An Engineering Guide for Trailer Safety Chain Installation, Attachment and Use

A Guide for Manufacturers, Distributors, and End Users

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Purpose and Scope:

While there are many factors which contribute to safe or unsafe towing of trailers, this paper will focus only on safety chains. For information on other considerations for safe towing that are not addressed in this paper, please follow the instructions from your trailer manufacturer and ensure that you know and understand the ratings for each part of the towing system including truck, receiver, hitch, ball, safety chains, and trailer.

Trailer Safety Chain Background:

Trailer safety chains are a secondary connection between the rear of the towing vehicle and the front of the trailer. This can be thought of as an added insurance that your trailer will not become detached from your tow vehicle should any part of the primary coupling fail. Primary coupler failure typically comes in one of the following forms:

- The coupler can come off of the ball
    - The coupler was never fully seated on the ball
    - The wrong size ball was used
    - The lock on the coupler was not properly locked down
- The ball can come off of the hitch
- The hitch can come out of the vehicle receiver
- The coupler can become detached from the trailer draw bar

The purpose of the safety chains is to keep the trailer connected to the tow vehicle long enough to bring the trailer to a safe stop. The chains are not meant to maintain the connection in the event of rollover, jackknife, collisions, etc.

The problem with primary coupler failure has been known for decades. Auxiliary safety connections for trailers were introduced as early as 1939 as described in US Patents 2,225,130 and 2,196,115 and the configuration where two chains are crossed under the coupler, which has become the standard auxiliary connection, was seemingly introduced as early as 1959. The purpose for the auxiliary safety connections as stated in the patents is "to hold the trailer connected with the machine and on the road in case of injury to the usual hitch or loss of a coupling pin or the like (2,225,130 Patent). Clearly the dangers associated with trailers that become unhitched from their towing vehicles or "runaway trailers" have been known for decades. Laws and standards have been put in place to prevent or limit the number of runaway trailers as will be discussed below, however this phenomenon is still ever present and causes millions of dollars of damage, thousands of injuries, and multiple deaths every year.

Unfortunately, the number of trailers that become decoupled from their tow vehicles is not tracked. However, The Los Angeles Times conducted research on recorded incidents such as lawsuits and news reports which identified approximately 540 such crashes between 2000 and 2007. As not all

incidents are reported or end up in lawsuits, this number likely understates the frequency of such incidents. Accident theories have been developed to explain the relationship between near misses, minor injuries, and major injuries. One popular theory is the Heinrich 300-29-1 model, commonly known as the safety triangle which was corroborated by research done by the Insurance Company of North America. This theory states that for every one major incident, such as those reported by the news, or that end up in lawsuits, there are 29 minor incidents such as runaway trailers that do not collide with any people and end up in a field, and 300 near misses, which may be considered decoupling incidents where runaway trailers were prevented by safety chains. Under this theory there would have been approximately 162,000 near misses in the years between 2000 and 2007. That is equivalent to a trailer decoupling incident every 22-23 minutes in the United States. As the number of trailers on the road has only increased since 2007, it follows that the number of incidents has also increased.

***Other Supporting Data/ Statistics

Federal and State Laws

Because of the dangers associated with runaway trailers, Federal laws have been put in place regarding safety chains. These laws are found in 49 CFR 393.7 (h) (10) (i) and (ii) and are reproduced below:

> (10) *Safety devices in case of tow-bar failure or disconnection.* (i) The towed vehicle shall be connected to the towing vehicle by a safety device to prevent the towed vehicle from breaking loose in the event the tow-bar fails or becomes disconnected. When safety chains or cables are used as the safety device for that vehicle, at least two safety chains or cables meeting the requirements of paragraph (h)(10)(ii) of this section shall be used. The tensile strength of the safety device and the means of attachment to the vehicles shall be at least equivalent to the corresponding longitudinal strength for tow-bars required in the table of paragraph (h)(1) of this section. If safety chains or cables are used as the safety device, the required strength shall be the combined strength of the combination of chains and cables.
>
> (ii) If chains or cables are used as the safety device, they shall be crossed and attached to the vehicles near the points of bumper attachments to the chassis of the vehicles. The length of chain used shall be no more than necessary to permit free turning of the vehicles. The chains shall be attached to the tow-bar at the point of crossing or as close to that point as is practicable.

Additionally, many states have also passed laws regarding safety chains. It is generally understood that states are able to create their own laws, but those new laws are not allowed to be less stringent than the federal laws. The most common additional law added by states is the provision that safety chains prevent the drawbar or trailer tongue from dropping to the ground in the event of primary coupler failure. At the time of this writing, this addition was incorporated by at least Alaska, California, Maryland, Massachusetts, Mississippi, Nebraska, New Hampshire, New York, Oregon, Pennsylvania, South Dakota, Texas, Utah, Washington, and Wisconsin. References for safety chain laws for these states can be found in Appendix 1.

Standards and Manufacturer Recommendations

The Society of Automotive Engineers has created and published the SAE J684 which can be found at http://standards.sae.org/j684_200507/ . The standard covers:

"couplings, hitches, and safety chains used in conjunction with all types of trailers or towed vehicles whose Gross Vehicle Weight Rating (GVWR) does not exceed 4540 kg (10,000 lb). This includes such types as utility, boat, camping, travel, and special purpose trailers which are normally towed by conventional passenger cars, light-duty commercial vehicles, light trucks, and multipurpose passenger vehicles"

Section 7 of the SAE J684 standard covers Safety Chains and includes subsections on

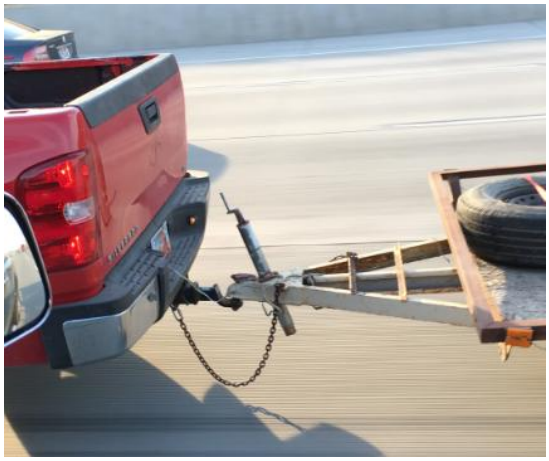
- **Strength Requirements -** The standard requires that "each individual safety chain and all attaching means, shall meet the minimum breaking force tensile load" shown in the table below. The standard also states that any operation performed on safety chains subsequent to the chains manufacture cannot reduce the strength below that shown in the table.

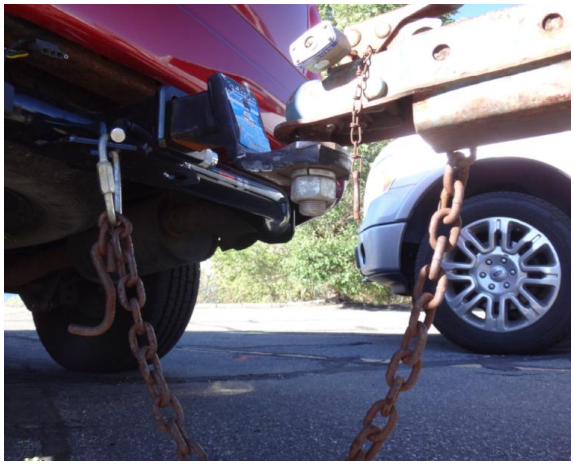
Safety Chain or Trailer Classification	Breaking Force - Minimum
Class 1	2,000 lbs
Class 2	3,500 lbs
Class 3	5,000 lbs
Class 4	The strength rating of each length of safety chain or its equivalent and its attachments shall be equal to or exceed in minimum breaking force the GVWR of the trailer (Class 4 trailers have GVWR up to 10,000 lbs)

- **Wire Rope Thimbles -** When cables or wire ropes are used as safety chain, a thimble needs to be used to protect the wires of the rope from damage where it is attached.
- **Chain Application and Identification -** Chains should be marked by class of trailer and GVWR when available for sale.
- **Installation -** When trailer chains are installed on trailers, they should be permanently fastened to the trailer tongue, one on each side for a total of two chains. A single chain may be used provided it is permanently fastened to each side of the trailer tongue so as to function as two separate chains. The chains should be connected from the trailer tongue to the hitch assembly of the towing vehicle. When connected, the slack for each length of chain should be approximately the same length when the vehicles are in a straight line, and there should only be enough slack to allow proper turning . The safety chains should be crossed under the trailer tongue, which reduces the probability of stressing or breaking the chains when turning. Chains should not be attached to any part of the ball, or any fasteners that connect the ball to the hitch member.
- **Equivalency -** Other methods of auxiliary connections are not precluded, provided they will effectively maintain connection between the towing vehicle and trailer in the event of separation of the coupling from the ball or the ball from the hitch.

Problems

Even though there are standards and laws on proper installation and use of safety chains, misuse and improper applications are very commonplace. There are a number of reasons that safety chains are not used correctly, including: ignorance, inexperience, lack of training, negligence, and improper chains or attachments. In the case of most serious accidents, there are multiple problems with the way the trailer is connected to the tow vehicle, that lead to injury and damage. While attaching safety chains should be simple and straight forward, it is very rarely done correctly as shown in the following pictures of trailer attachments taken on the way to or at Deer Creek Reservoir un Utah:





Frankly, it is terrifying knowing that we are on the road at the same time that these types of trailers are being towed. In all of the above scenarios, if the primary coupling fails (one every 22-23 minutes) the trailer tongue will undoubtedly fall to the road surface. The reason allowing the tongue to hit the ground is illegal in many states is that it is incredibly violent and dangerous. In a controlled environment, we tested the effects of primary coupling failure with different auxiliary connections. Fred Smith, as the driver in the decoupling scenarios noted,

> "There is an incredible difference in the ability to control the trailer when the tongue is cradled above the ground surface, as opposed to when the tongue hits the ground. In the first case the trailer is easy to control, you hardly notice a difference. The second case is terribly frightening. Even though I was expecting the decoupling, it was difficult to maintain control and come to a safe stop."

At or near freeway speeds, allowing the trailer tongue to fall to the ground is similar to applying a grinding wheel to the parts of the trailer that touch the ground, and the damage is fast and severe. A typical freeway speed of 65 MPH translates to 5,720 FPM (feet per minute). Most grinders operate at surface speeds between 4,000 and 12,500 FPM. As you can imagine this can cause safety chain failure and runaway trailers in addition to property damage, and the need to replace trailer parts. In one test, it took less than 1 second for cables being used as safety chains to be ground off, and for the trailer to come completely detached.

SOME GENERALIZED VALUES

In the data below, the measurement of speed is based upon surface feet per minute and not rpm. The actual speed of the abrasive grit on the wheel periphery is set by the length of the path it takes as it revolves about the wheel axis. Larger the wheels have faster surface speed for a given rpm. Simple formulas to convert rpm to the sfpm are published in many books.
Here are some common ranges of speeds reported McGraw Hill Machining and Metalworking Handbook.

TYPE	SPEEDS(sfpm)
Cutoff wheels	9,000-16,000
Cylindrical grinding	5,000-12,000
Disc grinding	4,000-5,500
Internal grinding	4,000-12,000
Portable grinding	6,500-12,500
Snagging	5,000-12,500
Surface grinding	4,000 - 6,500
Tool grinding	5,000-6,000
Weld grinding	9,500-14,200

http://www.abrasiveengineering.com/speeds.htm

What can be done to ensure that trailer safety chains are installed, attached, and used properly to reduce or eliminate the number of runaway trailers and to improve the safety of our roads? There are at least three groups of people that bear responsibility in keeping all of us safe: users, trailer manufacturers, and law enforcement.

- Users: People who tow trailers for work or pleasures bear some responsibility for knowing the laws, regulations and best practices for attaching their trailer to their tow vehicle. They also have a responsibility to ensure that best practices are implemented and followed. There is no room for incompetence or negligence when lives are on the line.

- Manufacturers: Manufacturers arguably should have the best understanding of the laws and standards regarding the proper installation, attachment, and use of safety chains. The difficulty for manufacturers lies in the fact that proper attachment depends on both the trailer being towed as well as the tow vehicle. Trailer manufacturers often provide safety chains that are easy to use with their trailers, however, chains that are long enough to accommodate attachment to the tallest trucks, will allow the trailer tongue to hit the ground when attached to a vehicle with a lower chain connection (e.g. a Honda Pilot). And vice versa, chains that are appropriately sized to a smaller vehicle will not reach to the connection points on a vehicle using a drop hitch. The manufacturers expect the end user to modify the chains to the proper length when attaching the trailer to their vehicle. This can be difficult for some, particularly when the trailer will not be towed by a dedicated vehicle (rentals, construction trailers, etc.). Manufacturers could do better at providing end users with a safety chain system that allows the end user to simply and easily adjust the length of the safety chain to properly fit any vehicle.

- Law enforcement: While it is no secret that law enforcement officers typically do a fantastic job at keeping the piece and preventing accidents, for some reasons the proper use of trailers and safety chains has gone largely unregulated. Given the trailer and safety chain attachments shown above, it stands to reason that law enforcement could provide invaluable support for proper installation, attachment and use of safety chains.

Proper Safety Chain Installation

How the Safety Chains are attached to the trailer

Federal law requires that two safety chains should be used. The SAE J684 Standard and suggests that trailer chains should be attached to the trailer tongue, one on each side. Often, trailer safety chains are attached to the bottom of the tongue, or to a guard welded to the bottom of the tongue. Attaching the chains on the side of the tongue is the best option, as attaching them to the bottom of the tongue or a guard increases the likely hood that that they will be ground off in the event of a primary coupling failure. As shown below, the guard that the trailer chains are attached to has been ground down significantly, likely due to a low speed decoupling. Once it is ground all the way through, testing shows that it will fold down exposing the safety chain connecting bolts to the road surface.

The standard also recommends that the two safety chains are permanently fastened, bolted or anchored to the trailer tongue. Welding safety chains is generally not recommended as the heat can weaken the chain material reducing the strength of the chain. And the standard clearly states that "Any operation performed on a safety chain subsequent to its manufacture shall not reduce the strength below the requirements" shown in the table in the Standards section above.

The safety chains should also be connected as far forward on the trailer as is reasonably possible. The further back the chains are connected, the more likely the tongue will contact the ground in the event of a primary coupling failure. Also, the further back the safety chains are connected, the more likely the trailer is to run into the back of the tow vehicle when slowing down. In the event a swing tongue is implemented on the trailer tongue, there should be an auxiliary connection between the swing tongue and the frame of the trailer. In many instances manufacturers attach the safety chains rearward of the

swing tongue. If failure of the swing tongue was the most common form of primary coupling failure, this might make sense, however, it is not. Attaching the safety chains so far back is illegal in many states, not to mention it significantly reduces the effectiveness of the trailer chains as I have not seen such an installation that did not allow the trailer tongue to hit the ground.

The use of safety cables as safety chains, while not expressly prohibited by the standard, requires close examination. More often than not, safety cables will also allow the trailer tongue to hit the ground in the event of a primary coupling failure. Safety cables have become popular as they can be manufactured in a coiled state, which keeps them up off of the ground when attached to the tow vehicle. They are made with plenty of length to be able to quickly attach to any tow vehicle. The problem is, though, that the additional slack in most cases will allow the trailer tongue to fall straight to the ground in the event of a primary decoupling.

Proper Safety Chain Connection and Use (How to attach to the tow vehicle)

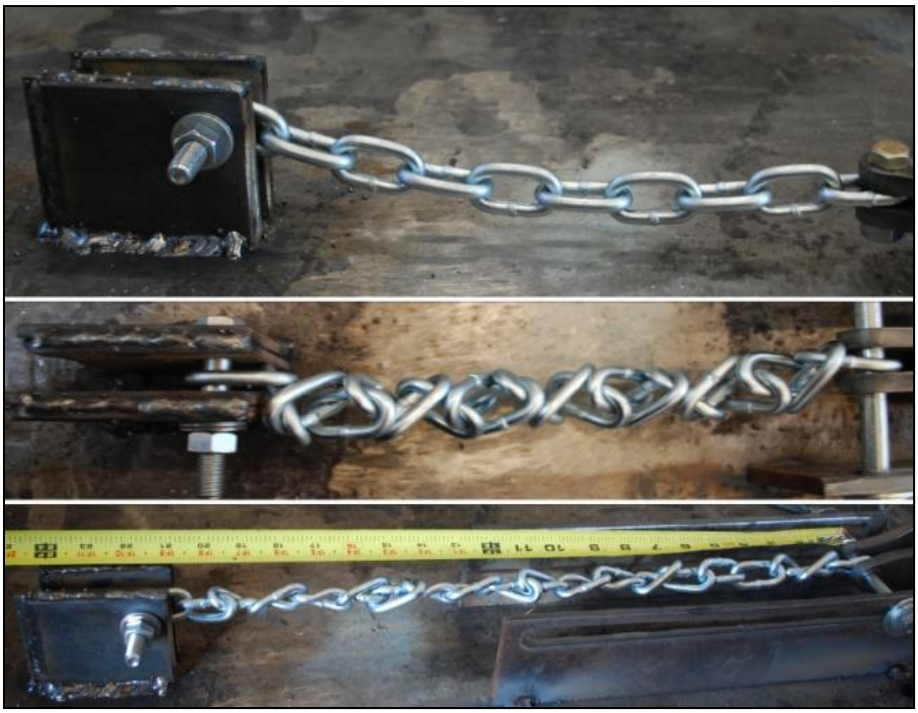
Once the trailer chains are properly installed on the trailer, they must also be properly attached to the tow vehicle if they are to serve their purpose. Federal Law requires that the safety chains be crossed. They should be crossed under the tongue of the trailer so that the chains cradle the tongue in the event of primary coupling failure. Federal law also requires that the length of chain used shall be no more than necessary to permit proper turning of the vehicle.

There are a number of common ways to adjust chains to make them the proper length for a vehicle including cutting chains to the right length, doubling back on the chain, and twisting the safety chains. Unfortunately, all of them have significant limitations.

One method of adjusting safety chains to the proper length is to remove them, cut them to length, and re-attach them. This is an effective way of achieving the proper length, but has several drawbacks. First, this is difficult and time consuming process, and thus rarely happens. Furthermore, cutting a safety chain is not a reversible process. Once the chain is cut, it can never be used in a situation where a longer chain would be desirable. For example, if the trailer is going to be pulled by a different tow vehicle.

Another way of adjusting the length of a trailer safety chain is to feed the end of the chain through the vehicle chain connection, double it back on itself and make a connection. This method also has several problems. First, many safety chains are equipped with hooks that are too large to fit entirely through the vehicle chain connection loop as shown below. Such chains are not meant to be and actually cannot be doubled back without removing the hook. A second difficulty lies in how the chain is secured back to itself. Historically this has been done by fitting a bolt through the end of the chain and a more central link of the chain, and securing the bolt with a nut. Another way this has been done is with a hook that is small enough to fir through the chain attachment on the tow vehicle receiver. The problem with using a bolt and nut is that it is well known that nuts come loose particularly under vibrations, like driving down a road. This is explained in the following YouTube video: https://www.youtube.com/watch?v=IKwWu2w1gGk . Hooks that are small enough to fit through the receiver chain attachment loops often lack the strength required, and thus are rarely used. For these reasons, adjusting the length of a chain by doubling it back on itself has fallen out of favor, and rightly so.

Twisting chains is a commonly recommended solution to chains that are too long. However, this also has significant drawbacks. First, most chain manufacturers say not to twist the chains because the load ratings only apply to longitudinal force. Again the SAE684 standard states that nothing should be done to the chain that reduces its strength. Further, testing done by Alpine Engineering and Design, Inc. shows that twisting safety chains can reduce their strength by as much as 75%. To put that into perspective, a chain rated to 10,000 lbs, would only be able to hold 2,500 lbs. Further, a small amount of force can cause the twisted chain to lengthen significantly. This can also lead to the tongue contacting the road. Twisting trailer chains is not recommended as a safe solution to trailer chains with excess length.



IMPORTANCE OF CRADLING THE TRAILER TONGUE ***PUT THIS SOMEWHERE

- cradle
  - keeps weight on back of vehicle
  - limits sway
  - maintain control
  - doesn't damage road
  - come to a safe stop
- Chains don't drag

Solving the problem

Fortunately there is a simple and safe solution that conforms to all of the laws and standards regarding safety chains. The Link Lock™ system uses a patent pending chain adjustment method to allow you to quickly and easily adjust the length of your trailer chains. The Link Lock™ system uses a sleeve that is permanently attached to the sides of the trailer tongue. The chain slides through the sleeve with ease and the sleeve's shape maintains a specific alignment of the chain links. The sleeve aligns the chain to allow a pin to be inserted through holes in the sleeve and through one link in the chain, locking the chain in the sleeve. This makes adjusting the length of your chains, whether longer or shorter simple, fast, and efficient!

When you are hooking up the trailer all you need to do is pull the pin out of the sleeve, adjust the slack in the chain to fit the towing vehicle and hitch, then reinsert the pin to lock the chain in place. Repeat the process for the other chain and you are done! If needed, any of the excess chain hanging out the back of the sleeve can be hooked over the pin to keep it from dangling too far below the tongue. The pin is permanently attached to the chain so you can never lose it. Another advantage of the pin being attached to the chain is it prevents the chain from completely pulling through the sleeve should someone forget to put the pin back in the sleeve. The pin also comes with a retaining pin on the bottom to prevent the unlikely occurrence of the pin coming out while you are traveling down a bumpy road.

Alpine Engineering & Design, Inc. has tested the Link Lock™ system and certified that it meets the strength requirements for Class 4 trailers as stated in SAE J684. That means that the Link Lock™ system can be used on any class of trailer covered by the SAE J684 standard.

LinkLock™ offers a free audit of current safety chain systems for manufacturers. The analysis provides strengths and weaknesses in connection with relevant laws and standards, and if shortcomings are found, recommendations for properly installing the LinkLock™ system on their trailers.

Call Today: 801-763-8484

Appendix 1: State Trailer Chain Laws Beyond Federal Laws

Alaska:

(a) A vehicle towed upon a street or highway must be coupled to its towing vehicle by means of a safety chain, chains, cable or equivalent device, in addition to the regular hitch or coupling. No additional connecting device may contain more slack than is necessary to permit proper turning of the vehicles connected, and the additional connecting safety devices must be connected to both the towing and the towed vehicles and to the drawbar or other rigid connecting device in a manner which will prevent the drawbar or other rigid connecting device from dropping to the ground in the event of its failure. The additional safety devices must be of sufficient strength to retain control of the towed vehicle in the event of failure of the rigid connecting device.

Link: http://www.touchngo.com/lglcntr/akstats/aac/title13/chapter004/section275.htm

California

Safety chains are required for travel trailers. Safety chains are not required for fifth-wheel trailers. The purpose of safety chains is to prevent the trailer from separating from the tow vehicle in event of a hitch failure, such as a hitch ball that has loosened. The chains should be crossed in an "X" fashion below the ball mount, with enough slack to allow unrestricted turning, but not enough to allow the coupler to hit the ground.

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Link: https://www.dmv.ca.gov/portal/wcm/connect/28423ba0-bba6-4347-9e21-db274e970772/dl648.pdf?MOD=AJPERES

Maryland:

(3) These chains or cables shall be connected to the towed and towing vehicle and to the towbar to prevent the towbar from dropping to the ground if it fails.]

Link: http://mgaleg.maryland.gov/2008rs/chapters_noln/Ch_373_sb0174T.pdf

Massachusetts:

22.10: Use of Safety Chains While Towing a Trailer

Except for motor vehicles and trailers which must comply with the federal requirements referenced in 540 CMR 14.00, when any vehicle is used to tow a trailer on the ways of the Commonwealth, two safety chains shall connect the trailer and the towing vehicle, one on each side of the central trailer hitch. One end of each chain shall be securely attached to the towing vehicle and the other end securely attached to the trailer in such a manner as to control the direction of travel of the trailer and prevent the tow bar dropping to the ground in the event the coupling fails. Each chain with its means of attachment shall be entirely independent of the other chain or of the coupling and shall have an ultimate strength at least equal to the gross weight of the trailer and its load. The chains shall not be permitted to drag on the ground and shall have no more slack than is necessary to allow proper turning of the vehicles.

Link: https://www.mass.gov/files/documents/2017/10/19/540cmr22.pdf

Mississippi:

(1) Every trailer which shall be towed on the public highways at a speed in excess of twenty (20) miles per hour shall be coupled to the towing vehicle by means of a safety chain, chains, cables, or equivalent devices in addition to the regular trailer hitch or coupling. This requirement does not apply to a semitrailer having a connecting device composed of a fifth wheel and kingpin assembly meeting the requirements of the Interstate Commerce Commission, nor to a pole, pipe, casing, long or piling dolly. No more slack shall be left in any such safety chains, cables or equivalent devices than shall be necessary to permit proper turning. The safety chains, cables or equivalent device shall be so connected to the towed and towing vehicles and to the drawbar to prevent the drawbar from dropping to the ground if the drawbar fails, and shall be of sufficient strength to control the trailer in event of failure of the regular trailer hitch or coupling.

Link: https://law.justia.com/codes/mississippi/2010/title-63/5/63-5-25/

Nebraska:

(3) Cabin trailers, recreational trailers, and utility trailers, when being towed upon a highway, shall be securely connected to the towing vehicle by means of two safety chains or safety cables in addition to the hitch or other primary connecting device. Such safety chains or safety cables shall be so attached and shall be of sufficient breaking load strength so as to prevent any portion of such trailer drawbar from touching the roadway if the hitch or other primary connecting device becomes disengaged from the towing vehicle.

Link: http://codes.findlaw.com/ne/chapter-60-motor-vehicles/ne-rev-st-sect-60-6-246.html

New Hampshire:

266:63 Trailer Breakaway Safety Chains. – Every trailer or semi-trailer including farm and agricultural vehicles shall have, in addition to the tow-bar or coupling device, a safety chain or cable to prevent breakaway from the towing vehicle. Each chain or cable shall have an ultimate strength at least equal to the gross weight of the trailer and load being towed. Chains or cables shall be connected to the towed and towing vehicle to prevent the tow-bar from dropping to the ground in the event the tow-bar fails. This provision shall not apply to:

Link: https://law.justia.com/codes/new-hampshire/2015/title-xxi/chapter-266/section-266-63/

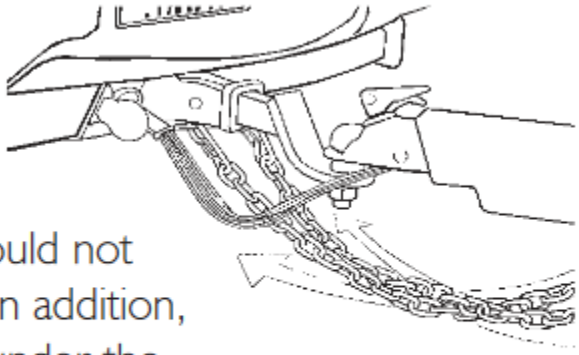
New York:

(2) Installation and connections.
The means of attachment of safety chains shall be located equally distant from and on opposite sides of the longitudinal centerline of the towing vehicle and of the trailer, except that where a single length of safety chain is connected to one single means of attachment of a trailer such single attachment shall be on the trailer longitudinal centerline. Each means of attachment shall not be common with or utilize fasteners common with a ball or coupling. No welding operation shall be performed on a safety chain subsequent to its manufacture. Safety chains shall be so connected that the slack for each length of chain between trailer and towing vehicle is the same and is not more than necessary to permit the proper turning of the vehicles. When passing forward to the towing vehicle, safety chains must be crossed under the tongue and oriented in such a manner as to prevent the tongue from dropping to the ground and to maintain connection in the event of failure of the primary connecting system. (See figures 2 and 3, section 57.5.)

Link:
https://govt.westlaw.com/nycrr/Document/I504e17f2cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)&bhcp=1

Oregon:

When connected, safety chains should have some slack to permit sharp turns but should not drag on the road. In addition, they should cross under the trailer tongue to help prevent the tongue from dropping to the road in the event the trailer separates from the tow vehicle.



Link: http://www.oregon.gov/ODOT/Safety/Documents/TowingATrailer.pdf

Pennsylvania:

(d) Safety chains.--Whenever two vehicles are connected by a ball-and-socket type hitch, or pintle hook without a locking device, they shall also be connected by two safety chains of equal length, each safety chain having an ultimate strength at least equal to the gross weight of the towed vehicles. The safety chains shall be crossed and connected to the towed and towing vehicle and to the tow bar so as to prevent the tow bar from dropping to the ground in the event the tow bar fails or becomes disconnected. The safety chains shall have no more slack than is necessary to permit proper turning.

Link:
http://www.legis.state.pa.us/cfdocs/legis/LI/consCheck.cfm?txtType=HTM&ttl=75&div=0&chpt=49&sctn=5&subsctn=0

South Dakota:

32-19-10. Safety chain slack and coupling--Violation as misdemeanor. No more slack shall be left in safety chains, cables, or equivalent devices than shall be necessary to permit proper turning and the safety chains, cables, or equivalent device shall be so connected to the towed and towing vehicle and to the drawbar to prevent the drawbar from dropping to the ground if the drawbar fails and shall be of sufficient strength to control the trailer in event of failure of the regular trailer hitch or coupling. Any person who violates this section is guilty of a Class 2 misdemeanor.
Source: SL 1963, ch 276, §§ 1, 2; SDCL § 32-19-11.

Link: http://sdlegislature.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=32-19-10

Texas:

(2) The two safety chains will be of equal length, long enough to permit free turning of the vehicles without placing stress on the chains, and attached to the towing vehicle equidistant right and left of the point at which the vehicles are connected. The safety chains must be connected to the towed and towing vehicles and to the tow-bar in a manner which prevents the tow-bar from dropping to the ground in the event it fails or becomes disconnected. In no event will the safety chains be allowed to contact the road surface during movement of the vehicles.

Link: http://txrules.elaws.us/rule/title37_chapter21_sec.21.5

Utah:

Effective 5/12/2015

41-6a-1634. Safety chains on towed vehicles required -- Exceptions.

(1) A towed vehicle shall be coupled by means of a safety chain, cable or equivalent device, in addition to the regular trailer hitch or coupling.

(2) Except as provided under Subsection (3), a safety chain, cable or equivalent device shall be:

(a) securely connected with the chassis of the towing vehicle, the towed vehicle, and the drawbar;

(b) of sufficient material and strength to prevent the two vehicles from becoming separated; and

(c) attached to:

(i) have no more slack than is necessary for proper turning;

(ii) the trailer drawbar to prevent it from dropping to the ground; and

(iii) assure the towed vehicle follows substantially in the course of the towing vehicle in case the vehicles become separated.

Link: https://le.utah.gov/xcode/Title41/Chapter6A/41-6a-S1634.html?v=C41-6a-S1634_2015051220150512

Safety chains and attaching means required.

(1) Every towed vehicle must be coupled to the towing vehicle by means of two safety chains, cables, or wire ropes in addition to the regular drawbar, tongue, or other connection which is certified by its manufacturer as complying with SAE J684 revised July 2005.

(2) The means of attachment of safety chains must:

(a) Be located equally distant from and on opposite sides of the longitudinal centerline of the towing vehicle and of the trailer.

(b) Not be common with or utilize fasteners common with a ball or coupling.

(3) No welding operation or repair, such as cold shuts, will be performed on a safety chain subsequent to its manufacture, including the direct welding of a safety chain link to the towed or towing vehicles.

(4) Safety chains must:

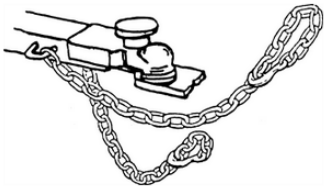
(a) Be so connected that the slack for each length of chain between trailer and towing vehicle is the same and is not more than necessary to permit the proper turning of the vehicles.

(b) Be crossed in such a manner as to prevent the tongue from dropping to the ground and to maintain connection in the event of failure of the primary connecting system. See Figure 1.

(c) Be replaced immediately if they contain cut, cracked, or excessively worn links, or frayed, stranded, or otherwise defective wire rope.

(d) Not be connected to the hitch ball or to a ball mount designed to be readily removable when not in use.

Figure 1 - Typical double safety chain installation.



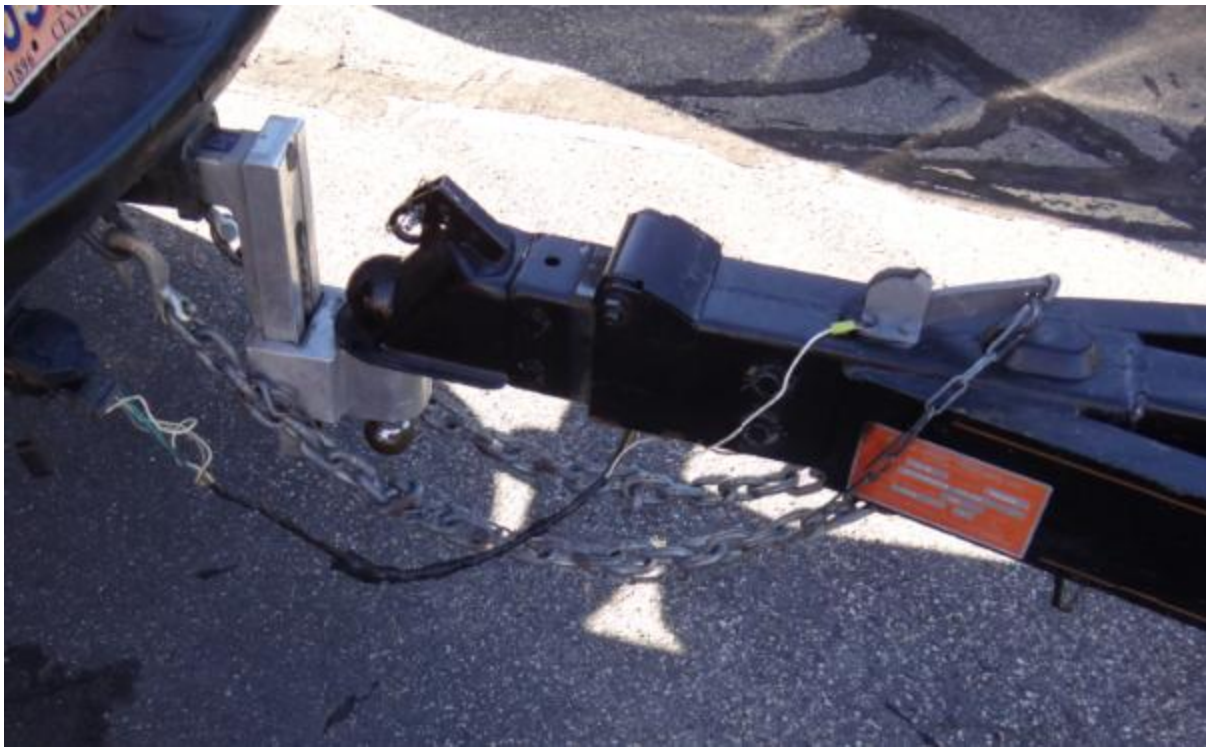
Link: https://app.leg.wa.gov/wac/default.aspx?cite=204-70-070

Wisconsin:

(3) In addition to the hitch and coupling specified in sub. (2), every towed vehicle shall be coupled to the towing vehicle by means of safety chains, leveling bars or cables. This requirement does not apply to a semitrailer having a connecting device composed of a 5th wheel and kingpin assembly, nor to a pole or pipe dolly. The safety chains, leveling bars or cables shall have only the necessary slack to permit proper turning and safety chains or cables shall be so connected to the towed and towing vehicle to prevent the drawbar from dropping to the ground if the hitch or coupling disengages. Two separate lengths of safety chain, leveling bars or cable shall be required on all trailers and mobile homes; however, the department may authorize use of such other appropriate equipment or methods approved by nationally recognized organizations which recommend safety standards for motor vehicles.

Link: https://www.lawserver.com/law/state/wisconsin/wi-laws/wisconsin_laws_347-47

Exhibit 2: Examples of Improperly Attached Safety Chains

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