Keeping Up with Big Trucks: Experiences in Washington State

STAN A. MOON

ABSTRACT

Changes in Washington State trucking regulations necessitated by the Surface Transportation Assistance Act of 1982 and attempts to standardize regulations among states are discussed.

Whether the public is ready for it or not, the big truck is here to stay. A concern that must be faced both now and in the future is that there may be more of them and they may get still bigger.

It can be agreed that the truck is a viable means of transporting goods or materials from one point to another. This means transporting raw materials from various areas such as forests, mines, ports, and farming communities to manufacturers and intermodal distribution points. Also of major importance are intrastate and interstate distribution of the manufactured products and final distribution to the user at the local level.

Why is the trucking industry important to Washington State? The Cascade Mountains divide the state into two quite distinct areas. West of the mountains the climate is mild with moderate precipitation. The region supports logging, lumber, pulp mills, wood products, commercial fishing industries, and poultry and dairy farming, the latter being the second largest agricultural business in the state. Puget Sound with its deep-water harbors is a major shipping area and supports such major industries as shipbuilding and the manufacture of aircraft, clothing, furniture, construction materials and equipment, aluminum, and glassware.

Eastern Washington has drier continental weather and greater temperature fluctuations. Vast expanses of previously open grasslands have been developed for agriculture through expanded use of irrigation. Fruits and grains are predominant and wheat is the state's number one agricultural product. Cattle and sheep ranches flourish as well.

These diverse activities of Washington State require an extensive transportation system to market their raw or finished products. The 7,000-mi state highway system as shown in Figure 1 serves this need.

During the past 15 to 20 years trucks have moved more tons of freight than railroads at the national level. In Washington State, however, railroads carried nearly twice as much tonnage as did trucks in 1967. By 1977 that figure had been almost reversed. Rail movement had dropped from 45 percent to 27 percent while truck movement had increased from 24 percent to 43 percent. These comparisons are shown in Figure 2.

This trend reversal is in part the result of railroad abandonments that have decreased the availability of railroad spur lines for the moving of crops from farms to the usual distribution centers.

Washington State Department of Transportation, Transportation Administration Building, Olympia, Wash. 98504.

The increase in the size of trucks has also been a factor. The number of big trucks (tractor-semitrailers or double combinations) increased more than 10 percent from 1972 to 1977 alone.

This increase in the number and size of trucks has presented a number of concerns to the Washington State Department of Transportation (WSDOT) and the traveling public. The primary concerns are the effects trucks have on the safety of the highway system and the life of the pavement structure.

Although existing transportation facilities serve all regions of the state, major movements of people and goods are concentrated within a limited number of travel corridors. These corridors, which are shown in Figure 3, connect principal activity and population centers. These corridors provide for movement of people and goods by various forms and are where most big truck movements are occurring.

The major corridors shown by hachure lines serve two major functions. They serve the interstate trucker making long hauls to and from the Puget Sound region and the intrastate trucker for getting the raw materials to markets or transfer points to rail or water facilities. Corridors west of Interstate 5 are used primarily by the logging industry to get timber to market whereas those east of the Cascades are generally used for transporting agricultural products to market or transfer facilities.

It is recognized that Washington, along with several other western states, may be considered liberal in its treatment of trucks on the highway system. Table 1 gives a summary of regulations for truck size both before and subsequent to the Surface Transportation Assistance Act (STAA) of 1982.

Before 1982 the typical legal vehicle was the semi with a width of 8 ft, which was 0.5 ft less than the AASHTO design vehicle at the time. Doubles could legally operate on the system if the total vehicle length was less than 65 ft. Because the tractor-semitrailer was the typical legal vehicle and also the predominant big truck in the traffic stream, it was considered the design vehicle and conformed to the characteristics of a WB-50.

Through a permit process larger trucks could also operate over the highway system. For general freight handling, annual permits for vehicles up to 75 ft in length, 8.5 ft in width, and with gross vehicle weight of 105,000 lb could be secured. These permits imposed no restrictions on when or where the vehicle could be operated.

For vehicles in excess of the noted limits, special oversize permits could be secured. This type of permit restricted the user's hours of travel, speed limit, and special route to his destination. No absolute maximum length was established by permit.

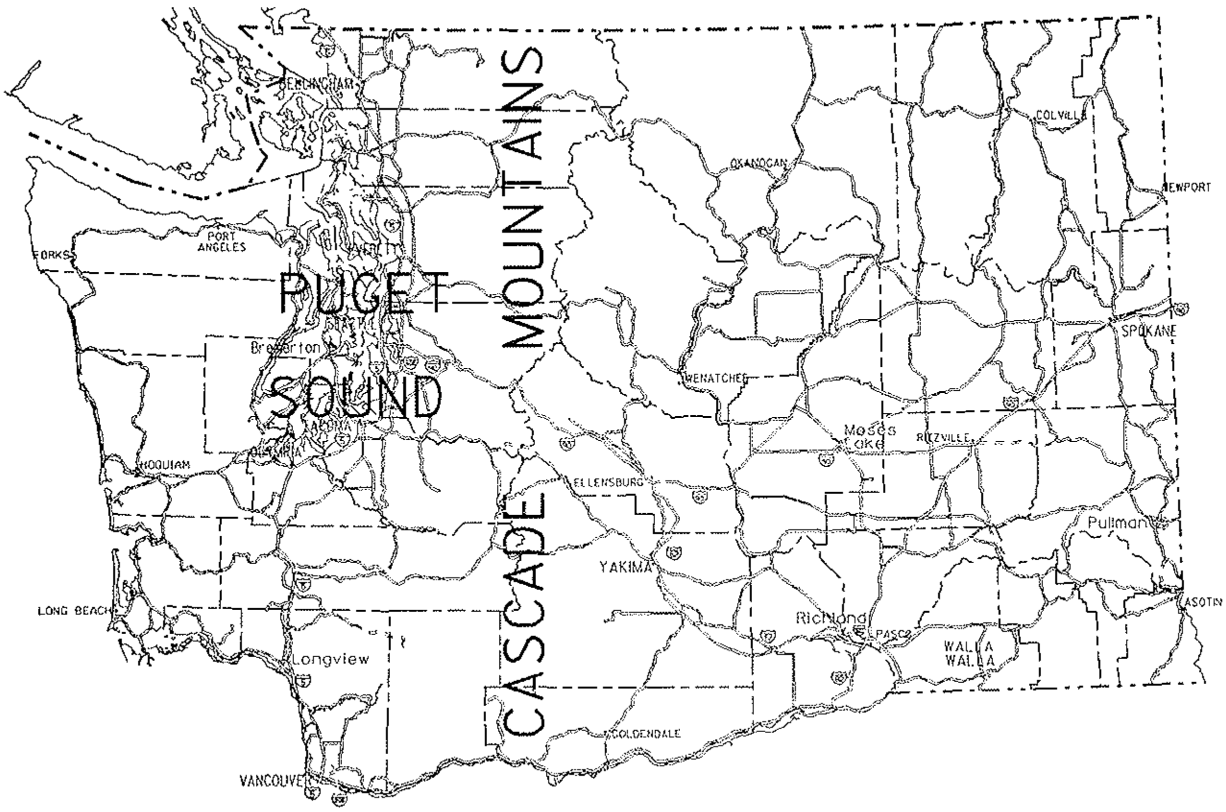

FIGURE 1 Washington State's highway system.

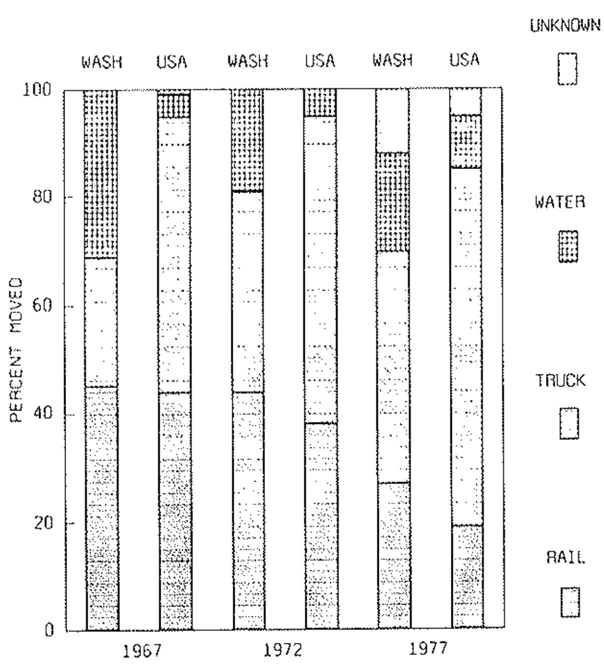

FIGURE 2 Percentage of freight (tons) movement by mode, Washington State versus national (exclusive of pipelines).

Route geometrics established the maximum length and the permissible route.

Classification by truck size on the highway system is not an exact science. The data for vehicle mix and accident rates given in Table 2 will provide at least some insight into their use of the highways.

Trucks heavier than 10,000 lb account for about 6 percent of travel on the urban system, and the rural system has about 9 percent trucks. Overall the mix is about 7 percent. The data in Table 2 indicate that these 7 percent trucks are traveling 12 to 15 percent of the mileage on the state highways.

It is estimated that 1 to 1 1/2 percent of the vehicles on the highway are big trucks (i.e., tractor-semitrailers or double combinations). The percentage of accidents involving big trucks during the 4-year period 1980-1983 ranges from 5 to 6 percent (Table 2). Big truck accident rates are 0.1 per million vehicle miles (MVM) of all vehicle miles traveled and 0.8 per MVM of all big truck miles traveled. The statewide accident rate for all vehicles ranges from 1.5 to 2.1 per MVM. The accident rate for big trucks therefore appears to be about one-half of that for all vehicles.

The surface condition of the roadway appears to play a big part in the big truck accident picture. Figure 4 shows the surface condition at the time of the accident for big trucks. Snow and ice were a factor in 16 percent of all big truck accidents. Wet pavements were evident in another 23 percent of these accidents. An interesting note is that a large number of these snow- and ice-related accidents occur on the best highways, the Interstate system. This is especially true on I-90 as it crosses the Cascade Mountains. Overall, 60 to 70 percent of the big truck accidents during the 1980-1984 period occurred within the previously discussed interstate or intrastate corridors.

There are two other potential safety problems that are not well documented. The first is those cases in which a large vehicle turning right strikes an object outside the roadway because of the offtracking characteristics of the vehicle. The second is when a right-turning vehicle swings wide onto a crossroad to correct for offtracking and strikes a

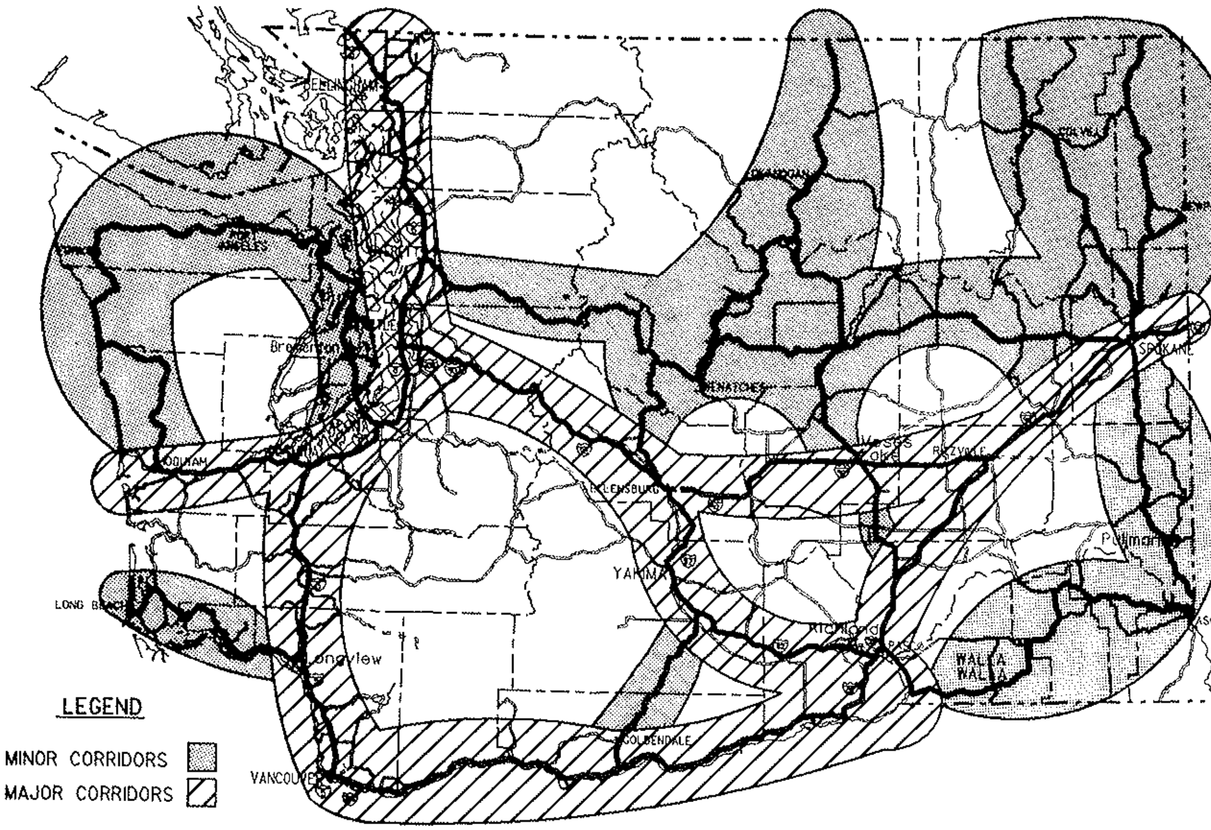

FIGURE 3 Statewide transportation corridors.

TABLE 1 Summary of Washington State's Truck Size Regulations

	Legal Width (ft)	Legal Length of Trailer (ft)	Total Legal Vehicle Length (ft)	Trailer Length by Permit (ft)	Total Vehicle Length Allowed by Permit for General Freight Hauling (ft)
Before 1967	8.0	40	60		
1967-1971	8.0	40	65		
1971-1975	8.0	45	65		73
1975-1982	8.0	45	65		75
1982-1985					
Semitrailer	8.5	48	65	56	75
Double	8.5	59[a]		68[a]	
1985					
Semitrailer	8.5	48	75	67	
Double	8.5	60[a]		68[a]	

[a]Combination vehicle.

TABLE 2 Big Truck Miles Traveled Versus Total Miles Traveled by All Vehicles

Year	Vehicle Miles Traveled by All Vehicles (billions)	Vehicle Miles Traveled by Trucks Heavier than 10,000 lb (billions)	Percentage of Total Miles Traveled by Big Trucks	Percentage of Accidents Involving Big Trucks
1977	15.34	1.87	12.2	
1978	16.50	2.20	13.3	
1979	16.34	2.32	14.2	
1980	16.33	2.39	14.6	6.1
1981	17.48	2.47	14.1	5.1
1982	17.70	2.41	13.6	5.6
1983	18.67	2.33	12.5	6.0

vehicle on the crossroad. It is anticipated that, with more big trucks in the traffic stream, those types of accidents will be more noticeable and therefore better documented in the future.

From the point of view of WSDOT, the 1982 STAA as it relates to big trucks can be summarized as follows:

- 102-in-wide trucks must be allowed;
- A state may grant special use permits for vehicles wider than 102 in.;
- 48-ft-long trailers must be allowed in tractor-semitrailer combinations and 28-ft-long trailers must be allowed in double combinations;
- Truck tractor lengths are not restricted;
- A grandfather clause requires that any trailer length previously legal must not be prohibited; and
- Reasonable access to the Interstate system; Federal-Aid system; terminals; facilities for food, fuel, repairs, and rest; and points of loading and unloading must be maintained.

Because the 1982 STAA required that certain vehicles be allowed to use both the Interstate and the designated primary Federal-Aid system, it became necessary for the states to review their systems to aid in the final determination of what roads they would designate. The approach in Washington State was to look at the system as a whole and review the historical use of the system by these types of vehicles. It was believed that the routes used by larger trucks before the 1982 STAA would be generally the same after the 1982 STAA.

Because the large trucks had been allowed by permit on the system before passage of the 1982 STAA, it was determined that legalizing of them as a result of the 1982 STAA would be little cause for hardship on the system. Except for the truly over-

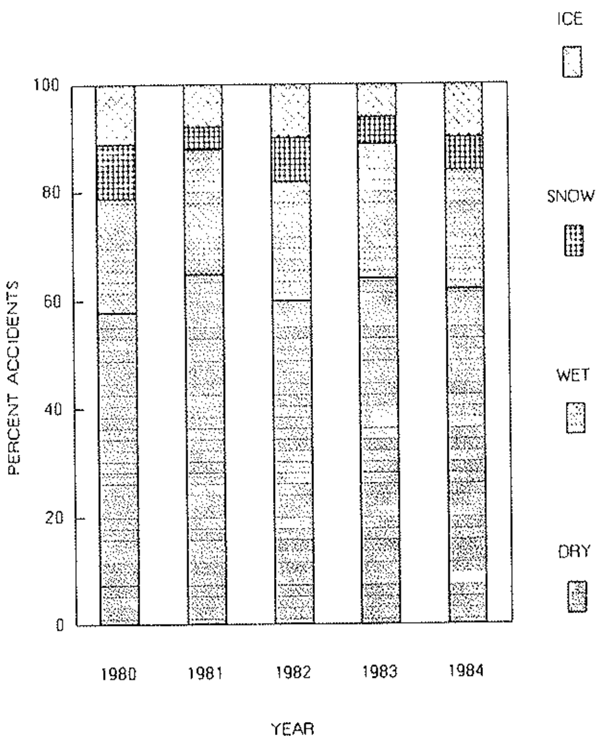

FIGURE 4 Percentage of accidents by surface condition.

sized loads, these vehicles were not restricted from any part of the system before and therefore should not be restricted as a result of the 1982 STAA. For this reason the entire 7,000-mi state highway system was designated and included both primary and secondary Federal-Aid highways.

As a result of the 1982 STAA, width increased from 8.0 to 8.5 ft. Single semitrailer length increased from 45 to 48 ft with no change in total length (Figure 5). Combined length of double trailers was established at 59 ft and total vehicle length was deleted (Figure 6). The legal vehicles in Washington State are the same ones mandated by the 1982 STAA. Through the permit process the trailer on a semi can be increased from 48 to 56 ft and the combined length of trailers on doubles can be increased from 60 to 68 ft. Once again there is no restriction on where these longer permit vehicles can operate. Special permits are still required for oversized loads and include restrictions on time of operation and the route they must take.

Figure 7 shows both total traffic and big truck traffic throughout the state since passage of the 1982 STAA and illustrates that there are some changes. Throughout the state the overall traffic volumes have generally increased about 2 percent per year with some areas seeing as much as a 4 percent increase. Big truck traffic, however, has remained relatively constant during the same period of time on the minor corridors. On the long-haul major corridors the percentage of big trucks has increased by as much as 40 percent along the I-90 corridor (on

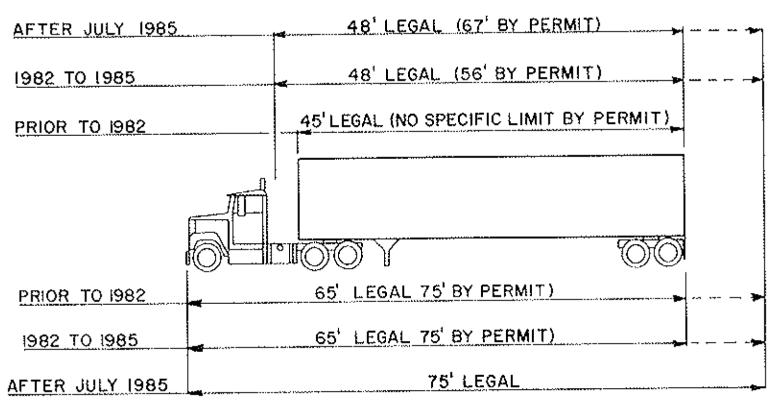

FIGURE 5 Legal and permit semi.

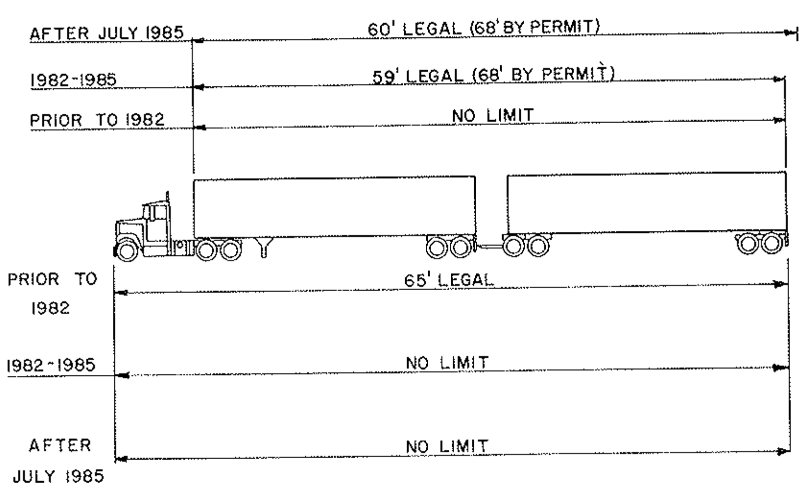

FIGURE 6 Legal and permit double.

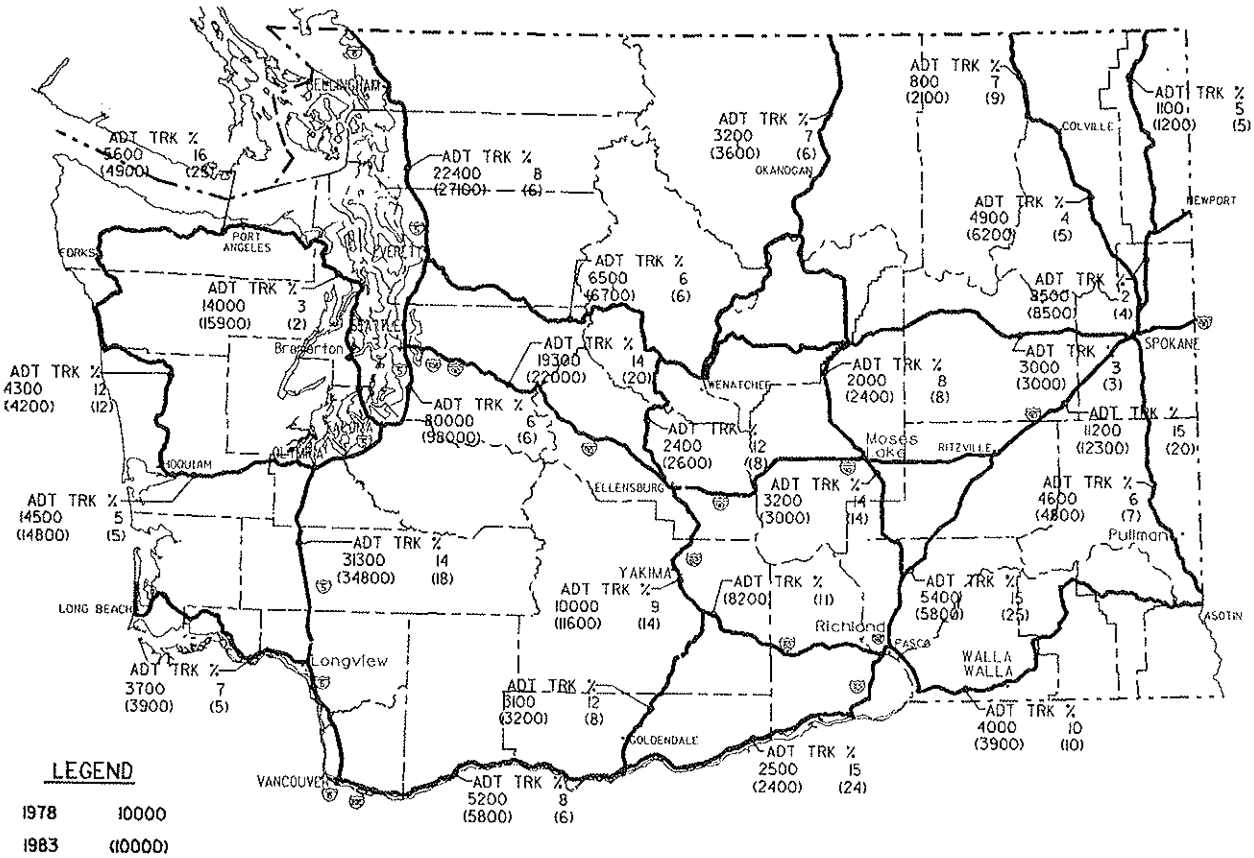

FIGURE 7 Weighted traffic volumes and big truck percentages in statewide corridors.

I-90 at Snoqualmie Pass average daily traffic (ADT) = 22,000 and trucks increased from 14 to 20 percent], 30 percent along the southern I-5 corridor (on I-5 at Centralia ADT = 35,000 and trucks increased from 14 to 18 percent), and 67 percent along the WA-395 corridor (on WA-395 near Mesa ADT = 6,000 and trucks increased from 15 to 25 percent).

As previously noted the larger trucks had been allowed on the system before the 1982 STAA. In general, it was believed that they were using mostly the major corridors that were designed to reasonably high geometric standards. However, because the number of these vehicles is increasing, it has caused WSDOT to take a closer look at even these high geometric standard areas. In the major corridors horizontal alignment on the Interstate roadways meets 80 mph design standards with 12-ft lanes. For the remaining major corridors, with the exception of the Washington side of the Columbia River corridor, 12-ft lanes and good alignment exist.

The minor corridors have at least 11-ft lanes but their alignments vary considerably. Most of these corridors will handle the larger vehicles within the available lane width but there are some isolated areas where tight curves would require encroachment on the adjacent lane to keep the vehicle on the roadway surface.

Strictly on the basis of geometrics, the current Interstate system cannot handle the legal vehicle within the designated lanes at every access point because of the offtracking characteristics of the vehicles. In rural areas the primary problem is the ramp terminal area at the crossroad. In suburban and urban areas ramp curvature comes into play especially on the loop ramps of parclo and cloverleaf interchanges. The cost to upgrade these ramp terminals and interchange ramps just for geometrics to accommodate the 1982 STAA vehicle is estimated at $32 million in 1983 dollars.

In a sampling of the rest of the non-Interstate system in both the major and minor corridors, it was noted that intersection geometrics are the biggest problem area. The cost for upgrading all non-Interstate routes is estimated to be $85 million. It should also be noted that these costs do not reflect any cost for providing access to nearby services. As can be seen, even though the entire system was designated, it was not designated in ignorance of its deficiencies.

Bigger trucks have also created challenges for cities and towns in providing local access to terminal or distribution centers. Generally speaking, truck routes within these localities have been established over a period of time. These routes have provided reasonable access to distribution points. There have always been some tight spots on city streets in the industrial areas. Bigger trucks now require more roadway for making turns because of their offtracking characteristics. Those municipalities that have large concentrations of big trucks are involved in modifying areas along existing truck routes to accommodate the bigger sizes. Intersection widening and increased curb return radii are the majority of modifications. In some cases new truck routes may be established as well.

Since passage of the 1982 STAA there has been little information published that relates specifically to the design characteristics of the larger vehicles mandated by the law. California prepared a study in 1983 that provided guidance for that state. This study determined that the tractor-trailer with the 48-ft box presented the worst case for offtracking and, as a result, offtracking curves for various turning radii were developed. For interim design purposes WSDOT has adopted California's offtracking curves as appropriate design guidance for Washington.

WSDOT has not established rigid criteria for when it will design for large trucks; it is left up to the designer to make a decision based on existing and anticipated land use, traffic volumes, and localized condition. WSDOT has, however, revised its intersection geometric requirements to generally reflect the anticipated use of these larger vehicle types under various conditions. For freeway ramp terminals, the 75-ft right-turn radius has been increased to 95 ft.

There are other areas in which WSDOT is continuing to work to update both standards and the highway system to handle these larger vehicles. Of major concern are the sight distance requirements for negotiating intersections and for stopping as well as passing. Turning roadway widths and approaches to commercial establishments are being reviewed to determine what changes must be made. Storage areas at weigh stations and rest areas are also being studied to determine appropriate turning areas and stall length and angle. Doubles affect length whereas the 48-ft box combination affects angle and turning areas.

Although it would appear that the 1982 STAA would work a hardship on state highway systems, inconsistent laws in adjacent states also work a hardship on the trucking industry. What is legal in one state may not be legal next door. This was true of Washington, Oregon, and Idaho.

Typical areas of concern that have been a detriment to the trucking industry are the legalizing of doubles or triples, the legal weight per tire inch allowed, the combined legal trailer length of doubles, and the total legal length of a tractor-semitrailer.. Table 3 gives differences that exist in Washington and the adjacent states of Oregon and Idaho.

To resolve these differences joint meetings have been held between the DOT staffs of all three states to discuss the standardization of these items in particular. As of late 1984 general agreement was reached on the figures shown in the "Proposed" column. The changes affecting Washington State were introduced in the legislative process and became effective July 28, 1985. Some of these values are in excess of those mandated by the STAA and yet because they were not standardized they continued to create problems. It is expected that this attempt at standardization will smooth the road for trucking firms operating in the Pacific Northwest.

TABLE 3 Regulatory Differences for Big Trucks in Washington, Oregon, and Idaho

	Washington	Oregon	Idaho	Proposed
Triples legal	No	Yes	Yes	NC
Legal weight carried per tire inch (lb)	550	550-600	300-800	600
Combined legal trailer length for doubles (ft)	59	60	60	60
Total legal length for semis (ft)	65	75	75	75
Mobile home transporting (ft)	14	14	17	14 and grandfather for Idaho

Note: NC = no change.

WSDOT intends to continue collecting and monitoring traffic and accident data for the entire system. This should provide appropriate information necessary to identify areas needing attention and what might be done to alleviate any problems that surface. Also on the horizon is high-speed weigh-in-motion (WIM). Its primary purpose is weight enforcement but it appears to have excellent capabilities of providing data on truck type and size. This information will then provide a better data base for determining type, number, and route usage of these vehicles. This information can also be used to help develop accident statistics and lead to possible corrective measures.

Currently WSDOT is participating in the "Crescent Demonstration Project" along with the states of Arizona, California, New Mexico, Oregon, and Texas and the province of British Columbia, Canada. The objective of this project is to develop and implement methods to improve the monitoring of truck usage, including measurements of mileage, size, weight, and speed. Automation of such data gathering will result in more efficient highway planning, design, and management.

Although the future is uncertain, WSDOT expects to keep abreast of the changing conditions and implement updated standards as necessary to keep the big trucks rolling. WSDOT would also expect to take an active role in areas of standardization among the states by suggesting that the steps taken by Washington, Oregon, and Idaho be expanded to include a larger area.