

Response to Comments

Dear Editors and Reviewers,

Thanks very much for taking your time to review this manuscript. I really appreciate all your comments and suggestions! Please find my itemized responses below and my revisions/corrections in the re-submitted files.

Response to

Point 1: In the introduction, I did not see the formulation of the problem, as well as the allocation of a previously unexplored area. What up to the authors is not sufficiently studied? What are the unresolved scientific questions?

Response 1: Thank you for your careful review. The common method of backfilling open pit is through a process called wet backfilling. However, wet backfill always filters out some water, which leads to the problem of whether local seepage and soaking will affect the stability of open pit slope. This is a problem that has not been fully studied. It has been mentioned in lines 32-36.

Point 2: Also, in the introduction, explain the following points more clearly: backfill drains water, which can affect slope stability. And what's next? The quarry is closed. What are the threats of water release? Why do you need to research it? What does it affect? Further in the sections of the article, you note the impact on underground mining. But I recommend doing this in the introduction, to add significance. This way the problem statement will be clearer.

Response 2: Thanks for your suggestion. Backfilling causes bleeding, which may affect the mechanical properties of surrounding rock, leading to the change of slope stability. And, the slope failure has been recognized as a main safety risk of a closed open-pit mine. Thus, it is necessary to study the influence of wet backfilling in open pit on slope stability. It has been added in lines 36-37.

Point 3: I would like to receive an answer from the authors of the discussion question. How is paste backfilling carried out in a quarry under the influence of climatic conditions - rains, high vvv in summer, winter? How are favorable conditions for the formation of backfill mass achieved?

Response 3: Thanks so much for your professional comment. The paste backfilling is designed to be stopped on rainy days, for that the rainwater will wash away solid particles and affect the consolidation effect. The studied mine is located in Anhui Province, China, where the average temperature is about 17 °C, thus We did not consider the effects of high and low temperatures. However, the temperature is an important factor affect the consolidation of backfill, and we will further study this issue in the future. It has been mentioned in the Conclusion section. Thanks again for your suggestions.

Point 4: In my opinion Figure 1 looks unrepresentative. Change the quality and make the drawing in color. There are a sufficient number of programs where you can imagine career voids. It is necessary to give explanations in the caption to Figure 1-6 and A-H.

Response 4: Thanks for your suggestion. Fig. 1 aims to explain the selection of studied positions of the slope. The studied mine monitored the slope stability at the positions presented in Figure 1-6 and A-H, and the results showed that the risk positions are upper wall slope C, E, and lower wall slope. Thanks to your suggestion, the studied positions are highlighted using different color.

Point 5: Unfortunately, I did not see the problem statement for numerical simulation in the Slide program. How are the geometric dimensions of the model justified? What are the accepted boundary conditions? What is the Criterion? What physical and mechanical properties were introduced into the model. It is necessary to substantiate this in a separate subsection.

Response 5: Thank you for providing valuable feedback on my manuscript. The calculation parameters for the cross-section model are referenced from the mining geotechnical engineering survey report and the saturated indoor test results. Certain parameters are referred to as per the "Technical Code for Building Slope Engineering" (GB 50330-2013). The material definition adopts the Mohr-Coulomb model. The physical and mechanical parameters such as unit weight, cohesive strength, and internal friction angle of each rock (ore) layer involved in the slope stability study are input into the calculation model.

Point 6: I did not see the justification and description of equivalent materials used in physical modeling.

Response 6: Thanks for your suggestion. I have already explained this in section 2.5. The main objective of the model testing is to simulate the impact of open-pit solidification and backfilling on the safety performance of the upper and lower slope. Therefore, based on the actual occurrence and relative position of the ore body with respect to the open-pit, a middle section profile of the open-pit is selected for similarity simulation. Due to the significant height of the lower slope, a proportional weight of iron blocks is selected as a similar substitute according to the similarity ratio.

Point 7: How was backfill strength determined and how was it used in the model?

Response 7: According to the research, the determined backfilling scheme is as follows: for the bottom of the open pit, a 10m bottom-up backfilling will be performed. The solidified material above 5m from the bottom should have a uniaxial compressive strength of no less than 3.0MPa at 28 days, and the strength of the material between 5m and 10m should be no less than 2.0MPa. For the area above 10m from the bottom, ordinary backfilling will be used, and the strength of the solidified material should be no less than 0.5MPa. Based on the backfilling effect and underground geostress monitoring data, the feasibility of dry consolidation can be considered.

After backfilling to a depth of 110-150m above the bottom, further increasing the backfill height will have little impact on underground mining safety. Therefore, the selected values for the solidified backfill heights in the stability analysis of the open-pit slope are 0m, 10m (bottom-up backfilling), 80m, and 140m.

After determining the strength of the backfill material, the properties of the backfill material are replicated in the simulation through various material ratios based on the determined similarity ratio. The strength of the backfill material in the model does not directly represent the actual strength of the backfill material. Instead, it is derived based on the actual strength of the backfill material and the similarity ratio used in the simulation.

Point 8: Unfortunately, the quality of figures 4, 5 and 6 leaves much to be desired. Absolutely not visible axes and measurement scale.

Response 8: Thank you for providing valuable feedback on my paper. I acknowledge the issue with the image quality and will address it during the revision process. I will reevaluate the current images being used and take the necessary steps to improve their quality. This may include using higher-resolution original images, adjusting the contrast and brightness of the images, and ensuring that the images are clear and easily readable. Additionally, I will carefully review the labeling and captions of the images to ensure they are consistent and accurate with the content of the paper. I apologize for any inconvenience caused and will make revisions promptly, providing higher-quality images. I appreciate your guidance and thank you for your patience and support.

Point 9: The results of subsection 3.3 are not convincing enough. There are no patterns, graphs and drawings with the results of physical modeling.

Response 9: Thank you for taking the time to review it and providing constructive comments and suggestions. apologize for the lack of convincing presentation in terms of patterns, graphs, and drawings with the results of the physical modeling. I understand the importance of visual representation in reinforcing the validity of the results and enhancing the clarity of the findings. To address this concern, I will make sure to include detailed patterns, graphs, and drawings in subsection 3.3 that accurately depict the results of the physical modeling. This will provide a better understanding of the experimental outcomes and strengthen the overall credibility of the study.

Point 10: There is no binding of research to grants, scientific topics. This would show the relevance and significance of the study.

Response 10: Thanks for your suggestion. The grants has been changed to “the National Natural Science Foundation of Hunan Province, China (2022JJ30714)”. It has been added in Acknowledgement Section.

Point 11: The references is poorly designed and insufficient (14 sources is not enough). I recommend doing a deeper scientific review and adding more modern scientific papers on the problem under consideration.

Response 11: Thank you for providing valuable feedback on my paper. I acknowledge the deficiency in the number of references and will make improvements during the revision process. I will conduct more in-depth literature research to ensure the reliability and scientific validity of the paper. Additionally, I will seek out additional relevant references to support my arguments and conclusions. I will make efforts to expand the scope of references to enhance the quality and credibility of the paper. Thank you for your guidance, and I will revise and incorporate more references as soon as possible.

Most sincerely,

Qiusong Chen (on behalf of all co-authors)