

**Preliminary Findings
into the April 25, 2010 Workplace Fatality at
Wolverine Mine**

PURPOSE:

These initial findings are being released to provide information into the direct causes of this fatality. It is hoped that providing this information will encourage others to review these causes and examine their own workplaces to ensure similar conditions either do not exist or, if they do, are immediately corrected.

Readers of these Preliminary Findings will find some technical language specific to underground mining, which are the workplaces where these conditions have the potential to exist. Technical language is only used as necessary.

INTRODUCTION:

At approximately 3:00 am on the morning of Sunday April 25th 2010, a 25 year old worker employed by Procon Mining and Tunnelling was killed when the ground collapsed in a stope on the 1220 level at Yukon Zinc's Wolverine Mine. Two other mine workers were at this location and witnessed the incident; one worker sustained injuries and the second was unhurt.

DIRECT CAUSES:

Preliminary findings indicate that the direct cause of this fatality is the rock on the left side of the 1220 stope slipping along a foliation plane, pinning the worker against a rock bolting machine and burying him.

The 1220 stope had been excavated approximately 200 meters from the main ramp. The stope size was planned to be 4.5 meters wide, but at the area where the ground collapsed, it had been widened to approximately 10 meters in order to remain in the ore. Ground support was installed in accordance with an existing generic ground support plan that had been designed for a 4.5 meters wide drift.

Several fault zones and shear zones intersect the tunnel at the location where the ground collapsed. The rock type is a foliated Rhyolite Tuff, which can be described as *very weak to weak, greenish grey, altered, fresh, with extremely closely spaced, planar smooth laminations and foliations, coated with chlorite and graphite.*

The shear strength between the foliation planes is considered to be low because the rock surface feels "greasy" and is coated with chlorite and possibly graphite. Rock fracture through the very weak, intact rock between the extremely closely spaced foliation planes also influences the stability. The rock at this location

appears damp or locally wet. Groundwater is thought to further decrease the shear strength between the foliation planes. Existing geological mapping of this location shows a fault on the left hand side wall, steeply dipping into the excavation.

The slope was supported with mesh (screen) as well as 1.8 m and 2.4 m split sets around the back (roof of the excavation) to a level 1.5 m above the sill (floor of the excavation). The slope was supported in the same way at the location where the slope had been widened and the ground collapsed.

The planar slide occurred because the distance between the sill and the start of the left side wall support was too great and had been left unsupported, initiating rock relaxation and stress relief. Given the 35 to 45 degree inclination of the foliation planes, the 1.8 m split set bolts were not long enough to stabilize the side wall and prevent planar sliding. At the top of this planar slide, the rock failed through intact, very weak rock, possibly in combination with sliding on the steeply dipping fault shown on the existing geological plans. As the slide initiated, it ripped out the mesh and other split set bolts along the left wall and into the back.

PREVENTION:

Ground support design must be modified on an ongoing basis to reflect actual rock behaviour and geotechnical conditions, rather than rely on generic plans. Communication between geologists, engineers and underground personnel regarding ground support design and implementation, as well as slope directional control and width, is paramount. This communication must result in modified ground support plans and implementation as conditions change. Ground support plans must be signed off by a qualified engineer and work that follows those plans may only proceed until conditions change.

Systematic procedures must provide for continually assessing geotechnical conditions and determining the required ground support. These procedures must include inspection and review of ground support installation, and provide for continuous monitoring (through observation and instrumentation measurements) of the ground support performance.

Employers are also reminded that they are required to provide workers with proper training and instruction on the work they are performing. Critical procedures (those that, if not followed, may result in injury) need to be developed and reviewed to ensure workers understand the hazards of their work and how to perform the work safely. Critical procedures must also be enforced to ensure they are being followed.