

Agricultural and Biosystems Engineering

Safety Chains for Agricultural Vehicles

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Operating motor vehicles on public roads may be one of your biggest liability exposures. While you may not be able to prevent all mishaps, you must do everything possible to protect yourself and others. One easily preventable type of mishap is separation of trailers from towing vehicles, resulting in spectacular crashes and often to tragic results. In fact, Tennessee's safety chain law was passed as a direct result of several fatal trailer separations.

All states have require safety chains for wagons and trailers used on public roads, and commercial vehicles are required by federal law to have safety chains. Safety chains are intended to keep the trailer under control and minimize losses if you make a mistake or the coupler fails.

According to Tennessee law, a **motor vehicle** is any motorized "device upon or by which any person or property may be transported or drawn upon a highway" except vehicles which operate on rails or are powered from overhead wires. Thus, farm equipment is considered a motor vehicle when on a public road. This includes the powered machine and trailers, wagons or towed equipment.

Tennessee law specifically defines a farm tractor as a motor vehicle.

A **highway or street** is defined as "the entire width between boundary lines of any publicly maintained way when any part of it is open to the use of the public for vehicular traffic." This includes the roadbed, shoulders and banks. This means that even if you are traveling on the grassy shoulder of the road, you are considered to be on a public road, and all the laws and regulations apply just as if you are traveling on the pavement.

This fact sheet is intended to help you understand and comply with Tennessee's safety chain law. However, keep in mind that laws may vary from state to state, especially regarding agricultural equipment, so check before traveling outside Tennessee.

The following checklist will help you determine steps you must take to comply with Tennessee and federal laws. You should make it a habit to check these items and correct any deficiencies prior to each trip. Your life and financial future may depend on it!



SAFETY CHAIN REQUIREMENTS:

YES__ NO__ **Is the towed vehicle required to have a safety chain?** Tennessee law requires a safety chain on each trailer, wagon or other towed vehicle when on a highway or street. The only vehicles exempt are fifth-wheel trailers and "implements used for tillage, planting or harvesting towed on state or local roads at speeds under 25 miles per hour." Gooseneck trailers using a ball coupler are required to have safety chains. *NOTE: Farm trailers and wagons specifically ARE NOT EXEMPTED from the safety chain requirement.*

YES__ NO__ **Is the safety chain the proper size?** Tennessee law requires a safety chain "capable of maintaining the attachment" should the coupler disconnect or fail. State law gives no further guidance on sizing safety chains: however, industry standards on safety chains require the breaking strength of the chain and all connecting hardware to equal or exceed the Gross Towed Weight (GTW). Refer to Table 1 for chain sizes required for various GTWs.

WARNING: Do not use any chain smaller than shown in Table 1. The standards require only one chain. If two or more safety chains are used, each chain must meet the strength requirement independently.

Either chain or wire rope is permitted as long as it meets the strength requirements. If purchasing a ready-made safety chain or cable, trailer classes are:

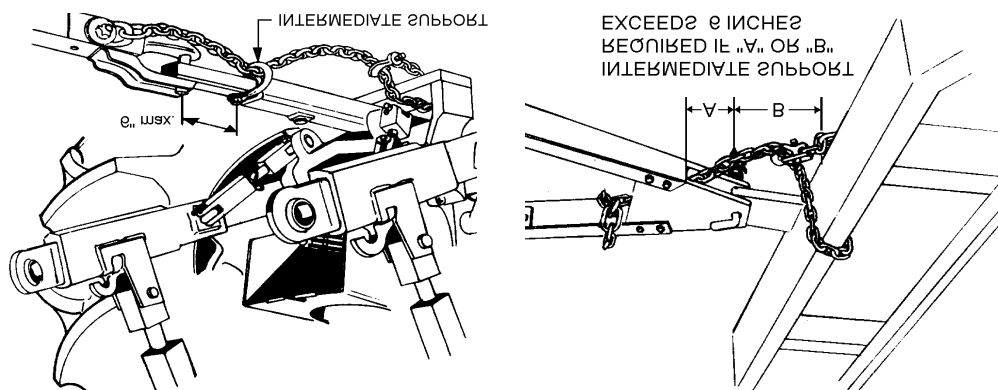
- Class 1: GVWR 2,000 lbs or less
- Class 2: GVWR 2,000 lbs to 3,500 lbs
- Class 3: GVWR 3,500 lbs to 5,000 lbs
- Class 4: GVWR 5,000 lbs to 10,000 lbs

YES__ NO__ **Is the chain properly attached?** The chain must be attached to points on both the towed and towing vehicles that are at least as strong as the safety chain. All hooks, bolts, etc. used must also meet the strength requirements. *Hooks must have safety devices to keep them from coming loose.*

WARNING: DO NOT WELD safety chains to vehicles - you will weaken the welded link and the link or weld may fail in an accident.

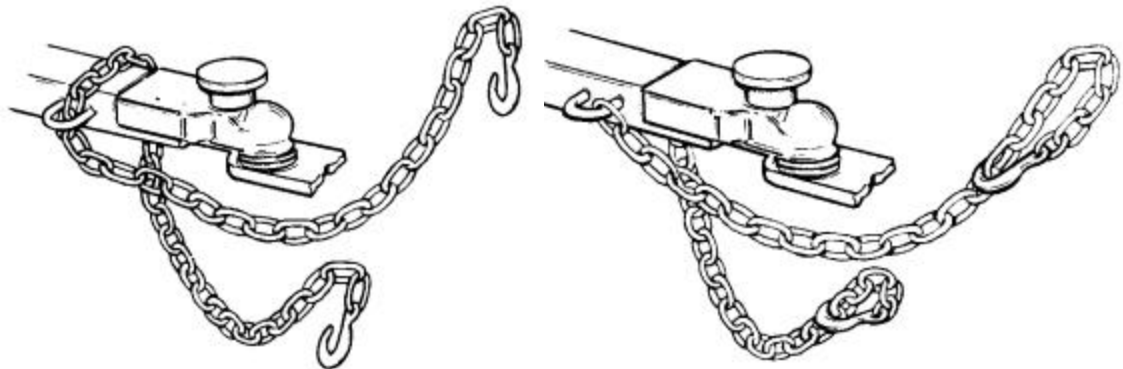
YES__ NO__ **Is there the enough slack for proper functioning?** There should be enough slack for turning and operation over uneven terrain, but no more. Excess slack can allow the tongue of the towed vehicle to catch the ground or wander excessively from side to side should the coupler become disconnected. Either could result in failure or loss of control.

YES__ NO__ **Is the safety chain supported within 6 inches of the hitch point?** Standards require the safety chain to be supported within 6 inches of the hitch (8 inches if GTW is over 30,000 lb). This reduces the risk of the tongue catching the ground and minimizes swaying side to side. Mount the chain on the tongue within 6 inches of the hitch, but it must not be fastened to the hitch or coupler itself. When towing with a tractor, run the chain through a clevis in the auxiliary hole of the drawbar.



Typical safety chain installations on agricultural equipment.

YES__ NO__ **Are the safety chains crossed beneath the coupler?** The recommended method for a two-chain system is to criss-cross the chains beneath the coupler. This helps prevent the coupler from falling to the pavement. If it did fall to the pavement, it might gouge into the surface or catch on joints in the pavement, causing further damage to the vehicle or possible failure of the safety chains.



Typical safety chain installations using single and double chains.

OTHER TOWING SAFETY REQUIREMENTS:

YES__ NO__ **Is the right hitch and coupler used?** Make sure the hitch, ball and coupler are rated for the load. Also, check to be sure the ball and coupler are properly matched.

Class 1: 1 ⁷/₈ inch ball

Class 2: 2 inch ball

Class 3: 2 inch ball rated for 5,000 lbs GVWR

Class 4: 2 ⁵/₁₆ inch ball rated for appropriate GVWR

YES__ NO__ **Is the coupler locked to prevent accidental separation?** ALWAYS lock the coupler or use a hitch pin with a safety device to prevent unintentional disconnects.

YES__ NO__ **Is the towing vehicle big enough for the job?** Towing too big a load is dangerous and leads to premature failure of your vehicle. When towing with a car or truck, do not exceed the GTW and tongue weight ratings for your vehicle or hitch. Check the nameplate or consult your dealer to determine the GTW for your vehicle. If towing with a tractor, the GTW should not exceed the weight of the tractor unless the trailer has brakes that function with the tractor.

YES__ NO__ **Is the trailer/wagon big enough for the job?** Check the nameplate or consult the manufacturer to determine the GVWR of your trailer/wagon. DO NOT exceed this rating. Overloading is dangerous and shortens the life of the vehicle.

YES__ NO__ **Does the trailer have brakes?** All states and Federal law require brakes on trailers over 3,000 pounds GVWR. Car and light truck manufacturers recommend brakes on trailers and wagons over 1,000 pounds GVWR. *EXCEPTION: Farm trailers used exclusively for transporting farm supplies/products can be operated without brakes in Tennessee.* Refer to Extension Engineering info sheet "Trailer Brakes" for additional information.

YES__ NO__ **Is there an emergency or breakaway brake controller** to apply brakes in the event of coupler failure? All states and Federal law require such devices on trailers over 3,000 lbs GVWR.

FOR MORE INFORMATION:

If you need additional information about safety chains and highway safety in general, contact your county Extension office, the Tennessee Department of Safety, your local law enforcement agency or a knowledgeable towing and hitch specialist.

TABLE 1. WORKING LOAD LIMITS AND BREAKING STRENGTHS OF WELDED STEEL CHAIN

Nominal or Trade Size (inches)	Grade 30 (Proof Coil)		Grade 43 (High Test)		Grade 70 (Transport)		Grade 80 (Alloy Steel)	
	Working Load Limit	Breaking Strength	Working Load Limit	Breaking Strength	Working Load Limit	Breaking Strength	Working Load Limit	Breaking Strength
$\frac{3}{16}$	792	3,168	1,144	4,576	1,848	7,392	2,134	8,536
$\frac{1}{4}$	1,276	5,104	1,848	7,392	3,014	12,056	3,300	13,200
$\frac{5}{16}$	1,672	6,688	2,420	9,680	3,938	15,752	--	--
$\frac{3}{8}$	2,640	10,560	3,784	15,136	6,160	24,640	7,040	28,160
$\frac{1}{2}$	4,466	17,864	6,380	25,520	10,406	41,624	11,880	47,520
$\frac{5}{8}$	6,754	27,016	9,680	38,720	15,774	63,096	17,600	70,400
$\frac{3}{4}$	10,560	42,240	15,114	60,456	24,640	98,560	27,500	110,000
$\frac{7}{8}$							34,100	136,400

NOTES: (1) All working loads and breaking strengths are in pounds. (2) Chain sizes shown are based on working loads and breaking strengths specified by the National Association of Chain Manufacturers.

TABLE 2. SELECTING SAFETY CHAINS BASED ON GROSS TOWED WEIGHT

GTW (pounds)	MINIMUM CHAIN SIZE			
	Grade 30 (Proof Coil)	Grade 43 (High Test)	Grade 70 (Transport)	Grade 80 (Alloy Steel)
2,000	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$
3,500	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$
5,000	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$
10,000	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{4}$
15,000	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{3}{8}$
20,000	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$
25,000	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$
30,000	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
35,000	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
40,000	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$

NOTE: Chain sizes shown are based on breaking strengths specified by the National Association of Chain Manufacturers.

REFERENCES:

Trailer Couplings, Hitches and Safety Chains – Automotive Type, SAE J684f. Society of Automotive Engineers, Warrendale, PA

Tennessee Code Annotated, Chapter 55

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