe operating condition at all times. The federal rule places responsibility for the condition of the vehicle on both the carrier and driver. The carrier may not require or permit a driver to operate a vehicle in such a condition that its operation would be hazardous or likely to result in a breakdown, nor may a driver drive a vehicle in such condition that breakdown is likely to occur.

With regard to the construction and outfitting of the vehicle, both sets of regulations give specifications for the installation of electrical wiring. Virginia requires that wiring be protected and fastened to prevent short-circuiting and located so as not to come in contact with any explosives. Federal regulations provide detailed specifications governing the protection and installation of wiring, and require that it be located so as not to become charred, overheated, enmeshed in moving parts, or, as far as practical not to run adjacent to a part of the fuel system. The regulations further provide specifications for the installation of detachable wiring, prohibit loose, chafed, and poorly connected wiring, and require, in general, that all wiring be arranged and installed in a workmanlike manner. The lighting system of a motor tank truck is required by Virginia regulations to be in proper condition before travel between a half-hour after sunset and a half-hour before sunrise. Federal regulations specify the type, placement, and installation of vehicle lights, and also require their use during the same sunset-sunrise period given in the Virginia rules. Lights other than those installed on the vehicle must be illuminated electrically for use when transporting HM in Virginia. Federal regulations allow for the use of any additional equipment on motor vehicles which is not inconsistent with the regulations and will not decrease the safety of vehicle operation. The regulations further prohibit the use of flame-producing emergency signals on motor vehicles transporting flammable, combustible, or explosive HM.

Further provisions concerning the vehicle include Virginia rules requiring the cargo area to be free of inwardly-projecting objects likely to damage containers of HM in transit; federal rules require the same for cargoes of explosives. Both regulations also

specify that vehicles transporting explosives (Class A or Class B under federal rules, which also exempt military shipments) must have tight floors, with the interior of the cargo area lined with nonmetallic material or nonferrous metals.

Finally, extinguishers are required on vehicles transporting HM by both sets of regulations. Virginia requires an extinguisher with a 10-lb. capacity (or a CO₂ type with a 4-lb. capacity) or equivalent on motor vehicles transporting HM. Motor tank trucks transporting petroleum products must carry an Underwriters Laboratories' approved extinguisher of 5-lb. CO₂ capacity or equivalent. Federal regulations require a readily accessible extinguisher that gives a visual indication of its amount, is protected from freezing, does not give off vapors of specified toxicities, and conforms to the Underwriters Laboratories' 20 BC rating.

Federal and Virginia regulation of the transport of HM extends to the determination of the vehicle's operating condition. Both regulatory schemes thus provide for routine vehicle inspections. Virginia places upon the owner or lessee of a vehicle transporting HM the duty of inspection before each trip to determine that the fire extinguishers, electric wiring, fuel system, and brakes are in proper working order; that the chassis, engine, and bottom of the vehicle's body are free from grease; and that the vehicle is in proper condition for handling HM. The same regulations apply to tank trucks transporting petroleum products, with the additional requirements that the cargo tank be adequately grounded to eliminate static electricity and that its valves have no leaks.

Federal regulations require the motor carrier to conduct systematic inspections to maintain compliance with vehicle equipment requirements. Drivers, agents of the carrier, and maintenance employees also must know the inspection and maintenance rules. Fire extinguishers, electric wiring, fuel system, and brakes all must be operational under the vehicle equipment rules. The regulations further specify that the service, trailer, and parking brakes, steering mechanism, and emergency equipment be in good working order before the motor vehicle is driven. The motor carrier must maintain proper lubrication and remove excess oil and grease; he must also make effective the rules concerning the grounding of cargo tanks and the closing and securing of valves and manholes before vehicle operation and instruct his employees on these rules. Carriers must keep inspection and maintenance records, and must obtain from the driver at the end of the workday a report detailing unsafe vehicle defects or deficiencies. Drivers and vehicles wholly engaged in intracity operations, and motor carriers and drivers of lightweight mail trucks, are exempt from these federal regulations.

Both federal and Virginia regulations require placarding of vehicles carrying HM. Federal placards are diamond-shaped signs about 1 foot long on edge which identify with one- or two-word descriptions, and also in certain cases with illustrations, the type of HM carried. An exact description of the HM being transported is usually not given on the placard; rather, the placard indicates the kind of danger the HM might present during an emergency situation. These emblems are most useful to emergency response personnel in the event of a vehicle accident; they also provide an initial signal of a vehicle's contents to inspection and enforcement personnel, thus indicating which sections of the rules will apply in checking the vehicle for compliance with the regulations. Virginia requires placards indicating the type of HM in letters 3 inches high of a color which contrasts with the background of the letters. Federal regulations specify in detail placard size, color, and lettering; symbol size and visibility; and materials acceptable for their construction. Both sets of rules require the placards to be mounted on the front, rear, and each side of the vehicle. Virginia also requires that placards be reflectorized or illuminated on vehicles transporting HM after dark.

The placards specified by the Virginia rules divide HM into seven categories and describe them as follows: HM defined as explosive is identified by a placard marked EXPLOSIVES; poisonous gas, POISONOUS GAS; radioactive material, DANGEROUS-RADIOACTIVE MATERIAL; flammable liquids, FLAMMABLE; flammable solids, oxidizing materials, and corrosive liquids, DANGEROUS; compressed gas, COMPRESSED GAS; poison, DANGEROUS-POISON. Virginia placards are required on vehicles transporting any quantity of explosives, small arms ammunition, or poisonous gas; on vehicles transporting more than 500 lb. gross weight of radioactive materials; and on vehicles transporting more than 2,500 lb. gross weight of flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gas, or poison.

Federal regulations specify seventeen placards to accompany shipments of HM. In addition to and different from the Virginia placards listed above, federal placards identify HM as follows: substances defined as explosives Class A must be identified by a placard marked EXPLOSIVES A; explosives Class B, EXPLOSIVES B; poison A, POISON GAS; poison B, fluorine gas, and etiologic material, POISON; flammable solids, FLAMMABLE SOLID (compare with Virginia's DANGEROUS label for this HM); flammable solid likely to be dangerous when wet, FLAMMABLE SOLID; radioactive material, RADIOACTIVE; uranium hexafluoride, RADIOACTIVE and CORROSIVE; explosives Class C and flammable liquids, FLAMMABLE; nonflammable gas, NONFLAMMABLE GAS; chlorine gas, CHLORINE; liquid oxygen, OXYGEN; flammable gas, FLAMMABLE GAS (compare with Virginia's COMPRESSED GAS label); combustible liquid, COMBUSTIBLE; oxidizer,

OXIDIZER (compare with Virginia's DANGEROUS label); organic peroxide, ORGANIC PEROXIDE; corrosive material, CORROSIVE (compare with Virginia's DANGEROUS label); and irritating material, DANGEROUS. Exempt from these requirements are vehicles transporting less than 1,000 lb. gross weight of any HM except explosives Class A or B, poison Class A, flammable solids which are dangerous when wet, and quantities of radioactive materials greater than "limited quantities" (an amount determined by radioactivity rather than by weight).

Virginia regulations also require the name and address of the carrier to be painted in contrasting color on the side of the tractor and rear of the tank of every motor tank truck transporting petroleum products. In addition, the words "GASOLINE," "FLAMMABLE," OR "INFLAMMABLE" must be painted in contrasting colors on both sides and the rear of the tank. Federal regulations require motor carriers in general to paint in contrasting colors visible at 50 feet the name of the carrier and the place where he maintains his principal office or the place where the vehicle is customarily based.

Driving Regulations

Concern for the safe transport of HM extends to the manner in which the vehicle is operated while on the road. Consequently, both regulatory schemes provide driving rules for carrying HM cargoes. Both federal and Virginia rules prohibit unauthorized passengers on vehicles transporting HM. Federal rules require written authorization from the carrier before a person not assigned to the vehicle may accompany the driver. Both schemes also discourage the unnecessary movement of HM through places where people are likely to gather. Thus, federal regulations require vehicles carrying HM to avoid, unless no practical alternative exists, routes which pass through heavily populated areas. Virginia requires drivers of trucks carrying explosives to stop at wayside restaurants for meals.

Presumably for safe visibility, Virginia requires vehicles carrying explosives or poisonous gas to be operated when possible during daylight. Both sets of regulations prohibit coasting while transporting HM. For similar safety concerns, Virginia requires HM vehicles to be driven within the applicable speed limit; federal regulations defer to local rules on this matter. Virginia also requires motor vehicles transporting sufficient quantities of HM to warrant placarding ordinarily to keep at least 300 feet apart while on the road. The Commonwealth prohibits both full and empty gasoline tank trucks from driving through tunnels; federal regulations again defer to local laws in this area.

Railroad crossings present a particularly dangerous situation for vehicles transporting HM. Virginia regulations require vehicles containing explosives or flammable liquids to come to a full stop before crossing any uncontrolled railroad tracks, and then to proceed across only when the way is clear and safe. When crossing tracks, vehicles carrying petroleum products must slow to five miles per hour and proceed only when the way is clear and safe. Federal regulations, which do not apply to certain controlled or abandoned tracks, require the driver of a vehicle transporting sufficient quantities of explosives Class A or B, poison, flammable, oxidizer, corrosive, flammable gas, radioactive, or dangerous HM or transporting HM by cargo tank (either loaded or empty), to stop between 50 and 15 feet of the tracks, and to proceed across only when safe and without shifting gears. Virginia rules also demand the exercise of caution upon entering a highway. The driver transporting HM must bring his vehicle to a full stop before entering a highway, or yield to traffic where a "Yield Right-of-Way" sign is posted; a vehicle transporting petroleum products must always come to a full stop and proceed only when the way is clear and safe.

The federal and Virginia regulatory schemes provide rules for parking and stopping vehicles containing HM. Virginia rules state broadly that all unnecessary stops must be avoided. Federal rules similarly require all HM shipments to be made without unnecessary delay. Both sets of regulations prohibit leaving the vehicle unattended unless the brake is set; Virginia also requires the motor to be stopped. In the Commonwealth, a vehicle carrying petroleum products must be stopped well away from traffic, fire risk, or parked vehicles. Under the federal rules, all motor vehicles must, when practical, be stopped or parked off the traveled portion of a highway located in a residential or business district. Further, vehicles transporting HM other than explosives Class A or B must not be parked within 5 feet of the traveled portion of a highway, unless the necessities of operation make it impractical to do otherwise. Vehicles carrying Class A or B explosives also must not be stopped within 5 feet of the highway, nor may they be parked on private property without the knowledge and consent of the person in charge of the property, nor, unless operational necessities make it otherwise impractical, may they be stopped within 300 feet of a bridge, tunnel, building, or place where people congregate.

Emergency stopping and signaling procedures are provided under both sets of regulations. Under Virginia rules, in the event of a breakdown the vehicle containing HM must be parked as far to the right of the highway as possible, and emergency signals consisting in the daytime of red flags, red reflectors or red electric lanterns, must be displayed at specified intervals in front of and behind the vehicle. Flame-producing signals are prohibited under

all circumstances. Under the federal rules, when a vehicle transporting HM makes an emergency stop, the driver must immediately activate his emergency flashers; and within 10 minutes must set out the required warning devices. Reflective triangles, electric lanterns, or red reflectors are the only signaling devices authorized for emergencies involving loaded or empty cargo tank vehicles used for transporting flammable liquids or flammable compressed gasses, vehicles transporting explosives Class A or B, or vehicles which use compressed gas for motor fuel. Liquid-burning flares may be used with other HM cargoes, so long as they are placed sufficiently far away from leaking gasoline, flammable liquids, or combustible liquids to prevent fire or explosion. The three signals must be placed at specified intervals in front of, to the side of, and behind the disabled vehicle. Federal regulations further specify daytime placement criteria for flares set out in business or residential areas, on hills and curves near obstructions, and on divided or one-way roads.

Under Virginia rules only, when the lighting system of a motor tank truck transporting petroleum products becomes inoperative, the vehicle must be stopped as soon as practical, must be marked as specified above with emergency signals, and must not proceed until the defect is remedied. Both regulatory schemes govern emergency repairs made in a garage. Virginia allows repairs inside a garage or repair shop only in an emergency and only after the repairman is given notice of the nature of the vehicle's cargo. Federal regulations prohibit in all cases repairs of HM-laden vehicles in a closed garage; otherwise, vehicle repairs are authorized only when they can be made without hazard. Virginia also has rules pertaining to placarded vehicles detained because of violations of state or DOT regulations. Such vehicles must be parked well away from places of work, dwellings, or main and secondary roads, and may be protected by a guard employed at the expense of the owner or lessee. Finally, both sets of rules require that the engine of a vehicle containing HM be stopped during the fueling process. Federal regulations also require that a person be present to control the fueling procedure at the point where the fuel tank is filled.

Both Virginia and the federal government require proper documentation. Virginia mandates that the driver of every vehicle carrying HM have in his possession at all times a bill of lading or similar document giving the common or generic name and total quantity of the HM cargo. Similar documents required for motor vehicles transporting petroleum products must also indicate the consignor, consignee, origin, and destination of each shipment. The original or a copy of these latter documents must be preserved by the carrier for at least 3 years. Under the federal rules,

the carrier must ensure that the required shipping papers are readily available to and recognizable by authorities in the event of an accident or an inspection. Both the driver and the carrier must clearly distinguish the HM shipping papers from other documents and keep them at all times either in a holder on the door or readily visible to a person entering the driver's compartment. Shipping papers must be placed on the driver's seat while the driver is away from the vehicle. Information required on the shipping paper includes the name and class of the HM cargo as specified in a table of some 1,200 substances at 49 CFR §172.101, and the quantity of HM covered by those descriptions. Both regulatory schemes require the shipper or person offering HM for transportation to furnish papers which include the descriptions prescribed by the regulations.

Federal and Virginia regulations are also directed to the driver of a vehicle transporting HM. Virginia makes the general requirement that the driver obey local HM ordinances when driving through a city or town. As mentioned before, federal regulations defer to local laws not at variance with a more stringent federal rule. Virginia requires that at all times the driver have complete control of a vehicle laden with HM. Both sets of regulations prohibit the operation of a vehicle by a person under the influence of intoxicants or narcotics. Federal regulations specifically prohibit the use of amphetamines or any other substance likely to render the driver incapable of safely operating a motor vehicle, and also prohibit any carrier from knowingly allowing a driver in such a condition to operate a vehicle. Substances prescribed by a physician which will not impair driving ability are exempt from these regulations. Federal regulations also prohibit the consumption within 4 hours of going on duty, or possession while on duty, of intoxicating beverages, regardless of alcoholic content. The carrier may not permit a driver to violate the above rules nor allow him to operate a vehicle if he appears to have violated the rules.

Both regulatory schemes also prohibit driving after less than the required amount of sleep. Virginia regulations state that no petroleum tank truck carrier shall cause or permit a driver to operate his vehicle longer than 8 consecutive hours, unless he has had at least 10 hours of sleep beforehand. Even then, the driver may not accumulate more than 13 hours driving time in any 24-hour period. Federal regulations apply to all motor carriers, their drivers, agents, and employees, and require generally that a vehicle may not be operated by a driver for more than 10 hours following 8 consecutive hours off-duty, nor after the driver has been on duty for 15 hours following the 8-hour off-duty period.

Personal qualifications for drivers appear in both Virginia and federal regulations. Virginia requires drivers of vehicles transporting HM to have a valid chauffeur's license. Federal regulations require drivers of motor vehicles in general to possess a currently valid motor vehicle operator's permit. Drivers of HM-carrying vehicles in Virginia must be experienced, careful, capable, and able to read and write in English; petroleum tank truck drivers must meet these requirements and also be at least 21 years old. Under federal rules, the driver of a motor vehicle must have sufficient experience and/or training to be able to operate the vehicle safely, must have sufficient knowledge of English to allow him to fill out required reports, read road signs, and answer official inquiries, and must be at least 21 years old. Neither set of regulations permits a driver who is addicted to intoxicants or narcotics to operate a motor vehicle. In Virginia, drivers are required to be familiar with state and local traffic laws and also the regulations governing the transportation of HM. Under federal regulations, both the motor vehicle carrier and the driver are required to know and be familiar with the federal rules on qualifications of drivers, the federal rules on driving and parking of motor vehicles transporting HM, and the local rules (where applicable) governing the transportation of HM. In Virginia, the driver must also be familiar with the Commonwealth's safety rules. Under federal regulations the carrier must make effective and thoroughly instruct his employees on the rules prescribed for the transportation of HM.

Summary

Virginia regulations on the transportation of hazardous material were promulgated in the 1950's and have never been revised. More detailed federal regulations govern the transportation of HM in interstate commerce, and preempt any inconsistent and less rigorous Virginia requirements. However, the regulations of Virginia's SCC would govern any intrastate shipment beyond the scope of the federal provisions. It is possible that HM are presently transported on Virginia highways by carriers or on vehicles not subject to federal regulation.

In general, the federal regulations on HM cargo, vehicle, and driver are more thorough and safety conscious than comparable Virginia regulations. The Commonwealth presently exempts flammable liquids, and fails to include certain dangerous substances regulated by the federal government. Virginia regulations on containers and placarding lack the detail of and are in places inconsistent with their federal counterparts. Finally, the Commonwealth authorizes much lighter penalties for violations of the regulations than does the federal government.

SURVEY OF EXISTING PROGRAMS

This section examines programs for enforcing the laws relating to truck weights, safety and the transportation of hazardous materials. The first part of the section deals with programs in Virginia, both state and federal. The second part deals with programs conducted by other states and includes an evaluation of the effectiveness of truck weighing programs across the country.

Enforcement Programs in Virginia

In Virginia, three state agencies have the responsibility for enforcing state laws relating to truck weights, safety, and the transportation of hazardous materials. The SCC, State Police, and the Department of Highways and Transportation all have roles in Virginia's enforcement programs. Additionally, the BMCS of the FHWA bears the burden of enforcing the federal regulations on truck safety and the transportation of hazardous materials.

Truck Weighing

The Department of State Police and the Department of Highways and Transportation (VDHT) share the responsibility for enforcing the state laws on truck weights. The latter operates the equipment necessary to perform truck weighings but does not have the authority to issue citations or summonses for violations. Consequently, a State Police officer works with the weighing personnel to write tickets and issue citations.

In conducting the truck weighing program, the Traffic and Safety Division of the VDHT operates 14 permanent scales. Seven are operated 24 hours a day, 7 days a week, while the remainder are operated on a limited basis. Exhibit 27 lists the locations and hours of operation of the scales. In addition to performing the weighing of vehicles, the Division has the responsibility of testing and maintaining the scales.

The Division also operates 9 mobile units equipped with portable scales. Through the use of the mobile units, temporary weighing stations may be established on any state maintained highway. Generally, the mobile crews operate during daylight hours on week-ends and nights.

The portable scales currently in use are known as loadometers. Use of these scales requires 3 men in each mobile team. Also in use are 10 scales manufactured by the General Electro-Dynamics Corp.

which are lighter and easier to handle than the loadometers, and consequently, these require only a 2-man team. The GED scales, however, have a disadvantage; they have a built-in, inclined ramp that causes difficulty in getting trucks onto them.

If a vehicle is overweight the State Police officer assigned to the weighing operation can issue a summons and/or make an arrest and require the driver to unload the overweight portion of the load. The owner or operator of an overweight vehicle will usually be assessed a fine and liquidated damages (based on the number of pounds overweight) by the court. When a vehicle not registered with the Virginia DMV is involved in an overweight violation the police officer is also authorized to hold it until the amount assessed by the court is paid.

The State Police may conduct weighing activities independent of the VDHT. An officer may stop a truck he suspects is overweight and direct the driver to travel up to 10 miles to a permanent weigh station. The police are authorized to weigh such trucks at any permanent station, even if it is not "officially" open at the time. If the distance to the nearest permanent weigh station is greater than 10 miles, the officer may weigh the truck on portable scales. However, over the last 3 years only 8,000 of the approximately 7,000,000 vehicles weighed annually were weighed in this manner.

When a truck is driven onto the scales three results are possible: the vehicle may be within the gross vehicle weight limit and each axle weight limit; the vehicle may exceed the gross vehicle weight limit; or the vehicle may not exceed the gross vehicle weight limit but violate one of the axle weight limits. In the first instance no violation has occurred. In the second instance, there is a clear violation of the weight limit. In the third instance, where the limit on an axle is exceeded but not the gross vehicle weight limit, the driver is given the opportunity to shift the load from that axle to another axle on which the load is below the weight limit. After the driver shifts the load, which may be achieved by physically moving part of the cargo from one part of the truck to another, by shifting the location of the rear trailer axle, or by shifting the location of the fifth wheel and thereby shifting the location of the trailer over the drive tandem axle on the tractor cab, he can have the truck weighed again. If the load on an axle still does not meet the weight limit, the driver may shift the load again.

Exhibit 27

VIRGINIA SCALE HOUSE LOCATIONS

<u>Weighing Station</u>	<u>Route and Location</u>	<u>County</u>
Alberta ^a	Rt. 85 -- 4.70 Mi. South of Rt. 46	Brunswick County
Aldie ^b	Rt. 50 -- 0.20 Mi. West of Rt. 15	Loudoun County
Bland ^c	Rt. 77 -- 4.20 Mi. North of Rt. 717	Bland County
Dahlgren ^a	Rt. 301 -- 1.00 Mi. South of Maryland State Line	King George County
Dumfries ^a	Rt. 95 -- 1.10 Mi. North of Rt. 234	Prince William County
Fairfax ^c	Rt. 66 -- 2.50 Mi. East of Rt. 28	Fairfax County
Hollins ^b	Rt. 11 -- 2.25 Mi. South of Rt. 604	Botetourt County
Middletown ^b	Rt. 11 -- 2.80 Mi. South of Rt. 277	Frederick County
New Church ^a	Rt. 13 -- 1.85 Mi. South of Maryland State Line	Accomack County
Sandston ^d	Rt. 64 -- 2.30 Mi. West of Rt. 33	Henrico County
Stephens City ^a	Rt. 81 -- 2.50 Mi. South of Rt. 277	Frederick County
Suffolk ^a	Rt. 13 -- 1.32 Mi. West of Chesapeake City Limits	City of Nansemond
Troutville ^a	Rt. 81 -- 1.40 Mi. South of Rt. 220	Botetourt County
Woodbridge ^b	Rt. 1 -- 2.25 Mi. South of Rt. 253	Prince William County

- ^aOperates 24 hours a day -- 7 days a week
- ^bOperates on an irregular schedule
- ^cOperates 16 hours a day -- 5 days a week
- ^dOperates 24 hours a day -- 5 days a week

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13
12
11

Truck Types and Weights

In addition to carrying out the normal activities at the weigh stations in the state, the Traffic and Safety Division conducts a biennial truck weight study in cooperation with the FHWA. The data collected for this study include the percentage of vehicles on the road, the average weight of loads carried by trucks, and the percentage of trucks carrying loads in excess of the state weight limits. Data from each state are combined by the FHWA into a report.

Single-unit trucks, mainly 2-axle, 4-tired vehicles, comprise the largest portion of nationwide truck traffic. The 5-axle tractor trailer is the most common multi-unit vehicle on the highways. It is the most common form of truck traffic on interstate roads, accounting for almost 43% of the trucks, and is second only to pickups and vans on the primary rural routes. The percentage of tractor trailers on U. S. roadways varies from 28% of the trucks on primary rural roads to just over 50% of the truck traffic on interstate roads (see Exhibit 28).

Exhibit 28

PERCENTAGES OF TRUCKS COUNTED — U.S.

<u>Type Vehicle</u>	<u>All Roads</u>	<u>Federal Aid Interstate</u>	<u>Primary Rural</u>
Single-Unit			
2-axle, 4-tire	48.30	36.39	55.86
2-axle, 6-tire	11.73	10.18	12.26
3 or more axles	2.47	1.86	3.14
Tractor Trailers			
3-axle	1.51	1.71	1.19
4-axle	5.49	6.11	4.71
5-axle	29.68	42.73	22.02
Other	0.82	1.02	0.82

Source: 1975 National Truck Characteristic Report

In Virginia the data for 1974 through 1977 indicate a 2.2% decline in the percentage of small passenger cars and a 2.8% increase in the percentage of pickup and panel trucks (see Exhibit 29).

The other categories of vehicles, with the exception of standard size passenger cars at a 1.1% change, did not have variations in excess of 0.5%. In general, passenger cars accounted for about 75.0% and tractor trailers for about 8.5% of the total vehicles on all roads in the state.

Exhibit 29

PERCENTAGES OF VEHICLES COUNTED — VIRGINIA
ALL ROAD SYSTEMS

<u>Type Vehicle</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Motorcycle	0.50	0.55	0.50
Passenger Car			
Small	7.79	10.29	10.02
Standard	66.49	65.59	65.55
Buses	0.40	0.46	0.49
Single-Unit Truck			
Pickup/Panel	12.62	10.89	9.84
2-axle, 4-tire	0.40	0.47	0.45
2-axle, 6-tire	2.83	2.76	2.87
3 or more axles	0.47	0.51	0.67
Tractor Trailer			
2-axle tractor	1.39	1.57	1.76
3-axle tractor	7.12	6.91	7.85

Source: Virginia Truck Weight Studies

Prior to 1975, truck weight studies were conducted on an annual basis; since then the studies have been carried out at 2-year intervals. For this reason data were not available for 1976.

Considering only trucks on Virginia roads, Exhibit 30 shows that over the period from 1974 to 1977 there was an increase in single-unit trucks and a decrease in the percentage of tractor trailers. The percentage of trucks in all categories decreased, except for pickups and panels, which rose from nearly 42% in 1974

to 50.8% in 1977. The percentage of trucks pulled by a 3-axle tractor decreased by 4.8%, from 33.48% in 1974 to 28.7% in 1977, and the percentage of tractor trailers with 2-axle tractors decreased by nearly 2%. While the percentage of pickup and panel trucks increased almost 9%, the percentage of tractor trailers dropped by 6.7%.

Exhibit 30

PERCENTAGES OF TRUCKS COUNTED — VIRGINIA
ALL ROAD SYSTEMS

<u>Type Vehicle</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit Truck			
Pickup/Panel	50.80	47.12	41.97
2-axle, 4-tire	1.59	2.01	1.90
2-axle, 6-tire	11.39	11.94	12.25
3 or more axles	1.91	2.22	2.87
Tractor Trailer			
2-axle tractor	5.58	6.78	7.50
3-axle tractor	28.70	29.90	33.48

Source: Virginia Truck Weight Studies

The percentages of all vehicles on the interstate system in Virginia also varied during the 1974 to 1977 period. Small passenger cars decreased 4.4%, from 10.93% to 6.55%, and standard sized passenger cars increased by 3.6%, from 64.29% to 67.90% of all vehicles. There was a rise in the percentage of pickup and panel trucks and a drop in the other categories of trucks. In general, the interstate system carried fewer single-unit trucks and more tractor trailers than did all other Virginia road systems (see Exhibit 31).

PERCENTAGES OF VEHICLES COUNTED -- VIRGINIA
INTERSTATE SYSTEM

<u>Type Vehicle</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Motorcycle	0.38	0.41	0.39
Passenger Car			
Small	6.55	10.05	10.93
Standard	67.90	64.73	64.29
Buses	0.40	0.51	0.46
Single-Unit Truck			
Pickup/Panel	11.05	9.54	9.63
2-axle, 4-tire	0.28	0.33	0.32
2-axle, 6-tire	2.66	2.66	2.64
3 or more axles	0.31	0.39	0.59
Tractor Trailer			
2-axle tractor	1.73	2.03	1.98
3-axle tractor	8.76	9.35	8.78

Source: Virginia Truck Weight Studies

The data presented in Exhibit 32 show the percentages of trucks operating on the interstate system in Virginia for a period of 3 years. When these data are compared with those from all road systems in the state, it can be seen that there were comparatively fewer single-unit trucks and more tractor trailers on the interstate system in 1977 than in 1974. Over this time span, there was an increase of over 4.4% in the number of pickup and panel trucks and over a 2.6% drop in the number of tractor trailers.

Exhibit 33 presents national data on the average weight of loads carried by selected types of trucks. Single-unit straight vans and refrigerated vans haul loads in the 4-5,000 lb. range. Single-unit petroleum tankers and flatbed trucks carry loads in the 6-7,000 lb. range. Single-unit dump trucks and combination vans generally haul loads from 21,000 to 24,000 lb., while refrigerated and flatbed combinations have loads near 30,000 lb. The heaviest loads, those in the 41,000 to 44,000 lb. category, are carried by the tractor trailer combination dump trucks and petroleum tankers.

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Exhibit 32

PERCENTAGES OF TRUCKS COUNTED — VIRGINIA
INTERSTATE SYSTEM

<u>Type Vehicle</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit Truck			
Pickup/Panel	44.59	39.25	40.24
2-axle, 4-tire	1.12	1.37	1.32
2-axle, 6-tire	10.71	10.93	11.02
3 or more axles	1.24	1.61	2.46
Tractor Trailer			
2-axle tractor	6.97	8.34	8.26
3-axle tractor	35.35	38.46	36.67

Source: Virginia Truck Weight Studies

Exhibit 33

AVERAGE TRUCK LOADS CARRIED — U.S.
(IN POUNDS)

<u>Vehicle Type</u>	<u>All Roads</u>	<u>Federal Aid Interstate</u>
Single-Unit		
Van	4,300	4,260
Refrigerated	4,160	4,800
Petroleum	6,040	6,580
Flatbed	6,880	7,040
Dump	21,340	21,600
Semi-Combination		
Van	22,960	24,260
Refrigerated	28,800	30,240
Petroleum	42,600	43,160
Flatbed	30,060	30,700
Dump	41,360	43,820

Source: 1975 National Truck Characteristic Report

There was little difference in the loads carried by single-unit trucks on the interstates as compared to all roads. However, tractor trailers on the interstates carried loads slightly greater than those on all roads, although this difference was less than 6%.

Three-year data on the average load carried by trucks traveling on highways of Virginia are shown in Exhibit 34 for all of the road systems and in Exhibit 35 for the interstate system. For single-unit trucks, loads did not typically exceed 1,000 lb. for pickups or 2,000 lb. for 2-axle, 4-tire trucks. Two-axle, 6-tire, single-unit trucks carried weights in the 4,500 lb. range and single-unit trucks with 3 or more axles had loads in the 19,000 lb. category. For tractor semi-trailers, those pulled by 2-axle tractors had loads around 10,000 lb. and those pulled by 3-axle tractors were loaded at about 30,000 lb.

There was consistency across time in the loads carried on both the interstate system and on all roads in the state for pickups, 2-axle, 6-tire, single-unit trucks, and tractor semi-trailers. There were some large differences in loads carried by 2-axle, 4-tire trucks and those single-unit trucks with 3 or more axles. In addition, the average load carried on the interstate system by large single-unit trucks was much lighter and that for tractor trailers was slightly lighter than the average loads for these vehicles on all roads.

Exhibit 34

AVERAGE TRUCK LOADS CARRIED — VIRGINIA
ALL ROAD SYSTEMS

<u>Vehicle Type</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit			
Pickup	993	951	1,015
2-axle, 4-tire	1,570	1,218	1,914
2-axle, 6-tire	4,507	4,497	4,703
3 or more axles	18,954	19,019	19,887
Tractor Semi-trailer			
2-axle tractor	9,815	13,640	10,906
3-axle tractor	30,505	30,662	30,832

Source: Virginia Truck Weight Studies

AVERAGE TRUCK LOADS CARRIED — VIRGINIA
INTERSTATE SYSTEM

<u>Vehicle Type</u>	<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit			
Pickup	764	1,094	1,032
2-axle, 4-tire	3,341	625	2,636
2-axle, 6-tire	4,737	4,640	4,492
3 or more axles	14,659	15,290	19,981
Tractor Semi-trailer			
2-axle tractor	9,644	13,619	10,176
3-axle tractor	28,757	28,867	29,685

Source: Virginia Truck Weight Studies

A number of comparisons among the data on the average loads carried in Virginia and those collected in the other states and aggregated into U. S. data can be carried out. Loads carried in single-unit vans and refrigerated trucks in the national data were roughly the same as those carried in single-unit, 2-axle, 6-tire trucks in the state data, with both groups carrying loads in the 4,500 lb. range. Single-unit dump trucks (national data) and trucks with 3 or more axles (state data) each carried loads of 20,000 lb.. Combination vans, refrigerated vans, and flatbeds (national data) carried nearly the same 30,000-lb. load as that carried by 3-axle tractor semi-trailers. The major difference in the two sets of data is that those vehicles which carried loads in excess of 40,000 lb. — tractor trailer dump trucks and petroleum tankers — cannot be factored out of the Virginia data for comparison purposes. However, in general, the weight of loads carried by the various classifications of trucks on the highways of Virginia were the same as those carried on the roads throughout the U. S..

The state Truck Weight Study also collects data on the percentage of trucks carrying loads in excess of the weight limits for the state. Data from all the road systems in the state are summarized in Exhibit 36. Practically speaking, none of the pickups and 2-axle, 4-tire, single-unit trucks were in violation of the load limits. In addition, between 1974 and 1977, there was a drop in the percentage of 2-axle, 6-tire trucks in violation.

This change was from 3.51% in 1974 to 0.76% in 1977, with a corresponding drop from 1.65% to 0.51% of those carrying loads in excess of the limit by 5% or more. For trucks with 3 or more axles, there was a decrease in the percentage of vehicles with loads in excess of the limit from 19.52% in 1974 to 11.73% in 1977. Those with loads in excess of the limit by 5% or more also dropped, from just over 10% in 1974 to 4.2% in 1977.

Exhibit 36

PERCENTAGES OF TRUCKS WITH LOADS IN EXCESS
OF VIRGINIA WEIGHT LIMITS
ALL ROAD SYSTEMS

<u>Vehicle Type</u>		<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit				
Pickup	not in excess	100.00	100.00	98.88
	all in excess	---	---	0.12
	excess by 5+	---	---	0.06
2-axle, 4-tire	not in excess	100.00	100.00	100.00
	all in excess	---	---	---
	excess by 5+	---	---	---
2-axle, 6-tire	not in excess	99.24	99.49	96.49
	all in excess	0.76	0.51	3.51
	excess by 5+	0.51	0.30	1.65
3 or more axles	not in excess	88.27	86.55	80.48
	all in excess	11.73	13.45	19.52
	excess by 5+	4.19	5.58	10.02
Tractor Semi-Trailer				
2-axle tractor	not in excess	97.97	98.20	94.06
	all in excess	2.03	1.80	5.94
	excess by 5+	1.08	1.10	2.02
3-axle tractor	not in excess	89.45	92.13	80.05
	all in excess	10.55	7.87	19.95
	excess by 5+	3.42	2.12	6.17

Source: Virginia Truck Weight Studies

During the last two surveys, only 2% of the 2-axle tractor semi-trailer combinations were in violation of the weight limits. About half of these exceeded the weight limit by 5% or more. For rigs pulled by 3-axle tractors, there was a variation in the data for the three surveys, with vehicles in violation of the limits ranging from a high of nearly 20% in 1974 to a low of 7.87% in 1975, to 10.55% in 1977. This same fluctuation was found in the data for 3-axle tractor semi-trailers in excess of the limit by 5% or more; with 6.17% in 1974, 2.12% in 1975, and 3.42% in 1977.

The percentages of trucks in excess of Virginia weight limits on the interstate system are given in Exhibit 37. The situation on the interstates was similar to that on all road systems for pickups and 2-axle, 4-tire, single-unit trucks in that they were not over the weight limits. Also, for the last two surveys nearly all of the 2-axle, 6-tire trucks were within the state weight limits. For single-unit trucks with 3 or more axles, the data for 1975 and 1977 show a much improved situation as far as excessive weight was concerned. In 1975, 4.73% and in 1977 5.51% of these large single-unit trucks were in excess of the weight limits while those in excess by 5% or more totaled about 1.4% in 1975 and 1.6% in 1977.

Adherence to the weight limits improved over the three surveys for both categories of tractor semi-trailers. Less than 1% of the 2-axle tractor rigs were found to be over the weight limit, and only about 0.2% were in excess of the limit by 5% or more during the 1975 and 1977 surveys. More 3-axle tractor semi-trailers than the other classes of trucks were over the limits (16% in 1974, 4.98% in 1975, and 6.43% in 1977). For those over the limit by 5% or more, the figures were 2.47% in 1974, 1.37% in 1975, and 1.47% in 1977.

Comparisons carried out between the data for the interstate system and those for all road systems showed that trucks using the interstate system were more likely to be within the state weight limits than were those on all road systems. The most dramatic differences were for single-unit trucks with 3 or more axles and for tractor trailers pulled by 3-axle tractors. These are the two categories of trucks which haul the heaviest loads.

Exhibit 37

PERCENTAGES OF TRUCKS IN EXCESS OF VIRGINIA WEIGHT LIMITS
INTERSTATE SYSTEM

<u>Vehicle Type</u>		<u>1977</u>	<u>1975</u>	<u>1974</u>
Single-Unit				
Pickup	not in excess	100.00	100.00	99.54
	all in excess	---	---	0.46
	excess by 5+	---	---	0.23
2-axle, 4-tire	not in excess	100.00	100.00	100.00
	all in excess	---	---	---
	excess by 5+	---	---	---
2-axle, 6-tire	not in excess	99.77	99.53	97.36
	all in excess	0.23	0.47	2.64
	excess by 5+	0.23	0.36	1.18
3 or more axles	not in excess	94.49	95.27	81.13
	all in excess	5.51	4.73	18.87
	excess by 5+	1.57	1.35	7.61
Tractor Semi-Trailer				
2-axle tractor	not in excess	99.20	99.31	96.51
	all in excess	0.80	0.69	3.49
	excess by 5+	0.20	0.23	0.62
3-axle tractor	not in excess	93.57	95.02	83.92
	all in excess	6.43	4.98	16.08
	excess by 5+	1.47	1.37	2.47

Source: Virginia Truck Weight Studies

Safety Inspections

Virginia

The SCC and State Police have responsibility for safety inspections of motor vehicles in Virginia. However, SCC investigators do not work directly with the State Police, though they do have contact with the police when working at the weigh stations.

The SCC has 30 investigators who have the authority to enforce the laws, rules, and regulations governing the operations of motor vehicles on the highways of Virginia, and these investigators have

the authority to issue a summons to or arrest any person found in violation. They may stop and examine the lading and documents of any motor vehicle, trailer, or semi-trailer operating on any highway in Virginia. The investigators are also given the authority to remove from any motor vehicle or to secure from any person any warrant, exemption card, registration card, tag, plate or other evidence of authority to operate such motor vehicle that was issued by the Commission which is being improperly used or which has been properly suspended or cancelled.

The SCC investigators have conducted safety inspections at the permanent weigh stations after first checking vehicles for SCC authority. Generally, investigators will stand at the scales and give the trucks cursory visual inspections. When an investigator sees a truck he thinks is likely to have safety problems, he can order the driver to pull his vehicle into the inspection area for a thorough inspection. Items checked include lights, windshield, exhaust system, brakes, tires, and the driver's license and other papers. Two of the SCC investigators' primary tasks are to check for the proper SCC authorization to operate in Virginia and to check for the fuel tax permit, though these are not safety-related items. These safety checks may be conducted at the permanent weigh stations during day or evening hours.

Though the SCC has conducted intensive safety inspections since April 1979, State Police officers may also undertake safety inspections. Officers may check vehicle registrations and licenses and inspect for safety violations at the weigh stations at their discretion. The safety inspections are essentially the same as the SCC checks and are modeled after inspections conducted by the BMCS inspectors.

Federal Activities in Virginia

BMCS activities can be divided into two general categories:

1. educational activities
2. highway and facility inspections

Included under educational activities is the task of ensuring widespread familiarity with the FMCSR. When a motor carrier begins operation, the BMCS sends him a copy of the FMCSR. This is usually followed by a visit from a BMCS investigator to discuss the meaning of the regulations and to advise the carrier of what steps, if any, he must take to comply. As new regulations are issued, BMCS investigators again visit carriers to determine whether they are aware

of and have complied with the new requirements. Attention here is directed toward small carriers whose knowledge of recent regulations may not be as up to date as that of the large carriers.

The bulk of the Bureau's activity regarding highway and facility inspections is concerned with carrier compliance with the FMCSR and the Federal Hazardous Materials Regulations (FHMR). Five members of the Bureau are charged with the responsibility of inspecting trucks on the highways and visiting carrier facilities in Virginia. This relatively modest force is composed of four safety investigators and one supervisory officer who coordinates their activities. They are stationed as follows:

Richmond: 3 (2 safety investigators, 1 officer in charge)
Roanoke : 1 safety investigator
Hampton : 1 safety investigator

Working independently of one another, the four investigators are often found at the permanent weighing stations throughout the state. The rest of their time is spent visiting and inspecting carrier facilities. The primary function of the investigators at the weighing stations is to ensure that interstate carriers are complying with the FMCSR and the FHMR.

The BMCS investigator follows a procedure similar to the one followed by Virginia's SCC investigators. The major differences are that the BMCS investigator focuses more on the driver, particularly his hours of service as indicated in his daily log, and the federal investigator may place a vehicle or driver immediately out-of-service. The SCC investigators presently lack authority to enforce hours-of-service requirements and to place drivers or vehicles out-of-service.

The following is a description of the BMCS investigation procedure. As the truck enters the area of the weighing station, it is given a relatively cursory examination to determine its overall condition. If a violation of the FMCSR is evident, the vehicle will be delayed and more thoroughly inspected. In this latter stage the investigator, after having first determined that the vehicle is indeed engaged in interstate commerce, will concentrate initially on evidence of the more common types of violations, such as those involving the hours-of-service or physical qualifications of the driver. The driver's daily log is checked to determine if he has driven in excess of permitted hours. The investigator will also verify that the 2-year doctor's certificate required by the Bureau is current. If violations are found, the driver can immediately be declared out-of-service.

During the general inspection of the vehicle, the BMCS investigator will verify whether it is properly loaded and, more importantly, whether the vehicle complies with §393 (Parts and Accessories Necessary for Safe Operation) and §397 (Transportation of Hazardous Materials) of the FMCSR. If a vehicle is found to be "imminently hazardous" or likely to break down or cause an accident, the investigator can declare it out-of-service on the spot. If the defect is less severe, the carrier will be directed to notify the BMCS within 15 days that corrective action has been taken. In addition, if the vehicle is transporting hazardous materials, the shipping papers, the vehicle and its cargo are checked for compliance with the FHMR.

In addition to the five-member staff working regularly within Virginia, the BMCS intermittently assembles a "strike force" made up of personnel from both within and outside the state to inspect vehicles at a variety of locations. These mobile inspection teams will stop and examine vehicles at rest areas, toll facilities, weighing stations, or on the shoulder of the road. Although no statistics were available to indicate the frequency of these inspections within Virginia, it may be assumed from the overall size of the Bureau's investigatory staff (133 persons) that they are rare.

The inspections of carrier facilities by investigatory staff are known as "safety compliance surveys." During the survey, the carrier's records are examined to determine whether the carrier has complied with FMCSR sections governing drivers' hours-of-service, maintenance and inspection of vehicles, driver qualification records, and the reporting and recording of accidents. The carrier is also required to keep an accident register listing motor vehicle accidents which have resulted in death or personal injury or damage to property.

A safety survey may also be undertaken to determine the validity of complaints — often from the carrier's employees — concerning violations of the FMCSR.

The results of safety surveys, as well as of road checks, are kept on file by the Bureau. The information thus collected forms the data for periodic studies used in establishing, revising, or revoking safety regulations.

The Bureau may employ several types of enforcement actions in its efforts to secure compliance with the FMCSR. Under the Interstate Commerce Act, for example, the Bureau may initiate civil, administrative, and criminal proceedings against offending carriers.

Civil penalties are imposed in the form of forfeitures. To illustrate, a carrier who violates the record keeping and reporting requirements of the FMCSR may forfeit up to \$500 for each offense and up to \$250 for each day the violation continues.

Administrative proceedings against a carrier, as authorized by the Interstate Commerce Act, are brought in the form of compliance orders. A serious violation of the FMCSR found at a carrier facility may activate this enforcement tool. The carrier may contest the Bureau's allegations that a violation exists, but once the final order is issued by the administrator of the FHWA, failure to comply is grounds for suspension or revocation of the carrier's authority to operate.

Criminal prosecution for violation of the FMCSR is also provided for in the Interstate Commerce Act, and fines of up to \$500 per offense can be levied.

Hazardous Materials

Virginia

The state agencies responsible for the enforcement of the hazardous materials regulations are the State Police and the SCC. State Police officers and SCC investigators are given the authority to stop and examine the lading of any motor vehicle suspected of being used to transport dangerous articles to determine whether it is in compliance with the rules and regulations governing the transportation of dangerous articles. These investigations are carried on as part of the safety checks conducted at the permanent weigh stations.

Federal

Under the Hazardous Materials Transportation Act, the Explosives and Other Dangerous Articles Act, and delegations of authority by the Secretary of Transportation, the BMCS is charged with enforcing the various regulations governing motor carriers engaged in the transportation of hazardous materials. Like the state investigators, the BMCS investigators often conduct their inspections in conjunction with the general safety inspections. The Acts also give the Bureau the authority to conduct investigations, issue subpoenas, and require the submission of evidence relevant to hazardous materials violations and compliance. Various penalties are available at the Bureau's discretion, as are other means of enforcement such as compliance orders and requests for injunctive relief and punitive damages. Sanctions may be severe. For example, a finding of noncompliance with §397 of the FMCSR (Transportation of Hazardous Materials) during the

operation of a motor vehicle or at the carrier's facility may result in civil penalties of up to \$10,000 per violation. Criminal penalties are provided for as well, with fines for willful violations ranging as high as \$25,000 per offense and imprisonment for up to 5 years.

In addition to the duty of enforcing the regulations, the Bureau has been given the responsibility of training state personnel in the proper handling of hazardous materials.

Training programs are held in a variety of locations. For example, BMCS instructors participate in several courses at the Transportation Safety Institute in Oklahoma City, Oklahoma. On the local level, BMCS investigators and hazardous materials specialists routinely train or supervise the training of state personnel in the field. Police, rescue squad, fire and civil defense personnel are taught to identify hazards and to safely evacuate threatened areas. In 1977, the most recent year for which statistics were available, the Bureau completed 1,044 sessions in the various locations, reaching 64,310 participants.

Finally, in a supervisory role, the Bureau has helped design other training programs sponsored by public interest organizations such as the National Fire Protection Association.

Special State Safety Programs

In California, the Highway Patrol (CHP) enforces commercial vehicle regulations through the on-highway commercial enforcement program, which consists of weighing operations and safety inspections conducted at inspection facilities, permanent platform scales, and temporary stations set up by mobile crews. Since September 1977, when truck inspections on Interstate 8 and 80 revealed that over 50% of the vehicles inspected had brake defects, the CHP has conducted the Truck Accident Reduction Program (TARP).

The CHP operates 9 large inspection facilities staffed with 7 sergeants, 41 traffic officers and 87 non-uniformed commercial vehicle inspection specialists. Located on interstates and other primary highways, these inspection facilities are operated on an irregular schedule and may be open on any day of the week at any hour. When open, the facilities are operated in 8-hour shifts. However, the objective of the TARP is to extend safety inspections to commercial vehicles that avoid inspections at these central inspection stations.

In order to do this, the CHP has 63 traffic officers assigned to 40 platform scales. The scales are much smaller than the central stations, they have less traffic, and the inspections conducted are generally limited in scope. The scales are manned by traffic officers only, with no civilian support staff. Like the inspection facilities, the permanent scales can be operated on any day of the week and at any time of the day or night.

An additional 65 traffic officers are assigned to mobile road enforcement teams. They cover the secondary road system and supplement the central station and platform scale inspections. Generally, one man is responsible for this operation and handles both the safety inspections and the weighing of the vehicles on portable scales.

A TARP inspection conducted at a platform scale or other roadside location takes 15 minutes or less and does not require any disassembling of the vehicle. Primary areas of focus include brake shoes, brake adjustments, spring hangers, suspension system, steering mechanisms, tires, air brakes, and drivers' logs.

Approximately 30% of the man-hours expended on the entire commercial enforcement program are expended on the TARP. Through this program, the CHP was able to inspect nearly 300,000 trucks in 1978 and found that 59% of the vehicles had faulty brakes.

Another state safety inspection program produced a positive safety impact in a very short period of time. In New Jersey, a total of 37 road safety checks were performed between August 10 and December 3, 1978. In 27 of the checks, BMCS investigators assisted the State Police. During the safety checks, 531 commercial vehicles were selectively inspected and 251 (47%) were placed out-of-service for defects requiring correction before the resumption of their trip. State officials found that bus and truck accidents on the New Jersey Turnpike decreased 12.3% during the four month period of the program, even though the total number of accidents involving all vehicles increased.⁽⁷⁸⁾

Questionnaire Survey of Other States' Programs

In order to evaluate Virginia's existing truck safety enforcement programs, a questionnaire was sent to highway officials of the other forty-nine states and the District of Columbia. The questionnaire contained questions dealing with programs for enforcing regulations on truck weight and safety and on the transport of hazardous materials. (Appendix B contains a copy of the questionnaire.) With 44 states and the District of Columbia responding, a fairly complete picture of enforcement activities around the country was obtained.

Weighing Operations

All of the respondents had some sort of truck weighing program. However, there was a great deal of variation among the states in the manner in which they conducted their programs.

Most states used both permanent (fixed) scales and portable scales (see Exhibit 38). Frequently, portable scales were used in conjunction with permanent scales in an effort to detect trucks attempting to bypass the permanent scales. One state used only permanent scales and 5 states used only portable scales. Of the states using portable scales, 40 utilized wheel weighers and 15 utilized axle weighers.

Exhibit 38

TRUCK WEIGHING SYSTEMS

<u>Weighing Methods</u>	<u>No.</u>	<u>Percent of Respondents</u>
States using:		
Permanent Scales	40	88.9
Portable Scales	44	97.8
Axle Weighers	15	33.3
Wheel Weighers	40	88.9
Permanent and Portable Scales	39	86.7
"Weigh-in-Motion"	3	6.7

Only three states indicated that they used the "weigh-in-motion" method of weighing trucks. Another state was in the process of installing the necessary equipment and 3 states were considering implementing the system. All of the states using the "weigh-in-motion" system were using it to screen out vehicles within the weight limits before weighing at a full stop. One state also was using the weigh-in-motion system for data gathering.

While most states used the same basic equipment to weigh trucks the number of scales used and hours of operation varied greatly. The number of permanent scales in use ranged from 1 to 65, with an average of 17.1, and the number of portable scale teams assigned for duty each day of operation ranged from 2 to 132. On average, each state assigned 17.1 teams of 1.7 persons each on days that portable scales were in operation (see Exhibit 39).

Exhibit 39

UTILIZATION OF WEIGHING EQUIPMENT

<u>Equipment</u>	<u>Percent</u>
Avg. No. of Permanent Scales/State	17.1
Median No. of Permanent Scales/State	12
Avg. No. of Portable Scale Teams/State	17.1
Median No. of Portable Scale Teams/State	11
Avg. No. of People/Team	1.7
Median No. of People/Team	2

The hours of operation also varied considerably. One-third of the states operated at least one permanent scale 7 days a week, 24 hours a day. Over two-thirds of the states had permanent scales open at least 5 days a week. In addition, over one-third of the respondents conducted truck weighing operations at fixed scales on weekends.

While portable scales can be set up in different locations, they are generally used only in daylight hours, since most locations are not lighted. Consequently, no state used portable scales on a 24-hour-a-day basis. Thirty states had portable scale teams in the field at least 5 days a week, however, and 12 states used portable scales for weekend weighing operations.

Many states used irregular scheduling, particularly for the mobile weighing teams. Over one-half of the states scheduled their portable weighing teams on an irregular basis, and more than one-third of the respondents stated that they operated permanent scales on an irregular schedule (see Exhibit 40).

Exhibit 40

HOURS OF OPERATION

States with:	<u>No.</u>	<u>Percent of Respondents</u>
Permanent Scales Operating:		
7 days/week, 24 hrs./day	15	33.3
5 or more days/week	32	71.1
On weekends	19	42.2
On irregular schedule	17	37.8
Portable Scales Operating:		
5 or more days/week	30	66.7
On weekends	12	26.7
On irregular schedule	27	60.0

While most states (24) weighed every truck passing a permanent weigh station, a substantial minority (16 states) did not weigh all trucks. Eight of these states said that they did not weigh obviously empty trucks and 4 states cited discretion on the part of scale personnel as the determining factor. The other criteria for determining whether to weigh a truck included traffic flow and exemptions for certain types of trucks (see Exhibit 41).

Exhibit 41

CRITERIA FOR WEIGHING AT PERMANENT SCALES

	<u>No.</u>	<u>Percent of States w/Permanent Scales</u>
No Criteria	24	60.0
Criteria Used	16	40.0
Empty trucks exempt	8	20.0
Discretion	4	10.0
Type of truck	3	7.5
Traffic flow	2	5.0
Local trucks exempt	1	2.5

Only 3 states indicated that they weighed all trucks passing portable scales. Thirty-three states relied on the discretion of the scale personnel to determine whether to weigh a truck at a mobile scale. Decisions were generally based on the appearance of the vehicle and the truck's ability to pull its load. Other states indicated that vehicles were weighed at random, empty vehicles were not weighed, or that factors such as the type of vehicle, commodity carried, traffic flow, and the bill of lading entered into the decision to weigh a truck (see Exhibit 42).

Exhibit 42

CRITERIA FOR WEIGHING AT PORTABLE SCALES

	<u>No.</u>	<u>Percent of States w/Portable Scales</u>
No Criteria	3	68.1
Criteria Used	41	93.2
Overweight appearance (discretion)	33	75.0
Random	5	11.4
Empty trucks exempt	5	11.4
Bill of lading	5	11.4
Traffic flow	2	4.5
Commodity carried	2	4.5
Type of truck	1	2.3

Virtually every respondent pointed to state law as a source of state rules governing truck weight and size limits. In addition, 9 states, 20.0%, indicated that state weight rules stemmed from agency regulations. Few states cited a legislative resolution or a departmental or commission policy as a source of truck weight rules (see Exhibit 43).

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Exhibit 43

SOURCE OF STATE RULES

	<u>No.</u>	<u>Percent of Respondents</u>
State law	44	97.8
Agency Regulations	9	20.0
Departmental or commission policy	5	11.1
Legislative resolution	2	4.4

According to the responding states, both state police and highway or transportation departments played a significant role in operating weighing programs. More than half of the states named the state police as an agency responsible for the weighing program, while roughly 40% of the respondents named the highway or transportation department as a responsible agency. In 16 of the states, the state police had the sole responsibility and in 9 states the highway department had the sole responsibility. State regulatory commissions, such as the SCC in Virginia, and motor vehicle agencies were also named as organizations having responsibility for truck weighing programs (see Exhibit 44).

Exhibit 44

RESPONSIBLE AGENCIES

<u>Permanent Scales</u>	<u>No.</u>	<u>Percent of States w/Permanent Scales</u>
State police	21	52.5
Highway or DOT	17	42.5
State regulatory commission	5	12.5
Motor vehicles	2	5.0
Other	2	5.0

<u>Portable Scales</u>	<u>No.</u>	<u>Percent of States w/Portable Scales</u>
State police	25	56.8
Highway or DOT	18	40.9
State regulatory commission	3	6.8
Motor vehicles	3	6.8
Other	2	4.5

No. of states with state police having sole responsibility - 16 (35.6%)
 No. of states with highway (of DOT) having sole responsibility -
 9 (20.0%)

Exhibit 46 shows the results of these calculations with the states ranked from best to worst. It is interesting that most of the states with permanent scales operating 7 days a week, 24 hours a day were among the states with the most effective weight programs. Also, the 5 states which had no permanent weigh stations were all among both the states cited by the U. S. DOT for inadequate weight enforcement and the lowest ranked states according to these calculations.

All of these rankings have certain problems. One is that the numbers used in the computations are proxy values and, therefore, are not completely accurate representations of the amount of truck traffic in a state. Additionally, not all of the states with permanent scales weigh every truck passing the scales. Consequently, the number of trucks weighed for those states is lower than if all trucks were weighed, even though those allowed to pass the weigh stations are probably under the weight limits.

On-Road Safety Inspection Programs

Unlike the weighing programs, on-road safety inspection programs were not conducted by all states. However, most states (36 of the respondents) had on-road safety inspection programs. Unfortunately, many states lacked data on the number of trucks inspected so no attempt was made to determine the relative effectiveness of these programs.

Exhibit 47 shows the areas of primary focus in safety inspections. Brakes and tires were both cited by 32 states, the most of any of the items. The suspension system was the only item listed on the questionnaire that was checked by less than half of the states conducting safety inspections.

RANKING OF STATE WEIGHT PROGRAMS BY EFFECTIVENESS

<u>Weighing Registrations</u>	<u>Weighing Fuel Cons.</u>	<u>Weighing Veh. Miles</u>
Va. (P)	Va. (P)	N. Mex. (P)
N. Mex. (P)	N. Mex. (P)	Ark. (P)
Ark. (P)	Utah (P)	Utah (P)
Tenn. (P)	Ark. (P)	Va. (P)
Utah (P)	Wash. (P)	N. Dak. (P)
La. (P)	N. Dak. (P)	La. (P)
N. C.	La. (P)	Tenn. (P)
Wash. (P)	Tenn. (P)	Wash. (P)
Illi.	Colo. (P)	N. C.
N. Dak. (P)	N. C.	Colo. (P)
Fla. (P)	Fla. (P)	Nebr.
Mo. (P)	Nebr.	Mo. (P)
Ohio	Illi.	Illi.
Nebr.	Mo. (P)	Mont. (P)
Colo. (P)	Ohio	Oreg. (P)
Oreg. (P)	Oreg. (P)	Fla. (P)
Wis.	Mont. (P)	Ohio
Mich.	Mich.	Wis.
Mont. (P)	Wis.	Calif.
Calif.	Calif.	Mich.
Ga. (M)	W. Va. (M)	W. Va. (M)
S. C. (M)	S. C. (M)	Ind.
Ind.	Ga. (M)	Ga. (M)
W. Va. (M)	Ky.	S. C. (M)
Ariz. (C) (P)	Kans. (P)	Kans. (P)
Ky.	Ind.	Ariz. (C) (P)
Kans.	Md. (M)	Ky.
Md. (M)	Ariz. (C) (P)	Idaho
Conn. (C)	Hawaii (C) (N)	S. Dak. (C)
S. Dak. (C)	S. Dak. (C)	Md. (M)
Idaho	Idaho	Hawaii (C) (N)
Hawaii (C) (N)	Conn. (C)	Wyom. (M) (P)
D. C. (M)	Maine (C) (N)	Conn. (C)
Vt. (M)	Okla. (C)	Vt. (M)
Wyom. (M) (P)	Vt. (M)	Okla. (C)
N. J. (C)	N. H. (M)	Maine (C) (N)
Maine (C) (N)	Wyom. (M) (P)	Nev. (C) (N)
Ala. (C)	N. Y. (C) (N)	N. J. (C)
N. H. (M)	N. J. (C)	D. C. (M)
N. Y. (C) (N)	Nev. (C) (N)	N. H. (M)
Nev. (C) (N)	D. C. (M)	N. Y. (C) (N)
Pa. (C)	Ala. (C) (N)	Ala. (C) (N)
Mass. (C)	Pa. (C)	Pa. (C)
Ala. (C) (N)	Mass. (C)	Mass. (C)

(C) Cited by U. S. DOT in February 1976 for inadequate weight enforcement.

(M) Classified as marginal in weight enforcement by U. S. DOT in February 1978.

(N) No permanent scales.

(P) Operating at least one permanent scale 24 hours/day, 7 days/week.

Source: Data on vehicle registrations, fuel consumption, and vehicle miles obtained from Highway Statistics 1977, U. S. DOT, FHWA.

Exhibit 47

SAFETY INSPECTIONS

	<u>No.</u>	<u>Percent of Respondents</u>
States conducting inspections	36	80.0
States with no inspection program	9	20.0
Areas of Primary Focus:	<u>No.</u>	<u>Percent of States w/Program</u>
Brakes	32	88.9
Tires	32	88.9
License	29	80.6
Registration	29	80.6
Lights	27	75.0
Turn signals	25	69.4
Exhaust system	23	63.9
Driver's logs	22	61.1
Steering mechanism	20	55.6
Suspension system	16	44.4
Driver condition	2	5.6
Fifth wheels	2	5.6
Emergency equipment	1	2.8

Seventeen states (47.2%) indicated that certain criteria were used to determine which trucks to inspect for safety violations. Many respondents stated that they conducted their inspections in conjunction with weighing operations, which provided an opportunity to make the determination of whether to inspect a truck. Several states said that a cursory visual inspection for obvious safety problems was undertaken to determine whether to give a truck a complete safety inspection. As Exhibit 48 shows, other factors included the type of vehicle, the age of the vehicle, and the carrier operating the truck.

Exhibit 48

CRITERIA FOR SAFETY INSPECTIONS

	<u>No.</u>	<u>Percent of States w/Program</u>
No criteria	17	47.2
Use criteria	17	47.2
Did not respond	2	5.6
Criteria Used:		
Visual inspection	7	19.4
Type of vehicle	3	8.3
Age of truck	2	5.6
Private carriers exempt	2	5.6
Carrier's record	1	2.8
Traffic flow	1	2.8
Lack of inspection sticker	1	2.8
Traffic infraction	1	2.8

The violation rate for safety inspections was far higher than the violation rate for truck weighings. For the 19 states which had data, the average violation rate was 20.5%. Rates ranged from a low of 0.03% to a high of 92.5% (see Exhibit 49).

Evaluation of Effectiveness of Weighing Programs

In analyzing the results of this questionnaire an attempt was made to determine the relative effectiveness of the truck weight enforcement programs. In trying to develop a measure of the effectiveness of the programs, various alternatives were considered and, while none of them was without problems, a number of them produced fairly consistent results.

The number of trucks weighed varied tremendously from state to state. At one end of the spectrum Virginia weighed over 7,000,000 trucks in 1978, and at the other end the District of Columbia weighed only 2,240. However, the number weighed, by itself, does not indicate the effectiveness of the program, because the volume of truck traffic varies considerably among the states (see Exhibit 45).

The violation rates were also examined, but these tended to increase as the number of trucks weighed decreased. This would be expected, because a program known to be effective in weighing a large percentage of the trucks traveling through a state would tend to deter truckers from running over the weight limit. On the other hand, if the probability of being caught is low, truckers would overload their trucks. Therefore, the states with ineffective programs would often have high violation rates while states with effective programs would have low violation rates (see Exhibit 45).

It should be noted that these violation rates do not give a completely accurate picture of the percentage of trucks exceeding the weight limits because truckers are allowed to shift their loads for weighing when it is found that they have been over the weight limit on an axle when traveling on the road.

The measures that produced the most consistent results involved comparing the number of vehicles weighed to another number representing the volume of truck traffic in a state. The figures used as proxies for the number of trucks traveling in a state were the number of commercial and private trucks registered in the state, the amount of highway diesel fuel consumed, and the number of truck vehicle miles (as estimated by the FHWA). If the effectiveness of a truck weighing program increases as the percentage of trucks weighed increases, which should be true as more trucks carrying weights over the limit should be detected, these ratios should indicate the relative effectiveness of truck weight enforcement programs. As the ratio increases, the effectiveness of the program increases, since all of the figures used in the denominator of the ratios — truck registrations, diesel fuel consumption, and truck vehicle miles — are directly related to the amount of truck traffic in a state.

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Exhibit 45

TRUCKS WEIGHED AND VIOLATION RATES

<u>State</u>	<u>No. of Trucks Weighed</u>	<u>Percent in Violation</u>
Ala.	15,856	27.3
Ariz.	195,654	0.2
Ark.	3,800,000	0.2
Calif.	4,472,809	1.3
Color.	1,789,115	0.3
Conn.	43,310	7.8
D. C.	2,240	83.8
Fla.	3,842,349	0.8
Ga.	681,759	1.0
Hawaii	14,803	1.9
Idaho	53,129	16.7
Ill.	4,972,900	0.8
Ind.	680,773	10.0
Kans.	223,362	1.8
Ky.	289,740	2.1
La.	3,811,216	0.1
Maine	12,986	15.5
Md.	146,000	4.3
Mass.	5,900	9.4
Mich.	1,808,267	0.2
Mo.	2,666,531	0.7
Mont.	492,735	0.5
Nebr.	1,208,203	1.4
Nev.	6,100	5.3
N. H.	4,895	16.5
N. J.	38,855	16.8
N. M.	3,198,879	0.1
N. Y.	39,968	25.0
N. C.	4,329,065	0.4
N. D.	1,040,680	0.2
Ohio	3,927,000	0.2
Okla.	54,793	6.6
Oreg.	1,194,552	4.6
Pa.	28,898	4.3
S. C.	314,197	2.5
S. D.	46,292	20.0
Tenn.	5,000,000	1.1
Utah	1,906,949	Not Available
Vt.	8,401	9.5
Wash.	3,551,546	4.3
W. Va.	288,861	1.4
Wis.	1,333,623	Not Available
Wyo.	16,073	4.9
Va.	7,403,184	0.2
Nation	61,721,876	0.8

Exhibit 49

VEHICLES INSPECTED AND VIOLATION RATES

Average violation rate	20.5%
Median violation rate	25.9%

<u>State</u>	<u>No. Inspected</u>	<u>Percent in Violation</u>
Colo.	96,702	43.6
Illi.	1,671,329	24.4
Ind.	691,140	10.0
Ky.	18,415	59.1
Md.	100,000	20.6
Mass.	11,000	37.6
Mich.	56,308	25.9
Mont.	492,735	0.03
Nev.	27,101	9.4
N. H.	18,144	13.7
N. J.	40,846	92.5
N. M.	290	20.3
N. D.	21,754	1.0
Ohio	60,000	33.0
Oreg.	1,383	34.6
Pa.	3,744	16.9
Tenn.	16,737	46.1
Tex.	505,679	28.8
Utah	2,312	34.0

As Exhibit 50 illustrates, over 80% of the states cited the State Police as having some responsibility for safety inspections. Regulatory commissions were involved in roughly 30% of the states and highway departments had some responsibility for inspections in slightly more than 20% of the states. In 18 of the states the State Police were the sole agency inspecting trucks for safety violations.

Exhibit 50

RESPONSIBLE AGENCIES

	<u>No.</u>	<u>Percent of States w/Program</u>
State Police	30	83.3
Highway or DOT	8	22.2
State Regulatory Commission	11	30.6
Motor Vehicles	3	8.3
Other	1	2.8

Hazardous Materials

Although only 1 state indicated that it had no rules governing the transportation of hazardous materials, only 24 states actively enforced their regulations. Thus, far fewer states had hazardous materials programs than either weighing or on-road safety inspection programs (see Exhibit 51).

Exhibit 51

HAZARDOUS MATERIALS ENFORCEMENT PROGRAMS

	<u>No.</u>	<u>Percent of Respondents</u>
Actively enforcing	24	53.3
Not actively enforcing	19	42.2
Did not respond	2	4.4

When compared with the responses for weighing programs, more states had agency regulations as a source of state rules on hazardous materials. State law was still the most frequently listed source of state rules, however. Though the question was not specifically asked, 13 states noted that they had adopted the federal regulations governing the transportation of hazardous materials. Two other states also said they were considering adopting the federal regulations (see Exhibit 52).

Exhibit 52

SOURCES OF STATE RULES FOR REGULATION OF
HAZARDOUS MATERIALS TRANSPORTATION

	<u>No.</u>	<u>Percent of Respondents</u>
State law	32	71.1
Agency regulation	20	44.4
Department or commission policy	7	15.6
Legislative resolution	1	2.2
No rules exist	1	2.2
Federal regulations adopted	13	28.9

As Exhibit 53 shows, a substantial number of states either had studied the transportation of hazardous materials or had a study under way. Seven of the 14 states doing studies did not have active enforcement programs, so there may be an increase in the near future in the level of enforcement across the country.

Exhibit 53

STUDIES OF TRANSPORTATION OF HAZARDOUS MATERIALS

	<u>No.</u>	<u>Percent of Respondents</u>
Had conducted study	18	40.0
Had not conducted study	23	57.5
Did not respond	4	8.9
Was conducting study	14	31.1
Was not conducting study	26	57.8
Did not respond	5	11.1

As Exhibit 54 illustrates, most states conduct random inspections on the road, as opposed to systematic roadway inspections and/or inspections at the terminal. Those states which inspect office records tend to inspect them at the terminal rather than on the road. As the exhibit shows, fewer states inspected private carriers than for-hire carriers. This difference occurred because some state agencies did not have the authority to inspect private carriers.

Exhibit 54

INSPECTION METHODS

	<u>No.</u>	<u>Percent of Enforcing States</u>
Inspecting For-Hire Carriers	24	100.0
Inspecting Private Carriers	21	87.5

For-Hire Carriers:

Inspecting Office Records	13	54.2
Inspecting Records on Vehicle	23	95.8
Inspecting Vehicle	22	91.7
Inspecting Cargo	21	87.5

Private Carriers:

Inspecting Office Records	10	41.7
Inspecting Records on Vehicle	20	83.3
Inspecting Vehicle	20	83.3
Inspecting Cargo	18	75.0

For-Hire Carriers:	<u>Method</u>		<u>Location</u>	
	<u>Random</u>	<u>Systematic</u>	<u>Terminal</u>	<u>On-Road</u>
Office Records	10(41.7%)	3(12.5%)	11(45.8%)	2(8.3%)
Vehicle Records	20(83.3%)	6(25.0%)	6(25.0%)	21(87.5%)
Vehicle	19(79.2%)	7(29.2%)	8(33.3%)	20(83.3%)
Cargo	19(79.2%)	5(20.8%)	7(29.2%)	16(66.7%)

Private Carriers:

Office Records	7(29.2%)	3(12.5%)	7(29.2%)	3(12.5%)
Vehicle Records	17(70.8%)	7(29.2%)	7(29.2%)	18(75.0%)
Vehicle	16(66.7%)	9(37.5%)	7(29.2%)	18(75.0%)
Cargo	16(66.7%)	6(25.0%)	5(20.8%)	15(62.5%)

In two-thirds of the states the state police had some responsibility for enforcing hazardous materials regulations. State regulatory commissions and highway or transportation departments each had some responsibility in one-third of the states. The police had the sole responsibility in only 5 states and regulatory commissions had the sole responsibility in only 3 states. The responsibility for enforcing regulations on the transportation of hazardous materials was often shared with other agencies concerned with health, environmental protection, and emergency services (see Exhibit 55).

Exhibit 55

RESPONSIBLE AGENCIES

	<u>No.</u>	<u>Percent of Enforcing States</u>
State police	16	66.7
Highway or DOT	8	33.3
State regulatory commission	8	33.3
State fire marshall	3	12.5
Health and environmental agencies	6	25.0
Local police	1	4.2
Disaster and emergency services	1	4.2
Ports of entry	1	4.2

As with safety regulations, though to an even greater degree, states lacked data on the numbers of inspections and violations. Consequently, no attempt to evaluate the effectiveness of the state programs was undertaken.

Summary

In Virginia, both state and federal agencies are active in enforcing regulations on truck weight limits, safety, and the transport of hazardous materials. The Department of Highways

and Transportation and the State Police share the responsibility of enforcing weight limits through the operation of permanent and portable scales. The SCC and State Police have the responsibility of enforcing the state safety and hazardous materials regulations. On the federal side, the BMCS enforces the regulations concerning safety and hazardous materials primarily through inspections at weigh stations and by the same method used by SCC investigators.

The questionnaire survey disclosed that all states responding had some sort of weighing program, though the effectiveness of the programs varied widely. Most states used both permanent and portable scales, as does Virginia. The evaluation of the effectiveness of the state weighing programs indicated that Virginia's program, with around-the-clock weighing at 7 of its permanent scales, was one of the most effective in the country.

Many states also had on-road safety inspection programs. However, data on these were lacking so no evaluation of their effectiveness could be performed. Most of these programs concentrated on easily detectable violations, such as those involving brakes and tires. In many cases the discretion of individual personnel played a very important role in determining which vehicles to inspect thoroughly, as inspectors gave vehicles at weigh stations a cursory visual inspection to decide whether to give them a complete inspection.

A smaller number of states were engaged in active programs for enforcing regulations on the transport of hazardous materials. More may do so in the near future, as several states were studying problems associated with the transportation of hazardous materials. Data on the number of inspections and violations were lacking to an even greater degree than for the safety inspections, however. The results of the questionnaire indicated that most states' enforcement activities were carried out on the road rather than at terminals where the materials were loaded onto the vehicles.

California's TARP program is an example of an intensive effort to enforce commercial vehicle safety regulations. The CHP conducts inspections at mobile scale locations as well as at permanent scales and central inspection facilities. Thus, the CHP is able to inspect trucks operating on a variety of road systems.

Another intensive state safety effort was undertaken by New Jersey over a 4-month period. This effort resulted in a decline in commercial vehicle accidents despite an increase in the total number of motor vehicle accidents during the same time period.

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APPENDICES

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APPENDIX A

VIRGINIA AND FEDERAL REGULATIONS GOVERNING
THE TRANSPORTATION OF HAZARDOUS MATERIALS

1397

Scope of Application

General

(Va.) "It shall be unlawful to ship or transport within the territorial limits of this Commonwealth, whether by motor vehicle, boat, aircraft, or any other means of conveyance, any dangerous article except in the manner prescribed by the [SCC]" (Emphasis added.) Va. Code §18.2-275.

(Fed.) Regulations apply to the transportation of HM in commerce; further, "commerce" means trade, traffic, commerce, or transportation, within the jurisdiction of the United States, (A) between a place in a state and any place outside of such state, or (B) which affects trade, traffic, commerce, or transportation described in clause (A)" (Emphasis added.) 49 USC §1801, §1802.(1).

Exceptions, General

(Va.) "Nothing [contained in the SCC regulations of HM, except E&DA Rule 16, which requires the driver to obey Va. rules and officers' directions concerning tunnels and bridges] shall apply to shipments or transportation of dangerous articles in interstate commerce when packed, marked, labeled and accompanied by shipping papers in conformity with the applicable regulations of the [U. S. Department of Transportation] and placarded in conformity therewith" E&DA Rule 3(a); Rule 4(d).

(Fed.) "Except [upon special application by a state to, and authorization from, the Secretary of Transportation], any requirement, of a state or political subdivision thereof, which is inconsistent with any requirement set forth [in 49 USC §1801 to §1812, the Hazardous Materials Transportation Act], or in a regulation issued under this [Act], is preempted." 49 USC §1811(a).

"Exemption will be permitted under these rules and regulations, except Rule 16 [requiring the driver to obey Va. rules and officers' directions concerning tunnels and bridges], for any article or substance due to its amount or its composition or the method in which it is contained if declared exempt under the rules and regulations of the [U. S. Department of Transportation] governing the transportation of dangerous articles." E&DA Rule 3(b).

"Any requirement, of a State or political subdivision thereof, which is not consistent with any requirement set forth [in the Hazardous Materials Transportation Act], or in a regulation issued under this [Act], is not preempted if, upon application of an appropriate state agency, the Secretary [of Transportation] determined . . . that such requirement (1) affords an equal or greater level of protection to the public than is afforded by [federal requirements] . . . and (2) does not unreasonably burden commerce." 49 USC §1811(b).

Exceptions, Military and other Government Agencies

(Va.) "Nothing [contained in the SCC regulations of HM, except E&DA Rule 16, which requires the driver to obey Va. rules and officers' directions concerning tunnels and bridges] shall apply . . . to the regular military or naval forces of the United States, nor to the duly authorized militia

(Fed.) " . . . [E]ach person who offers a package, overpack, or freight container containing a hazardous material shall label it, when required, with labels prescribed for the material . . . [except that a] . . . label is not required on . . . [m]ilitary ammunition shipped by, for, or to the U. S. Department of Defense (DOD) when in carload

of any State or Territory thereof, nor to the police or fire departments of this Commonwealth, providing the same are acting within their official capacity and in the performance of their duties. . . ." E&DA Rule 3(a).

or truckload shipments, if loaded and unloaded by the shipper, or DOD . . . [nor on a package] . . . containing hazardous material other than ammunition that is - (i) Loaded and unloaded under the supervision of DOD personnel, and (ii) Escorted by DOD personnel in a separate vehicle." 49CFR §172.400(a) (3 & 4).

"Shipments of hazardous materials offered by or consigned to the [DOD] must be packaged, including limitation of weight, in accordance with [federal regulations . . . or in containers of equal or greater strength and efficiency as required by DOD regulations." 49 CFR §177.806(a).

"Shipments of radioactive materials made by or under the direction or supervision of the U. S. Atomic Energy Commission or the [DOD] . . . , and which are escorted by personnel specially designated by or under the authority of these agencies, for the purpose of national security, are exempt from [federal regulations]" 49 CFR §177.806(b).

Exceptions, Flammable Liquids

(Va.) "It shall be the duty of the [SCC] . . . , from time to time, within its discretion, to promulgate rules and regulations. . . except as to flammable liquids, which may be transported in any manner and the methods of packing and marking the same." (Emphasis added.) Va. Code §18.2-275.

"Nothing [contained in Va. Code §18.2-274 to §18.2-278, which confer authority on the SCC to promulgate HM regulations having the full force of law,] . . . shall apply . . . to motor vehicles when transporting bulk flammable liquids by tank truck." (Emphasis added.) Va. Code §18.2-278.

(Fed.) No similar specific exemption exists in the regulations.

Legal Effect of Regulations

General

(Va.) "It shall be unlawful to ship or transport within the territorial limits of this Commonwealth [by motor vehicle] . . . any dangerous article except in the manner prescribed by the [SCC]" Va. Code §18.2-275, E&DA Rule 2.

(Fed.) "Except as provided in [49 CFR §171.12, which concerns import and export shipments], no person may offer or accept a hazardous material for transportation in commerce within the United States unless that material is properly classed, described, packaged, marked, labeled, and in the condition for shipment as required [by federal regulations]" 49 CFR §171.2(a).

"Except as provided in [49 CFR §171.12, which concerns import and export shipments], no person may transport a hazardous material in commerce within the United States unless that material is handled and transported in accordance with [federal regulations]" 49 CFR §171.2(b).

"No person may represent, mark, certify, or sell a packaging or container as meeting [federal requirements] . . . governing the use of that packaging or container in the transportation in commerce of a hazardous material unless the packaging or container is manufactured, fabricated, marked, maintained, reconditioned, or repaired, as the case may be, in accordance with [federal regulations]" 49 CFR §171.2(c).

Penalties, Civil Sanctions

(Va.) "The Commission may, by judgment entered after a hearing on notice duly served on the defendant not less than ten days before the date of the hearing, if it be proved that the defendant . . . has failed to comply with any lawful order, rule or regulation of the Commission, impose a penalty, not exceeding one thousand dollars" Va. Code §56-304.12.

(Fed.) "When the [Office of Hazardous Materials Operations (OHMO) of the Department of Transportation] has reason to believe that a person has knowingly committed an act which is a violation of any provision of [49 CFR §107 and 49 CFR §171 to §179, which contain federal procedures and regulations of HM, respectively,] . . . for which the OHMO exercises enforcement responsibility or of any exemption issued under [49 CFR §107.101-107.125, containing requirements for exemption from the regulations] . . . , it may conduct proceedings to assess and, if appropriate, compromise a civil penalty." 49 CFR §107.341.

"A person who knowingly violates a requirement of [the above mentioned regulations] . . . applicable to the transporting of hazardous materials or to the causing of them to be transported or shipped is liable for a civil penalty of not more than \$10,000 for each violation. When the violation is a continuing one, each day of the violation constitutes a separate offense." 49 CFR §107.343(a).

"A person who knowingly violates a requirement of [49 CFR §107, which contains the federal HM procedures,] applicable to the manufacture, fabrication, marking, maintenance, reconditioning, repair or testing of a package or container which is represented, marked, certified or sold by that person for use in the transportation of hazardous

materials in commerce is liable for a civil penalty of not more than \$10,000." 49 CFR §107.343(b).

Penalties, Criminal Sanctions

(Va.) "Any violation of any provision of [Va. Code § 18.2-274 to §18.2-278, which confer authority on the SCC to promulgate HM regulations having the full force of law] . . . , or the rules and regulations of the [State Corporation Commission promulgated pursuant thereto, shall constitute a Class 4 misdemeanor; and every subsequent offense shall constitute a Class 2 misdemeanor." Va. Code §18.2-275.

"The authorized punishments for conviction of a misdemeanor are: . . . For Class 4 misdemeanors, a fine of not more than one hundred dollars. . . . For Class 2 misdemeanors, confinement in jail for not more than six months and a fine of not more than five hundred dollars, either or both." Va. Code §18.2-11.

Authority for Enforcement and Inspection

Enforcement, Agencies Responsible

(Va.) "The enforcement of the provisions of [Va. Code §18.2-274 to §18.2-278, which confer authority to the SCC to promulgate HM regulations having the full force of law,] . . . shall be the duty of the State Corporation Commission and the Department of State Police, together with all law-enforcement and peace officers of this Commonwealth." Va. Code §18.2-276.

(Fed.) "A person is guilty of an offense if he wilfully violates a provision of [49 USC §1801 to §1812, the Hazardous Materials Transportation Act,] or a regulation issued under this [Act]. Upon conviction, such person shall be subject, for each offense, to a fine of not more than \$25,000, imprisonment for a term not to exceed 5 years, or both." 49 USC §1809(b).

(Fed.) "In accordance with delegations of authority from the Secretary of Transportation . . . , responsibility for enforcement of [49 CFR §107 and 49 CFR §171 to §179, which contain federal procedures and regulations of HM, respectively,] . . . is exercised by: . . . The Federal Highway Administration with respect to the transportation or shipment of hazardous materials by highway vehicles; [and] . . . The [Materials Transportation Bureau (MTB)] in all other respects. The MTB exercises this enforcement responsibility through the [Office of Hazardous Materials Operations]." 49 CFR §107.301 (c) and (e). These "other respects" include inspections of container manufacturers and intermodal shipments.

"Hazardous materials except such as may not be accepted and transported under [federal HM regulations] may be accepted and transported by private,

common and contract carriers by motor vehicle engaged in interstate or foreign commerce, provided they are in proper condition for transportation and are certified as being in compliance with [49 CFR §171 to §189, which contain federal HM regulations] . . . , and provided the method of manufacture, packaging, and storage, so far as they affect safety in transportation, are open to inspection by a duly authorized representative of the initial carrier or of the Bureau of Explosives." (Emphasis added.) 49 CFR §107.801.

In addition, the Federal Highway Administration conducts inspections and enforces regulations concerning manufacturers, carriers, and shippers of HM.

Cargo RegulationsProhibited Cargoes

Passenger Vehicles

(Va.) "Explosives must not be transported in or on any motor vehicle licensed as a passenger vehicle or a vehicle which is customarily and ordinarily used in the transportation of passengers except upon written permission of the State Police and under their direct supervision and only in the amount and between points authorized. If the movement is intracity, the permission of properly designated authority of said city must be secured. Dangerous articles, including small arms ammunition, but not including other types of explosives, may be transported in passenger type vehicles provided the maximum quantity transported does not exceed one hundred pounds in weight. Such transportation shall not be subject to these rules." (Emphasis added.) E&DA Rule 12(a).

Combinations of HM

(Va.) "A motor vehicle shall not have as its cargo more than one type of dangerous article at one time, one of which is set forth in [E&DA Rule 4(a), e.g., any quantity of explosives (other than small arms ammunition, small arms primers, and empty primer cartridge cases), any poisonous gas, or radioactive materials weighing more than 500 pounds including the container.]" E&DA Rule 6 (i).

(Fed.) "No hazardous materials except small-arms ammunition, emergency shipments of drugs, chemicals and hospital supplies, and the accompanying munitions of war of the Department of the Army, Navy, and Air Force of the United States Government, are authorized by [49 CFR §170 to §189, which contain the HM regulations] to be transported on motor vehicles carrying passengers for hire where other practicable means of transportation is available.

No explosive, except small-arms ammunition, may be carried in the passenger-carrying space of any motor vehicle transporting passengers for hire.

Where no other practicable means of transportation is available the following articles in the quantities as shown may be transported in motor vehicles carrying passengers for hire in a space other than that provided for passengers: Not to exceed 100 pounds gross weight of any or all of the kind of explosives permitted to be transported by rail express or rail baggage services, may be transported on a motor vehicle transporting passengers: Provided, however, That samples of explosives for laboratory examination, not exceeding a net weight of one-half pound each, and not exceeding 20 samples or not to exceed a total of 100 blast caps at one time in a single motor vehicle, may be transported in a motor vehicle transporting passengers." (Emphasis added.) 49 CFR §177.870(b).

No regulation requires notification of a government agency before transporting HM on passenger vehicles.

(Fed.) "In any single driven motor vehicle or in any single unit of a combination of motor vehicles, hazardous materials shall not be loaded together if prohibited by loading and storage chart [at 49 CFR § 177.848, which give all combinations of 22 categories of HM]. This section shall not be so construed as to forbid the carrying of materials essential to safe operation of motor vehicles. . . ." 49 CFR §177.834(j).

No prohibition against the poisonous gas - radioactive materials combination exists in the regulations.

"A motor vehicle shall not have as its cargo at the same time two types of explosives, one of which is blasting caps or initiating explosives." (Emphasis added.) E&DA Rule 6 (j).

"No blasting cap, regardless of type may be transported on the same motor vehicle with any Class A or Class B explosive unless -

. . . It is packed in a specification MC 201 [container, which is basically constructed of nonmetallic, non-sparking materials as described at 49 CFR §178.318], or

. . . It is packed and loaded in accordance with a method approved by the [DOT, an example of which is given at 49 CFR §177.835(g) (2)(i).]" 49 CFR §177.835(g). (Emphasis added.)

Blasting caps and initiating explosives are permitted to be transported in combination with some explosives, and prohibited with others, as indicated on the above mentioned chart at 49 CFR §177.848.

Explosives

"In no event shall the following explosives be transported within this State unless authorization is obtained in writing from the Commission:

(a) Explosive compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75 degrees C. (167 degrees F.)

(b) Explosives containing an ammonium salt and a chlorate.

(c) Liquid nitroglycerin, diethylene glycol dinitrate or other liquid explosives.

(d) Explosives condemned by the Bureau of Explosives.

(e) Leaking or damaged packages of explosives.

(f) Condemned or leaking dynamite that has been repacked.

(g) Firecrackers, flash crackers or salutes, the explosive content of which exceeds 12 grains each in weight, or pest control bombs, the explosive content of which exceeds 18 grains.

(h) Fireworks that combine an explosive and a detonator or blasting cap.

"Unless otherwise provided in [49 CFR §173.51, which contains regulations identical to those at left, except as noted below] the offering of the . . . explosives [listed at left] for transportation is forbidden." (Emphasis added.) 49 CFR §173.51(a).

No similar authorization from a governmental agency is required in the regulations.

Explosives forbidden by Virginia E&DA Rule 5 (a-q) are identical to those forbidden in 49 CFR §173.15(a) (1-17).

Regulations give at 49 CFR §173.53 definitions and specifications for explosives acceptable for transport, among which are authorized liquid explosives, listed as follows (49 CFR §173.51(a) (3)) :

". . . Desensitized liquid explosives are explosives which may be detonated separately or when absorbed in sterile absorbent cotton, by a No. 8 test blasting cap . . . ; but which cannot be exploded in the Bureau of Explosives' Impact Apparatus. . . by a drop of less than 10 inches. The desensitizer must not be significantly more volatile than nitroglycerine and the desensitized explosives must not freeze at temperatures above minus 10°F. Example: High explosives, desensitized nitroglycerine.

(i) Fireworks containing an ammonium salt and a chlorate.

(j) Fireworks containing yellow or white phosphorus.

(k) Fireworks or fireworks compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75 degrees C. (167 degrees F.)

(l) Fireworks properly condemned by the Bureau of Explosives.

(m) Toy torpedoes, the maximum outside dimension of which exceeds 7/8 inch, or toy torpedoes containing a mixture of potassium chlorate, black antimony and sulfur with an average weight of explosive composition in each torpedo exceeding four grains.

(n) Toy torpedoes containing a cap composed of a mixture of red phosphorus and potassium chlorate exceeding an average of one-half (0.5) grain per cap.

(o) Fireworks containing copper sulfate and a chlorate.

(p) New explosives.

(q) Loaded firearms." (Emphasis added.) E&DA Rule 5.

[Also authorized are] . . . liquid explosives that can be exploded in the Bureau of Explosives' Impact Apparatus. . . under a drop of less than 10 inches. Example: Nitroglycerin. . ." CFR §173.53(e) & (f).

In addition to those fireworks forbidden by E&DA Rule 5(g) at left, the regulations include" . . . any such devices, without respect to explosive content, which on functioning are liable to project or disperse metal, glass or brittle plastic fragments." 49 CFR §173.51(a), (7).

Further, "[c]ondemned or leaking dynamite must not be repacked and offered for shipment unless the repacking is done by a competent person in the presence of, or with the written consent of, an inspector, or with the written authority of the Chief inspector of the Bureau of Explosives. 49 CFR §173.51(a) (6).

Loading, Transport and Unloading

General Rules

(Va.) "Motor vehicles containing dangerous articles [and motor tank trucks transportating petroleum products] must not be loaded in excess of the existing weight laws of the Commonwealth of Virginia as applicable to the type of vehicle and route or routes travelled." E&DA Rule 11 (b); PTTC Rule 14 (a).

(Fed.) No similar general requirement exists; instead, the regulations defer to local laws: "Every motor vehicle must be operated in accordance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated. . . ." 49 CFR §392.2.

"Under no circumstances shall a tank motor vehicle be left unattended during the loading and unloading process. For the purpose of this part, the delivery hose, when attached to the motor vehicle, shall be deemed a part thereof.

"A cargo tank must be attended by a qualified person at all times when it is being loaded. The person who is responsible for loading the cargo tank is also responsible for ensuring that it is so attended.

. . . A motor carrier who transports hazardous materials by a cargo tank must ensure that the cargo tank is attended by a qualified person at all times during unloading. However, the carrier's obligation to ensure attendance during unloading ceases when -

. . . The carrier's obligation for transporting the materials is fulfilled

. . . The cargo tank has been placed upon the consignee's premises; and

. . . The motive power has been removed from the cargo tank and removed from the premises.

. . . A person "attends" the loading or unloading of a cargo tank if, throughout the process, he is awake, has an unobstructed view of the cargo tank, and is within 7.62 meters (25 feet) of the cargo tank.

. . . A person is "qualified" if he has been made aware of the nature of the hazardous material which is to be loaded or unloaded, he has been instructed on the procedures to be followed in emergencies, he is authorized to move the cargo tank, and he has the means to do so.

. . . A delivery hose, when attached to the cargo tank, is considered a part of the vehicle." 49 CFR §177.834(i).

Regulations are identical. 49 CFR §177.834(e).

"No dangerous article shall be loaded into or on, or unloaded from, any motor vehicle unless the hand brake be securely set and all other reasonable precautions be taken to prevent motion of the motor vehicle during such loading or unloading process." E&DA Rule 6 (d).

"No dangerous articles shall be loaded into or on or be unloaded from any motor vehicle with the engine running, unless an engine is necessary for loading or unloading." E&DA Rule 7(a).

"The engine of a motor tank truck must not be running at any time while being loaded or unloaded with petroleum products except when pumping equipment is used which requires the engine operation of the vehicle." (Emphasis added.) PTTC Rule 13.

"All of that portion of the lading of any motor vehicle which consists of dangerous articles shall be contained entirely within the body of the motor vehicle, and if such motor vehicle has a tailboard or tailgate, it shall be closed and secured in place during such transportation." E&DA Rule 7(f).

"No explosives shall be loaded into or on or be unloaded from any motor vehicle with the engine running." (Emphasis added.) 49 CFR §177.835(a).

"Unless the engine of the motor vehicle is to be used for the operation of a pump, no flammable liquid shall be loaded into, or on, or unloaded from any motor vehicle while the engine is running." (Emphasis added.) 49 CFR §177.37(a).

No flammable compressed gas shall be loaded into or on or unloaded from any tank motor vehicle with the engine running unless the engine is used for the operation of the transfer pump of the vehicle. Unless the delivery hose is equipped with a shut-off valve at discharge end, the engine of the motor vehicle shall be stopped at the finish of such loading or unloading operation while the filling or discharge connections are disconnected." (Emphasis added.) 49 CFR §177.840(d).

"Except as provided in [49 CFR §177.835(k), (g), and (m), which contain loading requirements, rules for transport with blasting caps, and rules for segregation from tools and blasting caps, pertaining to] . . . liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in [49 CFR §173.53(e), which gives the requirements for acceptable liquid explosives (see Cargo Regulations, Prohibited Cargoes, Explosives above)] all of that portion of the lading of any motor vehicle which consists of explosives shall be contained entirely within the body of the motor vehicle or within the horizontal outline thereof, without overhang or projection of any part of the load and if such motor vehicle has a tailboard or tailgate, it shall be closed and secured in place during such transportation. Every motor vehicle transporting explosives must either have a closed body or have the body thereof covered with a tarpaulin, and in either event care must be taken to protect the load from moisture and sparks, except that subject to other provisions of these regulations, explosives other than black powder may

be transported on flatbed vehicles if the explosive portion of the load on each vehicle is packed in fire and water resistant containers or covered with a fire and water resistant tarpaulin." (Emphasis added.) 49 CFR §177.835(h).

Regulations are identical. 49 CFR §177.834(h).

"Reasonable care should be taken to prevent undue rise in temperature of the containers and their contents during transit. There must be no tampering with such container or the contents thereof nor any discharge of the contents of any container between point of origin and point of billed destination. Discharge of contents of any container, other than a cargo tank, must not be made prior to removal from the motor vehicle. Nothing contained in this paragraph shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction or maintenance." E&DA Rule 6(g).

Regulations are identical. 49 CFR §177.835(i).

"No motor vehicle transporting any dangerous articles may transport as a part of its load any metal or other articles or materials likely to damage such dangerous articles or any package in which it is contained, unless the different parts of such load be so segregated or secured in place in or on the motor vehicle and separated by bulkheads or other suitable means as to prevent such damage." E&DA Rule 7(g).

"No cargo tank or compartment thereof used for the transportation of any flammable liquid shall be liquid full. The vacant space (outage) in a cargo tank or compartment thereof used in the transportation of flammable liquids shall be not less than 1 percent; sufficient space (outage) shall be left vacant in every case to prevent leakage from or distortion of such tank or compartment expansion of the contents due to rise in temperature in transit." (Emphasis added.) 49 CFR §173.116(h).

Outage requirements are further specified at 49 CFR §173.116(a)-(g).

"In no instance shall a tank [of a motor tank truck transporting petroleum products] be loaded to more than 99% percent of its shell capacity." PTTC Rule 14(b).

"Radio transmitting equipment must not be used on vehicles transporting detonators, blasting caps, or other explosives that can be set off by radio waves." (Emphasis added.) E&DA Rule 7(h).

No similar requirement exists in the regulations.

Cargo Handling

(Va.) "Containers of explosives, flammable liquids, flammable solids, oxidizing materials, corrosive liquids, acids, compressed gases, and poisonous liquids or gases, must be so braced as to prevent relative motion thereof while in transit. Containers having valves or other fittings must be so loaded that there will be the minimum likelihood of damage thereto during transportation." (Emphasis added.) E&DA Rule 6(f).

(Fed.) Regulations are identical. 49 CFR §177.834(g).

"No tools which are likely to damage the effectiveness of the closure of any package or other container, or likely adversely to affect such package or container, shall be used for the loading or unloading or any explosive or other dangerous article," E&DA Rule 6(e).

Regulations are identical. 49 CFR §177.834(f).

"No bale hooks or other metal tools shall be used for the loading, unloading, or other handling of explosives, nor shall any package or other container of explosives, except barrels or kegs, be rolled. No packages of explosives shall be thrown or dropped during process of loading or unloading or handling of explosives. Special care shall be exercised to the end that packages or other containers containing explosives shall not catch fire from sparks or hot gases from the exhaust tailpipe." (Emphasis added.) E&DA Rule 7(b).

Regulations are identical. 49 CFR §177.835(b).

Fire Hazards

(Va.) "Smoking on or about any motor vehicle while loading or unloading any explosive, flammable liquid, flammable solid oxidizing material, or flammable compressed gas is forbidden." (Emphasis added.) E&DA Rule (b).

(Fed.) Regulations are identical. 49 CFR §177.834(c).

"Extreme care shall be taken in the loading or unloading of any explosive, flammable liquid, flammable solid, oxidizing material, or flammable compressed gas into or from any motor vehicle to keep fire away and to prevent persons in the vicinity from smoking, lighting matches, or carrying any flame or lighted cigar, pipe or cigarette." (Emphasis added.) E&DA Rule 6(c).

"Except when actually contained in the bed or body of the truck or trailer, dangerous articles must not be placed within fifteen feet of the exhaust of the motor vehicle." E&DA Rule 11(c).

"Care must be taken to prevent the load [of dangerous articles] from moisture and sparks." E&DA Rule 7(f).

"Explosives must be loaded and transported in the body of the truck or in the semi-trailer. No explosives may at any time be transported in the cab of the truck or on a tractor." (Emphasis added.) E&DA Rule 11(a).

Cargo Information

Labelling

(Va.) "Dangerous articles must be packed or carried in containers sufficient in size, strength and composition for transportation of the commodity and each package or container must be marked to indicate its contents unless all

Regulations are identical. 49 CFR §177.834(d).

No similar requirement exists in the regulations.

"Special care shall be taken in the loading of any motor vehicle with flammable solids or oxidizing materials which are likely to become hazardous to transport when wet, to keep them from being wetted during the loading process and to keep them dry during transit. Special care shall also be taken in the loading of any motor vehicle with flammable solids or oxidizing materials, which are likely to become more hazardous to transport by wetting, to keep them from being wetted during the loading process and to keep them dry during transit. Examples of such dangerous materials are charcoal screenings, ground, crushed, or pulverized charcoal, and lump charcoal. (Emphasis added.) 49 CFR §177.838(b).

No similar requirements exist in the regulations.

(Fed.) "Except as otherwise provided in [49 CFR §171-§179, the HM regulations], each person who offers a package, overpack, or freight container containing a hazardous material for transportation shall label it, when required, with labels prescribed for the material as specified in [49 CFR §172.101, which gives an extensive

dangerous articles comprising the cargo of a single vehicle are of the same type and the vehicle is operated not for hire. In such event, the vehicle must be marked and placarded in accordance with [E&DA Rule 4(a) and 4(b), which give placarding requirements for any quantity of explosives (other than small arms ammunition, small arms primers and empty primer cartridge cases), and poisonous gas, radioactive material weighing more than 500 pounds including container, and shipments of 2,500 pounds gross weight or more of flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gas, or poison]." E&DA Rule 4(c).

list of HM and the corresponding labels] and in accordance with [49 CFR §172.400-§172.450, the HM labelling regulations].

. . . A label is not required on a -

. . . Package for which labelling is not required under the conditions set forth in this subchapter and in this section;

. . . Cylinder containing a compressed gas classed as flammable or nonflammable that is - (i) Carried by a private or contract motor carrier;

(ii) Not overpacked; and

(iii) Durably and legibly marked in accordance with CGA Pamphlet C-7, Appendix A.

. . . Military ammunition shipped by, for, or to the U. S. Department of Defense (DOD) when in carload or truckload shipments, if loaded and unloaded by the shipper, or DOD.

. . . Package containing a hazardous material other than ammunition that is - (i) Loaded and unloaded under the supervision of DOD personnel, and

(ii) Escorted by DOD personnel in a separate vehicle.

. . . Compressed gas cylinder permanently mounted in or on a transport vehicle;

. . . Portable tank which is placarded in accordance with [49 CFR §172.514, which gives placarding rules for such tanks];

. . . Freight container having a volume of 640 cubic feet or more which is subject to [49 CFR §172.512, which gives the placarding rules for such containers];

. . . Package containing a material classed as ORM-A, B, C, or D if that package does not contain any other material classed as a hazardous material that requires labeling.

. . . Package containing a combustible liquid; or

. . . Package of low specific activity radioactive material, when being transported in a transport vehicle assigned for the sole use of the consignor under [49 CFR §173.392(b) which exempts certain materials from specification packaging, marking, and labelling requirements];

. . . Cargo tank or tank car other than a multi-unit tank car tank." 49 CFR §172.400.

No regulation exempts cargoes comprised entirely of the same HM from labelling requirements.

Placarding

(Va.) Cargo identification is accomplished by marking according to E&DA Rule 4(b). See Cargo Regulations, Identification, Labelling above.

(Fed.) " . . . Each person who offers for transportation a hazardous material in a freight container having a capacity of 640 cubic feet or more shall affix to the freight container the placards specified for the material in accordance with [49 CFR §172.504, the general placarding requirements]. However,

(1) The placarding exception provided in [49 CFR §172.504(c) (1) applies, exempting from placarding requirements freight containers transported by highway and containing less than 1,000 pounds aggregate gross weight of HM] and,

(2) The placarding exception provided by [49 CFR §172.504, described directly above] applies to each freight container being transported for delivery to a consignee immediately following an air or water shipment.

When hazardous materials are offered for transportation, not involving air transportation, in a freight container having a capacity of less than 640 cubic feet, the freight container need not be placarded. However, it must be labeled in accordance with [49 CFR §172.400 to §172.450, the labelling requirements]" 49 CFR §172.512.

Vehicle RegulationsEquipment

General

(Va.) "Motor vehicles when used for transporting dangerous articles over the highways of this State must be strong enough to carry the load and in first-class condition . . ." E&DA Rule 6(a).

"Every motor tank truck shall be maintained in a safe operating condition at all times." PTTC Rule 18.

(Fed.) "No motor carrier shall permit or require a driver to drive any motor vehicle revealed by inspection or operation to be in such condition that its operation would be hazardous or likely to result in a breakdown of the vehicle nor shall any driver drive any motor vehicle which by reason of its mechanical condition is so imminently hazardous to operate as to be likely to cause an accident or a breakdown of the vehicle. If while a motor vehicle is being operated on a highway, it is discovered to be in such unsafe condition, it shall be continued in operation only to the nearest place where repairs can safely be effected, and even such operations shall be conducted only if it be less hazardous to the public than permitting the vehicle to remain on the highway." 49 CFR §396.4.

Installation and Operation Requirements

(Va.) "All electric wiring [on motor vehicles used for transporting dangerous articles over the highways of this State] must be completely protected and securely fastened to prevent short-circuiting, and any wire must be so located that it will not in any event come in contact with any package of explosives. Worn insulation must be repaired before any explosives are loaded on a motor vehicle." (Emphasis added.) E&DA Rule 6(a).

(Fed.) "Wiring shall, when possible, be grouped together and protected by nonmetallic tape, braid, or other covering capable of withstanding severe abrasion or shall be protected by being enclosed in a metallic sheath or tube. Wiring shall be properly supported. Wiring shall not be so located as to be likely to be charred, overheated, or enmeshed in moving parts. Insofar as is practicable, wiring shall not be adjacent to any part of the fuel system. The edges of all holes in metal through which the wiring passes, unless the wiring is metal-covered, shall be rolled or bushed with a grommet of rubber or other suitable material." 49 CFR §393.28.

"Electrical wiring shall be systematically arranged and installed in a workmanlike manner. All detachable wiring, except temporary wiring connections for driveaway-towaway operations, shall be attached to posts

it is a carbon dioxide extinguisher. If another approved type is used, the extinguisher must have a capacity equivalent to the minimum requirements set forth in the preceding sentence for carbon dioxide extinguishers." E&DA Rule 8.

"Each motor tank truck when used in the transportation of petroleum products must be equipped with not less than one fire extinguisher of a type approved by [Underwriters' Laboratories] for use on petroleum laden motor vehicles. Any such extinguisher must have a capacity of not less than five pounds each if it is a CO₂ extinguisher. If another approved type is used each extinguisher must have a capacity equivalent to at least five pounds CO₂. Extinguishers must be filled and ready for immediate use and placed at convenient points for such use." *PTTC Rule 8.*

Inspection Requirements

(Va.) "When a motor vehicle is to be used for transporting dangerous articles, it shall be the duty of the owner or the person acting for the owner and the lessee or the person acting for the lessee jointly and severally to see that the motor vehicle is inspected before each trip to determine that:

readily accessible for use. The fire extinguisher must be securely mounted on the vehicle. The fire extinguisher must be designed, constructed, and maintained to permit visual determination of whether it is fully charged. The fire extinguisher must have an extinguishing agent that does not need protection from freezing. The fire extinguisher must not use a vaporizing liquid that gives off vapors more toxic than those produced by the substances shown as having a toxicity rating of 5 or 6 in the Underwriters' Laboratories "Classification of Comparative Life Hazard of Gases and Vapors."

. . . On and after July 1, 1971, a power unit that is used to transport hazardous materials must be equipped with a fire extinguisher having an Underwriters' Laboratories rating of 10 B:C or more.

. . . Each fire extinguisher required above must be labeled or marked with its Underwriters' Laboratories rating and must meet the requirements [listed above].

For purposes of this paragraph, a power unit is used to transport hazardous materials only if the power unit or a motor vehicle towed by the power unit must be marked or placarded in accordance with [49 CFR §177.823, which requires generally that a vehicle transporting HM must not be moved unless placarded in conformance with 49 CFR §172, the detailed specifications for placarding.] 49 CFR §393.95(a).

(Fed.) "Every motor carrier shall systematically inspect and maintain, or cause to be systematically maintained, all motor vehicles subject to its control, and the accessories required by [49 CFR §393, which prescribes the parts and accessories necessary for safe operation], to be mounted thereon, to insure that such

. . . Fire extinguishers are filled and in working order.

. . . Electric wiring is completely insulated and firmly secured.

. . . Chassis, engine, pan and bottom of body are clean and free from surplus oil and grease.

. . . Fuel tank and feed line have no leaks.

. . . Brakes and steering apparatus are in good condition.

. . . The motor vehicle is in proper condition for handling dangerous articles." E&DA Rule 9.

motor vehicles are in safe and proper operating condition." 49 CFR §396.20

Drivers and vehicles wholly engaged in intracity operations, and motor carriers and drivers of lightweight mail trucks are exempt from these requirements. 49 CFR §396.1(b) and

" [Except as exempted above], every motor carrier, its officers, drivers, agents, representatives, and employees directly concerned with the inspection or maintenance of motor vehicles shall comply and be conversant with [the rules governing inspection & maintenance]." 49 CFR §396.1(a).

Items listed at left which are all required parts and accessories under 49 CFR §393 are:

Fire extinguisher. 49 CFR §393.95 (a). (See also Vehicle Regulations, Equipment, Fire Extinguishers above.)

Electric wiring. 49 CFR §393.28 and §393.33. (See also Vehicle Regulations, Equipment, Installation and Operation Requirements above.)

Fuel tank and feed lines. 49 CFR §393.65.

Brakes. 49 CFR §393.40.

In addition:

"No motor vehicle shall be driven unless the driver thereof shall have satisfied himself that the following parts and accessories are in good working order, nor shall any driver fail to use or make use of such parts and accessories when and as needed:

Service brakes, including trailer brake connections.

Parking (hand) brake.

Steering mechanism. . . ." 49 CFR §392.7.

Pertaining to fire extinguishers: "No motor vehicle shall be driven unless the driver thereof shall have satisfied himself that the emergency equipment required by [49 CFR §393.95 and §393.96, which give detailed emergency equipment requirements] is in place and ready for use; nor shall any driver fail to use or make use of such equipment when and as needed." 49 CFR §392.8.

or terminals by means of suitable cable terminals which conform to the SAE Standard for "Cable Terminals" [cited at 49 CFR §393.24(c) fn. 1] or by cable terminals which are mechanically and electrically at least equal to such terminals. The number of wires attached to any post shall be limited to the number which the post was designed to accommodate. The presence of bare, loose, dangling, chafing, or poorly connected wire is prohibited." 49CFR §393.33.

"No motor tank truck [transporting petroleum products] shall leave the terminus on any trip requiring travel after sunset, or before one-half hour before sunrise, unless its lighting system is in proper condition." PTTC Rule 15(d).

"If lights other than the lights of the motor vehicle [transporting dangerous articles] are necessary, only an electric flashlight or an electric lantern may be used." E&DA Rule 12(k).

"No motor vehicle shall be driven upon the highway unless the lamps required by [49 CFR §393.11 to §393.33, giving detailed requirements for type, placement, and installation of lighting devices, reflectors, and electrical equipment,] are lighted:

. . . During the period of one-half hour before sunset to one-half hour before sunrise;

. . . During any other time when there is not sufficient light to render clearly discernable persons and vehicles on the highway at a distance of 500 feet." 49 CFR §342.30.

Flame-producing emergency signals are prohibited for protecting cargo tank motor vehicles transporting flammable liquids or flammable compressed gasses, motor vehicles transporting Class A or Class B explosives, motor vehicles using compressed gas as a motor fuel, and motor vehicles leaking gasoline or any other flammable liquid, combustible liquid or gas. 49 CFR §172.854 (F) (2), §392.25, §392.95, §392.22 (b) (2) (vi). See also Driving Regulations, Rules of the Road, Emergency Stopping and Signaling below.

Otherwise, the regulations state: "Nothing contained in [49 CFR §390 to §397, giving federal motor carrier safety regulations, qualifications of drivers, driving rules, parts and accessories necessary for safe operation, notification, reporting and recording of accidents rules, hours

of service of drivers rules, inspection and maintenance rules, and driving and parking rules for the transportation of HM,] shall be construed to prohibit the use of additional equipment and accessories, not inconsistent with or prohibited by [the rules listed directly above], provided such equipment and accessories do not decrease the safety of operation of the motor vehicles on which they are used." 49 CFR §393.2.

Cargo Area

(Va.) "No motor vehicle transporting any kind of dangerous articles shall have on the interior of the body in which the dangerous articles are contained, any inwardly projecting bolts, screws, nails, or other inwardly projecting parts likely to produce damage to any package or container of dangerous articles during the loading or unloading process or in transit." E&DA Rule 7(d).

"Motor vehicles transporting explosives shall have tight floors, shall have that portion of the interior in contact with the load lined with either nonmetallic material or nonferrous metals; and shall have the interior of the cargo space in good condition so that there will not be any likelihood of containers being damaged by the exposed bolts, nuts, broken side panels or floor boards, or any similar projections." (Emphasis added.) E&DA Rule 7(f).

Fire Extinguishers

(Va.) "Each tractor or truck when used in the transportation of dangerous articles must be equipped with not less than one fire extinguisher of a type approved by the Underwriters Laboratories for use on motor vehicles laden with dangerous articles. The extinguisher must have a capacity of at least ten pounds if used on a tractor and four pounds if used on a truck if

(Fed.) "No motor vehicle transporting any kind of explosive shall have on the interior of the body in which the explosives are contained, any inwardly projecting bolts, screws, nails, or other inwardly projecting parts likely to produce damage to any package or container of explosives during the loading or unloading process or in transit." (Emphasis added.) 49 CFR §177.835(e).

"Motor vehicles transporting Class A or Class B explosives shall have tight floors: shall have that portion of the interior in contact with the load lined with either nonmetallic material or nonferrous metals, except that the lining is not required for truck load shipments loaded by the Departments of the Army, Navy, or Air Force of the United States Government provided the explosives are of such nature that they are not liable to leakage of dust, powder, or vapor which might become the cause of an explosion. The interior of the cargo space must be in good condition so that there will not be any likelihood of containers being damaged by exposed bolts, nuts, broken side panels or floor boards, or any similar projections." (Emphasis added.) 49 CFR §177.835(f).

(Fed.) "Except for a lightweight vehicle, every bus, truck, truck-tractor, and every driven vehicle in a driveaway-towaway operation must be equipped as follows:
 . . . Except as provided in [49 CFR §393.95(a) (4)], which exempts the driver unit in a driveaway-towaway operation, every power unit must be equipped with a fire extinguisher that is properly filled and located so that it is

Concerning the remaining items listed at left:

"Every motor carrier shall institute such procedures as may be necessary to insure that motor vehicles are properly lubricated; that proper action is taken to correct oil and grease leaks that undue accumulations of grease and oil are investigated, removed, and the cause thereof corrected." 49 CFR §396.3.

"When a motor tank truck is to be used for transporting petroleum products, it shall be the duty of the operator to see that the motor tank truck is inspected daily to determine that:

. . . Fire extinguisher is filled and ready for use.

. . . Electric wiring is completely insulated and firmly secured.

. . . Chassis, engine, pan, body, and tank are clean and free from surplus oil and grease.

. . . Fuel tank and feed line have no leaks.

. . . Brakes and steering apparatus are in good condition.

. . . The tank, discharge and safety valves have no leaks.

. . . The motor tank truck is adequately grounded to eliminate static electricity.

. . . The motor tank truck is in proper condition for handling petroleum." PTTC Rule 9.

". . . It is the duty of each [private, common, or contract carrier transporting HM by motor vehicle engaged in interstate or foreign commerce] to make the prescribed regulations [below] effective and to thoroughly instruct employees in relation thereto." 49 CFR §177.800.

"A person shall not drive a tank motor vehicle and a motor carrier shall not require or permit a person to drive a tank motor vehicle containing a flammable liquid (regardless of quantity) unless - . . . All manhole closures on the cargo tank are closed and secured; and . . . All valves and other closures in liquid discharge systems are closed and free of leaks." (Emphasis added.) 49 CFR §177.837(e).

"When a cargo tank is loaded through an open filling hole, one end of a bond wire shall be connected to the stationary system piping or integrally connected steel framing, and the other end to the shell of the cargo tank to provide a continuous electrical connection. (If bonding is to the framing, it is essential that piping and framing be electrically interconnected.) This connection must be made before any filling hole is opened, and must remain in place until after the last filling hole has been closed. Additional bond wires are not needed around All-Metal flexible or swivel joints, but are required for nonmetallic flexible connections in the stationary system piping. When a cargo tank is unloaded by a suction-piping system through an open filling hole of the cargo tank, electrical continuity shall be maintained from cargo tank to receiving tank.

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When a cargo tank is loaded or unloaded through a vapor-tight (not open hole) top or bottom connection, so that there is no release of vapor at a point where a spark could occur bonding or grounding is not required. Contact of the closed connection must be made before flow starts and must not be broken until after the flow is completed.

Bonding or grounding is not required when a cargo tank is unloaded through a nonvapor-tight connection into a stationary tank provided the metallic filling connection is maintained in contact with the filling hole." 49 CFR §177.837(c).

Further, carriers cannot allow a vehicle to be operated in a condition that would be hazardous or likely to produce a breakdown. 49 CFR §396.4 (See also Vehicle Regulations, Equipment, General above.) Carriers are required to keep systematic inspection and maintenance records covering, in addition to many others, those items listed at left. 49 CFR §396.2(b). Carriers must also require drivers to submit at the end of the workday a report detailing unsafe vehicle defects or deficiencies 49 CFR §396.7.

Identification

Placarding

(Va.) "Every motor vehicle while transporting any quantity of explosives other than small arms ammunition, small arms primers and empty primer cartridge cases, or any poisonous gas, or transporting radioactive material weighing more than five hundred pounds, including the container, shall be marked or placarded on the front, rear and each side with a placard or lettering in letters not less than three inches high on a contrasting background as follows:

- Explosives..... EXPLOSIVES
- Poisonous Gas.....POISONOUS GAS
- Radioactive material.....
- DANGEROUS — RADIOACTIVE MATERIAL

(Fed.) "Except as otherwise provided in [49 CFR §171 to §179, the HM regulations,] each motor vehicle, rail car, and freight container containing any quantity of a hazardous material must be placarded on each end and each side with the type of placards specified in the following tables and other placarding requirements of this subpart, including the specifications for the placards named in the tables [below] and described in detail in [49 CFR §172.519 to §172.558, giving specifications and illustrations for placards].

Every motor vehicle transporting 2500 pounds gross weight or more of Flammable liquids, flammable solids or oxidizing materials, corrosive liquids, compressed gas or poison shall be marked or placarded on each side and the rear with a placard or lettering in letters not less than three inches high on a contrasting background as follows:

- Flammable liquids FLAMMABLE
 - Flammable solids DANGEROUS
 - Oxidizing Materials DANGEROUS
 - Corrosive Liquids DANGEROUS
 - Compressed Gas COMPRESSED GAS
 - Poison.....DANGEROUS-POISON."
- (Emphasis added.) E&DA Rule 4(a) and (b).

. . . A freight container, motor vehicle, or rail car containing two or more classes of materials requiring different placards specified in Table 2 may be placarded DANGEROUS in place of the separate placarding specified for each of those classes of material specified in Table 2. However, when 5,000 pounds or more of one class of material is loaded therein at one loading facility, the placard specified for that class in Table 2 must be applied. This paragraph does not apply to a portable tank, cargo tank, or tank car.

. . . No placard is required on a -
 . . . Motor vehicle, or a freight container if transported by highway only, containing less than 1,000 pounds (aggregate gross weight) of one of more materials covered in Table 2, or

. . . Rail car loaded with freight containers or motor vehicles when each freight container or motor vehicle contains less than 1,000 pounds (aggregate gross weight) of one of more materials, covered by Table (2).

This paragraph does not apply to portable tanks . . . [or] cargo tanks, [the regulations for which appear below] . . .

TABLE 1

Class A explosives...	EXPLOSIVES A.
Class B Explosives...	EXPLOSIVES B.
Poison A	POISON GAS.
Flammable solids (DANGEROUS WHEN WET label only).....	FLAMMABLE SOLID W.
Radioactive material...	RADIOACTIVE
Radioactive material:	
Uranium hexafluoride, fissile (containing more than 0.7 pct U ²³⁵ ...	RADIOACTIVE AND CORROSIVE.
Uranium hexafluoride, low specific activity (containing 0.7 pct or less U ²³⁵).....	RADIOACTIVE AND CORROSIVE.

TABLE 2

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Class C explosives.....	FLAMMABLE
Nonflammable gas.....	NONFLAMMABLE GAS
Nonflammable gas (chlorine).....	CHLORINE
Nonflammable gas (fluorine).....	POISON
Nonflammable gas (oxygen, pressurized liquid).....	OXYGEN
Flammable gas.....	FLAMMABLE GAS
Combustible liquid....	COMBUSTIBLE
Flammable liquid.....	FLAMMABLE
Flammable solid...FLAMMABLE	SOLID
Oxidizer.....	OXIDIZER
Organic peroxide.....	ORGANIC FEROXIDE
Poison B.....	POISON
Corrosive material.....	CORROSIVE
Irritating material.....	DANGEROUS

49 CFR § 172.504.

"Each person who offers for transportation a cargo tank or a portable tank containing a hazardous material shall affix the placards specified for the material in accordance with [the regulations in the first paragraph above].

However, if placarded instead of labeled as provided in [49 CFR §172-406(e) (4), requiring labels to be displayed on at least two sides or two ends], a portable tank having a rated capacity of less than 1,000 gallons need be placarded on only two opposite sides.

. . . Each cargo tank and portable tank that is required to be placarded when it contains a hazardous material must remain placarded when it is emptied unless it is -

. . . Reloaded with a material not subject to 49 CFR §171 to §179, the HM regulations]; or

. . . Sufficiently cleaned and purged of vapors to remove any potential hazard." 49 CFR §172.514.

Limited quantities of radioactive materials [defined at 49 CFR §173.391(a)], which are measured by radioactivity instead of weight, are exempt from placarding requirements. 49 CFR §172.500(b) (3).

Vehicle Markings

(Va.) "The name and address of the petroleum tank truck carrier shall be painted in contrasting colors or both sides of every tractor owned by such carrier in letters at least three inches high and on the rear of every tank owned by such carrier in letters at least four inches high, and the word "GAS-OILINE", "FLAMMABLE" or "INFLAMMABLE" must be painted in contrasting colors on both sides and the rear of each tank in letters not less than four inches high." (Emphasis added.) PTTC Rule 6.

(Fed.) " (a). . . A motor vehicle being operated by a private carrier of property must be marked as specified in paragraphs (b) and (c) of this section if that vehicle -

(1) Is transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in accordance with [49 CFR §177.823, which requires that a carrier may not move a transport vehicle containing HM unless marked and placarded in accordance with 49 CFR §172, the HM rules concerning shipping papers, marking, labelling, and placarding]; and

(2) Is operating under its own power, either alone or in combination.

(b)... The marking must display the following information:

(1) The name or trade name of the private carrier operating the vehicle.

(2) The city or community in which the carrier maintains its principal office or in which the vehicle is customarily based.

(3) If the name of a person other than the operating carrier appears on the vehicle, the words "operated by" immediately preceding the information required by paragraphs (b) (1) and (2) of this section.

Other identifying information may be displayed on the vehicle if it is not inconsistent with the information required by this paragraph.

(c) . . . The marking must -

(1) Appear on both sides of the vehicle;

(2) Be in letters that contrast sharply in color with the background;

(3) Be readily legible during daylight hours from a distance of 50 feet while the vehicle is stationary; and

(4) Be kept and maintained in a manner that retains the legibility required by paragraph (c)(3) of this section.

The marking may consist of a removable device if that device meets the identification and legibility requirements of this section." 49 CFR §397.21.

Driving Regulations

Rules of the Road

Driving Restrictions

(Va.) "No unauthorized persons are permitted to ride on vehicles at any time while transporting dangerous articles." E&DA Rule 12(g).

"No passengers or unauthorized persons are permitted to ride on vehicles at any time while transporting petroleum products." (Emphasis added.) PTTC Rule 15(a).

". . . Stops for meals by drivers of explosive laden vehicles shall only [be] made at a wayside restaurant." (Emphasis added.) E&DA Rule 12(i).

"Dangerous articles set forth in [E&DA] Rule 4(a) (1) & (2) [namely, explosives and poisonous gas,] should, when possible, be transported during daylight." E&DA Rule 12(k).

"Motor vehicles while transporting dangerous articles must not coast at any time." E&DA Rule 12(d).

"Motor vehicles transporting dangerous articles on the highways shall not be driven at a speed in excess of the speed limit applicable to the type of vehicle." E&DA Rule 12(f).

"No motor vehicle required to be placarded as transporting dangerous articles may ordinarily operate within three hundred feet of another vehicle traveling in the same direction on the highways." E&DA Rule 12(è).

(Fed.) "Unless specifically authorized in writing to do so by the motor carrier under whose authority the motor vehicle is being operated, no driver shall transport any person or permit any person to be transported on any motor vehicle other than a bus. . . . No written authorization however, shall be necessary for the transportation of:

. . . Employees or other persons assigned to a vehicle by a motor carrier;

. . . Any person transported when aid is being rendered in case of an accident or other emergency. . . ." 49 CFR §392.60.

"Unless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near heavily populated areas, [or] places where crowds are assembled. . . ." 49 CFR §397.9.

No similar requirement exists in the regulations.

"No motor vehicle shall be driven with the source of motive power disengaged from the driving wheels except when such disengagement is necessary to stop or to shift gears." 49 CFR §392.68.

Regulations defer to local laws: "Every motor vehicle must be operated in accordance with the laws, ordinances and regulations of the jurisdiction in which it is being operated. . . ." 49 CFR §392.2.

No similar requirement exists in the regulations.

"No motor tank truck transporting gasoline or moving empty after transporting gasoline shall be driven through any tunnel." (Emphasis added.) PTTC Rule 17.

Regulations defer in part to local laws: "Nothing contained in [49 CFR §171 to §189, which contain federal HM regulations,] . . . shall be so construed as to nullify or supersede regulations established and published under authority of State statute or municipal ordinance regarding the kind, character, or quantity of any hazardous material permitted by such regulations to be transported through any urban vehicular tunnel used for mass transportation." 49 CFR §177.810. Further, the general requirement exist that " [u]nless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near. . . tunnels, narrow streets, or alleys. . . ." (Emphasis added.) 49 CFR §397.9.

"The driver of a motor vehicle while transporting explosives and flammable liquids must cause his vehicle to come to a full stop before crossing any railroad track not controlled by a police officer or a traffic control signal and must not cross it until it is known that the way is clear and safe." E&DA Rule 12(b).

"The driver of a motor tank truck while transporting petroleum products must cause his vehicle to slow to five miles per hour before crossing any railroad track and must not cross it until it is known that the way is clear and safe." (Emphasis added.) PTTC Rule 11(b).

"Except [in those cases noted in 49 CFR §392.10(b); in short, streetcar crossings, industrial tracks used exclusively for switching, grade crossings directed by a police officer or railroad flagman, grade crossings controlled by a highway signal transmitting a green indication, abandoned crossings that have been so marked by a sign, and industrial or spur lines marked 'Exempt Crossing' by State or local authorities,]. . . the driver of a motor vehicle specified [below] . . . shall not cross a railroad track or tracks at grade unless he first: Stops the vehicle within 50 feet of, and not closer than 15 feet to, the tracks; thereafter listens and looks in each direction along the tracks for an approaching train; and ascertains that no train is approaching. When it is safe to do so, the driver may drive the vehicle across the tracks in a gear that permits the vehicle to complete the crossing without a change of gears. The driver must not shift gears while crossing the tracks.

[This applies to drivers of:]

. . . Every motor vehicle transporting any quantity of chlorine,

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. . . Every motor vehicle which, in accordance with the regulations of the Department of Transportation, is required to be marked or placarded with one of the following markings:

. . . Explosives A
. . . Explosives B
. . . Poison
. . . Flammable
. . . Oxidizers
. . . Compressed Gas
. . . Corrosives
. . . Flammable Gas
. . . Radioactive
. . . Dangerous
. . . Combustible (cargo tanks on
. . . Every cargo tank motor vehicle, whether loaded or empty, used for the transportation of any hazardous material as defined in the Hazardous Materials Regulations [49 CFR §171 to §189]

. . . Every cargo tank motor vehicle transporting a commodity which at the time of loading has a temperature above its flash point as determined by [49 CFR §173.115, which specifies the testing procedure for measuring the flash point]." (Emphasis added.) 49 CFR §392.10(a).

"The driver of a motor vehicle while transporting dangerous articles when entering a highway, which is improved and hard surfaced and is a part of the State Highway System from the side thereof, shall, immediately before entering such a highway, stop, unless a 'Yield Right of Way' sign is posted; where any such sign is posted, the driver of a vehicle entering such highway shall yield the right of way to the driver of a vehicle approaching on such highway from either direction." E&DA Rule 12(c).

"The driver of a motor tank truck while transporting petroleum products must cause his vehicle to come to a full stop before entering any main highway and then may proceed only when the way is clear and safe." (Emphasis added.) PTTC Rule 11(c).

No similar requirements exist in the regulations.

Stopping and Parking

(Va.) " . . . All unnecessary stops shall ["must" in the PTTC rule] be avoided." E&DA Rule 12(i), PTTC Rule 15(b).

(Fed.) "All shipments of hazardous materials shall be transported without unnecessary delay, from and including the time of commencement of the loading of the cargo until its final discharge at destination." 49 CFR §177.853(a).

"Motor vehicles required to be placarded as containing dangerous articles shall not be left unattended until the motor is stopped and the brakes securely set" E&DA Rule 12(i).

"No motor vehicle shall be left unattended until the parking brake has been securely set and all reasonable precautions have been taken to prevent the movement of such vehicle." 49 CFR §392.20.

"Motor tank trucks containing petroleum products must never be left until the motor is stopped and the brakes securely set. . . ." (Emphasis added.) PTTC Rule 15(b).

"No motor vehicle shall be stopped, parked, or left standing, whether attended or unattended, on the traveled portion of any highway outside of a business or residential district, when it is practicable to stop, park, or leave such vehicle off the traveled portion of the highway. In the event that conditions make it impracticable to move such motor vehicle from the traveled portion of the highway, the driver shall make every effort to leave all possible width of the highway opposite the standing vehicle for the free passage of other vehicles and he shall take care to provide a clear view of the standing vehicle as far as possible to the front and rear." 49 CFR §392.21.

". . . In the event that a stop is necessary, [a motor tank truck containing petroleum products] shall be left well away from traffic, fire risk, and parked vehicles." PTTC Rule 15(b).

"A motor vehicle which contains hazardous materials other than Class A or Class B explosives must not be parked on or within five feet of the traveled portion of public street or highway except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park the vehicle in any other place." (Emphasis added.) 49 CFR §397.7(b).

"A motor vehicle which contains Class A or Class B explosives must not be parked -

. . . On or within 5 feet of the traveled portion of a public street or highway;

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. . . On private property (including premises of a fueling or eating facility) without the knowledge and consent of the person who is in charge of the property and who is aware of the nature of the hazardous materials the vehicle contains; or

. . . Within 300 feet of a bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble, except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park the vehicle in any other place. . . ." (Emphasis added.) 49 CFR §397.7(a).

Emergency Stopping and Signaling

(Va.) "In the event of a breakdown of a [motor vehicle containing dangerous articles or a motor tank truck carrying petroleum products] on the highway, the vehicle shall be parked as far to the right of the highway as possible and the following emergency signals shall be immediately displayed: At night - red electric lanterns or red reflectors. During daylight hours - red flags, red reflectors or red electric lanterns. Three emergency signals shall be used. One to be placed not less than forty paces nor more than one hundred and twenty paces from the rear of the vehicle, one less than forty paces nor more than one hundred and twenty paces from the front, and one within ten feet of the vehicle on the traffic side. In no event shall flame-producing signals be used." E&DA Rule 12(1), PTTC Rule 15(c).

(Fed.) Regulations require vehicles to stop, when practicable, off the traveled portion of the highway - see Stopping and Parking above.

"Whenever any motor vehicle transporting flammable liquids, flammable solids, oxidizing materials, corrosive materials, compressed gasses, or poisons is stopped for any cause other than necessary traffic stops upon the traveled portion of any highway, or shoulder next thereto, the following requirements shall be complied with during the period of such stop:

. . . For motor vehicles other than cargo tank vehicles used for the transportation of flammable liquids or flammable compressed gasses and not transporting explosive Class A, or Class B, warning devices, must be set out in the [following] manner: . . ." (Emphasis added.) 49 CFR §177.854(f)(1).

". . . [T]he driver of the stopped vehicle shall immediately flash the two front and two rear turn signals simultaneously as a vehicular traffic hazard warning and continue the flashing until he places the warning devices required [below] . . . in use on the highways. The flashing signals shall be used during the time the warning devices are picked up for storage before movement of the vehicle. The flashing lights may be used at other times while a vehicle is stopped in addition to, but not in lieu of, the warning devices required [below]"

. . . [T] he driver shall as soon as possible; but in any event within 10 minutes, place the warning devices with which his vehicle is equipped in conformity with [the specifications for warning devices found at 49 CFR § 393.95] . . . , either three emergency reflective triangles, three electric emergency lanterns, three liquid-burning emergency flares, or three red emergency reflectors in the following manner:

. . . One at the traffic side of the stopped vehicle, within 10 feet of the front or the rear of the vehicle;

. . . One at a distance of approximately 100 feet from the stopped vehicle in the center of the traffic lane or shoulder occupied by the vehicle and in the direction in which the traffic in that lane is moving. . . ." 49 CFR §392.22.

The regulations further specify placement criteria for fuses, during daylight hours (red flags may be used; electric lanterns are not required), in business or residential districts, on hills, curves, or near obstructions, and on divided or one-way roads. 49 CFR §392.22(b) (2) (i-v).

" . . . For cargo tank motor vehicles used for the transportation of flammable liquids or flammable compressed gasses, whether loaded or empty, and vehicles transporting explosives Class A or Class B, warning devices must be set out [as specified below:] . . ." (Emphasis added.) 49 CFR §172.854(f) (2).

" . . . No driver shall use or permit the use of any flame-producing emergency signal for protecting any motor vehicle transporting [any HM listed directly above] . . . ; or any motor vehicle using compressed gas as a motor fuel. In lieu thereof, emergency reflective triangles, red electric lanterns, or red emergency reflectors shall be used, the placement of which shall be in the same manner as prescribed [above] ." 49 CFR §392.25 (Identical requirements at 49 CFR §392.95.)

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"If gasoline or any other flammable liquid, or combustible liquid or gas seeps or leaks from a fuel container on a motor vehicle stopped upon a highway, no emergency warning signal producing a flame shall be lighted or placed except at such a distance from any such liquid or gas as will assure the prevention of a fire or explosion." (Emphasis added.)
49 CFR §392.22(b) (2) (vi).

"Should the lighting system [of a motor tank truck containing petroleum products] become defective or out of order, as promptly as practicable after the discovery of such condition by the driver, the vehicle shall be stopped on the right side of the highway and as far to the right as conditions may permit, and shall not proceed until the defect is remedied. The emergency signals described [above] for use at night shall be immediately displayed in the manner set forth." (Emphasis added.) PTTC Rule 15(d).

"Motor vehicles containing dangerous articles must never be taken into a garage or repair shop for repairs or storage, unless in an emergency and only after the garage is notified as to the lading of the vehicle." E&DA Rule 12(j).

"Whenever it is necessary to detain a motor vehicle transporting dangerous articles required to be placarded under these rules or under the rules and regulations of the [DOT], because of violation of any statute, or for violation of any rule or regulation of the [DOT] properly applicable, the vehicle shall be parked at a place well away from any residence or building where persons may live

No similar specific requirement exists in the regulations.

"No repairs shall be made on any motor vehicle containing explosives or other dangerous articles except in case such repairs may be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage." 49 CFR §177.854(h)

In addition, ". . . [a] motor vehicle which contains Class A or Class B explosives must not be parked. . . [o]n private property . . . without the knowledge and consent of the person who is in charge of the property and who is aware of the nature of the hazardous material the vehicle contains. . . ." (Emphasis added.) 49 CFR §397.7(a) (2).

No similar specific requirement exists in the regulations.

or work and as far off of any main or secondary highway as possible, at the expense of the owner or lessee of such vehicle and a guard may be employed for the time of such detention which expense shall be paid by the owner or lessee." E&DA Rule 13.

Fueling

(Va.) "The fuel tank of a motor vehicle transporting dangerous articles shall be filled only when the engine of the motor vehicle is stopped." E&DA Rule 12(h).

(Fed.) "When a motor vehicle which contains hazardous materials is being fueled -

. . . Its engine must not be operating; and

. . . A person must be in control of the fueling process at the point where the fuel tank is filled." 49 CFR §397.15.

Required Documents

(Va.) "The driver of every motor vehicle being used to transport dangerous articles for hire shall have in his possession at all times the vehicle is so laden, a manifest, memorandum receipt, bill of lading, shipping order, shipping paper or other memorandum setting forth the exact description of the dangerous article contained in his vehicle. Such description should include the common or generic name of the dangerous article, the total quantity by weight, volume or otherwise, as appropriate for each kind of explosive, or dangerous article, and the type of dangerous article as defined in [E&DA Rule 1, which provides definitions for the different classes of dangerous articles]. . . . This rule is also applicable to vehicles operated not for hire, unless the vehicle is so marked as to adequately describe its contents to the public." E&DA Rule 14(a).

"With every motor vehicle transporting petroleum products there shall be carried with such property on the same vehicle a full and complete manifest, waybill, bill of lading or receipt of all such property, which shall indicate the consignor, consignee, origin, destination, gallonage and nature of

(Fed.) "A driver of a motor vehicle containing hazardous material, and each carrier using such a vehicle, shall ensure that the shipping paper required [before a carrier may transport HM (49 CFR §177.817(a))]. . . is readily available to, and recognizable by, authorities in the event of accident or inspection. Specifically, the driver and the carrier shall -

. . . . Clearly distinguish the shipping paper, if it is carried with other shipping papers or other papers of any kind, by either distinctly tabbing it, or by having it appear first; and

. . . Store the shipping paper as follows:

. . . When the driver is at the vehicle's controls, the shipping paper shall be . . . [w]ithin his immediate reach while he is restrained by the lap belt; and either readily visible to a person entering the driver's compartment or in a holder which is mounted to the inside of the door on the driver's side of the vehicle.

. . . When the driver is not at the vehicle's controls, the shipping paper shall be . . . [i]n a holder which is mounted to the inside of the door on the driver's side of the vehicle; or on the driver's seat inside the vehicle." 49 CFR §177.817(e).

commodity of each shipment on the motor vehicle. The original, or a copy of the manifest, waybill, bill of lading or receipt shall be preserved by such carrier in its principal office in this State for a period of at least three years." (Emphasis added.) PTTC Rule 26.

Regulations at 49 CFR §172.200 and §172.201 detail the manner in which entries must be made on a shipping paper. The rules further provide:

"Each description of a hazardous material on a shipping paper must include -

. . . The proper shipping name prescribed for the material as required by [49 CFR §172.101, which is a table naming some 1,200 substances, their hazard classes, labelling and packaging requirements, and maximum quantities per package].

. . . The class prescribed for the material as required by [the table mentioned above]. When the words of the proper shipping name are identical . . . with the words of the class, the inclusion of the class is not required.

. . . Except for empty packaging, the total quantity (by weight, volume or as otherwise appropriate) of the hazardous material covered by the description." 49 CFR §172.202(a).

No similar specific rule requiring the carrier to preserve the original or a copy of the manifest, waybill, bill of lading, or receipt exists in the regulations.

"It shall be the duty of the shipper to furnish to the carrier a complete description of the dangerous article to be transported. Such description shall conform with the requirements set forth in [E&DA Rule 14(a) above]. E&DA Rule 14(b).

"Except as otherwise provided in [49 CFR §172.200 to §172.204, the shipping papers regulations], each person who offers a hazardous material for transportation shall describe the hazardous material on the shipping paper in the manner required [by the shipping papers regulations]." 49 CFR §172.200(a).

Driver Requirements

General

(Va.) "The driver of a motor vehicle containing dangerous articles operating through or within a city or town shall comply with these rules and also all ordinances of the city or town pertaining to the transportation of dangerous articles." E&DA Rule 12(n).

"The driver of a motor tank truck [transporting petroleum products] operating through or within a city shall comply with

(Fed.) "Every motor vehicle containing hazardous materials must be driven and parked in compliance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated, unless they are at variance with specific regulations of the Department of Transportation which are applicable to the operation of that vehicle and which impose a more stringent obligation or restraint." 49 CFR §397.3.

these rules and also with all ordinances and the police regulations of the city." PTTC Rule 16.

"The driver of a motor vehicle shall at all times have complete control while such vehicle is laden with and transporting dangerous articles." E&DA Rule 12(m).

". . . No person shall have control of or drive a motor vehicle used in the transportation of dangerous articles while under the influence of intoxicants or narcotics." E&DA Rule 10(b).

No similar general requirement exists in the regulations.

"No person shall operate, or be in physical control of, a motor vehicle if he possesses, is under the influence of, or is using, any of the following substances:

. . . A narcotic drug or any derivative thereof;

. . . An amphetamine or any formulation thereof (including, but not limited to, 'pep pills' and 'bennies');

. . . Any other substance, to a degree which renders him incapable of safely operating a motor vehicle.

. . . No motor carrier shall knowingly require or permit a driver to violate [the above regulations]" 49 CFR §392.4.

Regulations state further (49 CFR §392.4(c) & (d)) that substances prescribed by a physician who has advised the driver that such will not impair his driving ability are exempt from the above rules; and that "possession" does not refer to substances manifested and transported as part of a shipment.

" . . . No person shall -

. . . Consume an intoxicating liquor, regardless of its alcoholic content, or be under the influence of an intoxicating liquor, within 4 hours before going on duty or operating, or having physical control of, a motor vehicle; or

. . . Consume an intoxicating liquor, regardless of its alcoholic content, or be under the influence of an intoxicating liquor, while on duty, or operating, or in physical control of, a motor vehicle; or

. . . Be on duty or operate a motor vehicle while he possesses an intoxicating liquor, regardless of its alcoholic

"No petroleum tank truck carrier controlling, operating, or managing any motor tank truck shall cause or allow any driver or operator of such vehicle to work as a driver or operator for more than a maximum of eight actual driving hours unless such driver or operator has had at least ten consecutive hours off-duty rest in every twenty-four hour period, and in no case shall the driving time in any twenty-four hours aggregate more than thirteen hours." (Emphasis added.) PTTC Rule 12,

content. However, this requirement does not apply to possession of an intoxicating liquor which is manifested and transported as part of a shipment.

. . . No motor carrier shall require or permit a driver to -

. . . Violate any provision of the [regulations above] ; or

. . . Be on duty to operate a motor vehicle if, by his general appearance and by his conduct or by other substantiating evidence, he appears to have consumed an intoxicating liquor within the preceding 4 hours." 49 CFR §392.5.

"Except [vehicles classified as 'Lightweight mail trucks' at 49 CFR §395.1(b)] , . . . every motor carrier and its officers, drivers, agents, employees, and representatives shall comply with the rules [governing hours of service] , . . . and every motor carrier shall require that its officers, drivers, agents, employees, and representatives be conversant with [such rules]." 49 CFR §395.1

". . . Except as provided in [49 CFR §395.3(c), which exempts drivers of certain 2-axle and deliver vehicles, 49 CFR §395.3(e), which gives the hours of service for driver in Alaska, and 49 CFR §395.10, which allows a 2-hour extension to the hours of service for adverse driving conditions], no motor carrier shall permit or require any driver used by it to drive nor shall any such driver drive more than 10 hours following 8 consecutive hours off duty or drive for any period after having been on duty 15 hours following 8 consecutive hours off duty" 49 CFR §395.3(a).

Regulations further specify rules for cumulating hours, weekly maximum hours of service, and hours for oil field workers. 49 CFR §395.3

Personal Qualifications

(Va.) "The driver of a motor vehicle used in the transportation of dangerous articles must comply with each of the following requirements:

. . . Have the qualifications to obtain a chauffeur's license under existing Virginia statutes

("A motor tank truck transporting petroleum products must be driven by and be in charge of a driver who . . . must hold a valid chauffeur's license." (Emphasis added.) PTTC Rule 10.)

. . . Be experienced, careful, capable, reliable and able to read and write the English language

("A motor tank truck transporting petroleum products must be driven by and be in charge of a driver who is not less than 21 years of age, careful, capable, reliable, [and] able to read and write the English language. . . ."

(Emphasis added.) PTTC Rule 10.)

. . . Not addicted to the use of intoxicants or narcotics

("A motor tank transportating petroleum products must be driven by and be in charge of a driver who is . . . not addicted to the use, or under the influence of intoxicants or narcotics. . . ." (Emphasis added.) PTTC Rule 10.)

. . . Be familiar with the road rules, State laws and regulations governing the transportation of explosives and dangerous articles in this State, and local ordinances of any city or town through which the vehicle moves

("The driver [of a motor tank transporting petroleum products] must be familiar with the road rules, the State laws and the rules and regulations of the State Corporation Commission governing the transportation of petroleum products in this state. . . ." (Emphasis added.) PTTC Rule 11(a).)

(Fed.) "Except as provided in [49 CFR §391.61 to §391.71, which contain certain limited exemptions], a person is qualified to drive a motor vehicle if he -

. . . Has been issued a currently-valid motor vehicle operator's license or permit;

. . . Is at least 21 years old; . . . Can read and speak the English language sufficiently to converse with the general public, to understand traffic signs and signals in the English language, to respond to official inquiries, and to make entries on reports and records; . . .

. . . Can, by reason of experience, training, or both, safely operate the motor vehicle he drives." 49 CFR § 391.11.

"A person shall not drive a motor vehicle unless he is physically qualified to do so." 49 CFR §391.41 (a).

"...A person is physically qualified . . . if he [among other things]

. . . Does not use an amphetamine, narcotic, or any habit-forming drug; and

. . . Has no current clinical diagnosis of alcoholism." 49 CFR §391.41 (b) (12) and (13).

See Driver Requirements, General, above for regulations concerning driving under the influence of alcohol or drugs.

" Each motor carrier and each driver shall know, and be familiar with, the rules of [49 CFR §391, governing qualifications of drivers]. 49 CFR §391.5

"Except as provided in [49 CFR §392.1(c) and (d), which exempt drivers and vehicles wholly engaged in intracity operations, and light-weight mail trucks], every motor carrier, its officers, agents, representatives, and employees responsible for the mangement, maintenance,

operation, or driving of motor vehicles, or the hiring, supervising, training, assigning, or dispatching of drivers, shall be instructed in and comply with the rules in [49 CFR §392, governing the driving of motor vehicles]." 49 CFR §392.1(a).

"Except as provided in [49 CFR §397.1(c), which exempts drivers and vehicles wholly engaged in intracity operations], the rules in [49 CFR §397, concerning driving and parking rules for transportation of HM,] apply to each motor carrier engaged in the transportation of hazardous materials by a motor vehicle which must be marked or placarded in accordance with [49 CFR §177.823, which requires marking as specified in a table of some 1200 HM at 49 CFR §172.101] and to . . . [e]ach person who operates or who is in charge of a motor vehicle containing hazardous materials." 49 CFR §397.1(a) (2).

"Every motor vehicle containing hazardous materials must be driven and parked in compliance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated, unless they are at variance with specific regulations of the Department of Transportation which are applicable to the operator of that vehicle and which impose a more stringent obligation or restraint." 49 CFR §397.3.

"It is the duty of each [private, common, or contract carrier by motor vehicle engaged in transporting HM in interstate commerce] to make the prescribed regulations effective and to thoroughly instruct employees in relation thereto." 49 CFR §177.80(a).

. . . Be familiar with the safety rules for the handling or transportation of explosives or dangerous articles transported or to be transported on or in the vehicle in his care." E&DA Rule 10.

"The driver of a motor tank truck transporting petroleum products must be familiar with the necessary safety rules for handling and transporting petroleum products." PTTC Rule 11 (a).)

APPENDIX B

LETTER AND QUESTIONNAIRE

1435

June 8, 1979

7.13

Dear Sir:

With the increased use of heavy trucks, national and state legislators, as well as traffic safety officials, have shown a growing concern over the safety record of these vehicles. As a result of the rising concern in our state, the Virginia Highway & Transportation Research Council has undertaken a study to determine the magnitude of the truck accident experience in Virginia.

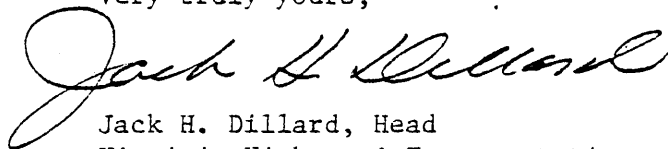
An important goal of this study is to determine if existing regulations and enforcement programs are sufficient. Vital to this research is a survey of how other states enforce their regulations on the size and weight of trucks, the safety inspection of trucks, and the transportation of hazardous materials. This information will be of much help in our evaluation of Virginia's current efforts in this area of law enforcement.

We ask that you complete the attached questionnaire and return it in the enclosed envelope. If you do not feel qualified to complete it (or any part of it), please forward it to the person or agency best able to complete it. In particular, if necessary please detach and forward to the appropriate agency the section concerning the transportation of hazardous materials.

We would appreciate receiving your reply by June 29. If you have any questions, please contact Clint Simpson or Kevin McLean of our staff at (804) 977-0290.

Thank you for your interest and assistance.

Very truly yours,



Jack H. Dillard, Head
Virginia Highway & Transportation
Research Council

CS/rem
Attachment

cc: Mr. John T. Hanna

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QUESTIONNAIRE: ENFORCEMENT OF TRUCK SAFETY REGULATION

I. WEIGHING OPERATIONS AND SAFETY INSPECTIONS

1. State: _____

Agency Name: _____

2. What is the source of state rules governing truck weight and size limits?

- _____ State law
- _____ Legislative resolution
- _____ Departmental or Commission policy
- _____ Agency regulations
- _____ Other (please specify) _____

3. In enforcing weight limitations, are permanent (fixed) scales used?

- _____ Yes If yes, how many? _____
- _____ No If no, go to question 6.

4. How many days per week and hours per day are the permanent scales operated? If scales are operated on various schedules, indicate the number of scales in each category, including irregular scheduling. (e.g., 5 scales operate 7 days/week, 24 hours/day)

5. Are all trucks passing permanent (fixed) weigh stations weighed?

- _____ Yes
- _____ No Please specify the criteria used to determine which trucks are not weighed: _____

6. Are portable scales used?

- _____ Yes
- _____ No If no, go to question 11.

7. What types of portable scales are used, and how many of each type do you have?

8. What is the average number of mobile weighing teams assigned each day?

_____ teams of _____ persons each.

9. How many days per week and hours per day are the portable scales operated? If scales are operated on various schedules, indicate the number of scales in each category, including irregular scheduling.

10. What criteria are used to determine which vehicles are weighed at portable scales?

11. Is the "weigh -in-motion" method used?

Yes If yes, at how many scales?
No If no, go to question 13.

12. For what purpose is "weighing-in-motion" used?

Data gathering
Determining if a vehicle violates weight limits
Screening vehicles before weighing at a full stop
Other (please specify)

13. For the most recent year for which data are available, how many vehicles were:

Weighed?
Found to be in violation of weight limits?
Measured?
Found to be in violation of size limits?
Year

14. Are on-road safety inspections conducted?

Yes
No If no, go to question 18.

15. Are there any criteria for determining which vehicles are subjected to safety inspections?

Yes (please specify)
No

16. Which items are areas of primary focus in inspections:

- Brakes
 Suspension system
 Steering mechanism
 Tires
 Lights
 Turn signals
 Exhaust system
 License
 Registration
 Driver's logs
 Other (please specify) _____

17. For the most recent year for which data are available, how many vehicles were:

- Inspected?
 Found to be in violation?
 Year

18. Which state agencies are responsible, fully or in part, for the operation of the listed programs:

	Permanent Scales	Portable Scales	Safety Inspections
State Police	_____	_____	_____
Highway Department	_____	_____	_____
State Regulatory Comm.	_____	_____	_____
Other (please specify) _____			

19. If you have any additional information concerning weighing or safety inspection programs, please feel free to send it along with your response to the rest of the questionnaire.

Your name: _____

Title: _____

Mailing Address and Telephone: _____

II. HAZARDOUS MATERIALS

20. State _____

Agency _____

21. What is the source of state rules concerning the transportation of hazardous materials?

- _____ State law
- _____ Legislative resolution
- _____ Department or Commission policy
- _____ Agency regulation
- _____ No such rules exist
- _____ Other (please specify) _____

22. Has your state conducted a study of the transportation of hazardous materials?

- _____ Yes
- _____ No

23. Is it presently conducting such a study?

- _____ Yes
- _____ No

24. Does your state conduct an active program for enforcing regulations on hazardous materials?

- _____ Yes
- _____ No If no, go to question 28.

25. Please furnish the following information concerning inspections of FOR-HIRE CARRIERS of hazardous materials. (check the appropriate activity)

	<u>Inspection Method</u>		<u>Location</u>		<u>Violations</u>	
	<u>Random</u>	<u>Systematic</u>	<u>At Terminal</u>	<u>On Road</u>	<u># of Inspections</u>	<u># of Violations</u>
a) Inspect Office Records:	_____	_____	_____	_____	_____	_____
b) Inspect Records On-Board Vehic. (incl. driver logs):	_____	_____	_____	_____	_____	_____
c) Inspect Vehic. Itself:						
Vehicle	_____	_____	_____	_____	_____	_____
Cargo	_____	_____	_____	_____	_____	_____

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d) Other _____

e) Year in which data were collected: _____

26. Please furnish the following information concerning inspections of PRIVATE CARRIERS of hazardous materials. (check the appropriate category)

	<u>Inspection Method</u>		<u>Location</u>		<u>Violations</u>	
	<u>Random</u>	<u>Systematic</u>	<u>At Terminal</u>	<u>On Road</u>	<u># of Inspections</u>	<u># of Violations</u>
a) Inspect Office Records:	_____	_____	_____	_____	_____	_____
b) Inspect Records On-Board Vehic. (incl. driver logs):	_____	_____	_____	_____	_____	_____
c) Inspect Vehic. Itself:						
Vehicle	_____	_____	_____	_____	_____	_____
Cargo	_____	_____	_____	_____	_____	_____
d) Other _____						

e) Year in which data were collected: _____

27. Which state agencies are responsible, fully or in part, for the operation of the hazardous materials program?

- State police _____
- Highway Department _____
- State Regulatory Comm. _____
- Other (please specify) _____

28. If you have any additional information concerning hazardous materials programs, please feel free to send it along with your response to the rest of the questionnaire.

Your name _____

Title _____

Mailing Address and Telephone: _____