

Survey Manual

Chapter 7

Safety

TABLE OF CONTENTS

Chapter 7 – Safety

7.1	General	4
7.1.1	Purpose of this Chapter.....	4
7.1.2	Policy and Procedural Directives.....	4
7.1.3	Workplace Safety Manual.....	4
7.1.4	First Aid.....	4
7.1.5	Accidents and Injuries.....	5
7.1.6	Safety Education.....	5
7.2	Responsibilities	6
7.2.1	CDOT.....	6
7.2.2	Project Development.....	6
7.2.3	Region Survey Coordinator.....	6
7.2.4	Survey Crew Members.....	7
7.3	Personal Protective Equipment (PPE)	9
7.3.1	Procedural Directive 87.2 – Safety Office – Maintenance.....	9
7.3.2	Personal Protective Equipment Types.....	9
7.4	Manual on Uniform Traffic Control Devices (MUTCD)	10
7.4.1	CDOT Procedural Directive 1505.1 – Safety and Traffic Engineering Branch.....	10
7.4.2	CDOT Work Zone Safety Guide.....	10
7.4.3	CDOT Procedural Directive 306.1 – Flagging Training & Certification Program.....	10
7.5	Surveying Near Traffic	12
7.5.1	General.....	12
7.5.2	Guidelines.....	12
7.6	Confined Space Entry Program	14
7.6.1	General.....	14
7.7	First Aid	15
7.7.1	General.....	15
7.7.2	First Aid Guidelines.....	15
7.8	General Safety	17
7.8.1	Sanitation.....	17
7.8.2	Operating Vehicles.....	19
7.8.3	Hand Tools.....	23
7.9	Field Surveying	25
7.9.1	General.....	25
7.9.2	Brush and Tree Cutting.....	25
7.9.3	Chain Saws.....	27
7.9.4	Climbing Fences.....	28
7.9.5	Clothing.....	28
7.9.6	Hot Weather.....	29

7.9.7	Cold Weather	30
7.9.8	Electrical Storms	31
7.9.9	Electric Lines	32
7.9.10	Poisonous Plants	32
7.9.11	Bees, Hornets, Wasps	33
7.9.12	Chiggers	34
7.9.13	Spiders.....	34
7.9.14	Ticks.....	35
7.9.15	Mosquitoes (West Nile Virus)	36
7.9.16	Snakes	37
7.9.17	Dogs and Animals.....	38
7.10	Special Considerations	39
7.10.1	Construction Sites	39
7.10.2	Railroads	39
7.10.3	Water.....	39
7.10.4	Night	40
7.10.5	Avalanche	40
7.10.6	Miscellaneous	41
7.11	References.....	42

7.1 General

7.1.1 Purpose of this Chapter

This chapter provides a compact source of the basic specifications and responsibilities for safety and health that will aid in preventing accidents and personal injuries while performing field surveying by CDOT or contract consultant surveyors. It was compiled from various safety publications distributed by federal, state, and private agencies or firms.

Any variation from the specifications shall have the prior approval of the Region Survey Coordinator.

7.1.2 Policy and Procedural Directives

This chapter is provided as a supplemental guide for field surveying and is not intended to replace any CDOT Policy or Procedural Directives on safety such as but not limited to the following:

- 10.0 Workplace Violence
- 15.0 Employee Wellness Policy
- 80.0 Occupational Safety and Health
- 80.2 Accident Reporting and Claim Handling
- 80.3 Worker Compensation
- 82.1 Reporting of Unsafe or Unhealthy Working Conditions
- 87.2 Use of Personal Protective Equipment
- 89.2 Medical Surveillance for Hazardous Materials Workers
- 306.1 Flagger Training and Certification Program
- 387.0 Construction by Public Agencies
- 800.0 Policy Directive - Division of Highway Safety
- 1001.1 Handling of Hazardous Materials and Hazardous Waste
- 1055.4 Authorized Service Vehicles
- 1225.1 Incident (Accident) Review Board
- 1245.1 Substance Abuse & Drug & Alcohol Testing
- 1250.1 Occupational Safety and Health: DOH Building or Facility Inspection
- 1250.2 Occupational Health Examinations
- 1505.1 Traffic Safety in Highway and Street Work Zones

7.1.3 Workplace Safety Manual

This chapter is provided as a supplemental guide for field surveying and is not intended to replace CDOT's Workplace Safety Manual, or any other CDOT safety manuals or guides.

7.1.4 First Aid

This chapter is provided as a supplemental guide for field surveying and is not intended to replace any First Aid training or manuals.

The following information is being provided only as a guide to assist crew members in the event of an accident or emergency and is not intended as first aid manual, or first aid training. In the event of an actual accident or emergency call for emergency response!

7.1.5 Accidents and Injuries

Accidents and injuries do not happen without cause. The identification, isolation, and control of these causes are the underlying principles of all accident and injury prevention techniques. It's important to employ safe working practices in order to maintain the morale and work efficiency of all personnel. Injuries can interrupt the progress of surveying operations and cause the injured or sick needless pain and discomfort as well as substantial loss of earnings.

No job is so important and no service so urgent that time can't be taken to perform work in a safe manner.

7.1.6 Safety Education

Safety education is the most effective tool in preventing accidents and injuries. Through adequate instruction personnel can gain useful knowledge and develop safe work practices and attitudes.

Safety education begins with you. Employees who have learned to work safely and use safety equipment realize that it is for their own benefit and the benefit of their fellow employees. They have learned to keep their mind on working safely, are aware of any changing conditions around them, and take pride in their ability to accomplish work safely.

7.2 Responsibilities

7.2.1 CDOT

It is the responsibility of CDOT to provide for a safe working environment through policy and procedural directives, manuals, guides, education, and training to assist in safeguarding the lives and physical welfare of all of us.

It is the responsibility of CDOT to provide Personal Protective Equipment to each employee appropriate for performing their assigned task.

It is the responsibility of CDOT to provide Traffic Control Devices in accordance with the most current Manual on Uniform Traffic Control Devices (MUTCD) to each survey crew appropriate for performing their assigned task.

7.2.2 Project Development

It is the responsibility of CDOT Project Development to establish and coordinate a Spring Surveying Safety Course annually each year.

For more information or to establish a particular safety course contact the following:

Dan Smith
CDOT Project Development ROW Survey/Plans
4201 East Arkansas Ave 4th Floor
Denver, Co. 80222
phone: 303-512-4401
fax: 303-757-9868
daniel.a.smith@dot.state.co.us

7.2.3 Region Survey Coordinator

It is the responsibility of the Region Survey Coordinator to initiate and maintain safety programs for education, inspection, and enforcement as are necessary to ensure that every employee has maximum practical protection against accidents, injuries, and sickness while working.

Each Region Survey Coordinator shall:

1. Be familiar with CDOT's Workplace Safety Manual and have it available as reference at all times.
2. Be familiar with this chapter and have it available as reference at all times.
3. Be familiar with the most current Manual on Uniform Traffic Control Devices (MUTCD) and have it available as reference at all times.
4. Is responsible for providing each employee with the appropriate Personal Protective Equipment (PEP) and training in the use of such equipment for performing their assigned task.

5. Is responsible for providing each survey crew with the appropriate Traffic Control Devices in accordance with the current MUTCD and training in the use of such devices for performing their assigned task.
6. Is responsible for ensuring that each employee is observing and complying with all applicable safety policies, directives, and guidelines necessary for their safety and their fellow employees safety.

7.2.4 Survey Crew Members

It is the responsibility of each survey crew member to take advantage of available opportunities, facilities, and equipment to keep themselves and their fellow crew members safe from job related accidents, injuries, or sickness.

Each survey crew member shall:

1. Be familiar with CDOT's Workplace Safety Manual and have on copy for their crew available as reference at all times.
2. Be familiar with this chapter and have on copy for their crew available as reference at all times.
3. Be familiar with the most current Manual on Uniform Traffic Control Devices (MUTCD) and have on copy for their crew available as reference at all times.
4. Make full use of Personal Protective Equipment and safeguards.
5. Make full use of Traffic Control Devices and safeguards.
6. Participate in safety education and training programs.
7. Ensure all safety devices are operative.
8. Leave their work area, tools, and equipment in a safe condition.
9. Identify, correct, and report unsafe conditions, practices, or activities.
10. Only operate equipment when trained and authorized to do so.
11. Avoid horseplay and distraction others from their work.
12. Report all accidents and injuries to their immediate supervisor.
13. Be familiar with and abide by the Department's Dress Code Regulations (See CDOT Workplace Safety Manual, Work Clothing Regulations, for additional information).
14. Operate any motor vehicle at any time with the seat belt fastened securely.

15. Conduct themselves in a safe and prudent manner when employed in the acts of surveying and traveling to and from surveying sites in his employer's vehicles, when in the office, or on the grounds of the employer or when carrying out other tasks assigned by their supervisor.

7.3 Personal Protective Equipment (PPE)

7.3.1 Procedural Directive 87.2 – Safety Office – Maintenance

Each employee shall use the appropriate Personal Protective Equipment appropriate for the operations and situations encountered which create a risk of injury in order to promote a safer working environment in accordance with CDOT Procedural Directive 87.2 – Safety Office – Staff Maintenance.

7.3.2 Personal Protective Equipment Types

The following list is generally the type of PPE used while performing field surveying:

1. Hard Hat
2. Soft Hat
3. Vest
4. Safety Glasses – clear
5. Goggles – clear and amber
6. Leather Gloves
7. Respirators
8. Dust Mask
9. Ear Protection – muff and plug
10. Protective Clothing
11. Foot Protection
12. Life Jackets
13. Fall Protection

7.4 Manual on Uniform Traffic Control Devices (MUTCD)

7.4.1 CDOT Procedural Directive 1505.1 – Safety and Traffic Engineering Branch

All work performed in or near to any traveled roadway shall follow the current Manual on Uniform Traffic Control Devices (MUTCD) in accordance with CDOT Procedural Directive 1505.1 – Safety and Traffic Engineering Branch.

<http://internal/PolicyGovernRelations/procedures.htm>

MUTCD

http://mutcd.fhwa.dot.gov/kno-millennium_12.28.01.htm

The above link provides information and download of the latest MUTCD.

See Appendix CDOT Procedural Directive 1505.1 – Safety and Traffic Engineering Branch, for additional information and MUTCD requirements.

7.4.2 CDOT Work Zone Safety Guide

CDOT Work Zone Safety, Guidelines for Municipalities, Utilities, and Contractors, October 2002, also provides information directly from the MUTCD for surveying along the centerline of a low and high volume road and is available at the following:

7.4.3 CDOT Procedural Directive 306.1 – Flagging Training & Certification Program

In situations when a flagger is required for traffic control by the MUTCD, CDOT Procedural Directive 306.1 – Flagging Training & Certification Program shall be followed and a Colorado certified flagger shall be used.

The following is the best practices to provide CDOT surveyors with a certified flagger:

1. Arrange for CDOT maintenance personnel to provide certified flaggers and traffic control.
2. Have CDOT surveyors provide their own certified flaggers and traffic control.
3. Contract with a traffic control firm to provide certified flaggers and traffic control.

See Appendix CDOT Procedural Directive 306.1 – Flagging Training & Certification Program, for additional information and certified flagger requirements.

The flagman is responsible for safe-guarding his fellow workers, warning motorists, and guiding them safely through a work area.

1. The flagman should always stand alone and not mingle with a group of other workmen.
2. If a motorist appears not to heed his signals and thereby places the crew in danger, the flagman should yell "TRAFFIC" to alert them.

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3. The flagman should not leave his post until properly relieved.

7.5 Surveying Near Traffic

7.5.1 General

Each year many people who work in or near traffic are killed; some of these are survey crew members and flaggers for the survey crews. All work performed in or near to any traveled roadway shall follow the current Manual on Uniform Traffic Control Devices (MUTCD).

The controlling safety rule is: Always stay as far from the traffic lanes as requirements of the survey will permit.

7.5.2 Guidelines

One of the most necessary defenses against traffic hazards is constant alertness; however, there are several precautions that can lessen the hazards as follows:

1. Surveying operations should be scheduled to avoid peak traffic hours.
2. Instruments should not be put together or taken apart on the roadway.
3. All equipment should be placed clear of the traveled lane.
4. Whenever possible, survey parties should use offset lines to avoid working for unnecessary periods of time on the road surface.
5. Personnel should work on both sides of the roadway only when absolutely necessary.

When working near or on the roadway, each crew member should:

1. Size up the situation before starting work and decide in advance upon the safest course of action to follow in case of an emergency. A split-second decision might result in stepping into the path of a vehicle instead of getting out of the way.
2. Wear an orange hard hat or orange soft hat, an orange vest, shirt, or jacket.
3. Face in the direction of the approaching vehicular traffic as much as possible.
4. Look in both directions before starting to cross a highway.
5. Walk on the left side of the roadway in the direction of approaching traffic when it's necessary to walk on a highway for any appreciable distance.
6. Keep one eye on the work and the other on approaching vehicles and get well in the clear when it appears necessary.

When working on the roadway:

1. The maximum traffic protection described in the current MUTCD shall be utilized.
2. Traffic cones or flags should be used around the transit.

3. Survey methods associated with other forms of land surveying can be accommodated without encroaching on the traveled lanes.
4. Measurements across the roadway should be split to take advantage of breaks in the flow of traffic in either direction.
5. For divided highways, maximum use should be made of offset traverse lines in the median or at either side.
6. Pins or stakes, which might interfere with mowing operations, should not be left in the right-of-way.
7. Vehicles should be parked on the shoulder of a limited access highway within the sign protection area.

7.6 Confined Space Entry Program

7.6.1 General

All CDOT and consultant surveyors shall follow CDOT's Confined Space Entry Program. The purpose of the program is to prevent accidents and injury by training and equipping surveyors who might be required to enter approved Class C Confined Spaces. The program is designed to help eliminate or control the hazards associated with entering, working within, and exiting confined spaces.

Only those who have been properly trained as outlined in the Confined Space Entry Program, and equipped in accordance to OSHA regulations, will be allowed to enter a Class C confined space. All CDOT employees are prohibited from entering any Class A or B confined space.

A CDOT Confined Space Entry Permit shall be completed prior on entering any confined space. The permit shall be filed with the Region Survey Coordinator and a copy placed in the project files.

See Appendix Confined Space Entry Program for additional information and for CDOT's Confined Space Entry Permit.

7.7 First Aid

7.7.1 General

All crew members shall be trained in first aid from the American Red Cross or its equivalent.

One member of each crew should be trained in Cardiopulmonary Resuscitation (CPR).

Each survey vehicle shall be equipped 16-unit first aid kit (National Safety Council Data Sheet No. 202) and have a copy of the current Red Cross First Aid Manual available as reference at all times.

The telephone numbers of physicians, hospitals, and ambulances in the area worked by a survey crew should be conspicuously posted in the field vehicle. If a hospital or physician cannot be reached within a reasonable amount of time, a person who has a valid certificate in first-aid training from the American Red Cross or its equivalent should be a member of the survey crew.

7.7.2 First Aid Guidelines

The following first aid information is being provided only as a guide to assist crew members in the event of an accident or emergency and is not intended as first aid manual, or first aid training. In the event of an actual accident or emergency call for emergency response!

The following basic requirements for first aid should be followed:

Shock - Always treat for shock, which usually follows severe injuries, by keeping the victim in a lying position and by retaining his body heat with a blanket. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

Bleeding – Direct pressure over the wound is the first step in controlling bleeding. Place sterile gauze or the cleanest material available over the wound and apply firm pressure with your hand. Elevation of the wounded part will aid. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

Electric Shock - Remove the person from contact by moving the wire with a rope or dry board. Apply artificial respiration if breathing has stopped. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

Burns - Minor burns may be treated by applying cold water. Any burns where the skin is blistered or the clothing is stuck to the skin will require medical attention. Cover the burned area with a sterile compressed bandage and get the patient to the physician as soon as possible. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

Fractures - If a broken back, neck, or pelvis is suspected, the patient should not be moved except to prevent further damage from traffic, exposure, etc. If a fracture of the leg or arm is compound, apply a sterile dressing to the wound but do not push a protruding bone back. Send immediately for medical assistance. If it is necessary to move the patient, securely splint the fractured part. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

Breathing stoppage – A crew member currently certified in Cardiopulmonary Resuscitation (CPR) should apply artificial respiration at once. Call for emergency response! (Crew members should learn more about detailed methods at first aid training.)

7.8 General Safety

7.8.1 Sanitation

The following basic requirements for drinking water should be followed:

1. An adequate supply of potable water should be provided in offices and in field vehicles that carry survey crews.
2. Drinking from strange wells, springs, or other water sources is not safe unless approved by a reliable local person who knows the water is safe.
3. Portable containers used to dispense drinking water should be kept tightly closed and be equipped with a tap. Water should not be dipped from open containers.
4. Any container used to distribute drinking water should be clearly marked as to the nature of its contents and should not be used for any other purpose.
5. The common drinking cup is prohibited.
6. Where single service cups are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups should be provided.
7. Outlets for non-potable water, such as for fire fighting, should be clearly posted to indicate that the water is unsafe for drinking.
8. There should be no cross-connection between a system furnishing potable water and a system furnishing non-potable water.

The following basic requirements for toilets facilities at construction jobsites should be followed:

1. Toilets should be provided for employees. For 20 or less employees, one toilet is required. For 20 or more, one toilet and one urinal per 40 workers is required, and with 200 or more, one toilet and one urinal per 50 workers is required.
2. These requirements don't apply to mobile survey crews having transportation readily available to reach nearby toilet facilities.

The following basic requirements for fire prevention should be followed:

1. Good housekeeping will eliminate many conditions that can cause fires in or around offices and buildings.
2. Rubbish, trash, or other combustible materials shall not be permitted to accumulate in vehicles, buildings or on grounds, and weeds and brush that constitute fire hazards should be cleared from the vicinity of vehicles, buildings, and structures.
3. When driving and parking survey vehicles the operator needs to be aware of dry weeds or dead vegetation that might catch fire from the vehicles exhaust system. If such conditions exist the operator of the vehicle should find an alternate route and not park the vehicle in this area.

4. Ash trays shall not be emptied into waste baskets or outside on the ground.
5. Smoking shall not be permitted where flammable liquids or gases are handled or stored or where highly combustible materials are used or stored. NO SMOKING signs should be posted in these areas.
6. Flammable liquids such as gasoline shall be kept in safety cans which are tightly sealed and marked as to content.
7. Spilled flammables shall be cleaned up as soon as possible
8. Gasoline or other highly flammable liquids shall not be used for cleaning or degreasing.
9. When survey operations are to be conducted in an area that is susceptible to forest or brush fires, the local fire agency should be notified. This notification should consist of pinpointing the location of the work and the routes that are to be used to reach the worksite. The crew members should discuss any restrictions and familiarize himself with all fire laws and permits pertaining to his area of operation, and to check for alternate routes out of the work area in the event of a fire.
10. Extreme care should be exercised when working in the field after a prolonged dry spell. Matches and cigarettes should be carefully extinguished before discarding. In some high fire danger areas, permits to smoke are required. It may also be necessary to have vehicles or equipment with internal combustion engines, such as chain saws, equipped with spark arrestors.

The following basic requirements for fire protection should be followed:

1. The phone number of the local fire department and reporting instructions should be conspicuously posted at phones and at employee entrances. Employees should be familiar with evacuation procedures in case of fire.
2. A fire extinguisher, rated not less than 2A, should be provided for each 3000 square feet of protected building area or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher should not exceed 100 feet. Each floor should have at least one 2A fire extinguisher.
3. Extinguishers subject to freezing should be protected from freezing.
4. Fire extinguishers, rated not less than 10B, should be provided in any vehicles that carry flammables with flashpoints below 100 F. This requirement doesn't apply to the integral fuel tanks of motor vehicles.
5. All fire extinguishers should be inspected periodically and maintained.
6. In the event that a survey crew discovers a forest fire, they should move to a barren area or into a burned out area. The crew should move to the flanks of the fire rather than to try to outrun it. If trapped in a forest area by a fire, each party member should lie down in a depression or ditch, or dig in flat terrain, and cover his body with dirt. The face should be covered with a wet handkerchief and buried in the arms to protect it as much as possible.

7.8.2 Operating Vehicles

Every person who operates a motor vehicle must have a valid driver's license in his possession at all times. All vehicles should be inspected on a scheduled maintenance basis, and no vehicle should be placed in service until it has been inspected by a mechanic and found to be in safe operating condition.

A driver should be physically able and fit to operate a motor vehicle safely when required. Should the driver feel otherwise, they should not attempt to operate the vehicle. Some medications cause drowsiness or other physical changes that may make driving hazardous. Persons using such medication should not drive.

All vehicles should be equipped with the following:

1. Two headlights, one on each side.
2. Tail lights, and stop lights.
3. Directional signal lights front and back.
4. Service brakes and hand operated parking brakes.
5. Speedometer, fuel gauge, and horn in proper operating condition.
6. Windshield, windshield wipers, and defrosting or defogging devices.
7. Rear view mirror or mirrors.
8. Safety glass in all windshields and windows.
9. Safety belts in all passenger seats.

General rules for safe operating of motor vehicles are as follows:

1. Drive at a speed that is reasonable and proper, with due regard for weather, traffic, intersections, width and character of the roadway, type of motor vehicle, and any other existing condition. You should at all times have the vehicle under such control as to be able to bring it to a complete stop within the assured clear distance ahead.
2. Depress headlight beams when approaching other vehicles.
3. Don't drive on a downgrade with gears in neutral or clutch disengaged.
4. Exercise extreme caution at all railroad crossings and reduce speed at intersections, narrow bridges, blind curves, and hilltops. Never attempt to pass at such places and do not park a vehicle at these locations.
5. Be very careful and reduce speed when approaching persons or bicycles, when children are playing near the roadway, or when livestock are on or alongside the highway.
6. Activate directional signals several hundred feet before a turn. If the signals are not working

properly, use your hand and arm as follows:

- a. Left turn - hand and arm extended horizontally
 - b. Right turn - hand and arm extended upward
 - c. Stop or decrease speed - hand and arm extended downward
7. Clean mud, snow, or grease from your shoes before operating a motor vehicle.
 8. Don't permit your attention to be distracted while driving and, as a passenger, be equally careful not to distract the driver.
 9. Drive at a safe stopping distance from the car ahead and be alert for sudden stops. One car length for each 10 MPH is generally a safe distance under normal conditions.
 10. Always drive defensively by anticipating what the other driver might do and try to foresee potential hazards that might develop.

Observe the following rules for winter driving on ice or snow:

1. Don't move your vehicle until frost, snow, and/or ice are removed from windshield and windows.
2. Accelerate and brake slowly.
3. Move slowly and keep a safe distance from the car in front of you.

In backing vehicles, observe the following rules:

1. Before backing a park vehicle walk around the vehicle and check for any objects directly behind or to the side of the vehicle.
2. Back slowly and cautiously and keep looking to the rear as you back. If you can't see, don't back unless a fellow employee guides you.
3. Don't back into intersections or pedestrian crosswalks.
4. Avoid backing out into a main highway from a driveway or secondary road if possible. Where this can't be avoided, use extreme caution.
5. Never back along the shoulder of a highway or road as your sight may be limited, always proceed in a forwards direction.

Observe the following rules for parking vehicles:

1. Park on the proper side of the highway with the vehicle headed in the direction of traffic.
2. Park off the traveled portion of the highway on main highways. On other roads, do so whenever possible. If there is a curb along a permissible parking space, park within six inches of the curb.
3. When parking, observe state and municipal regulations with regard to distances from intersections, stop signs, fire hydrants, etc.

4. Always set the handbrake securely, and, if parking on a hill, leave the automatic transmission in "park" position. For vehicles with standard transmission, put the vehicle in low gear when facing uphill and in reverse when facing downhill. Cramp the wheels so that if the vehicle starts to roll, the curbside wheel will stop the roll.
5. Never hold roadside conferences while standing on the traffic side of a vehicle, even though it's parked on the shoulder of a roadway.

When carrying passengers, observe the following rules:

1. The number of passengers in a passenger-type vehicle should not exceed the number who can be seated.
2. Trucks, which are used to transport people, should be equipped with a securely anchored seat, a rear tailgate or door, and guard rails.
3. Passengers should be taken on and deposited on the curb side away from traffic whenever possible.
4. Passengers should not be permitted to ride with arms or legs outside the vehicle, either in a standing position on the body of a truck or its running boards or seated on the side fender, cab, tailgate, rear of the truck bed, or on the load.
5. The operator must see that all passengers are properly seated in the body of the vehicle with their safety belts fastened before moving, because it is a State law as well as a Department rule.
6. All passengers should remain seated while the vehicle is in motion.
7. All tools and equipment should be guarded, stored, and secured when transported with personnel. Sharp tools can be lethal in a collision or sudden stop. They should be sheathed, firmly secured to the vehicle, or carried in storage compartments that will prevent them from causing injury to passengers in the event of a sudden stop.

When loading a vehicle:

1. Don't load a vehicle beyond its rated capacity.
2. Where possible, load and unload from the curb side away from traffic.
3. Don't load so as to obscure the driver's view.
4. If a load overhangs the rear or sides of a vehicle, place proper warning flags to warn other drivers.
5. Turn off the engine before fueling and don't smoke during the fueling operation.

Off-road vehicle operation:

Occasionally, crew members may have to operate survey vehicles, four-wheel drive vehicles or trail

bikes off the road and in rough terrain.

The following safety procedures should be observed while operating vehicles and trail bikes off road:

1. When driving vehicles through rough terrain, proceed slowly.
2. In crossing deep ditches, use the lowest forward gear and front wheel drive if available. When you reach the bottom, accelerate enough to keep rolling as you go up the other side.
3. Look over gullies and ravines carefully before attempting to cross. Be sure to examine both banks. Make the approach slowly, in low gear, and at a right angle to the edge. By using the footbrake, ease the front wheels into the gully and have them strike the bottom at the same time. Bring the engine up to normal operating speed as the wheels hit the bottom, then accelerate enough to climb as the front wheels touch the opposite bank.
4. A four-wheel drive vehicle will seldom encounter a hill which it can't negotiate directly. However, natural obstacles may make it necessary to travel diagonally up or down the hill. The danger lies in losing traction and slipping sideways with the possibility of tipping. When necessary, choose as mild an angle as possible, keep moving, and make turns quickly. Don't travel diagonally across a hill unless absolutely necessary.
5. When climbing a steep hill with four-wheel drive, "walk" the vehicle up the last few feet if the wheels start to slip with only a few feet of ascent remaining. Headway is maintained by swinging the front wheels sharply left and right to provide fresh bite into the surface. This maneuver will usually result in enough traction to complete the climb. If the vehicle stalls or loses headway, make a fast shift to reverse or first gear. Don't leave the clutch pedal depressed after the shift has been completed and never try to back down with the clutch released and only the brakes holding the vehicle.
6. When driving through woods or over rocky terrain, use an established trail if possible. A high tree stump or boulder, if straddled, can cause serious damage to the axles and other low parts of the vehicle. Drive with caution. Also, be alert for low-hanging limbs.
7. When riding trail bikes, balance must be maintained and power applied evenly.
8. Walk the bike if the route or trail is very rough, the outward slope is steep, or the trail is too narrow to place both feet simultaneously on good footing.
9. If control is lost, don't try to hold the trail bike; let it go and save yourself. Stay on the trail.
10. Keep your toes on the foot pegs of trail bikes. Don't place the instep of your foot over the pegs.
11. Don't ride double on trail bikes.
12. When driving any off-road vehicles, yield the right-of-way to stock, animals, and hikers.

7.8.3 Hand Tools

The following general rules for the use of hand tools should be observed:

1. All hand tools should be kept in good repair and used only for the purpose for which designed. (e.g. axes should not be used as mauls.)
2. Hand tools should be inspected regularly and defective tools removed from service. Examples of defective tools are:
 - a. Hammers and picks with split, cracked, or loose handles
 - b. Chisels with mushroomed heads and cracked points
 - c. Screwdrivers with split handles or bent shanks
 - d. Mauls with burred or mushroomed heads.
3. The throwing of tools from one location or employee to another should not be permitted.
4. Employees should not carry unguarded sharp-edged or pointed tools in their pockets.
5. Tools should be kept clean. Grease and dirt cause slips and mashed fingers.
6. Edged tools must be sharp if they are to cut cleanly with minimum effort. A sharp tool is easier to use and less likely to slip or rebound than a dull one. Blades should be sharpened with a medium-cut, flat file by beginning at the edge and filing toward the butt. File only on the down stroke and tilt or rock the file slightly as it is stroked downward so that the edge is slightly rounded. Finish sharpening by honing with a hand-held stone and by using a circular motion.
7. Use sheathes for blades when either carrying tools or storing them in a vehicle. Gang truck storage should be in a well-designed bracket, separate from the space occupied by crew members.

Picks:

1. When using a pick, be sure that the area in back of you and to the sides is clear.
2. Be sure that both pick points are kept sharp to prevent the tool from glancing and striking the user.
3. Wear goggles if there is a danger of flying chips of rock or other materials.
4. Obtain a secure footing and avoid swinging the pick too close to your feet.

Mauls and Sledge Hammers:

1. When using a maul or sledge, be sure that the area in back of you and to the sides is clear.
2. Never attempt to strike an object when it is at or above shoulder height. Use a platform if necessary.
3. The man who holds the stake, pin, or wedge being driven should place himself at right angles to the direction of the maul and should use a holding device to grip the driven item.

4. Keep your eye on the item to be struck and exercise caution to avoid injuring the fingers of the person holding the driven item.
5. In excessively cold weather, slightly warm the metal pins and maul heads before striking the pins to minimize the possibility of metal fracture and flying particles.

Files:

1. Always use a file with a handle attached to it.
2. Be extra careful when filing against the cutting edge of a sharp tool.
3. Clean the file frequently.
4. Pay attention to your work and, if interrupted, stop filing.

Screwdrivers:

1. Keep the tips of screwdrivers properly ground and squared across.
2. Select a screwdriver to fit the size of the screw being driven.
3. For electrical work, use screwdrivers that have insulated handles.
4. Keep all parts of your body clear of the screwdriver tip in case it slips when in use.

Pliers:

1. Never use pliers as wrenches.
2. Use cutting pliers only for cutting soft metals, and do not use them for nail pullers.

Axes, Hatchets, and Machetes:

1. When using an axe or hatchet, avoid rebounding it toward other workmen or yourself.
2. Follow the procedures outlined in Section 5.1 on brush and tree cutting.

7.9 Field Surveying

7.9.1 General

Sharp-edged tools, especially machetes, are involved in a major number of surveying accidents. Misuse of these tools can cause serious injury, and it is imperative that workmen follow safe procedures.

Some general rules for brush cutting safety include the following:

1. Always use sharp tools. Dull tools are likely to slip or rebound.
2. Under no conditions should party members who are using sharp-edged tools simultaneously be within 10 feet of each other.
3. Remove vines and low hanging limbs that might catch machetes, axes, or brush hooks and cause them to fly out of your hand or strike your body.
4. Never use a machete, axe, or brush hook while in a tree.
5. Be particularly careful when walking along a cleared survey line having protruding sharp stubs. They can cause serious injury if fallen upon.
6. Maintain a distance of at least 10 feet between party members when walking through dense vegetation or woods so that rebounding branches don't cause eye injuries.
7. Special attention should be given to the removal of foliage from wild cherry, wild crab apple and locust trees that have been cut in pastures, grazing fields, and similar livestock access areas. Wilted leaves and branches of these trees, if consumed by livestock, can cause death.

7.9.2 Brush and Tree Cutting

Machete:

1. The machete should be used only to cut light brush.
2. The end of the machete blade should not be sharpened. To reduce the possibility of injury, it can even be blunted.
3. Always have a firm footing before swinging the machete.
4. Strokes should be made away from the body. No cut should ever be directed downward toward the feet or toward any other part of the body.
5. When not in use, the machete should be placed in a stout scabbard to reduced the chance of injury and to protect its cutting edge.

Axes:

1. Axes are for cutting trees with trunks or limbs greater than one inch in diameter.

2. Make sure that the head of the axe is tight on the handle.
3. Proper grip of the handle is important. Where working space is ample and full-force chopping is necessary, place one hand near the end of the handle and move the other toward the head as the axe is being lifted; on the down stroke, this hand should slide toward the end of the handle. In crowded locations, hold the handle near its center with both hands. Strokes with this grip are easily controlled but are not too powerful.
4. Keep your eyes on the spot you're aiming for.
5. Warm the blade of an axe slightly before using it in cold weather. This can be done by holding the axe in gloved hands for a short period of time. A tempered steel blade, when cold, can fracture and cause particles of metal to fly.
6. Do not chop frozen wood or very hard knots. They can cause the blade to rebound.
7. When cutting a dead, hardwood tree, be very careful because many of them are extremely hard.
8. To trim limbs from a fallen tree trunk, stand to the side of the tree opposite the limb.
9. Carry an axe by gripping the handle just behind the head and turning the sharp edge outward. The axe should be sheathed.

Brush Hook:

1. The brush hook functions like an axe that has its cutting head reversed. It is used for rough work in brush too thick for an axe and finds its best use in thick underbrush where a low cut, requiring a long cutting edge, is needed.
2. To keep the head solidly on the handle, workers should carry a tool to adjust the collar or clamp.
3. Hold the brush hook like you would an axe, except keep your upper hand a little more toward the cutting edge to give better balance when making a low cut.
4. When cutting, try not to fight the foliage but, rather, strike at the base of the plants. Aim carefully and keep your body balance.
5. Make sure adequate clearance is maintained. The brush hook can be more easily deflected than the axe because of the shape of its blade.
6. Carry a brush hook like you would carry an axe. Keep your hand close to the head. Because the beak easily catches on vines and wires when the brush hook is carried with its head pointing backward, always point the head to the front. Never carry a brush hook on your shoulder.
7. Because of their shape, brush hooks are difficult to store in trucks or tool houses unless special provisions are made. Sheathes should be provided to protect workmen and to keep the blades from being nicked.

7.9.3 Chain Saws

An operator of a chain saw is exposed to many hazards:

1. Operator can fall while carrying the saw or while sawing.
2. Operator can be cut by the chain whether it is in motion or not.
3. Operator can be injured when starting the gasoline engine.
4. Operator can inhale exhaust gases.
5. Operator can be struck by falling overhead wood when the tree he is cutting vibrates.
6. Operator can be burned by a hot muffler or cylinder head.
7. Operator can be injured when the saw binds or kicks.
8. Operator can be injured by falling trees because the noise of the gasoline engine prevents him from hearing their descent.

To avoid injuries, the following precautions should be taken:

1. Due to the many hazards involved, only employees who have been properly instructed by an experienced chain saw operator should be permitted to use chain saws.
2. Follow the manufacturer's instructions as to operation and adjustment.
3. Inspect the saw daily when it's in use to assure that all handles and guards are in place and tight, that all controls function properly, and that the muffler is operative.
4. When carrying the saw to and from the work area, stop the motor. The bar should be in a forward position when the saw is carried uphill at the side of the operator. The bar should be to the rear when the saw is carried downhill. When carrying the saw on your shoulder, the bar and dogs should be well padded and guarded.
5. Operators should wear goggles and hard hats.
6. When starting the saw, get a good footing, place the saw on level ground, put the chain out of gear, hold the saw with one hand and pull the starting cord away from the body, being careful not to wrap the cord around your hand.
7. Start and operate the motor only when all other workers are clear of the saw.
8. Stop the motor for all cleaning, fueling, adjustments, and repairs of the saw or motor.
9. Don't use the saw to cut directly overhead or at a distance that requires you to relinquish a safe grip on the saw.
10. Before refueling a chain saw motor, it should be cooled for five minutes. Fill the fuel tank on a

level surface away from combustible materials and start it at least 10 feet away from the fueling area.

11. Place the chain saw in a vehicle so that it can't shift in transit. The saw blade should be guarded.
12. When felling a tree, be careful to avoid being struck by smaller trees which may spring back upright after being hit by the falling tree.

7.9.4 Climbing Fences

The following precautions should be observed while climbing fences:

1. If a gate is available, you should walk a reasonable distance to avoid climbing a fence. Be sure to close the gate after walking through.
2. Don't attempt to climb fences, stone walls, or other obstructions with instruments held over your shoulders or in your arms.
3. Where possible, go through or over a barbed wire fence at the middle of a span, where slack in the wire can be obtained. If you can't straddle the top wire safely, go between the wires or under them. The removal of a staple holding the top wire will permit easier and safer crossing of the fence, but care should be taken to restore the fence to good condition.
4. If it's necessary to climb the fence post, make sure that staples are firm and that the post isn't rotted and weak.
5. Be alert for snakes and spiders when climbing stone walls.
6. Be wary of electric fences because some are connected to a 110-220 system. Don't allow chains or metallic tapes to come in contact with electric fences.

7.9.5 Clothing

The following should be observed for clothing:

1. Crew members should wear high leather shoes with non-slip soles. Lace type boots are preferable because they afford more ankle support than the loose pull-on type. Safety toes are recommended.
2. Tennis shoes or other cloth shoes should not be worn, nor should boots with thin or worn-out soles as they are easily penetrated by sharp stubs, nails, or glass.
3. Pants should be cuff-less, and shorts shouldn't be worn.
4. Lightweight clothing that is light in color is recommended for summer surveying work.
5. For cold weather work, lightweight insulated underwear is recommended. Outer clothing should not be so tight as to hinder circulation.

(See CDOT Workplace Safety Manual, Work Clothing Regulations, for additional information).

7.9.6 Hot Weather

The following precautions should be observed in hot weather:

1. To avoid sunburn, wear a shirt and long pants. Light colored clothing is preferred.
2. Wear a hat when working in the sun.
3. Drink plenty of water but avoid excessive quantities of ice water.
4. Avoid over-exertion.
5. Persons with high blood pressure or a past history of sunstroke should not do field work during hot weather.

Sunstroke or heatstroke:

Sunstroke or heatstroke is an extreme medical emergency and medical aid must be obtained as soon as possible. A delay of one or two hours may mean the difference between life and death.

Symptoms of sunstroke are:

1. Hot and dry skin, high temperature.
2. Face red and flushed.
3. Dizziness, intense headache, hard breathing.
4. Possible convulsions and loss of consciousness.

To treat sunstroke:

1. Move to a cool, shady spot.
2. Strip to underclothing.
3. Lay on back, head and shoulders raised.
4. Cool body with water or wet cloths.
5. When conscious and able to drink, give cool drink, not ice cold. Do not give stimulants.
6. Get victim to a doctor or hospital as soon as possible.

Heat exhaustion or heat prostration:

Heat exhaustion or heat prostration is not as serious as sunstroke but should be treated promptly.

Symptoms of heat exhaustion are:

1. Skin cold with clammy perspiration.
2. Face pale.
3. May have chills, cramps, or dizziness.
4. May feel sick and vomit.
5. Pulse weak and rapid.

To treat heat exhaustion:

1. Move to fresh, moving air.
2. Keep lying down and head low.
3. Loosen clothing.
4. Keep warm with blankets or clothing, both over and under.
5. Rub arms and legs gently toward heart.
6. Get to a doctor or hospital as soon as possible.

Keep in mind this simple rule for first aid in case of either sunstroke or heat exhaustion. If the patient is cold, make him/her warm; if he/she is hot, make him/her cool.

Another danger in hot weather is food poisoning, caused by bacterial contaminated food in lunches that have been at warm temperatures for several hours. Victims, one to six hours after eating, are seized with severe cramps and abdominal pain, nausea, retching, vomiting, and diarrhea.

Food poisoning:

To help avoid food poisoning as the result of contaminated lunches:

1. Don't use mayonnaise, eggs, milk, or fish in lunches, unless they can be kept at 60 F or lower prior to eating.
2. A person with a mild case of food poisoning may recover without treatment, but if the symptoms are extreme, get the victim to a doctor at once.

7.9.7 Cold Weather

Sufficient clothing should be worn to protect against the cold, but tight clothing that restricts the circulatory system should be avoided. CDOT orange coveralls should be worn by crew members. If jackets or coats are worn a orange safety vest should be worn on the outside. The jacket or coat should be of a color that will not diminish the orange vest.

Frostbite:

Frostbite is the most likely danger in cold weather. Frostbite develops most frequently when a high wind is blowing. The most likely body parts where frostbite might occur are:

1. Nose
2. Cheeks
3. Ears
4. Fingers
5. Toes

Symptoms are:

1. Pain sometimes is felt early but subsides later.
2. Skin becomes grayish white.
3. Affected part feels intensely cold and numb.
4. Blisters may appear later.

To treat frostbite:

1. Do not rub the affected part with snow or with the hands.
2. Rewarm the frozen part by using moist rags or towels dipped in water at 90 to 100 F.
3. Bring the victim indoors only after re-warming the frozen part.
4. Avoid walking on ice-covered streams, ponds, or lakes unless the ice has been determined to be at least three inches thick. If you fall through, put your arms in front of you on solid ice, kick to keep your body level, crawl forward on your stomach until your hips reach the ice, then make a quick full-length roll onto the ice. Keep rolling until safe. If the ice is too thin to support you, break a way to shore with one hand and support your-self with the other.

7.9.8 Electrical Storms

To minimize chances of being struck by lightning:

1. If a storm approaches while you are engaged in field work, discontinue working in the open.
2. Don't handle chain or metallic tape, transits, or metal range poles during electrical storms.
3. Keep away from wire fences, telephone lines, metal tools, rivers, and lakes.
4. Avoid tops of ridges, hilltops, wide open spaces, ledges, and outcrops of rocks.
5. If in open country, sit or lie down. Avoid grouping together and avoid large or isolated trees.
6. Get away from horses and livestock.
7. Get within a metal shield such as the cab of a rubber-tired vehicle if possible.
8. Choose building shelters in the following order:
 - a. Large metal or metal frame buildings.
 - b. Buildings with lightning protection.
 - c. Large unprotected buildings.
 - d. Small unprotected buildings. However, avoid small sheds or shelters in exposed locations.
9. In the absence of buildings, seek shelter in dense woods, a grove of trees (if possible, a stand of young growth), a cave, a depression in the ground, a deep valley, or the base of a steep cliff. If you take shelter in a dense wood and high winds accompany the storm, be alert for falling limbs. Avoid standing under dead trees.
10. If you are outdoors on a humid day when a thunderstorm threatens and you notice a sensation that your hair is beginning to stand on end, lie down quickly in a ditch or depression.

7.9.9 Electric Lines

The use of surveying rods or range poles under high electric lines is very dangerous. It's been estimated that electricity will arc from electric lines at the ratio of one inch to every 1000 volts. Even the use of wooden rods can be dangerous if the rod and ground are damp.

To minimize chances of being electrocuted when working beneath electric lines:

1. Use clean, dry, wooden rods and nonmetallic cloth tapes.
2. At no time should the end of the rod be closer than 10 feet to the lowest wires.
3. Never attempt to measure directly the height of electrical transmission lines with a rod. Use triangulation or a range finder.

Surveying and measurements in the vicinity of electric lines should be made:

1. With clean, dry, wood rules or nonmetallic cloth tapes.
2. By the stadia method.
3. By frequent breaks in tape to avoid long spans across canyons or deep ravines.
4. By offsetting away from dangerous areas.
5. Don't handle cloth or steel tapes in such a way as to come into contact with or near an electrical line.
6. Be alert for underground cables when digging holes or driving pins.

7.9.10 Poisonous Plants

Poison Ivy:

Poison ivy is a plant which, when young, is low and woody but later may become a high climbing or creeping vine, bears dark green leaves composed of three oval-shaped leaflets which may be slightly or entirely toothed along the edges. The leaves have an oily appearance, and this plus their dark green color and the fact that they are always found in groups of three serves as an easy mark of identification. When mature, the plants bear a white waxy berry which is poisonous to the touch. The leaves turn scarlet early in the fall.

Poison Oak:

Poison oak is a small branching shrub which grows to a height of three feet. The foliage occurs in groups of three somewhat hairy, lobed, or deeply toothed leaflets. The fruit is a whitish, wax-like berry which is poisonous to the touch.

Dermatitis:

Dermatitis may appear from one to three days after contact with the plant. The affected area first becomes red, swollen, and intensely itchy. Later, small blisters appear which may unite to form large

ones. If it reaches this latter stage, medical treatment is imperative. For relief from the severe itching, calamine lotion has been found effective. Also, common household bleach, which is applied and then rinsed off immediately, has been used to relieve itching.

The best preventative of plant dermatitis is to recognize the plant and avoid exposure. Crew members should point out poisonous plants to new or inexperienced party members so that they can learn to identify them.

While some people are not sensitive to these plants, they may develop sensitivity on later exposures. The sensitivity of any person varies at different times. Some persons become more susceptible to the poisoning after once having suffered it.

Poison ivy and poison oak are plants which result in dermatitis or skin rash caused by:

1. Bodily contact with any part of the plant.
2. Exposure of any part of the body to smoke from the burning plant.
3. Contact with clothing or other objects that have previously been exposed to the poison.

Steps that can be taken if one is susceptible to the poison include:

1. Immunization or desensitization by means of poison ivy extracts which are injected. These extracts should be given only by a physician. Eating the leaves of poison ivy plants is both worthless as a preventative and extremely dangerous.
2. Protective creams which can be applied to the hands, arms, face, and neck, or other exposed portions of the body before starting work for the day.
3. Wearing of heavy leather gauntlet gloves, with shirt sleeves tucked inside, and tying the bottoms of trousers at the ankle below the tops of the socks. When clothing is removed, it should be dry cleaned, and boots or tools should be cleaned with a dry cleaning solution.
4. If one of these plants has been touched by any part of the body, that part should be washed with plenty of laundry soap and tepid water. Follow by sponging the area with rubbing alcohol.

7.9.11 Bees, Hornets, Wasps

Bee, hornet, or wasp stings generally cause a burning or itching with localized swelling. However, if a person is allergic, more serious reactions occur, such as nausea, shock, and unconsciousness. Swelling may occur in another part of the body. Allergic reactions to insect stings are cumulative; the first sting sensitizes, and subsequent encounters cause increasingly severe reactions.

Fortunately, the nests of most of these insects aren't difficult to see and avoid. One exception is the nest of the yellow jacket that may be covered by leaves under logs, stumps, or rocks. As surveyors frequently encounter yellow jackets, they should be on the watch for them. There are usually a few flying around the entrance to the nest, so if you see three or more, be especially careful when driving pins, sticking range poles in the ground, or otherwise disturbing the soil. If there are many flying in an area, the nest has probably already been disturbed and the yellow jackets are looking for trouble. Avoid swift movements in this case as the yellow jackets won't usually disturb an object that isn't moving. Strong

smelling hair sprays or suntan lotion may attract them, so it's a good idea to avoid using these in the woods.

Crew members who are known to be allergic to insect stings should obtain vaccine and/or allergy medication before going into the field.

If stung by a bee, hornet, or wasp:

1. Gently scrape (don't pluck) the stinger to remove it if possible.
2. Wash with soap and antiseptic.
3. Apply a paste of baking soda and cold cream or apply cold applications.
4. Take anti-allergy medication if reaction is severe.
5. If dizziness, cramps, nausea, difficulty in breathing, or hives appear, the victim should be taken to a doctor immediately.
6. If a bee or other type of stinging insect gets in the cab of a truck or car while the vehicle is in motion, pull off on the shoulder, stop, and dispose of it.

7.9.12 Chiggers

Chiggers are very tiny insects; the larva of which attaches itself to the skin and injects a digestive fluid. Itching from secreted enzymes results several hours after contact. Small red welts appear and secondary infection often follows as the result of scratching. The degree of irritation varies with individuals. Chiggers are found in woods, high grass, or weeds, and lawns.

To minimize chigger bites:

1. Apply powdered sulfur or commercial insect repellents to the ankles, legs, waist, and arms before going into the field.
2. Avoid sitting on the ground or on logs and avoid low vegetation if practicable.
3. Bathe in hot soapy water at the end of each day and wash clothing.
4. Scratching chigger bites may result in a secondary infection.
5. Bathing affected parts with a warm solution of baking soda or use of antiseptic creams sometimes relieves itching.

7.9.13 Spiders

Most spiders prefer dark places such as:

1. Trash piles
2. Rough ground
3. Stones
4. Logs

5. Hollow stumps
6. Brush piles
7. Barns
8. Garages
9. Outhouses

Brown Recluse:

The brown recluse spider has an oval body with eight legs. It is light yellow to medium dark brown and has a distinctive mark shaped like a fiddle on its back. It's about three-fourths of an inch long from toe to toe.

Bites produce an almost painless sting, but in two to eight hours pain may be noticed and be followed by blisters, swelling, hemorrhage, or ulceration. Some people experience rash, nausea, jaundice, chills, fever, cramps, or joint pain.

Get the victim to a doctor immediately. The bite may require hospitalization for a few days, and full healing of the ulcerated area may take eight weeks or longer.

Black Widow:

The black widow spider's color varies from dark brown to glossy black. There is a red or yellow hourglass marking on the underside of the female's abdomen that is absent on the male. Only females are poisonous. Overall length with legs extended is about one and one-half inches.

Bites cause a local redness and two tiny red spots may appear. Pain follows almost immediately. Larger muscles become rigid and body temperature rises slightly. Profuse perspiration and tendency toward nausea follow. It's usually difficult to breathe or talk, and where fatalities occur (in only about five percent of bite cases), death is caused by asphyxiation.

Get the victim to a doctor immediately. Use an antiseptic such as alcohol or hydrogen peroxide on the bitten area to prevent secondary infection. Keep the victim quiet and calm. Don't treat the bite as you would a snakebite because this will only increase the pain and chance of infection; bleeding will not remove the venom.

To help avoid being bitten:

1. Wear work gloves when moving old brush or working around rock piles or rocky areas. Inspect material before handling it.
2. Be especially alert for black widow spiders in outdoor toilets.

7.9.14 Ticks

Ticks are oval shaped bugs that have small heads. When mature they measure from one-fourth to three-eighths inch in length. Their bodies are gray or brown and are not divided into definite segments. The tick attaches itself to the skin and sucks blood.

Ticks are known to carry:

1. Rocky Mountain Spotted Fever
2. Tularemia, and Colorado
3. Tick Fever

Ticks are found in areas of:

1. Low shrubs
2. Grasses
3. Trees
4. Especially abundant in pastures and cattle lots

To protect against tick bites:

1. Cover the exposed parts of the body when in tick-infested areas. Wear medium-high boots and fasten the trouser legs over boot tops.
2. Periodically wipe the back of your neck with your hand.
3. Inspect body and clothing twice a day and remove ticks. Don't crush them with your fingernails, because this may transmit disease carrying organisms to the skin.

If a tick is found to be embedded in the skin:

1. Apply a heated needle or the hot head of an extinguished match to the tick.
2. Gently remove it with tweezers.
3. If the head breaks off, don't probe for it with a knife or needle.
4. Get to a doctor and let him remove the head.
5. Wash the bite with soap and water and if the head is removed apply antiseptic.

7.9.15 Mosquitoes (West Nile Virus)

West Nile Virus is caused by being bitten by an effected mosquito, and can cause flu-like symptoms and swelling of the brain that can be fatal.

The disease first appeared in the United States on the east coast in 1999. It has slowly traveled west, carried by infected birds and then spread locally by mosquitoes that bite the infected birds. The mosquitoes can pass the virus to humans and animals, other birds, and horses. Most people bitten by an infected mosquito do not become ill.

The Centers for Disease and Prevention recommends the following steps to help avoid being infected by West Nile Virus:

1. Use insect repellent that contains DEET to exposed skin. Use products that say they contain N,N-diethyl-meta-toluamide.
2. Wear long sleeves, long pants, and socks.

3. Mosquitoes may bite through thin clothing, so spray clothing with repellent contain permethrin or DEET will give extra protection.
4. Try and avoid working outdoors during the evening or early morning hours.

7.9.16 Snakes

There are three poisonous snakes to be found in the United States:

1. Copperhead
2. Rattlesnake
3. Water moccasin or cottonmouth.

All have a shallow opening or pit on either side of the head between the eyes and the nostrils. All have v-shaped heads.

Rattlesnake:

The Rattlesnake is distinguished by the rattles on the end of it's tail.

Copperhead:

The Copperhead has a general pattern of copperish, chestnut, or reddish-brown cross-bands on a lighter background color. The head is copper colored.

Water Moccasin:

The Water Moccasin has dark olive or dark brown markings. When annoyed, they draw back their head and open the mouth wide, exposing the cotton-white mouth tissue.

To minimize the chance of being bitten by a snake:

1. Wear high boots in snake country.
2. Wear leather gloves when moving brush, rocks timbers, or other objects. If possible, use a bar for this purpose.
3. Don't put your hands in rock piles, animal burrows, or brush piles.
4. Don't step over logs that lie across your trail. Step on them and look down before stepping off.
5. Be observant around places obscured by foliage and look carefully before you move rocks on the ground. Use extra caution when climbing a rock ledge and reaching for hand-holds. Bites by large poisonous snakes on the head or shoulders are very frequently fatal.

Snake bites:

The first symptoms of a poisonous snake bite are immediate pain, severe swelling, and dark purple discoloration. The punctures made by the snake's fangs can usually be seen. As time progresses, there is

great weakness, shortness of breath, rapid weak pulse, nausea and vomiting, and dim vision.

If the bite is made by a nonpoisonous snake, none of the above symptoms appear. Only horseshoe shaped surface scratches made by the snake's teeth can be seen.

If bitten by a snake, the following steps should be taken:

1. Call for emergency response.
2. Wrap cracked ice (if available) in a cloth and apply it to the wound. Do not allow ice to come in direct contact with the flesh.
3. Drink strong coffee or cola if it doesn't nauseate you.
4. If alone, walk slowly toward help. If with companions, let them carry you to a vehicle and take you to a physician as fast as possible.
5. Be as calm as the situation will permit.
6. Avoid alcoholic beverages.
7. Don't squeeze the wound to stimulate bleeding.
8. Don't attempt surgery or allow others to.

7.9.17 Dogs and Animals

Crew members should arrange to have vicious dogs chained or confined if you're working on private property especially near farm houses. An aerosol spray dog repellent is commercially available and can be carried in the survey vehicle for anticipated confrontations with dogs.

Abnormal behavior in both domestic and wild animals is one sign of rabies. Look with suspicion upon nocturnal animals, such as skunks, foxes, or bats, that you see in the daytime. Foaming at the mouth, snarling and snapping are other signs of rabies.

If confronted by a bothersome dog, face the dog and stand still. Speak to him confidently; make friends if possible but don't attempt to pet him. If this fails, retreat very slowly still facing the dog.

If bitten by a dog or wild animal seek medical attention immediately. If bitten by a dog or cat, the pet should be confined for observation for 10 days.

A bite or wound should be washed thoroughly with soap and water. Get to a doctor for further treatment which may include tetanus inoculation and anti-rabies serum.

Domesticated bulls or pigs are very dangerous. Don't survey in a pasture when either a bull or a sow with piglets is present. Speak to the owner and have the animal isolated away from the work.

7.10 Special Considerations

7.10.1 Construction Sites

Many potential hazards may be present at construction sites. Due to the large number of different activities that may be occurring simultaneously, it's necessary to be constantly alert if injuries are to be avoided. CDOT shall adhere to OSHA criteria especially in regard to trenching activities.

Always keep yourself and your equipment clear of the contractor's operations. Due to dust, drowsiness or distractions, equipment operators may not see you on a fill, in a trench, or on a structure.

Stay off the contractor's equipment unless you're on official business.

Park your vehicles and assemble or disassemble your equipment away from areas where the contractor's men and equipment are working.

All necessary precautions should be taken to protect yourself from traffic through the work area, whether it's contractor's equipment or vehicles on a public road.

Working in trenches, excavations, or under bluffs is always dangerous. Be sure that the soil is at the angle of repose or that it's properly shored. You have the right to refuse to enter unsafe areas and should report such areas to your supervisor.

7.10.2 Railroads

When working in the vicinity of railroads, always be alert for oncoming trains. They aren't always noisy, especially if there's other noise in the area or the train is moving slowly.

Never crawl under stopped cars and don't cross tracks between cars. They may be bumped at any time.

Avoid any use of the color red. To a trainman, red means "immediate danger" and "Stop", without exception. Surveyors must not wear red vests or clothing when working near rails. Red markers, flagging or lights shouldn't be used.

Stakes shouldn't be left protruding above ground nor should any holes be left within 10 feet of the track centerline. Vehicles shouldn't be parked within 10 feet of the tracks; train crews need this area as a walk-way in their operations.

Steel tapes across both rails may activate signals; therefore, tapes should be supported above the rails at all times.

7.10.3 Water

All crew members performing work over or near water where the danger of drowning exists including working from or riding in boats, working on steep embankments near lakes, river, or streams, and working on bridges, pilings, or piers shall:

1. Wear U.S. Coast Guard approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers should be inspected for defects that could affect their strength or buoyancy. Defective units should not be used.

2. Always work in pairs using the “buddy system”.
3. Never wade barefoot in ponds, channels, or basins.
4. Use rubber boots as protection against slippery rocks and sharp objects.
5. Never walk on floating debris in reservoirs or debris basins.
6. Be cautious of recently puddled trenches and dredging fills.
7. In a bog, swamp, or quicksand, if you start to sink, throw yourself forward onto your stomach and swim or crawl out. Grab an overhanging limb if available.
8. Be certain that fallen trees which span streams are firm enough to hold your weight if they are used for bridges.

7.10.4 Night

Most hazards encountered in daytime operations increase at night when darkness limits visibility. All hazards become hidden hazards and are much more difficult to identify and neutralize. Therefore, surveying at night shall not be done unless reasonable daylight alternatives are not satisfactory.

When a survey requires night work, it's good practice to notify local law enforcement agencies as well as property owners. This enables enforcement officers to be aware of the source and reason for the appearance of unusual lights and activity.

All night survey crew members shall:

1. Make safety the number one priority in planning of night surveys.
2. Allow extra time for night operations.
3. Always work in pairs using the “buddy system”.
4. Wear orange safety vests with reflective stripes.
5. Use reflective flagging to guide crew members along safe roads and trails.
6. Provide radio communication between all work members.
7. Provide for any required traffic control.

7.10.5 Avalanche

All crew members performing work in or near to any identified avalanche area shall:

1. Utilize additional Personal Protective Equipment
 - a. Rescue transceiver / beacon
 - b. Rescue probe pole
 - c. Rescue snow shovel
 - d. High quality flashlight
 - e. Fifty feet of climbing rope
2. Prepare for extreme weather and temperature conditions.
3. Use multiple hearing protection (*i.e.* both earplugs and earmuffs) while working around artillery

during avalanche control or training functions.

See CDOT Workplace Safety Manual, for additional information.

7.10.6 Miscellaneous

Range poles should not be used as javelins, nor chaining pins as throwing knives.

Plumb bobs should not be carried in pants pockets as they may cause injury in a fall.

Wooden rods should be inspected frequently for dangerous splinters, and the splinters should be removed.

Never drag a cloth tape by inserting a finger through the end ring. A vehicle accidentally passing over the tape and catching it could sever the finger.

It's best to stay out of the field during deer hunting season, but if it's necessary to work in the woods or other areas of limited visibility, bright colored clothing should be worn.

Lifting should be done with the legs, arms, and shoulders, not with the back. Keep the back as nearly upright as possible.

A sling or back-pack arrangement should be used to carry heavy weights a considerable distance.

Pressurized spray paint cans may cause serious personal injuries and costly cleanup from improper respect for the potential danger of these pressurized cans. Crew members should read and comply with the instructions on the labels. Do not store cans in a very hot or very cold place. Heat will cause high pressure in cans, causing them to explode. Freezing temperatures will cause paint to separate.

7.11 References

CDOT Survey Manual – CDOT, 1992

Safety - California Department of Transportation, Survey Manual, Chapter 2, November, 1997

Survey Safety Handbook, Safety for Surveyors – Florida Department of Transportation, Rev. June 6, 1999

CDOT Workplace Safety Manual – CDOT, 1999

Guide to West Nile Virus – Rocky Mountain News