THESIS TITLE:
NUMERICAL ANALYSIS OF EXTERNAL OVERBURDEN DUMPS STABILITY IN WARDHA VALLEY COALFIELDS

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ABSTRACT

Optimization of the dump slope angle under complex field conditions for accommodating maximum overburden materials becomes key concern for the field engineers keeping the safety of man and machinery into consideration. The particulate nature of the overburden dump materials, which are mixtures of broken rocks and loose soil materials, provides a characteristic micromechanical feature which varies from one to the other dump. Continuum based numerical approaches neglect the discrete nature of the dump material and the effect of their micromechanical interactions towards the stability of the dumps.

A total of eleven different mine sites were selected for the present study, with three different types of external overburden dump, namely, the running, old and vegetated dumps. Two hundred fifty two field samples were collected following standard sampling plan and tested in the laboratory for determination of the physical and geotechnical properties which were used for the numerical modelling. It is observed, from laboratory study, that the material constituting the external overburden dumps in the study area exhibit different nature of geotechnical characteristics. These differences made the development of a single generalised numerical model for all these slopes difficult.

Numerical modelling of the different cases, 2057 in continuum, 33 in discontinuum and 15 in hybrid approach, have been carried out in the present study. Field data regarding the

recent slope failures in the external dumps have been compared with the results obtained from the three different numerical modelling approaches, wherever possible.

From the analyses it has been observed that double stage dumping has 1.5 times more material accommodation capacity compared to the other two types of dumping when base area remain fixed and height was kept constant . External dumps at two of the mine sites have been identified to be unstable after 35° dump angle under the considered saturation condition. Toe side materials have been found to displace more under dynamic loading conditions. The duration of earthquake has been found to have incremental effect on the overall displacement by 7.6% for every second of time increment starting from two seconds. The micromechanical approach has been observed to be a better tool to capture the toe material displacements and crest sliding, compared to conventional continuum approach.