Requirements For Axles And Brakes Should Harmonize With Federal Transportation Law

HUD Proposed Requirement

HUD has proposed the following requirement for multistory manufactured homes:

> *"There must be a minimum of two axles equipped with brake assemblies on each transportable section of the manufactured home including any transportation system used for an upper floor of a multistory manufactured home."*

The proposed requirement addresses transportation systems, axles, and brake assemblies used to transport manufactured home sections on public highways.

Axles

The proposed requirement establishes a fixed minimum axle requirement without reference to transportation weight, axle spacing, bridge formula calculations, or permitting requirements. However, FHWA regulations and guidance demonstrate that axle configurations are determined through the relationship between weight, axle quantity, and axle spacing. As a result, transportation equipment carrying upper-floor sections may require different axle configurations depending upon the characteristics of the transported load.

Federal Highway Administration Oversight

The U.S. Department of Transportation, Federal Highway Administration (FHWA), through its Office of Freight Management and Operations, administers the Commercial Vehicle Size and Weight Program.

FHWA states that authorization of the Interstate Highway System created a federal interest in preserving the integrity of highways constructed with federal funds. FHWA further states that federal interest in vehicle size and weight regulation extends to ensuring the safety, productivity, and mobility of freight commerce.

FHWA oversees state enforcement of commercial vehicle size and weight standards throughout the United States.

Federal commercial vehicle weight standards on the Interstate Highway System include:

- Single Axle: 20,000 pounds
- Tandem Axle: 34,000 pounds
- Gross Vehicle Weight: 80,000 pounds

FHWA explains that these standards work in conjunction with the Federal Bridge Formula.

Federal Bridge Formula Requirements

Federal commercial vehicle weight requirements are established under 23 CFR § 658.17.

23 CFR § 658.17(b) provides:

> "The maximum gross vehicle weight shall be 80,000 pounds except where lower gross vehicle weight is dictated by the bridge formula."

23 CFR § 658.17(c) provides:

> "The maximum gross weight upon any one axle, including any one axle of a group of axles, or a vehicle is 20,000 pounds."

23 CFR § 658.17(d) provides:

> "The maximum gross weight on tandem axles is 34,000 pounds."

23 CFR § 658.17(e) provides:

> "No vehicle or combination of vehicles shall be moved or operated on any Interstate highway when the gross weight on two or more consecutive axles exceeds the limitations prescribed by the following formula, referred to as the Bridge Gross Weight Formula."

The Federal Bridge Formula is:

$$W = 500[(LN/(N-1)) + 12N + 36]$$

Where:

- W = Maximum allowable weight carried by a group of axles
- L = Distance in feet between the outer axles of the axle group
- N = Number of axles in the axle group

FHWA explains:

> "The bridge formula was introduced in 1975 to reduce the risk of damage to highway bridges by requiring more axles, or a longer wheelbase, to compensate for increased vehicle weight."

According to FHWA, the formula establishes the maximum allowable weight that may be carried by an axle group based upon both axle count and axle spacing.

FHWA further explains:

> "The federal axle caps (20,000 lb single, 34,000 lb tandem) apply on top of the formula — the lower number governs."

Accordingly, compliance with federal transportation requirements involves consideration of:

- Maximum gross vehicle weight
- Single axle weight limits
- Tandem axle weight limits
- Federal Bridge Formula calculations
- Axle spacing
- Consecutive axle groups

The lower applicable weight limitation governs.

Consecutive Axle Group Requirements

FHWA explains that compliance with the Federal Bridge Formula is not determined solely by evaluating the overall axle group extending from the first axle to the last axle.

FHWA explains:

> "A vehicle has to clear the formula on every consecutive subgroup of axles, not just the outer bridge from the first axle to the last."

FHWA further explains:

> "A long rig can pass on its full wheelbase and still fail on an interior tandem or tridem that sits too close together."

FHWA states:

> "That is why heavy-haul setups spread weight across more axles over a longer span."

These FHWA explanations illustrate the relationship between transportation weight, axle quantity, axle spacing, and bridge protection requirements.

Relationship Between Weight, Axles, and Brakes

Federal transportation regulations evaluate vehicle weight, axle quantity, axle spacing, and allowable axle loads together.

The Federal Bridge Formula specifically incorporates:

- Vehicle weight
- Number of axles

- Distance between axles

FHWA explains that additional axles or increased wheelbase length may be required as transportation weights increase.

The Federal Bridge Formula therefore evaluates both axle quantity and axle spacing when determining allowable transportation weights.

As transportation weights increase, additional axles may be necessary to distribute loads, satisfy bridge formula requirements, comply with axle weight limitations, and protect highway infrastructure.

Transportation Implications of the Proposed HUD Requirement

HUD's proposed language establishes a minimum requirement of two axles equipped with brake assemblies on each transportable section, including transportation systems used for upper-floor sections of multistory manufactured homes.

The proposed language does not reference transportation weight, axle spacing, bridge formula calculations, consecutive axle groups, single axle weight limits, tandem axle weight limits, gross vehicle weight limitations, or other factors evaluated under **23 CFR § 658.17.**

Upper-floor sections may vary in:

- Length
- Width
- Structural design
- Material selection
- Roof systems
- Mechanical equipment
- Interior finishes
- Transportation weight

Because transportation weights may vary from one design to another, transportation equipment may also vary.

Federal transportation regulations evaluate allowable weight based upon axle quantity, axle spacing, and bridge formula calculations. FHWA's Commercial Vehicle Size and Weight Program and the requirements contained in **23 CFR § 658.17** evaluate these factors together.

Special Permit Authority

23 CFR § 658.17(h) provides:

> "States may issue special permits without regard to the axle, gross, or Federal Bridge Formula requirements for nondivisible vehicles or loads."

Manufactured homes and other oversized structures are frequently transported pursuant to state oversize and overweight permitting requirements.

Brake Assemblies and Transportation Safety Considerations

HUD has proposed the following requirement for multistory manufactured homes:

> "There must be a minimum of two axles equipped with brake assemblies on each transportable section of the manufactured home including any transportation system used for an upper floor of a multistory manufactured home."

The proposed requirement addresses brake assemblies utilized on transportation equipment operating on public highways. Federal transportation regulations contain specific requirements governing emergency braking and breakaway braking systems for trailers.

49 CFR § 393.43, Breakaway and Emergency Braking, provides:

> "Every trailer required to be equipped with brakes shall have brakes which apply automatically and immediately upon breakaway from the towing vehicle."

The regulation further provides:

> "The brakes must remain in the applied position for at least 15 minutes."

49 CFR § 393.43 also establishes requirements for:

- Towing vehicle protection systems.
- Emergency brake activation systems.
- Automatic emergency brake operation.
- Breakaway braking systems.
- Air brake emergency valves.

These transportation safety requirements address the operation of braking systems in emergency situations, including separation of the trailer from the towing vehicle.

The proposed HUD requirement addresses the number of brake-equipped axles on a transportable section. Federal transportation regulations additionally address emergency braking performance, automatic brake application upon breakaway, and protection of the towing vehicle and motoring public in the event of a trailer separation.

Accordingly, brake assemblies present transportation considerations in addition to axle quantity and axle spacing considerations discussed elsewhere in this document.

Need for Transportation Agency Coordination

The proposed rule addresses transportation systems, running gear, axles, and brake assemblies that operate on public highways.

Before adopting permanent axle and brake requirements for upper-floor transportation systems, HUD may benefit from consultation with agencies and organizations involved in transportation safety and commercial vehicle operations, including:

- Federal Highway Administration (FHWA)
- Federal Motor Carrier Safety Administration (FMCSA)
- National Highway Traffic Safety Administration (NHTSA)
- Commercial Vehicle Safety Alliance (CVSA)
- State transportation agencies
- State permitting authorities
- State commercial vehicle enforcement agencies

Such consultation could assist in evaluating transportation-related considerations associated with the movement of multistory manufactured home sections on public highways.

Resources

Federal Highway Administration (FHWA)
Office of Freight Management and Operations
Commercial Vehicle Size and Weight Program

23 CFR § 658.17 – Weight

Federal Bridge Formula

Federal Bridge Formula Calculator and Explanation

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