



Feasibility of Allowing the Use of Twin 33-Foot Trailers in California

Requested by
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Executive Summary

Background

Caltrans, in conjunction with other state agencies and industry partners, is exploring the viability of using 33-foot trailers in dual configurations (twin 33s) on its highway system—a practice that would increase load capacity per trip and reduce congestion and delays on the highway. Adopting the use of twin 33s could potentially increase the safety and efficiency of the highway system while meeting growing transportation demand and addressing environmental sustainability.

To inform its evaluation of this issue, Caltrans is seeking information about the impact of twin 33s, including the rules and regulations in states now allowing their use, and a review of the advantages and disadvantages, performance, and environmental and operational impacts of twin 33s. To assist Caltrans with this effort, CTC & Associates compiled publicly available research and other resources on this topic.

Summary of Findings

While a literature search identified a number of resources that addressed elements of the twin 33s issue, none of the resources provided a comprehensive, definitive assessment of the operational impacts associated with the use of twin 33s and the state-specific rules and regulations governing their use.

Below is a summary of relevant resources we identified in four topic areas:

- Comprehensive Truck Size and Weight Limits Study.
- Future federal truck size and weight limits research.
- State truck size and weight limits.
- Other research and related resources.

A background section that precedes the presentation of relevant resources describes the National Network (NN) and National Highway System (NHS), which are referenced in publications cited in this Preliminary Investigation, and the current length limits on the NN (28 to 28.5 feet for trailing units of a twin trailer combination).

Comprehensive Truck Size and Weight Limits Study

In 2015 and 2016, Federal Highway Administration (FHWA) completed the most significant recent research on the impacts of truck size and weight. This FHWA study sought to address the impact of six vehicle configurations (among them, a tractor plus twin 33-foot trailers), along with two control vehicles currently operating on the Interstate system and NN (the latter includes most of the NHS).

Researchers examined the impact of the six vehicle configurations in five focus areas: bridge structures, compliance, highway safety and truck crashes, modal shift and pavement (see page 7 of this Preliminary Investigation for a summary of results). However, researchers noted that study findings “do not provide definitive evidence or direction to support any specific new change of direction in the areas of truck size and weight limitations,” and additional research is needed.

Future Federal Truck Size and Weight Limits Research

In a 2016 report to Congress describing the results of its comprehensive truck size and weight limits study, FHWA noted the limitations of its efforts to date and recommended continuing the research into truck size and weight limits. After submission of the 2016 report, FHWA's Office of Freight Management and Operations asked the Transportation Research Board (TRB) to recommend a research plan "to reduce uncertainties in estimates of the impacts of changes in truck size and weight limits." In response, TRB established the Truck Size and Weight Limits Research Plan Committee and directed it to produce an interim and final report.

The TRB committee's April 2018 interim report includes a preliminary list of research and data needs in the five research areas addressed in FHWA's 2015-2016 study (bridges, pavement, safety, enforcement and modal shift). The final report, which will present the committee's research roadmap of specific problem statements, estimated costs and timelines, is expected later in 2018. (See page 11 of this Preliminary Investigation for more details of this ongoing effort.)

State Truck Size and Weight Limits

Two federal publications describe the truck length limits applicable by state to certain classes of trucks operating on the NN and NHS. The latter includes Interstate and non-Interstate routes. State laws control maximum gross vehicle sizes and weights on non-Interstate routes.

- Appendix C to 23 CFR Part 658 provides state-by-state size and weight limits for commercial motor vehicles operating on the NN, including the maximum cargo-carrying length of a "truck tractor and two trailing units."
- A May 2015 FHWA report to Congress compiles existing state truck size and weight limit laws in force as of October 1, 2012. The report does not specifically address twin 33s.

We cite two examples of publicly available commercial publications that provide varying degrees of detail about the state rules and regulations that impact operation of twin 33s:

- A 2018 trucking industry publication that compiles the legal limits for Interstate highways and other state roads does not appear to provide enough data to identify all states permitting the use of twin 33s. This publication does not include oversize/overweight (OS/OW) provisions, which may be used by some states to permit twin 33s.
- A sample section from a 2017 publication published by a vendor specializing in transportation-related safety and compliance offers a more comprehensive review of states' vehicle size and weight limits. The sample provides a nine-page summary of the limits that apply in Montana. The complete manual is available for purchase.

Other Research and Related Resources

We identified a dearth of other state and federal research that considers the use of twin 33s. A March 2017 Texas Department of Transportation report noted that the limited use of twin 33s prompted the agency to not consider investments into this configuration, even though the practice could result in savings of 1 billion miles per year. While not specifically addressing twin 33s, a 2010 National Cooperative Highway Research Program (NCHRP) report that examined Canadian practices for regulating large commercial motor vehicles may provide helpful context when considering changes to domestic length limits. We also provide a sampling of the many resources published or sponsored by associations and interest groups that present data and commentary supporting and opposing the use of twin 33s.

Gaps in Findings

While the literature search identified publications that consider the use of twin 33s, it did not uncover definitive, widely held conclusions about their impacts or the extent of their use. The most significant recent federally sponsored research—FHWA's 2015-2016 comprehensive study of truck size and weight limits—cautioned against using study findings to support changes in current federal rules to permit use of the study's tested scenarios (including twin 33s), noting that more research is needed. Responding to this need for additional research, efforts underway by the Truck Size and Weight Limits Research Plan Committee will produce a research roadmap, expected later in 2018, to further examine the impacts of truck size and weight limit changes. This research roadmap may address the use of twin 33s.

We did not identify a single source or compilation of publicly available sources that provides a comprehensive assessment of the rules and regulations governing twin 33s in all states allowing their use. This type of publication appears to be available for purchase from a commercial vendor.

Next Steps

Moving forward, Caltrans could consider:

- Reviewing the technical reports published in connection with the recent FHWA truck size and weight limits study to learn more about the testing protocols and how they might be applied to future exploration in California.
- Watching for publication of the Truck Size and Weight Limits Research Plan Committee's final report to determine if the committee's research roadmap includes an examination of twin 33s.
- Seeking more state-specific information through follow-up contacts with states appearing to allow the use of twin 33s on state roadways.
- Examining Canadian research and practices documented in a 2010 NCHRP report to determine how those findings might be relevant to Caltrans' exploration of twin 33s.

Detailed Findings

Background

Caltrans, in conjunction with other state agencies and industry partners, is exploring the viability of using 33-foot trailers in dual configurations (twin 33s) on its highway system. This practice will increase load capacity per trip and reduce congestion and delays, which will make the system more efficient, meet growing transportation demand and consider environmental sustainability.

A 2004 Federal Highway Administration (FHWA) publication describes the current length limits for truck tractor-semitrailer-trailer combinations (see

https://ops.fhwa.dot.gov/freight/publications/size_reqs_final_rpt/size_reqs_final_rpt.pdf):

The *minimum* length that States must allow for trailers and semitrailers in these combinations on the NN [National Network] is 8.53 m (28 feet) (Figure 3). States must also allow the continued use of semitrailers 8.69 m (28 feet 6 inches) long that were in use on December 1, 1982, provided the overall length of the combination does not exceed 19.81 m (65 feet). The *maximum overall length* of cargo-carrying units that States may allow for twin trailer combinations *when one trailing unit is longer than 28.5 feet* is determined by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA).

The National Network (NN), referenced in the excerpt above, includes approximately 65,000 miles of highways beyond the National Highway System (NHS), and the NHS includes about 50,000 miles of highways that are not on the NN. Both the NN and NHS are about the same length: roughly 200,000 miles. The NN supports interstate commerce by regulating the size of trucks; the NHS supports interstate commerce by focusing on federal investments.

Exploring the use of twin 33s involves consideration of federal limitations on truck length and state rules and regulations governing size limits on twin trailers. As former Secretary of Transportation Anthony Foxx noted in his letter accompanying a May 2015 FHWA report to Congress that compiled state truck size and weight limit laws, “States have laws that allow sizes and weights on non-Interstate highways in excess of the current Federal truck size and weight limits. This is an expected finding, as State laws control maximum gross vehicle sizes and weights on non-Interstate highways, including the NHS” (see page 14 of this Preliminary Investigation for more information about the May 2015 report).

The results of a literature search to identify the rules and regulations governing truck size limits and the impacts of twin 33 use are summarized below in the following topic areas:

- Comprehensive Truck Size and Weight Limits Study
- Future federal truck size and weight limits research.
- State truck size and weight limits.
- Other research and related resources.

Comprehensive Truck Size and Weight Limits Study

The most significant recent research on the impact of truck size and weight was completed by FHWA in 2015 and 2016. Cited below are the key publications produced in connection with this study.

The FHWA study sought to address the impact of six vehicle configurations (among them, a tractor plus twin 33s), along with two control vehicles currently operating on the Interstate system and NN (the latter includes most of the NHS). Researchers examined the impact of the six vehicle configurations in five focus areas: bridge structures, compliance, highway safety and truck crashes, modal shift and pavement. As we highlight below, researchers noted study findings “do not provide definitive evidence or direction to support any specific new change of direction in the areas of truck size and weight limitations.”

MAP-21 Comprehensive Truck Size and Weight Limits Study, Freight Management and Operations, Federal Highway Administration, January 2018.

<https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/>

This web site provides access to the publications produced in connection with the FHWA study and also describes the impetus for the study:

Provisions in MAP-21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), require the USDOT to conduct a Comprehensive Truck Size and Weight Limits Study (MAP-21 §32801) addressing differences in safety risks, infrastructure impacts, and the effect on levels of enforcement between trucks operating at or within federal truck size and weight (TSW) limits and trucks legally operating in excess of federal limits; comparing and contrasting the potential safety and infrastructure impacts of alternative configurations (including configurations that exceed current federal TSW limits) to the current Federal TSW law and regulations; and, estimating the effects of freight diversion due to these alternative configurations.

Report to Congress: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, April 2016.

<https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/ctsw/CTSLWS%20Report%20to%20Congress%20FINAL.pdf>

Below is a representation of a table from this report summarizing the vehicle configurations examined in the study (see page 5 of the report; page 7 of the PDF):

Table 1: Truck Configurations and Weights Scenarios Analyzed in the MAP-21 Comprehensive Truck Size Weight Limits Study

Scenario	Configuration	# Trailers or Semi-trailers	# Axles	Gross Vehicle Weight (pounds)	Roadway Networks
Control Single	5-axle vehicle tractor, 53 foot semitrailer (3-S2)	1	5	80,000	Currently operating on the entire Interstate System and National Network, including most of the National Highway System
1	5-axle vehicle tractor, 53 foot semitrailer (3-S2)	1	5	88,000	Modeled to use same networks as above

Table 1: Truck Configurations and Weights Scenarios Analyzed in the MAP-21 Comprehensive Truck Size Weight Limits Study

Scenario	Configuration	# Trailers or Semi-trailers	# Axles	Gross Vehicle Weight (pounds)	Roadway Networks
2	6-axle vehicle tractor, 53 foot semitrailer (3-S3)	1	6	91,000	Modeled to use same networks as above
3	6-axle vehicle tractor, 53 foot semitrailer (3-S3)	1	6	97,000	Modeled to use same networks as above
Control Double	Tractor plus two 28 or 28½ foot trailers (2-S1-2)	2	5	80,000 maximum allowable weight 71,700 actual weight used for analysis	Modeled to use same networks as above
4	Tractor plus twin 33 foot trailers (2-S1-2)	2	5	80,000	Modeled to use same networks as above
5	Tractor plus three 28 or 28½ foot trailers (2-S1-2-2)	3	7	105,500	Modeled to use a 74,500 mile roadway system including the Interstate System, approved routes in 17 Western States allowing triples, and certain four-lane roads in the Eastern United States.
6	Tractor plus three 28 or 28½ foot trailers (3-S2-2-2)	3	9	129,000	Modeled to use same networks as above

Tables 2 and 3 (beginning on page 10 of the report, page 12 of the PDF) summarize the key technical results of the study for each of the five focus areas. Below is a summary of results associated with twin 33-foot trailers (Scenario 4):

Bridge Projected One-Time Costs. The study estimates a \$1.1 billion one-time cost to strengthen or replace bridges that would have posting issues associated with the twin 33 scenario.

Compliance (Enforcement Program Costs and Effectiveness). A reduction of 1.1 percent reflects a cost savings associated with 653,000 more trucks that could be weighed for the same cost.

Modal Shift. Researchers noted that Scenarios 4 through 6 only affect less-than-truckload (LTL) shipments, while Scenarios 1 through 3 affect more tonnage because they primarily affect movements of bulk commodities.

Specific findings include:

- Truck vehicle miles traveled: A reduction of 2.2 percent.
- Total logistics costs: A reduction of 6.3 percent.

Pavement Changes in Life-Cycle Cost. The study team examined the average impact of each scenario in terms of time to first rehabilitation and life-cycle cost. Researchers indicated that “[n]otably, flexible pavements exhibited more accelerated deterioration with Scenarios 1 and 4, whereas rigid pavements were more negatively impacted by Scenarios 4, 5 and 6.” Results associated with Scenario 4 include:

- Weighted average change in service intervals (time to rehabilitation): A reduction of 1.6 percent.
- Weighted average change in life-cycle costs: An increase of 1.8 percent to 2.7 percent.

Safety (Violations and Citations). Twin trailers generally have higher vehicle inspection violation rates than five-axle, 80,000-pound single trailers.

Safety (Crashes). The authors noted that the study’s highway safety and crash analysis does not include an assessment of twin 33s because of the “very limited operation” of twin 33-foot trailers weighing 80,000 pounds in the U.S. at the time of publication.

Safety (Vehicle Stability and Control). Table 3 on page 11 of the report (page 13 of the PDF) highlights three results related to vehicle stability and control:

- *Did not perform as well as the control vehicle in avoidance maneuver.* Researchers assessed “off-tracking,” which they described as “the phenomenon of one or more trailers following a path different than the tractor.” As the technical report indicated, “[s]horter trailers off-track less than longer trailers in low-speed maneuvering, so the control double configuration has less off-tracking than the control single. For this same reason, the 33-ft trailers in Scenario 4 have more off-tracking than the 28-ft trailers in the control double.”
- *Slightly longer stopping distance.* The twin 33 configuration “had a higher average axle load than the other combinations and had a marginally higher stopping distance.”
- *Path deviation not affected by the anti-lock braking system (ABS) malfunction.* None of the multitrailer configurations jackknifed when the ABS malfunction was applied to the lead dolly (the coupling device that connects the tractor to the trailer), although three of them experienced a path deviation of approximately 36 inches (Scenario 4 had a minor path deviation). The twin 33 tested as Scenario 4 “was on the verge of instability, but its path deviation was not affected by the ABS malfunction under the specific conditions of this study.”

A peer review panel report noted that the technical reports (cited on page 10 of this Preliminary Investigation) “lacked a consistent and complete quantitative summary of the evaluations of the alternative configuration scenarios. In particular,

- Lack of cost estimates for major categories (local roads, bridge structural costs, user costs from detours, crashes);
- Inconsistency in the way in which units of measure for impacts estimates are presented;
- Missing or inaccurate assessments of the uncertainty of estimates.”

Recommendations, which begin on page 21 of the report (page 23 of the PDF), sound a cautionary note about the use of study results to predict national impacts (emphasis added):

At the conclusion of the Technical Reports, the Department believed that **the current model and data limitations were so profound that the results could not accurately be extrapolated to confidently predict national impacts.** Subsequent public input and peer review has not altered that view. **As such, the Department stresses that no changes in the relevant Federal truck size and weight laws and regulations should be made until these limitations are overcome.** Despite recent Congressional action approving additional size and weight exceptions and waivers on a piecemeal and nationwide basis, DOT recommends a thoughtful approach to future policy making.

Similarly, the report's conclusions, beginning on page 25 of the report (page 27 of the PDF), highlight the limitations of the current effort (emphasis added):

In many ways, this study produced more questions than it sought to answer. Another study effort, with more time and more money, would not at this point yield more reliable results. To make a genuine, measurable improvement in the knowledge needed for these study areas, a more robust study effort should start with the design of a research program that can establish data sources and models to advance the state of practice. Not all of this is within the purview or capacity of DOT. Even recent gains in long term reauthorization of transportation programs does not sufficiently advance the state of research and data to enable us to say when or even whether we will be in a position to collect and analyze better data and apply it to improved policy determinations and regulatory strategies.

Changes made by Congress regarding the size and weight of vehicles allowed on the Nation's Interstate System are matters of policy. **The work performed and the findings produced in this study can inform the debate on these matters but do not provide definitive evidence or direction to support any specific new change of direction in the areas of truck size and weight limitations.** This work has helped identify the areas in which we are reminded that we need to know more, and that new technologies for data collection and sharing can offer us improved mechanisms for growing that knowledge.

Stakeholder Sessions 2013-2015: Feedback and Comments—Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, April 2016.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/ctsw/stakeholder/ctswls_sum_cmnts.pdf

From the introduction:

This report presents a quantitative and qualitative analysis of trends, themes and patterns identified through the review of the comments received as part of this Study effort. This material also provides a summary of the disposition of those comments by the Department's subject matter experts who led the technical research.

Comments were recorded during stakeholder sessions that solicited feedback from interested parties on the alternative configurations that would be evaluated during the study. Feedback or observations related to twin 33s include:

- Twin 33 would be their first choice; this is of particular interest to the Less Than Truckload (LTL) sector. Triples would be the second choice. (Trucking Association recommendation)
- Agreed with Twin 33 and Triples being the top choice. No clear choice from either of them on the third pick. There was no clear preference between the two types of doubles.

Some thought there would be more data for Rocky Mountain doubles in the United States. If using data from Canada, Turnpike doubles would have more miles. (Truck Safety advocate)

- The LTL Industry strongly supports twin 33 ft. double at current 80,000 lb. limit. Suggested variations, examine this unit at 80,000 lbs. and at bridge formula limit in both the A and B configuration.

Technical Reports

Volume 1: Technical Reports Summary—Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/vol1technicalsummary.pdf

As the executive summary indicates, the 2015 study follows other research that examined truck size and weight limits. FHWA's comprehensive 2000 study was followed by the Western Uniformity Scenario Analysis, which was published for the Western Governors' Association by FHWA in 2004. That analysis focused on the impacts of expanding longer combination vehicle (LCV) operations in Western states. As this summary of the study's technical reports indicates, "other agencies and organizations have looked at various aspects of truck size and weight regulations in individual States or regions and at freight transportation issues in general. These reports present a range of findings that address changes in truck size and weight regulations and the impacts of those changes on industry productivity, infrastructure, safety and the environment. To understand these diverse views, FHWA conducted extensive outreach and a thorough literature search of prior research at the outset of this Study."

Volume 1 provides a summary of study results that are presented in more detail in the individual technical reports cited below. A brief summary of the findings presented in these reports begins on page 7 of this Preliminary Investigation.

Bridge Structure Comparative Analysis Technical Report: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/bscanalysis.pdf

Compliance Comparative Analysis Technical Report: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/ccanalysis.pdf

Highway Safety and Truck Crash Comparative Analysis Technical Report: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/hstcanalysis.pdf

Modal Shift Comparative Analysis Technical Report: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/mscanalysis.pdf

Pavement Comparative Analysis Technical Report: Comprehensive Truck Size and Weight Limits Study, Federal Highway Administration, June 2015.

https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/technical_rpts/pcanalysis.pdf

Future Federal Truck Size and Weight Limits Research

In a 2016 report to Congress describing the results of its comprehensive truck size and weight limits study, FHWA noted the limitations of its efforts to date and recommended continuing the research into truck size and weight limits. After submission of the 2016 report, FHWA's Office of Freight Management and Operations asked the Transportation Research Board (TRB) to recommend a research plan "to reduce uncertainties in estimates of the impacts of changes in truck size and weight limits."

In response, TRB established the Truck Size and Weight Limits Research Plan Committee and directed it to produce two reports:

- **Interim report.** This report will include a preliminary list and description of research and data needs and objectives in five research areas (bridges, pavement, safety, enforcement and modal shift) that mirror the research areas addressed in the 2015-2016 FHWA study; recent developments not addressed in the FHWA study will also be considered.
- **Final report.** This report will present the committee's research roadmap. The roadmap will include research problem statements, estimated costs and timelines in the five research areas to address "the impacts of larger and heavier trucks in these five areas on national state and local roads." Publication of this report is expected later in 2018.

Below is a brief summary of the committee's interim report, published April 16, 2018 (see **Related Resources** below for a link to this publication):

After a review of previous research, calling out key conclusions in numbered boxes, the report presents candidate research problem statement topics in the five research areas:

- Pavement and bridge research (see page 15 of the report, page 16 of the PDF).
- Safety research (see page 17 of the report, page 18 of the PDF).
- Enforcement research (see page 21 of the report, page 22 of the PDF).
- Mode choice and freight market research (see page 22 of the report, page 23 of the PDF).
- Research on methods to evaluate truck size and weight regulatory and management options (see page 23 of the report, page 24 of the PDF).

The report concludes with a description of the committee's six criteria for assessing research priorities:

- Relative magnitudes of the potential cost changes caused by a change in limits.
- Degree of uncertainty in present estimates.
- Likelihood that research could make progress.
- Public and interest group concerns.
- Potential value of research results for general highway management applications.
- Assumed objectives of the regulatory changes under consideration.

Related Resources

Truck Size and Weight Limits Research Plan Committee: First Report: Candidate Research Topics; Framework for Setting Priorities, Truck Size and Weight Limits Research Plan Committee, Transportation Research Board, April 2018.

Report available at <http://nap.edu/25091>

This interim report describes the candidate topics for the research problem statements that will appear in the final research plan. The report does not include recommendations and its authors caution that statements about research priorities are “preliminary.”

Project Information: Truck Size and Weight Limits Research Plan, Truck Size and Weight Limits Research Plan Committee, National Academy of Sciences, 2018.

<https://www8.nationalacademies.org/cp/projectview.aspx?key=49889>

This web site provides information about the committee’s efforts, including meeting dates and committee membership.

State Truck Size and Weight Limits

An Americans for Modern Transportation publication cites FHWA data in identifying the following states as allowing twin 33s:

- Alaska.
- Arizona.
- Colorado.
- Florida.
- Idaho.
- Indiana.
- Iowa.
- Kansas.
- Massachusetts.
- Missouri.
- Montana.
- Nevada.
- New York.
- North Dakota.
- Ohio.
- Oklahoma.
- Oregon.
- South Dakota.
- Utah.
- Wyoming.

(See page 17 of this Preliminary Investigation for this publication’s citation.)

We found no publically available resources that provide sufficient information to describe in detail the truck length limits associated with different roadway classes for all 20 states identified above. We did, however, locate some corroborating information in resources that are presented below in two topic areas:

- Federal guidance.
- Commercial guides and manuals.

Federal Guidance

The federal publications cited below describe the truck length limits applicable by state to certain classes of trucks operating on the NN and NHS. The latter includes Interstate and non-Interstate routes. (State laws control maximum gross vehicle sizes and weights on non-Interstate routes.) These resources are:

- An appendix to 23 CFR Part 658 that provides state-by-state size and weight limits for commercial motor vehicles on the NN, including the maximum cargo-carrying length of a “truck tractor and two trailing units.”

- A May 2015 FHWA report to Congress that compiles existing state truck size and weight limit laws in force as of October 1, 2012. The report does not specifically address twin 33s.

23 CFR Appendix C to Part 658

23 CFR Appendix C to Part 658, Trucks Over 80,000 Pounds on the Interstate System and Trucks Over STAA Lengths on the National Network, provides state-by-state size and weight limits for commercial motor vehicles on the NN. (See <https://www.gpo.gov/fdsys/pkg/CFR-2011-title23-vol1/pdf/CFR-2011-title23-vol1-part658-appC.pdf> for the text of Appendix C.)

Note: The Surface Transportation Assistance Act (STAA) of 1982 allows large trucks, referred to as STAA trucks, to operate on routes that are part of the NN; see <http://www.dot.ca.gov/dist1/d1projects/staa.htm>.

The table below excerpts data included in Appendix C and indicates the “maximum cargo-carrying length” allowed on the NN by states that appear to permit use of twin 33s. Appendix C describes how the measurement reflected in the table below is determined:

... maximum cargo-carrying length [is] measured in feet from the front of the first cargo unit to the rear of the last cargo unit. This distance is not to include length exclusive devices which have been approved by the Secretary or by any State. Devices excluded from length determination shall only include items whose function is related to the safe and efficient operation of the semitrailer or trailer. No device excluded from length determination shall be designed or used for carrying cargo.

Trucks Over STAA Lengths on the National Network			
State	Tractor and Two Trailing Units (in feet)	State	Tractor and Two Trailing Units (in feet)
Alaska	95	Montana	93
Arizona	95	Nebraska	95
Colorado	111	Nevada	95
Florida	106	New York	102
Idaho	95	North Dakota	103
Indiana	106	Ohio	102
Iowa	100	Oklahoma	110
Kansas	109	South Dakota	100
Massachusetts	104	Utah	95
Missouri	110	Wyoming	81

Appendix C provides detailed information, by state, of the types of LCVs permitted on the NN (including tractors with two trailing units); the permitted length of cargo-carrying units; and

operational conditions such as the considerations associated with weight, driver and vehicle, the permits required, access and the specific routes where LCVs like the twin 33 are permitted.

Compilation of Existing State Truck Size and Weight Limit Laws

The May 2015 FHWA publication, *Compilation of Existing State Truck Size and Weight Limit Laws: Report to Congress*, available at https://ops.fhwa.dot.gov/freight/policy/rpt_congress/truck_sw_laws/truck_sw_laws.pdf, compiles state truck size and weight limit laws in force as of October 1, 2012, that relate to the NHS (the Interstate highway system is a subset of the NHS).

The report does not specifically address twin 33s; however, the report does consider the STAA Double, which consists of a tractor and two trailers, with neither trailer exceeding 28 feet in length. Below are two excerpts from this report for states that allow the operation of LCVs, which appear to include twin 33s, on state roadways:

Florida. See page 42 of the report (page 55 of the PDF) for limitations associated with “turnpike tandems”:

“Turnpike Tandems”: State regulations define a “Turnpike Tandem” as a combination of truck tractor, semitrailer, and trailer that operates as a SU [single unit] and in which either the semitrailer or the trailer unit is longer than 28 feet but neither the semitrailer nor the trailer unit is longer than 48 feet (Fla. Admin. Code §14-61.0012). The Department of Transportation’s Road User Permits Office is authorized to issue permits for oversize or overweight Turnpike Tandems to be operated on the Florida Turnpike System only (Fla. Admin. Code §14-61.0016[2][a]). For a Turnpike Tandem, the gross weight of the truck tractor and the first semitrailer cannot exceed 80,000 lbs.; the maximum gross weight of the unit of dolly and second trailer cannot be more than 67,000 lbs. or the limit calculated under the State bridge formula, whichever is less; and the gross weight cannot exceed 147,000 lbs. (Fla. Admin. Code §14-61.0017[3]).

Oklahoma. See page 149 of the report (page 162 of the PDF) for limitations associated with the use of “doubles with trailers over 29 feet”:

Grandfathered Routes: Doubles with 29-foot trailers may use any route on the NN in Oklahoma, including Interstate highways. Doubles with trailers over 29 feet are limited to Interstate highways and 45 separate Oklahoma highway segments, which are listed in 23 CFR 658, Appendix C. [See 23 CFR Appendix C to Part 658, Trucks Over 80,000 Pounds on the Interstate System (page 316 of the report, page 2 of the PDF) and Trucks Over STAA Lengths on the National Network (page 316 of the report, page 2 of the PDF), available at <https://www.gpo.gov/fdsys/pkg/CFR-2011-title23-vol1/pdf/CFR-2011-title23-vol1-part658-appC.pdf>.]

Commercial Guides and Manuals

Below are examples of commercial publications that provide state-by-state descriptions of size and weight limits. A 2018 trucking industry publication compiles the legal limits for Interstate highways and other state roads. This publication does not appear to provide enough data to identify all states permitting the use of twin 33s (it lacks details of states’ oversize/overweight (OS/OW) permit requirements). A 2017 vendor publication offers a more comprehensive review of states’ vehicle size and weight limits. The complete manual is available for purchase.

Size and Weight 2018 Guide, XTRA Lease, Inc., 2018.

<http://www.xtralease.com/SiteCollectionDocuments/Size%20and%20Weight%20Guide/SizeWeight.pdf>

Produced by a commercial trucking company, this guide provides a state-by-state listing of size and weight legal limits for Interstate highways and other state roads. The guide provides length limits for a range of vehicle types, including tractor-twin-trailer combinations. Based on guide data, only a small number of the states identified as allowing the operation of twin 33s on state roadways do so under standard legal limits. While other states may allow the operation of twin 33s under an OS/OW permit, this guide does not address OS/OW permit requirements.

The guide provides data for states that permit twin trailing units longer than 28 or 28.5 feet; see below for the length limit of each trailer in a twin-trailer combination:

Alaska. 48 feet.

Idaho. 61 feet of trailers (or 75 feet overall), including tongue.

North Dakota. 53 feet (length limit includes the load on the semitrailer).

Oklahoma. 53 feet each trailer (not to exceed 110 feet (cargo carrying capacity limits) on Interstate and four-lane divided highways only; five-mile access).

Wyoming. 48 feet for first semitrailer; 40 feet for second combination trailer; combined length not to exceed 81 feet, including connections.

Vehicle Sizes and Weights Manual, J.J. Keller and Associates, Inc., 2017.

https://cdn.jjkeller.com/wcsstore/CVCatalogAssetStore/samples/1M/1M_lookInside.pdf

This vendor publication summarizes the legal vehicle size and weight limits, including OS/OW permitting requirements and superload permit criteria, for each state. The nine-page summary in these sample pages describes Montana's size and weight limits. The OS/OW section of each state summary provides information on how to obtain a permit, the types of permits available, permit fees and permitted vehicle limitations. The manual, available for purchase at <https://www.jjkeller.com/shop/Product/Vehicle-Sizes-and-Weights-Manual>, is updated each June and December.

Other Research and Related Resources

The resources below are organized into two categories:

- Related research.
- Stakeholder publications.

Related Research

Infrastructure-Friendly Vehicles to Support Texas Economic Competitiveness, Jorge A. Prozzi, Prasad Buddhavarapu, Sareh Kouchaki, José Weissmann, Angela Weissmann, Nan Jiang, Kevin Savage and C. Michael Walton, Texas Department of Transportation, March 2017. <https://library.ctr.utexas.edu/ctr-publications/0-6817-1.pdf>

From page 65 of the report (page 80 of the PDF): As part of this study, the research team identified leaders within the industry that provided significant insight into the future of truck configurations. These individuals were reached out in an effort to solicit input concerning the practical design limitations of nonconventional vehicles configurations and to identify potential benefits and costs relating to potential changes in the TS&W [truck size and weight] regulations.

....

It was noted that there is a big push from the 28.5 ft to the 33 ft trailer for the industry; however, there is resistance from the labor and safety perspectives. Twin 33s are currently legal in only 17 states, while triples are legal in others. Due to this, investments into these configurations are not being considered. However, it was noted that changes in TS&W regulations could show savings benefits of 1 billion miles/year should 18% of the current miles be saved from the efforts.

NCHRP Report 671: Review of Canadian Experience With the Regulation of Large Commercial Motor Vehicles, John Woodrooffe, Peter Sweatman, Dan Middleton, Ray James and John R. Billing, 2010.

Report description at <http://www.trb.org/Publications/Blurbs/164522.aspx>

From the foreword: This report documents the process used in Canada to harmonize heavy truck size and weight regulations across the country and provides insights on how lessons learned from the Canadian experience might be applied in a U.S. context. It will provide a valuable contribution to the ongoing discussion of truck size and weight regulation in the United States. The authors include a summary of the regulatory framework for truck size and weight regulation in the United States and the efforts that have been made over time to achieve greater uniformity. This report will be of interest to truck size and weight regulators in the United States, who face similar jurisdictional challenges to develop and implement regulations that permit common configurations of heavy trucks that can operate legally across the country without compromising safety concerns or creating excessive impacts on road pavement.

U.S. specifications are highly influenced by the Federal Bridge Formula, which tends to define the number of axles in a vehicle, the allowable weights, and overall length. There is the potential for an approach based on the bridge formula that could result in undesirable outcomes for vehicles with 6 or more axles. Unless otherwise prohibited, it is likely that lift axles would flourish, which would be threatening to the infrastructure.

The approach in Canada was to provide a complete specification for the vehicle, including internal dimensions critical to both infrastructure and vehicle dynamic performance.

Stakeholder Publications

The citations below are a sampling of the many resources published or sponsored by associations and interest groups that present data and commentary supporting and opposing the use of twin 33s.

States Allowing LCVs and Twin 33 Trailers, Americans for Modern Transportation, undated.

<http://americansformoderntransportation.org/wp-content/uploads/LCV-Factsheet-Final.pdf>

This fact sheet uses FHWA data to identify the 20 states that allow LCVs and twin 33s:

- Alaska.
- Arizona.
- Colorado.
- Florida.
- Idaho.
- Indiana.
- Iowa.
- Kansas.
- Massachusetts.
- Missouri.
- Montana.
- Nevada.
- New York.
- North Dakota.
- Ohio.
- Oklahoma.
- Oregon.
- South Dakota.
- Utah.
- Wyoming.

According to the organization's web site (<http://americansformoderntransportation.org>), Americans for Modern Transportation "represents the nation's largest shippers, deliverers and retailers who are committed to improving the safety and efficiency of America's transportation system and modernizing the delivery of products across the country."

Heavy-Duty Innovation: Energy, Automation, and Technology in the Trucking Sector,

Securing America's Future Energy, November 2017.

http://secureenergy.org/wp-content/uploads/2017/11/Heavy-Duty-Innovation_Energy_Automation_Tech.pdf

Securing America's Future Energy (SAFE), the document's publisher, is described on its web site (<http://secureenergy.org>):

SAFE unites prominent military and business leaders to develop and advocate for policies that improve America's energy security by significantly curtailing our dependence on oil and promoting responsible use of our domestic energy resources. SAFE relies on the knowledge and experience of four-star retired military officers, Fortune 500 CEOs and its expert staff to produce high-quality, fact based analysis and policy recommendations for lawmakers, regulatory agencies and the public.

Excerpts from a discussion of twin 33s that begins on page 8 of the document include:

- Trucks hauling twin 33s have logged more than 1.5 million miles on the Florida Turnpike—the nation's third-busiest toll road—over the past six years without any accidents.
- A 2015 U.S. Department of Transportation (FHWA) report found that even though trucks with twin-33 foot trailers are capable of braking within established stopping guidelines, trucks hauling twin-33s require 22 additional feet to arrive at a complete stop relative to other trucks on the road today.
- Twin 33s increase trailer volume by 18.6 percent, while the number of trucks needed to transport the same amount of cargo decreases by 15.7 percent.
- A recent report by Americans for Modern Transportation—an advocacy group formed by a coalition of U.S. shippers, retailers and deliverers—found that 4,500 fewer truck accidents would occur if legislation allowing twin 33s was passed.

- SAFE modeling estimates that improvements in freight efficiency and the adoption of twin 33s will result in 23 billion cumulative gallons of diesel saved by 2050.

Twin 33 Foot Truck Trailers: Making U.S. Freight Transport Safer and More Efficient,

Ronald R. Knipling, Americans for Modern Transportation, March 2017.

<http://americansformoderntransportation.org/wp-content/uploads/Ron-Knipling-Twin-33-Study-vF.pdf>

This publication commissioned by a freight industry interest group includes the following in the report's conclusion (see page 17 of the report):

Congressional authorization of T-33s [twin 33s] would allow the transportation industry to provide the greatest possible productivity and efficiency for shippers and the public, while *improving* its safety performance and environmental stewardship. It would save American consumers billions of dollars annually while increasing U.S. competitiveness in the world economy. Higher productivity inevitably means lower prices and greater value for consumers. As the U.S. DOT has concluded, "Increases in maximum allowable truck sizes...will predictably lead to lower truck transport costs; industry competition and regulatory pressure will translate these lower costs into lower transport rates."

Mandated Twin 33 Trailers Produce Costly Shifts in Freight Movement, Roger D. Mingo and Mark L. Burton, R.D. Mingo and Associates, University of Tennessee, August 2015.

<https://ca-bt-s3z6.squarespace.com/s/Mingo-Burton-9-8-2015-FINAL.pdf>

This document appears on the Coalition Against Bigger Trucks web site. The authors conclude that "[c]hanging Federal law to allow twin-33-foot trailer combinations on Interstates and other national network highways will result in significant substitution of these combinations in place of existing 53-foot single trailers in the movement of existing highway freight and the diversion of freight traffic from rail-truck intermodal carriage to all-truck highway routings. Our estimates suggest this will directly lead to pronounced safety and environmental impacts (200 additional annual fatalities) and similarly striking pavement and bridge costs (\$5.5 - \$10.5 billion, annually)."

The authors describe how they arrived at their estimates:

Existing U.S. Department of Transportation data lead to the inescapable conclusion that double-trailer combinations impose more fatalities among motorists and produce more extensive damage to pavement and bridges. Therefore, measuring the probable outcomes attributable to the widespread adoption of twin-33-foot trailer combinations involves only two steps – (1) estimating the volume of new 33-foot and twin-33 combinations used in place of existing equipment and (2) applying what we already understand about increased risk and damages to the additional traffic volumes[.]

"FedEx Presses Congress for 33-ft.Twin Trailers," Avery Vise, *Fleet Owner Newsline*, FleetOwner, Informa USA, Inc., February 27, 2014.

<http://www.fleetowner.com/fleet-management/fedex-presses-congress-33-ft-twin-trailers>

This online article summarizes the testimony of Henry Maier, chief executive officer of FedEx Ground, before the House Transportation and Infrastructure Committee's Subcommittee on Highways and Transit. Below are a few key points of his testimony:

- Increasing the national standard for twin trailers to 33 feet from the existing 28 feet would allow carriers to absorb up to 18 percent of future freight growth without any change in gross vehicle weight or additional miles traveled on roadways.

- Projected benefits of allowing twin 33s are based on data supplied not only by FedEx, but also ABF Freight, Con-way Inc., Estes Express Lines, Old Dominion Freight Line, UPS and YRC Worldwide.
- Industrywide benefits include up to 1.8 billion fewer miles driven, more than 300 million gallons of gasoline saved and \$2.6 billion in reduced costs annually.
- FedEx has been testing twin 33s in Florida since 2010. Maier said that “not only have the larger trailers been just as safe, but also some drivers operating them believe safety is enhanced because the longer combination is even more stable than those with 28-foot twins.”

Related Resource:

Improving the Nation’s Highway Freight Network, Hearing Before the Subcommittee on Highways and Transit of the Committee on Transportation and Infrastructure, U.S. House of Representatives, February 27, 2014.

<https://www.gpo.gov/fdsys/pkg/CHRG-113hrg86846/pdf/CHRG-113hrg86846.pdf>

This document presents the testimony highlighted in the article cited above, as well as the testimony of other witnesses appearing before the House subcommittee during the February 2014 hearing.

Comparative Performance Evaluation of Proposed 33 ft Double Trailers Combinations With Existing 28 ft Double Trailers, John Woodrooffe and John De Point, Woodrooffe Dynamics LLC, April 11, 2011.

<http://americansformoderntransportation.org/wp-content/uploads/Woodrooffe-study.pdf>

This report, prepared for Con-way Inc. and FedEx, is often cited by proponents of the expanded use of twin 33s. The authors conducted a literature survey and a comparative vehicle dynamic analysis using a computer simulation that used the standard 28-foot trailer combination as the baseline vehicle to compare with a 33-foot trailer combination with a standard A-train coupling option. (An A-train is a multitrailer vehicle using A-dollies with a single-point hitch.) Among the study’s findings:

- The literature survey showed that longer vehicles tend to have better vehicle dynamic characteristics and in general have better safety performance.
- Research strongly suggests that a significant portion of the safety benefit attributed to LCVs is related to the policies that guide their use.
- Computer simulations produced the following results:
 - The 33-foot double trailer combination was equal to or outperformed the 28-foot double trailer in four performance measures: static rollover threshold, rearward amplification, load transfer ratio and high-speed transient off-tracking (see page 9 of the report for performance measure descriptions).
 - The 28-foot double combination demonstrated better high-speed and low-speed off-tracking performance.
- In general, the analysis shows that lengthening the trailers diminishes the low-speed turning performance but improves high-speed dynamics.
- The proposed 33-foot double combination shows improved productivity by volume and 16 percent improved fuel use and emissions.
- The additional volume in the 33-foot double trailer combination will require 16 percent fewer truckload trips to complete.