

# ***Guidelines for Conducting District and Regional Avalanche Program Reviews***

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This document provides the guidelines for conducting District and Regional Snow Avalanche Program reviews.

The primary objective of these reviews is to ensure that all avalanche programs consistently apply avalanche hazard management principals in a method which complies with this Ministry's policies and standards. The secondary objective is to identify future initiatives that will lead to the betterment of the avalanche hazard management program.

Avalanche program reviews have been a requirement of the Annual Performance Agreement between Highways Maintenance Branch and Professional Services Division since 1993.

The reviews will be coordinated by the Senior Avalanche Officers (SAO) under the direction of the Manager, Snow Avalanche Programs. There are three basic components of the review: compiling data, analysis of procedures and data, and recommended improvements in procedures to comply with provincial standards.

The collection and compilation of material and data will be delegated to both headquarters and field snow avalanche staff. The analysis will be conducted by the SAO and the Snow Avalanche Technician. The recommendations will be made by the Manager, Snow Avalanche Programs through consultation with the appropriate personnel (e.g., District Highways Manager, Senior Avalanche Officer).

Although all aspects of the avalanche program will be looked at, each review will target specific, current limitations and operational concerns. The focal areas of each review will be clearly stated upon initiation of the review process. Written notice to involved participants will be made to formally announce the intent of Snow Avalanche Programs to initiate a review.

To clarify the focus of the review and responsibilities of all involved participants, a pre-review meeting will be held with the Manager, Snow Avalanche Programs, Senior Avalanche Officer (coordinating the review), District Highways Manager (if available), and Snow Avalanche Technician and avalanche crew.

The following describes the areas which will be assessed during the process of performing avalanche program reviews.

# Section 1: Hazard Management Program Overview

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## Inventory of Program

A brief inventory of the District or Regional Avalanche Program will be conducted with a review of the avalanche atlas data for inconsistencies or missing data. The key information in this section will be summary reports of paths and occurrence data for each avalanche area. This information will be gathered by the District or Regional avalanche crew in conjunction with the Victoria Avalanche Systems Technician.

The previous work on hazard indices conducted by Moffat and Schaerer will be reviewed and summarized by the Senior Avalanche Officer and avalanche staff. This information will be based on previous calculations of hazard indices data. The data will summarize path, area and avalanche program. Brief comparisons to adjoining avalanche programs will be made if applicable.

The Snow Avalanche Technician and Senior Avalanche Officer will review the summaries, which will include:

- Type and location of roads;
- Avalanche path/area description;
- Summary of occurrence data;
- Hazard Indices;
- Order of concern -- local perspective (paths);
- Order of concern -- provincial perspective (areas);
- Traffic volumes;
- Passive control measures;
- Active control measures;
- Road closures;
- Alternative routes.

## Statistical Analysis of Avalanche Occurrence Data

The Senior Avalanche Officer in conjunction with the avalanche crew will summarize avalanche occurrence data (total recorded and number affecting highway, natural vs. controlled, size etc.), and conditions under which they occurred. This information will be further used by the SAO and the Snow Avalanche Technician in evaluating the operations of the hazard management program.

## Section 2: Operations Program Management Overview

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### Point of Assembly and Location of Operation

The Snow Avalanche Technician will summarize the current operations of the local avalanche program. This will include: staffing, operational budgets, point of assembly, major equipment (i.e., remote weather stations, Gaz.Ex program infrastructure, etc.), shift schedules, overtime and operational support.

### Personnel

Where appropriate, an assessment will be made of technical and personal skill levels for avalanche crew members to perform their required duties. Any necessary training programs to ensure competent fulfillment of these duties will be identified at this time.

### Equipment

The equipment review will focus on the technical tools required to manage the respective avalanche hazard. The Snow Avalanche Technician and SAO will compile the details of the current operation.

After reviewing the program's current operation, the SAO, through discussion with the Snow Avalanche Technician, will provide an objective evaluation of the technical tools currently available to the program. If necessary, recommendations will be made to include changes in the current infrastructure and/or better use of existing technology. No benefit/cost analysis will occur at this time.

## Section 3: Application of Snow Avalanche Safety Measures

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### Acceptable Level of Safety

Acceptable level of safety will be reviewed and discussed by example. These examples will be based on local information and previous incidents and occurrences affecting the road. Compilation of this information will be done by the Senior Avalanche Officer with the assistance of the Snow Avalanche Technician. The SAO and the Snow Avalanche Technician will then review this information to identify problems and patterns associated with the local avalanche program. Upon completion, this information will be critiqued by the Manager, Snow Avalanche, District Highways Manager, SAO, and Snow Avalanche Technician. The intent is to identify and discuss the limitations of the local avalanche program, and to clearly define the expectations of the Ministry's guidelines for acceptable level of safety. The outset of this process will be a comprehensive understanding of the Ministry's document on ***Snow Avalanche Programs Safety Standards for Avalanche Hazard Levels*** for each avalanche area throughout the province.

It is the goal of this review process to make recommendations in areas of the operational program that will lead to the successful application of Acceptable Levels of Safety.

## **Hazard Assessment**

The SAO will review the hazard assessment process. This section will evaluate the procedures used by the District or Regional Avalanche Program for the collection, interpretation and use of snow profile, avalanche occurrence, and weather observation and forecast data. The process used for evaluation will be based on the local program's operation.

## **Hazard Forecasting**

Review of hazard forecasting procedures will be done by the SAO. This process will involve direct interaction with the Snow Avalanche Technician and their crew during real time forecasting periods. Ideally the SAO will be part of a series of cycles and changes in the avalanche hazard level. The review will focus on the implementation of hazards levels, the tools utilized to support current hazard levels and the process used for forecasting change to current levels. This process will also look at the distribution of hazard information between the road crews, the staff, the media, management, headquarters and the general public.

## **Road Closures**

Review of road closure procedures will be reviewed by the SAO. This process will involve direct interaction with the Snow Avalanche Technician and their crew, as well as the evaluation of closure locations and implementation procedures.

Each closure location site will be assessed for safety and efficiency.

Road closure procedures will be assessed during real time closures. Ideally the SAO will be present during one or more closures.

Once the snowpack has stabilized, avalanche safety measures and hazard management procedures will be critiqued by the SAO, Snow Avalanche Technician and crew. For this process a critique will be defined as an open discussion about the successes and problems (if any) of the tasks performed.

## **Application of Technology (Data Acquisition and Data Management)**

The Remote Weather Network Technician, Avalanche Systems Technician, and SAO will evaluate the use and maintenance of data acquisition technology. This part of the review will include an assessment of the effective use of Snow Avalanche Program computer software programs and Remote Automated Weather Stations (RAWS).

In addition they will identify local procedures that may be adopted by others and recommend changes to improve operational procedures. On-site visits will occur at their discretion.

## **Avalanche Rescue Procedures and Equipment**

Random inspections of avalanche rescue equipment will be done by the SAO. These inspections will review the Maintenance Contractors rescue cache and the Snow Avalanche Technicians rescue equipment to ensure readiness if required for an avalanche search and rescue effort.

## **Section 4: Application of Explosive Control Measures**

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The SAO will review the application of explosives used for avalanche control based on the procedures and regulations which currently exist. These include:

- Snow Avalanche Programs, Explosive Use - Operational Plan
- WCB Industrial Health and Safety Regulations
- Transport Canada - Transportation of Dangerous Goods Regulations
- Workplace Hazardous Material Information System (WHMIS)
- Ministry Emergency Response Plan for Explosive Spill on a Highway

In addition to the application of procedures, the methods of delivery and the appropriate use of explosives will be reviewed by the SAO. Discussion will be held with the Snow Avalanche Technician in order to determine optimal explosive avalanche control methods.

## **Section 5: Recommendations and Conclusions**

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Conclusion statements on the current status of the avalanche program under review will be made by the SAO.

Recommendations will be made by the Manager, Snow Avalanche Programs for changes in procedures that will effectively improve the avalanche program.

All recommendations will be discussed with the District Highways Manager and/or Regional Manager of Operations. Further discussions will be held with the Snow Avalanche Technician prior to implementation of operational changes. These recommendations will be based on the results of this review, and may identify items such as:

- Inconsistency in the application of operational guidelines;
- The need for further improvement for static or active control measures;
- The need for further research into new technologies;
- A reduction or reorganization of resources which would be to the betterment of the Ministry's program;
- The need for a capital project to mitigate the avalanche hazard.