# PERFORMANCE-BASED OVERSIZE AND OVERWEIGHT PERMITTING SYSTEM

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## ABSTRACT

This paper presents a conceptual framework for a federally supervised, state-administered, performance-based oversize and overweight permit program for the operation of heavier and larger vehicles on the public highways. The structure of the permitting system is based on experiences and practices in implementing performance-based systems in Australia, Canada, New Zealand, and the United States. Conceptually, the framework consists of three main interrelated components: administrative, enforcement, and evaluation systems. The administrative system comprises several elements directed at establishing the requirements, standards, and administration of the permitting system. The enforcement system includes regulations, special conditions, education or communication to the industry, effective fines or penalties for violators, and adjudication. The enforcement system will periodically generate records indicating carrier compliance or non-compliance with the terms and conditions of permits and the frequency of these events. The evaluation system defines the data and processes to ensure that the permitting system is continuously evaluated. The results of the evaluation are necessary for revising the performance standards, limits, and conditions for the permitted vehicles. The challenge is enforcement of the performance-based, oversize/overweight, permitting system. Periodic re-assessments of permitted vehicles in addition to continued roadside enforcement of operating conditions is recommended.


## INTRODUCTION

Truck size and weight (TSW) regulations are important in determining infrastructure construction and maintenance requirements and the cost of freight transportation. All states regulate the sizes and weights of trucks operating on the public roads *(1).* Federal and state TS&W regulations define the weight and dimensional envelope into which the truck fleet must fit, and this influences the characteristics of the national truck fleet. While federal law regulates truck size and weight, the states use a varied combination of weight limits. Only seven states apply the federal law directly without any modification or "grandfather right" adjustment. Several recent TS&W studies have generally included options to both increase and decrease Federal TS&W limits, and focused primarily on options to improve productivity through various increases in TS&W limits. The recent TRB Special Report 267, "*Regulation of Weights, Lengths, and Widths of Commercial Motor Vehicles," (2)* provides policy-level recommendations designed to promote reform of the current federal regulations, as well as changes in the regulations to improve the efficiency of truck freight transportation and mitigate the cost of truck traffic to the public. The report recommended a federally supervised permit program to rationalize the current state-issued exemptions. The permit program, implemented with federal oversight would be a mechanism whereby the performance of the regulations could be evaluated, and adjustment could be made when warranted by the evaluations and by changes in external conditions *(2).*

This paper presents a conceptual framework for a federally supervised, state-administered, performance-based permit program. First, the state of the practice in oversize and overweight permitting in the United States and other countries, including Canada, Australia, and New Zealand was assessed. The structure of the proposed permitting system is based on experiences and practices in implementing performance-based systems in Australia, Canada, New Zealand, and the United States.

## STATE-OF-THE PRACTICE IN PERMITTING IN THE UNITED STATES

Most heavier and longer combination trucks currently operate under some form of overweight and/or oversize (OS/OW) permit system, and arguments have been made that the most promising approach to achieve improvements in motor carrier productivity, safety, and other goals is through substantially improved permit systems. States continue to control size and weight limits on state highways and Interstate highways under grandfather rights. Many states allow weight exemptions for divisible loads based on certain classes of vehicles or commodities, by statute or with permits. Significant variations exist among states in terms of policies and fees charged for vehicles that are above established size and weight limits. States participating in multi-state OS/OW permitting agreements have enabling legislations in place for non-divisible loads and would require legislative revisions for divisible load permits.

The structure and implementation of OS/OW permitting systems in the United States are generally similar in the sense that through grandfather rights or special statutory exemptions, 31 states allow vehicles weighing more than 80,000 pounds to operate on the interstate highway system under divisible-load permits. Most of the states make extensive use of their grandfather rights, increasingly through issuance of multiple-trip permits. Multiple-trip permits essentially allow unlimited operation with no accounting for mileage or routes for a greater length of time, generally one year. In addition, 22 states allow operation of multi-trailer combinations of more than 80,000 pounds *(2)*. States also participate in multi-state OS/OW permitting agreements that have enabling legislations in each participating state.

Permit fees are usually set up to primarily recover the cost of administering the permit program and several states are in the process of revising the permit fee structures to include the cost responsibility of trucks into the pricing framework. However, full cost recovery is least likely to be implemented because permits are usually issued to promote local industries and thus it is difficult to charge permit fees that are commensurate with full cost recovery.

All states consider infrastructure-related performance measures in OS/OW permitting. The bridge formula and bridge analysis are the main infrastructure performance criteria used. With regards to safety-related performance, some states e.g., Idaho and Oregon apply special performance-related conditions or standards as part of the process used to determine the allowed routing and trailer combinations.

## PERMITTING SYSTEMS IN OTHER COUNTRIES

Australia, New Zealand, and Canada have used the performance-based system approach to investigate innovations in vehicle configuration and approve vehicles for operation under the permit regime *(3), (4), (5,) (6)*. For example, performance-based systems are utilized in evaluating prospective vehicles applying for special permits for the transportation of divisible loads. Although the approach in Australia and Canada is similar (there are significant variations from jurisdiction to jurisdiction because of differences in need), there appears to be a significant difference in emphasis between these two countries and New Zealand.

In Australia and Canada, the performance-based system has been used to approve vehicles that are more productive and have performance characteristics that are better than the vehicles they replace. Thus, the main safety benefits arise from greater efficiency resulting in fewer trips and hence less exposure as well as some safety gains on individual vehicles. This emphasis is particularly noticeable in lightly populated regions such as Queensland, Australia and Saskatchewan, Canada.

In New Zealand, the focus has been much more on safety gains at the individual vehicle level rather than with substantial productivity improvements. To some degree, this is a reflection of the different geography and transport requirements. The more densely populated states in Australia (Victoria and New South Wales) are more inclined to this approach as well. However, in Canada's more populated provinces (Ontario and Quebec), the use of performance-based systems is less frequent as they are only now being applied to guide policy. The delay in the implementation of performance-based systems is probably due to the entrenched nature of existing size and weight limits in these provinces, which tend to be more liberal than the national average. Recent concerns about infrastructure wear and use of steerable axles have prompted the renewed interest in performance-based systems.

Australia, on the other hand, is undertaking research to develop an alternative compliance regime for size and weight based primarily on performance-based systems. (Note that New Zealand is participating in this research project and if the results are implemented in Australia, it is likely that they will also be implemented in some way in New Zealand.) This compliance regime will be an optional alternative to the prescriptive limits. Given the probable costs of a performance-based system assessment, it is unlikely that operators would avail themselves of the performance-based system alternative unless there are significant economic advantages (probably in the form of productivity gains). Safety benefits are likely to arise from reduced exposure more than improved safety at the individual vehicle level.

In some provinces in Canada, the concept of "envelops" of over-dimensional and overweight vehicles is used that depicts candidate requirements, conditions and restrictions for different widths, heights and lengths of vehicles and/or loads. Unlike the United States, certain enforcement rules apply with operation of special permits in some other countries. For example, Canada operates a revocable special permitting system where vehicles operating under special permits can be revoked for non-compliance with the terms and conditions of the permit. The revocable nature of this system serves an incentive to carriers to recognize the importance of maintaining good records. There is also close coordination between the regulating body and the carriers to develop and implement strategies that ensure safety and efficiency.

## CONCEPTUAL FRAMEWORK FOR OS/OW PERMITTING SYSTEM

A good performance-based system must be both robust and simple enough to be practical and accommodate growth. A practical system is one that can be easily implemented and enforced. Implementation may require certification of vehicles stratified by type of configuration, commodity, and highways on which they operate. Practicality also can be defined in terms of ease of enforcement by roadside inspectors. This means that the system's performance measures or surrogate measures can be easily verified by conducting simple and quick tests at the roadside. It is also expected that there should be some level of regional flexibility in the methods of analysis in the performance-based system's pass/fail level criteria. However, the same criteria would be applicable to the same operating conditions regardless of the region or the country.

The following sections outline the essential elements of a performance-based system suitable for implementation in the United States. The performance-based permitting system comprises two major elements – the performance standards used and the framework of the system.

## Performance Standards

Given that highway functional classes are designed to different geometric design standards, it is essential that any performance-based system be sensitive to functional road class (e.g., interstate, arterials, divided, non-divided). The geometric features have significant effects on the safety performance of vehicles. Thus, operational considerations are important when choosing a vehicle for special permit service. This means that vehicles that qualify for the special permit system must be constrained to designated routes defined by road class.

In order to achieve this required flexibility, it may be necessary to create variable performance criteria that are sensitive to the various factors. Performance standards can be grouped into two main categories: (i) safety-related performance measures and (ii) infrastructure preservation performance measures.

### *Safety Performance*

The intrinsic safety performance of a particular vehicle under a specific TS&W limit is related to its engineering dynamic performance. This relationship is affected by external factors such as the operating environment. Certain dynamic performance measures appear to be more important than others in terms of their casual relationship to crashes. Some analyses have linked rollover threshold, rearward amplification, braking efficiency, and low-speed offtracking to risks of certain classes of crashes. Of these measures, rollover threshold and load transfer ratio are the most meaningful. Low propensity for rollover in both rapid steering maneuvers and in steady-state maneuvers is especially desirable for vehicles transporting hazardous materials in bulk. Rearward amplification is correlated to the load transfer ratio and the friction utilization measure is useful in determining how close tractor steer axle tires are to saturation. Rearward amplification is of great significance for multi-combination trucks and congested, high-speed traffic. Concerns about steer axle saturation can be reduced considerably by stipulating a minimum wheelbase for tractors, thus eliminating the need to include friction utilization as a measure. Also, outboard offtracking response in a steady turn, and under transient conditions, is of importance for multi-combination vehicles.

The real factor influencing crash rates is by increasing safety awareness with the driver and maintenance crew. The culture of safety in a motor carrier company can be significantly influenced by a special permit system that is conditional on safety-related outcomes. Ultimately, drivers and their actions as well as driving nature will have the biggest influence on safety.

### *Infrastructure Preservation*

Bridge and pavement loading are the two primary infrastructure concerns of permitting OS/OW vehicles. Analysis of potential stresses imposed by a permitted vehicle provides an indication of the ability of the bridge structure to withstand the imposed loading. Similarly, analysis of potential pavement distresses resulting from repeated loading from OW vehicles provides indication of the performance of the infrastructure.

The notion linking infrastructure preservation to user/permit fees reflecting the cost of longer, heavier vehicles on the infrastructure is essential for accountability of the program. There is significant flexibility in how this can be accomplished and a national program will require a practical procedure. New Zealand fits all commercial vehicles with hubometers and uses a weight distance tax. In this system, diesel fuel is not taxed. In Saskatchewan, Canada, the government calculates the increased profit that an overweight haul will produce and collects 50 percent of the increased profit from the carrier for infrastructure improvement on the particular

haul route. This system is probably the most progressive as the carrier must prove that there is a significant economic benefit before it can be approved and must ensure that the vehicle complies with vehicle dynamic safety performance measures. Such complex systems may not be practical within a large-scale U.S. program. An example of a more realistic solution is graduated fees calculated on the basis of equivalent axle loads or extended vehicle dimensions possibly tied to offtracking that can be related to infrastructure use. In this way the costs to the infrastructure can be accounted for as part of the permit fee. It will be important to ensure that the fees collected for the permit system are retained by the road authority so that the funds can be invested into the infrastructure and the administrative costs of the permit system.

The states own, operate, and maintain most of the highway system. Therefore, as long as the states have the information needed to make route-specific decisions, the federal government does not need to have such detailed information. The federal government can, however, develop permitting criteria that could be either mandatory or advisory, depending on how much responsibility the federal government is prepared to cede to the states. This performance based system essentially redefines federal role in truck size and weight regulation where there is increased federal oversight of safety, fees, and enforcement. In this system, federal role in defining numerical dimensional limits will be diminished. The rationale behind increased federal role in OS/OW permitting is to promote rational and consistent standards across the nation and the ability to evaluate the consequences of regulatory changes at a national level.

The following sections describe a concept of the operations and the components of the framework for a federally supervised state-administered OS/OW permitting system. The framework is applicable to both, the existing truck size and weight regulatory regime as well as the truck size weight provisions recommended by TRB *(2).*

## CONCEPT OF OPERATIONS

The proposed permit system will be administered by the State Departments of Transportation (DOTs). The concept of operation of the permitting system is based on the framework illustrated in Figure 1 which shows the interrelationships among the various components.

The permit system can either be the only permitting system or an alternative approach available to the states. The federal government develops and provides the performance standards, thresholds, and the testing method or approach to the states.

To participate in the program, ***carriers need to be qualified*** by the state DOTs based on their safety records. ***New vehicle ideas*** can be initiated by the pre-qualified carriers or by state DOTs in response to the demand from carriers. A ***permit system administrator*** will test and certify vehicles to be permitted for compliance with the various performance standards. The permit system administrator can be the state permitting agency or a public or private third party who is ***accredited*** by the federal government or a government-approved body, such as the Society of Automotive Engineers (SAE).

If a vehicle configuration fails to meet the performance criteria, the carrier and the state agency will be required to make modifications to the suggested configurations. Upon successful testing, the permit system administrator produces a report for the state DOT, ***certifying that the vehicle configuration*** meets the performance criteria.

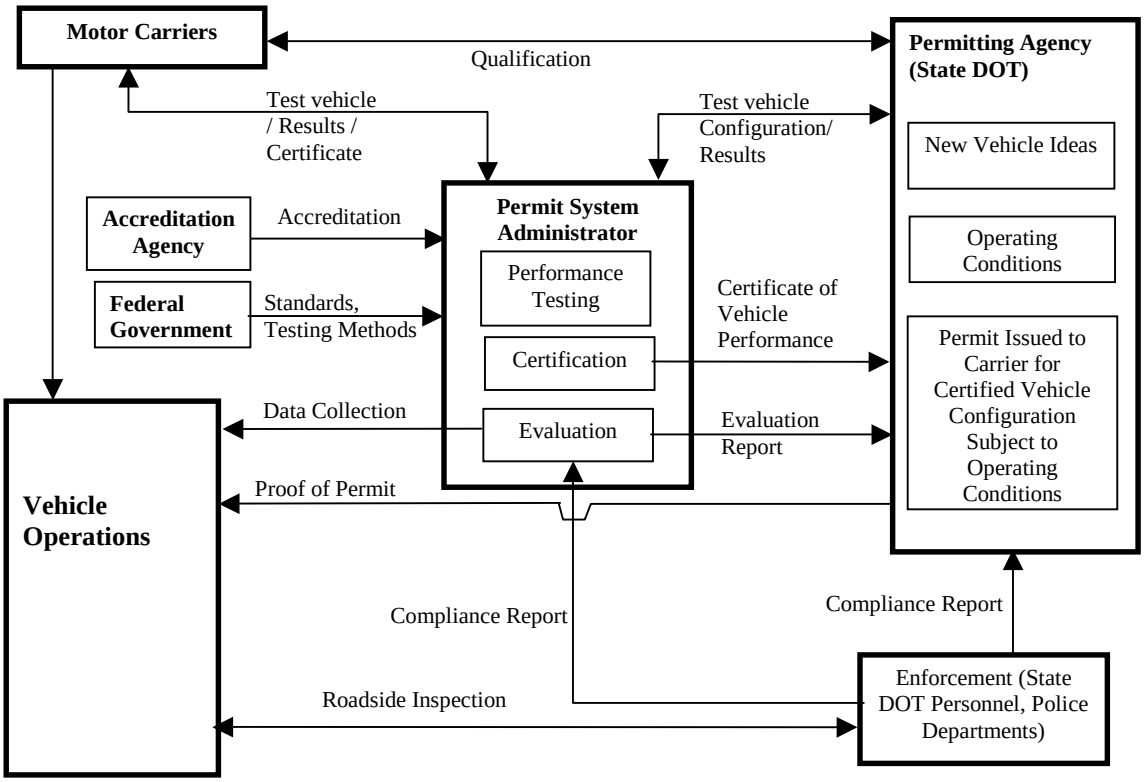


**FIGURE 1 Structure of the Permit System**

The state DOT, upon receipt of the certification, may issue a permit to the carrier contingent on the ***operating controls*** on available routes, speeds, time of day requirements, etc. The operating conditions are set by the state DOTs. The ***proof of the permit*** can be provided either in paper or electronic form using transponders, smart cards, or equivalent technology.

The carrier agrees to operate the vehicle in accordance to the terms and conditions of the permit and also agrees to provide data for an initial ***period of three to six months for evaluation and pilot testing*** by the permit system administrator. The pilot testing will evaluate the vehicle configuration with respect to the ***evaluation goals*** set for the program.

The enforcement of the permits should be handled by ***roadside inspections*** performed by existing law enforcement personnel. Violation of the permit rules could result in ***suspension or revocation of the carrier's permit*** for the vehicle configuration until resolution of the violation.

## STRUCTURE OF PERMITTING SYSTEM FRAMEWORK

The conceptual framework of the permit system as illustrated in Figure 1 comprises three major systems or building blocks (administrative, enforcement, and evaluation). The components of each system are shown in Figure 2 and described in the following sections.

## Administrative System

The administrative system comprises several elements directed at establishing the framework, requirements, and standards, as well as administration of the permitting system. Figure 3 illustrates the relationships among the components of the administrative system. The components are described in the following sections.

*Legislative Framework*

The legislative framework defines the roles, responsibilities, and authorities of federal, state, and other entities that would be involved in the permitting process. The relationship of the permitting system with existing multi-state agreements should be defined. Furthermore, the administrative procedures for appeal (due process) must be defined.

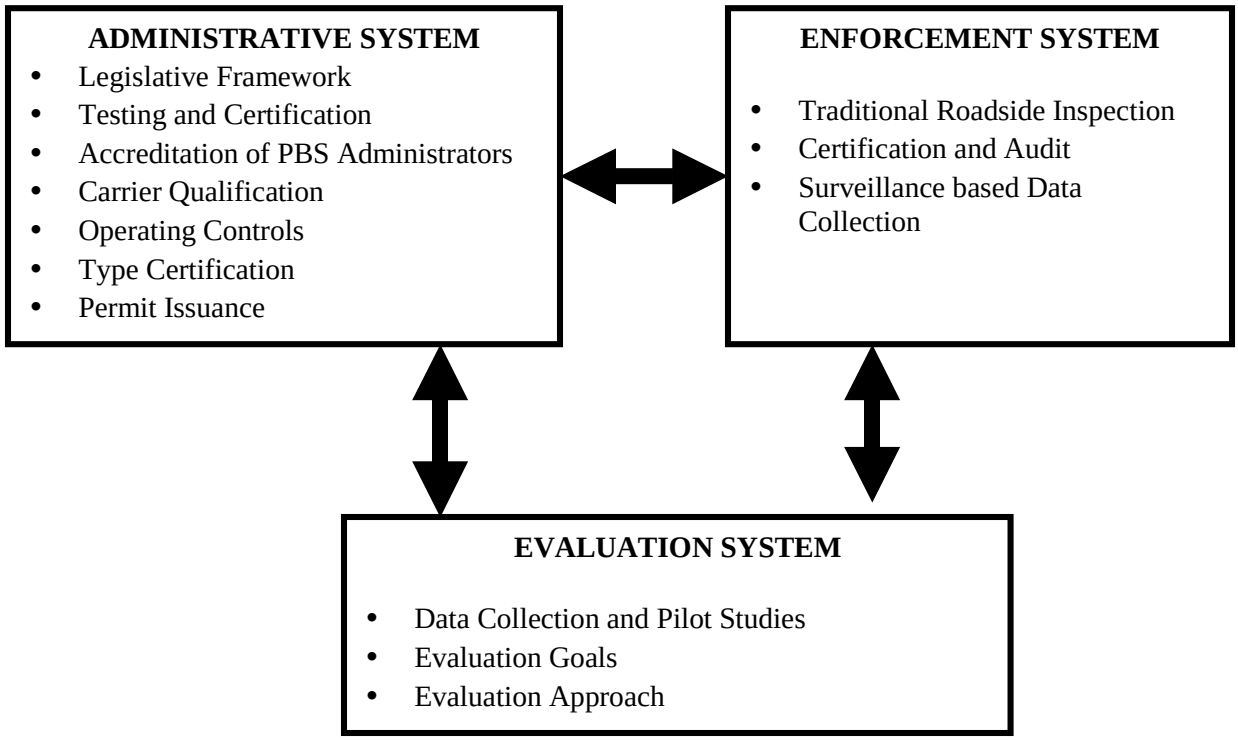


**FIGURE 2 Conceptual Framework for Permit System**

*Testing and Certification*

Certification defines performance standards and methods of assessment in evaluating and certifying candidate vehicle combinations to meet the requirements for safety and infrastructure performance. The two essential elements of the testing and certification process are (i) definition of performance standards, and (ii) specification of methods for performance assessment.

### Performance Standards Definition

U.S DOT should define vehicle performance measures and standards for use in the performance-based permit system. It is expected that these performance measures also would be related to

highway functional classes and traffic volumes. The permit system should address certain requirements for infrastructure issues, including construction closures, pavement management systems, and bridge analysis requirements.

The following measures and thresholds in Table 1 are suggested as the core measures of performance. These measures and respective thresholds are derived from experiences in Australia, Canada, and New Zealand. Additional measures and thresholds may be added as needed.

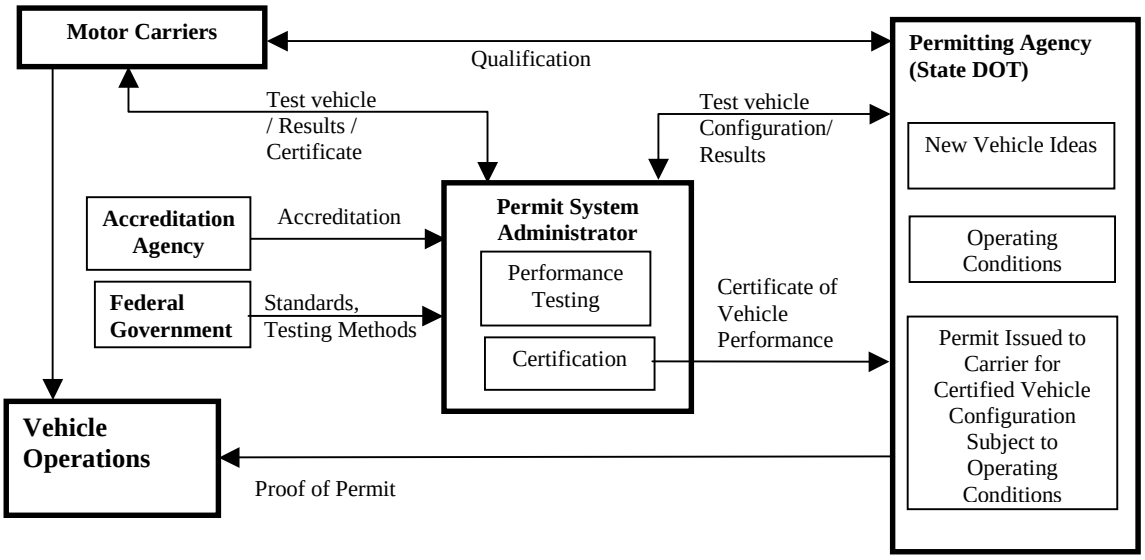


**FIGURE 3 Administrative System**

**TABLE 1 Core Performance Measures and Thresholds**

| Performance Measure | Criteria |
|---|---|
| Static Rollover Threshold | Greater than 0.35g |
| Rearward Amplification | Less than 2 |
| Load Transfer Ratio | Less than 0.6 |
| Low Speed Offtracking | 6.0 m |
| High Speed Offtracking | Less than 0.46 m |

**Method of Performance Assessment for Certification**

This aspect requires the development of a uniform performance assessment system that can be used by the permit system administrator for certification. For most performance measures, computer-based modeling is the preferred method of vehicle performance assessment, as variables can be controlled and testing errors can be eliminated while results can be audited after the testing. Computer models for simulating vehicle behavior must be approved and calibrated on a regular basis. Recognizing the limitations of computer simulations, some form of vehicle testing would be required to calibrate and validate the simulation models. This should be done periodically to ensure that the simulation models yield reliable results. It may be appropriate that the certification agency uses a specific software package specially created or modified for this

process. Where it is necessary to develop new models and/or databases, the development cost of the models and vehicle parameter data sets should be recovered over time from performance-based system permit user charges.

*System Administration*

The systems administration defines the administrators who would serve as the accredited agency or expert for testing and certifying vehicles. Certification can be either through the permit agency itself or an independent system administrator. The use of a third party also ensures that the testing and certification process is uniform across the states.

It is noted that the use of a third-party performance-based system administrator does not necessarily mean the use of private agencies. Third-party permit system administrators could imply a federal agency or a multi-state consortium tasked with the testing, certification, and evaluation of the permit system.

*Carrier Qualification*

Carrier qualification defines the process for pre-qualifying carriers participating in the permitting program. The screening criteria are pre-set by each participating state. Participating vehicles are pre-certified and the carrier's safety record and credentials routinely verified with state and federal agencies by the third-party administrator

A carrier qualification process would be developed considering safety-related criteria, such as crash history, FMCSA inspection history, SafeStat rating, state weight violation history, and insurance filing. Acceptance into the program is conditional and may be revoked upon evidence of violation of any of the conditions.

*Operating Controls*

This defines the operating conditions of permitted vehicles and can include such elements as minimum driver experience, time-of-day operating restrictions, inclement weather and road condition operating restrictions, enhanced safety equipment requirements, and the setting of load and traffic violation thresholds.

*Type of Certification*

Once a vehicle type has been certified, it would seem logical that the carrier be permitted to operate identical vehicle configurations without having to provide performance-based system compliance proof. However, it is important to note that the performance characteristics are not only determined by the vehicle configuration but also by the loading pattern, the geometry of the highway, and to some extent the driver behavior as well.

In essence, the carriers will be permitted to operate vehicles similar to the performance-tested configuration only to carry the commodity it was tested with and will be restricted to similar classes of roadway and compliance with other operational conditions.

*Permit Issuance*

As the final step before issuing a permit, the state DOTs should define permit issuance procedures and requirements, including user fee structure. In addition, a mechanism for fee collection and distribution procedures as well as auditing provision for compliance should be clearly defined. The type and duration must be determined by the participating state. Fees that are charged for the permit will be determined by the states within the guidelines/ parameters

issued by the U.S. DOT. Federal fee structures also would be adjusted to recover the federal share of any added infrastructure costs and to pay for federal costs to administer the permit program. The fee structure could also include an incentive scheme to encourage the use of better performing vehicles. To the extent possible, such an incentive scheme should reward truck operators that use better performing truck configurations with lower permit fees.

**Proof of Permit**

The "permit" may be for a single trip, unlimited number of trips, or it may be a multi-state permit issued by a base-state. The possibility of using transponders to include the proof of permit needs more research in terms of the technical and business feasibility. These vehicle-specific transponders can be mounted on the vehicle by the issuing agency. The information contained in the transponders will include the approved performance standards, information about the vehicle and carrier, permit number, type, and expiration. For purposes of enforcement, the use of Intelligent Transportation System (ITS) technology such as transponders would allow permitting agency and enforcement officials to assess the legality of a vehicle, load, and driver. The objective should be to ensure that the workload for enforcement officers will remain largely unaffected by the performance-based system as ITS will largely automate the enforcement process. The use of transponders or smart cards for storing permit information also would greatly facilitate enforcement and evaluation activities.

**Enforcement System**

Enforcement is critical in assuring compliance with all laws, rules, and regulations governing the operation of trucks and truck combinations on the highway system. The traditional enforcement system consists of more than just the physical presence of law enforcement officers. It includes regulations, special conditions, education or communication to the industry, effective fines or penalties for violators, and adjudication. A performance-based approach to permitting larger and/or heavier trucks discussed in this research requires a futuristic enforcement system. Along with ensuring compliance, a well-managed enforcement system also helps to fortify the safety culture within transport companies.

The enforcement system must consider operating conditions that assure the field enforcement officer that he/she can easily recognize a "legally permitted" truck or truck combination, and not feel compelled or required to measure or weigh it. Enforcement could assume 100 percent compliance with the requirements since there would be a process in place to ensure that a carrier and vehicle receiving a permit has been approved and certified in a structured process involving qualification, certification of vehicle configuration, and use of operating controls. Deviations from the permit requirements (e.g., routes, loading, speed) constitute violations. Violations should result in permit revocations and vehicles violating the provisions of the special permit should be suspended from operation (placed out-of-service) and the vehicle restrained until the carrier demonstrates compliance. Figure 4 illustrates the enforcement system and the various elements of the system described in the following sections.

*Achieving Visibility and Recognition*

The traditional enforcement method for oversize or overweight permitted vehicles requires a driver to possess a permit (facsimile or paper) that contains the conditions for operation and a permit number. This requires law enforcement to stop a vehicle on the highway or at a weigh station and check the paperwork. In the future, an enforcement system could inform the agency

of the legality of a vehicle and load through the use of ITS technology. The objective should be to ensure that the workload for traditional enforcement officers remain largely unaffected by the performance-based system, as the ITS would largely automate the enforcement process.

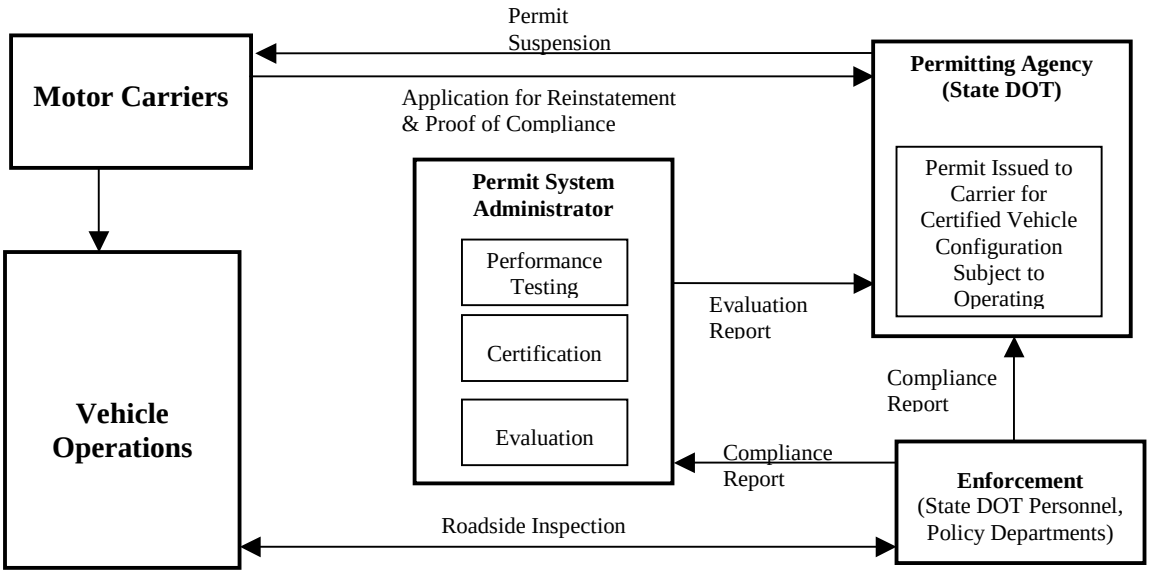


**FIGURE 4 Enforcement System**

*Monitoring of Carrier Operation*

The data would be collected from the transponder and recorded daily on an event-by-event basis by the local law enforcement personnel. The data are then transferred and downloaded to a clearinghouse maintained by the permit system administrator. Periodically, the permit system administrator will produce a record for the state DOT and carrier that shows the operation of the carrier vehicles is in compliance with the pre-established routing, permitted time-frame, and conditions for operation (e.g., weight, size, configuration). The performance-based system administrator will also produce a record for enforcement that indicates carrier compliance or non-compliance with conditions of permits and the frequency of these events

In this system, similar to the Australian approach, the compliance mechanisms are associated with the risk involved. Where there is a high risk, compliance mechanisms will be designed to guarantee better compliance results are achieved. Where there is a low risk, compliance mechanisms can be simpler and less onerous.

## Evaluation System

The evaluation system defines the data and processes to ensure that the permitting system is continuously evaluated. The results of the evaluation are necessary for revising the performance standards and limits for the permitted vehicles. Figure 5 shows the structure of the evaluation system.

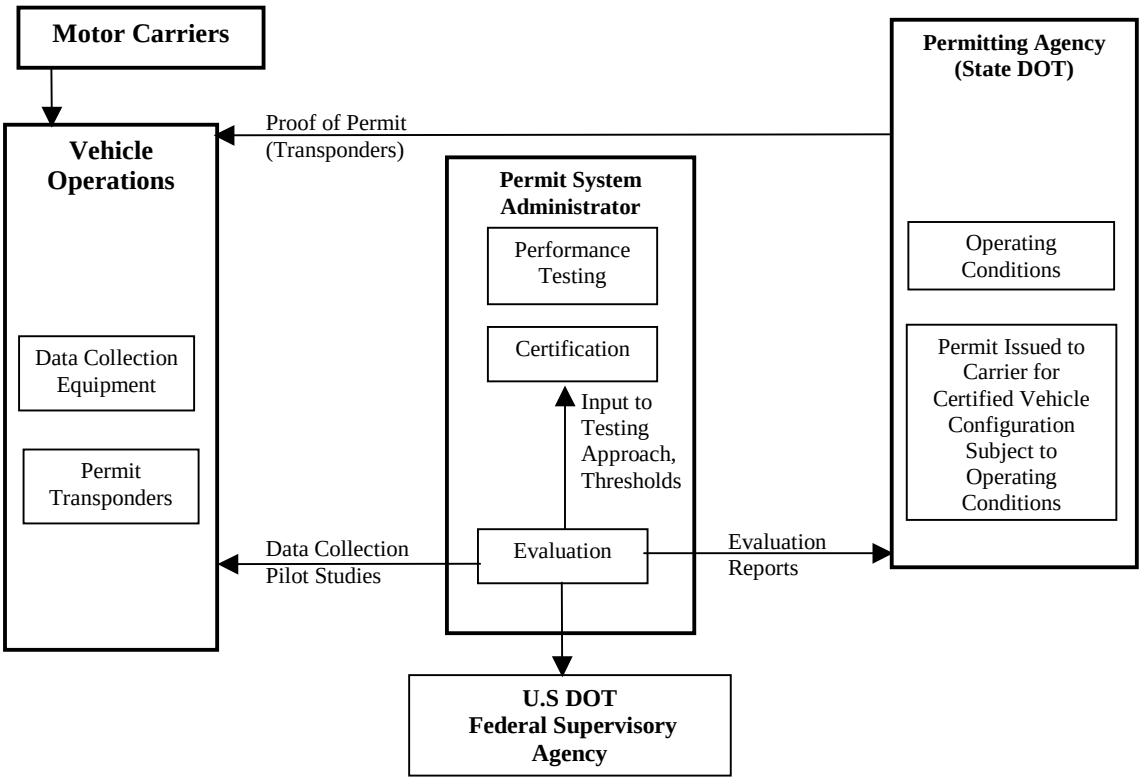


**FIGURE 5 Evaluation System**

*Data Collection and Pilot Tests*

The definition of vehicles eligible for permitting would be subject to review over time, based on the results of the evaluations. Thus, a key premise of the TRB study was that regulations should be dynamic and that changes should be considered based on the evaluations conducted. Federal reviews of the performance of the permitting program would be permanent and ongoing, and the program's results would guide the revision of the limits.

The notion of a performance-based system, on the other hand, may seem to be static in that a set of performance criteria are established and all vehicles must conform to those criteria. The criteria or threshold values for the various performance measures should be redefined, depending on the vehicle type and operating conditions. Therefore, once the vehicle configurations and operating conditions continue to change, the threshold values need to evolve accordingly.

The OS/OW permit framework allows for a structured evaluation of these goals by providing a basis for data collection and carrier co-operation. The carriers, as a part of the permitting project, would agree to participate in pilot tests for a period of three to six months. This three to six-month period allows early feasibility testing and validation. The three to six-month test adds a layer of intermediate testing before new vehicle types are allowed to operate.

*Evaluation Goals*

Evaluation is intended to measure the consequences of changes in dimensions, weights, and operating practices. The evaluation component for trucks operating under the special permit framework has six major goal areas discussed below.

1. **Use and Compliance of Carriers and Vehicles Operating under Special Permits-** Evaluation is intended to track the use of special permits with consideration to the number of permits, types of loads, and types of vehicle configurations for which permits are being requested. The evaluation also will monitor the compliance of the permit stipulations by coordinating with the enforcement system to track vehicle configuration, weights, and routes. While this has been a critical and difficult element to measure in the traditional permitting systems, the use of transponders and associated technologies would make evaluating compliance and tracking violations easier.

2. **Safety Impacts -** Historical crash data for configurations expected to be operating under the special permits will not be available initially. However, over time this system will allow for the collection of accurate exposure data leading to hi-fidelity crash data. In the current absence of these data, collecting on-board vehicle operations and driving performance data will provide a means for evaluating safety impacts. Statistical analysis can be used to identify unsafe conditions and relate crash involvement to truck performance measures. Data requirements include vehicle control inputs such as lateral acceleration, brake application pressure, speed and distance traveled, and GPS-related inputs.

3. **Infrastructure Impacts -** The infrastructure impacts of vehicles operating under the special permit system can be broadly classified into three types: (i) pavement impacts, (ii) bridge impacts, and (iii) roadway geometry impacts.

   Pavement and bridge costs should be calculated for vehicles operating under the special permits. Offtracking performance and tail swing are key indicators of vehicle turning characteristics. Offtracking tests should be performed as a part of the permitting process rather than as an evaluation component. The “infrastructure impact” goal also includes research into emerging infrastructure design concepts and truck-only facilities. While this evaluation goal does not require on-board driving data, pavement cost and bridge cost models should be developed for configurations operating under the special permit framework.

4. **Traffic Operation Impacts -** The introduction of new truck configurations could have significant effects on operations and level of service on the highway network. Potential evaluation goals in this area include identifying the effects of larger and heavier truck combinations on the capacity of the road network. The effect of operational controls such as time-of-day restrictions also should be investigated to determine their influence on highway capacity and congestion.

5. **Productivity Impacts -** This evaluation goal identifies the economic benefits of using vehicles operating with special permits to allow for comparisons to the vehicles they

would be replacing. The scope of the evaluation includes identifying the variables allowing for the calculation of cost savings to shippers in terms of volume of freight, VMT, fuel, and time. The evaluation is also useful in forecasting impacts of freight transportation.

6. **Environmental Impacts -** By monitoring fuel consumption and knowing the emissions characteristics of engines, reliable estimates of emissions can be determined. With accurate freight weight and volume data, it is possible to normalize emissions to a given freight task. Such data will become increasingly valuable to environmental policy makers and for future international agreements on the environment.

*Evaluation Approach*

Continuous evaluation of vehicles operating under the permit system is proposed. Consequently, the carriers would have the responsibility for reporting crash information and violations to the permit framework along with being subject to random compliance reviews and inspections by a federal supervisory agency such as FMCSA. It is noted that such reporting and review systems already exist for hazmat transportation.

## CONCLUDING REMARKS

A framework for a performance-based, oversize/overweight, permitting system was developed in response to the recommendations of the TRB 267 report. Information derived from the state of the practice in performance-based, oversize/overweight permitting systems in Australia, Canada, and New Zealand and oversize/overweight permitting practices in the United States guided the development of the framework.

The framework consists of three main interrelated components: administrative, evaluation, and enforcement systems. Each system has a number of elements or subcomponents that define the functions of each system. The proposed performance measures were selected based on experiences and practices elsewhere. A unique feature of the framework is the evaluation component, where the performance of the system is continuously monitored and results are used in revising the performance measures. Feedback from the evaluation and enforcement systems into the administrative system allows for overall assessment of the performance of the permitting system in meeting the goals of improving highway safety.

The challenge is enforcement of the performance-based, oversize/overweight permitting system. Periodic re-assessments of permitted vehicles in addition to continued roadside enforcement of operating conditions is recommended. It is also advised that this permitting framework be tested through pilot studies, using a few vehicle configurations (e.g., six-axle tractor semitrailer truck at 90,000 lbs and double-trailer configurations with each trailer up to 33 feet long), before implementation is extended to other vehicle configurations.

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