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AN ANALYSIS OF THE EFFECTIVENESS OF WRITTEN DRIVER LICENSE EXAMINATIONS IN EVALUATING APPLICANT DRIVING ABILITIES

Arizona Classified License System
Task III

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Report of Task 3
ARIZONA CLASSIFIED LICENSE SYSTEM

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16. ABSTRACT

A state of the art description of classified driver's licensing systems accross the country is provided in the report. Key findings include:

1) High accident rates for heavy vehicles and special skills required for their operation has led to the creation of special licenses for these vehicles.
2) The most common distinction between vehicle classifications is a gross weight of 24,000 pounds.
3) Special license endorsements are commonly required to operate motorcycles, school buses, emergency vehicles and vehicles carrying hazardous materials.
4) Most states using classified systems have phased them in slowly.
5) Thirty one states classify vehicles into three size categories; passenger vehicles, straight trucks and busses and tractor-trailer combinations. Twenty two of these states require special written exams for operators of heavy vehicles.
6) Most states have established standards of visual acuity but few have established health screening for operators of all heavy vehicles.
7) All of the states having classified licenses use skill tests.
8) Most states license heavy vehicle operators at age 18 and some require at least one year of experience.

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INTRODUCTION

BACKGROUND

The report "Arizona Driver Licensing for the '90s" proposed a classified license system for the State of Arizona. This report discussed key issues related to implementation of the classified license system. Under the terms of the contract for which this report was prepared, content was to be confined to the published scientific and technical literature and to other documentation available to the project staff through previous studies. It was not to include any form of original data collection.

Proposed Classified License System

The proposed classified license system consists of the following three classes:

1. Tractor-trailer--All vehicles except those requiring special endorsements.

2. Truck and Bus--All vehicles over 24,000 pounds except tractor-trailers and vehicles requiring special endorsement.

3. Operator--All vehicles except those over 24,000 pounds and those requiring special endorsements.

In addition to these three classes, the following endorsements to any of the three classes of license would permit operation of vehicles as follows:

C. Chauffeur--To operate any vehicle for hire (not needed by holders of tractor-trailer and truck/bus licenses).

M. Motorcycle--To operate any motor-powered 2-wheeled vehicle other than a moped (which requires an operator's license).

S. School bus--To operate any school bus; an endorsement to either Class 2 or Class 3 licenses, depending upon the size of the vehicle to be operated.

E. Emergency vehicle--To operate any emergency vehicle for a non-governmental agency; an endorsement to Class 1, Class 2, or Class 3 depending upon the size of the vehicle.

Legislation to put into effect the three recommended classes of licenses is now under consideration. Specifically, what is being considered is the addition to the present single operator's class of two or more classes to accommodate heavy vehicles. No new endorsements are contemplated. Arizona already requires motorcycle and chauffeur's endorsements; additional endorsements for operators of school buses or emergency vehicles are not under active consideration.

Purpose of Report

The purpose of this report is to discuss in detail the various elements of classified licensing systems in order to assist in formulating legislation that will meet Arizona's needs. The discussion incorporates the results of both scientific inquiry and practical experience in matters relating to classified licensing. The report makes no specific recommendations regarding the nature of a classified license system. It merely attempts to present information that will aid those who are responsible for deciding the characteristics of the classified licensing sytem.

The primary sources of information used in preparing this report have been:

- A comprehensive review of scientific and technical literature relating to the operation of motor vehicles
- In-depth examination of state motor vehicle laws
- Discussions with state officials who are knowledgeable in both the background and operation of classified license systems.

Some of the earlier material dealing with the background and essential characteristics of classified licensing has been incorporated into the present discussion in order to make it unnecessary to refer to the earlier report.

BASIS FOR CLASSIFIED LICENSING

Accidents involving heavy vehicles have increased public concern over the qualifications of the drivers who operate these vehicles. More and more states have responded to this concern by classifying licenses such that drivers of heavy vehicles are required to demonstrate their ability to operate such vehicles safely before being granted a license.

Accident Involvement of Heavy Vehicles

Neither trucks nor buses appear to be overinvolved in accidents generally. According to figures furnished by the National Safety Council (NSC, 1983), trucks were involved in about 18.7% of crashes while constituting 21.1% of vehicle registrations. Combination trucks were somewhat more involved, being responsible for 3.6% of accidents and only 0.9% of registrations. Similarly, commercial buses were involved in .5% of accidents and .1% of registrations.

It is in the more serious accidents that trucks and buses seem to be a greater threat. Because of their heavier weight, any accident in which they are involved is likely to be more serious than would be an accident involving passenger cars. During 1982, trucks were involved in 24.6% of fatal accidents, compared with their 21.1% of total vehicle registrations. Combination vehicles were involved in 9.1% of fatal accidents in comparison with their .9% of registrations. Commercial buses, on the other hand, were involved in only .5% of fatal accidents--the same level of involvement as in non-fatal accidents.

It is difficult to determine to what extent the overinvolvement of trucks and buses in serious accidents is due to hazards inherent in the vehicles themselves--their size--and to what extent it is due to the number of vehicle miles that they travel. Trucks and buses compile far greater mileage on the average than do automobiles. Probably the most accurate compilation of heavy vehicle accidents relative to mileage is that prepared by the American Automobile Association (AAA, 1983). Using fatality data from the Fatal Accident Reporting System and mileage from the Federal Highway Administration, AAA found combination trucks to be involved in 5.23 fatal accidents per 100 million vehicle miles traveled (V.M.T.). In contrast, passenger cars were involved in only 2.47 fatalities per 100 million V.M.T. Data on buses and single unit trucks are not available.

Vehicle Miles Traveled is not the only variable other than size to influence the relative accident involvement of trucks and buses. Other variables include the following:

> Roadway--Heavy vehicles tend to compile their mileage on different roadways than do cars. For example, intercity trucks and buses tend to make greater use of interstate highways than do cars.
>
> Time of Day--Trucks and buses are more likely to operate throughout the night and are, therefore, on the road during those times when serious accidents are most likely to occur.
>
> Weather--In an effort to maintain schedules, commercial drivers are more likely to brave the elements and, therefore, encounter more hazardous driving conditions than do car drivers.
>
> Speed--Since an inordinate amount of truck and bus operation takes place on high speed highways, their accidents are likely to occur at higher speeds. The speed factor, along with the size of the vehicle, contributes to the relatively high severity of truck and bus accidents.

It is difficult to believe that these factors could account for more than a two-fold difference in fatal accidents between automobiles and combination trucks. The size of the vehicles--their length and weight--certainly account for much of the difference.

Need for Separate Licensing of Truck and Bus Operators

While the high severity of accidents involving trucks and buses has focused attention upon the operation of these vehicles, it does not by itself justify a separate license. It is the accident involvement, coupled with the special requirements that are imposed upon truck and bus operation, that justifies the need for a separate license. Special requirements arise with respect to each of the three variables upon which classified licensing systems are based: level of ability, type of ability, and responsibility.

> Level of Ability--That increased vehicle length demands increased operating ability has been more or less assumed by the general public. As mentioned earlier, this is the primary basis for treating trucks and buses in separate license classes. Direct evidence of the relationship was found by McKnight, Kelsey, and

Edwards (1984) who observed that scores on an offstreet skill test were inversely correlated with the vehicle length. The actual correlations were .54 for straight trucks and buses and .31 for articulated vehicles (the differences in correlations were attributed to the greater variation in length for trucks and buses).

Type of Ability--The length, mass, power train, and visibility restrictions of trucks and buses, along with the regulations under which they operate, demand different sets of abilities than those required in operation of other vehicles. The specific skills and knowledge will be described later when license tests are discussed.

Responsibility--Operators of trucks and buses have a particularly great responsibility, not only because of the numbers of people and goods they can carry, but because of the greater ability of heavy vehicles to inflict damage and injury upon the motoring public.

These issues, and the need for separate licensing for truck and bus operators, have been fully discussed by Waller et al. (1976), Waller and Li (1979) and McKnight, Kelsey, and Edwards (1984).

As of the time this report is submitted, some 31 states require special licenses for operation of trucks and buses. The trend is definitely in the direction of more classified licensing; in 1976, 8 fewer states had systems calling for separate licenses for operators of trucks and buses. The states presently having classified licenses are as follows:

California
Colorado
Connecticut
Delaware
Georgia
Hawaii
Illinois
Iowa
Kansas
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Utah
Virginia
Wyoming

CLASSIFIED LICENSE SYSTEM

A proposed classified license system was described in detail in the prior report, "Arizona Driver Licensing for the '90s." This section of the report will review the license classes, the way classified license systems have been influenced, and the items of costs associated with implementation and operation of classified license systems.

LICENSE CLASSES

Having established the need to require a separate license for operating trucks and buses, it becomes necessary to specify what is a truck or bus as far as licensing is concerned. If there were to be more than one class of truck or bus, as has been recommended, it is necessary to specify what is to distinguish between the two classes. These two issues will be addressed separately.

Definition of Truck/Bus

Since it is primarily the size that dictates the need for a separate truck/bus license, size is the obvious basis of classification. Of the 31 states currently requiring separate licenses for truck and bus operators, 28 classify trucks on the basis of weight while 3 require a special license for operating vehicles having more than 3 axles, regardless of weight. In the case of buses, 26 states use weight as a classification while the remaining 4 use the number of passengers.

Where weight is used as the basis of classification, the specific criteria employed by the individual states are distributed as follows:

WEIGHT	NUMBER OF STATES
less than 9,000 lbs.	2
10,000-19,000 lbs.	9
20,000-29,000 lbs.	14
30,000 and over	3
	28 states

The single most common weight threshold is 24,000 pounds, which serves as the threshold in eight states. It is also the threshold proposed in the AAMVA vehicle classification plan. While the Bureau of Motor Carrier Safety has proposed a 26,000 pound threshold, it is probably easier to change one Federal regulation than eight state laws.

Arriving at an accepted weight threshold involves balancing the needs of public protection against the need to avoid placing an excessive burden upon drivers or the MVD. The higher the weight threshold, the greater risk there is that someone with just an operator's license will be permitted to drive a vehicle that is too heavy for them to handle. On the other hand a lower weight threshold increases the administrative burden upon the MVD as well as the number of drivers who will be inconvenienced by the need to

obtain a separate license. A weight threshold of a 24,000 pound range has the advantage of excluding from the licensing requirement almost all vehicles that are used in private, non-commercial transportation, including vans, pickup trucks, and small trucks used in moving household goods.

The advantage to Arizona of adopting a standard that is as widely used as the 24,000 pound standard is the opportunity it offers to avoid having to test large numbers of out-of-state applicants. The issue of waiving elements of license testing for those from out-of-state will be discussed later. However, if this practice is adopted, it would presumably be extended only to states having standards similar to those of Arizona. The more states there are in this category, the fewer will have to be tested when they transfer to Arizona.

Classes Within Truck/Bus Categories

If increasing vehicle weight demands increasing skill, then it may be appropriate to create additional classes within the truck and bus category as the weight of the vehicle increases. Without additional classes, someone licensed to drive a 24,000 pound delivery truck could also get behind the wheel of an 80,000 pound tractor-trailer combination. The only way that this could be done without hazard to the public would be to require all those seeking truck/bus licenses to show that they can handle tractor-trailers.

To avoid this problem, all of the states having classified license systems now provide for two license classes within the truck/bus category. In 29 of the states, the distinction is made on the basis of configuration, with buses and straight trucks being differentiated from tractor-trailers. The other 2 states distinguish on the basis of weight. However, it works out to the same thing since the weight break is such that most tractor-trailers would fall in a heavier category, and most straight trucks and buses in the lighter category.

Not all vehicles pulling vehicles are tractor-trailer combinations. Many cars pull boat trailers; many trucks pull utility trailers. These combinations obviously do not create the same potential hazard as tractor-trailer combinations. Therefore, states that employ articulation (i.e., tractor-trailer) also apply a weight criterion to the trailer. Only if the trailer weighs over a specified limit, is a tractor-trailer license required. In the overwhelming majority of states, the maximum weight falls between 6,000 and 10,000 pounds. Almost all the trailers over this threshold are cargo trailers which, when fully loaded, can weigh well over 10,000 or even 20,000 pounds. In some states, the trailer weight limit is raised for certain categories of vehicles. For example, California imposes a 6,000 pound limit on trailers, but raises the limit to 9,000 pounds for trailers towing boats and agricultural products.

A weight limit of 10,000 pounds should be sufficient to distinguish true tractor-trailer combinations from other combinations of vehicles and trailers for which a special license should not be required.

Need for Separate Tractor-Trailer Operator's License

The same three factors that justify separate truck and bus licenses

also justify a distinction between single unit vehicles and tractor-trailers.

Ability--A higher level of skill is required to operate a tractor-trailer for two reasons:

- The purpose of articulation is to permit greater length, which in turn leads to the need for greater skill.
- The articulation of tractor-trailer complicates backing maneuvers and prevention of skids (i.e., jackknife).

Responsibility--The added vehicle weight, length, and ability to jackknife increases the potential danger to other motorists. The tractor-trailer's greater potential for harm is evident in the higher involvement in fatal accidents.

Types of Ability--Articulation imposes requirements for additional skills and knowledge, including coupling/uncoupling and vehicle inspection.

Endorsements to Heavy Vehicle Operator's License

The classified license system proposed in the previous report, "Arizona Driver Licensing for the '90s," proposed a set of endorsements that could be applied to any of the three license classes, that would allow operators to drive certain categories of vehicles within the class for which they are licensed. Two endorsements that would be applied to Class 1 and 2 licenses are:

School Bus--Thirteen states currently require endorsements to operate school buses. In most of these states, applicants seeking to operate school buses that exceed the size threshold for heavy vehicle must obtain the school bus endorsement to a Class 2 license.

Emergency Vehicle--The previous report suggested that non-governmental employees operating emergency vehicles be required to have an emergency vehicle endorsement. Only one state adopts this practice at the present (California requires an ambulance endorsement). However, most states do require emergency vehicle operators to have a license appropriate to the type of vehicle they are operating (e.g., Class 2 for a single-unit fire-fighting vehicle or rescue truck; Class 1 for a fork-and-ladder truck).

The rationale underlying these two endorsements is described in greater detail in the earlier report.

With the ever-increasing volume of hazardous materials being shipped across the country, states have been becoming increasingly concerned about the ability of drivers to safely operate the vehicles carrying them.

Hazardous materials include both those that are inherently hazardous, such as flammable, explosive, or toxic materials as well as unstable loads such as bulk liquid or livestock, which can become hazardous if the vehicle carrying them is not properly operated.

The State of California requires that any California driver have an endorsement in order to transport hazardous materials within that State. Drivers licensed in other states would be permitted to carry hazardous materials without an endorsement. Because California's endorsement is only recent, no such endorsement was recommended as part of the classified license system pending study of California's experience.

License Exemptions

Several states exempt from the requirement for classified licenses operators of certain vehicles exceeding the threshold for a heavy vehicle. While no summary of such exceptions is available within the published literature, California exempts single-unit motor homes regardless of weight, and increases the weight limit for towed vehicles that haul livestock, agricultural products, or boats when it is not done for hire. The majority of states avoid the need for such exceptions by having weight thresholds that are sufficiently high to place motor homes and trailers used for recreational purposes within the category of automobiles. As noted in the previous section, this is one of the reasons why many states maintain a relatively high weight threshold, such as 24,000 pounds.

Another category of vehicle often exempt from requirements for heavy vehicle operator license is farm vehicles. The reason given is that farm vehicles (primarily straight trucks) are operated on public streets and highways infrequently and for relatively short distances. Moreover, it is advantageous for farmers to be able to allow different people to operate the vehicle at various times. Requiring all of them to obtain Class 2 licenses in order to drive infrequently over short distances is considered an imposition.

While some states have exempted farm vehicles, others have not. In one of the states that doesn't, California, the belief has been expressed by the Highway Patrol that farm vehicles are overinvolved in accidents relative to their miles of travel and that many accidents involving farm trucks result from the lack of skill and experience of their operators. However, no data supporting this belief are available. Given the often unstable loads carried by farm vehicles an exemption doesn't seem warranted.

IMPLEMENTATION OF CLASSIFIED LICENSE SYSTEM

On an average, about 5% of the drivers within a state will hold heavy vehicle operator's licenses. In Arizona this would amount to over 100,000 licenses. The breakdown between truck/buses and tractor-trailers varies depending upon the weight limits employed. Given the weight limits proposed for the Arizona system, we could expect that between one-half and two-thirds of the applications would be for operation of trucks and buses.

While a law creating license classes will become effective on a particular date, it cannot apply to all drivers at the time it goes into

effect. To do so would mean hordes of heavy vehicle operators swarming over MVD branch offices seeking Class 1 and 2 licenses. States have avoided being swamped by applicants for heavy vehicle operator's licenses by two procedures: (1) gradually phasing in the license requirement, and (2) waiving the road test for experienced drivers.

Almost all the states that have implemented classified license systems have phased the program in by applying it only to original applications and renewals. Under such a phase-in, drivers holding valid Chauffeur's licenses could continue to operate heavy vehicles on their original licenses until they were up for renewal. The examination and testing of existing heavy vehicle operators would thus be spread out over the four years following the effective date of the classified license system.

With the imposition of any change in license requirements comes the inevitable suggestion of "grandfathering", that is either exempting those currently licensed to operate heavy vehicles from having to obtain a classified license or providing it to them automatically without testing. While states have not exempted or automatically given licenses to drivers operating heavy vehicles before classified licensing, they have waived the road test requirement for those applicants who can produce statements from their employers that they have been operating a heavy vehicle for a year or more. Waivers for experienced drivers should not be confused with employer certification of new drivers who become qualified after a classified license system has been implemented. Under certification, employers cannot merely testify to a driver's experience but must certify that the driver has demonstrated safe operating skills. Employer certification will be discussed in the section called "Exemption."

So far as can be determined, the gradual phase-in of classified licensing by renewal date along with the use of employer statements has prevented any state from being inundated by applicants for heavy vehicle operator's licenses.

CLASSIFIED LICENSE SYSTEM COSTS

The published literature disclosed no systematic analysis of costs associated with classified license systems. Nor were any of the state personnel with whom classified licenses discussed able to provide information concerning the cost of a classified license system. One reason is that in no state were additional funds allocated for materials or services necessitated by any specific elements of a classified license system. However, some of the information provided by state personnel helped to provide a basis for estimating the overall impact of a classified system upon licensing costs.

Implementation Costs

Activities involved in implementing a classified license system include:

- Working with representatives of other governmental agencies and private organizations to work out details of procedure (e.g., employer certification)

- Developing and modifying license procedures to accommodate the additional classes
- Preparing manuals, tests, application forms, and other materials required in support of the licensing process
- Modifying driver license record systems to accommodate additional license classes.

In most states, these activities were handled simply by assigning to a small group within the driver license agency the task of implementing the classified license system. Typically three or four staff members shouldered the major burden of implementation. Of course, almost all personnel within the licensing agency were called upon to devote time to implementation, as were many in other agencies (e.g., Central Data Processing). There is no way of estimating how much time was involved. However, all of the state representatives with whom the process was discussed recalled that imposition of a classified license requirement without the allocation of additional funds or personnel slots placed some strain upon the agency.

Operating Costs

Creation of a classified license system places the following additional requirements upon the day-to-day operation of a license agency:

- Training of agency personnel including examiners and clerks
- Additional examination's and examination time
- Monitoring of certification programs.

The training of agency personnel is considered an operational rather than an implementation activity since it goes on continuously as new personnel are hired or are assigned to positions requiring training. Despite the use of certification programs to reduce the requirement for testing, a classified license system generally requires the administration of additional tests. Finally, if a certification system is to operate effectively, it must be closely monitiored and that requires time.

Most state representatives reported that the additional burden created by classified licensing was ultimately accommodated through more funds as the additional demands were reflected in assessments of agency workloads. During the interim, some agencies made use of state highway safety funds, particularly for examiner training. While there is no way of ascertaining to what extent increases in manpower or funds are attributable to classified licensing, one state representative was willing to estimate that their classified licensing system had necessitated approximately a 10% increase in manpower.

The need for additional testing time is created both by the number of additional tests that must be administered and the length of the vehicle operator road tests. The need for additional tests can be reduced by the use of employer certification, to be described later in this report. Moreover, some of the drivers taking Class 1 and 2 road tests would otherwise be taking road tests for a standard operator's license.

Equipment and real estate costs appear to be minimal. Vehicles are, of course, furnished by applicants. Those few states that have provided off-street facilities for testing hevy vehicle operator applicants appear to do so largely because the facilities are available. The number of states conducting off-street testing appears to be on the decline.

DRIVER QUALIFICATIONS

While the categories of a classified license system are defined in terms of vehicles, the system is actually a classification of qualifications. The primary purpose of a classified license system is to assure that drivers have the qualifications needed to operate safely those vehicles they wish to drive. The reason for requiring special licenses to operate different vehicles is that they are believed to require different qualifications, and the basis for the various license classes is assumptions as to which vehicles require different qualifications.

If the purpose of a classified license system is to assure that drivers are qualified to operate their vehicles, then the effectiveness of the classification system will depend upon how well the qualification of drivers match those demanded by the vehicles they operate. This section will discuss the special qualifications required of truck/bus and tractor-trailer drivers along with the methods that are available to assess them. The discussion of qualifications will be limited to those that are needed over and above current qualifications for an ordinary operator's license. While the adequacy of current operator license requirements is open to discussion, and was discussed at length in the earlier report, it is not at issue in the institution of a classified license system.

Areas in which special qualifications might be required for operators of trucks and buses include the following:

- Age
- Experience
- Vision
- Knowledge
- Skill
- Physical Condition

AGE

Arizona currently requires applicants for Chauffeur's licenses to be at least 18 years of age. This same age limitation is imposed upon operators of heavy vehicles by three-quarters of the states. A breakout of age requirements for states having classified or Chauffeur's license systems appears in the table on the next page.

MINIMUM AGE REQUIREMENTS

AGE*	FRE.	PERCENT
16	9	20%
17	3	6%
18	34	74%
TOTALS	46	100%

* Rounded to nearest year

The responsibility of operating vehicles capable of causing the damage and injury that a truck or bus can, as well as the responsibility of carrying people and other people's goods, is generally believed to demand more maturity than is posessed by the typical 16-year-old. The role of maturity in safe driving is seen in the fact that young people are heavily over-involved in accidents, with over twice as many accidents per mile traveled as the adult population.

The over-involvement of youth in accidents continues well beyound age 18. While it begins to drop at this age, it doesn't really begin to level off until age 25. However, 18 is the age at which most young people graduate from high school in substantial numbers and enter the job market. Withholding the license to operate a heavy vehicle beyound age 18 would deprive many young people of a livelihood. There appears to be no basis for changing the current minimum age.

EXPERIENCE

At the present time, Arizona drivers must be licensed as motor vehicle operators for at least one year before being granted a Chauffeur's license, to allowing them to operate a vehicle for hire. Arizona is one of six states requiring a year of driving experience for operators of heavy vehicles. However, some 27 other states have differences of at least a year between the minimum ages of regular, Chauffeur's, and heavy vehicle operator licenses. A breakdown of age requirements of operator's license and those of Chauffeur's and heavy vehicle operators appears in the table on the next page.

MINIMUM AGE AT LICENSING FOR OPERATOR'S LICENSES AND THOSE OF CHAUFFEUR'S AND HEAVY VEHICLE OPERATOR'S LICENSES

Operator's Licenses	Heavy Vehicles	Fre.	Percent
15	17	1	3%
15	18	2	6%
16	16	9	24%
16	17	1	3%
16	18	23	61%
17	17	1	3%
Totals		37	100%

As can be seen, 27 states issue operator's licenses and licenses for Chauffeur's or heavy vehicles at diferent ages and, therefore, impose a de facto driving experience requirement for the operation of heavy vehicles. In all but 1 of these 27 states, this age difference is at least two years. This differential in minimum licensing age functions as a de facto experience requirement, given that a majority of drivers obtain their first license within a year of their earliest date of eligibility.

When both de facto and mandated experience requirements are considered, it appears that in, a total of (27 + 6 =) 33 states, heavy vehicle applicants will have accumulated at least some prior driving experience, some as many as two years. Even in those 10 states issuing heavy vehicle and regular operator licenses at the same age, it is likely that the majority of applicants for the heavy vehicle operator's license will have had previous driving experience.

Because of the correlation between age and experience, it has been difficult to measure the effect of experience alone upon safe driving. However, a study by Munsch (1966) found that accidents were more frequent during the first few years of driving, regardless of the age at which driving begins. The greatest number of accidents occurred in the first year of operation.

Merely extending the 18-year minimum age for a Chauffeur's license to operators of heavy vehicles under a classified license system would result in most applicants for a truck/bus operator's license having some prior experience in vehicle operation. However, preserving the present requirement for a year's driving experience would assure that such is the case.

VISION

Special visual requirements for operators of heavy vehicles are limited to aquity and visual field. While colorvision is also tested in some states, the practice is applied to operators of all vehicles and is generally declining across the country.

Visual Aquity

Arizona currently limits vision testing among license applicants to a test of visual acuity. Drivers must have visual acuity of 20/40 or better for an unrestricted license. The same standards are maintained for a Chauffeur's license. Extending the current vision requirement to operation of trucks and tractor-trailers would be consistent with practices employed in other states. Visual aquity standards for states requiring either classified or Chauffeur's licenses appear in the table below.

STATIC ACUITY STANDARDS

	Uncorrected		Corrected	
Acuity	Fre.	Percent	Fre.	Percent
20/40	41	89%	37	80%
20/50	1	2%	4	9%
20/60	1	2%	2	4%
20/70	3	7%	3	7%
Totals	46	100%	46	100%

Two facts are evidenced in these tabulations:

(1) Most states impose a minimum static visual acuity standard of 20/40.

(2) Little difference exists in corrected vs. uncorrected standards. Only four states differ in this regard, lowering acuity standards where visual correction is required.

The majority of states apply the same static visual acuity standards of 20/40 required by the Bureau of Motor Carrier Safety (BMCS). In only four states, however, are these requirements limited only to heavy vehicle operators. There is no apparent reason for altering visual acuity requirements under classified licensing.

Visual Field

Arizona does not currently test for visual field nor impose any requirement with regard to size of visual field. However, it is our understanding that a test of visual field will be introduced into the vision screening process in the near future. What standard is being considered has not been announced. Research cited in the previous report (Arizona Driver Licensing for the '90s") showed that drivers with field loss in both eyes had twice the number of accidents and three times the number of convictions as drivers with normal vision, given the same age and sex. Whether this statistical finding is sufficient to justify withholding the license from drivers suffering field loss is debatable. Despite the greater accident rate of drivers with reduced visual field, the majority are still without an accident in any given year.

Requiring truck and bus drivers to possess a normal visual field before being allowed to conduct business in an oversized vehicle on public highways is less likely to be challenged than is requiring the same of all drivers. As of 1980, 14 states imposed visual field standards on operators of heavy vehicles. The most common requirement is for a visual field of at least 70° in each eye, 140° total. Such a standard tolerates a 40°-50° decrement from the normal field of 180°-190°.

Because of the time and cost involved, we would hesitate to recommend introducing a test of field into the visual screening process. However, if the test is going to be administered anyway, we have no hesitation in recommending that the results be used to prohibit operation of trucks and buses by a driver whose total visual field is less than 140°.

Monocular Drivers

A related issue is that of drivers lacking vision in one eye. As of 1980, some two states denied truck/bus operator's licenses to monocular drivers. Such drivers are also prohibited from operating in interstate commerce by the Bureau of Motor Carrier Safety.

A study cited in our earlier report did not find monocular drivers to have any higher accident rate than normally sighted drivers provided vision in the good eye was normal. Our own research disclosed no differences between binocular and monocular drivers with respect to everyday driving. This research did find that monocular drivers as a group cannot see as clearly as binocular drivers and must be approximately 10% closer to signs in order to read them clearly. However, many binocular drivers could not see as clearly as the average monocular driver. In view of a lack of evidence suggesting that monocular vision is a hazard, we can see no justification for denying a license to operate heavy vehicles to any monocular driver. The states that do not issue heavy vehicle licenses to monocular drivers do so not because of any offical ruling that such drivers are hazardous but simply because they have adopted Federal Motor Carrier Safety regulations in toto.

KNOWLEDGE

Operation of heavy vehicles demands specialized knowledge. The different knowledges involved in operating straight trucks, buses, and tractor-trailers will be discussed, along with the special knowledge requirements introduced when these vehicles are used as school buses or emergency vehicles or to transport hazardous material.

Truck and Bus Operators

A special knowledge requirement for operating trucks and buses was described earlier in the discussion of classified licensing. The requirement is one of the reasons why truck and bus operation was recommended for a separate class of license. Knowledge requirements for operation of trucks and buses include the following:

- o Preoperative inspection--The size and construction of trucks and buses makes inspection particularly important

- Maneuvering--The length, construction, and handling characteristics make stopping, backing, turning, and other maneuvers a more complicated process

- Clearances--Because of the height and weight, a truck requires greater clearance in front, back, and overhead

- Speed--The greater mass of the truck affects the control of speed particularly on hills and curves

- Rules of the road--There are a number of laws that apply particularly to trucks and buses

- Emergencies--A variety of certain techniques are required in handling emergencies, particularly those resulting from equipment defects (e.g., loss of brakes)

- Driver requirements--Requirements pertaining to the physical and mental conditions of truck and bus drivers are set forth in local, state, and federal regulations

- Vehicle requirements--State requirements (construction, safety equipment, and documentation of trucks and buses)

- Passengers and Cargo--Regulations and practices to insure the safety and security of passengers and cargo

Tractor-trailer Operators

The recommended classification systems distinguish between drivers of buses or straight trucks on the one hand and tractor-trailer drivers on the other. This distinction is based, in part, on distinct knowledge requirements. These include:

Backing--Articulation between tractor and trailer changes backing procedures

Emergencies--Presence of a trailer creates the possibility of jackknifing

Coupling--Coupling tractor and trailer is a unique operation necessitating use of safety precautions to prevent hazards to the public

School Bus Operators

Should Arizona create a school bus operator endorsement, applicants for the endorsement will have to be assessed for their ability to meet knowledge qualifications. Since driving a school bus involves relatively few unique skills, it is primilarily knowledges that create a need for a separate license. The unique information requirements include:

- Handling the bus, including steering, turning, backing, maintaining speed
- Operating regulations, including speed restrictions, railroad crossings, lane restrictions, and following distances
- Practices for loading and unloading students, including stopping areas, use of warning signals, observing traffic, and supervising students
- Passenger management, including maintaining discipline, evacuation procedures, and working with bus patrols.
- Special situations, including field trips and transporting physically handicapped students.
- Pre/post trip inspection and operator arrangements.
- Driver mental and physical requirements

Emergency Vehicle Operators

While operation of emergency vehicles demands some special skills, they are not sufficiently greater than those required for Class 1, 2, or 3 operators to demand a separate skill test. The only unique qualifications would be those involving the following subject areas:

Rules of the road--Exemptions from traffic laws

Signals--Proper use of sirens and warning lights

Speed--The relationship of speed to emergency needs and driving conditions

Traffic practices--Interacting with traffic during emergency operations

Contingencies--Techniques for handling such contingencies as vehicle problems and road hazards

Route selection--Selection of special routes for responding to emergencies (to reduce response time, minimize hazard, and avoid disturbance)

Emergency service requirements--Vehicle operation as it relates to loading and unloading the patients, patient safety, and comfort enroute

Communication--Radio communication procedures

Hazardous Materials

The transportation of hazardous materials requires specialized knowledge. One type of hazardous material is that which is inherently hazardous to the public, including materials that are flammable, toxic, explosive, or radioactive. Another category of hazardous materials consists of those that are unstable and can become hazardous if not handled properly, including bulk liquid, livestock, and hanging meat.

Safe operation of these two categories of vehicles requires knowing the hazards they represent, the special precautions needed to transport them safely, and the implications of the materials for safe operation of the vehicle. While most states require special permits and placards for vehicles transporting these materials, only a few impose special knowledge requirements upon drivers. One is California, which requires drivers transporting hazardous materials to demonstrate knowledge of these materials.

Knowledges required for the transportation of inherently hazardous materials include:

- Driver qualifications and operating rules*
- Classification and a definition of hazardous materials/wastes
- Shipping papers/manifests*
- Pre-trip safety inspection of vehicles/loads*
- Inspections of drums, tanks, cylinders, etc.*
- Placarding/marking/labeling
- Unloading/loading/compatibilities*
- Driving and parking rules
- Emergency/incident procedures/notification/reporting.*

Knowledges required of drivers who wish to transport unstable cargo such as bulk liquids include those categories marked with an asterisk in the list above.

SKILL

The skills involved in operating a heavy vehicle involve:

- Acceleration
- Braking
- Coordination of accelerator, brake, and shift level in up-shifting and down-shifting

- Coordination of acceleration and braking
- Achieving and maintaining a specified speed
- Adjusting speed to curvature
- Stopping at a designated point
- Maintaining a straight path
- Maintaining a curved path
- Judging clearance between two objects
- Judging lateral clearance between an object and a vehicle
- Judging overhead clearance
- Selecting appropriate gaps for entering or crossing traffic
- Applying brakes to the maximum degree without locking wheels
- Steering sharply around objects to avoid a collision

Except for judging overhead clearance, the list of activities requiring special skills is the same as that for any vehicle. What is different is not the activities themselves but the specific skills involved, which differ because of the vehicle control stystem, size, and weight.

PHYSICAL CONDITION

Almost all drivers bringing heavy vehicles into Arizona from other states are engaging in interstate commerce and are therefore subject to the physical qualifications imposed under federal motor carrier safety regulations (FMCSRs). These regulations are intended to assure that the physical characteristics and health of drivers operating heavy vehicles in interstate commerce is such as to assure that they can operate safely. Drivers having conditions that would threaten the safety of operation are prohibited from driving. In the case of certain physical handicaps, such as amputation of a limb, drivers may seek waivers from a particular physical standard by demonstrating their ability to operate safely through a road test.

The physical qualifications of drivers operating entirely within the state is subject only to state requirements. All states require initial applicants for a heavy vehicle operator's license to meet certain established standards of physical condition (exclusive of vision), and most exclude applicants with a history of certain disorders or functional disabilities, i.e., epilepsy, loss of limbs, etc. One of the following three mechanisms is currently employed by states in ascertaining the physical "fitness" of applicants:

> Certificate--of health furnished by physician. In some instances, a standardized form is used.

Questionnaire--oral or written, detailing the applicant's health history.

Inquiry--as part of the application process, wherein applicants are asked to indicate their general health.

Information descriptive of physical health requirements was obtained from 33 of the 46 states issuing licenses for the operation of heavy vehicles. The frequency with which each of these three mechanisms is employed is provided in the table below.

HEALTH SCREENING MECHANISMS

Method	Frequency	Percent
Certificate	11	33%
Questionnaire	18	55%
Inquiry	4	12%
	33	100%

In only 11 states are applicants for heavy vehicle operator licenses required to furnish proof of physical fitness. And, only three states require certificates of all heavy vehicle operators (California, Hawaii, and Nebraska). In the remaining states, applicants could easily conceal physical problems for visual deficiencies not revealed by the vision tests given for licensing.

TESTING

If the need for specialized qualifications forms one of the bases for a classified license system, then an assessment of those specialized qualifications is an obvious requirement. However obvious it may be, not all states with a classified license system require drivers to demonstrate they possess the requisite knowledges and skills. Without such a requirement, a classified license system is little more than a revenue gaining measure.

Tests measuring those knowledges and skills enumerated earlier in the discussion of qualifications need to be developed and administered to all applicants for Class 1 and 2 licenses. Since the two classes demand somewhat different knowledges and skills, separate tests need to be prepared.

KNOWLEDGE TESTS

Of the 31 states with classified licenses, 22 require applicants for heavy vehicle operator licenses to pass written tests addressing such topics as traffic laws, safe driving practices, and operating procedures peculiar to heavy vehicles. The following analysis of these practices is obtained from information supplied by 45 of the 46 states issuing either classified or chauffeur's licenses for the operation of heavy vehicles. The information is taken from a report by McKnight, Kelsey, and Edwards (1984).

Specific test characteristics examined included:

- Methods of administration
- Length
- Content

Test Administration

In recent years, states have begun to replace pencil-and-paper knowledge tests with testing machines which permit both the automatic administration and scoring of knowledge tests. For the most part, use of testing machines continues to be restricted to larger metropolitan areas where the volume of applicants is greatest. Few states have converted entirely to automated testing. Many use a combination of automated and manually administered knowledge tests. This is reflected in the table below.

METHODS OF TEST ADMINISTRATION

Method	Frequency	Percent
Automated	1	2%
Manual	24	53%
Combined	20	45%
	45	100%

This continuing trend toward the increased utilization of automated knowledge testing equipment is evidenced in those usage rates reported in the 1977 "Comparative Data and Analysis in State Motor Vehicle Administrations," published by the American Association of Motor Vehicle Administrators. During 1977, 36% of the states were employing automated testing equipment, as compared to 45% in 1981.

The reasons given for use of automated test equipment include:

Reduced Manpower--The use of automated testing equipment reduces the manpower required to score tests.

Information Feedback--Most automated test equipment is capable of supplying correct answers to applicants after they have completed answering questions. In addition to providing information, this feedback reduces the examiner time required in justifying tests to applicants.

Reduced Testing Time--Most testing machines terminate testing whenever the applicant misses the maximum number of items permissible, thereby conserving available time for other applicants. Some computerized systems provide a method of "adaptive testing" in which the applicant's pattern of responses can be used to greatly reduce the number of questions that must be asked of certain applicants.

Test Length

The number of items contained in states' tests of chauffeur and heavy vehicle operator knowledge provide one measure of the time made available for knowledge testing. Perhaps more important, they provide an index of the extent to which heavy vehicle operators are required to demonstrate knowledges beyond that required of other applicants, e.g., the greater the number of items, the more in-depth the test.

An analysis of knowledge test length is provided in the following table for the 43 states providing this information.

KNOWLEDGE TEST LENGTH

No. of Questions	Frequency	Percent
10 - 15	4	9%
20 - 25	25	58%
30 - 35	6	14%
40 - 45	5	12%
50+	3	7%
	43	100%

The modal length of existing knowledge tests is in the range of 20-25 questions, although 33% of states currently administer a longer test.

Test Content

An analysis of knowledge test content was performed on tests supplied by 32 States whose written tests encompass heavy vehicles (not just states having classified licensing). The content areas, in order of decreasing frequency of test items, appear in the table below.

KNOWLEDGE TEST CONTENT

Content Area	Percent of Total
Traffic Laws, Signals and Markings	49.0%
General Traffic Safety	21.0%
Vehicle/Equip. Regulations	15.0%
Safe Operating Practices	13.0%
Licensing Laws & Regulations	3.0%
Consumer Information	.5%
Prelicensing Requirements	.4%
Testing Requirements	.2%

These results clearly indicate that the bulk of existing knowledge test content is devoted to topics addressing the legal requirements for operating a motor vehicle. When combined with items examining the applicant's knowledge of (1) licensing laws/regulations, and (2) vehicle/equipment regulations, such items constitute about 65% of existing test content.

It is of interest to contrast these findings with those from previous research regarding the knowledge possessed by novice and experienced drivers (McKnight and Edwards, 1978). As part of this study, certain subgroups of drivers were administered knowledge tests which concluded novice and experienced drivers were most deficient in their knowledge of safe operating practices and least deficient in their knowledge of traffic laws. Approximately 90% of the drivers in both sample groups correctly answered questions related to traffic laws, signs, signals, and markings, as compared to 80% for those questions addressing safe operating practices. Given that only 13% of items sample such knowledges (approximately 4 items on a 30-item test), it would appear that present testing practices inadequately examine the driver's knowledge of this topic area.

Tailoring Knowledge Tests

Applicants for Class 1 and Class 2 licenses need only be required to pass a written test sampling those knowledges that are critical for safe operation of the vehicle they wish to operate. Tests could be tailored to different categories of applicants by being divided into three parts as follows:

> Driver Test--Laws and the safe driving practices covering operation of all vehicles.
>
> Truck/bus Test--Laws and the safe driving practices for operation of trucks and buses.

Tractor-Trailer Test--Laws and the safe driving practices covering tractor-trailers.

Dividing the test into three parts allows tests to be adapted to the needs of individual applicants as follows:

APPLICANT	TEST		
	DRIVER	TRUCK/BUS	TRACTOR/TRAILER
Resident with Class 3			
Seeking Class 1		x	x
Seeking Class 2		x	
Resident with Class 2			
Seeking Class 1			x
Transfer (all)			
Seeking Class 1	x	x	x
Seeking Class 2	x	x	

Operators Manual

The report prepared and submitted under Task I explains the importance of providing a manual to allow applicants to prepare for written tests. Indeed, the almost sole purpose in giving a written test is to provide an incentive to applicants to read manuals and acquire the knowledges they are intended to impart.

A Truck Operator Manual (TOM) and Truck Operator Knowledge Examination (TOKE) meeting the knowledge requirements for truck and bus operators was prepared and submitted to the MVD as a part of Task 1. The TOKE includes 88 items that have been shown through earlier study to distinguish levels of knowledge among applicants for truck operator's licenses. The item pool may be divided into two 44-item test forms. The availability of these two forms will allow those who have failed an examination to be given different test forms, thereby preventing applicants from passing the test simply by learning the answers to questions they have missed.

The special requirements of tractor-trailer drivers are dealt with in the TOM. Creating a separate manual for tractor-trailer drivers would incur unnecessary cost and add unnecessary complications to the distribution of materials. An additional eight items were provided in the TOKE, four of which could be added to each test form. Only tractor-trailer operators would be required to take the form containing tractor-trailer items.

At such time as different license classes are created for truck and bus operators and for tractor-trailer operators in Arizona, additional items dealing with the Arizona-specific content of the manual would have to be added to the Truck Operator Knowledge Examination.

SKILL TESTS

In addition to demonstrating their knowledge of laws and safe driving practices for operating heavy vehicles, applicants for Class 1 and 2 licenses should be required to demonstrate their possession of the skills that were described earlier in the discussion of qualifications.

The evaluation tests given to assess skill are widely believed to measure safe operating practices as well as skill. Certainly many of the driver performances that are assessed on road tests involve practices rather than skills, examples being use of turn signals and mirror checks. However, there is evidence from a number of sources that safe operating practices provide indirect measures of skill in that applicants who lack operating skill must divide their attention between controlling the vehicle and applying safe operating practices, with resulting lapses in the latter. Several studies have shown significant correlations between measures of operating skill and the safe operating practices (McPherson, McKnight, and Knipper, 1978; McKnight, and McPherson, 1981; McKnight, Kelsey, and Edwards, 1984).

The same analysis of state practices that covered knowledge testing also evaluated practices in assessing skill tests for operators of heavy vehicles. Skill tests were assessed with respect to the following:

Routes--Utilization of different test routes for heavy vehicle operators as compared to others.

Testing Time--The amount of time (in minutes) devoted to skill testing.

Testing Mode--The utilization of on-street and off-street skill measures in the assessment of heavy vehicle operator skills.

Test Content--The performance used to assess skill.

Pre-Trip Inspection--As part of the examination process.

Routes

A majority of states (62%) utilize common test routes for conducting all on-street skill testing activities. Only 38% employ a separate on-road test route for heavy vehicle operator applicants.

The use of a single test route for administering all skill tests would appear to have a number of disadvantages from the standpoint of adequately assessing applicant performance abilities. Previous research in the development of motorcycle and automobile skill tests has shown a need to tailor on-road test routes to specific vehicles to ensure that unique skills can be assessed within the test route. Such also would be the case for heavy vehicles. For example, a skill unique to the operation of

articulated heavy vehicles is proper positioning of the vehicle during right-hand turns in order to prohibit other right-turning traffic from passing between the vehicle and the curbline and yet not get so close to the curb as to strike it. No such skill requirement exists for passenger vehicles, and it wouldn't be as important to include several right turns in most test routes designed to accommodate the testing of applicants in other types of vehicles.

Test Administration Times

The amount of time devoted to the on-road assessment of applicant skills was provided in information supplied by 30 states presently issuing Chauffeur's and classified licenses. A distribution of these times is provided in the table below. The times depicted are the total in- vehicle testing times for heavy vehicles only.

APPROXIMATE LENGTH OF SKILL TEST

Time in Minutes	Frequency	Percent
Less than 15	2	6.6
15-20	13	43.3
21-30	10	33.3
31-45	2	6.6
Greater than 45	3	10.0

As is apparent, the vast majority of states devote 15 to 30 minutes to on-road skill testing. The time includes any time required for applicant briefing and debriefing by the examiner. A test of approximately 30 minutes has been found to be sufficient to permit a reliable and accurate assessment of applicant skill.

Testing Mode

According to Tirtsch and Kumbar (1980), 25 of the 31 states having classified licensing reported on their testing practices. Of these, 18 or almost three-quarters confined heavy vehicle operator testing to public streets and highways. Five (20%) used a combination of off-street and on-street testing, while the remaining two used either mode depending upon where the test was given. It should be noted that "off-street" testing often involves no more than limited maneuvering in a parking lot prior to going out on a street. Moreover, off-street testing appears to be dying out as fewer and fewer off-street facilities are available. Since road testing is the predominant outcome, further discussion of skill testing will be confined to road tests.

Test Content

On-road skill tests are devoted almost exclusively to assessing the applicant's ability to engage in safe operating practices. The following list of performances assessed in on-road tests is compiled from examiners manuals furnished by 18 of the states having classified license systems.

PERFORMANCES TESTED ON-ROAD

		Frequency	Percentage
1.	RIGHT TURN	18	100%
2.	LEFT TURN	18	100%
3.	SIGNALING	17	94%
4.	SPEED AND BRAKING	16	89%
5.	STARTING	15	83%
6.	USE OF GEARS	15	83%
7.	TRAFFIC SIGNALS	14	78%
8.	FOLLOWING	14	78%
9.	STOP SIGNS	13	72%
10.	ROAD POSITION	13	72%
11.	HILL STOP AND START	13	72%
12.	APPROACH INTERSECTION	11	61%
13.	BACKING	11	61%
14.	MIRROR USAGE	10	56%
15.	PASSING/BEING PASSED	9	50%
16.	PARALLEL PARKING	6	33%
17.	TRAILER BRAKING	5	28%
18.	DOCK PARKING	5	28%
19.	RAILROAD CROSSING	3	17%
20.	CURB PARKING	2	11%
21.	QUICK STOP	1	6%

Pre-Trip Inspection

Because of the extent to which vehicle defects are involved in heavy vehicle accidents, a few states include in the testing process an assessment of the applicant's ability to conduct a pre-trip inspection (not to be confused with an inspection by the examiner to make sure the vehicle is safe to ride in). The states that do not provide a pre-trip inspection test do cover such inspections in their manuals and knowledge tests, describing the nature, symptoms, and consequences of vehicle equipment failures as well as procedures for pre-trip inspection. However, performing a thorough pre-trip inspection adds at least 15-20 minutes to a skill test. Moreover, all that can be tested is the applicant's knowledge of what checks to make. Whether applicants can actually recognize defects cannot be ascertained except those parts that happen to be defective at the time of the examination. For these reasons, the majority of license administrators do not feel a pre-trip inspection test is worth the time involved.

Test Vehicle

It would appear appropriate that applicants for a heavy vehicle operator's license be required to take a test in the type of vehicle for which a license is sought. Applicants seeking a license to operate vehicles over 24,000 pounds (Class 2) would be required to take the test in a vehicle exceeding that weight. Those seeking licenses to operate combination vehicles (Class 1) would take the test in a combination tractor-trailer. Unfortunately, many states allow applicants for truck/bus operator licenses to take their tests in an ordinary van, or applicants for tractor-trailer licenses to tow a small utility trailer.

Of the 31 states having classified license systems, 26 supplied information concerning the vehicle in which a skill test must be taken.

Within these 26 states, about a fourth made no attempt to define the type of vehicle in which the test must be taken, half required that it be taken in a suitable vehicle (without defining what "suitable" is), and a fourth specified the minimum size of the test vehicle.

Drivers taking tests in vehicles representing the minimum weight of the license class would, of course, be allowed to operate much heavier vehicles. The only way to prevent this would be to require drivers to take tests in vehicles representing the maximum size that they intended to operate. Drivers intending to operate tractor-trailer combinations 60 feet in length and weighing up to 80,000 pounds would have to take the test in such a combination. Unfortunately, this is not practical. It would require some way of entering on the license the weight of the vehicle in which the test was taken. Moreover, applicants would have to know in advance the maximum size vehicle they intend to operate or return for a road test each time they stepped up to a larger vehicle.

While allowing drivers to take tests in the minimum size vehicle for which they are qualified is not perfect, it is certainly better than leaving the size of the vehicle unspecified.

Test Procedures

States typically give very little guidance to examiners on procedures to be employed in administering tests. Generally, examiners are provided a checklist identifying the performances to be assessed. Some checklists identify specific errors such as "failed to signal", or "took corner too wide". Others allow examiners to rate applicants on how well they carried out a particular performance. Most state road tests lack well-defined criteria of acceptable performance. As a result, there is a lot of room for judgment in evaluating applicant performance.

Research carried out by the National Highway Traffic Safety Administration has studied ways of making road tests more reliable and equitable. The results of these studies have pointed to the importance of the following steps:

- All scoring of applicant performance should be made at predetermined checkpoints selected as the places where specific performance is most likely to occur. Examiners who are allowed to score anything they see, where they see it, tend to see rather different things.

- Examiners should score applicant performance against very specific criteria of what is correct and what is incorrect. Allowing examiners to subjectively rate applicants on how well they perform leads to an unreliable test.

- All road test routes should consist of a specified number of checks consisting of the same array of performances and scored over roughly equivalent roads.

Test Facilities

As noted earlier, very few states administer off-road skill tests to heavy vehicle operators. Where off-street tests are administered, a paved area suitable for test administration is usually already available. Where tests are administered on the street, the only facilities needed are areas where applicants may park their vehicles while completing the paper work. The problem of providing parking can be handled in either of two ways:

- Administering heavy vehicle operator tests only at selected licensing stations where sufficient parking is available and where neighboring streets and highways are suitable for administration of road tests

- Completing paper work at one time and making appointments for later administration of road tests at facilities remote from the licensing station, such as a state-owned parking lot or fairground.

As noted earlier in the discussion of costs, administration of a skill test to heavy vehicle operators does not impose a requirement for facilities beyound those generally available to licensing agencies.

Examiner Training

Owing to the lack of extensive documentation, it is not possible to identify the procedures used to train examiners to administer heavy vehicle operator license tests. Most states simply turn trainees over to experienced examiners who explain the test and monitor test administration. A number of states contract with truck driver training schools to instruct examiners in proper vehicle operation.

Probably the best documented training program is that provided as part of the Truck Operator Road Test (TORT) developed by the National Highway Traffic Safety Administration. To administer the TORT, a program for chief examiners would require approximately three days and would include the following topics:

Background

- Purpose of road testing

- Requirements for valid and reliable road testing

Road test procedures

- Performances tested

- Pass/fail criteria

- Common driver errors

- Administrative and scoring procedures

Route selection

- o Preferred locations
- o Assembling a route

Practice administration

- o Single unit vehicle
- o Tractor-trailers

A program for individual road test examiners would require two days and would be limited to road testing procedures and practice administration.

In some states, training examiners in giving road tests for heavy vehicles amounts to little more than teaching them how to drive the vehicles. However, being able to drive a heavy vehicle no more qualifies an examiner to test heavy vehicle operator license applicants than being able to drive an automobile qualifies them to give the standard automobile road test. The skills involved in giving a road test are quite different from those involved in operating a vehicle.

Eight states require that their examiners be licensed to operate the vehicle in which road tests are given, largely on the grounds that the examiner must be able to drive the vehicle if the applicant proves unable to do so safely. However, because of possible liability, most states prohibit examiners from getting behind the wheel of an applicant's vehicle.

EXEMPTION

Almost all states exempt certain categories of applicant for heavy vehicle operator licenses from the road test requirement. Other aspects of the testing process--written tests, vision testing, and health screening--are typically required of all applicants.

The basis for exempting drivers from the road test is evidence that the applicant has already demonstrated the necessary skills. The three primary forms of exemption are:

> Reciprocity--Exempting applicants who have been previously licensed by another state to operate the type of vehicle for which a license is sought.
>
> Employer Certification--Exempting applicants whose employers certify to their operating skills.
>
> School Certification--Exempting applicants who have completed an approved heavy vehicle operator training program and demonstrated requisite skills for an end-of-course test.

Exempting qualified applicants from a road test requirement offers potential advantages to both the licensing agency and the applicants. For the licensing station, it eliminates the most costly and time-consuming element of the licensing process. Moreover, it can virtually eliminate the initial wave of applicants that would occur when a classified licensing system is first implemented were it necessary to test all drivers.

For the applicants, exemption eliminates the inconvenience of having to obtain access to a heavy vehicle for testing purposes and the time that would be required to take the test, particularly when license facilities are overloaded.

RECIPROCITY

While all drivers are typically required to take a written test on state laws and regulations, those drivers who currently hold valid heavy vehicle licenses from other states are generally granted an exemption from the road test. To be eligible for exemption, out-of-state drivers are generally required to hold the same category of license that they are seeking. Drivers seeking to operate tractor-trailers in Arizona would have to hold a license which qualified them to do so in another state.

Some states require that the vehicle criteria employed by the state from which applicants are transferring should be approximately the same as theirs. For example, if Arizona adopted the 24,000 pound weight threshold that was suggested, drivers seeking a Class 2 license would have to have gotten their current Class 2 license from a state having the same or higher threshold. This way, it can be assumed that the applicant has demonstrated the ability to operate the vehicle for which the license is sought.

Before exempting applicants from a road test, some states examine the road test procedures employed by other states and only give exemptions where the procedures are similar. It is hard to see the justification for this. The road test given in the original state was simply to allow the applicant access to the public highway. Drivers who held their license for any appreciable period of time have certainly acquired at least the minimum acceptable operating skills; the test by which they qualified is no longer relevant. What is important is making sure that the vehicle the driver has been licensed to operate is of the same type and size as that for which a license is sought.

EMPLOYER CERTIFICATION

Several states authorize employers to administer training and/or road tests to employees who operate heavy vehicles and offer a certificate to that effect in lieu of road testing. In some of the states exemption is only extended to certain categories of employers or drivers.

Prevelance of Employer Certification

The most recently published report of employer certification is that prepared by Tritsch and Kumbar (1980). Their tables list 18 states as permitting employer certification. However, some states now known to have employer certification do not appear in the list while some states listed as having employer certification do not presently provide for it. Still, the Tritsch and Kumbar data provide the best estimate of the proportion of states allowing employer certification.

In states providing for employer certification, the percent of applicants taking advantage of it varies widely. In discussions with state officials, estimates of use range from about one-third to 90%. The extent to which certification is used depends somewhat upon how well it is known and understood by employees. This in turn depends upon how long it has been in existence and how well it has been publicized. In Utah, for example, introduction of employer certification drew almost no response until it was actively marketed among employers. In one year, the percent of drivers being certified rose from almost zero to about 60%. With adequate publicity, it is likely that the overwhelming majority of applicants for heavy vehicle operator's license in any state will be employer certified.

Employer Certification Requirements

Employer certification rests on the assumption that employers are as able to assess the skills of their employees as are license examiners. The validity of certification depends upon the ability and willingness of employers to do so.

It is obviously unwise for any licensing agency to count on an employers to have either the opportunity or motivation to ascertain the operating skills of their employees. It is likely that many employers have had little opportunity to observe the driving of their employees. And, there are undoubtedly employers who prefer to trust to their insurance rather than employee assessment to protect them. To assure that drivers are qualified, employers can be specifically required to (1) administer a test

as comprehensive as that given by the licensing agency, (2) establish scoring standards that assure that tests are given validly and uniformly, and (3) certify only those who demonstrate the requisite skills.

Of the certification procedures reviewed, those of California appear to be the most rigorous in attempting to assure the qualifications of new drivers. Provisions of the California system are:

> Road Testing--Before they may certify employees, employers must administer a road test that includes a pre-trip inspection, putting the vehicle in operation, using the vehicle controls and emergency equipment, operating in traffic, turning the vehicle, braking and downshifting, backing and parking.
>
> Employer Ownership--In addition to employing the driver, the organization certifying an applicant must own the vehicles that the employee will drive. An employer cannot certify a driver that operates someone else's vehicles.
>
> Employer Statement--Before being authorized to certify employees, employers must submit their qualifications to the Department of Motor Vehicles. Only certificates from approved employers will be accepted.
>
> Follow Up--Employers may be visited at any time without notice and asked to provide records documenting information provided in their statements. Falsification of records can result in penalties.

Copies of the employer forms appear as an appendix to the report.

Endorsement Certifications

As mentioned earlier, California requires endorsements for drivers transporting hazardous materials, hazardous wastes, and bulk liquids. Employers are permitted to certify employees for any or all of the endorsements. The requirements imposed upon employers and employees for endorsement of certifications are those just described in connection with road test certification. Employers seeking to issue certificates must, in their employer statement, identify the types of endorsements they wish to certify. This allows the Department of Motor Vehicles representatives making spot checks to know what types of records an employer should be expected to have on hand.

SCHOOL CERTIFICATION

At least one state permits approved heavy vehicle operator training schools to certify the performance of their students on road tests in lieu of a road test administered by the licensing agency. Kansas allows instructors in state vocational schools to administer a road test to heavy vehicle operators. However, the same certification is also authorized for teachers of high shool driver education courses.

The advantages of school certification are largely the same of those of employer certification--easing the test administration burden for the licensing agency and making testing more convenient for applicants. However, all of the safeguards just mentioned with respect to employer certification must be applied to schools in order to assure that applicants are indeed administered a valid and reliable test, and not automatically issued certificates. There is one additional requirement that can be extended to schools and that is that certification be based not only upon the nature of the road test but the school curriculum as well. Employers of training programs considered inadequate to assure the qualifications of drivers need not be certified.

In many states, the regulation of commercial truck driving schools is already exercised by the motor vehicle department. Since most schools will wish to be able to certify graduates, the certification process provides an additional means of assuring the quality of commercial schools.

In many localities, road test examiners will journey to school facilities to administer road tests to graduating students. This affords the students some of the convenience of school certification while also allowing examiners to process students at a greater rate than would be the case if the same students had to come to the licensing station.

SUMMARY

This report has provided a state-of-the-art description of classified licensing across the country. The following is a summary of key findings:

1. The high involvement of heavy vehicles in serious motor vehicle accidents, along with the special skills demanded by heavy vehicles, has led to the creation of separate license classes for operators of these vehicles.

2. At present, 31 states classify vehicles into three size categories: passenger vehicles, straight trucks and buses, and tractor-trailers.[1]

3. The most common distinction between passenger vehicles and heavy vehicles is on the basis of weight. The single most common weight threshold is 24,000 pounds, employed by eight states.

4. Endorsements to the basic license class are required in various states to operate motorcycles, school buses, emergency vehicles, and vehicles transporting hazardous materials.

5. A few states which have low weight thresholds exempt from a heavy vehicle operator's license individuals seeking to operate recreational vehicles and/or farm vehicles exceeding the weight threshold. In most states, the weight threshold is sufficiently high to obviate the need for exemption.

6. Most states implementing classified license systems avoided an initial wave of applicants by gradually phasing in the requirement and waiving road testing those currently employed as heavy vehicle operators.

7. Dollar costs for implementation and operation of classified license systems are unavailable. Implementation costs include those involved in (1) working with other agencies to introduce the system, (2) developing licensing tests and procedures, (3) preparing manuals, tests, and other materials, and (4) modifying driver license record systems. Where employer/school certification systems are employed, operating costs are believed to be minimal.

8. Most states license heavy vehicle operators at age 18, with the minimum age for an operator's license being age 16. Six states specifically require at least a year of experience.

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[1] In two states, the largest vehicle is specified in terms of weight rather than articulation.

9. Most states require a minimum of 20/40 visual acuity. In addition, 14 states impose visual field standards, the most common being a minimum of 140°. Two states deny licenses to monocular heavy vehicle operators.

10. While 11 states require health screening of certain categories of drivers, only 3 impose the requirement on operators of all heavy vehicles.

11. Of the 31 states requiring classified licenses, 22 require a special heavy vehicle operator written test.

12. All of the states having classified license systems require skill tests. Three-quarters of the states administer only road tests, while the remainder issue off-road tests either as an alternative or in combination with on-road tests. Only a quarter of the states specify the size of the vehicle in which the test must be taken. In three-quarters of the states, the test ranges between 15 and 30 minutes.

13. Eighteen states permit employers to certify employees in lieu of a road test. An effective certification program requires encouragement to employers both to utilize the program and to assure valid assessment of employee skill. The one state known to issue a hazardous materials endorsement permits employer certification of the endorsement in lieu of written tests.

14. At least one state is known to permit school certification of drivers in lieu of a road test. In several states, examiners administer written tests and road tests at school facilities.

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