

South Dakota

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TIE-DOWN SYSTEMS

How to Protect
Your Mobile Home
from Wind Damage



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CAUTION:

The tie-down measures described in this brochure are designed to protect a mobile home from wind damage, but they are not a guarantee since wind speeds can be unexpectedly high and beyond the capabilities of the tie-down system. Occupants of mobile homes should always vacate their mobile home and seek a designated shelter or a more substantial structure when severe thunderstorm or tornado warnings are issued.



Introduction

South Dakotans are accustomed to wind, but the high velocities produced by thunderstorms and tornadoes present a serious threat to life and property. Mobile homes are particularly vulnerable because of their light weight and their flat, wind-catching surfaces.

However, while storms can produce extremely high wind speeds, even tornadoes often have velocities that are less than 125 miles per hour. During a storm of this magnitude, a mobile home that is properly constructed and has a tie-down system in place has a good chance of surviving with minimum damage. This brochure explains the elements in a tie-down system and how you can use such a system to protect your mobile home.

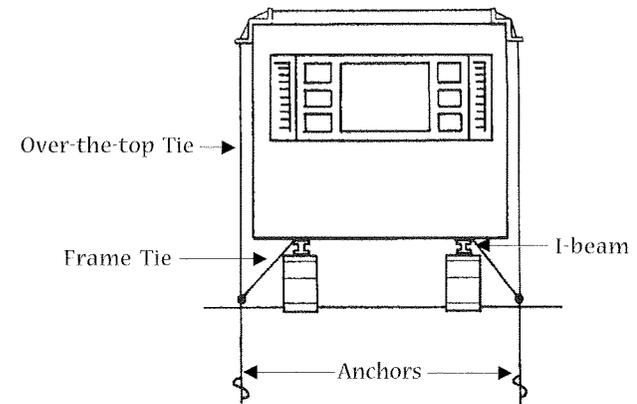
Please note, however, that installing these systems is not a do-it-yourself job. A professional installer should do the work to insure that all steps are executed properly. The advice and help of a professional engineer may also be required for unusual circumstances such as poor soil conditions or a steeply sloping lot.

The Tie-Down System

A tie-down system consists of two elements:

1. the ties — steel strapping or cable attached to I-beams in the mobile home's frame or wrapped over the mobile home
2. the anchoring device — buried in the ground or built into the home's con-

Ties attached to the I-beams are known as frame ties while those that wrap vertically around the home are called over-the-top ties. Most tie-down systems utilize both, but a few manufacturers design their units to be anchored with frame ties only.



Frame Ties

Frame ties resist both horizontal forces and the forces that tend to overturn the mobile home. They are usually made of galvanized steel strapping or galvanized steel cable, both of which must have a breaking strength of at least 4,750 lbs. Use of steel straps is by far the most common. The ties include a device that permits them to be tightened when attached to the anchor. Common tightening devices are a split-bolt for straps and a turnbuckle for cable.

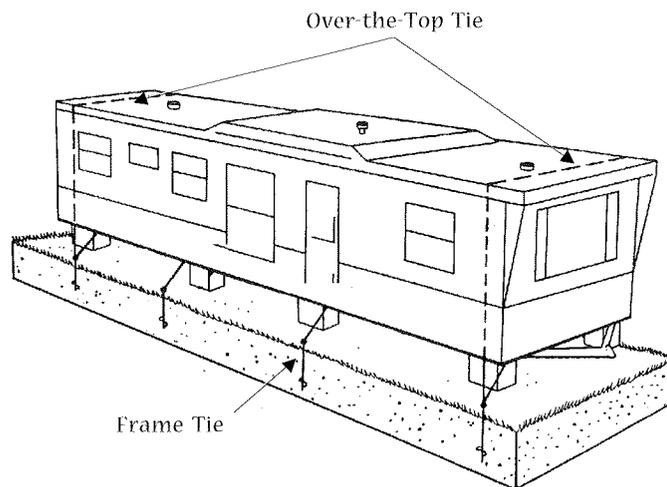
Frame ties run directly from an I-beam extending the length of the mobile home to the anchor. Frame ties are never attached to a cross beam. (See diagram above.)



Over-the-Top Ties

Over-the-top ties supplement frame ties by giving additional strength to the home's shell and increasing resistance to turn-over. However, they are never used as a substitute for a frame tie.

Manufacturers who incorporate over-the-top ties into their home design conceal them under the exterior skin of the unit. The ties must be secured to the ground anchors or other foundation elements on each side of the unit (see diagram), using the same anchors that the frame ties use. If over-the-top ties are added to a unit, they should be located within two feet of each end of the mobile home and at intervals between as recommended by the home manufacturers. All over-the-top ties should be placed at stud and rafter locations (never over windows, doors or raised portions of the roof).



This 60-foot mobile home meets the requirements for tie-downs given in the table on page 7.

How Many Tie-Downs?

In determining the number of frame ties and over-the-top ties needed to adequately secure a mobile home, follow the manufacturer's installation instructions, if available. If instructions are not available, use the information in the following table. The requirements have been calculated for mobile homes in the "standard" zone, which includes South Dakota.

The number of tie-downs specified in the table assumes that each anchor has a pull resistance in its axial direction of 4,750 lbs.

Number of Ties Required Per Side of Single-Section Mobile Homes ¹		
Length ² of Mobile Home, in feet	Number of Over-the-Top Ties	Number of Frame Ties
up to 45	2	3
46 to 48	2	3
49 to 53	2	3
54 to 57	2	4
58 to 69	2	4
70 to 72	2	4
73 to 83	2	5
84 to 89	2	5

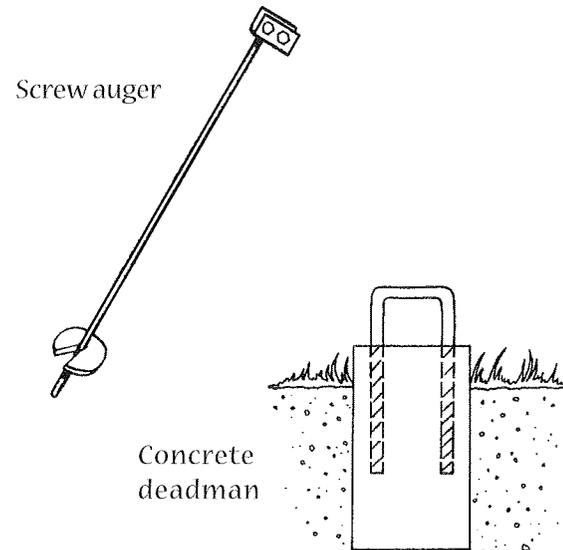
¹Except when the anchoring system is designed and approved by a registered engineer.

²Length excludes draw bar.

Note: Double-section mobile homes require only frame ties, which must be placed along the outer side walls.

Anchors

The second element in a tie-down system is the anchor. Common types of anchors include the screw auger and the concrete deadman.



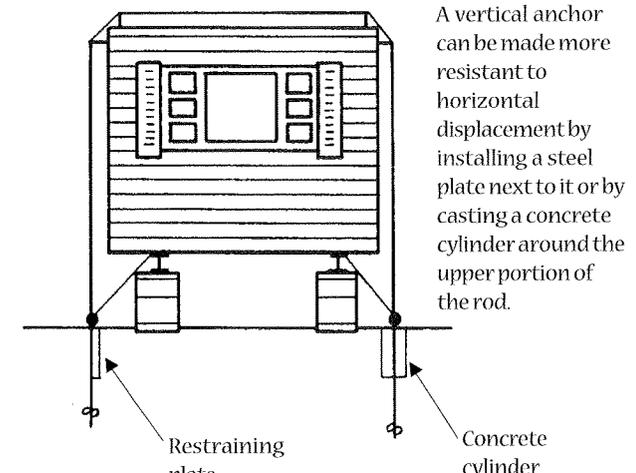
Anchors are installed to a depth of four to five feet, depending on soil conditions. Different soils and different types of anchors provide different holding strengths. For example, a 6-in. diameter screw auger in a stiff clay soil might meet the requirement of withstanding a pull of 4,750 lbs., but might only withstand 2,500 lbs. in a sandy soil. If soil conditions are such that the specified resistance cannot be attained, or if the anchors selected cannot sustain this force, then use of either stronger anchors or more anchors and ties than are called for in the table will be required. This is a critical decision and should be made by a professional installer, who may in turn require the services of a geotechnical engineer.

Some mobile home developments provide concrete slabs upon which to place the mobile home. The slab may be used as the anchor if hooks or other connecting devices are embedded in the slab and properly located in relationship to the ties extending from the home. An engineer or city building inspector should verify that the concrete slab is heavy enough to resist the overturning wind forces.

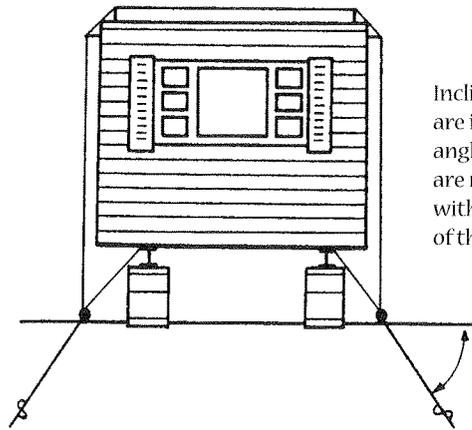
Improving Anchor Performance

If the top of the anchor rod bends or slices through the soil when it is subjected to horizontal force from strong winds, the mobile home may shift horizontally and possibly slide off its piers. This is particularly likely to happen if the soil is saturated with moisture. To minimize the possibility of such an occurrence, several measures can be taken, including the installation of extra protection on vertical anchors, using inclined anchors, or diagonally pre-loading the anchors.

Extra Protection on Vertical Anchor

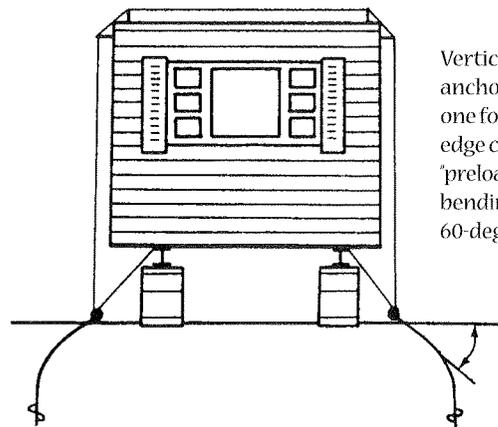


Inclined Anchor



Inclined anchors are installed at an angle so that they are more in line with the direction of the pull.

Diagonally Preloaded Anchor



Vertically driven anchors installed one foot outside the edge can be 'preloaded' by bending them to a 60-degree angle.

Points to Remember

1. Using a tie-down system is not a guarantee that your mobile home won't suffer wind damage. Wind storms and tornadoes are highly unpredictable and sometimes destroy everything in their paths. A tie-down system, however, will improve your chances of avoiding major damage.
2. Use the services of a professional installer.
3. Follow the manufacturer's instructions, if available.
4. All mobile homes in a community should be tied down. Units that are not may be blown into other mobile homes during a severe storm and cause extensive damage.

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