



COLORADO

**Division of Reclamation,
Mining and Safety**

Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

November 24, 2015

Mr. Jack Henris
Cripple Creek & Victor Gold Mining Company
100 N. 3rd Street
P. O. Box 191
Victor, CO 80860

**Re: Cripple Creek & Victor Mining, Co., Cresson Project, M-1980-244;
Clarification on Slope Stability/Geotechnical Analyses**

Dear Mr. Henris:

Based on recent communications with mine personnel and CC&V consultants related to the mitigation efforts for the SGVLF PSSA, the Division of Reclamation, Mining and Safety (Division) believes it prudent to clarify our requirements related to the selection of a factor of safety (FS) for slope stability and geotechnical analyses. Rule 6.5 provides the Division with the basis to account for uncertainties (geologic setting, groundwater conditions, mining parameters, etc.) in the selection of an appropriate FS for slope stability. The selection of an appropriate FS should consider the following factors:

1. Magnitude of damages (potential risk to human safety, environmental impact and property damage),
2. Reliability of geologic information such as the proximity to faults, orientation of jointing, and subsurface soil and water data,
3. Changes in soil properties due to mine operations and variability in subsurface material,
4. Accuracy (or approximations used) in developing design/ analysis methods, and
5. If relevant: Construction tolerances, Relative change in probability of failure by changing the factor of safety, and Relative cost of increasing or decreasing the factor of safety.

The required FS standards in Table 1 are consistent with other Colorado State agencies such as the Colorado Department of Transportation (CDOT) and the Colorado Geological Survey (CGS). CDOT uses the ASHTO minimum FS of 1.3 for construction slopes near roadways and utilities. CGS uses a minimum FS of 1.5 for residential areas when using "generalized" strength values, or 1.3 for analyses when good quality site-specific rock and soil parameters are known.

The Division now requires the criteria in Table 1 (which are in the process of becoming state-wide Division policy) be used for all future stability analyses submitted to the Division.



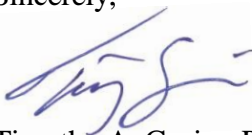
Table 1. Recommended Minimum Factors of Safety for Slope Stability Analyses

Type of Structure/Consequence of Failure	Generalized, Assumed, or Single Test Strength Measurements	Strength Measurements Resulting from Multiple Tests ⁽¹⁾
<u>Non-Critical Structures</u> (e.g., fences) / No imminent danger to human life, minor environmental impact, and minor repair costs if slope fails	1.3 (1.15) ⁽²⁾	1.25 (1.1) ⁽²⁾
<u>Critical Structures</u> (e.g., residences, utilities) / Potential human safety risk, major environmental impact, and major repair costs if slope fails	1.5 (1.3) ⁽²⁾	1.3 (1.15) ⁽²⁾
<p>(1) The number of tests required to provide a high degree of confidence in the strength parameters used depends on the variability of the material being tested and the extent of the highwall disturbance.</p> <p>(2) Numbers without parentheses apply for analyses using static conditions and those within parentheses apply to analyses using seismic acceleration conditions</p>		

Please be aware these requirements are not retroactive in that previously approved analyses need not be resubmitted. However, from this point forward, all submitted slope stability and geotechnical analyses are required to meet the above criteria.

If you have any questions or need further information, please contact me at (303)866-3567 x8169.

Sincerely,



Timothy A. Cazier, P.E.
Environmental Protection Specialist

cc: Wally Erickson, DRMS
Amy Eschberger, DRMS
Elliott Russell, DRMS
DRMS file