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Vibration Control Blasting for Low Stability Final Walls

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ABSTRACT

In the Pilbara region of Western Australia, an iron ore mine is undertaking a high wall cut-back to improve stability and allow access to deeper ore deposits. Several sections of the wall have been classified low factor-of-safety due to unstable localised geology, and therefore an engineered approach to vibration critical blasting was required.

The use of electronic detonators allowed multiple signature (seed) holes to be incorporated into a production blast adjacent to the low factor-of-safety area, therefore providing baseline vibration data to be used for future modelling with the added advantage of eliminating unnecessary pit closure downtime typically associated with a signature hole program. All subsequent blast patterns also incorporated multiple signature holes to provide additional data and allow continual updating – and therefore improved accuracy - of the blast prediction model.

Electronic detonators and blast initiation systems were combined with advanced blast vibration modelling software to produce optimal timing sequences with predictable vibration outcomes. Although minimising vibration was the primary focus, blasting induced frequency was also a concern for the project team and therefore initiation sequencing was optimised to also avoid undesirable frequencies.

Minor variations in ground factors (vibration transmission and attenuation) were noted, and therefore justified the inclusion of regular signature holes which allowed continual vibration model updates. Blasting results produced vibration and frequency measurements within allowable limits and closely resembled the predictive model. These positive results were achievable through the combination of electronic detonators, advanced modelling software and good onsite practices by engineering and on-bench teams alike. This project will remain ongoing as the pit progresses to deeper benches, and therefore the same methodology will be applied; quality and continual data collection, the use of electronic detonators, and optimisation via advanced vibration and frequency modelling software.