

OVERVIEW

TITLE:

Part 22, Underground Workings
NEW sections to accommodate tunnel boring and cut and cover excavation methods

1. NATURE OF THE PROBLEM TO BE SOLVED

Part 22 (Underground Workings) was developed based on the traditional high risk “drill and blast” excavation method. Over the past several years a substantial number of underground projects have been undertaken in BC using lower hazard excavation methods, such as tunnel boring machines, and cut and cover procedures, for which some sections in Part 22 are not appropriate.

For lower hazard operations in major projects around the province, there have been 33 variance/acceptance requests processed. Eight more are pending, for a current total of 41. This has resulted in a major administrative workload for a number of employers, and other workplace parties, and for WorkSafeBC. It has become an industry-wide issue and merits consideration for regulatory amendment under section 171 of the *Workers Compensation Act*.

A secondary issue has been the need to clarify the concept of underground workings as covered in the definitions and scope provisions of Part 22.

2. PURPOSE OF THE PROPOSED AMENDMENTS

It is proposed to address the issues associated with variances by inserting a number of new provisions within sections of Part 22 to accommodate the low(er) hazard tunneling methods. Specific provisions involved would be expected to include lighting, cap lamps, refuge stations, some aspects of ventilation, and various matters related to rescue.

Note: Part 22 overall is a valid and necessary set of requirements for drill and blast excavation operations, and needs no change. Hence the proposed amendments would merely involve a series of modifications on selected topics covered in Part 22.

3. SOURCE OF REQUEST

Worker and Employer Services Division, WorkSafeBC
Investigations Division, WorkSafeBC

PART 22: UNDERGROUND WORKINGS

Definitions 22.1 In this Part:

“limited hazard underground working”

means a non-gassy underground working being excavated using tunnel boring technology or cut and cover technique, or an underground working that is at a stage where excavation of material is complete and any necessary lining or support structures to secure the underground faces have been installed;

Explanatory Note:

Part 22 Underground Workings, was developed based on the “drill and blast” excavation technique that was the traditional method of underground excavation used in BC. This method is considered “high risk” due to the high levels of dust generated, the hazards of storing, handling and firing explosives, presence of explosion gases following a blast, and the high levels of other air contaminants, such as internal combustion engine exhaust and from gases entering the space from the surrounding rock or soil, such as methane and hydrogen sulfide, which may be present or accumulate in the underground working.

Over the past several years a substantial number of projects have been undertaken in BC that use different methods of excavation, such as tunnel boring machines (TBMs) and cut and cover procedures. These methods eliminate some hazards encountered in the drill and blast excavation technique, present lower levels of some hazards and provide different ways to manage some hazard. The result is some sections in Part 22 are not appropriate. For such operations in projects around the province, there have been around 40 variance/acceptance requests processed related to a variety of Part 22 requirements. This has resulted in a major administrative workload for a number of employers and other workplace parties, and for WorkSafeBC. It has become an industry-wide issue and merits consideration for regulatory change under section 171 of the *Workers Compensation Act*.

A secondary issue has been the need to clarify the concept of underground workings as covered in the definitions and scope of provisions of Part 22.

It is proposed to add to Part 22 a definition for a *limited hazard underground working*, and to establish a series of exception clauses for some of the provisions of Part 22 that are not appropriate for the circumstances that typically exist in a limited hazard underground working.

GENERAL REQUIREMENTS

- Hours of work** **22.8**
- (1) The employer must not permit the employment of a worker in an underground working for a period longer than 8 hours in any 24 hours.
 - (2) Subsection (1) does not apply when
 - (a) there are emergencies where life or property is in danger, or
 - (b) urgent work is essential to the continuation of the ordinary operation of an underground working, provided it is only on an infrequent basis, or to accommodate shift changes within a 24 hour period, provided there is an 8 hour rest period between shifts.
 - (3) Work performed pursuant to the exceptions in subsection (2) must not exceed 16 hours in any 24 hour period.
 - (4) If it is impractical to restrict routine underground work to a maximum of 8 hours, the employer must submit written procedures to the Board, as part of the notice of project, and must obtain prior written permission from the Board to work longer hours.
 - (5) Despite subsection (4), in a limited hazard underground working, workers may be scheduled to work up to 10 hours per shift if the reduced exposure limits established by section 5.50 are not exceeded.**
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Explanatory Note:

The proposal is to provide an exception to section 22.8 (4) so a worksite that is a *limited hazard underground working* can schedule work shifts up to 10 hours long without needing to seek the prior permission of WorkSafeBC.

In a limited hazard underground working the dust levels are generally much lower than the levels normally encountered during excavation work in a traditional “drill and blast” operation. By definition, a limited hazard underground working is a non-gassy underground working. The likelihood of unexpected or high volumes of naturally occurring hazardous gas intruding into the underground space from the surrounding rock or soil is minimal. And generally the heavy equipment present in the underground working is either electrically powered or the ventilation system can be sized and set to provide sufficient air changes to keep air contaminant levels below the permissible exposure limits. Therefore it is considered reasonable to permit the work shift to be extended up to 10 hours without the employer needing to get prior permission from WorkSafeBC.

Note that section 5.50 “Extended work periods” applies for shifts of greater than 8 hour duration with respect to determining an appropriate TWA exposure limit. For example, for work shifts longer than 8 hours but less than 10 hours, the reduction factor applied to the TWA exposure limit is 0.7 (which means 70% of the 8-hour TWA exposure limit).

GENERAL REQUIREMENTS

- Self-rescuers** **22.11** (1) For non-gassy workings, a minimum of an approved self-rescuer of the air purifying type must be carried by the worker.
- (2) For gassy workings, a minimum of a self-contained (air supply) self-rescuer capable of delivering 30 minutes of air must be immediately accessible to each worker underground.
- (3) Despite subsections (1) and (2), in a limited hazard underground working, a worker does not need to carry a self-rescuer if**
- (a) the worker is within 50 m (164 ft.) of the portal,**
- (b) workers are more than 50 m (164 ft.) from the portal, sufficient self-rescuers are provided in the immediate work area so each worker can readily obtain one in an emergency, or**
- (c) the worker is leaving the area referred to in paragraph (b) in non-emergency conditions.**
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Explanatory Note:

The proposal is to provide an exception to section 22.11 (1) so a worksite that is a *limited hazard underground working* can, under certain conditions, operate without workers underground having to carry self-rescuers, provided they have ready access to self-rescuers in their immediate work area.

The primary reason for carrying a self-rescuer is not present in a limited hazard underground working. There is little likelihood of a cave-in, unexpected intrusion of gas, or other event where a self-rescuer would be needed.

Self-rescuers provide emergency respiratory protection against carbon monoxide resulting from underground fires or explosions, allowing the wearer to “self-rescue” to a safe location.

WORKING REQUIREMENTS

Air flow

- 22.19** The main ventilation system must be capable of operating on blowing or exhaust duty and be equipped with a reversing switch, which normally will operate on exhaust, and the air flow must be
- (a) at least 15 cubic metres per minute for each square metre (50 cfm for each square foot) of the working face area, and
 - (b) where internal combustion engines are used underground, the total of the air flows specified on the engine permits.

22.19.1 Despite section 22.19, the ventilation system in a limited hazard underground working may operate on blowing duty provided there is a capability to change to exhaust duty in the event an exhaust ventilation function is needed.

Explanatory Note:

The proposal is to provide an exception to section 22.19 so a worksite that is a *limited hazard underground working* can have the ventilation system normally operate on blowing service.

The normal ventilation flow in drill and blast excavation work is the exhaust mode. This is to allow gases generated during a blast (as well as any oxygen deficient air), the dust from excavation and mucking, any naturally occurring gas intruding into the space and engine exhaust to be captured near the working face and ducted out of the underground space. In a limited hazard underground working the reduced risk of exposure to such conditions makes it reasonable to permit use of the blowing mode.

The capability to switch or convert to exhaust duty in a limited hazard underground working will be appropriate in circumstances such as fire, to help draw smoke away from the exit and to help ensure a worker is moving into a flow of fresh air as they move to the exit.

WORKING REQUIREMENTS

- Radioactivity survey** **22.33**
- (1) When excavation commences, the employer must ensure that a survey is conducted to determine if significant levels of ionizing radiation are present at the underground working.
 - (2) If results of the survey indicate that significant levels of ionizing radiation are present, the employer must establish a radiation protection program.
 - (3) If the initial survey does not indicate the presence of significant levels of ionizing radiation, the underground working must be resurveyed every 30 days as the excavation work proceeds.
 - (4) Despite subsection (3), in the parts of a limited hazard underground working where**
 - (a) active excavation work has ceased for a period of at least 60 days, and**
 - (b) 2 consecutive radioactivity re-surveys of those parts indicate that no significant levels of ionizing radiation are present,****no additional ionizing radiation surveys are required.**
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Explanatory Note:

The proposal is to provide an exception to section 22.33 (3) so a worksite that is a *limited hazard underground working* can have the parts of the underground working not involved in active excavation work exempt from the requirement to do repeated ionizing radiation surveys if there does not appear to be any likelihood of such radiation hazards being present in those areas.

In the parts of an underground working where excavation work and any tunnel lining or support has been completed for at least two months and the initial survey during excavation work and two subsequent monthly resurveys required under section 22.33 (3) show no indication of significant levels of ionizing radiation, it is considered reasonable to conclude these parts are not likely to present a risk of ionizing radiation developing. The portions of the underground working where active excavation is underway would still require the initial radioactive survey and at least two monthly resurveys in accordance with sections 22.33 (1), (2) and (3).

WORKING REQUIREMENTS

- Cap lamps** **22.37** (1) Cap lamps must be kept in the worker's possession at all times while underground.
- (2) All newly purchased cap lamps, and after January 1, 1999 all cap lamps, must be capable of providing a peak illumination of at least 1 500 lux (150 foot candles) 1.2 m (48 in) from the light source, throughout the work shift.
- (3) Despite subsection (1), in a limited hazard underground working, a worker is not required to carry a cap lamp if**
- (a) cap lamps are readily available to the worker in sufficient numbers for all workers in the area, or**
- (b) for limited hazard underground workings other than tunnel boring operations, the worker carries a portable flashlight, for safe exit of the underground working or to get to a refuge area in the event of a failure of the regular lighting system for the underground working.**
- (4) For the purpose of subsection 3 (b), a portable flashlight must provide a minimum illumination level of 100 lux (10 footcandles).**
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Explanatory Note:

The proposal is to provide an exception to section 22.37 (1) so that in a *limited hazard underground working*, workers do not have to carry cap lamps if the lamps can be made readily available in proximity to the workers, or in specified circumstances, a worker carries a flashlight that provides sufficient illumination.

In a limited hazard underground working there is normally sufficient general or area illumination provided for workers to do all necessary tasks. Also there is little likelihood of a tunnel structural failure or other significant emergency that might disrupt the regular general illumination system.

During tunnel boring operations there is ongoing excavation of material inside a tunnel. These conditions necessitate the availability of cap lamps. However, if the lamps can be provided in proximity to workers, for example at the TBM for those workers involved in work at the face then there is no need to carry them. For other limited hazard underground workings, the risk is such that as an alternative, a flashlight would be considered sufficient to provide illumination to allow the worker to safely move to a refuge area or to exit the underground working in the event the regular illumination system fails.

EMERGENCY REQUIREMENTS

Refuge stations

- 22.50** (1) A refuge station must be provided within 500 m (1 640 ft.) of the main underground work area, which is
- (a) large enough to accommodate all workers underground,
 - (b) supplied with drinking water and compressed air tanks or cylinders,
 - (c) equipped with a communication system to the surface,
 - (d) capable of being sealed to prevent the entry of gases,
 - (e) provided with a plan of the underground working which shows all exits,
 - (f) maintained in sanitary condition, and
 - (g) equipped with emergency lighting.
- (2) When unusual conditions warrant, such as gassy underground workings, additional refuge stations may be required by the Board.
- (3) Despite subsection (1), in a limited hazard underground working**
- (a) a refuge station may be provided as part of a tunnel boring machine, and**
 - (b) in the case of a cut and cover underground working or an underground working where the excavation work is complete, a refuge station is not required provided there are two routes that are classified as limited hazard underground workings allowing workers to either**
 - (i) exit the underground working, or**
 - (ii) get to an adjacent limited hazard underground working capable of being sealed off from the one the workers are exiting.**

Explanatory Note:

The proposal is to provide an exception to section 22.50 (1) so a worksite that is a *limited hazard underground working* has options regarding the need for and positioning of a refuge station.

The reasons for having a refuge station are not present in a limited hazard underground working, except right at the tunnel boring machine or where other active excavation work is taking place. There is little likelihood of a cave-in, unexpected intrusion of gas, or other event justifying a refuge station other than at the tunnel boring machine or where other active excavation work is taking place. The exception for limited hazard underground workings that do not use a tunnel boring machine will apply only if the worker has two safe routes available to get either to an adjacent and independent limited hazard underground working or to exit the underground working.

EMERGENCY REQUIREMENTS

**Rescue
workers**

- 22.51** (1) The employer must ensure that workers holding certificates of competence in underground mine rescue valid in BC, or other similar certification acceptable to the Board, who are trained in and capable of carrying out the established emergency procedures, are available for rescue operations as follows:
- (a) at least 3 workers when 6 to 10 workers are underground on shift;
 - (b) at least 5 workers when more than 10 workers are underground on shift;
 - (c) if 5 or fewer workers per shift are employed underground, or if the underground workings do not progress more than 300 m (1 000 ft), the employer must submit written rescue procedures, including details of training and availability of rescue workers, for Board approval.
- (2) The names and locations of trained workers must be posted in conspicuous places.
- (3) The employer must ensure that proficiency drills for workers trained in rescue work are held at least every 30 days, and are recorded in the Underground Record.
- (4) Despite subsections (1), (2) and (3), in a limited hazard underground working a mine rescue capability meeting the requirements of subsections (1), (2) and (3) is not required if**
- (a) the capability and emergency procedures are in place for the evacuation of workers, and**
 - (b) there is provision for transportation of any injured workers to a location where the ambulance service can assume the responsibility for care.**

Explanatory Note:

The proposal is to provide an exception to sections 22.51 (1), (2) and (3) so a worksite that is a *limited hazard underground working* does not need to provide and maintain a mine rescue capability.

The reasons for having a mine rescue capability are not present in a limited hazard underground working. There is little likelihood of a cave-in, unexpected intrusion of gas, or other event where a mine rescue team would be needed to enter the underground working to assist and rescue workers. The workplace must still have procedures in place for an injured worker to get first aid treatment and to ensure an injured worker can be packaged and moved to a location where the ambulance service can take over treatment and transport of the injured worker. In a limited hazard underground working, emergency services may very well be able to enter the working and move through it to the injured worker, but the expectation of and capability for such services should be confirmed with the relevant agencies before underground work commences.

EMERGENCY REQUIREMENTS

**Self-
contained
breathing
apparatus**

- 22.52 (1) **Except as provided by subsection (3),** The **the** employer must ensure that self-contained breathing apparatus (SCBA) for use in emergencies is available and located on the surface as near to the portal as is practicable, and capable of at least 2 hours operation.
- (2) The employer must provide
- (a) at least 4 units of SCBA when 10 or fewer workers are underground on shift, and
 - (b) at least 6 units of SCBA when more than 10 workers are underground on shift.
- (3) In a limited hazard underground working other than a tunnel boring operation, self-contained breathing apparatus of 30 minute capacity can be used by workers whose duties include fire and rescue operations.**

Explanatory Note:

The proposal is to provide an exception to sections 22.52 (1) and (2) so a worksite that is a *limited hazard underground working* does not need to provide and maintain self-contained breathing apparatus unless it is necessary because the workplace provides its own firefighting capability, or it has an industrial firefighting brigade.

The reasons for having self-contained breathing apparatus are not present in a limited hazard underground working. There is little likelihood of a cave-in, unexpected intrusion of gas, or other event where self-contained breathing apparatus would be needed, except where the underground working has to provide its own underground firefighting capability. With respect to these considerations, subsection (3) is proposed allowing a standard 30-minute capacity self-contained breathing apparatus to be used in a limited hazard underground working with the exception of a tunnel boring operation. A 30-minute capacity should provide an adequate supply in a limited hazard operation such as a cut and cover working.