MINING INDUCED SEISMICITY

5.1. Introduction

Seismicity in mines, in general, depends on depth, production rate, mining geometry and geological discontinuities such as dykes, faults etc. and on ambient tectonic stress field. One or combination of the above factors may contribute significantly to mining seismcity in any specific case (Gibowicz and Kijko, 1994; Mendecki, 1997; Holub, 1997; Holub *et. al.*, 1995)). It is often observed that most of the damaging events, commonly known as rockbursts, are induced at the geological discontinuity in the mining area, Figure 5.1. Most of the seismic events less than magnitude zero in the Richter scale are induced following production blasting.

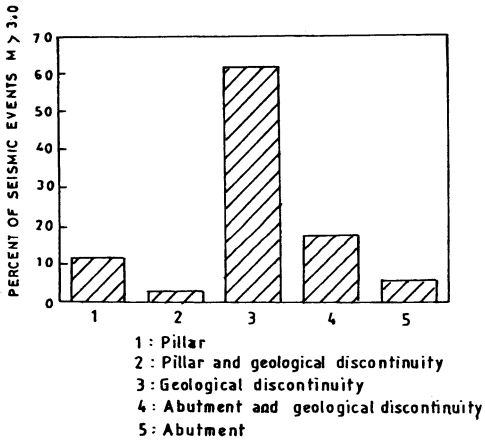

Figure 5.1 : *Relative importance of pillar, geological discontinuity and abutment in inducing mining seismicity (after Lenhardt, 1989).*

However, many larger mining seismic events ($M \geq 3.0$) are not necessarily controlled by production blasts, indicating long period stress-redistribution responsible for the same. Monitoring of seismic events in deep mines and detailed geological knowledge are thus the two main inputs for identification of critical areas for possible preconditioning for destressing for mitigation of rockburst hazard (Lenhardt, 1989; Senfaute *et al.*, 1997; Urbancic *et.*

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al., 1996; Urbancic and Young, 1993). Figure 5.2 shows typical picture of damage to steel support due to a large rockburst at Kolar gold fields (Caw, 1956).

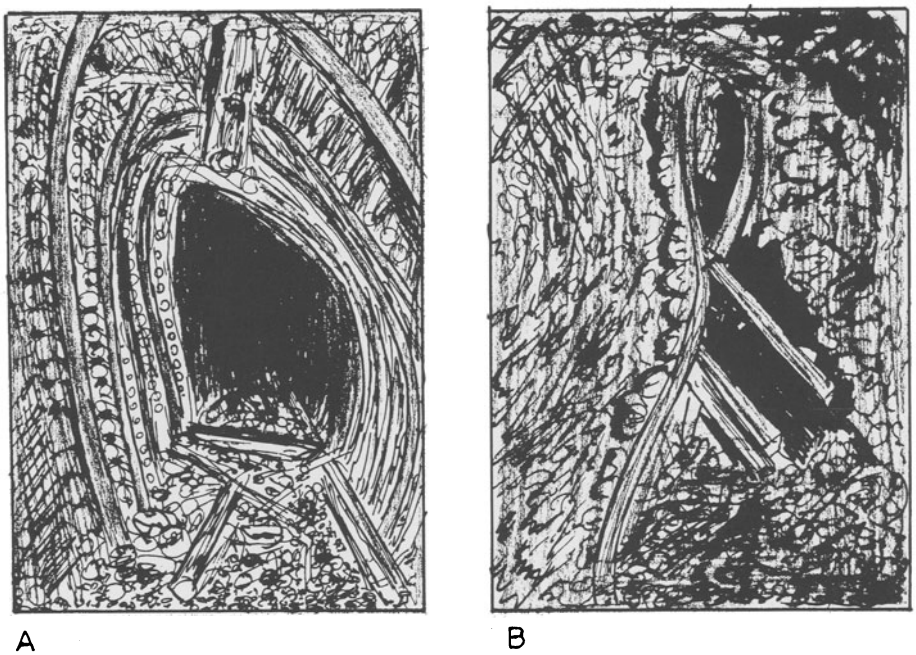

Figure 5.2 : *Rockburst damage to steel support at Kolar gold fields (India) (after Caw, 1956).*

Earlier, Isaacson (1958) from the results of photoelastic analysis for shear stress contours around a stope having ratio of vertical (P_z) and lateral (P_h) stresses = 4 : 1 predicted high stress concentrations at the corners resulting in localised crushed zone and subsequent stress redistribution, often observed in mines. However, the loops of high shear stress concentrations are deformed with higher values of P_h. This may have implications in layout of underground shafts etc. Nearby fault, dyke or other geological discontinuities may also deform the shear stress contours around stope significantly thereby causing hazard to mining unless suitable precautions are