

**SNOW AVALANCHE
SAFETY MEASURES FOR HIGHWAYS
MANUAL**

MINISTRY OF TRANSPORTATION

Construction/Maintenance Branch - Snow Avalanche Programs

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I. INTRODUCTION

The primary objectives of the Ministry, Avalanche and Weather Programs is to:

- a) ensure safety of Highway Users;
- b) minimize frequency and duration of avalanche related road closures.

Maintenance Contractor agencies must comply with all snow avalanche related safety issues as defined in this manual.

II. TRAINING

A. TRAINING SUBJECTS

The Maintenance Contractor must ensure that all personnel involved in snow avalanche - related activities be trained and knowledgeable in accordance with this manual and as specifically defined in the Guidelines for One-Day Avalanche Safety Training (Appendix F).

Training programs must include both Ministry and Maintenance Contractor management and field personnel.

The Maintenance Contractor will ensure the training of new staff and winter seasonal personnel at time of hire. Ministry or Maintenance Contractor approved One-Day Avalanche Safety instructors must provide training dates, times, locations and agendas to Ministry and Maintenance Contractor personnel who require training.

The Maintenance Contractor must keep, and supply to the Ministry upon request, records indicating the avalanche training history of all Maintenance Contractor staff.

All avalanche training must be taken from Ministry - approved instructors / organizations, or by Maintenance Contractor employees who meet the required qualifications as defined in the “Guidelines for One-Day Avalanche Safety Training, Terms of Reference” (appendix F).

This training must be successfully completed as outlined in this manual.

Training is required in three main areas, as outlined below.

1. Snow, Weather and Avalanche Observations

This includes:

- a) maintenance of manual weather station equipment (if applicable);
- b) taking manual weather station observations (if applicable);
- c) allowing FBSYS weather forecasts to be properly broadcast and how to poll for FBSYS broadcasts as necessary;
- d) recording and reporting avalanche occurrence observations.

2. Safety Procedures

All Contractor personnel who work or travel within avalanche hazard areas must:

- a) be familiar with avalanche hazard locations within their contract area;
- b) know the correct procedures to follow if buried by an avalanche;
- c) know the correct procedures to follow when an avalanche is on the highway;
- d) be familiar with the five level avalanche forecast definitions and specific operational procedures;
- g) be able to recognize changes in weather that may result in rising avalanche hazard conditions and the need to report them to avalanche personnel.

3. Rescue Procedures

All Contractor personnel who work or travel within avalanche hazard areas must:

- a) know how to initiate an Avalanche Search and Rescue, if necessary;
- b) be able and available to safely and competently participate in all stages of an Avalanche Search and Rescue mission, if necessary;
- c) be able to effectively and competently use an avalanche transceiver to locate buried avalanche victims;
- d) be able to participate in a fine, coarse or vehicle probe line, if necessary.

B. TRAINING COURSES

Snow avalanche areas which affect highways throughout the Province have been identified by the Avalanche and Weather Programs (see Appendix A). These Snow Avalanche Areas require a specific level of avalanche safety training which is dependent on:

- a) the avalanche hazard potential of the area;
- b) the location of the area (i.e., the area is remote, or the area is proximal to a higher hazard area which may require a response from trained personnel in the event of an avalanche rescue);
- c) the position of the person and their possible involvement in an avalanche rescue;
- d) the frequency and duration that staff are expected to work in an avalanche area (i.e., personnel working in areas with higher probability of avalanches affecting the highway will require a higher level of training).

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Information can be found in Appendix A defining the required training plan for each of the avalanche areas (Plan A or Plan B). Each position is further defined in the required training plan as described below.

1. Plan A

- a) **Canadian Avalanche Association (CAA) Level One avalanche safety courses** are required by supervisors and those who make decisions directly affecting the safety of employees and the public.

The following are to attend:

- Maintenance Contractor supervisors responsible for maintenance in avalanche areas;
- Ministry Area Managers who have avalanche areas within their areas of responsibility.

- b) **One-day avalanche safety courses** are required **annually**. Annual courses are necessary in order to train new hire and auxiliary employees, and to provide for acceptable instructor/student ratio.

The following are to attend the one-day avalanche safety courses **once every two years**:

- Maintenance Contractor Supervisors responsible for maintenance in avalanche areas;
- All maintenance personnel who work in avalanche areas;
- Sub-contractor staff who work in avalanche areas;
- Ministry Area Managers who have avalanche areas within their areas of responsibility;
- Assistants to Ministry Area Managers who have avalanche areas within their area of responsibility.

A minimum of once every three years the following are to attend the one-day avalanche safety courses:

- All other maintenance contractor staff who may be used as second party personnel in an avalanche rescue, for example, mechanics, bridge crew, etc.;
- Maintenance Contractor General Managers and Operations Managers if they have not attended a CAA Level One course in the past five years;
- Ministry District Highways Manager who have avalanche areas in their districts if they have not attended a CAA level One course in the past five years.

2. Plan B

- a) **Canadian Avalanche Association Level One avalanche safety courses** are required of supervisors who make decisions directly affecting the safety of their employees and the public.

The following are to attend:

- Maintenance Contractor supervisors responsible for maintenance in avalanche areas;
- Ministry Area Managers who have avalanche areas within their areas of responsibility.

- b) **One, one-day avalanche safety course** is required a minimum of **once every three years**. This course is required of all personnel who work in avalanche areas or who may assist in an avalanche rescue.

The following are to attend:

- Maintenance Contractor Supervisors responsible for maintenance in avalanche areas;
- All maintenance personnel who work in avalanche areas;
- Sub-contractor staff who commonly work in avalanche areas;
- Ministry Area Managers who have avalanche areas within their areas of responsibility;
- Assistants to Ministry Area Managers who have avalanche areas within their area of responsibility;
- All other maintenance contractor staff who may be used as second party personnel in an avalanche rescue, for example, mechanics, bridge crew, etc.;
- Maintenance Contractor General Managers and Operations Managers if they have not attended a CAA Level One course in the past five years;
- Ministry District Highways Managers who have avalanche areas in their districts if they have not attended a CAA Level One course in the past five years.

3. Follow-up Rescue Training

The Contractor is responsible for organizing and conducting annual and monthly follow-up training sessions. All Maintenance Contractor personnel working within the avalanche area will participate in these sessions.

The follow-up sessions will cover:

- a) **Monthly** (from December to March)
- Rescue Transceiver Practice
 - Probe Search Techniques (optional)
- b) **Annually** (just prior to the commencement of winter)
- Terrain Familiarization
 - Rescue Plan Familiarization

- c) **As Required** (during the winter season at the discretion of the Province)
 - Mock Rescue

Monthly training sessions will involve the practice of avalanche rescue transceiver and optional probing search techniques. **Annual** terrain familiarization will identify the sections of highway exposed to avalanche hazard and the resources available to the Contractor and their staff in order to ensure their safety and that of the traveling public in the event of a rising avalanche hazard and/or incident.

The Contractor must keep, and supply to the Ministry upon request, records of avalanche follow-up training and a list of the Maintenance Contractor staff who have attended these sessions.

Mock Rescues

Mock rescues will be planned by the Ministry Snow Avalanche Technician. The purpose of the mock rescue is to assess the preparedness of the Ministry and Maintenance Contractor to appropriately respond to an avalanche related emergency situation. The frequency, location and timing of these mock rescues will be determined by the Ministry Snow Avalanche Technician in discussion with the Maintenance Contractor. The Contractor will ensure that all personnel who work in snow avalanche hazard areas attend the mock rescue training sessions.

4. Information Sessions:

- The Contractor's Road Maintenance Supervisor and personnel responsible for road closures will attend an annual a pre-winter meeting with the Ministry Area Manager and the Ministry Snow Avalanche Technician to discuss pertinent maintenance and avalanche program issues.

III. RESCUE EQUIPMENT

The Contractor will be responsible for storage and maintenance of the Avalanche Search and Rescue equipment provided by the Province. The Contractor will be familiar with and trained in the use of equipment as specified.

Rescue Equipment must be properly stored and maintained by the Maintenance Contractor, and is to be used only for rescue practices or emergency situations.

- a) Avalanche rescue equipment (excluding transceivers) will be initially supplied by the Ministry.
- b) Replacement of misused, lost or stolen equipment is the responsibility of the Contractor.
- c) Replacement of worn or defective equipment will be initiated by the Contractor through the Ministry Area Manager.
- d) Separate inventories will be maintained by the Contractor and the Ministry.

A. RESCUE CACHE EQUIPMENT

The avalanche rescue equipment supplied by the Ministry for each avalanche hazard area is standard, and is outlined in detail in Appendix B. Depending on the avalanche hazard potential for a given area, the rescue cache is classified as Level I, Level II, or Level III.

The rescue cache must be identified with standard Ministry signs. Signs are available from the Ministry and will identify the location of these rescue caches. There are two sizes of signs - one large and one small.

- a) A large sign is to be located near the entrance to the building where the rescue cache is situated.
- b) A large sign is to be located at the one piece probe cold storage location.
- c) A small sign is to be located immediately beside the rescue cache, for example on the door of the rescue room, or on the wall beside the locker(s) in which the equipment is stored.
- d) Adequate lighting and good vehicle access to the cache are required at all times.
- e) The entire cache must be stored in one location.

To aid in orderly use as required at the rescue site the equipment is divided into two groups. "First Party" equipment is used to start the search. Each first party pack functions as a unit and includes a complete set of essential rescue equipment. "Second Party" equipment completes and complements the first party supplies, and is transported to the rescue site as more personnel and time is available.

All equipment will be stored in portable packs (with the exception of those items which will not fit in packs, e.g., long-handled shovels and one piece probes).

Identification crests will be sewn (not stapled) onto the outside of each pack; this will make different equipment easily identifiable. First Party packs will have crests: "First Party", "Avalanche Rescue" and "Don't Forget Radios". Second Party packs will have crests: "Second Party", "Avalanche Rescue" and "Don't Forget Radios". All crests are supplied by the Ministry. Tags listing the pack contents are to be attached to the outside of each pack.

The rescue equipment caches must **not** be locked. The equipment may be sealed in a cache with an easily removable seal. The seal must not restrict use during a rescue operation but it will allow for easy checking for cache tampering and equipment replenishment.

The rescue caches must be maintained at moderate temperatures in clean, dry conditions. If the equipment is too warm, it may "ice up". Clean equipment is important because avalanche rescue dogs have difficulty searching areas that have been contaminated, especially with petroleum products.

One piece steel probes must be stored outside in a shaded, cold location (e.g. a piece of culvert attached to an outside building wall). The probe storage location must be readily accessible, in close proximity to the rescue cache and signed "Avalanche Rescue Equipment".

The Maintenance Contractor is responsible for ensuring that all rescue equipment which requires batteries is checked, and the batteries replaced, as specified in Appendix B.

B. AVALANCHE RESCUE TRANSCEIVERS

The Ministry will provide avalanche rescue transceivers to Maintenance Contractor personnel from its existing inventory. As transceivers need to be repaired or replaced, it will be the responsibility of the Maintenance Contractor to cover all associated costs. Defective transceivers must be returned to the Ministry Snow Avalanche Technician for proper disposal.

Replacement avalanche transceivers must be new (not second hand) and operate at 457 khz. Prior to placing a transceiver purchase, it is strongly recommended that the Maintenance Contractor consult with the local Snow Avalanche Technician to ensure that their purchase is compatible with existing units. The Maintenance Contractor will suitably identify transceivers they have purchased so as not to be confused with units owned by the Ministry.

The Ministry Snow Avalanche Technician will work in consultation with the Maintenance Contractor to determine:

- the quantity of transceivers required;
- the use of transceivers (shared vs. personal);
- that transceivers signal strength has been tested prior to winter issue.

The Ministry Snow Avalanche Technician will work cooperatively with the Maintenance Contractor to ensure that avalanche rescue transceivers are distributed to:

- all personnel (Maintenance Contractor and sub-contractor) who work in avalanche areas that support Level I or Level II rescue caches.

In areas with Level III rescue caches, four (4) transceivers (supplied by the Ministry) will be required in each First Party pack. The Ministry will determine the quantity of First Party Packs required in Level III rescue caches.

The Maintenance Contractor will collect and retain all transceivers used by their personnel at the conclusion of each winter season. The Maintenance Contractor will establish and maintain an inventory of all transceivers. The Maintenance Contractor will perform signal strength tests (minimum distance of 50m or as per manufacturers recommendations) to ensure proper transmission, reception and range for each transceiver prior to re-issue of units in the fall. The Ministry will provide assistance (as available and if requested) to ensure that quality control testing is performed properly.

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Testing to ensure proper transmission and reception should be carried out at the beginning of each shift (by the individual user), prior to working or traveling within avalanche areas.

The Ministry Snow Avalanche Technician will perform transceiver signal strength tests and issue units to required Ministry personnel as required.

Transceiver battery supply and replacement is the responsibility of the Contractor (including transceivers in Level III First Party Packs):

- Alkaline batteries are required (rechargeable batteries must not be used);
- Batteries are to be replaced annually or as per manufacturer's recommendations;
- Date of battery replacement must be recorded on a label attached to the unit.

It is the Contractor's responsibility to ensure that all personnel who use avalanche rescue transceivers are trained in their use. This training must be in accordance with the Guidelines for One-Day Avalanche Safety Training requirements as defined in this manual.

Transceivers must be worn around the upper torso as suggested by the manufacturer and under any outer layers of clothing.

Transceivers must be turned off when not in use. Batteries must be removed for summer time storage.

At the completion of the ten year contract the Maintenance Contractor will return all avalanche transceivers owned by the Ministry to the local Snow Avalanche Technician.

C. RADIO EQUIPMENT

Radio communication in avalanche areas is essential, and is used in a variety of ways. Rescue operations require the use of radio equipment.

All Maintenance Contractor, sub-contractor and Ministry vehicles, or any personnel working outside of their vehicles in avalanche areas must be equipped with two-way radios on the Ministry frequency. Under no circumstances should any personnel working outside their vehicles (e.g., flag people) ever be without radio communication with the Maintenance supervisor. When required, due to the operating noise of the equipment, the radios must be equipped with an external speaker or earphones.

Any change in an avalanche forecast must be made available to Maintenance Contractor personnel who work in avalanche areas. This notification must be available via postings on a bulletin board and radio broadcasts to ensure all personnel are aware of current avalanche forecast status.

D. MAINTENANCE VEHICLE EQUIPMENT

In addition to radio equipment, the Contractor must supply and ensure that all maintenance vehicles or equipment working in snow avalanche hazard areas are equipped with the following:

- shovel,
- WCB Basic first aid kit,
- flashlight,
- wool blanket,
- flagging vest,
- sectional snow avalanche rescue probe,
- an accessible Snow Avalanche Rescue instruction sheet (see Appendix C).

All of this equipment will help in the event that either the operator or another vehicle is involved in an avalanche accident.

The Ministry will supply:

- the Snow Avalanche Rescue instruction sheet (see Appendix C).

IV. AVALANCHE SEARCH AND RESCUE PLANS

A. PLAN DISTRIBUTION

An inventory and distribution list will be maintained by the Ministry. Designated Contractor recipients and locations include the following:

- Contractor Operations Manager: Vehicle and Office;
- Contractor Division Manager: Vehicle and Office;
- Road Supervisor: Vehicle and Office;
- Assembly Room;
- Other Contractor personnel as required by the Ministry.

In addition, a generic accident site Avalanche Search and Rescue Plan is to be kept in the front pocket of each "First Party" rescue pack.

- a) The Contractor must maintain all rescue plans in good order, and keep them accessible in their designated locations.
- b) The Contractor must ensure that all personnel are trained and knowledgeable in the following:
 - location of Avalanche Search and Rescue Plans;
 - use of Avalanche Search and Rescue Plans.

B. PLAN UPDATING

The Ministry will update the plans annually. To aid in this process, the Contractor must do the following:

- a) Return the plans to the Ministry Avalanche Technician at the end of the Avalanche Season (no later than June 1);
- b) Supply the Ministry with any information needed for plan updating in the early fall (no later than October 1).

V. SIGNS

A variety of signs are used as avalanche safety measures.

A. AVALANCHE PATH IDENTIFICATION SIGNS

Individual small, yellow or orange signs with the number and/or name of each avalanche path are located along the highway near the runout zone of each avalanche. The names, numbers and descriptions of the avalanche paths are provided in the Avalanche Atlas and on the Avalanche Strip Maps for each avalanche area.

- These signs will identify individual avalanche paths, and will simplify the discussion of locations in storm conditions, identification of avalanche hazard locations, and the subsequent recording of avalanche deposits.
- These signs will remain in place throughout the year.
- The Contractor is responsible to ensure all personnel working or travelling through avalanche hazard areas are aware of the location of these signs and use.
- The Contractor is responsible for the maintenance of the avalanche path I.D. signs as directed by the Ministry Snow Avalanche Technician.

B. AVALANCHE AREA WARNING SIGNS

Avalanche area warning signs identify hazardous areas consisting of single avalanche paths or groups of paths. The end of the hazardous area is identified by "End of Avalanche Area" signs. The signs discourage stopping in these areas to prevent vehicles and/or people being exposed unnecessarily to avalanche hazard.

- The signs are large and reflective to be visible in winter storm conditions.
- Maintenance of signs is the responsibility of the Maintenance Contractor.
- Signs must be erected just prior to the avalanche season and taken down/covered immediately after, as specified by the Ministry Snow Avalanche Technician.
- Folding signs or sign covers can be used to ease the amount of maintenance required.

C. AVALANCHE CONTROL WARNING SIGNS

Maintenance of explosive misfire and blasting area warnings signs are the responsibility of the Maintenance Contractor.

D. CHANGEABLE MESSAGE SIGNS

Multi-message illuminated signs are located at the start of many Ministry avalanche areas. These signs allow prompt dissemination of warning and information messages to the public, assisting with highway closures, convoys and avalanche control.

- Changes to the wording on these signs with respect to increasing avalanche hazard conditions will be requested by the Ministry Snow Avalanche Technician or, where there is no Ministry Snow Avalanche Technician, by the Ministry Area Manager.

- Changes with respect to decreasing avalanche hazard conditions may be requested by the Ministry Snow Avalanche Technician, or by the Contractor, after discussion with the Ministry Snow Avalanche Technician or, where there is no Ministry Snow Avalanche Technician, with the Ministry Area Manager.
- The Contractor will monitor the multi-message signs to ensure that the messages displayed are accurate at all times.

VI. OPERATIONAL PROCEDURES AND HAZARD FORECASTS

A. OPERATIONAL PROCEDURES

Throughout the winter season the Maintenance Contractor must adhere to **general** and **specific** winter operational procedures when working within avalanche areas (see Appendix A – Location of Avalanche Areas). These procedures will ensure that work is conducted effectively, efficiently and safely within an avalanche area. **“General Winter Operational Procedures”** are activities and responsibilities, which the Contractor must adhere to throughout the winter season. **“Specific Operational Procedures”** are restrictions, activities and responsibilities based on the avalanche forecast which the Contractor must adhere to throughout the forecast period.

General Winter Operational Procedures

The Contractor must ensure that all crews working within an avalanche area are aware of the **“General Winter Operational Procedures”** and that work is conducted in accordance with them.

The Contractor will:

- be familiar with the avalanche areas within their contract areas (see Appendix A);
- monitor and report changes in the following to the Ministry Snow Avalanche Technician/Ministry Area Manager as soon as possible, such as:
 - Avalanche occurrence observations (as per Appendix D),
 - Basic indicators of snowpack stability,
 - Current weather observations;
- immediately notify the Ministry Snow Avalanche Technician of avalanches above or on the highways;
- maintain records of such avalanches by completing Avalanche Occurrence Reports H664 (see Appendix D) unless otherwise directed by the Ministry Snow Avalanche Technician;
- clear snow from and maintain access to avalanche facilities. Avalanche facilities include operational buildings, rescue and explosive caches, gun emplacements, gun platforms and bomb tramways;
- ensure avalanche barrier gates and turnarounds are free of snow, that gate locks are not frozen and operational;
- monitor weather forecasts;

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- receive, post and disseminate the **Avalanche Forecasts** to personnel immediately upon first receipt, and will have a communications mechanism available which ensures that staff coming to work on subsequent shifts are informed of the current **Avalanche Forecast**;
- maintain communication with Ministry Snow Avalanche Technician regarding potentially increasing avalanche activity and changes in Avalanche Forecast level;
- ensure that avalanche rescue equipment is maintained and ready for use;
- ensure that correct avalanche safety measures are practiced;
- ensure that maintenance staff conduct routine patrols of the avalanche area for changing conditions and avalanche activity as necessary and/or requested by the Ministry Snow Avalanche Technician;
- maintain previously announced road closures to allow for avalanche patrols and for the removal of snow and/or deposits from the highway;
- commence clearing of snow avalanche deposits from the Highway when instructed by the Ministry Snow Avalanche Technician.

B. AVALANCHE FORECASTS

The Ministry's Snow Avalanche Programs produce "Avalanche Forecasts" as part of the safety measure employed to manage the avalanche hazards along the provincial highway corridors. These forecasts are based on a progressive five level scale of low, moderate, considerable, high and extreme. The individual forecast determine the state of readiness and determine the "**Specific Operational Procedures**" which the Contractor must be adhered to during the "Avalanche Forecasts" period. The Avalanche Forecasts:

- are produced when there is a change or update in the Avalanche Forecast as determined by the Ministry Snow Avalanche Technicians;
- are provided to the Contractor by Ministry radio system or telephone and /or posted electronically;
- identify the area of concern, the expected duration of the forecast and the reason for the change in forecast level;
- may cover a large geographic area or be specific to a small localized area;
- reflect the highest hazard within the forecast area.

Specific Operational Procedures

"**Specific Operational Procedures**" define the restrictions, activities and responsibilities of the Contractor specific to the Avalanche Forecast level. The Contractor must respond to these procedures for the duration of the Avalanche Forecast period. The Contractor must ensure that all crews working within the avalanche area are aware of these procedures and that work is conducted in accordance with the Avalanche Forecast level.

See: Avalanche Forecasts and Specific Operational Procedures on following page.

AVALANCHE FORECASTS AND SPECIFIC OPERATIONAL PROCEDURES

AVALANCHE FORECAST	DEFINITION	ACTIONS TAKEN BY CONTRACTOR
LOW	<p>Avalanches are unlikely. OR Small avalanches are possible, but are expected to terminate far above the highway</p>	<p>When the Avalanche Forecast is “LOW” the Contractor may proceed with normal winter operation procedures. The Contractor will:</p> <ul style="list-style-type: none"> ❖ Remove snow from avalanche catchment areas; ❖ Remove snow from static avalanche defense structures unless directed not to by the Snow Avalanche Technician; ❖ Maintain previously announced road closures to allow for avalanche patrols and for the removal of snow and/or deposits from the highway.
MODERATE	<p>Small avalanches are probable but are expected to terminate above the highway. AND/OR Large avalanches are possible, but are expected to terminate far above the highway.</p>	<p>When the Avalanche Forecast is “MODERATE” the Contractor will:</p> <ul style="list-style-type: none"> ❖ Notify Snow Avalanche Technician if there is a change in weather, such as, increased wind speed, rise of temperature and/or increased snowfall intensity; ❖ Notify Snow Avalanche Technician immediately after observing NEW avalanche occurrences; ❖ Ensure there are no personnel working outside of vehicles within avalanche areas; ❖ Ensure there is no equipment working outside of the travel lanes and shoulders of the highway within avalanche areas; ❖ Take interval weather and/or avalanche occurrence observations, as requested by the Snow Avalanche Technician; ❖ Be prepared for road closures/delays, as a result of unexpected natural avalanche activity on the highway or explosives avalanche control, as requested by the Snow Avalanche Technician; ❖ Maintain previously announced road closures to allow for avalanche patrols and for the removal of snow and/or deposits from the highway (stationary or mobile equipment okay for deposit removal).
CONSIDERABLE	<p>Small avalanches may affect the highway. AND/OR Large avalanches are probable, but are expected to terminate above the highway. AND/OR Snow dust events may affect the highway.</p>	<p>When the Avalanche Forecast is “CONSIDERABLE” the Contractor will:</p> <ul style="list-style-type: none"> ❖ Notify Snow Avalanche Technician if there is a change in weather, such as, increased wind speed, rise of temperature and/or increased snowfall intensity; ❖ Notify Snow Avalanche Technician immediately after observing NEW avalanche occurrences; ❖ Ensure there are no personnel working outside of vehicles within avalanche areas; ❖ Ensure there is no equipment working outside of the travel lanes and shoulders of the highway within avalanche areas; ❖ Ensure there is no stationary equipment working within avalanche areas; ❖ Ensure safety of personnel by performing one of the following: <ol style="list-style-type: none"> 1. Radio call-in when entering and exiting avalanche areas* 2. Radio call-in at least every 30 minutes* 3. Plow in tandem (second vehicle may be a pick-up or another plow truck) * The person receiving the radio call may or may not be working in avalanche areas, but must be available 100% of the forecast time period; ❖ Take interval weather and/or avalanche occurrence observations, as requested by the Snow Avalanche Technician; ❖ Be prepared for road closures/delays, as a result of unexpected natural avalanche activity on the highway or explosives avalanche control, as requested by the Snow Avalanche Technician; ❖ Maintain previously announced road closures to allow for avalanche patrols and for the removal of snow and/or deposits from the highway (mobile equipment only for deposit removal).
HIGH	<p>Numerous small avalanches are expected to affect the highway. AND/OR One or more large avalanches are expected to affect the highway.</p>	<p>When the Avalanche Forecast is “HIGH” the Contractor will:</p> <ul style="list-style-type: none"> ❖ Close and sweep the highway between Standard Closure Locations (as determined by the Snow Avalanche Technician) using Standard Closure Procedures; ❖ Ensure there is no equipment or personnel working within the avalanche closure area except for: <ul style="list-style-type: none"> • Sweep vehicles • Avalanche Program vehicles and personnel • Snow maintenance equipment, provided they operate in safe areas and do not enter avalanche hazard areas (as determined by the Snow Avalanche Technician) * * This is possible because many Standard Closure Locations are located outside of avalanche hazard boundary locations ❖ Take interval weather observations from weather stations with safe access, as requested by the Snow Avalanche Technician.
EXTREME	<p>Numerous, large avalanches are expected to affect the highway.</p>	<p>When the Avalanche Forecast is “EXTREME” the Contractor will:</p> <ul style="list-style-type: none"> ❖ Close and sweep the highway between Standard Closure Locations (as determined by the Snow Avalanche Technician) using Standard Closure Procedures; ❖ Ensure there is no equipment or personnel working within the avalanche closure area; ❖ Take interval weather observations from weather stations with safe access, as requested by the Snow Avalanche Technician.

❖ Avalanche Deposit Removal

❖ If the Snow Avalanche Technician determines that conditions are safe, the Contractor may be instructed to commence avalanche deposit removal from specific locations where avalanches have affected the highway, even though adjacent avalanche areas may be rated at different forecast levels. September 2001

C. AVALANCHE OCCURRENCE OBSERVATIONS

As indicated in the Hazard Level Operational Procedures, reporting of avalanche occurrence is an ongoing responsibility of the Contractor. The Contractor will:

- Immediately notify the Ministry Snow Avalanche Technician, via radio, telephone, or in person, of any snow avalanche occurrences above or on the highway;
- In areas with no resident Ministry Snow Avalanche Technician, report avalanche occurrence observations using form H664, in accordance with the recording instructions for said form contained in Appendix D.

VII. AVALANCHE RELATED ROAD CLOSURES

A. CLOSURE PROCEDURES

Closures are used during periods of High and Extreme avalanche hazard. At times closures are required for explosive control and for target registration.

Traffic control and highways closures through snow avalanche areas will be performed by the Contractor, based on the snow avalanche hazard. The Contractor will be aware of standard avalanche closure locations (see Appendix E).

In order to prevent rescue operations for those who choose to ignore a closure notice, enforcement of closures is a prime concern. During a closure, highway hazard areas are closed to all personnel except for:

- those conducting the sweep;
- those conducting avalanche patrols;
- avalanche control personnel; or
- other personnel specifically approved by the Ministry Snow Avalanche Technician.

The Contractor will ensure that sufficient personnel who are familiar with road closure procedures will be available at all times to initiate road closures at the request of the Ministry Area Manager or Ministry Snow Avalanche Technician. The Contractor will designate one person to liaise with the Ministry representative for the duration of the closure (usually the road or shift supervisor).

The Contractor will conduct closure procedures as follows:

- a) The Contractor will designate one person who is familiar with road closure locations and procedures to be responsible for expediting the closure. This person will be the only contact for the Ministry Snow Avalanche Technician with respect to road closure information.
- b) Exact location of the requested closure as per Appendix E or upon the direction of the Ministry Snow Avalanche Technician.
- c) Road closure warning signs are to be displayed in areas that have them.

Snow Avalanche Safety Measures for Highways Manual

- d) Where there are barrier gates, they will be lowered, manned or locked, and the sweep begun.
- e) The sweep vehicle will be adequately equipped for use in adverse road and weather conditions and will have radio frequency common to the Ministry radio communication.
- f) The Contractor will ensure that the closure area is secured by a sweep of the area.
- g) The Contractor will confirm sweep and closure locations to the Ministry Area Manager or Ministry Snow Avalanche Technician.
- h) The Ministry Area Manager or Ministry Snow Avalanche Technician must be notified of the location of any unattended parked vehicles. The Contractor will place a notice on the windshield advising the driver not to move the vehicle.
- i) If avalanche barrier gates are not manned during the closure, they shall be locked as authorized by the Ministry Snow Avalanche Technician.
- j) Manned closure gates will allow the Ministry, through the Contractor, to provide information to the public regarding the closure.
- k) The Ministry Snow Avalanche Technician or his designate will inform the Contractor when to re-open the highway.
- l) Any road closure signs will be removed, covered or changed by the Contractor to indicate that the highway has re-opened.

B. STANDARD CLOSURE LOCATIONS

Closure locations are often associated with avalanche barrier gates, particularly in active avalanche areas. There are also locations without gates, specific to each area. A list of standard closure locations is contained in Appendix E.

Other closure locations may be identified by the Ministry Snow Avalanche Technician.

C. AVALANCHE GATES SITE LOCATION AND MARKINGS

- a) The location of the gates must be approved by the Ministry Snow Avalanche Technician or the Ministry Area Manager.
- b) They must be located so that lineups of traffic are on near level terrain, free of avalanche hazard, and have turning space suitable for transport trucks.
- c) Standard signs must be used in conjunction with the gates.
 - Signs must be located in accordance with Appendix A of the *Traffic Control Manual for Work on Roadways (Second Office Edition)* and/or the *Traffic Control Manual for Work on Roadways (Second Field Edition)*. Figure A.1, A2, or A3 depending on the type and location of the road closure.
 - These signs have proven easier to use if they are either mounted permanently with sign covers, or mounted so that the signs can be turned to face away from the road when not in use.

Snow Avalanche Safety Measures for Highways Manual

- The R-1 and R-12 signs mounted permanently on the closure gates will be covered when the gate is not in use and will be tested annually for reflectivity;
 - Signs will be used as directed by the *Traffic Control Manual for Work on Roadways*.
- d) Standard hazard markers are also to be placed in front of and behind the bases approximately one metre from the bases. The numbers for these markers are TW-54L and TW-54R.
- If the placement of these markers is not possible due to snow removal maintenance, then the gate pedestal base must be marked and/or painted in a similar fashion to the TW-54 markers. The markers on the pedestal base must be reflective and clearly visible.
- e) Two or three Type B standard flashing warning lights (with battery pack) with red lenses must be fastened to each arm to ensure that the gates are visible in the worst storm conditions (see the *Traffic Control Manual for Work on Roadways (Second Office Edition)* and/or the *Traffic Control Manual for Work on Roadways (Second Field Edition)*).
 - f) The ends of the gates are to be painted fluorescent yellow, or covered with yellow centreline marking tape to improve their visibility in poor light situations.
 - g) The Contractor is responsible for maintaining all of the above, as well as any cleaning, sandblasting and repainting necessary for proper maintenance of the gates.

VIII. CONVOY GUIDELINES

The objective of a convoy is to keep traffic moving through avalanche areas to safe locations in hazardous conditions.

Convoys must only be used in areas with Ministry Snow Avalanche Technicians, as outlined below:

- a) when vehicles are caught within an avalanche closure area, to move them to a safe location;
- b) in emergency situations at the discretion of the District Highways Manager, upon the recommendation of the Ministry Snow Avalanche Technician.

If convoys are to be used upon the recommendation and approval of the Ministry Snow Avalanche Technician and the District Highways Manager, the Contractor must adhere to the following guidelines:

- a) Be prepared for a rescue.
- b) Traffic control including flagpersons must be in place at the closure gates or the locations where the convoy is to be used.
- c) Depending on the recommendation of the Ministry Snow Avalanche Technician, each motorist may need to be given detailed directions as to what is expected of him/her. For example:

Snow Avalanche Safety Measures for Highways Manual

- Each vehicle must maintain a spacing of at least 100 metres from the vehicle in front;
 - Each driver must know what to do in case of an avalanche on the road.
- d) For convoys over short distances where the vehicles will be visible to the flagpersons at all times the situation may be controlled by the flagpersons.
- e) Where the convoy will be over longer distances, pilot cars in front of and behind the convoy are to be used in order to keep radio control of the convoy and to facilitate a rescue.
- f) Personnel responsible for the convoy must be radio equipped with Ministry frequency and have rescue equipment available on-site.
- g) Maintenance equipment must be kept close to areas where avalanches might be expected.

**APPENDIX A
LOCATION OF AVALANCHE AREAS**

Contract Number	Contract Name	Depot	Avalanche Area	Training Plan	Rescue Cache Level
#4	Howe Sound	Pemberton	Pemberton - D'Arcy Duffey Lake	A	I
		Whistler	Cheakamus Canyon	B	III
		Squamish	Cheakamus Canyon	B	III
#7	Fraser Valley	Allison Pass	Allison Pass	A	I
		Boston Bar	Fraser Canyon	A	I
		Hope	Coquihalla South	A	I
		Rosedale	Mt. Cheam - Floods	B	III
		Deroche	Hemlock Valley Ski Area Road	B	III
#8	South Okanagan	Coalmont	Coalmont	B	II
		Penticton	Apex Alpine Ski Area Road	B	II
#9	Kootenay Boundary	Grand Forks	Blueberry - Paulson Grand Forks North	A	II
		Fruitvale	Seven Mile Dam	B	III
		Castlegar	Castlegar Bluffs	B	III
		Rossland	Sheep Creek Blueberry - Paulson	A	II

**APPENDIX A
LOCATION OF AVALANCHE AREAS**

Contract Number	Contract Name	Depot	Avalanche Area	Training Plan	Rescue Cache Level
#10	Central Kootenays	Winlaw	Cape Horn Bluffs	A	II
		Winlaw	Vallican Bluffs		
		New Denver	New Denver - Kaslo Sandon Cody Ranch Ridge Hills	A	II
		Lardeau	Lardeau	A	II
		Kaslo	Coffee Creek	A	II
		Kaslo	New Denver- Kalso		
		Nakusp	Hills - Summit Lake	B	III
		Kootenay Pass	Kootenay Pass	A	I
		Salmo	Kootenay Pass	A	II
		Creston	Kootenay Pass	A	I
		Nelson	Whitewater Road Coffee Creek	A	II

**APPENDIX A
LOCATION OF AVALANCHE AREAS**

Contract Number	Contract Name	Depot	Avalanche Area	Training Plan	Rescue Cache Level
#11	East Kootenay	Fernie	Fernie	B	II
		Invermere	Toby Creek	A	II
#12	Selkirk	Golden	Golden East	A	I
		Trout Lake	Trout Lake - Gerrard Galena Pass	A	I
		Revelstoke	Three Valley Gap Greenslide	A	I
		Albert Canyon	Revelstoke - Glacier	A	I
		50 Mile	Revelstoke - Mica	A	I
#13	Okanagan-Shuswap	Chase	Chase	B	III
		Cherryville	Monashee Pass	B	III
#14	Nicola	Lytton	Fraser Canyon North	B	II
		Coldwater	Coquihalla	A	II
		Summitt	Coquihalla	A	I
		Merritt	Coquihalla	B	

**APPENDIX A
LOCATION OF AVALANCHE AREAS**

Contract Number	Contract Name	Depot	Avalanche Area	Training Plan	Rescue Cache Level
#15	Thompson	Birch Island	Blackpool	B	III
		Barriere	Barriere - Little Fort	B	III
#16	South Cariboo	Lillooet	Duffey Lake Lillooet - Pavilion Lillooet - Lytton	A	I
		Goldbridge	Bridge River	A	I
#17	Central Cariboo	Anahim	Heckman Pass	A	II
		Bella Coola	Bella Coola Heckman Pass	A	II
		Anahim	Heckman Pass	A	II
#18	North Cariboo	Wells	Quesnel - Bowron Lake	A	II
#20	Robson	Tete Jaune	Red Pass Albreda	A	II
#21	South Peace	Mt. Lemoray	Pine Pass	B	II
#25	Bulkley Nass	Meziadin	Bear Pass	A	I
		Stewart	Bear Pass Stewart - Hyder	A	I
#26	Skeena	Salvus	Terrace-Tyee Shames Mountain Ski Road	A	I III
		Terrace	Terrace-Tyee Terrace-Cedarvale Shames Mountain Road	B	II

**APPENDIX A
LOCATION OF AVALANCHE AREAS**

Contract Number	Contract Name	Depot	Avalanche Area	Training Plan	Rescue Cache Level
#27	North Coast	Prince Rupert	Rainbow Summit	B	II
#28	Stikine	Bob Quinn	Ningunsaw Pass	A	II
		Bell II	Ningunsaw Pass		III
		Cassiar	Cassiar Pass	B	II
		Telegraph Creek	Telegraph Creek	B	III

APPENDIX B

RESCUE CACHE EQUIPMENT LIST

Standard First Party Pack

*** Ready access to one or more portable radios.

The number of standard First Party packs is dependent upon the area and hazard level, but the recommendation is three packs for Level I areas, two packs for Level II areas and one pack for Level III areas to begin with.

*** The rescue equipment listed below should be placed in each First Party pack and be complete and ready to go at all times.

- 1 Rescue pack with "FIRST PARTY" crest and tag listing contents
- 1 Rescue plan (applicable section) and pencil
- 4 Collapsible probes
- 2 Short - handled shovels - "D" handle
- 30 Marking wands - bright colours
 - red, blue, orange flagging
- 1 (roll) Flagging tape
- 1 WCB Basic first aid kit in weatherproof case
- 2 Heat packs
- 1 Blankets - disposable
- 1 - space - re-usable
- 1 "Fox 40" Rescue whistle or Air warning horn
- 4 Headlamps - new batteries each winter - remove each spring
- 1 Hand lantern (6 volt) - new batteries each winter - remove each spring
- 1 Flagging vest - "AVALANCHE RESCUE" crest
- 5 "Cyalume" light sticks

APPENDIX B RESCUE CACHE EQUIPMENT LIST

Standard Second Party Equipment - LEVEL I

*** The rescue equipment listed below should be placed in the Second Party packs and be ready to go at all times.

- 10 Trapper Nelson #3 board and bag with "SECOND PARTY" crest and tag of contents
- 60 One piece probes
- 20 Shovels - "D" and straight handles
- 150 Marking wands - bright colours
- red, blue, orange flagging
- 1 WCB Level 1 first aid kit
- 10 Heat packs
- 2 Blankets - disposable
- 2 - space - re-usable
- 4 Rope (100 foot lengths of 1/2")
- 1 Loudhailer
- 1 "Fox 40" Rescue whistle or air warning horn
- 6 (pair) Snowshoes
- 20 Headlamps - new batteries each winter - remove each spring
- 5 Hand lanterns (6 volt) - new batteries each winter - remove each spring
- 1 Toboggan kit - see attached list

Extra Equipment

- 1 Portable lighting
- 1 Airways set - zero through five

APPENDIX B RESCUE CACHE EQUIPMENT LIST

Standard Second Party Equipment - LEVEL II

*** The rescue equipment listed below should be placed in the Second Party packs and be ready to go at all times.

- 5 Trapper Nelson #3 board and bag with "SECOND PARTY" crest and tag of contents
- 30 One piece probes
- 10 Shovels - "D" and straight handles
- 75 Marking wands - bright colours
- red, blue, orange flagging
- 5 Heat packs
- 2 Blankets - disposable
- 2 - space - re-usable
- 4 Rope (100 foot lengths of 1/2")
- 1 Loud hailer
- 1 "Fox 40" Rescue whistle or air warning horn
- 3 (pair) Snowshoes
- 10 Headlamps - new batteries each winter - remove each spring
- 2 Hand lanterns (6 volt) - new batteries each winter - remove each spring
Extra batteries
- 1 Toboggan kit - see attached list

Standard Second Party Equipment - LEVEL III

*** The rescue equipment below should be ready to go at all times.

- 10 One piece probes
- 5 Shovels - "D" and straight handles

Standard Second Party Toboggan Kit - LEVEL I AND LEVEL II

*** The following rescue equipment should be wrapped neatly in a waterproof canvas tarp and placed securely in the toboggan.

- 1 Toboggan stretcher (Cascade)
- 1 Canvas tarp - waterproof 9' x 6'
- 2 Blankets - wool
- 1 WCB Level 1 first aid kit and splint set

APPENDIX B

RESCUE CACHE EQUIPMENT LIST

Further Equipment Specifications and Maintenance Guidelines

Trapper Nelson #3 Board and Bag

- no holes in the bag, all straps to be in good condition

Crest and Tag Listing Contents

- crests are supplied and are to be sewn/glued on the upper front of each pack bag
- tags on packs must list contents as well as initials of the person who last checked the cache and the date it was checked

Rescue Plan and Pencil

- the Immediate Action section supplied and a pencil must be sealed in a large envelope labelled "AVALANCHE RESCUE"

Probes

- collapsible probes must be stored in the First Party packs
- all probes must be checked annually to ensure that all sections are present and fit together properly
- the one-piece probes must be stored outside in a cold, shaded location

Marking Wands

- green or other bright colour bamboo wands
- red, blue, or orange flagging tape tied to each wand
- these wands must be grouped evenly according to tape colour, so that only one colour will be used to mark the boundary of the avalanche deposit, while another colour will mark victims or articles found in or on the deposit

First Aid Kits

- store the WCB Basic and Level 1 first aid kits in a weatherproof carton
- all first aid kits are to be equipped with a CPR mask and CPR mask one-way valve

Blankets

- the disposable and space blankets must be stored in a protective plastic bag
- space blanket must reflect no less than 75% of body heat
- the wool blankets must be protected by a plastic bag and placed in the stretcher

APPENDIX B

RESCUE CACHE EQUIPMENT LIST

Loud Hailer

- check batteries regularly, at least twice per winter

"Fox 40" Rescue whistle or air warning horn

- to be in working condition
- the air canisters must not have been previously used

Snowshoes and Harnesses

- must be checked and repaired annually
- ensure that all staff know how to use them

Headlamps

- batteries must be checked at least twice per winter to ensure that no leakage has occurred and caused equipment damage
- batteries must be new each fall and removed each spring

Hand Lanterns

- must be checked at least twice per winter for good working condition
- batteries must be new each fall and removed each spring

Extra Equipment

- must be tested and used regularly to ensure that employees are familiar with equipment use
- generators or equipment engines must be checked monthly

APPENDIX C

IF YOU ARE CAUGHT IN AN AVALANCHE

1. REMAIN in Vehicle
2. Shut off **ENGINE** and **HEADLIGHTS**
3. Leave **RADIO** and **FLASHERS ON**
4. Call **FOREMAN** or **PHCC** with:
5. **Preliminary Accident Particulars:**

Date and Time of Accident

Location (Path Number, Nearest Landmark)

Number of Vehicles and Persons in Accident

6. Ensure rescue beacon is in **TRANSMIT** mode
7. **DO NOT START** engine or smoke
8. Push sectional avalanche **probe** up to surface and **AWAIT RESCUE TEAM**

WORKING IN AVALANCHE AREAS: Always wear rescue beacon in transmit mode.

Equip vehicle with sectional avalanche probe, shovel, blanket, flashlight, this instruction sheet, and wear or carry warm clothing. Know the safe terrain within your avalanche areas and the hazard forecast.

APPENDIX C

VEHICLE OR PERSON IN AVALANCHE

Wear **RESCUE BEACON** in transmit mode unless directed otherwise.

DO NOT proceed into **HAZARD ZONE ALONE** if **AVALANCHE HAZARD** persists

1. **HOLD WITNESS** – Record Names and addresses.

Preliminary Accident Particulars:

Date and Time of Accident

Location (Path Number)

Number of Persons in Accident

Number of Vehicles in Accident

2. **MOVE PEOPLE AND TRAFFIC** To a safe location
3. **NOTIFY RADIO ROOM (PHCC)** of accident particulars.
4. **ASSESS AVALANCHE HAZARD** before taking action and activating rescue plan.
5. **USE RESCUE PLAN**

APPENDIX D
AVALANCHE OCCURRENCE REPORT

RECORDING INSTRUCTIONS

1. Avalanche Area: Must be entered on all reports.
 Enter the appropriate five digit avalanche area code.
2. Avalanche Path: Must be entered on all reports.
 Enter the number of the path where the avalanche occurred. This number is usually posted on a yellow sign at the avalanche path, and can also be found in the avalanche atlas for the area.
 Note: the avalanche path number is not the distance along the highway in km or miles.

e.g., avalanche path 26.0

	2	6	.	0	0
--	---	---	---	---	---

3. Date of Occurrence: Must be entered on all reports.
 Enter the year, month and day of the occurrence.
 e.g., January 4, 1986

8	6	0	1	0	4
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Yr. Mo. Day

4. Time of Occurrence and
5. Time Estimated: Must be entered on all reports.
- a) For known time of occurrence (time not estimated) exact time in hours and minutes is entered and 00 is entered for Time Estimated Within \pm .
- b) To estimate the time of an avalanche occurrence determine the most likely time of occurrence and an estimate of how many hours on either side of the time estimate is likely.

An avalanche occurring at some unknown time during the night can be listed as the middle of the night with a Time Estimated Within listed to cover the entire range of unknown time.

Example: A patrol occurred January 5, 1986, at 1700 hrs. and no avalanche occurrences were noted. When a morning patrol was undertaken at 0900 hours January 6, 1986, an avalanche deposit was observed in a particular path. The time entered should be 0100 (of January 6, 1986) \pm 08 hrs.

APPENDIX D
AVALANCHE OCCURRENCE REPORT

6. Road Open Prior to Occurrence:

Circle Y (for Yes) if the avalanche occurred during a time when the road was open. Circle N (for No) if the avalanche occurred during a time when the highway was closed.

Destructive Potential

7. Avalanche Size:

Must be entered on all reports.

Circle a number beside the phrase that you think best describes the damage this avalanche could have done if the objects described (car, buildings, trees) were in the track or at the top of the runout zone.

Size Number

- 1
2
3
4
5

Destructive Potential

The avalanche was too small to injure a person.
The avalanche could bury, injure, or kill a person.
The avalanche could bury and destroy a car, damage a truck, destroy a small building, or break a few trees.
The avalanche could destroy a railway locomotive, large truck, several buildings, or a forest with an area up to 4 ha (about 10 acres).
The avalanche could destroy a village or a forest with an area of 40 ha (about 100 acres).

Half-sizes, for example, 1.5, 3.5, may be used for avalanches that fall between two size classifications.

Initiation

8. Avalanche Type:

- a) Slab/Loose

Circle S for a slab avalanche and L for a loose avalanche.

A slab avalanche breaks away from the snowpack as a wide chunk or slab, leaving a wide path and a fracture line behind it.

A loose avalanche starts from a single point, gathers more snow as it slides downhill, and leaves a triangular path behind it.

- b) Slab Width/
Slab Thickness

If the avalanche was a slab, measure or estimate the width and depth of the fracture line in metres.

APPENDIX D
AVALANCHE OCCURRENCE REPORT

9. Release Level in Snowpack: Circle 1 for new snow if only new, surface snow avalanched.
Circle 2 for old snow if old snow broke away and avalanched.
Circle 3 for ground if all the snow on the ground avalanched, and the ground was left bare behind it.
10. Start Aspect: Circle one number corresponding to the start aspect of the avalanche.
Start aspect is the direction the slope faces, not the direction an individual is facing to observe the aspect. When the avalanche started in multiple starting zones, note the main aspect.
11. Start Location: Decide where in the starting zone the avalanche started. Circle 1, 2, or 3 for top, middle, or bottom of the starting zone.
12. Trigger: Circle the number beside the phrase which best describes the cause of the avalanche. Most avalanches have a natural trigger. If you cannot find a phrase to describe the trigger, circle 36 for other, and give details in the Comments section below.

Deposition

13. Moisture Content: Squeeze a handful of snow from the avalanche deposit.
Circle 1 for dry if the snow crumbles, or is powdery, and will not stick together.
Circle 2 for moist if the snow sticks together and a snowball forms, but there is not any noticeable water.
Circle 3 for wet if water runs out, or if you can see drops of water in it.
14. Terminus: Do not complete unless instructed by Avalanche Technician.

APPENDIX D
AVALANCHE OCCURRENCE REPORT

15. Toe Distance From Road Edge: Measure or estimate the distance in metres from the road edge nearest the path to the toe of the avalanche deposit (not including snowdust deposit). If toe ended on road edge enter 0.0 m. If the toe of the avalanche deposit is upslope of the highway's edge, record the value as a negative number. If the toe of the avalanche deposit is on the highway or beyond the highway (downslope of the highway), record the value as a positive number.
16. Snowdust Distance From Road Edge: Where applicable record in metres the distance of the toe of the snowdust deposit from road edge. If the toe of the snowdust deposit is upslope of the highway's edge, record the value as a negative number. If the toe of the snowdust deposit is on the highway or beyond the highway (downslope of the highway), record the value as a positive number.
17. Length of Road Buried: When the mass deposit affects the highway, estimate or measure the length in metres of highway affected. If only the snowdust of an avalanche affected the highway, enter the length of highway affected by the snowdust.
Circle appropriate Estimated/Measured code.
18. Maximum Depth on Road: Measure or estimate the maximum depth of snow on the road to the nearest 1/10 of a metre, and enter it.
Circle measured or estimated.
19. Average Depth of Road: Estimate the average depth of snow on the highway to the nearest 1/10 of a metre.
20. Length of Deposit: (Average) Measure or estimate in metres the average length of the total deposit, not just the snow on the highway.
Circle one number for Estimated or Measured.
21. Width of Deposit: (Average) Measure or estimate in metres the average width of the total deposit, not just the portion affecting the highway.
22. Depth of Deposit: (Average) Measure or estimate to the nearest one-tenth metre the average depth of the total deposit.

APPENDIX D

AVALANCHE OCCURRENCE REPORT

Incident

23. Incident: If an incident occurred circle the appropriate number. Explain further in the Comments section.
- 1 Incident Examples: Vehicle ran into deposit, vehicle(s) or/and persons trapped between two or more avalanche deposits, avalanche hitting or burying vehicle(s) or person(s) without resulting in damage or injury.
- 2 Incident - Damage Examples: Vehicle ran into, hit or buried by deposit resulting in damage to vehicle or goods carried by vehicle, damage to building(s), structure(s) or vegetation. No bodily injury occurred.
- 3 Incident - Injury Incident resulting in bodily injury or death. No property damage occurred.
- 4 Incident - Damage & Injury Combination of 2 and 3.

Miscellaneous

24. Comments: In the shaded space provided, give details of any accidents or damage, or anything unusual about this avalanche occurrence, such as rock and/or trees in the deposit, air blast damage, unusual trigger, etc. You may also clarify any of the information in the above section.
25. Observer: Please print initials of observer of the above information. This assists those involved with reviewing the avalanche data in the event that additional information is required.

General Points:

- All toe distances are measured from road edge nearest to the upslope portion of the avalanche path.
- Mass, snowdust lengths and widths are all measured to the nearest metre.
- Deposit dimensions are to be up to where there are a few snowballs.
- Multiple aspects for an occurrence are to be recorded as the centre aspect or main aspect.

Forward all completed cards as soon as possible to the Ministry Area Manager in your area. Additional Avalanche Occurrence Report forms (H664) can be obtained from your Ministry Area Manager.

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
25	Bear Pass	51100	BEAR PASS	37A	American Creek	0.5km north of the Bear Two Bridge	None
					Argyle Creek	5.5km north of the Bear Two Bridge	None
					Dahlie Creek	0.5km north of the Bear River Bridge.	Single Gate
					Fred's Place	Fred Banard Cabin	None
					Meziadin Camp	4.7km west of Meziadin Junction	Double Gate
					Pearly Gates	0.9km north of Bitter Creek Bridge	Double Gate
					Surprise Creek	0.7km west of Surprise Creek Bridge	None
District of Stewart	Bear Pass	51300	MT. RAINEY	Stewart Bypass	Bypass North	North end of Stewart Townsite Bypass	Large Single Gate
					Bypass South	South end of Stewart Townsite Bypass	Double Gate

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
8	Central	24200	COALMONT	Coalmont Rd.	Brookmere Turnoff		None
					Coalmont		Single Gate
					Peterson's Bluff		Single Gate
					Tulameen		None
18	Central	42100	WELLS-BOWRON LK	26 & Bowron Lk Rd	East Gate		Single Gate
					West Gate		Single Gate
20	Central	46100	RED PASS	16	E. side of Path 7.2		Single Gate
					Overlander Falls		Single Gate
					Tete Jaune Junction		Single Gate
17	Central	47100	BELLA COOLA	20	Bottom of Hill		Single Gate
					East Gate		Single Gate
					Second Summit		Single Gate
					West Gate		Single Gate

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
16	Coast Chilcotin	26100	BRIDGE RIVER	Lillooet-Pioneer	Apple Spring Gate	0.2km west of Applespring Ck	Double Gate
					Bluenose North	0.7km northeast of the end of path #42 at the top of the hill.	None
					Bluenose South	0.7km southwest of the end of Path #42.0 at the turnaround.	None
					Bralorne Gate	0.2km north of Bralorne at the south end of avalanche path #117	Single Gate
					Goldbridge end gate	At the west end of the Plateau Ponds avalanche area east of Goldbridge	Single Gate
					Goldbridge-Brexton Gate	0.7km south of Goldbridge on the Bralorne Rd	Single Gate
					Mission Mtn North	Also known as Terzaghi Dam Gate	Single Gate
					Shalalth Mission Mtn South	80m north of the Shalalth Cutoff Rd	Single Gate
					Terzaghi Dam Gate	At the junction of Rd 40 at Terzaghi Dam on the Mission Mtn Rd	Single Gate
					Tyaughton Junction	West of Tyaughton Lk Rd and Rd 40 junction	Double Gate
					Tyaughton Lake Rd Gate	North of the Rd 40 junction by Mowson Pond	None
					Yalakom Gate	50m west of Yalakom River bridge	Double Gate
16	Coast Chilcotin	26300	BIG SLIDE	12	Big Slide North Gate	16km south of Lillooet on Hwy #12 at the north end of Big Slide	Single Gate
					Big Slide South gate	16.8km south of Lillooet on Hwy #12 at the south end of Big Slide	Single Gate

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
4	Coast Chilcotin	26200	DUFFEY LAKE	99	Balbirnie Pit	2.0km north of Evans pit bridge	None
					Blowdown Gate	2km north of Blowdown Ck bridge at junction of Blowdown Ck FSR	Double Gate
					Boat Launch	2.8km north of Steep Ck bridge	None
					Cerise Creek Parking Lot	East of path #65.6	None
					Gaz.ex control point	0.9km north of Steep Ck bridge	None
					Lilloet Lk Gate	0.2km southwest of Lower Joffre Ck bridge at Lilloet Lake FSR junction	Double Gate
					South of Path 17.0	Downton pit 2km southwest of Evans pit bridge	None
					Summit Gate	At Cayoosh Summit sand shed	Single Gate
					Van Horlick Cr Bridge		None
					Walden North	Lilloet end gate at junction of Enterprise Ck FSR	None
16	Coast Chilcotin	26200	DUFFEY LAKE	99	Balbirnie Pit	2.0km north of Evans pit bridge	None
					Blowdown Gate	2km north of Blowdown Ck bridge at junction of Blowdown Ck FSR	Double Gate
					Boat Launch	2.8km north of Steep Ck bridge	None
					Cerise Creek Parking Lot	East of path #65.6	None
					Gaz.ex control point	0.9km north of Steep Ck bridge	None
					Lilloet Lk Gate	0.2km southwest of Lower Joffre Ck bridge at Lilloet Lake FSR junction	Double Gate
					South of Path 17.0	Downton pit 2km southwest of Evans pit bridge	None
					Summit Gate	At Cayoosh Summit sand shed	Single Gate
					Van Horlick Cr Bridge		None
					Walden North	Lilloet end gate at junction of Enterprise Ck FSR	None

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
12	Columbias	38100	TCH WEST	1	East End of 3 Valley Gap	East of Path 18.4 at the 3 Valley Gap Hotel Frontage Road Entrance	None
					Griffen Lake		Double Gate
					Mica Dam Sawmills		Double Gate
					Perry River		Single Gate
					Revelstoke		None
					West End of 3 Valley	On straight stretch of highway just west of Path 19.9	None
12	Columbias	38200	TCH EAST	1	Donald Station	North of Golden just east of the Columbia River Bridge	None
					Flat Creek	Inside Galcier National Park at the mouth of the Flat Creek Valley	None
					Flat Creek - Illecillewaet Brake Check		None
					Giant Cedars	On the straight section of Trans-Canada Highway west of the Woolsey Creek	None
					Golden	At the northern end of the four lane section of the Trans-Canada highway that runs through Golden	None
					Illecillewaet Brake Check	At the truck brake check pullout @ 7.5 kms east of the Tangiers River	None
					Revelstoke Eastern Entrance	At the eastern entrance to the City of Revelstoke @ the Overhead sign bridge	None
					Revelstoke Park Gate West	At the eastern end of the 4 lane section of highway just west of the Mt. Revelstoke west boundry	None

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
12	Columbias	38300	HWY 23 NORTH	23	Bigmouth Creek	On the south side of Big Mouth Creek	Double Gate
					Birch Creek	aka Pitt Creek south of and around the outside corner from Path 121.0	None
					Bottom Mica Dam Hill	Immediately north of the entrance to the Mica gravel storage area / B.C. Hydro storage yard.	Double Gate
					Bottom Revelstoke Dam Hill	Just north of the entrance to the MoT's Kelly Gravel Pit	Double Gate
					Fissure Creek	North side of Fissure Creek Paths	Double Gate
					Key Road	At the south entrance to the Downie Loop from the Columbia Valley	Double Gate
					Martha Creek	At the south side of the entrance to the Martha Creek B.C. Provincial Park	Double Gate
					Mica Village	Just south of the southern entrance to the Mica Village	Double Gate
					Top Mica Dam Hill	At the top of the Mica Dam Hill immediately south of the eastern access to the top of the Mica Dam	Double Gate
12	Columbias	38400	GALENA PASS	31	Armstrong Lake	Immediately west of the Armstrong Lake Bridge on Highway #31	Double Gate
					Fish Hatchery Rd	Immediately east of the entrance to the Hill Creek Hatchery	Double Gate
					Junction Hwy31/23S	On Highway #31 just east of the junction with Highway #23 South	Double Gate
					Lardeau River	Delete this record and Children	None
					Trout Lake Village	Delete this record and children	Single Gate
12	Columbias	38500	HWY 31S-TROUT LK	31	Lardeau River	At the bridge across the Lardeau River at Gerard	None
					Trout Lake Village	South Side Trout Lake Village	Single Gate
12	Columbias	38600	GREENSLIDE	Airport Way	North of Greenslide	approximately five hundred metres north of path 16.0	None
					South of Greenslide	Approximately 500 metres south of Path 16.5	None

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
10	Kootenay Pass	39100	KOOTENAY PASS	3	East Gate		Double Gate
					Northfork Chain Up		None
					Tower 5	Old avalancher site-wide viewpoint	None
					West Gate		None
					Stagleap Park-Picnic Area	0.3 km east of Kootenay Pass Camp	None
					Summit - Kootenay Pass	Height of land(roadway) over Kootenay Pass	None
					Noname Bench access road	1.2 km west of Kootenay Pass Summit	None
					Tower 3 Avalancher Site	Old avalancher Metal tower(2.5km west of Kootenay Pass Camp)	None

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
10	Kootenays	31100	CAPE HORN BLUFFS	6	North Gate		Double Gate
					South Gate		Double Gate
10	Kootenays	31300	WHITEWATER	Whitewater Rd	Apex Bridge		None
					Lower Gate		Single Gate
					Ski Hill Parking Lot		None
9	Kootenays	32200	SHEEP CREEK	22 & Rossland Cascade Rd	East Gate		Single Gate
					west Gate		Single Gate
9	Kootenays	32300	SEVEN MILE DAM	Seven Mile Dam Rd	East Gate		Single Gate
					West Gate		Single Gate
9	Kootenays	33100	BLUEBERRY-PAULSON	3	East Gate		Double Gate
					West Gate		Double Gate
10	Kootenays	34100	NEW DENVER-KASLO	31A	Keen Creek		Double Gate
					London East Gate		Double Gate
					London West Gate		Double Gate
					Mnt Carpenter		
					Warning Gate	Warning Gate. Allows Local Traffic Through	None
					Sandon Gate		Single Gate
					Three Forks		None
10	Kootenays	34200	LARDEAU	31	Upper Whitewater Canyon		None
					North gate		Double Gate
					South gate		Double Gate
10	Kootenays	34600	COFFEE CREEK	31	North Gate		Double Gate
					South Gate		Double Gate
11	Kootenays	36100	FERNIE	3	Elko		None
					Morrissey Road		None
11	Kootenays	37200	TOBY CREEK	Toby Creek Rd	East Gate		Single Gate
					West Gate		Single Gate

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
26	North West	52200	TERRACE - KITWANGA	16	East - Binwall	600m east of avalanche path	None
					West - Binwall	1 km west of avalanche path	None
					Kwinitsa	At Kwinitsa gun position	None
					30 Mile	6 km east of Exchamsiks bridge	None
					East - Rainbow Summit	At Green river bridge	None
					East of 35 Mile	600m east of Exchamsiks bridge	None
					Exstew	1.6 km east of Exstew Bridge	Double Gate
					Kasiks	At west end of tangent 600m east of Kasiks bridge	None
					Kwinitsa	At Kwinitsa gun position	None
					Level Crossing	100m east of CNR level crossing	None
					New Remo	0.5 west of New Remo	None
					Rainbow	13.6 km east of Port Edward arterial	Double Gate
					Telegraph Point	At Telegraph Point rest area	None
					West - Rainbow Summit	1km west of Rainbow Summit	None
					West of 35 Mile	1.5 km west of Exchamsiks bridge	None
					Kwinitsa	At Kwinitsa gun position	None
					30 Mile	6 km east of Exchamsiks bridge	None
					East - Rainbow Summit	At Green river bridge	None
					East of 35 Mile	600m east of Exchamsiks bridge	None
					Exstew	1.6 km east of Exstew Bridge	Double Gate
					Kasiks	At west end of tangent 600m east of Kasiks bridge	None
					Kwinitsa	At Kwinitsa gun position	None
					Level Crossing	100m east of CNR level crossing	None
					New Remo	0.5 west of New Remo	None
					Rainbow	13.6 km east of Port Edward arterial	Double Gate
					Telegraph Point	At Telegraph Point rest area	None
					West - Rainbow Summit	1km west of Rainbow Summit	None
West of 35 Mile	1.5 km west of Exchamsiks bridge	None					

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
26	North West	52310	Amsbury	16	Amsbury East	East of Amsbury	None
					Amsbury West	West of Amsbury	None
26	North West	52400	SHAMES	Shames Access Rd	North of Path 4.1	300m north of 4th bridge	None
					Shames Rd/HWY 16	600m north of junction Shames Rd/Hwy 16	Double Gate
					Shames Ski Area	200m south of Shames Ski Area parking lot	Double Gate
					South of Path 3.4	At avalanche warning sign south of path 3.4	None
26	North West	52500	GREENVILLE-KINCOLITH	113	Greenville	1.6 km west of Greenville	Double Gate
					Kincolith	0.4 km east of Kincolith	Double Gate
28	North West	53100	NINGUNSAW PASS	37	Bob Quinn Camp		None
					Bell 2	Immediately north of Bell 2 Lodge access	Double Gate
					Eskay Creek Mine Turnoff	500m south of Eskay Creek mine turnoff	Double Gate
					North of Beaverpond	300m north of Beaverpond avalanche area	None
					North of Gamma	100m north of Gamma avalanche area	None
					North of Snowbank	Immediately north of Redflat creek bridge	None
					South of Beaverpond	500m south of Beaverpond avalanche area	None
					South of Gamma	200m south of Carl's Corner weather station	None
28	North West	53200	CASSIAR	Cassiar Access	Cassiar	At Cassiar townsite	None
					Cassiar Access Turnoff	At Cassiar access turnoff from Hwy 37	None

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
28	North West	53200	CASSIAR	37	North - Centreville Paths	1 km south of Good Hope Lake	None
					North - Cottonwood Paths	At avalanche warning sign at north end of Cottonwood avalanche area	None
					South - Centreville Paths	At Avalanche warning sign south of Centreville avalanche area	None
					South - Cottonwood Paths	At avalanche warning sign at South end of Cottonwood avalanche area	None
28	North West	53240	Joe Reid Hill	37	North - Joe Reid	1.3Km north of North Fork Creek No. 1	None
					South - Joe Reid	1.7 km south of 2nd North Fork Creek	None
28	North West	53400	MOOSE PASTURE	37	Beady Creek	At Beady Creek 1km south of avalanche area	None
					Moose Pasture Pit	At Moose Pasture pit 1km north of avalanche area	None
28	North West	53300	TELEGRAPH CREEK	51	Downtown Telegraph	Immediately north of junction of Telegraph Creek Road and Stikine Street	None
					Meehaus Pit	800m west of Meehaus Pit (approx 70km west of Dease Lake)	Single Gate
					Mud Lake	At turnoff to Mud Lake	None
					Nine Mile		Single Gate
					Tahltan East	At Cattleguard approx 800m east of Tahltan Bridge	None
					Tahltan West	At wide area approx 600m west of Tahltan hill.	None
					Telegraph Gate	Approx 4km east of Telegraph Creek at Dump road turnoff	Single Gate
					Upper Downtown Telegraph Access	Approx 100m south of Junction of Telegraph Creek Road and Sawtooth Road	None
					Upper Downtown Telegraph Access	Approx 100m south of Junction of Telegraph Creek Road and Sawtooth Road	None

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STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
28	North West	53310	Telegraph Town	51	Downtown Telegraph	Immediately north of junction of Telegraph Creek Road and Stikine Street	None
					Upper Downtown Telegraph Access	Approx 100m south of Junction of Telegraph Creek Road and Sawtooth Road	None
					Upper Downtown Telegraph Access	Approx 100m south of Junction of Telegraph Creek Road and Sawtooth Road	None
28	North West	53320	Telegraph Highway	51	Mud Lake	At turnoff to Mud Lake	None
				51	Nine Mile		Single Gate
25	North West	54100	Doris Lake	Babine Lake Road	Doris Lake North	600m north of Doris Lake avalanche paths	None
					Doris Lake South	1 km south of Doris Lake avalanche paths	None
25	North West	54200	Visermans Hill	Hazelton-Kitwanga Backroad	East Gate	At gate east of avalanche area	Large Single Gate
					West Gate	At gate west of avalanche area	Large Single Gate

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
7	North Cascades	15300	ALLISON PASS		Allison Summit	Westbound closure at maintenance yard (double gates).	Large Double Gate
7	North Cascades	15300	ALLISON PASS		Burn Hill	Eastbound closure at the bottom of Burn Hill, west of path 50.4 at wood park sign.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Eastgate	Westbound closure at east entrance of Manning Park (bear carving).	No gate present at site
7	North Cascades	15300	ALLISON PASS		Engineers Road	Eastbound closure at Engineers Road near Foundation Mines (double gates).	Double Gate
7	North Cascades	15300	ALLISON PASS		Gibson Pass		None
7	North Cascades	15300	ALLISON PASS		Hope Slide Brake Check	Westbound closure at Brake Check.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Manning Park Resort	Westbound closure across highway from resort.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Manning Park Ski Hill	Eastbound closure at parking lot.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Manning West Gate	Westbound closure at Manning Park west entrance.	None
7	North Cascades	15300	ALLISON PASS		Mule Deer West	Westbound 0.5 km east of Mule Deer Campground.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Mule Deer East	Eastbound closure at the Hampton Campground.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Nine Mile Hill	Eastbound closure bottom of hill at Nicolum Creek Bridge.	Single Gate
7	North Cascades	15300	ALLISON PASS		Princeton	Closure gate across from Mohawk service station.	Single Gate
7	North Cascades	15300	ALLISON PASS		Similco Mine	Double Gates near entrance road to Similco Mine West of Princeton.	Double Gate
7	North Cascades	15300	ALLISON PASS		Similkameen Falls East	Eastbound closure at Garret Road 2km east of East Gate.	No gate present at site
7	North Cascades	15300	ALLISON PASS		Similkameen Falls West	Westbound closure at Placer Similkameen Forrest Service Road.	No gate present at site

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
7	North Cascades	15300	ALLISON PASS		Ski Hill Road	Westbound closure ski hill road at Manning Park Resort	No gate present at site
7	North Cascades	15300	ALLISON PASS		Strawberry Flats Parking Lot	East or Westbound closure at the parking lot.	None
8	North Cascades	15300	ALLISON PASS		Allison Summit	Westbound closure at maintenance yard (double gates).	Large Double Gate
8	North Cascades	15300	ALLISON PASS		Burn Hill	Eastbound closure at the bottom of Burn Hill, west of path 50.4 at wood park sign.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Eastgate	Westbound closure at east entrance of Manning Park (bear carving).	No gate present at site
8	North Cascades	15300	ALLISON PASS		Engineers Road	Eastbound closure at Engineers Road near Foundation Mines (double gates).	Double Gate
8	North Cascades	15300	ALLISON PASS		Gibson Pass		None
8	North Cascades	15300	ALLISON PASS		Hope Slide Brake Check	Westbound closure at Brake Check.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Manning Park Resort	Westbound closure across highway from resort.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Manning Park Ski Hill	Eastbound closure at parking lot.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Manning West Gate	Westbound closure at Manning Park west entrance.	None
8	North Cascades	15300	ALLISON PASS		Mule Deer West	Westbound 0.5 km east of Mule Deer Campground.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Mule Deer East	Eastbound closure at the Hampton Campground.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Nine Mile Hill	Eastbound closure bottom of hill at Nicolum Creek Bridge.	Single Gate
8	North Cascades	15300	ALLISON PASS		Princeton	Closure gate across from Mohawk service station.	Single Gate
8	North Cascades	15300	ALLISON PASS		Similco Mine	Double Gates near entrance road to Similco Mine West of Princeton.	Double Gate
8	North Cascades	15300	ALLISON PASS		Similkameen Falls East	Eastbound closure at Garret Road 2km east of East Gate.	No gate present at site

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
8	North Cascades	15300	ALLISON PASS		Similkameen Falls West	Westbound closure at Placer Similkameen Forrest Service Road.	No gate present at site
8	North Cascades	15300	ALLISON PASS		Ski Hill Road	Westbound closure ski hill road at Manning Park Resort	No gate present at site
8	North Cascades	15300	ALLISON PASS		Strawberry Flats Parking Lot	East or Westbound closure at the parking lot.	None
7	North Cascades	25200	COQUIHALLA		Falls Lake	Southbound closure is at the southbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Falls Lake to Zopokios		None
7	North Cascades	25200	COQUIHALLA		Juliet Creek	Southbound closure at the southbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Larson Hill North	Northbound closure at Brookmere Bridge.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Larson Hill South	Larson Hill Interchange Southbound closure at southbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Merritt	Southbound closure at Coldwater interchange at Merritt	None
7	North Cascades	25200	COQUIHALLA		Mine Creek	Northbound closure at the northbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Peers Creek	Northbound at Peers Creek interchange. Highway gates in place and on the ramp as well.	Double Gate
7	North Cascades	25200	COQUIHALLA		Portia	North bound closure is at off ramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Sowaqua Creek	Exit 192 southbound closure is located at southbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Toll Booth	North or Southbound closure	None
7	North Cascades	25200	COQUIHALLA		Zopkios Northbound	Northbound at northbound onramp.	No gate present at site
7	North Cascades	25200	COQUIHALLA		Zopkios Southbound	At the break check offramp	No gate present at site
14	North Cascades	25200	COQUIHALLA		Falls Lake	Southbound closure is at the southbound onramp.	No gate present at site

**APPENDIX E
STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
14	North Cascades	25200	COQUIHALLA		Falls Lake to Zopokios		None
14	North Cascades	25200	COQUIHALLA		Juliet Creek	Southbound closure at the southbound onramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Larson Hill North	Northbound closure at Brookmere Bridge.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Larson Hill South	Larson Hill Interchange Southbound closure at southbound onramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Merritt	Southbound closure at Coldwater interchange at Merritt	None
14	North Cascades	25200	COQUIHALLA		Mine Creek	Northbound closure at the northbound onramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Peers Creek	Northbound at Peers Creek interchange. Highway gates in place and on the ramp as well.	Double Gate
14	North Cascades	25200	COQUIHALLA		Portia	North bound closure is at off ramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Sowaqua Creek	Exit 192 southbound closure is located at southbound onramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Toll Booth	North or Southbound closure	None
14	North Cascades	25200	COQUIHALLA		Zopkios Northbound	Northbound at northbound onramp.	No gate present at site
14	North Cascades	25200	COQUIHALLA		Zopkios Southbound	At the break check offramp	No gate present at site
7	North Cascades	15100	FRASER CANYON		Boston Bar North	Northbound single gate at the north end of Boston Bar.	Single Gate
7	North Cascades	15100	FRASER CANYON		Boston Bar South	Southbound double gates 1 km north of Anderson Creek Bridge.	Double Gate
7	North Cascades	15100	FRASER CANYON		Falls Creek		No gate present at site
7	North Cascades	15100	FRASER CANYON		Hope	Northbound single gate north of Ross Road.	Single Gate
7	North Cascades	15100	FRASER CANYON		Kanaka Bar	Southbound double gates at Siwash Creek.	Double Gate

APPENDIX E
STANDARD CLOSURE LOCATIONS

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
7	North Cascades	15100	FRASER CANYON		Spences Bridge		Single Gate
7	North Cascades	15100	FRASER CANYON		Spuzzum North	Southbound single gate at the north end of Spuzzum.	Single Gate
7	North Cascades	15100	FRASER CANYON		Spuzzum South	Northbound single gate at the south end of Spuzzum.	Single Gate
7	North Cascades	15100	FRASER CANYON		Top of Florence Hill	Southbound single gate north of Florence Pit.	Single Gate
7	North Cascades	15100	FRASER CANYON		Yale	Northbound double gates at Yale	Double Gate
7	North Cascades	15100	FRASER CANYON		Yale to Jackass	Yale to Jackass mtn	None
14	North Cascades	15100	FRASER CANYON		Boston Bar North	Northbound single gate at the north end of Boston Bar.	Single Gate
14	North Cascades	15100	FRASER CANYON		Boston Bar South	Southbound double gates 1 km north of Anderson Creek Bridge.	Double Gate
14	North Cascades	15100	FRASER CANYON		Falls Creek		No gate present at site
14	North Cascades	15100	FRASER CANYON		Hope	Northbound single gate north of Ross Road.	Single Gate
14	North Cascades	15100	FRASER CANYON		Kanaka Bar	Southbound double gates at Siwash Creek.	Double Gate
14	North Cascades	15100	FRASER CANYON		Spences Bridge		Single Gate
14	North Cascades	15100	FRASER CANYON		Spuzzum North	Southbound single gate at the north end of Spuzzum.	Single Gate
14	North Cascades	15100	FRASER CANYON		Spuzzum South	Northbound single gate at the south end of Spuzzum.	Single Gate
14	North Cascades	15100	FRASER CANYON		Top of Florence Hill	Southbound single gate north of Florence Pit.	Single Gate
14	North Cascades	15100	FRASER CANYON		Yale	Northbound double gates at Yale	Double Gate

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STANDARD CLOSURE LOCATIONS**

CONTRACT AREA	PROGRAM	AREA CODE	AREA NAME	HIGHWAY	LOCATION NAME	LOCATION DESCRIPTION	BARRIER GATE(S)
7	North Cascades	15500	HEMLOCK VALLEY		Hemlock Valley North	Single Gate South of Hemlock Ski Hill.	None
7	North Cascades	15500	HEMLOCK VALLEY		Hemlock Valley South	Single gate immediately south of catchment wall near Sakwi Creek on Hemlock Ski Hill road.	Single Gate
7	North Cascades	15400	MT. CHEAM FLOODS		Flood East	Trans Canada East of Flood Paths	No gate present at site
7	North Cascades	15400	MT. CHEAM FLOODS		Flood West	Trans Canada Highway West of Flood Paths	No gate present at site

APPENDIX F

Appendix F

Ministry of Transportation

**Guidelines for
One-Day Avalanche Safety Training**

Terms of Reference

Snow Avalanche Programs
Construction/Maintenance Branch
September 2001

APPENDIX F
GUIDELINES FOR ONE-DAY AVALANCHE SAFETY TRAINING
TERMS OF REFERENCE

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APPENDIX F
GUIDELINES FOR ONE-DAY AVALANCHE SAFETY TRAINING
TERMS OF REFERENCE

OBJECTIVE

This document defines qualifications and responsibilities for individuals who conduct One-Day Avalanche Safety Training to Maintenance Contractor and Ministry personnel.

The designated trainer must be prepared to provide avalanche training courses throughout the entire geographic area covered by the specific contract (if there is more than one avalanche hazard area). In the interests of continuity and consistency, it is preferable to designate one individual who can supply the training over an extended period of years.

This training is necessary in order to ensure that work crews who operate or travel within avalanche areas conduct their work in compliance with Ministry, avalanche safety measures and are able to effectively initiate and participate in avalanche search and rescue efforts as necessary.

INSTRUCTOR CANDIDATES

Individuals who qualify to teach One-Day Avalanche Safety Training can either be:

1. Current Ministry approved avalanche training agencies/individuals. These agencies/individuals must apply for approval from the Ministry, Snow Avalanche Programs Headquarters office. Due to the level of experience and certification of these agencies/individuals, they are approved to teach One-Day Avalanche Safety Courses anywhere in the Province (see attached 1998/99-2000/01 Terms of Reference);
2. Employees of the Maintenance Contractor who meet or exceed instructor qualifications as defined in this document.

REQUIRED INSTRUCTOR QUALIFICATIONS

Individuals under the employment of the Maintenance Contractor who wish to apply for the position of instructor for One-Day Avalanche Safety Training must:

- Provide proof of attendance on a recognized Instructional Techniques/Instructional Skills course of at least sixteen (16) hours duration, which requires all participants to conduct at least two (2) ten minute mini-lessons, and receive constructive peer and facilitator feedback on their presentations;
- Provide proof of attendance at a Canadian Avalanche Association (CAA) Level 1 course within the past five years (Transportation and Resource Industry preferred);
- Have worked for a minimum of three winter seasons on a highway operation in an “A” avalanche hazard area where it is necessary to practice and observe avalanche safety measures on a daily basis throughout the winter season.

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- Have a thorough knowledge and understanding of:
 1. Ministry, Snow Avalanche Safety Measures for Highways Manual;
 2. Ministry, Avalanche Search and Rescue Plans and search techniques;
 3. Locations of local Avalanche Search and Rescue Equipment;
 4. How an avalanche beacon works in addition to how to test and confirm proper function. Trainers must also know how to operate in transmit and receive mode the beacon of use in contract areas where training takes place;
 5. Ministry FIVE level Avalanche Forecasts and Specific Operational Procedures that correspond to each level;
 6. Local avalanche terrain (avalanche path characteristics - size, length, width, proximity to other avalanche paths and specific landmarks);
 7. Local historic avalanche occurrences (typical release patterns, frequency, size and toe distance mass on highway);
 8. Local avalanche road closure points;
 9. How to conduct efficient local avalanche related road closures;
 10. The Maintenance Services Manual which defines Contractor and Ministry avalanche responsibilities.

INSTRUCTOR APPROVAL PROCESS

Excluding currently approved One-Day Avalanche Safety Instructors, it will be the responsibility of the Maintenance Contractor to ensure that their on-staff candidate meets or exceeds required qualifications as listed above.

INSTRUCTOR RESPONSIBILITIES

Course Participants

Approved instructors will conduct One-Day Avalanche Safety Training to Maintenance Contractor and Ministry personnel, in addition to sub-contractors (i.e., flagging personnel) who work within avalanche areas, as defined in the *Snow Avalanche Programs, Snow Avalanche Safety Measures for Highways Manual*.

Class Room and Field Sessions

Instructors will be expected to conduct both in class theory presentations and outside field sessions. Field sessions must include instructor demonstrations and participant practice of avalanche search and rescue techniques and devices. When weather conditions permit acceptable visibility of various avalanche terrain features (start zone, track, run out, defense structures, etc) on-site visits to one or more avalanche areas are expected. Instructors must ensure that participants understand how to initiate an avalanche rescue, know what their responsibilities are at various stages of the rescue and demonstrate an ability to locate a buried avalanche beacon within five minutes.

Record Keeping

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Instructors must record the names and affiliations of course participants including the date and location of the course. This information must be submitted to the local Snow Avalanche Technician. The Maintenance Contractor must also keep this information on file. It will be the Maintenance Contractor's responsibility to ensure that employees who require training attend as per Plan A and B Training Schedules of the *Snow Avalanche Programs, Snow Avalanche Safety Measures for Highways Manual*.

Testing and Certification

The Instructor must administer a multiple-choice test consisting of at least 10 questions and evaluate the test results before the conclusion of the training session. The test is expected to provide a summary of the most important items covered during the day of theory and field topics. Participants who pass the test will receive a certificate of successful completion. Participants who fail the test must review pertinent items with the instructor until such time that the information is fully understood. Candidates who initially failed the test will be issued a certificate only when the instructor is satisfied that the individual can correctly answer the questions that were originally incorrect.

Candidates who hold avalanche training certificates are expected to retain them throughout the duration of their employment and involvement of working within provincial avalanche hazard areas.

TRAINING COURSE DETAILS

Training Options

The *Snow Avalanche Programs, Safety Measures for Highways Manual* defines two types of training options available. Plan "A" refers to areas with significant avalanche hazards where the probability exists that avalanches may frequently affect a highway. Plan "B" refers to areas with a lower probability of avalanches affecting a highway.

Participant Frequency of Training

In order to recognize the difference between type A and B avalanche areas the training frequency for those who require training is as follows:

- *For Plan "A" areas, training will be required once every two years.*
- *For Plan "B" areas, training will be required once every three years.*

Course Frequency of Training

One-day avalanche training courses must still be provided annually in order to train new and/or auxiliary employees. By maintaining annual training sessions with attendance required only once in two or three years, the instructor - student ratio becomes more favourable and creates a more conducive learning environment.

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Instructor – Student Ratio

For in-class sessions the class size must not exceed 24 participants. For field sessions, there must be no more than eight participants per instructor.

Assistant Field Instructors

In order to maintain required instructor-student ratios, it may be necessary to provide Assistant Field Instructors. These individuals must possess a CAA Level 1 endorsement (Transportation and Resource Industry preferred) and be familiar with avalanche beacon operation and avalanche search and rescue techniques including random, coarse and vehicle probe methodology.

Assistant Field Instructors will not be required to possess an Instructional Techniques course.

Training Dates

There should be snow on the ground in order to conduct the One-Day Avalanche Safety Training. This is especially important during the avalanche beacon and probe line practice sessions.

Although it may be difficult to determine in advance whether or not there will be snow on the ground at the time of training, courses should not be scheduled until after November 1 so that there is a reasonable probability that conditions will be favourable.

If the Contractor wishes to schedule training earlier than these dates they must contact the local Snow Avalanche Technician for approval. All training must be completed by January 15.

MINISTRY INVOLVEMENT IN COURSES

Ministry Snow Avalanche Programs staff will attend training courses when they are able. When possible, Ministry Snow Avalanche Programs staff will make presentations of information they feel is pertinent for their particular area. They will not be expected to assist instructors in field sessions.

Approved One-Day Avalanche Safety Training instructors should contact the local Ministry, Snow Avalanche Programs office (two weeks notice) to determine whether or not there will be any involvement by Snow Avalanche Programs staff in scheduled courses.

ONE-DAY AVALANCHE SAFETY TRAINING TOPICS

Training courses should include the following topics:

Class Room Session

- Introductions;
- Mandate of Ministry, Snow Avalanche Programs;
- Avalanche related responsibilities of Maintenance Contractor;

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- Basic avalanche phenomenon (avalanche types, sizes classification, what causes them);
- Discussion of local avalanche terrain;
- Discussion of local avalanche occurrence trends;
- Discussion of local Avalanche Safety Measures;
- Discussion of the Five Level Avalanche Forecast Definitions and Specific Operational Procedures;
- Discussion of Search and Rescue Plans (stage 1, 2 and 3 including responsibilities of Rescue Leader, Accident Site Commander, Probe Line Leader, Dog Handler, etc.) including security, locations and methods of quickly procuring rescue equipment to the accident site;
- Avalanche training video (optional).

Field Session

- Terrain familiarization (travel to avalanche area to discuss size, frequency, toe distance mass, path boundaries, safe areas, priority paths, historic events, weather and snowpack issues, etc.);
- “What if” scenarios can be discussed (i.e., what if a vehicle gets blocked by or trapped between deposits, what if a vehicle gets caught in a deposit... etc.);
- Road closure points can be identified and what measures are used to ensure security of the area during explosives control work or during high avalanche hazard periods;
- Avalanche beacon practice. Participants should be able to find a buried beacon within five minutes;
- Avalanche random, coarse and vehicle probe line practice.

AUDIO VISUAL MATERIALS

The training agency/individual will ensure that audiovisual materials are available for each course that they provide training.

TRAINING VENUES AND LOCATIONS

One-Day Avalanche Safety Training Instructors must ensure that the designated venue for in class theory presentations is suitable and proximal to field locations (to view avalanche terrain and practice search and rescue techniques).

MATERIALS AND SERVICES PROVIDED BY THE MINISTRY

The Ministry will supply the following for One-Day Avalanche Safety Training:

- Avalanche occurrence statistics of local avalanche areas;
- Availability of local avalanche staff and Headquarters staff to discuss training course agenda topics.

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SCHEDULING AND NOTIFICATION OF COURSES

One-Day Avalanche Safety courses must be scheduled at times which allow new hire or auxiliary employees to attend.

Training dates, times and locations in addition to an agenda must be provided to participants expected to attend the training (as defined in *the Snow Avalanche Programs, Snow Avalanche Safety Measures for Highways Manual*), in addition to the local Snow Avalanche Technician. A minimum of two (2) weeks notice is required.

Notification should also indicate the requirement for fieldwork to ensure that participants are adequately dressed for spending time outside in a winter environment.

As previously indicated, training dates should occur when there is snow on the ground and must be completed prior to January 15.

INSTRUCTOR AND TRAINING COURSE AUDITS

The Ministry will periodically conduct course audits to ensure that all aspects of a course have been managed as defined in this document and that course material was sufficiently presented and understood by participants. Constructive comments will be provided, as necessary.

Course audits will also determine that those who are required to attend the training have done so. Participants who should have attended a course and failed to do so (because the Maintenance Contractor instructor failed to notify them) may result in the requirement to schedule another course.

In the event that a course has not met its intended objective, it may be necessary to schedule a make-up course with an alternate approved One-Day Avalanche Safety Training instructor.

In situations where the quality of the course was inadequate, the Ministry reserves the right to cancel the contractors ability to offer any further One-Day Avalanche Safety training to Ministry and Maintenance Contractor personnel.

Any subsequent financial costs of running additional make-up courses must be born solely by the Maintenance Contractor.