PRESENTATION ON MINING FACILITY DEFICIENCIES

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ABSTRACT: *A major investigation of deficiencies in the structures of two $1.3B mines. The number of load combinations for the most complex structures exceeded 50. Of particular interest was the investigation of vibration induced on the structures by the equipment supported. The performance of the structures was modelled using a Finite Element 3D Model generated in SAP2000 Software based on provided documentation. Dynamic loads for vibrating machinery were applied as a time history function for Harmonic linear analysis of the Finite Element Model. Following modelling the vibration within sample elements of the structures was measured on site. The actual velocity measured was compared to that predicted. We concluded that, for equipment of the type required to be accommodated on the WS&S building adoption of a steel framed structure is appropriate. It is concluded that for Crusher facilities adoption of a structure of high mass (not steel framed is appropriate to achieve tolerable levels of vibration attenuation.*

KEY WORDS: Mining Structures, Crushers, Vibration amplitude, Resonant frequency, Transmissibility

1 INTRODUCTION

In 2014 I was briefed to investigate the deficiencies in the structures of two $1.3 billion mines.

Structures for mining facilities endure many more load cases than occur with buildings. The number of load combinations for the most complex structures exceeded 50. Of particular interest, and the subject of this presentation, is the investigation of vibration induced on the structures by the equipment supported.

2 TYPES OF STRUCTURES

The structures investigated on both mines included the Crusher support structure and the Wet Scrubbing and Screening support structures.

In the case of the Crusher Building the vibration component to the structure is primarily from the Primary Crusher and from the Secondary Crusher. This underestimates the complexity of the installation which includes a Run of Mill Bin, a Rock Breaker, Primary Sizer Crusher, a Secondary Sizer Crusher, an Apron Feeder, an Apron Feeder Feed Chute, a Dribble Chute, Primary Sizer Feed Chute, Primary Sizer Travelling Chute, Secondary Sizer Discharge Chute and a Secondary Sizer Maintenance Overhead Crane. All of these items are accommodated by the structure and the structure responds to their activity by vibrating.

The Wet Scrubbing and Screening structure has **12 levels** and accommodates 6 sets of major dynamic equipment, comprising two Double Deck Shaker Screens at Level 3, two Single Deck Shaker Screens at Level 6 and two Scrubbers at Level 11.

An image of the Wet Scrubbing & Screening Building is presented in Figure 1, below. It has 12 levels, 3,478 nodes and 3,371 members. These elements have variable lengths, stiffness and restraints and their modelling takes time. Once the model is established some consideration can be given to the effects of the machines installed which are two Double Deck Screens at level 3, two Single Deck Screens at Level 6 and two Scrubbers at Level 11.
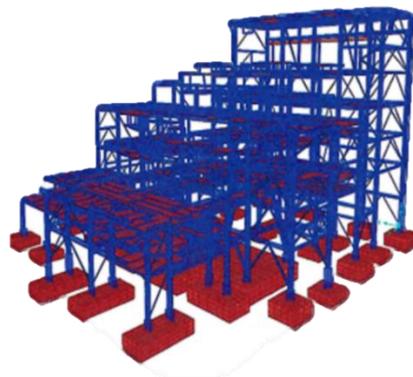

Figure 1: Rendered image of modelled structure

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