



# Snow Avalanche Safety Measures for Highways Manual



British Columbia Ministry of Transportation  
and Infrastructure  
Avalanche and Weather Programs

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# 1. Introduction

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

- Ensure the safety of all highway users; and
- Minimize the frequency and duration of avalanche-related road closures.

The maintenance contractor must comply with this manual.

## 2. Pre-Winter Meetings

Prior to the start of avalanche season, the maintenance contractor's staff responsible for working in and/or managing an avalanche area will attend a meeting with the Ministry to discuss avalanche program issues. Additional Ministry or maintenance contractor personnel may be invited or required to attend these meetings.

## 3. Training

The maintenance contractor will ensure that all personnel involved in road maintenance and operations activities in avalanche areas are trained and knowledgeable in accordance with this manual, and as specifically defined in Appendix E – Guidelines for One-Day Avalanche Safety Training.

### 3.1. Training Courses

Training is required for all workers who perform duties or supervise workers in avalanche areas. The Ministry has based the frequency of training on the avalanche risk in each avalanche area. Please refer to the training cycles (Plan A or Plan B) for specific service areas listed in Appendix A – Rescue Cache and Training Plan Lists.

The maintenance contractor must provide qualified supervision at all times in avalanche areas for their workers and sub-contractors for activities including, but not limited to:

- a) Co-ordination of road closures;
- b) Periods of elevated avalanche hazard;
- c) Avalanche deposit removal;
- d) Maintenance of static defense structures; and
- e) At the request of the Ministry.

## 4. Equipment and Materials

The maintenance contractor will be responsible for storage, maintenance, and inventory of all materials and avalanche rescue equipment initially supplied by the Ministry. The maintenance contractor will be familiar with and trained in the use of avalanche rescue equipment, as specified.

### 4.1. Avalanche Rescue Equipment

Avalanche rescue equipment is to be used only for rescue practices or emergency situations.

- a) Avalanche rescue equipment will be initially supplied by the Ministry.
- b) Replacement, updating, or upgrading of materials and avalanche rescue equipment is the responsibility of the maintenance contractor. Avalanche transceivers will not be supplied by the Ministry. The maintenance contractor is responsible to provide one avalanche transceiver for staff and sub-contractors who are working within avalanche areas during periods when an avalanche risk exists, or as directed by the Ministry.
- c) Replacement of worn or defective avalanche rescue equipment will be initiated by the maintenance contractor. Replaced materials and equipment must be of the same or better type and quality, as approved by the Ministry. The maintenance contractor must consult with the local District Avalanche Supervisor to ensure quality and compatibility with existing avalanche rescue equipment.
- d) The maintenance contractor will inventory and inspect the condition of the avalanche rescue cache equipment prior to each avalanche season (Nov 1<sup>st</sup>) and following any use of the equipment. A report on the inspection and the avalanche rescue equipment inventory will be supplied to the Ministry upon request.

### 4.2. Avalanche Transceiver Purchase, Supply, Replacement and Inventory

As avalanche transceivers need to be repaired or replaced, it is the responsibility of the maintenance contractor to purchase new avalanche transceivers. Avalanche transceivers must be digital, 3-antenna transceivers, and operate at 457khz. Prior to replacing an avalanche transceiver, the maintenance contractor must consult with the local District Avalanche Supervisor to ensure that new transceivers are of equal or better quality than existing units, and that they are compatible with existing units.

- a) The maintenance contractor will collect and retain all avalanche transceivers used by their personal or sub-contractors at the direction of the District Avalanche Supervisor.
- b) The maintenance contractor will establish and maintain an inventory of all avalanche transceivers, including date of purchase.

#### 4.2.1. *Avalanche Transceiver Distribution*

All workers involved in road maintenance and operations that perform duties in avalanche areas must wear an avalanche transceiver in “transmit” mode while working in an avalanche area during the avalanche season, or as determined by the District Avalanche Supervisor.

#### 4.2.2. *Avalanche Transceiver Testing and Use*

- a) The maintenance contractor will perform signal strength testing as per the manufacturer's specifications and recommendations to ensure proper transmission, reception, and range for each avalanche transceiver prior to issue of units. The Ministry will provide assistance (as available and if requested) to ensure quality control testing is performed properly. Avalanche transceivers will be replaced according to manufacturer's recommendations, if the unit is damaged, or if the unit is not fully functional.
- b) Avalanche transceivers must have both "transmit" and "receive" capabilities.
- c) Testing to ensure proper transmission and reception must be carried out (by the unit's user) at the beginning of each shift prior to working or travelling within avalanche areas.
- d) Avalanche transceiver battery supply and replacement is the responsibility of the maintenance contractor.
- e) Lithium or Alkaline batteries are required (rechargeable batteries must not be used).
- f) Batteries are to be replaced annually, or when the battery strength drops to or below 25% as per manufacturer's specifications and recommendations.
- g) Date of battery replacement must be recorded on a label attached to the unit or recorded on the maintenance contractor's avalanche transceiver inventory sheet.
- h) It is the maintenance contractor's responsibility to ensure that all personnel who use avalanche transceivers are trained in their use. This training must be in accordance with the Appendix E – Guidelines for One-Day Avalanche Safety Training, as defined in this manual.
- i) Avalanche transceivers must be worn and operated as per manufacturer's specifications and recommendations.
- j) Avalanche transceivers must be turned off when not in use.

#### 4.3. **Avalanche Rescue Cache Signage, Access and Lighting**

Each avalanche rescue cache must be identified with standard Ministry signs as shown in Figure 4.1.



*Figure 4.1 – Rescue Cache Signs*



- a) A large sign (FM-001) is to be located near the entrance of the building where the avalanche rescue cache is situated, and at the one-piece probe cold storage location.
- b) A small sign (FM-002) is to be located immediately beside the avalanche rescue cache (e.g.: on the door of the avalanche rescue equipment room, or on the wall beside the locker in which the avalanche rescue equipment is stored).
- c) The avalanche rescue cache must have adequate lighting.
- d) Vehicle access to the avalanche rescue cache is required at all times.
- e) The avalanche rescue caches must not be locked. The avalanche rescue equipment may be sealed in a cache with an easily removable seal. This will allow easy inspection for avalanche rescue cache tampering, and for avalanche rescue equipment replenishment. The removable seal must not restrict use during a rescue operation.

#### 4.4. Avalanche Rescue Cache Content, Storage and Maintenance

There are three standardized levels of avalanche rescue cache equipment (Level I, Level II, and Level III). The Ministry has assigned an avalanche rescue cache level to each avalanche area based on the avalanche risk to the road. Avalanche area locations and their corresponding training plans and avalanche rescue cache requirements are listed by service area in Appendix A – Rescue Cache and Training Plan Lists.

The entire avalanche rescue cache must be stored in one location.

#### 4.5. Radio Equipment

Radio communication in avalanche areas is essential.

- a) All maintenance contractor and sub-contractor vehicles must have functional, two-way radios on correct Ministry radio frequencies. Personnel working outside of their vehicles in avalanche areas, or in support of activities in avalanche areas (e.g. traffic control personnel), must be equipped with two-way radios on the correct Ministry frequency.
- b) When required, due to any noise that may affect communication, two-way radios must be equipped with an external speaker or earphones.

#### 4.6. Maintenance Vehicle Equipment

The maintenance contractor must supply and ensure that all maintenance vehicles or heavy equipment working in avalanche hazard areas are equipped with the following:

- a) Snow shovel;
- b) WorkSafeBC – Level 1 first aid kit;
- c) Flashlight;
- d) Sectional snow avalanche rescue probe;
- e) Accessible Snow Avalanche Rescue Instruction Sheet (vehicle inserts) as shown in appendix C (supplied by the Ministry).



## 5. Avalanche on Highway Search and Rescue Incident Response Plan

Avalanche search and rescue incident response plans serve as a guide to avalanche rescue and provide current contact information for a wide variety of rescue resources.

It is essential that all persons who work or supervise workers in Ministry of Transportation avalanche areas know what to do in the event of an unexpected avalanche, and how to initiate an organized avalanche rescue.

Effective rescue response at the field level requires reliable access to the Avalanche on Highway Search and Rescue Incident Response Plan section of the plan, along with appropriate training.

- a) Maintenance Contractor and plan holders must maintain the Avalanche on Highway Search and Rescue Incident Response Plan plans in good order and keep them accessible.
- b) The maintenance contractor must ensure that all workers are knowledgeable of the location(s) and trained in the use of Avalanche on Highway Search and Rescue Incident Response Plan.
- c) The maintenance contractor must ensure that vehicle inserts (Appendix C) are located and easily identifiable in all vehicles and heavy equipment that may be operating in avalanche areas.

## 6. Avalanche Hazard Forecasts and Operational Procedures

### 6.1. Avalanche Hazard Forecasts

Ministry Avalanche Technicians produce avalanche hazard forecasts as part of the safety measures to manage avalanche within Ministry of Transportation avalanche areas. Avalanche hazard forecasts are the primary means of communicating avalanche risk information to both Ministry and maintenance contractor workers. See Appendix F – Avalanche Hazard Levels and Specific Operational Procedures.

Avalanche hazard forecasts:

- a) Are produced when there is a change or update in avalanche conditions as determined by the Ministry Avalanche Technician;
- b) Identify the area of concern, the expected duration of the forecast, and the reason for the change in forecast level;
- c) Are provided to the maintenance contractor by Ministry radio system or telephone, and/or posted electronically;
- d) May cover a large geographic area or be specific to a small localized area;
- e) Reflect the highest hazard within the avalanche risk forecast area; and
- f) Will include notification of avalanche season commencement and finish, and required maintenance contractor action.

Upon Receipt of an avalanche hazard forecast:

- a) The hazard forecast level must be communicated to those who may be working in the avalanche area; and
- b) The current avalanche hazard forecast must be posted in a location where workers, including those coming on shift, will have ready access to the posting (e.g. on a bulletin board).

### 6.2. Operational Procedures

The maintenance contractor must adhere to general and specific winter operational procedures when working within avalanche areas (see Appendix A – Rescue Cache and Training Plan Lists for locations of avalanche areas). These procedures will ensure that work is conducted effectively, efficiently, and safely within an avalanche area. Specific operational procedures are based on the avalanche hazard forecast level. They are safety measures, activities, and responsibilities that the maintenance contractor must adhere to throughout the avalanche season.

#### 6.2.1. General Winter Operational Procedures

The maintenance contractor must ensure that all crews working within an avalanche area are aware of this section, and that work is conducted in accordance with the defined procedures.

The maintenance contractor will:

- a) Be familiar with the avalanche areas within their service areas (see Appendix A – Rescue Cache and Training Plan Lists);
- b) Monitor and report, in a timely manner, any significant changes in the following to the Ministry Avalanche Technician as soon as possible:
  - Avalanche occurrences on or near the road; or
  - A change in weather, such as increased snowfall intensity, onset of rain, rising temperature, and increased wind;
- c) Monitor weather forecasts;
- d) Receive, post, and disseminate the avalanche hazard forecasts to workers and sub-contractors immediately upon first receipt;
- e) Have a communications mechanism available which ensures that staff coming to work on subsequent shifts are informed of the current avalanche hazard forecast;
- f) Maintain communication with the Ministry Avalanche Technician regarding changes in weather conditions or avalanche activity, and changes in avalanche hazard forecast level;
- g) Ensure that avalanche rescue equipment is maintained and ready for use;
- h) Ensure that maintenance staff conduct patrols of the avalanche area for changing conditions and avalanche activity as requested by the Ministry Avalanche Technician;
- i) Ensure that traffic is not stopped for avalanche control or any other purpose within avalanche areas signed as follows, unless otherwise directed by the District Avalanche Supervisor:
  - P-104 No Stopping Avalanche Area;
  - W-106 End Avalanche Area;
- j) Ensure that all equipment used within an avalanche area is sufficiently equipped to operate safely and efficiently.

#### 6.2.2. *Specific Operational Procedures*

Specific operational procedures are the safety measures, activities, and responsibilities of the maintenance contractor specific to each avalanche hazard forecast level. The maintenance contractor must respond to these procedures for the duration of the avalanche hazard forecast period. The maintenance 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 specific operational procedures. See Appendix F – Avalanche Hazard Levels and Specific Operational Procedures.

The specific operational procedures along with expected avalanche activities are listed by avalanche forecast level below:

### **Low Hazard:**

Avalanche activity forecast: Avalanches are unlikely or small avalanches are possible, but are expected to terminate far above the road.

Specific operational procedures: When the avalanche hazard forecast is **LOW**, the maintenance contractor may proceed with normal operations. The maintenance contractor will:

- Remove snow and debris from avalanche catchment areas;
- Remove snow and debris from static avalanche defense structures, unless directed not to by the District Avalanche Supervisor; and
- Maintain previously announced road closures to allow for avalanche patrols, and for the removal of snow and/or avalanche deposits from the road.

### **Moderate Hazard:**

Avalanche activity forecast: Small avalanches are probable but are expected to terminate above the road and/or large avalanches are possible, but are expected to terminate far above the road.

Specific operational procedures: When the avalanche hazard forecast is **MODERATE**, the maintenance contractor will:

- Notify the District Avalanche Supervisor if there is a change in weather such as increased wind speed, rise in temperature, and/or increased snowfall intensity;
- Notify the District Avalanche Supervisor immediately after observing NEW avalanche occurrences;
- Ensure there are no personnel working outside of vehicles within avalanche areas, unless approved by the District Avalanche Supervisor;
- Ensure there is no equipment working outside of the travel lanes and shoulders of the road within avalanche areas, unless approved by the District Avalanche Supervisor;
- Take interval weather and/or avalanche occurrence observations, as requested by the District Avalanche Supervisor;
- Be prepared for road closures/delays as a result of unexpected natural avalanche activity on the road or explosives avalanche control, as requested by the District Avalanche Supervisor; and
- Maintain previously announced road closures to allow for avalanche patrols, and for the removal of snow and/or deposits from the road.

### **Considerable Hazard:**

Avalanche activity forecast: Small avalanches may affect the road; and/or large avalanches are probable, but are expected to terminate above the road; and/or snow dust events may affect the road.

Specific operational procedures: When the avalanche hazard forecast is **CONSIDERABLE**, the maintenance contractor will:

- Notify the District Avalanche Supervisor if there is a change in weather such as increased wind speed, rise in temperature, and/or increased snowfall intensity;
- Notify the District Avalanche Supervisor immediately after observing NEW avalanche occurrences;
- Ensure there are no personnel working outside of vehicles within avalanche areas, unless approved by the District Avalanche Supervisor
- Ensure there is no equipment working outside of the travel lanes and shoulders of the road within avalanche areas, unless approved by the District Avalanche Supervisor;
- Ensure there is no stationary equipment working within avalanche areas, unless approved by the District Avalanche Supervisor;
- Ensure safety of personnel by performing one of the following:
  - Radio call-in when entering and exiting avalanche areas<sup>1</sup>;
  - Radio call-in at least every 30 minutes<sup>1</sup>; or
  - Plow in tandem (second vehicle may be a pick-up or another plow truck);
- Take interval weather and/or avalanche occurrence observations, as requested by the District Avalanche Supervisor;
- Be prepared for road closures/delays as a result of unexpected natural avalanche activity on the road or explosives avalanche control, as requested by the District Avalanche Supervisor; and
- Maintain previously announced road closures to allow for avalanche patrols, and for the removal of snow and/or deposits from the road.

### **High Hazard:**

Avalanche activity forecast: Numerous small avalanches are expected to affect the road and/or one or more large avalanches are expected to affect the road.

Specific operational procedures: When the avalanche hazard forecast is **HIGH**, the maintenance contractor will:

- Close and sweep the road between standard closure locations (as determined by the District Avalanche Supervisor) using standard closure procedures;

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<sup>1</sup> 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.

- Ensure there is no equipment or personnel working within the avalanche closure area, except for:
  - Sweep vehicles (continue radio call-ins at increased frequency);
  - Avalanche Program vehicles and personnel; and
  - Snow maintenance equipment, provided they operate in safe areas and do not enter avalanche hazard areas (as determined by the District Avalanche Supervisor)<sup>2</sup>; and
- Take interval weather observations from weather stations with safe access, as requested by the District Avalanche Supervisor.

### **Extreme Hazard:**

Avalanche activity forecast: Numerous, large avalanches are expected to affect the road.

Specific operational procedures: When the avalanche hazard forecast is **EXTREME**, the maintenance contractor will:

- Close and sweep the road between standard closure locations (as determined by the District Avalanche Supervisor) using standard closure procedures;
- Ensure there is no equipment or personnel working within the avalanche closure area; and
- Take interval weather observations from weather stations with safe access, as requested by the District Avalanche Supervisor.

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<sup>2</sup> This is possible because many standard closure locations are located outside of avalanche hazard boundary locations.

## 7. Avalanche and Weather Observations

### 7.1. Recording Avalanche Occurrence Observations

As indicated in the specific operational procedures, reporting of avalanche occurrence is an ongoing responsibility of the maintenance contractor. The maintenance contractor will:

- Immediately notify the Ministry Avalanche Technician of any snow avalanche occurrences above or on the road;
- Report avalanche occurrence observations using form H664, unless otherwise directed by the District Avalanche Supervisor; and
- Report any significant change in the weather including, but not limited to: heavy snowfall, rain, wind, or temperature.



## 8. Avalanche-Related Road Closures

### 8.1. Standard Closure Procedures

The maintenance contractor will conduct road closure procedures as follows:

- a) Traffic control and road closures through snow avalanche areas will be performed by the maintenance contractor.
- b) The maintenance contractor will be aware of standard closure locations (see Appendix D – Road Closure Locations).
- c) During a closure, road hazard areas are closed to all personnel except:
  - Those conducting the sweep;
  - Those conducting avalanche patrols;
  - Avalanche control personnel; and
  - Other personnel specifically approved by the District Avalanche Supervisor.
- d) The maintenance contractor must have a qualified supervisor available during an avalanche closure.
- e) The maintenance contractor will ensure that sufficient personnel who are familiar with road closure procedures will be available at all times to initiate and maintain road closures at the request of the Ministry Area Manager or Ministry Avalanche Technician.
- f) The maintenance 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 Avalanche Technician with respect to road closure information.
- g) Identify the exact location of the requested closure as per Appendix D – Road Closure Locations, or upon the direction of the Ministry Avalanche Technician.
- h) During closures, the traffic must not be stopped within the signed Avalanche Areas unless approved by the District Avalanche Supervisor.
- i) Road closure warning signs are to be displayed in areas where closures exist, on all roads that access avalanche areas, or where there are barrier gates, they will be lowered, manned, or locked, and a sweep will be completed.
- j) 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.
- k) The maintenance contractor will ensure that the closure area is secured by a sweep (supervised evacuation) of the area.
- l) A physical check of the entire avalanche closure area must be completed by the sweep personnel.
- m) There may be times when an avalanche deposit blocks a road before a closure is initiated or before the sweep is complete. In these instances, sweep personnel must travel from each end of the closure area up to the site of the avalanche deposit in order to ensure no persons or vehicles remain in the closure area. If

there are vehicles unable to turn around, the occupants must be persuaded to leave their vehicles and evacuate the area in another vehicle (in most instances the sweep vehicle).

- n) The maintenance contractor will confirm sweep and closure locations to the Ministry Avalanche Technician.
- o) The Ministry Avalanche Technician must be notified of the location of any unattended parked vehicles. The maintenance contractor will place a notice on the windshield advising the driver not to move the vehicle.
- p) The maintenance contractor will confirm the completion of the sweep to the Ministry Avalanche Technician.
- q) The Ministry Avalanche Technician will inform the maintenance contractor when to re-open the road.
- r) At that time, road closure signs will be changed or removed by the maintenance contractor to indicate that the road has re-opened.
- s) The maintenance contractor will comply with the maintenance specifications along the road, and remove avalanche deposits within an avalanche closure area only when directed by the Ministry Avalanche Technician.

## 8.2. 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 D – Road Closure Locations.

Other safe closure locations may be identified by the District Avalanche Supervisor.

## 8.3. Avalanche Area Emergency Evacuation

Convoying is a method that may provide an adequate measure of safety during the emergency evacuation of an avalanche area. The objective of a convoy is to move traffic out of avalanche areas to safe locations.

Convoys must only be used under the following circumstances:

- a) To move people who are caught within an avalanche closure area to a safe location;
- b) In emergency situations, upon the recommendation of the District Avalanche Supervisor; or
- c) To be prepared for a rescue.

Convoys must adhere to the following safety measures:

- a) Traffic control personnel must be in place at the closure gates or the locations where the convoy is to be used.
- b) Depending upon the recommendation of the District Avalanche Supervisor, each motorist may need to be given detailed directions as to what is expected. For example:
  - 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.
- c) For convoys over short distances where the vehicles will be visible to the traffic control personnel at all times, the situation may be controlled by the traffic control personnel.
- d) For convoys over long distances, pilot cars in front of and/or behind the convoy are to be used to keep radio control of the convoy, and to facilitate a rescue.
- e) Personnel responsible for the convoy must be radio-equipped with Ministry frequency and have rescue equipment immediately available.
- f) A sweep of the area must be performed during the convoy operation.
- g) During convoy operations, loaders must be kept close to areas where avalanches are expected.

## Appendix A – Rescue Cache and Training Plan Lists

Service Area #	Service Area Name	Avalanche Program	Rescue Cache Location	Cache Level	Avalanche Area(s)	Training Plan
4	Howe Sound	Coast Chilcotin, Pemberton	Pemberton	1	Pemberton - D'Arcy	A
			Rohr Ridge Sand Shed	3	Duffey Lake	A
7	Fraser Valley	North Cascades, Hope	Allison Pass	2	Allison Pass	B
			Boston Bar	2	Fraser Canyon-South	A
			Hope	3	Coquihalla South	B
			Deroche	3	Hemlock Valley Road	B
8	South Okanagan	Central, Penticton	Princeton	2	Coalmont	B
					Princeton North	B
			Penticton	2	Apex Alpine Road	B
9	Kootenay Boundary	Kootenay, Nelson	Grand Forks Maint. Yard	2	Blueberry-Paulson	A
					Grand Forks North	A
			Birchbank	2	Seven Mile Dam	B
					Castlegar Bluffs	B
					Sheep Creek	A
					Blueberry - Paulson	A
10	Central Kootenay	Kootenay, Nelson	Winlaw Maint. Yard	3	Cape Horn Bluffs	A
					Vallican Bluffs	A
			New Denver	2	New Denver - Kaslo	A
					Sandon Cody	A

Service Area #	Service Area Name	Avalanche Program	Rescue Cache Location	Cache Level	Avalanche Area(s)	Training Plan
					Hills / Silverton	A
10	Central Kootenay	Kootenay, Nelson	Kaslo Maint. Yard	2	Coffee Creek	A
					New Denver - Kaslo	A
			Cooper Ck Yard	3	Lardeau	A
			Nakusp	2 +Toboggan kit	Hills - Summit Lake	A
					Nakusp Hotsprings Rd.	A
					Nakusp South	A
					Nakusp North	A
			Nelson Maint. Yard	2	Whitewater Road	A
					Coffee Creek	A
					Vallican	A
		Kootenay Pass	Kootenay Pass	1	Kootenay Pass	A
		Columbia, Revelstoke	Trout Lake	3	Hwy 31 S - Trout Lake	A
					Galena Pass	A
11	East Kootenay	Kootenay, Nelson	Elko Maint. Yard	2	Fernie	B
					Elko	B
			Cranbrook Maint. Yard	3	St. Mary's	A
			Fairmont Maint. Yard	2	Toby Creek	A
			Sparwood	3	Corbin	B
					Morrissey	B

Service Area #	Service Area Name	Avalanche Program	Rescue Cache Location	Cache Level	Avalanche Area(s)	Training Plan
	Golden / Kicking Horse	Columbia, Golden	Golden Maintenance Yard	1	Hwy 1 Kicking Horse	A
12	Selkirk	Columbia, Revelstoke	Revelstoke	1	Trans-Canada Highway West of Revelstoke	A
					Greenslide	A
			Albert Canyon	2	Trans-Canada Highway East of Revelstoke	A
			55 Mile Camp	2 + Toboggan kit	Hwy 23 North	A
			Mica Dam Hill	3	Hwy 23 North	A
13	Okanagan-Shuswap	Central, Penticton	Chase	2	Chase	B
			Cherryville	2	Monashee Pass	B
14	Nicola	North Cascades, Hope	Lytton	2	Fraser Canyon North	B
			Coldwater	1	Coquihalla	A
			Merritt	N/A	Coquihalla	B
15	Thompson	Central, Penticton	Clearwater	2	Clearwater	B
			Barriere	2	Barriere - Little Fort	B
16	South Cariboo	Coast Chilcotin, Pemberton	Lillooet	1	Duffey Lake	A
					Marble Canyon	A
					Big Slide	A
			Bridge River	1	Bridge River	A
17	Central Cariboo	Central, Penticton	Anaheim	2	Heckman Pass	A

Service Area #	Service Area Name	Avalanche Program	Rescue Cache Location	Cache Level	Avalanche Area(s)	Training Plan
			Bella Coola	2	Bella Coola	A
					Heckman Pass	A
18	North Cariboo	Central, Penticton	Wells	2	Quesnel - Bowron Lk	A
20	Robson	Central, Penticton	Tete Jaune	2	Red Pass	A
					Albreda	A
21	South Peace	Central, Penticton	Mt. Lemoray	2	Pine Pass	B
			Honeymoon Creek	2	Pine Pass	B
25	Bulkley Nass	Bear Pass, Stewart	Meziadin	1	Bear Pass	A
		Bear Pass, Stewart	Stewart	1	Bear Pass	A
					Stewart - Hyder	A
					Stewart - Mt Rainey	A
		Northwest, Terrace	Smithers	3	Doris Lake	B
26	Skeena	Northwest, Terrace	Terrace	1	Exstew-Rainbow Summit	A
					Terrace - Cedarvale	B
					Shames Mountain Road	B
			Nass Camp	3	Greenville-Kincolith	B
27	North Coast	Northwest, Terrace	Prince Rupert	1	Rainbow Summit and Kwinita to Telegraph rest area	A
28	Stikine	Northwest, Terrace	Bob Quinn	2	Ningunsaw Pass	A
			Dease Lake	1	Moose Pasture	B



Service Area #	Service Area Name	Avalanche Program	Rescue Cache Location	Cache Level	Avalanche Area(s)	Training Plan
			Cassiar	2	Cassiar Pass	B
			Telegraph Creek	3	Telegraph Creek	B

## Appendix B – Rescue Cache Inventory Lists

There are three levels of Avalanche Rescue Cache: Level I, II and III. The appropriate level of Avalanche Rescue Cache for each avalanche area is identified in Appendix A – Rescue Cache and Training Plan Lists.

Avalanche Rescue Caches contain Task Force Team Leader avalanche rescue equipment that is intended for transport to the avalanche rescue site at an early stage in the rescue. Task Force Team Leader avalanche rescue equipment is contained in backpacks that are each intended to supply a small party of 4 to 6 rescuers.

Strike Team avalanche rescue equipment consists of gear stored and transported in backpacks, as well as items too large for the packs. This includes items such as: one piece avalanche probes, extra marking wands, rescue toboggans etc. This equipment is intended to supply large groups of rescuers during an extended rescue operation.

The lists below must be photocopied or printed for use when checking the condition of the equipment, replacing batteries, and documenting the inventory of the rescue caches.

Level 1 Avalanche Rescue Cache Equipment List (20 Rescuers)		
Level 1 – <b><u>Task Force Team</u></b> – Avalanche Rescue Equipment		
Content	Quantity	Audited
Large waterproof back pack / duffle	1	
Identified Task Force Team with equipment listed in pack /duffle	1	
On Site Supervisor / green vest	1	
Avalanche on Highway Search and Rescue Plan with pencil	1	
Collapsible +3 metre probes	5	
Collapsible shovels	5	
Marking wands - orange- access and egress	10	
Marking wands - yellow - borders	10	
Marking wands - red - searched areas	10	
Marking wands - blue - persons and objects found	10	
Flagging tape roll - orange	1	
WSBC Level 1 first aid kit	1	
Chemical heat pack	10	
Reinforced space blanket	3	
Synthetic blanket	3	
Small air horn	1	
Chemical glow sticks	5	
Headlamps	6	
Bright lantern	2	

Level 1 – <b><u>Strike Team</u></b> – Avalanche Rescue Equipment		
Content	Quantity	Audited
Large waterproof back packs/ duffle	3	
Identified task force tags -equal distributed equip listed per pack	3	
Collapsible shovels	15	
Collapsible + 3 metre probes	10	
Threaded +3 metre probe	10	
Solid +3 metre probe	20	
Marking wands - orange - access and egress	10	
Marking wands - yellow - borders	15	
Marking wands - red - searched areas	15	
Marking wands - blue - persons and objects found	10	
WSBC Level 1 first aid kit	3	
Chemical heat packs	20	
Synthetic blanket	3	
Reinforced space blanket	3	
Air horn	1	
Loudhailer	1	
Headlamps	15	
Lanterns	5	
Rope 30 metre x 9mm	1	

Level 1 – <b><u>Strike Team</u></b> – Avalanche Rescue Toboggan		
Content	Quantity	Audited
Cascade rescue toboggan	1	
Burrito roll tarp 9' x 6'	1	
Wool blankets	3	
WSBC Level 1st first aid kit	1	
Joint immobilization splint set	1	
Clam shell, backboard, spider straps and adjustable collar	1	

Level 2 Avalanche Rescue Cache Equipment List (10 rescuers)		
Level 2 – <b><u>Task Force Team</u></b> – Avalanche Rescue Equipment		
Content	Quantity	Audited
Large waterproof back pack / duffle	1	
Identified Task Force Team with equipment listed in pack	1	
On Site Supervisor / green vest	1	
Avalanche on Highway Search and Rescue Plan with pencil	1	
Collapsible +3 metre probes	5	
Threaded +3 metre probe	5	
Collapsible shovels	5	
Marking wands - orange - access and egress	10	
Marking wands - yellow - borders	10	
Marking wands - red - searched areas	10	
Marking wands - blue - persons and objects found	10	
Flagging tape roll - orange	1	
WSBC Level 1 first aid kit	1	
Chemical heat pack	10	
Reinforced space blanket	3	
Synthetic blanket	3	
Small airhorn	1	
Chemical glow sticks	5	
Headlamps	6	
Bright lantern	1	

Level 2 – <b><u>Strike Team</u></b> – Avalanche Rescue Equipment		
Content	Quantity	Audited
Large waterproof back pack / duffle	1	
Identified Strike Team with equipment listed in pack	1	
Collapsible shovels	5	
Collapsible + 3 metre probes	10	
Marking wands - orange - access and egress	10	
Marking wands - yellow - borders	10	
Marking wands - red - searched areas	10	
Marking wands - blue - persons and objects found	10	
Synthetic blanket	3	
Reinforced space blanket	3	

Level 3 Avalanche Rescue Cache Equipment List (5 Rescuers)		
Level 3 – <b><u>Task Force Team</u></b> – Avalanche Rescue Equipment		
Content	Quantity	Audited
Large waterproof back pack / duffle	1	
Identified Task Force Team with equipment listed in pack	1	
On Site Supervisor / green vest	1	
Avalanche on Highway Search and Rescue Plan with pencil	1	
Collapsible +3 metre probes	5	
Collapsible shovels	5	
Threaded +3 metre probe	5	
Marking wands - orange - access and egress	10	
Marking wands - yellow - borders	10	
Marking wands - red - searched areas	10	
Marking wands - blue - persons and objects found	10	
Flagging tape roll - orange	1	
WSBC Level 1 first aid kit	1	
Chemical heat pack	10	
Reinforced space blanket	3	
Synthetic blanket	3	
Small air horn	1	
Chemical glow sticks	5	
Headlamps	6	
Bright lantern	1	

## **Appendix C – Maintenance Contactor Vehicle Inserts and Avalanche Occurrence Report**

**\*Must be in all maintenance contractor and sub-contractor vehicles and heavy equipment.**

### **VEHICLE OR PERSON IN AVALANCHE**

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

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

#### **1. HOLD WITNESSES**

#### **2. Record the Preliminary Incident Particulars:**

Location of avalanche (road or highway, Avalanche Area, path number):

\_\_\_\_\_

Date and time of the avalanche: \_\_\_\_\_

Avalanche size: \_\_\_\_\_

Any people or vehicles buried? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

#### **3. NOTIFY the Transportation Management Center BC (TMCBC) and relay the incident particulars.**

Use M.O.T. Radio **\*0**, OR phone 1-866-707-7862

**4. MOVE PEOPLE AND TRAFFIC** to a safe location.

**5. ASSESS AVALANCHE HAZARD** before taking action and activating rescue plan. An Avalanche Technician will call you.

**6. USE RESCUE PLAN**

### **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 TMCBC Radio Room** with:

Preliminary incident particulars

Date and time of incident

Location (path number, nearest landmark)

Number of Vehicles and Persons in Incident

**6. Ensure rescue transceiver 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 transceiver 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.



## Occurrence Report H664 – 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 road in km or miles.

e.g.: Avalanche path 26.0

	2	6	.	0	0
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### 3. Date of occurrence:

- Must be entered on all reports.
- Enter the year, month, and day of the occurrence.

e.g.: January 4, 2017

1	7	0	1	0	4
Yr.		Mo.		Day	

### 4. Time of occurrence

Estimated time:

- Must be entered on all reports.
- For known time of occurrence (time *not* estimated): The exact time in hours and minutes is entered, and 00 is entered for time estimated within +/-.
- To estimate the time of an avalanche occurrence: Determine the most likely time of occurrence, and estimate how many hours on either side of that time it is likely that the avalanche occurred.
- An avalanche occurring at an unknown time during the night can be listed as such (e.g. "the middle of the night"), with a "*time estimated within*" listed to cover the entire range of unknown time.

e.g.: A patrol occurred January 5, 2017, at 1700 hrs, and no avalanche occurrences were noted. When a morning patrol was undertaken at 0900 hours on January 6, 2017, an avalanche deposit was observed in a particular path. The time entered should be: 0100 (January 6, 2017) +/- 08 hrs.

5. 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 road was closed.

**Destructive Potential**

6. 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	Destructive Potential
1	The avalanche was too small to injure a person.
2	The avalanche could bury, injure, or kill a person.
3	The avalanche could bury and destroy a car, damage a truck, destroy a small building, or break a few trees.
4	The avalanche could destroy a railway locomotive, large truck, several buildings, or a forest with an area up to 4 ha (about 10 acres).
5	The avalanche could destroy a village or a forest with an area of 40 ha.
Half-sizes	for example, 1.5, 3.5, etc. May be used for avalanches that fall between two size classifications.

**Initiation**

7. 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.

8. Release level in:

a) 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.

b) Start aspect:

- Circle one number corresponding to the start aspect of the avalanche.
- The start aspect is the *direction of the slope faces*, not the direction an individual is facing to observe the aspect.
- When the avalanche started in multiple zones, note the main start aspect.

9. 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, respectively.

10. Trigger:

- Circle the number beside the phrase that 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

11. 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.

12. Terminus:

- Do not complete unless instructed by Avalanche Technician.

13. Toe distance from:

- Measure or estimate the distance in metres from the road edge. This is the road edge nearest the path to the toe of the avalanche deposit (not including snowdust deposit).
- If the toe ended on the road edge, enter 0.0 m.
- If the toe of the avalanche deposit is upslope of the road edge, record the value as a negative number.
- If the toe of the avalanche deposit is on or beyond the road (downslope of the road), record the value as a positive number.

14. Snowdust distance:

- Where applicable, record the distance (in metres) of the toe of the snowdust deposit from road edge.
- If the toe of the snowdust deposit is upslope of the road edge, record the value as a negative number.
- If the toe of the snowdust deposit is on or beyond the road (downslope of the road), record the value as a positive number.

15. Length of road buried:

- When the mass deposit affects the road, estimate or measure the affected length, in metres.
- If only the snowdust of an avalanche affected the road, enter the length of road affected by the snowdust.
- Circle the appropriate “estimated” or “measured” code.

16. Maximum depth on road:

- Measure or estimate the maximum depth of snow on the road to the nearest 1/10 of a metre.
- Circle “measured” or “estimated”.

17. Average depth on road:

- Estimate the average depth of snow on the road to the nearest 1/10 of a metre.

18. Length of deposit:

- Measure or estimate the average length of the deposit, in metres.

19. Width of deposit:

- Measure or estimate the average width of the total deposit, not just the portion affecting the road (in metres).

20. Depth of deposit:

- Measure or estimate the average depth of the total deposit to the nearest 1/10 of a metre.

## Incident

### 21. Incident:

- If an incident occurred, circle the appropriate number.
- Explain further in the comments section.

Incident	Examples
1	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 – Damage	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.
3 – Injury	Incident resulting in bodily injury or death. No property damage.
4 – Damage & Injury	Combination of 2 and 3.

## Miscellaneous

### 22. Comments:

- In the shaded space provided, give details of any incidents or damage, or anything unusual about the avalanche occurrence such as: rock and/or trees in the deposit, air blast damage, unusual trigger, etc.
- You may also clarify any information in the above section.

### 23. Observer:

- Please print the initials of the observer of the above information.
- This assists those 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 snow dust lengths and widths are measured to the nearest metre.
- Deposit dimensions are measured 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 and District Avalanche Supervisor in your area.
- Additional Avalanche Occurrence Report forms (H664) can be obtained from your Ministry Area Manager or District Avalanche Supervisor.

## Appendix D – Road Closure Locations

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
7	North Cascades	15100	FRASER CANYON	1	Boston Bar South	Southbound double gates 1 km north of Anderson Creek Bridge.	Double Gate
					Kanaka Bar	Southbound double gates at Siwash Creek.	Double Gate
					Yale	Northbound double gates at Yale	Double Gate
					Falls Creek	Northbound at Large Yellow Gate	Gate
					Yale to Jackass	Yale to Jackass mtn	No Gate
					Boston Bar North	Northbound single gate at the north end of Boston Bar.	Single Gate
					Hope	Northbound single gate north of Ross Road.	Single Gate
					Spences Bridge		Single Gate
					Spuzzum North	Northbound single gate at the north end of Spuzzum.	Single Gate
					Spuzzum South	Southbound single gate at the south end of Spuzzum.	Single Gate
					Top of Florence Hill	Southbound single gate north of Florence Pit.	Single Gate
14	North Cascades	15100	FRASER CANYON	1	Boston Bar South	Southbound double gates 1 km north of Anderson Creek Bridge.	Double Gate
					Kanaka Bar	Southbound double gates at Siwash Creek.	Double Gate
					Lytton	Near Maintenance Yard Southbound Closure	No Gate
					Yale	Northbound double gates at Yale	Double Gate
					Falls Creek		No gate
					Yale to Jackass	Yale to Jackass mtn	No gate
					Boston Bar North	Northbound single gate at the north end of Boston Bar.	Single Gate
					Hope	Northbound single gate north of Ross Road.	Single Gate
					Spences Bridge		Single Gate
					Spuzzum North	Southbound single gate at the north end of Spuzzum.	Single Gate
					Spuzzum South	Northbound single gate at the south end of Spuzzum.	Single Gate
					Top of Florence Hill	Southbound single gate north of Florence Pit.	Single Gate
7	North Cascades	15300	ALLISON PASS	3	Engineers Road	Eastbound closure at Engineers Road near Foundation Mines (double gates).	Double Gate
					Similco Mine	Double Gates near entrance road to Similco Mine West of Princeton.	Double Gate
					Allison Summit	Westbound closure at maintenance yard (double gates).	Double Gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
7	North Cascades	15300	ALLISON PASS	3	Burn Hill	Eastbound closure at the bottom of Burn Hill, west of path 50.4 at wood park sign.	No gate
					Eastgate	Westbound closure at east entrance of Manning Park (bear carving).	No gate
					Hope Slide Brake Check	Westbound closure at Brake Check.	No gate
					Manning Park Resort	Westbound closure across highway from resort.	No gate
					Manning Park Ski Hill	Eastbound closure at parking lot.	No gate
					Mule Deer West	Westbound 0.5 km east of Mule Deer Campground.	No gate
					Mule Deer East	Eastbound closure at the Hampton Campground.	No gate
					Similkameen Falls	Eastbound closure at Garret Road 2km east of East Gate.	No gate
					Similkameen Falls	Westbound closure	No gate
					Manning Park Ski Hill	Parking lot entrance	No gate
					Gibson Pass		No gate
					Manning West Gate	Westbound closure at Manning Park west entrance.	No gate
					Strawberry Flats Parking Lot	East or Westbound closure at the parking lot.	No gate
					Nine Mile Hill (Hope)	Eastbound closure bottom of hill at Nicolum Creek Bridge.	Single Gate
					Sunshine Valley	Eastbound Closure	
					Princeton	Closure gate across from Mohawk service station.	Single Gate
8	North Cascades	15300	ALLISON PASS	3	Engineers Road	Eastbound closure at Engineers Road near Foundation Mines (double gates).	Double Gate
					Similco Mine	Double Gates near entrance road to Similco Mine West of Princeton.	Double Gate
					Allison Summit	Westbound closure at maintenance yard (double gates).	Double Gate
					Burn Hill	Eastbound closure at the bottom of Burn Hill, west of path 50.4 at wood park sign.	No gate
					Eastgate	Westbound closure at east entrance of Manning Park (bear carving).	No gate
					Hope Slide Brake Check	Westbound closure at Brake Check.	No gate
					Manning Park Resort	Westbound closure across highway from resort.	No gate
					Manning Park Ski Hill	Eastbound closure at parking lot.	No gate
					Mule Deer West	Westbound 0.5 km east of Mule Deer Campground.	No gate
					Mule Deer East	Eastbound closure at the Hampton Campground.	No gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
8	North Cascades	15300	ALLISON PASS	3	Similkameen Falls East	Eastbound closure at Garret Road 2km east of East Gate.	No gate
					Similkameen Falls West	Westbound closure at Placer Similkameen Forrest Service Road.	No gate
					Ski Hill Road	Westbound closure ski hill road at Manning Park Resort	No gate
					Gibson Pass		No gate
					Manning West Gate	Westbound closure at Manning Park west entrance.	No gate
					Strawberry Flats Parking Lot	East or Westbound closure at the parking lot.	No gate
					Nine Mile Hill	Eastbound closure bottom of hill at Nicolum Creek Bridge.	Single Gate
					Princeton	Closure gate across from Mohawk service station.	Single Gate
7	North Cascades	15400	MT. CHEAM FLOODS	1	Flood East	Trans Canada East of Flood Paths	No gate
					Flood West	Trans Canada Highway West of Flood Paths	No gate
		15500	HEMLOCK VALLEY	Hemlock Ski Rd	Hemlock Valley North	Single Gate South of Hemlock Ski Hill.	Single Gate
					Hemlock Valley South	Single gate immediately south of catchment wall near Sakwi Creek on Hemlock Ski Hill road.	Single Gate
8	Central	24100	APEX MT.	Apex Mountain Rd	Braketing path 12 & 10		Single Gate
		24200	COALMONT	Coalmont Rd	Brookmere Turnoff		No gate
					Tulameen		No gate
					Coalmont		Single Gate
					Peterson's Bluff		Single Gate
		24300	PRINCETON NORTH	5A	Hwy 5A Gulliford Lake to Princeton		No gate
7	North Cascades	25200	COQUIHALLA	5	Peers Creek	Northbound at Peers Creek interchange. Highway gates in place and on the ramp as well.	Double Gate
					Falls Lake	Southbound closure is at the southbound onramp.	No gate
					Juliet Creek	Southbound closure at the southbound onramp.	No gate
					Larson Hill North	Northbound closure at Brookmere Bridge.	No gate
					Larson Hill South	Larson Hill Interchange Southbound closure at southbound onramp.	No gate
					Mine Creek	Northbound closure at the northbound onramp.	No gate



Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
7 or 14	North Cascades	25200	COQUIHALLA	5	Portia	North bound closure is at off ramp.	No gate
7	North Cascades	25200	COQUIHALLA	5	Sowaqua Creek	Exit 192 southbound closure is located at southbound onramp.	No gate
					Zopkios Northbound	Northbound at northbound onramp.	No gate
					Zopkios Southbound	At the break check offramp	No gate
					Falls Lake to Zopkios		No gate
					Merritt	Southbound closure at Coldwater interchange at Merritt	No gate
					Toll Booth	North or Southbound closure	No gate
14	North Cascades	25200	COQUIHALLA	5	Peers Creek	Northbound at Peers Creek interchange. Highway gates in place and on the ramp as well.	Double Gate
					Falls Lake	Southbound closure is at the southbound onramp.	No gate
					Juliet Creek	Southbound closure at the southbound onramp.	No gate
					Larson Hill North	Larson Hill Interchange Southbound closure at southbound onramp	No gate
					Larson Hill South	Northbound closure at bridge over Coldwater	No gate
					Mine Creek	Northbound closure at the northbound onramp.	No gate
					Portia	North bound closure is at off ramp.	No gate
					Sowaqua Creek	Exit 192 southbound closure is located at southbound onramp.	No gate
					Zopkios Northbound	Northbound at northbound onramp.	No gate
					Zopkios Southbound	At the break check offramp	No gate
					Falls Lake to Zopkios		No gate
					Merritt	Southbound closure at Coldwater interchange at Merritt	No gate
					Toll Booth	Southbound closure	No gate
16	Coast/ Chilcotin	26100	BRIDGE RIVER	Bridge River Rd	Apple Spring Gate	0.2km west of Applespring Ck	Double Gate
					Hydro Sand Shed	0.6km west of White rock path 44.0	Double Gate
					Tyaughton Junction	West of Tyaughton Lk Rd and Rd 40 junction	Double Gate
					Yalakom Gate	50m west of Yalakom River bridge	Double Gate
					Bluenose North	0.7km northeast of the end of path #42 at the top of the hill.	No gate
					Bluenose South	0.7km southwest of the end of Path #42.0 at the turnaround.	No gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
16	Coast/ Chilcotin	26100	BRIDGE RIVER	Bridge River Rd	Tyaughton Lake Rd Gate	1.2km north of the Rd 40 junction by Mowson Pond	Single Gate
					Bralorne Gate	0.2km north of Bralorne at the south end of avalanche path #117	Single Gate
					Goldbridge end gate	On Rd 40 100m east of the Goldbridge bridge.	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
4	Coast/ Chilcotin	26200	DUFFEY LAKE	99	Blowdown Gate	2km north of Blowdown Ck bridge at junction of Blowdown Ck FSR	Double Gate
					Lilloet Lk Gate	0.2km southwest of Lower Joffre Ck bridge at Lilloet Lake FSR junction	Double Gate
					Balbirnie Pit	2.0km north of Evans pit bridge	No gate
					Boat Launch	2.8km north of Steep Ck bridge	No gate
					Cerise Creek Parking Lot	East of path #65.6	No gate
					Gaz.ex control point	0.9km north of Steep Ck bridge	No gate
					South of Path 17.0	Downton pit 2km southwest of Evans pit bridge	No gate
					Van Horlick Cr Bridge	Van Horlick Cr Bridge	No gate
					Summit Gate	At Cayoosh Summit sand shed	Single Gate
16	Coast/ Chilcotin	26200	DUFFEY LAKE	99	Walden North	Lillooet end gate at junction of Enterprise Ck FSR	Double Gate
					Balbirnie Pit	2.0km north of Evans pit bridge	No gate
					Boat Launch	2.8km north of Steep Ck bridge	No gate
					Cerise Creek Parking Lot	East of path #65.6	No gate
					Gaz.ex control point	0.9km north of Steep Ck bridge	No gate
					South of Path 17.0	Downton pit 2km southwest of Evans pit bridge	No gate
					Van Horlick Cr Bridge	Van Horlick Cr Bridge	No gate
		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
10	Kootenays	31100	CAPE HORN BLUFFS	6	North Gate		Double Gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
10	Kootenays	31100	CAPE HORN BLUFFS	6	South Gate		Double Gate
		31300	WHITEWATER	Whitewater Ski Rd	Apex Bridge		No gate
					Ski Hill Parking Lot		No gate
					Lower Gate		Single Gate
9	Kootenays	32200	SHEEP CREEK		East Gate		Single Gate
					West Gate		Single Gate
		32300	SEVEN MILE DAM		East Gate		Double Gate
					West Gate		Double Gate
		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	No gate
					Three Forks		No gate
					Upper Whitewater Canyon		No gate
					Sandon Gate		Single Gate
		34200	LARDEAU	31	North gate		Double Gate
					South gate		Double Gate
		34600	COFFEE CREEK	31	North Gate		Double Gate
					South Gate		Double Gate
11	Kootenays	36100	FERNIE	3	Elko		No gate
					Morrissey Road		No gate
12	Kicking Horse	37100	KICKING HORSE CANYON	1	W. Kicking Horse Canyon Entrnc	(0.8km E of the Maintenance Yard	Double Gate
					Sheep Corner	YOHO Bridge Project	No gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
12	Kicking Horse	37100	KICKING HORSE CANYON	1	Top of Ten Mile Hill		No gate
					West End 4 Lane	YOHO Bridge Project	No gate
11	Kootenays	37200	TOBY CREEK		East Gate		Single Gate
					West Gate		Single Gate
12	Columbias	38100	T.C.HWY WEST OF REVELSTOKE	1	Griffen Lake		Double Gate
					Mica Dam Sawmills		Double Gate
					East End of 3 Valley Gap	East of Path 18.4 at the 3 Valley Gap Hotel Frontage Road Entrance	No gate
					Revelstoke		No gate
					Perry River		Single Gate
					West End of 3 Valley	On straight stretch of highway just west of Path 19.9	Single Gate
		38200	TCH EAST OF REVELSTOKE	1	Donald Station	North of Golden just east of the Columbia River Bridge	No gate
					Flat Creek	Inside Galcier National Park at the mouth of the Flat Creek Valley	No gate
					Giant Cedars	On the straight section of Trans-Canada Highway west of the Woolsey Creek	No gate
					Golden	At the northern end of the four lane section of the Trans-Canada highway that runs through Golden	No gate
					Illecillewaet Brake Check	At the truck brake check pullout @ 7.5 kms east of the Tangiers River	No gate
					Illecillewaet brake check		No gate
					Revelstoke Eastern Entrance	At the eastern entrance to the City of Revelstoke @ the Overhead sign bridge	No gate
					Revelstoke Park Gate West	At the eastern end of the 4 lane section of highway just west of the Mt. Revelstoke west boundry	No gate
		38300	HWY 23 NORTH	23	Bigmouth Creek	On the south side of Big Mouth Creek	Double Gate
					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

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
12	Columbias	38300	HWY 23 NORTH	23	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
					Birch Creek	aka Pitt Creek south of and around the outside corner from Path 121.0	No gate
		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	At Lardeau River Bridge	No gate
					Trout Lake Village	South end of Trout Lake Village	Single Gate
		38500	HWY 31 S-TROUT LAKE	31	Lardeau River	At the bridge across the Lardeau River at Gerard	No gate
					Trout Lake Village	South Side Trout Lake Village	Single Gate
		38600	GREENSLIDE		North of Greenslide	approximately five hundred metres north of path 16.0	No gate
					South of Greenslide	Approximately 500 metres south of Path 16.5	No gate
10	Kootenay Pass	39100	KOOTENAY PASS	3	East Gate		Double Gate
					West Gate		Double Gate
					Northfork Chain Up		No gate
					Tower 5	Old avalancher site-wide viewpoint	No gate
					Stagleap Park-Picnic Area	0.3 km east of Kootenay Pass Camp	Double Gate
					Summit - Kootenay Pass	Height of land(roadway) over Kootenay Pass	Double Gate
					Noname Bench access road	1.2 km west of Kootenay Pass Summit	No gate
					Tower 3 Avalancher Site	Old avalancher Metal tower(2.5km west of Kootenay Pass Camp)	No gate
18	Central	42100	WELLS-BOWRON LK		East Gate		Single Gate
					West Gate		Single Gate
					Bowran Lake Road		Double Gate
20	Central	46100	RED PASS	16	Tete Jaune Junction		Double Gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
20	Central	46100	RED PASS	16	East side of Path 7.2		Single Gate
					Overlander Falls		Single Gate
					Tete Jaune Junction		Double Gate
					East end of the Overlander pull put		Double Gate
17	Central	47100	BELLA COOLA	20	Bottom of Heckman Pass Hill		Single Gate
					East Gate		Single Gate
					Top of Heckman Pass Hill		Single Gate
					West Gate		Single Gate
		47110	Heckman Pass	20	Top of Heckman Pass Hill		Double Gate
		47120	Heckman - Valley Bottom	20	Valley Bottom of Heckman	Valley Bottom of Heckman Pass Hill	Double Gate
		47140	Boat House	20	Boathouse bracketing paths 1.7 to 2.1		Single Gate
25	Bear Pass	51100	BEAR PASS	37A	Pearly Gates	0.9km north of Bitter Creek Bridge	Double Gate
					American Creek	0.5km north of the Bear Two Bridge	No gate
					Argyle Creek	5.5km north of the Bear Two Bridge	No gate
					Cullen Creek Eastbound	Cullen Creek Bridge	No gate
					Fred's Place	Fred Banard Cabin	No gate
					Meziadin Camp	4.7km west of Meziadin Junction	Double Gate
					Surprise Creek	0.7km west of Surprise Creek Bridge	Double Gate
					Dahlie Creek	0.5km north of the Bear River Bridge.	Single Gate
		51300	MT. RAINEY	Stewart Bypass	Bypass South		Double Gate
					Bypass North		Single Gate
26	North West	52200	TERRACE - KITWANGA	16	East - Binwall	600m east of avalanche path	No gate
					West - Binwall	1 km west of avalanche path	No gate
		52300	TERRACE - TYEE	16	Exstew	1.6 km east of Exstew Bridge	Double Gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
26	North West	52300	TERRACE - TYEE	16	Rainbow	13.6 km east of Port Edward arterial	Double Gate
					30 Mile	6 km east of Exchamsiks bridge TCP 28	No gate
					East - Rainbow Summit	At Green river bridge	No gate
					East of 35 Mile	600m east of Exchamsiks bridge TCP 2A	No gate
					Kasiks	At west end of tangent 600m east of Kasiks bridge	No gate
					Kwinitsa	At Kwinitsa gun position TCP 3B	No gate
					Level Crossing	100m east of CNR level crossing TCP 1A	No gate
					New Remo	0.5 west of New Remo	No gate
					Telegraph Point	At Telegraph Point rest area TCP 4B	No gate
					West - Rainbow Summit	1km west of Rainbow Summit	No gate
					West of 35 Mile	1.5 km west of Exchamsiks bridge TCP 2B	No gate
					Kwinitsa	At Kwinitsa gun position TCP 4A	No gate
					Rainbow	13.6 km east of Port Edward arterial	Double Gate
					East - Rainbow Summit	At Green river bridge	No gate
					West - Rainbow Summit	1km west of Rainbow Summit	No gate
		52310	Amsbury	16	Amsbury East	East of Amsbury	No gate
					Amsbury West	West of Amsbury	No gate
		52400	SHAMES	Shames Ski Rd	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
					North of Path 4.1	300m north of 4th bridge	No gate
					South of Path 3.4	At avalanche warning sign south of path 3.4	No gate
		52500	GREENVILLE-KINCOLITH	952	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	Bell 2	Immediately north of Bell 2 Lodge access	Double Gate
					Eskay Creek Mine Turnoff	500m south of Eskay Creek mine turnoff	Double Gate

Service Area Number	Avalanche Program	Area Code	Area Name	Highway	Location Name	Location Description	Barrier Gate(s)
28	North West	53100	NINGUNSAW PASS	37	North of Bell-Irving	1.1km north of Bell-Irving Paths	No gate
					North of Beaverpond	Avalanche Sign at north end of avalanche area	No gate
					North of Gamma	100m north of Gamma avalanche area	No gate
					North of Snowbank	Immediately north of Redflat creek bridge	No gate
					South of Beaverpond	500m south of Beaverpond Avalanche Area	No gate
					South of Gamma	200m south of Carl's Corner weather station	No gate
					South of Snowbank	Immediately south of Snowbank creek bridge	No gate
		53200	CASSIAR	Cassiar Access	Cassiar	At Cassiar townsite	No gate
					Cassiar Access Turnoff	At Cassiar access turnoff from Hwy 37	No gate
				37	North - Centreville Paths	At Good Hope Lake	No gate
					North - Cottonwood Paths	At avalanche warning sign at north end of Cottonwood avalanche area	No gate
					South - Centreville Paths	At Avalanche warning sign south of Centreville avalanche area	No gate
					South - Cottonwood Paths	500m south of Cottonwood bridge	No gate
		53240	JOE REID HILL	37	North - Joe Reid	1.3Km north of North Fork Creek No. 1	No gate
					South - Joe Reid	1.7 km south of 2nd North Fork Creek	No gate
		53300	TELEGRAPH CREEK	51	Downtown Telegraph	Immediately north of junction of Telegraph Creek Road and Stikine Street	No gate
					Mud Lake	At turnoff to Mud Lake	No gate
					Tahltan East	At Cattleguard approx 800m east of Tahltan Bridge	No gate
					Ward's Hill West (days Ranch)	Avalanche Sign at West end of Avalanche Area	No gate
					Tahltan West	At wide area approx 600m west of Tahltan hill.	No gate
					Upper Downtown Telegraph Access	Approx 100m south of Junction of Telegraph Creek Road and Sawtooth Road	No gate
					Meehaus Pit	800m west of Meehaus Pit (approx 70km west of Dease Lake)	Single Gate
					Telegraph Gate	Approx 4km east of Telegraph Creek at Dump road turnoff	Single Gate



Service Area Number	Avalanche 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	No gate
		53320	TELEGRAPH HIGHWAY	51	Mud Lake	At turnoff to Mud Lake	No gate
		53330	GLENORA		Glenora East	1km West of Telegraph Town	No gate
					Glenora West	3km East of the end of the Hwy	No gate
		53400	MOOSE PASTURE	37	Beady Creek	At Beady Creek 1km south of avalanche area	No gate
					Moose Pasture Pit	At Moose Pasture pit 1km north of avalanche area	No gate
25	North West	54100	DORIS LAKE	Babine Lake Road	Doris Lake North	600m north of Doris Lake avalanche paths	No gate
					Doris Lake South	1 km south of Doris Lake avalanche paths	No gate
		54200	VISERMANS HILL	Kitwanga Back Rd	East Gate	At gate east of avalanche area	Single Gate
					West Gate	At gate west of avalanche area	Single Gate

# **Appendix E – Guidelines for One-Day Avalanche Safety Training**

**Ministry of Transportation and Infrastructure  
Avalanche and Weather Programs**

**Terms of Reference**

November 2022

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## 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 area). In the interest of continuity and consistency, it is preferable to designate one individual who can supply the training over several years.

This training is necessary to ensure work crews who operate or travel within avalanche areas are in compliance with WorkSafe BC regulations and 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 or 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.

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 at a recognized Instructional Techniques / Instructional Skills course of at least eight (8) hours in duration.
- Provide proof of attendance at a Canadian Avalanche Association (CAA) Level 1 course within the past five (5) years (Transportation and Resource Industry preferred).
- Have worked for a minimum of three (3) years on a highway operation in an “A”-avalanche area where it is necessary to practice and observe avalanche safety measures on a daily basis throughout the winter season.
- Have a thorough knowledge and understanding of:
  1. Ministry Snow Avalanche Safety Measures for Highways Manual and the 3.04 – Snow Avalanche Response, which defines maintenance contractor avalanche responsibilities;
  2. Ministry avalanche search and rescue plans and search techniques;
  3. Locations of local avalanche search and rescue equipment;
  4. How an avalanche transceiver works, in addition to how to test and confirm proper function. Trainers must also know how to operate in “transmit” and “receive” mode the transceiver 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 road);
8. Local avalanche road closure points; and
9. How to conduct efficient local avalanche-related road closures;

## 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 candidates meet or exceed the required qualifications 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.: traffic control personnel) who work within avalanche areas, as defined in the Snow Avalanche Safety Measures for Highways Manual.

### Classroom 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) via site visits to one or more avalanche areas is 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 the ability to locate a buried avalanche transceiver within five minutes.

### Record Keeping

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 District Avalanche Supervisor. 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 the Plan A and B training schedules of the Snow Avalanche Safety Measures for Highways Manual.

## 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 avalanches may frequently affect a road. Plan "B" refers to areas with a lower probability of avalanches affecting a road.

### 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 favorable, creating a more conducive learning environment.

### 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 (8) 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 transceiver operation and avalanche search and rescue techniques including spot, slalom, 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 transceiver and probe line practice sessions.

Courses should not be scheduled until after November 1, as it may be difficult to determine in advance whether or not there will be snow on the ground at the time of training. This will ensure that there is a reasonable probability that conditions will be favorable.

If the contractor wishes to schedule training earlier than these dates, they must contact the local District Avalanche Supervisor for approval. All training must be completed by December 15.

## **Ministry Involvement in Courses**

District Snow Avalanche Programs staff will attend training courses when they are available. When possible, District 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 Avalanche Programs office (giving two weeks' notice) to determine whether or not there will be any involvement by Avalanche Programs staff in scheduled courses.

## One-Day Avalanche Safety Training Topics

Training courses should include the following topics:

### Classroom Session

- Introductions;
- Mandate of Ministry Snow Avalanche Programs;
- Avalanche-related responsibilities of maintenance contractor;
- Basic avalanche phenomena (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, Incident Commander, Task Force Team Leader, Strike Teams (Probe Line Leader, Dog Handler, etc.) including security, locations and methods of quickly procuring rescue equipment to the incident site; and
- 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, 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, including what measures are used to ensure security of the area during explosives control work or during high avalanche hazard periods;
- Avalanche transceiver practice. Participants should be able to find a buried avalanche transceiver within five minutes; and
- Avalanche spot, slalom, and vehicle probe line practice.

## Audio-Visual Materials

The training agency / individual will ensure that audio-visual materials are available for each course for which 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; and
- Availability of local avalanche staff and Headquarters staff to discuss training course agenda topics.

## Scheduling and Notification of Courses

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

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

Notification should also indicate the requirement for fieldwork to ensure participants are adequately dressed to be in a winter environment.

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

## Instructor and Training Course Reviews

The Ministry will periodically conduct course reviews 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 reviews will also determine if those required to attend training have done so. When participants who should have attended a course fail to do so because the maintenance contractor instructor failed to notify them, the maintenance contractor may be required 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 contractor's 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.



# Appendix F – Avalanche Hazard Levels and Specific Operational Procedures

## Ministry of Transportation and Infrastructure - Avalanche and Weather Programs Avalanche Hazard Levels & Specific Operational Procedures

### LOW

Avalanches are unlikely **OR** small avalanches are possible, but are expected to terminate far above the road.

The contractor may proceed with normal winter operations. The contractor will:

- Remove snow and debris from avalanche catchment areas
- Remove snow and debris from static avalanche defense structures, unless directed not to by the District Avalanche Supervisor
- Maintain previously announced road closures to allow for avalanche patrols and for removal of snow and/or deposits from the road

### MODERATE

Small avalanches are probable but are expected to terminate above the road **AND/OR** large avalanches are possible, but are expected to terminate far above the road.

The contractor will:

- Notify the District Avalanche Supervisor if there is a change in weather such as increased wind speed, rise in temperature, and/or increased snowfall intensity
- Notify the District Avalanche Supervisor immediately after observing NEW avalanche occurrences
- Ensure there are no personnel working outside of vehicles within avalanche areas, unless approved by the District Avalanche Supervisor
- Ensure there is no equipment working outside of the travel lanes and shoulders of the road within avalanche areas, unless approved by the District Avalanche Supervisor
- Take interval weather and/or avalanche occurrence observations, as requested by the District Avalanche Supervisor
- Be prepared for road closures/delays as a result of unexpected natural avalanche activity on the road or explosives avalanche control, as requested by the District Avalanche Supervisor
- Maintain previously announced road closures to allow for avalanche patrols and the removal of snow and/or deposits from the road

### CONSIDERABLE

Small avalanches may affect the road; **AND/OR** large avalanches are probable, but are expected to terminate above the road; **AND/OR** snow dust events may affect the road

The contractor will:

- Notify the District Avalanche Supervisor if there is a change in weather such as increased wind speed, rise in temperature, and/or increased snowfall intensity
- Notify the District Avalanche Supervisor immediately after observing NEW avalanche occurrences
- Ensure there are no personnel working outside of vehicles within avalanche areas, unless approved by the District Avalanche Supervisor
- Ensure there is no equipment working outside of the travel lanes and shoulders of the road within avalanche areas, unless approved by the District Avalanche Supervisor
- Ensure there is no stationary equipment working within avalanche area unless approved by District Avalanche Supervisor
- Ensure safety of personnel by performing one of the following:
  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 District Avalanche Supervisor
- Be prepared for road closures/delays as a result of unexpected natural avalanche activity on the road or explosives avalanche control, as requested by the District Avalanche Supervisor
- Maintain previously announced road closures to allow for avalanche patrols and for removal of snow and/or deposits from the road

## HIGH

Numerous small avalanches are expected to affect the road **AND/OR** one or more large avalanches are expected to affect the road.

The contractor will:

- Close and sweep the road between standard closure locations (as determined by the District Avalanche Supervisor) using standard closure procedures
- Ensure there is no equipment or personnel working within the avalanche closure area except for:
  - Sweep vehicles (continue radio call-ins at increased frequency)
  - 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 District Avalanche Supervisor)\*
- \* 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 District Avalanche Supervisor

## EXTREME

Numerous, large avalanches are expected to affect the road.

The contractor will:

- Close and sweep the road between standard closure locations (as determined by the District Avalanche Supervisor) 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 District Avalanche Supervisor.

**Avalanche Deposit Removal:** Avalanche Technicians will determine when conditions are appropriate for work such as avalanche deposit removal at specific locations within the avalanche area. An avalanche hazard forecast will be issued to identify these work locations. The overall avalanche hazard forecast for the area may remain at a higher level, indicating that only the specifically identified areas are safe for conducting work such as avalanche deposit removal. The maintenance contractor may be instructed to commence avalanche deposit removal at these specific safe work locations. Specific operational procedures remain in effect throughout the rest of the avalanche area.

*August 2017*

## Appendix G – Definitions

### Avalanche Hazard

- A source of potential harm or loss. The potential for an avalanche(s) to cause damage to something of value. It is a function of the likelihood of triggering or frequency, and the avalanche size or magnitude.

### Avalanche Hazard Identification

- A process that includes the identification of avalanche terrain, recognition of avalanche potential, and recording and representing its location.

### Avalanche Hazard Evaluation

- Entails comparing the results of the analysis against evaluation criteria that rate or rank the hazard

### Avalanche Path

- A fixed locality within which avalanches start, run and stop. Paths consist of a starting zone, a track and a runout zone and sometimes an air blast zone.

### Avalanche Rescue Cache

- A location proximal to a Ministry avalanche area where avalanche rescue equipment is stored.

### Avalanche Risk

- Avalanche Risk is the probability or chance of harm resulting from interactions between avalanche hazard and specific element(s) at risk. Avalanche risk is determined by the exposure of that element, and its vulnerability to the avalanche hazard.

### Avalanche Season

- The snowpack depth within an avalanche area reaches threshold. Generally early November to late April.

### Avalanche Terrain

- The area and topography within the physical boundary of the potential formation, movement and effect of an avalanche.

### Avalanche Threshold

- When the snowpack within avalanche areas becomes deep enough to create an avalanche risk to the user.

### Delegation of Authority

Each District Avalanche Supervisor has a District Avalanche Technician as a direct report, and in most cases share in the supervision of one or two District Avalanche Assistants. The District Avalanche

Supervisor is responsible for ensuring that their area of responsibility is operated in compliance with all industry policies, procedures, guidelines, and standards in compliance with provincial and federal regulations. It is understood that the District Avalanche Supervisor will delegate specific responsibilities to the District Avalanche Technicians, such as, but not limited to;

- Acting in the role of District Avalanche Supervisor when the District Avalanche Supervisor is unavailable.
- Issuing of Hazard Forms and avalanche risk assessments.
- Implementing Site Specific Safety Measures.
- Road maintenance and deposit removal within Ministry of Transportation avalanche areas during avalanche closures.
- Avalanche Search and Rescue.
- Specific field work.

### **Ministry Avalanche Areas**

- A set of geographically associated avalanche paths. These may affect a specific element at risk, or multiple elements at risk.

### **Ministry Avalanche Technicians**

- Manager, Avalanche and Weather Programs, Senior Avalanche Officer(s), District Avalanche Supervisor, District Avalanche Technicians and Assistant Avalanche Technicians.

### **Qualified Supervisor / Supervision of Workers**

- The Ministry's **One Day Avalanche Safety Training** course is a minimum requirement for persons who supervise workers operating in Ministry avalanche areas as well as those who make decisions directly affecting the safety of employees and the public.

### **Snow Avalanche**

- A volume of snow, usually more than several cubic metres, moved by gravity at perceptible speed. Snow avalanche may contain rock, broken trees, ice or other material.