

Maintenance

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**Project Title:**

Evaluation of Devices for Improving  
Traction Control in Winter Conditions

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## Evaluation of Devices for Improving Traction Control in Winter Conditions

Evaluate what technologies are available, create test procedures, and test various tire traction control devices.

### WHAT IS THE NEED?

During the winter months, motorists may encounter tire traction controls (or “chain control”) in the California mountain regions. There are three levels of tire traction control requirements in California.

- Requirement One (R1): Chains or snow tread tires required. Snow tires must have a tread depth of 6/32” with a “M & S” imprint on the tire’s sidewall.
- Requirement Two (R2): Chains required on all vehicles except four-wheel drives or all-wheel drives with snow tread tires on all four wheels. NOTE: four-wheel and all-wheel drive vehicles must carry traction devices in chain control areas)
- Requirement Three (R3): Chains are required on all vehicles, no exceptions.

Caltrans, partnering with California Highway Patrol (CHP) and local law enforcement, have to ensure the safety of the motorists by enforcing the tire traction restriction conditions. New tire traction devices are emerging which Caltrans, CHP and local law enforcement are unsure if they meet the definition of tire traction devices as noted in the California Vehicle Code. The California Vehicle Code, Section 605 defines tire traction devices as follows: “Tire traction devices” are devices or mechanisms having a composition and design capable of improving vehicle traction, braking, and cornering ability upon snow or ice-covered surfaces. Tire traction devices shall be constructed and assembled to provide sufficient structural integrity and to prevent accidental detachment from vehicles. Tire traction devices shall, at the time of manufacture or final assembly, bear a permanent impression indicating the name, initials, or trademark of the assembling company or primary manufacturer, and the country in which the devices were manufactured or assembled in final form.



Caltrans provides a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

According to the vehicle code, Caltrans and CHP will allow any device that claims that it is in compliance with the Vehicle Code. All of the vendors claim that their devices are in compliance while driving on snow, but Caltrans sets up the tire traction device inspection sites well below the snow line which leaves a few to several miles traveled with the tire traction control device on wet roadway surfaces depending on changing snow conditions. This research is to evaluate what technologies are available, create test procedures, and test various tire traction control devices.

## WHAT WAS OUR GOAL?

This research's goal is to develop performance criteria that Caltrans can use on existing and future tire traction control devices.

## WHAT DID WE DO?

The aim of this study was to develop methods for the evaluation of traction control devices. A more quantitative approach is necessary to establish clear standards and promote the qualification of these devices. The Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center was tasked with performing an extensive study of traction control devices, with an emphasis on quantifying the friction characteristics between the vehicle and the roadway. The specific tasks were:

1. The investigation of traction control product and their availability.
2. The investigation of testing methods for the measurement of the coefficient of friction in winter conditions.
3. The development of the experimental approach and detailed experimental design.
4. Data acquisition and processing.
5. Engineering analysis.
6. Documentation.

The goal of this research was to develop an understanding of the efficacy of traction control devices in winter driving conditions. The project was terminated at the end of tasks 1 and 2, so the research that was completed only addressed the following:

- Investigate the types of traction control devices that are commercially available.
- Investigate the current methods used for testing the tire traction control devices.

## WHAT WAS THE OUTCOME?

The research discovered a wide variety of winter traction control devices that are available, and many devices are under development. The researchers compiled and classified both available traction control devices and those under development. Traditional traction control devices include: mud and snow tires, studded tires, traditional tire chains, and cable chains. Additionally, numerous nontraditional devices exist including, but not limited to: variations on traditional tire chains, textile devices, and various cleated systems.

While traction control devices are required in numerous states under extreme winter conditions, no uniform standards exist for their use or for their qualification testing. The research discussed the various methods used to measure road friction under winter conditions with the aim to understand how traction control devices can be tested and thus qualified for use. As such, the report provides a brief overview of tire friction to help understand the requirements for road friction testing. While there are specific methods and products for measuring friction, any general qualification test procedure must be physically compatible with the variety of traction control devices currently available and under development. This presents a significant challenge considering the variety of products and test instrumentation must allow



for the mounting of various devices while still providing accurate measurement.

The research identifies the guidelines for traction control devices in all states. Some states merely articulate the permitted traction control devices, whereas other states have enforceable chain control requirements. This research also considers the methods employed by other government agencies to accept the use of a particular traction control device. Only three government agencies use detailed qualification testing for traction control devices. In all of these three test guidelines, a traction control device must perform at least as well as the traditional tire chain. The direct comparison of devices is a challenge, as test procedures need to account for changing environmental conditions from one test to the next.

## WHAT IS THE BENEFIT?

The benefit of the research was to give Caltrans a better understanding of the current and future development of tire traction control devices. Also to allow Caltrans to gain knowledge of testing and possible guidelines of tire traction control devices. The researchers provided several recommendations for future research. First was to develop a very specific test procedures and associated performance criteria to assess and ultimately accept any traction control device. Second, methods need to be developed to disseminate information on accepted devices to the traveling public, Caltrans employees and law enforcement officers in order to ensure that proper use and enforcement takes place.

## LEARN MORE

Review the final report:  
<http://ahmct.ucdavis.edu/pdf/UCD-ARR-16-07-31-01.pdf>