

CHAPTER R

Snow/Ice Control

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R.01 Introduction

R.01.01 Chapter Content and Resources

This chapter contains information relevant to all work performed for snow and ice control on the State Highway System.

The snow removal and ice control family (HM6R), includes all work in connection with the following:

- (1) Snow removal operations;
- (2) Drift prevention;
- (3) Installation and maintenance of snow fences;
- (4) Snow pole installation and removal;
- (5) Tire chain fabrication and repair;
- (6) Maintenance and control of chain control locations;
- (7) Anti-icers, deicers and abrasives; and
- (8) Avalanche control.

The program also includes truck haul of snow to waste areas, opening drains covered by snow and ice, and the spring opening of roads that are normally allowed to close for the winter season. Mechanical and manual sanding and the use, and material handling for storage, of deicing agents, both solid and liquid solution types are also included.

Refer to Volume 2 of the Maintenance Manual for administrative procedures to be used in connection with this work.

For resources referenced within this chapter, please see the following:

California Streets and Highways Code: [Codes: Codes Tree - Streets and Highways Code - SHC \(ca.gov\)](#)

California Vehicle Code: [Codes: Codes Tree - Vehicle Code - VEH \(ca.gov\)](#)

Caltrans Chain Controls/Chain Installation: [Chain Controls / Chain Installation | Caltrans](#)

Caltrans Electronic Forms System (CEFS): [CEFS - Forms \(ca.gov\)](#)

Caltrans Stormwater Quality Handbook Maintenance Staff Guide: [Caltrans Stormwater Quality Handbook - Maintenance Staff Guide | Environmental Analysis](#)

Division of Maintenance, Winter Operations Branch (Includes Winter Operations Preparedness Memorandum and Checklist and Chain Requirements): [Winter Operations Branch | Maintenance \(ca.gov\)](#)

See Ronald D. Tabler, *Snow Fence Guide*: [SHRP Report H-320: Snow Fence Guide \(trb.org\)](#)

R.01.02 Definitions

ATD	Automatic Traction Device
BMP	Best Management Practices
C	Celsius
CEFS	Caltrans Electronic Forms System
CMS	Changeable Message Sign
F	Fahrenheit
IMMS	Integrated Maintenance Management System
MUTCD	Manual on Uniform Traffic Control Devices
RWIS	Road Weather Information System
SHC	California Streets and Highways Code

Deicer: Deicer is a chemical freezing point depressant such as, but not limited to, salt (sodium chloride), salt brine. Deicers are used to melt already formed frost, snow, or ice.

Anti-icer: Anti-icer is a chemical freezing point depressant (as defined above) used to prevent the formation of frost, snow, or ice on a road surface.

Pack: Pack refers to a buildup of ice and/or compacted snow on the road surface.

Bare Pavement: Bare pavement means the road is clear of loose snow but may have patches of ice or snowpack that, when treated with chemicals or abrasives or a combination of these, may be negotiated safely by the average driver without the need of chains.

Road Weather Information System (RWIS): The RWIS is an installation of weather and pavement sensors that is used to monitor conditions at a remote location. Real-time information from RWIS sensors can alert Traffic Operations in the case of high winds or reduced visibility due to fog, activating CMS boards for traffic safety. Some RWIS can use historical data previously gathered to predict local weather as a decision-making tool for winter operations.

Chain Requirements: Caltrans and the California Highway Patrol (CHP) reserve the right to prohibit any vehicle from entering a chain control area when it is determined that the traction devices do not meet the requirements of California Vehicle Code Section 605.

Automatic Traction Devices: Automatic traction devices (ATDs) as defined in the California Vehicle Code section 605, are devices that can be automatically deployed by the driver of a vehicle. These devices are most commonly found on trucks and buses.

R.01.03 References and Hyperlinks

There are hyperlink resource materials identified within this chapter. If any hyperlink is not accessible, please notify the appropriate personnel to inquire about that resource or reference.

R.01.04 Chapter Contact

This chapter of the Maintenance Manual is maintained by Division of Maintenance, Office of Emergency Operations and Recovery.

R.02 Policy

In compliance with SHC Section 95, Caltrans adopted the following policy in July 1992:

“Snow removal and ice control should be performed as necessary in order to facilitate the movement and safety of public traffic and should be done in accordance with the best management practices outlined herein with particular emphasis given to environmentally sensitive areas.”

This policy is outlined in the Caltrans report to the Legislature in response to Chapter 318, Statutes of 1991 (Hauser), “The Use of Deicing Chemicals on California State Highways” July 1992.

- (A) Through coordination with the Chief, Division of Maintenance, each district is responsible for preparation of detailed operational guidelines for their individual snow routes. These will be based on overall needs.

Factors to be used in determining these needs are:

- (1) Safety.
- (2) Average daily traffic (ADT).
- (3) Congestion and traffic delay.
- (4) Pedestrian movements.
- (5) Availability of alternate routes.
- (6) Consequences of not providing appropriate level of service.
- (7) Public interest and concern.
- (8) Potential economic impact.

- (9) Environmental considerations.

Final determination in levels of service will consider cost and budgetary constraints. In addition, districts are to comply with the following requirements regarding their snow and ice control programs:

- (10) Maintain accurate records of the locations and quantities where anti-icers and deicers are used.
- (11) Provide necessary training for Maintenance personnel involved in snow and ice control efforts.
- (12) Calibrate equipment used to apply deicers, anti-icers or abrasives.
- (13) Identify areas that are potentially environmentally sensitive. This includes vegetation areas and bodies of water receiving direct roadway runoff.
- (14) Submit to the Chief, Division of Maintenance, no later than November 1st of each year, an annual Snow Plan for the next winter season, including proposed levels of service, chemical usage, and any proposed changes in winter operations in or near environmentally sensitive areas. Only changes or revisions to each Snow Plan need to be submitted in subsequent years. If no changes or revisions are made, a statement should be submitted to verify that no changes have been made, and that the current Snow Plan is still in effect.
- (15) At the close of each winter season, no later than September 1st, each district is to specify the quantity, type, and placement of anti-icers, and deicers used in the previous winter season, and have been reconciled in IMMS.

R.03 Maintenance Levels

Snow removal and ice control should enhance safety while balancing traffic demands, amount of traveler delay, and environmental impacts. It is expected that R-1 and R-2 chain controls will need to be used on some routes. All roadway segments subject to snow and ice conditions will be designated with a Snow Road Classification “A”, “B”, “C”, “D”, or “E.” The level of service to be provided will be dependent on this classification of each segment. The determined level of service for each route will be determined by each district with concurrence of the Chief, Division of Maintenance. Any changes to the current designated level of service must be approved by the District Director or his or her designee, and will be immediately reported to the Chief, Division of Maintenance.

Snow Road Classifications are defined as follows:

- (A) Snow Road Classification “A”

Snow will be removed as continuously as reasonably possible during a storm to keep the road open for traffic except when poor visibility or avalanche hazard exists. Chain requirements will be lifted, and the roadway returned to bare pavement as soon as reasonably possible. Patrols will be established for those areas where conditions require surveillance of the roadway for possible snow, ice, or avalanche hazards. Anti-icers, deicers, or abrasives, or a combination of materials should be applied to enhance traffic safety as deemed necessary by the designated supervisor on duty.

(B) Snow Road Classification “B”

This level is the same as “A” above, except that, chain requirements will be lifted, and bare pavement achieved to the extent reasonably possible within 48 hours after the end of the storm.

(C) Snow Road Classification “C”

At this level, only enough snow should be removed during the storm to keep the road open and enhance safety for traffic. Around the clock shifts may be necessary to accomplish this.

Patrols will be established for those areas where conditions require surveillance of the roadway for possible snow, ice, or avalanche hazards. Anti-icers, deicers, or abrasives, or a combination of materials should be applied to enhance traffic safety as deemed necessary by the designated supervisor on duty.

(D) Snow Road Classification “D”

Snow should be removed only during normal daytime work shifts, except that some routes may be plowed at any time when the District Director determines there is sufficient reason for plowing. Some routes may be allowed to close temporarily during moderate to heavy storms when the District Director determines this to be the appropriate course of action. Once open, anti-icers, deicers, or abrasives, or a combination of both should be applied to enhance traffic safety as deemed necessary by the designated supervisor on duty.

(E) Snow Route Classification “E”

These routes are allowed to close during the winter and are reopened in the Spring when it is reasonable to assume the storm possibilities are over.

R.04 Organization and Practice

Deputy District Directors, Maintenance, Maintenance Region Managers, and Area Superintendents should make advance preparations so that snow removal work can begin with

the first storm. Weather forecasts and temperature readings must be monitored frequently during the winter season.

Road Weather Information System (RWIS) should be utilized if available. Regularly assigned crews should be supplemented by transfers from non-snow areas, personnel from other agencies through an interagency agreement, permanent intermittent, limited term, and temporary help personnel as available.

Close cooperation, good communication and application of the principles of teamwork with members of the California Highway Patrol (CHP), local law-enforcement, and other governing agencies are essential for successful snow removal operations.

Roads having extremely light winter traffic (snow route classification “E”), where the expense of snow removal is not justified, may be closed as reasonably necessary.

Except for SNO-Parks, established State maintained parking areas, and under properly executed Maintenance Agreements negotiated with other agencies, State forces should not remove snow beyond the Caltrans right-of-way line. Property owners may clear snow from driveways within the right-of-way and deposit that snow only on the portion of the right-of-way not used by vehicles or pedestrians. No snow from other portions of private property should be deposited on the right-of-way.

In business districts where snow cannot be blown out and there is sufficient roadway width, snow may be plowed to the center of the road for later removal. Where openings are made in center of the road snow berms for left turns and cross traffic, the openings should be made wide enough to provide a reasonable sight distance. When temperatures warm sufficiently for melting, center of the road snow berms may be spread as a thin layer on the traveled way as a method of snow removal in lieu of expensive snow hauling. This method may only be used in areas where it is acceptable to local environmental authorities.

At resorts and clubs where parking may be continuous over storm periods or for overnight or weekends, space for parking should be provided by the resorts or clubs beyond the right-of-way.

If cars are parked within the right-of-way, it is the responsibility of the resort or club officials to have such cars moved, if snow removal equipment is expected to clear the area. If private vehicles are parked on the traveled way, the CHP should be requested to remove the vehicles.

A preferred method of controlling pack is mechanical removal. Sufficient anti-icers should be applied at the beginning of a storm to deter bonding and minimize the buildup of pack. When pack does build up, chain controls can be utilized as appropriate to enhance safe travel conditions until the surface has been treated with abrasives or bare pavement conditions are achieved.

When possible freezing conditions are anticipated, special patrols should be scheduled for the detection and correction of slippery conditions. Particular attention should be paid to curves, intersections, grades, and problem locations such as shaded areas and bridges. Anti-icing liquid

can be applied, sometimes many hours in advance of anticipated freezing conditions, to discourage frost and ice from forming and reducing the need for some after-hours patrols.

(A) Areas of Special Consideration

(1) Bridge Decks

Salt applied to bridge decks can cause corrosion damage to structures and should be used with caution. Non-chloride chemical deicers are recommended whenever possible. At lower elevations, slippery conditions on bridge decks can often be mitigated by use of properly constructed chip seals (Contact Bridge Maintenance Engineer). Application of abrasives and non-chloride deicers can be used to control frost.

(2) At Grade Railroad Crossings

When removing snow at railroad crossings, every precaution should be taken to ensure that ice, snow, abrasives, and other debris are not deposited and left on the crossing. When engaged in plowing activity at railroad crossings, plow trucks must come to a complete stop, adjust the plow to clear all obstructions and carefully cross the tracks before resuming regular plowing. This procedure will prevent damage to the tracks and plowing equipment.

(3) Snow Fence and Jet Roofs

Inspect annually and repair snow fences and jet roofs, preferably two (2) or three (3) months prior to anticipated snowfall.

(4) Pedestrian Pathways

When there are pedestrian pathways, such as a sidewalk, along the roadway, precautions should be taken to ensure ice, snow and other debris is not deposited on the facilities when possible.

(B) Snow Pole Policy

Snow poles used for delineating the highway should be replaced if damaged, or reinstalled where removed, before the first snowfall. These should be placed at the shoulder edge in accordance with Section 3F.04, Delineator Placement and Spacing, of the California MUTCD.

Snow poles are an essential element in almost all snow removal operations. The basic purpose of a snow pole is for guidance for snow removal crews and the public during and after storms.

Snow poles are placed to accomplish the following:

- (1) Delineate culvert ends.
- (2) Delineate slope drains.
- (3) Mark beginning and end of dikes.
- (4) Mark beginning and end of guardrails.
- (5) Delineate bridge rails.
- (6) Delineate ramp gores.
- (7) Delineate median islands.
- (8) Delineate at-grade railroad crossings, and metal cattle guards.
- (9) Delineate miscellaneous obstructions to plows such as rock outcroppings.
- (10) Delineate objects that could be damaged by snow from rotary snowplows (cabins, homes, trailers, advertising signs, etc.).

(C) Color Coding of Snow Poles

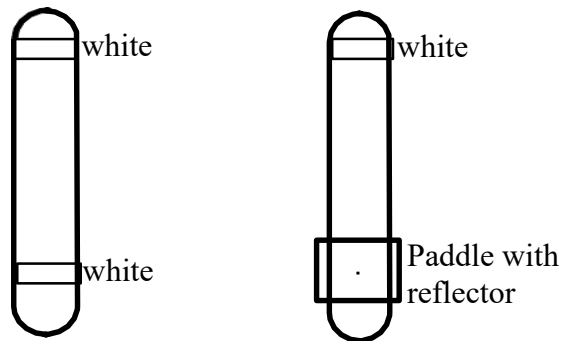
The intent of this policy is to standardize the color coding of snow poles that is consistent throughout the State and to provide guidance for snow removal crews in identifying the above listed obstructions and objects within, or near, the right-of-way.

All snow poles should be color coded with one or more bands of 3-inch-wide high intensity type "Encapsulated lens" reflective sheeting (tape) wrapped around the pole with a minimum 1-inch overlap or painted with an approved reflective type of paint.

References to placement of tape on poles are too top of tape. Types of snow pole installations and their color coding are as follows: (Note: All references to "4 feet from ground" apply to freestanding poles only. Delineators with extensions are not subject to tape at the 4-foot). Standard snow pole color coding is as follows:

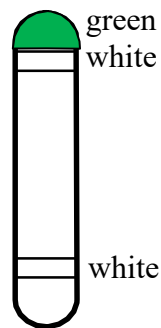
- (1) Standard Snow Pole Installation (freestanding pole or guide marker and extension).

White tape 3 inches from top of pole and 4 feet from ground.



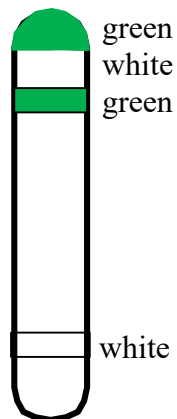
(2) Culvert Marker

Green tape at top of pole, white tape 3 inches from top and 4 feet from ground.



(3) Slope Drain

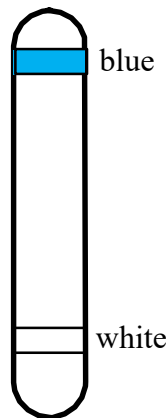
Green tape at top of pole, white tape 3 inches from top, green tape 6 inches from top, and white tape 4 feet from ground.



- (4) Roadside Obstructions (bridges, guardrail, curbs, dikes, etc.).

Pole at beginning of obstruction and continuing through obstruction, blue tape 3 inches from top of pole, and white tape 4 feet from ground.

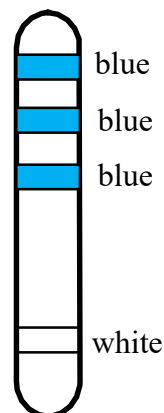
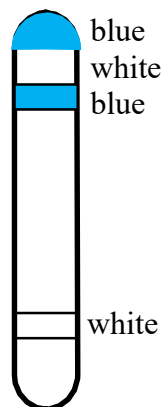
End pole, white tape 3 inches from top of pole and 4 feet from ground (same as “(1)” above).



- (5) Highway Obstructions Requiring Plow to Stop (metal cattle guards, at-grade railroad crossings, etc.).

Pole 300 feet ahead of obstruction, blue tape at top of pole, white tape 3 inches from top, blue tape 6 inches from top, and white tape 4 feet from ground.

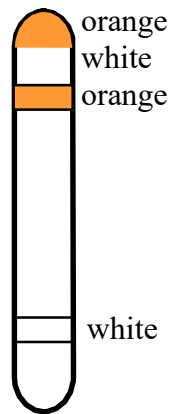
Pole at obstruction, blue tape 3 inches, 9 inches, and 15 inches from top of pole, and white tape 4 feet from ground.



- (6) Rotary Snowplow Obstructions (cabins, homes advertising signs, high voltage lines, transformers, frontage roads, ski trails, etc.).

Pole at beginning of obstruction and continuing through obstruction, orange tape at top of pole, white tape 3 inches from top, orange tape 6 inches from top, and white tape 4 feet from ground.

End pole, white tape 3 inches from top of pole and 4 feet from ground (same as “(1) above”).



To minimize the danger to the neon type of advertising signs during snow removal operations, it is suggested that the protection of these signs be discussed with the owners prior to the start of the snow season. In some cases, wire screens have been installed by the owners to provide protection against the discharge of snow from the right-of-way. It is often helpful to have the sign lights left on all night during the winter season to assist equipment operators in recognizing the unit. Where heavy snow removal requires use of rotary plows, the operators should be instructed to reduce speed in the areas where adjacent buildings or facilities might be damaged by the flying snow, and to direct the chutes to minimize this danger. Operators are to respect private property at all times. Care must be taken to avoid damaging cars parked adjacent to the highway.

(D) Type of Pole

Fiberglass slip in, or add on, type snow poles should be used on guide markers.

Length may vary as required. These poles should be black with an ultraviolet inhibitor to prevent them from bleaching to white or yellow.

Hat shaped or 1-inch black pipe, free standing type snow poles may be utilized in heavy snowfall, high altitude areas, or areas subject to extreme vandalism or theft.

Duplication of poles in an immediate area should be avoided, i.e., where one pole can perform several desired functions in lieu of more than one.

Maximum use of delineators supplement with snow poles should remain the preferred method to reduce numbers of poles needed and better perform roadside delineation.

(E) Placement of Snow Poles

The minimum number of poles necessary should be utilized.

Spacing of 400 feet or more between poles should be the goal, recognizing exceptions for areas of poor alignment, fog, and severe blowing and driving snow conditions.

In areas with low annual snowfall, it may be appropriate to delete snow poles and rely on existing guide markers only. Snow poles should not be removed during the summer months unless there are compelling reasons to do so.

R.05 Equipment

In territories of light snowfall and lower levels of service, light dump trucks equipped with light push plows are recommended. Where the snowfall is heavy and the levels of service are higher, motor graders, heavy trucks 8 cubic yards and bigger with heavy (Type C) plows, rotary snowplows and heavy plow trucks equipped with exhaust heated slip in sander bins should be used as long as they are in the fleet.

On major routes, the main plow unit should be the 8 cubic yards and bigger sander truck (3-axle) equipped with Type C plows and wing plows. This increases production and cuts down on the amount of equipment needed. It is recognized that if pack is allowed to build up, the motor grader and heavy use of deicing chemicals may be necessary. Reversible plows are utilized where it is necessary to push snow either to the right or the left.

Rotary plows are used to clean up deep berms of snow left on the shoulders and to open mountain pass roads that are allowed to close in the winter. Occasionally, drifts and avalanches are deep enough that rotary plows are required. Large truck plows equipped with a wing plow, can be used to minimize the rotary plow work that is slow and costly.

Two-way radios should be installed in all snow removal equipment, which operate in remote areas, to provide rapid emergency communication and promote more efficient snow and ice removal operations. Some low use equipment may be operated without installation of two-way radios but may be equipped to use plug in or portable two-way radios. Personnel working in avalanche prone areas should wear avalanche rescue beacons set to the “transmit” mode at all times.

R.06 Lights for Snow Equipment

In addition to normal lighting, snow removal equipment may be equipped with special lighting equipment. Examples include revolving amber lights, flashing amber lights, blade lights, spotlights, and fog lights.

- (A) In addition to the normal lighting equipment, chain control trucks and trailers should have the following:
 - (1) Two 8-inch flashing red lights visible from the rear.
 - (2) Two 4½ -inch white flood lamps on the rear, to illuminate the overhead chain check point sign.
 - (3) One 36- inch R1-1 (STOP) sign mounted on right rear corner of truck. It should be removable for traveling or mounted so that it can be opened or closed to traffic.
- (B) Changeable message signs should be used when available to supplement other chain control equipment.

R.07 Care of Equipment

When snow removal equipment is idle, it should be kept in good condition for quick starting. Sheltered quarters may be provided where necessary.

Particular attention is directed to those items requiring lubrication every 8 hours, regardless of length of working shift.

Tire chains should be inspected frequently and promptly repaired when they become worn or damaged.

Equipment should be inspected, and pre-operation checklists (“pre-ops”) must be filled out at the beginning of each shift. When shift changes occur out on the road and the equipment will not return to the Maintenance station or shop, the operator must review the latest pre-operation checklist and complete a new one. Post-operation checklists (“post-ops”) must be filled out at the end of each shift. The Pre-Op/Post-Op checklists are available through Headquarters Warehouse and the electronic form DME-0283 can be found on the Caltrans Electronic Forms System (CEFS), provided in Section R.01.01 of this chapter. For additional information regarding care of equipment, refer to Volume 1, Chapter 4 of the Maintenance Manual.

Equipment should be hosed-off with water and serviced as needed at the end of each shift. Stormwater Best Management Practices (BMP) should be used, and storm water runoff issues should be considered. For additional information, consult the *Caltrans Stormwater Quality Handbook Maintenance Staff Guide* for snow/ice control BMPs, provided in Section R.01.01 of

this chapter. It is the responsibility of supervisors and operators to see that snow removal equipment is properly serviced and maintained in top operating condition.

Extreme care should be taken by operators to avoid hitting bridges, berms, guardrail, or other obstacles that may be hidden by snow. Operators should be aware of overhead height obstructions.

R.08 Prevention of Drifts

Identify locations subject to drifting and take preventative measures. The *Snow Fence Guide* by Dr. Ronald D. Tabler (SHRP-W/FR-91-106), available from the Federal Highway Administration (FHWA), includes detailed instructions regarding snow fences and reduction of drift, including, “plowing snow drifts costs about 100 times more than installing effective snow fences.”

Proper trimming of trees may reduce drift formation at some locations. Planting of trees away from the roadway as outlined in the *Snow Fence Guide* is a cost effective and environmentally acceptable method of snow-drift reduction.

R.09 Snow Fences

Snow fence may serve a dual purpose. First, they reduce drifting problems. Second, they may decrease visibility problems where snow blows horizontally across the traveled way. Formal rights acquired through normal right-of-way processes should exist for all permanent highway features, such as snow fences. See Volume 1, Chapter C5, “Entry Upon Private Property” of the Maintenance Manual, for instructions regarding permission to enter private property.

The proper position for fences will be determined by the local conditions, as wind currents vary in each locality. See the *Snow Fence Guide* for additional guidance.

R.10 Protection and Handling of Traffic

It is the responsibility of the Caltrans’ Area Superintendent to determine chain requirements and post them. Permanent chain control signs, that can be turned to face traffic, should be installed at strategic locations.

On heavily traveled major routes, flaggers and checkers may be necessary to aid in enforcing chain control and preventing excessive delay in the chaining up operation. CHP officers should be requested to aid in the enforcement aspects of chain control. In addition, District Traffic Operations personnel should be requested to help ensure the expeditious and orderly flow of traffic during chain control conditions through the application of traffic management techniques.

Private chain installers may be allowed if they are properly trained and have obtained the proper permits.

Often, mobile chain control units will be necessary due to rapidly changing conditions requiring changes in chain control locations. Portable highway advisory radios and changeable message sign units may also be necessary where traffic volumes are high. Where “fixed” highway advisory radios are in the area, they should be utilized in conjunction with the portable highway advisory radios, when possible. This will improve the coverage area, thereby giving motorists more time to plan and react to highway conditions.

When chain requirements are implemented, maintenance personnel should provide updates to the District Communications Center so that up-to-date road information is available to the public. The Chain Requirements provided at the Division of Maintenance, Winter Operations Branch web page, found in [Section R.01.01](#) and Appendix R1 of this chapter, outlines standardized chain requirements. Under certain conditions, snow tires may be used on passenger vehicles in lieu of chains. However, those vehicles must carry chains of the correct size and type in case they are needed.

Chain or snow tire requirements should be made known to the local Zone and Area Commanders of the California Highway Patrol for purposes of proper enforcement.

The chain chart requirements should be posted and kept current on the Caltrans public website, provided in [Section R.01.01](#) of this chapter, for up-to-date information for the traveling public, truckers or any others who may have questions or concerns.

Chain control signs should be changed promptly as conditions warrant.

(A) Conditions During which standard MUTCD signs are required

There are four conditions for which standard signing for chain control areas are necessary.

- (1) R1A: The first condition, Example 1a of Figure R-1, may be used when road conditions are such that only single-axle drive vehicles with trailers need chains. (Commonly referred to as “Modified R1”). The sign should be mounted below the CHAINS REQUIRED sign (R76).
- (2) R1: The second condition, Example 1 of Figure R-1, is when chains are required but autos and pickups with approved legal snow tires are exempted from using chains.
- (3) R2: The third condition, Example 2 of Figure R-1, is when chains are required but vehicles with four-wheel drive (or all-wheel drive) and approved legal snow tires on all four wheels are exempted from using chains.
- (4) R3: The fourth condition, Example 3 of Figure R-1, is when chains are required with no exemptions.

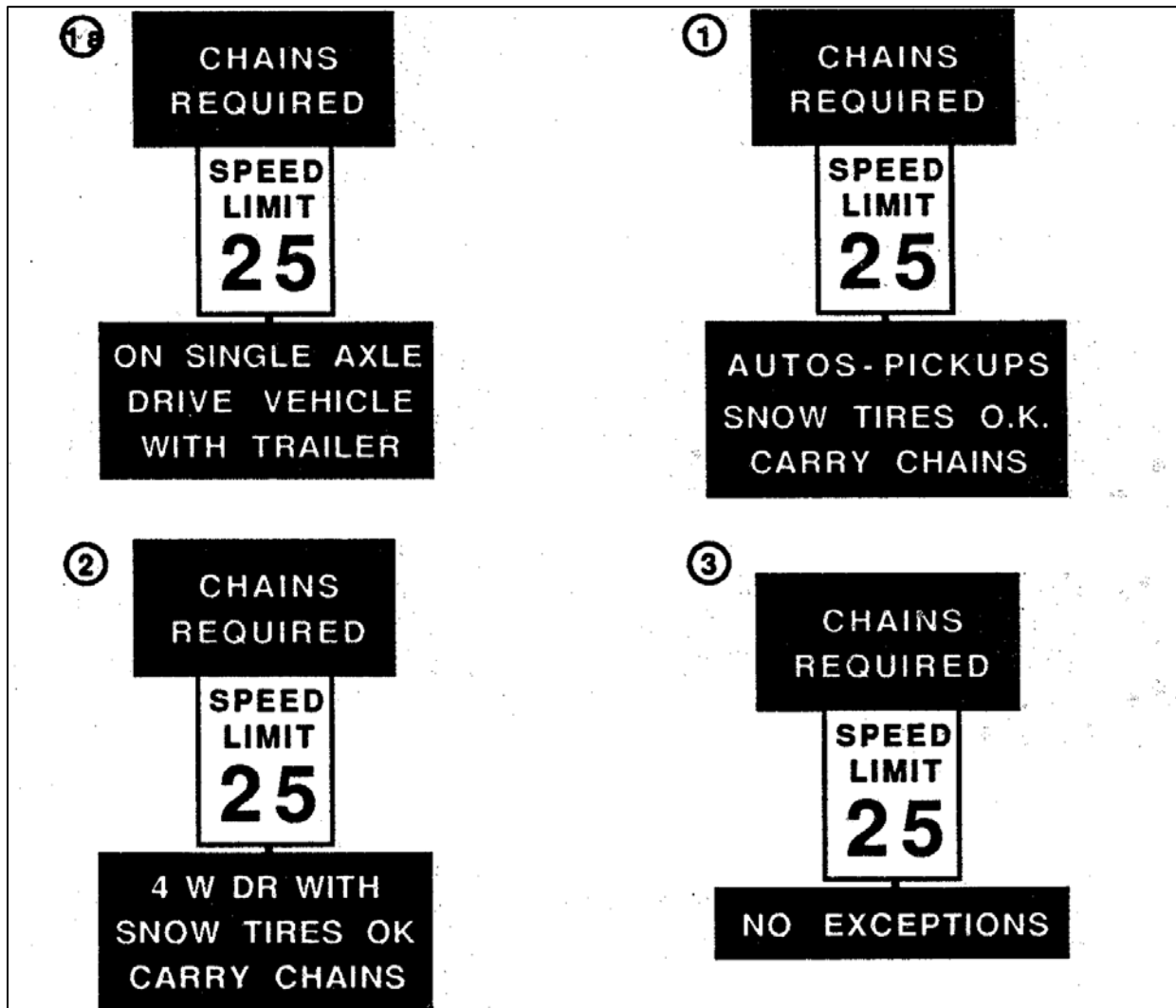


Figure R-1: Chain Requirements ("Speed Limit 25" is for illustration only)

Speed limits may be set at 40, 35, 30, or 25 miles per hour in chain control areas according to prevailing conditions as outlined in Section 22363 of the California Vehicle Code.

All designated areas should have "End of Chain Control" signs at the end of the chains required area.

R.11 Highway Condition Reports

November 1 to April 30 is considered as the normal winter season. During this period, Highway Condition Reports should be completed daily and consolidated in each district where required. They do not need to be sent to Headquarters.

R.12 Parking Areas

As equipment becomes available after highway snow removal is completed, clearing of established parking areas on the right-of-way, and driveway berms, should be done.

R.13 SNO-Parks

Normally, clearing of SNO-Parks should proceed only after State highways are open and equipment and personnel can be made available for such work. Exceptions are SNO-Parks that are used for snowplow turn arounds, or where it is impractical or inefficient to return later. All SNO-Park work must be documented for reimbursement according to the properly executed agreement in effect at the time. Supervisors are responsible for using correct coding to ensure that resources spent on this work will be fully reimbursed to Caltrans. Inter-Agency Agreements for SNO-Park work are administered by the Headquarters Maintenance Program.

R.14 Sand and Deicers Storage

Where ice, frost or snow cause slippery pavements, provisions for abrasives storage should be made. Abrasives should be stored in covered stockpiles in areas where a frozen crust will not form on the stockpile. Where large quantities are required, and temperatures could get low enough to cause a frozen crust, a sand house or other structure may be provided. Deicers should be stored in covered areas, bunkers, abrasive storage buildings, or tanks, but they should not be kept in equipment buildings. Abrasives and deicers should be stockpiled prior to and as needed during the winter season. Stockpiled material should be dry to prevent caking.

Deicers should be stored in compliance with the National Pollutant Discharge Elimination System (NPDES) standards. Contact the District NPDES (or Storm Water) Coordinator for further information on storm water pollution prevention measures. Stored abrasives and deicers must be kept from coming into contact with runoff. Contain any spills from brine storage and brine preparation.

R.15 Applying Anti-Icers, Deicers and Abrasives

Anti-icers, deicers and abrasives are spread to enhance safety by providing increased traction to maintain an orderly flow of traffic during adverse weather conditions. Anti-icers or deicers can be used to:

- (A) Prevent the formation of frost or ice films.

- (B) Weaken or prevent bonding between the snowpack and road surface.
- (C) Melt compacted snow that remains after plowing.

Sodium chloride (salt) is very effective above 25° F (-12.6° C), effective between 25° and 15° F (-12.5° and -30.6° C), marginal between 10° and 15° F (-39.6° and -30.6° C). It is ineffective below 10° F (-39.6° C).

Because of potentially detrimental effects of sodium chloride to vegetation, water quality and corrosion of metal, Maintenance personnel should use the minimum amount necessary for effective snow and ice control per Section 95.6 of the California Streets and Highways Code. All deicing products are to be applied under the strict control and direction of the assigned supervisor on duty unless prior authorization for a specific use has been given. A Material Safety Data Sheet (MSDS) will be kept on file for each anti-icer, and deicer being used. Always apply only the necessary amount for the condition.

(A) Application Guidelines

The following guidelines should be used when applying dry salt (Sodium Chloride-NaCl).

DRY SALT APPLICATION RATES

TEMPERATURE degrees Fahrenheit			RATE Pounds per lane mile		
With Falling temp F	In shade	In sun	To prevent ice films or to weaken bond between snow and road surface	To remove thin crusts of snow and ice after plowing	To remove thick crusts of snow and ice
	25-up	20-25	50 – 200	150	300
25-up	20-25	10-20	100 – 200	150 – 250	300 – 400
20-25	10-20	5	125 – 250	250	500

Salt may be made into brine by adding dry salt to water until an approximate 23% solution is achieved. The concentration of salt in the brine should be checked by use of a hydrometer. Brine may be used on trucks set up for this purpose to spray abrasives as they are applied. Proper use of brine can effectively reduce the total amount of salt and abrasives used in each area. Avoid

spilling brine or salt during the mixing process. Spilled brine or salt should be contained and removed from the pavement or other surface, to prevent any discharge with runoff.

Abrasives and/or chemicals will be used as needed on grades, curves, bridge decks, grade crossings, intersections, frost areas, and in cities and towns to improve vehicle traction.

Abrasives will ordinarily be applied at 1,000 pounds or less per lane mile. Up to 2,000 pounds per lane mile may be required on super-elevations or under unusual conditions. Applications should be repeated as necessary.

Spreaders should be calibrated at the beginning of the snow season to provide accurate application rates. To spread the desired amount of chemical and abrasive for given conditions, it is essential that the driver know the proper settings and speed to operate the equipment. Spreaders should be re-calibrated following mechanical repair or indications of inaccurate spreading.

Sand and salt should be spread using an approved sander or salt spreader. On lightly traveled roads, the sander may be adjusted so that the full width of the pavement is covered in one operation from the right-hand lane. However, on roads having considerable traffic, it may be necessary to shield the sander so that the sand will be spread on only one lane at a time. Equipment used with sodium chloride should be washed and serviced at least once each shift and always immediately after each storm to prevent corrosion. Washing must only be done at approved rinse areas or wash racks with best management practices to contain or prevent salt or sediment laden wash water from entering storm drains or discharging to water bodies.

R.16 Avalanche Control

Certain highways are in areas prone to avalanches. Three (3) systems are used to mitigate avalanche hazards by releasing them under controlled conditions.

- (A) GAZ-EX - a permanently mounted system of gas exploder tubes fired by remote control.
- (B) LoCAT - a semi-portable high pressure dry air propellant artillery type system.
- (C) Avalauncher - portable short-range low-pressure gas propellant artillery type system.

Explosive hand charges are used at remote locations under strictly controlled conditions when other methods are not appropriate or available.

Personnel involved in avalanche control must be trained and licensed blasters certified to work with explosives.

Avalanche rescue beacons must always be worn by Caltrans personnel working in avalanche prone areas. The beacons are to be in the “transmit” mode at all times. Two-way radios should be

used in all highway equipment and vehicles working in avalanche prone areas.

Specially designed jet roofs are ridge top structures used in some areas to redirect air currents to help prevent buildup of dangerous snow cornices. These are annually inspected and repaired to maintain structural integrity.

Caltrans works closely with the U.S. Forest Service, National Park Service, and private industry ski resort operators to enhance public safety by posting warning signs restricting parking and off highway travel in avalanche prone areas.

APPENDIX R1

Chain Requirements

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STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (Caltrans)

Chain Requirements

Revised 10/16



Vehicles are permitted in chain control areas when equipped with link-type chains or Alternative Traction Devices (ATD). Examples of ATDs include: cable chains, textile snow chains, wheel hub attached chains, and automatic tire chains. Tire traction devices are defined in the California Vehicle Code (CVC) Section 605. When the term "chains" is used here, it means any "tire traction device" which meets the requirements of (VC) Section 605.

Vehicles with cable chains as well as other less conventional devices are legal in California. However, these may be restricted at times due to local conditions.

Minimum legal tread depth for mud and snow tires is 6/32 of an inch.

Caltrans and the California Highway Patrol (CHP) reserve the right to prohibit any vehicle from entering a chain control area when it is determined that the traction devices do not meet the requirements of (CVC) Section 605.

LEGEND

- Driving axle
- Non-driving axle
- Wheel with chains or ATD
- Wheel with no chains or ATD
- Drive axle must be chained.
- Chains on trailers may be staggered front and back.
- Caltrans and CHP may require chains on all drive wheels if conditions warrant.
- Both axles must be chained (four wheels with chains or ATD).
- Chains required on inside dual (if possible).



NOTES

- All vehicles, including four-wheel or all-wheel drive vehicles must carry chains upon entering a chain control area.
- All vehicles, including four-wheel or all-wheel drive vehicles, that are towing trailers must have chains on one drive axle.
- Trailers with brakes must have chains on one axle.
- Front-wheel drive vehicles must have chains on front (drive) axle.
- On any semi-trailer, only one set of chains is required regardless of number of axles.
- Chains are not required on tag axle.
- Trucks or tractors equipped with super singles, chains are required on all drive wheels.



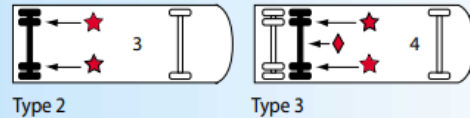
Acceptable on either axle of semi-trailers.

AUTOS/PICKUPS

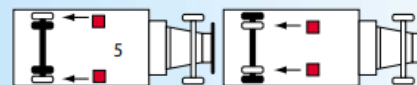


BUSES/RECREATIONAL VEHICLES

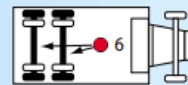
(Articulated buses must also chain outside wheels of last axle.)



TRUCKS



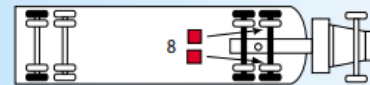
Truck Type 2



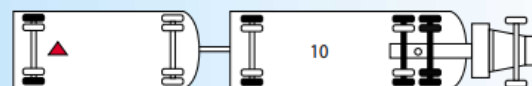
Truck Type 3



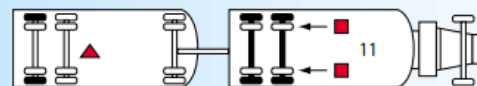
Tractor and Semi-trailer Single Dr.



Tractor and Semi-trailer Type 3-S-2

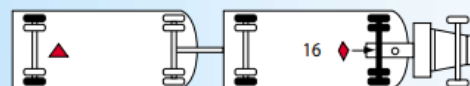


Tractor, Semi-trailer, and Trailer Type 3-S-1-T-2



Truck and Trailer Type 3-T-3 or 3-T-2

The following truck may be restricted when chains are required:



Tractor, Semi-trailer, and Trailer Type 2-S-1-T-2