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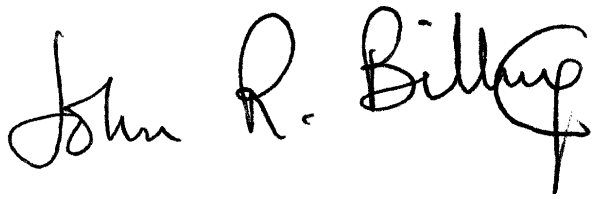
To : U.S. Department of Transportation
Dockets Management Facility, Room PL-401
400 Seventh Street, SW
Washington, DC 20590-0001

Re : Comments Docket No. FMCSA-97-2289
Development of a North American Standard for Protection Against Shifting and Falling Cargo

By way of background, and while formerly employed by Ontario Ministry of Transportation, I developed the research plan for the North American Load Security Research Project, was responsible for conduct of much of the research, and was the author or principal author of 15 of the research reports. Subsequently, as a consultant to the Canadian Council of Motor Transport Administrators, I was a member of the group that drafted the North American Standard, and participated in much of the Standard Harmonization process.

Attached please find comments on some of the topics on which FMCSA specifically requested comment in the Notice of Proposed Rulemaking published on 18 December 2000, and on some of the clauses in the proposed rule. These comments are offered not on behalf of any organization, but on behalf of the laws of physics, which seem to have got lost somewhere between the North American Standard and the NPRM.

Yours truly



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Introduction

FMCSA's NPRM unilaterally:

- Deletes significant parts of the North American Cargo Securement Standard ("the NACSS"), now in Draft 4;
- Changes definitions of terms;
- Changes language;
- Adds material; and
- Make other changes.

This NPRM undermines the goal for a harmonized performance-based rule that could be adopted by all jurisdictions in North America, a goal made achievable by the research and standard development process. If FMCSA felt these changes were necessary, they should have been raised and argued at the Drafting Group and at the several Harmonization Committee meetings that shaped and effectively ratified the NACSS.

The NPRM suggests that cargo securement is not a significant problem, because cargo does not frequently fall off trucks. It is not difficult to load a truck and secure the cargo in accordance with the current regulation, make a severe brake application, and watch the cargo slide or fall off. Fortunately, cargo does not fall off most of the time on the highway, because drivers drive defensively. If a driver must brake hard, cargo shift is often inevitable. It may even be excused, because hard braking is relatively infrequent, or because the incident also resulted in a collision. This still does not mean that the cargo was secured adequately.

The objective when we started was to ensure that cargo would stay on the truck, to the limit of the driver's ability to keep the truck standing on its tires, and on the road. The research suggested that much current practice was adequate, or could be made adequate by more effective use of tiedowns that are already required. This would provide real gains in safety among those already doing a good job. The principal gains would come by bringing those who were not aware of the requirements up to speed.

The current rule is based on counting tiedowns, regardless of whether the tiedowns provide effective securement or not. The NACSS was based on the laws of physics, and attempted to ensure an objective level of securement within the current equipment and practice. This NPRM ignores the laws of physics, and many of the key research findings. It is now neither objective, nor performance-based. It will allow those carriers who want to do just about anything, without regard to the actual effectiveness of the securement system, to go on doing just that, either in ignorance, or deliberately. They will just be expected to do it a bit more specifically for a number of types of cargo. If FMCSA truly wants to achieve reliable, objective performance-based cargo securement, it needs to go back the original text of the NACSS.

Some Topics on which FMCSA Specifically Requested Comment

Direct versus Indirect Tiedowns

An indirect tiedown is attached to one side of the vehicle, passes over the cargo, and is attached to the vehicle and is tensioned from the other side. The tension in the tiedown provides a net downward force on the cargo, in addition to its own weight, which effectively increases frictional resistance between the cargo and the vehicle, or between tiers of cargo. To be effective, an indirect tiedown needs to be tensioned as tightly as possible. The fact is that most indirect tiedowns cannot be tensioned sufficiently tightly to provide much increase in pressure. If they could be tightened more, they would damage the corners of many types of cargo. Indirect tiedowns work well, especially for cargo loaded against a headboard then loaded continuously to the rear. If cargo is not prevented from moving forwards by some means, then once it starts moving forward, indirect tiedowns provide very little additional force to bring it to a stop, Research Report 9. The cargo will stop when it wants to stop, not when the tiedowns bring it to a stop. Indeed, if there is enough space and the truck decelerates for long enough, it is quite possible that an article could slide right out from under the tiedowns.

A direct tiedown is attached between the vehicle and an article of cargo, or is attached to the vehicle, passes around the cargo, and is attached to the vehicle again. A direct tiedown generates an increasing force to resist movement of the cargo by stretching the tiedown as the cargo moves. A direct tiedown is increasingly effective as the cargo moves, and provided it is strong enough, it should not only prevent unlimited movement, but should be able to limit movement to no more than 1-2 inches, Research Report 15. This, incidentally, is why it is necessary to eliminate the prohibition on cargo shifting. If the prohibition against shifting is maintained, a literal interpretation prevents the use of direct tiedowns, which in many cases (such as for metal coils) have proven to be the most effective form of securement. A direct tiedown should not be tensioned tightly. It merely needs to be taut, with no more effort than is needed to tighten a lever lock binder by hand. If a direct tiedown is tensioned tightly, it reduces the capacity available to restrain an article of cargo.

The current rule treats all types of tiedown as equal. The NACSS attempts to recognize the different mechanisms provided by direct and indirect tiedowns, for two principal reasons.

First, a direct tiedown connected just between the vehicle and an article of cargo has half the value that it would have if it were used some other way. The current regulation gives it full value, which is potentially unsafe. The NACSS and the NPRM recognize and correct this.

Second, there are a number of cases where the actual level of securement can be increased, and the securement can be made more reliable, if a direct tiedown is substituted for an indirect tiedown. For example, suppose an article requires three tiedowns and is sitting in the middle of the deck with open space around it. It will often

be much more effective to use two indirect tiedowns and one direct tiedown running forward on one side of the article, across the front, then rearward down the other side, than to use three indirect tiedowns. Of course, the direct tiedown must be installed so that it engages reliably against the article, and will not slip under the article once it begins to move. There are the same numbers of tiedowns in each case. In some ways, it may be easier to install a direct tiedown than an indirect tiedown, because it does not need to be thrown over the load, and does not need to be tensioned tightly.

The NACSS recognized there are important differences between direct and indirect tiedowns, and there are some important advantages to replacing some indirect tiedowns with direct tiedowns. The NPRM says it has adopted the concept. Unfortunately, it has also removed the requirement for orientation of these tiedowns. The angles are necessary to ensure that a direct and an indirect tiedown each performs in a satisfactory and reliable manner. A direct tiedown at zero degree angle (straight across the vehicle) is in fact an indirect tiedown. Look at Figure 21 in Research Report 15. A single ¼ in grade 7 chain provided about 7,000 lb of resistance for a metal coil when installed at an angle of 45 deg, about 4,500 lb of resistance at 60 deg, about 2,000 lb at 75 deg, and about 500 lb at 90 deg, in each case after the coil had moved 2 inches. The tiedown at 90 deg still only provided a pathetic 1,800 lb of resistance after the coil had moved 10 in, even though its tension was about 6,500 lb. Angles may be difficult for some, they may be inconvenient without a protractor, but they are a necessary part of the mechanics of installing a tiedown to achieve useful resistance.

Drivers install tiedowns. It takes just about the same amount of effort to install a tiedown in a manner that will provide effective resistance, as to install it in a manner that is decorative rather than effective. The NACSS introduced the angles to ensure that the work that drivers are required to do to install tiedowns would result in effective securement.

The NACSS introduced the angles to ensure each tiedown provided effective resistance, on the assumption that most of those securing cargo would prefer to use the minimum number of tiedowns. If FMCSA wants to remove the angles, if it wants to ensure the tiedowns used actually provide resistance, then it should introduce a table of reduction factors against tiedown angle. The angle of each tiedown would be measured, the appropriate reduction factor found from the table, multiplied to the tiedown's working load limit, and the factored working load limits added and compared to the required capacity. As a compromise, the tabular method could be allowed in cases where tiedowns were installed at an angle less than that stipulated in the NACSS.

The NACSS may perhaps not have explained the different need and requirements of direct and indirect tiedowns as well as may be necessary. This can be rectified, its not rocket science. If the similarity of their names causes confusion, choose names that are more meaningful. The training task must ensure that shippers, carriers, drivers and inspectors are all able to understand these differences.

It would be an immensely retrograde step for FMCSA to be persuaded that the differences between direct and indirect tiedowns are too difficult for the industry to understand. FMCSA should resist all such suggestions.

The NPRM is similar to the current rule, which gives equal credit to a tiedown that provides effective resistance, and a tiedown whose only value is as decoration. FMCSA should restore the requirement for minimum angles, or provide a table of reduction factors by angle, as suggested above.

Front End Structures

Headboards are a good idea. Unfortunately, despite the current rule, many flatbed trailers do not appear to be equipped with a headboard. Of those that are, the uncalibrated personal eyeball would not expect all the headboards to meet the current strength requirement. Regardless of the actual strength of a headboard, something is always better than nothing, especially if cargo secured by indirect tiedowns can be placed against the headboard.

Unfortunately, some carriers consider that a headboard might restrict the flexibility of a trailer, by preventing cargo from overhanging the front of the trailer. Even if there is a headboard, axle weight rules will always require some types or amounts of cargo to be placed back from the headboard, when it becomes less useful. Thus, despite the requirement for a headboard, they are not always either installed or used.

Other means can be just as effective as a headboard for some types of cargo. A simple lip on the front of the deck, or pegs or stakes in stake pockets across the front of the trailer may be equally effective as long as the device is high enough to engage the cargo and prevent it over-riding or tipping. The regulation should perhaps be generalized, to encourage the installation and use of headboards, or other means of equivalent strength and effectiveness, to serve as a stop to prevent forward movement of cargo. There may be an issue whether a headboard or stake pockets and stakes are included in the length of a trailer. If they are within the swing radius, and do not carry any load, but simply prevent it from shifting, it should not be a problem to exclude them from the measurement of trailer length.

Prohibition on Use of Unmarked Tiedowns

A lot of the cargo that moves on the highway is of modest weight, and might well be adequately secured by tiedowns that are unmarked. One of the objectives of the standard is to ensure that shippers, carriers and drivers use the proper tools and techniques to secure cargo. When it comes to heavy specialized loads, like logs, metal coils, billets or plate, concrete pipe, and others, there should be no room for doubt about the capacity of the tools or the reliability of the techniques. Most carriers who move such commodities on a daily basis used marked tiedowns and trailers designed for the loads they carry. Prohibiting use of unmarked tiedowns will not affect them. It will affect the driver who tries to take such a load, and has neither the experience nor the proper

equipment. An objective of the standard is to try to prevent the inexperienced and under-equipped from doing things they should not be attempting. Allowing use of unmarked tiedowns will continue this as the status quo.

If FMCSA is not prepared to consider the direction set by the NACSS, and phase out use of unmarked tiedowns, it should consider categorizing cargo, to ensure that those types of cargo that require proper treatment cannot be carried in an ad hoc manner. Thus, it should consider defining those types of that must be secured by marked tiedowns, and allow the rest to be secured by unmarked tiedowns.

I would suggest serious loads of logs, metal coils, concrete pipe, heavy vehicles, RO/RO containers and large boulders should require marked tiedowns. A “serious” load would be any individual article over (say) 10,000 lb, and the gross payload weight over (say) 30,000 lb as the starting point for discussion. The requirement should also apply in general to any other commodity meeting these weight criteria. It would not apply if the load was blocked at the front by vehicle structure or other means that was strong enough of itself to meet the performance standard.

Mandatory Rating and Marking of Anchor Points

Tests conducted during the research project, Research Report 10, and by TTMA members and others since, showed that a number of devices used as cargo anchor points had much lower strength than anybody realized. Some of these are in common use on trailers that routinely carry heavy loads. A driver secures a load properly with a 5/16 in grade 8 chain with a breaking strength over 20,000 lb, and attaches the chain to an anchor point that may pull off at not much more than 10,000 lb. Everyone believed this was safe, because there were the right number of tiedowns, although the strength of the anchor point was unknown, and it actually did not comply with the regulation.

This issue is really the same issue as allowing use of unmarked chain. If a trailer will carry a serious load, secured by marked chain of serious capacity, then the anchor points need to be strong enough to resist the loads that the chain will apply to them. Most heavy-duty steel stake pockets are probably strong enough. Some aluminium stake pockets may be questionable. Chain-in-tube devices are clearly questionable. Most webbing strap winches are probably satisfactory. If FMCSA is not comfortable requiring all stake pockets to be rated and marked, then a compromise like that suggested for tiedowns would be appropriate. That means only a trailer with suitable anchor points should be used for serious loads. If the anchor points are not suitable for the load, the load should not go on that trailer, it should go on one that has suitable anchor points. Safety is about using the right tools for the job. The objective of the NACSS was to ensure this. FMCSA’s proposed rule would continue letting anybody do anything, regardless of the suitability of the equipment. There are some areas where this is inappropriate. As suggested above for tiedowns, FMCSA should delineate these areas. Where light loads are carried, the carrier may continue to do anything quite safely, as long as the strength of the anchor points on the vehicle is not challenged.

Section by Section Comments on FMCSA's NPRM.

§392.9 Inspection of Cargo, etc

This has always been in §392. I suggest clause (b)(2) simply read "Inspect cargo and adjust cargo securement devices as required by §393.xxx", and move the text of clauses (2), (3) (4) back where they came from in the NACSS. If you want people to understand cargo securement, keep it all together, don't scatter it through the regulations. It was evident during the Harmonization Committee process that while carriers and shippers were well aware of §393.100, many were not aware of §392.9 at all.

§393.5 Definitions

A large number of the definitions from the NACSS have been omitted, apparently because they may already be defined elsewhere in FMCSR's, possibly with slightly different wording. The objective of the NACSS was a standard that would be uniform across North America. Uniformity is only possible if terms used in the standard are interpreted in the same way, everywhere. The intent of a comprehensive set of definitions was to build a common vocabulary and usage for terms relating to cargo securement, to try to give the uniform standard some chance of success. Deleting those definitions, and implicitly substituting other definitions "with slightly different wording" totally undermines that goal. The comprehensive set of definitions should be restored, so that everything that is relevant to cargo securement is in the same place. Where a term may already be defined in different words, and possibly for a different purpose, the definition from the NACSS should be added, but its application should be restricted to this regulation.

The term "Bell pipe concrete" is never used. The term "Bell pipe" is used, as a type of concrete pipe. Revert to the original term and definition from The NACSS.

A definition for "g", the acceleration due to gravity, is added. This is helpful. FMCSA is also to be commended for its attempt to increase the actual level of securement by increasing the value of g. Unfortunately, the standard value for g is about 9.80665 m/s^2, which corresponds to about 32.174 ft/s^2, so the added benefit will not be realized. The above values should be used.

§393.100 Application

Under (a), isn't it easier, clearer and more inclusive to say "Any commercial motor vehicle and any trailer it tows"?

Under (b), go back to the words of NACSS 1.2. The added clause on "Prevention against of shifting of load" effectively prevents direct tiedowns, and strictly would require all cargo to be bolted to the trailer. It is necessary to accept that cargo may shift a small

amount to engage direct tiedowns, or the tiedowns will not work. The amount of shift must be controlled. Go back to the right words.

§393.102 Performance Criteria

Why change the words? Those in NACSS are clearer and simpler. There is no need to add “devices”, because these are part of the system. Go back to the original words.

§393.104 Standards

(a) really just repeats §393.102 (a), it does not say the same as NACSS s2.1 . The rest re-states some of NACSS 2.1, and omits the rest. All the omitted text is important, as it lays the groundwork for what comes. It states in general terms what shippers, carriers and drivers must do, and forms the basis for inspection, though it may not be directly enforceable. In particular, the requirement that cargo must have the structural integrity to withstand the forces involved really does need to be understood. It is an issue that was issue raised repeatedly by carriers. Put back all the omitted text.

§393.106 General Requirements

This section of the NPRM has totally gutted and rendered meaningless the heart of the NACSS s2.2.

The content of s2.2.2, omitted, is important. This is what we want them to do. How will they know if we don’t tell them? If they leave space between articles, the articles will migrate together and any tension in the tiedowns will quickly be lost. Tests showed that, Research Report 5. Then the only thing keeping the cargo on the truck is gravity. I thought we were trying to do a bit better than that.

The angles are omitted for both direct and indirect tiedowns. In each case, the tiedown will not perform its required function if it is not placed properly. The angles may not be critical for light articles, like trailer tarps. They are critical for heavy articles. If tiedowns are not used properly, again, you’re only left with gravity keeping the cargo on the truck. The regulation can hardly claim to be performance-based if it simply leaves out the criteria that ensure adequate performance. If you want to let people just pile stuff on the truck and go, then say so. If you want the stuff to be loaded and secured to meet objective criteria, it must be done right, which means meeting certain criteria, like those laid out in the NACSS. You’ve budgeted time for carriers to train their staff on understanding direct and indirect tiedowns. Use the time to the full, so they know what they must do. This issue was more extensively discussed under FMCSA’s request for comment.

Put back all the omitted text. Put back the angles.

§393.110 Number of Tiedowns

This deletes the provision of the NACSS s2.2.5.1 that allows less tiedowns if an article is properly blocked at the front. If an article is immobilized so it cannot slide forward, it won't move. This provision of the NACSS gave credit for more effective securement, in the hope it would be used. The provision should be restored.

§393.112 Strength of Load Binders, §393.114 Strength of Anchor Points and §393.116 Strength of Winches

These completely reverse the definition adopted in the NACSS, that the working load limit of a tiedown is the least working load limit of the anchor point or any component of the tiedown, which includes hooks, chain, links, D-rings, the linear structure of the tiedown, stitching, binders, etc.

The last two are known to be unenforceable. They are also not meaningful, now that we know that many anchor points and winch installations may not be nearly as strong as the tiedowns used on them.

Go back to the definition of tiedown in the NACSS.

Where has the requirement that the rub rail not be used as an anchor point gone? Where has the requirement that tiedowns should pass inside the rub rail, if any, gone? These need to be restored.

§393.122 Logs

(a) Applicability

The first sentence completely reverses the intent of the NACSS. Logs that are unitized, or up to four processed logs, may be treated as general cargo. This section applies to other logs. The text should go back to the NACSS language and intent.

(b) Components of a Securement System

The requirement for a minimum working load limit in the NACSS has been deleted. This may be acceptable for occasional small loads of logs, but serious loads of logs demand serious tiedowns. It may be acceptable to omit this for stacks of shortwood loaded lengthwise. There should certainly be a minimum for heavy loads of logs on pole trailers. See (g) below.

The requirement for tiedowns to be tensioned as tightly as possible in the NACSS has been deleted. This is desirable for all loads of logs. It may not be entirely objective or enforceable in this form, but this is what we want the driver to do. If we don't tell drivers what to do here, they may never find out. This clause should be restored.

(c) Use of Securement System

Clauses (1) and (2) add bunks and bolsters to stakes. We want the logs solidly against the stakes that are on the sides. A bunk includes stakes. A bolster is the horizontal member of a bunk and the bottom log will always rest solidly on it, due to gravity.

Clause 4 has been changed from the NACSS, and it is not clear exactly what it means now. Specifically, all logs on the top of the load should be secured by at least one tiedown. If all logs on the top are secured, they automatically secure those on which they are sitting. Go back to the original wording, so the intent is clear.

The NACSS required the driver to fasten the tiedowns at initial loading, so that they would be fastened for travel on a forestry road, and check and adjust the tiedowns at the entry to a public road, in addition to the other required checkpoints. These requirements have been deleted. There may be no jurisdiction over the forestry road, but this is the place to tell the driver the load must be secured from the start of the trip. One of the most significant factors in avoiding dropping logs on the highway is to get the driver to inspect and adjust the tiedowns before entering the highway. These points should be restored. It needs to be directly stated in this section, as this is the only specific commodity that may consistently have significant off-road travel before entering the public highway. You might also consider adding it as a general requirement to §392.9, that any load that has traveled more than some time/distance to reach the highway, the load must be inspected and tiedowns adjusted on entry to the public road.

(e) Rail Vehicles

The NACSS requirement for a minimum tension of 900 kg (2,000 lb) in longitudinal tiedowns over shortwood loaded crosswise, and for a device that automatically takes up slack in tiedowns, has been deleted. Research and testing conducted by the Forest Engineering Research Institute of Canada (FERIC), and the Ministere des Transports du Quebec, made available during both the research and standard development phases, clearly shows that automatic slack compensation is the only effective way to maintain tension in such tiedowns. This level of tension is necessary to lock the logs together into a bundle. Less tension, and the tension drops almost to nothing in as little as 15-20 minutes, and logs are left loose on the top of the load, where vertical accelerations in excess of 1 g allows logs gradually to migrate laterally and off the trailer. This securement system, a check of the load before entering a public highway, and proper supervision together essentially eliminated log spills in Ontario. The requirement should be restored.

§393.124 Dressed Lumber

(c) (3) Securement of Bundles in more than one Tier

The requirement in the NACSS for spacers to provide good interlayer friction has been deleted. Loads like dressed lumber are kept in place only by friction. The spacers are

not just separators to allow forks under bundles for lifting. Friction provided by the spacers beneath every tier, including the bottom tier, is critical in preventing bundles from sliding. The requirement may not be objective, but it is telling the shipper and driver that high-friction spacers must be used, which is very significant to preventing cargo movement. I have observed narrow slices of gypsum board, which is both very slippery and crushable, used as spacers. This requirement is intended to prevent such materials being used. It is critical that this requirement be restored.

(c) (iv) Securement of Bundles in more than one Tier

The reversion to Roman numerals is quaint. The grammar is nonsensical: "The arrangement of the tiedowns for the bundles must be secured by indirect tiedowns over the...". If the tiedowns must secure themselves, what is keeping the bundles on the truck?

§393.126 Metal Coils

(c) (1) (ii) Coil with Eyes Crosswise

Tiedowns are required to be at an angle "no more than 45 degrees with the horizontal, ***whenever practicable***", here and in a number of other places. The bold italic highlight is mine, to highlight text added by FMCSA. This creates a major loophole, which allows a serious reduction in restraint relative to both the NACSS and the current regulation. Metal coils are one of the most difficult commodities to secure. That is why the current rule addresses them in detail. A serious accident in Buffalo, N.Y. was partly responsible for FHWA becoming involved in the research project. If the trailer or the tiedowns available do not allow a coil to be secured in a manner that provides proper resistance, then the coil should not be allowed to leave on that vehicle. Period. No argument, no discussion. You do not maintain highway safety by putting in a loophole that allows anyone to do anything they want. Testing showed quite clearly that a tiedown at a 45 degree angle provides significant resistance, Research Report 15. Resistance diminished as the angle increased, until it is negligible for a tiedown vertically through the eye. Under the current rule, if the weight of a coil requires three tiedowns, the common practice is two tiedowns placed fore and aft at angles less than 45 deg, and the third vertically through the eye. The third tiedown is required to provide the resistance required by the weight of the coil, but its location makes it almost completely ineffective. Such a coil in most cases is almost certainly inadequately secured under the current 0.6 g, rule, let alone the NACSS. There is a key difference between the current rule, and the NACSS. The current rule as interpreted in and used in practice simply requires that number of tiedowns that meets the aggregate working load limit. The tiedowns do not have to provide effective resistance. Some part of current practice clearly provides inadequate resistance while complying with the law, and loads will inevitably shift upon or fall from vehicles if the driver has to make a serious stop. The NACSS requires an objective level of resistance, and attempts to use the minimum number of tiedowns to provide that resistance. The NACSS requires the third tiedown to the rear, where it provides the additional securement required. If chains are not long

enough, get longer chains, or join two together by the grab hook on each into a link on the other, and wiring the hooks in so they do not accidentally become unfastened. The long run to a pocket behind that used for the first chain may seem difficult to tension, but it is not necessary to get a high tension in such a direct tiedown. In fact, a very high tension is counterproductive, it reduces the amount of chain capacity available to resist motion. Direct tiedowns should just be taut, they should never be tensioned tightly. The "whenever practical" loophole must be removed in all occurrences in this section, to ensure that an objective level of resistance is provided for metal coils.

While about it, this section should also ban use of flexible tiedowns like webbing strap or rope as direct tiedowns for use with metal coils. Maybe this should be a general ban, for all use as a direct tiedown. A synthetic webbing strap or rope with the same working load limit as a chain or wire rope in the past has been considered equivalent to the chain or wire rope, and it is when used as an indirect tiedown. However, the strap or rope is 5 to 10 times more flexible than the chain or wire rope. This means a metal coil will move 5 or 10 times more when secured by a webbing strap or rope than when secured by a chain, as each must stretch sufficiently to develop essentially the same tension necessary to stop movement of the coil. In tests, a coil moved 2 to 3 inches to the point where the chain reached its working load limit. If a coil is able to move 10 to 30 inches before stopping, the risk is much greater. If the coil should roll on a timber, rather than the coil bunks sliding on the deck, the coil could roll right out of the bunk. With such extreme movement, it would be likely that the tiedown would slide out of any edge protector, and would be liable to be cut by the edge of the coil. In addition, a webbing strap would come off the winch at an angle. The winch is not designed to be loaded in such a direction. If a sliding winch or its track is somewhat worn, there is risk that the winch would be pulled right out of the track. If it is difficult to put in a direct ban on use of synthetic webbing strap or rope as a direct tiedown, insert wherever a direct tiedown is required that "Any direct tiedown must have a linear stiffness comparable to that of chain".

§393.130 Concrete Pipe

(e) (1) (iv) and(v) Securing Pipe

Tiedowns are required to be at an angle "no more than 45 degrees with the horizontal, ***whenever practicable***". The bold italic highlight is mine, to highlight text added by FMCSA. The same comments apply as for Metal Coils above, though the mechanics is slightly different. The purpose of the angle in this case is to bring all the pipes tightly in contact, to ensure there is no space between consecutive pipes, and to generate friction between touching pipe that will prevent any tendency for any pipe to roll. If the pipe cannot roll, they can only slide as a group. Blocking at the front, the longitudinal tiedowns, and a high coefficient of friction between concrete pipe and the deck effectively ensure the performance standard is met, provided the pipe remain in contact. The added text would allow a tiedown at any angle, and as the tests for metal coils showed, a tiedown that is vertical or close to vertical, which would be allowed by the added text, provides no significant restraint. Again, if the trailer or the tiedowns

available do not allow concrete pipe to be secured in a manner that provides proper resistance, then the load should not be allowed to leave on that vehicle. The added text must be deleted from all occurrences in this section, to ensure that an objective level of resistance is provided for loads of concrete pipe.