Understanding paste fill consolidation behaviour in underground stoping operations

Tobias Massang1

1. Student, The University of Queensland, Brisbane QLD 4066, email: tobiasmassang@outlook.com

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# ABSTRACT

Cemented paste backfill is an integral part of the mining value chain for many underground hard rock stoping mines. From an operational perspective, well-engineered fill volumes with predictable long-term performance serve to increase ore recovery and improve regional rock stability. From an environmental perspective, paste backfill provides a permanent, low-impact and inherently stable method of tailings disposal (Henderson & Morrison, 1998). Extensive paste delivery networks, complex stope geometries and varying mix designs however have led to short- and long-term consolidation of fill masses. Such has required expensive top-up procedures to rectify, causing disruption to downstream production schedules, a problem experienced at Cannington - South32’s Lead, Zinc, Silver operation in Queensland. This report aims to identify and understand factors contributing to the consolidation behaviour of paste fill masses in stope voids. With this, a preliminary model is intended to be developed for total paste volume reduction over time. Such a model could then be used to identify the upcoming stopes which are expected to slump and detail to what extent, enabling scheduling which accounts for paste top-up activities. To identify contributing factors, a review of historical stope fill mass data at Cannington will be conducted, focusing on those that have reported slumping. Total slump will be correlated against paste mix design, number of fill runs, stope geometry, rock drainage conditions, alongside other factors. Live self-weight consolidation testing will also be performed with paste samples of varying rheology, in conditions simulating those experienced underground. This will provide further insight into the mechanisms of particle settlement and water removal. As the industry looks to target deeper and more geotechnically challenging orebodies, paste fill will only become more prevalent (Kuganathan & Grice, 2007). Findings from this study will assist future and existing operations to optimise their fill processes, decreasing production downtime and enabling safer, cleaner and more predictable mining.

# REFERENCES

Henderson, A. & Morrison, D., 1998. Backfill: An Integral Component of Mine Production, Townsville: AusIMM Underground Operators’ Conference - 1998.

Kuganathan, K. & Grice, A., 2007. State-of-the-Art in Paste Fill Technology in the Mining Industry — A Functional Review, Perth: Australian Centre for Geomechanics.