

Prediction and Prevention of Rock Burst at Working-Face Roof

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Abstract: The fracture of the working-face roof induced the sudden release of energy. The greater of spread speed, the working face and adjacent roadway will be more serious damaged. This paper analyzes the causes of bumping and the conditions in order to prevent rock burst, focusing on the prediction and prevention of overload pressure.

Failure mechanism of rock burst

The working face in shock compression can be caused by the release of pressure, its flashpoint (source) occurred in the high stress concentration around the site.

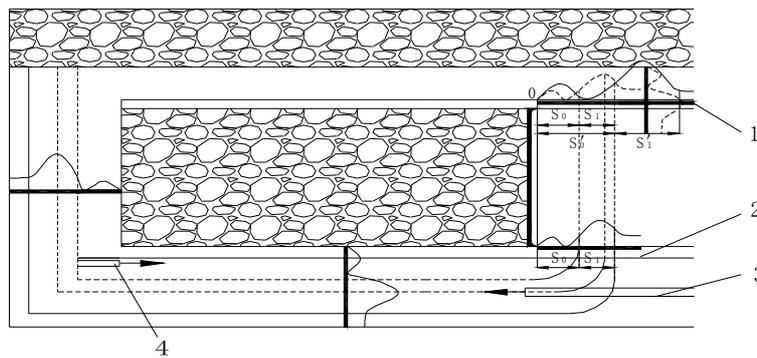


Fig.1 The distribution of pressure in mining field induced by rock burst

Face and adjacent parts of the roadway from the earthquake the closer, vibration shock hazard damage and the corresponding greater accident. Instead, Face and adjacent roadway farther away from the earthquake epicenter elastic energy absorption to reduce the width of the larger "buffer zone", the shock of impact damage and threat-related accidents will smaller. Therefore, try to mining roadway layout in the "internal stress field", and in the face advance to shocks that may occur to the pressure of the site, take a pre-injection or blasting out to expand the width of the buffer and other measures to reduce the impact of ground pressure, especially the "threat to vibration impact damage "is very effective. Recovery working face advance Burst Induced damage range and its relationship with support pressure distribution shown in Figure 1:

Figure 1 for the coal seam has compression failure can have a dampening effect of the low stress range. Elastic energy of compression stress zone, which is the source of fat segment rock burst; which, advance entry near the upper side of the mined-out area (Figure 1), if the peak pressure in the upper face in supporting the site, then when rock burst occurred, due to the superposition of two effects working surface compressive stress, its impact damage than the increase in the scope and intensity of the lower ahead of Lane doubled. The roadway is in low stress areas of the upper face in abutment pressure distribution, namely "internal stress field" site. Its strength and impact damage range are the lower than the advance entry (Fig. 2) is much smaller.

Similarly, when digging and deployment of the lower face continuous mining drift, if the wrong area of the roadway layout peak in support of the working surface pressure distribution, and in advance of the excavation (Figure 3), the following rock burst damage that is inevitable.

Rock Burst Classification

Recovery working face advance shocks occur during ground pressure, including the working surface mining or coal seam roof breaking induced compression elastic energy release, and in a large area of thick elastic bending state hard roof breaking, rock burst caused by two types. Recovery working face rock burst prediction and control classification cation model shown in Figure 2.

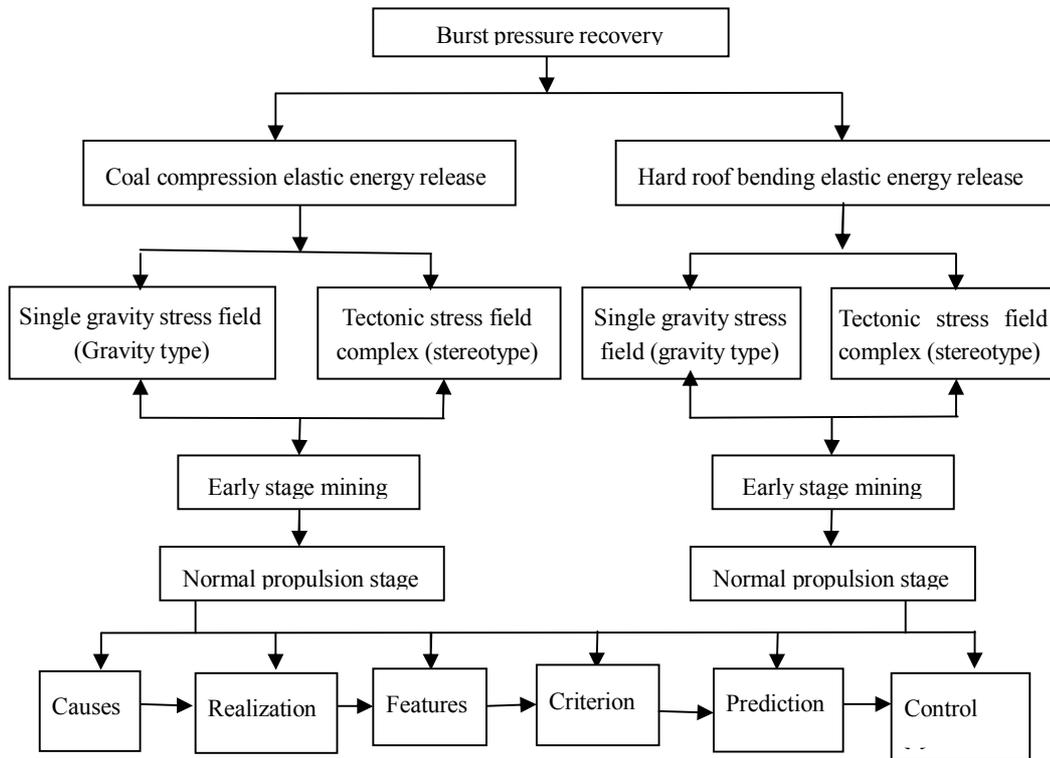


Fig.2 The disaggregated model of rockburst during driving

Burst pressure prediction of Occurrence

(1) Initial exploration phase of bumping the development of the law

When Face Cut open tectonic stress accumulation in the original layout of the site, or arranged in adjacent mining face has been supporting the peak pressure zone, the situation that is shown in Figure 3.

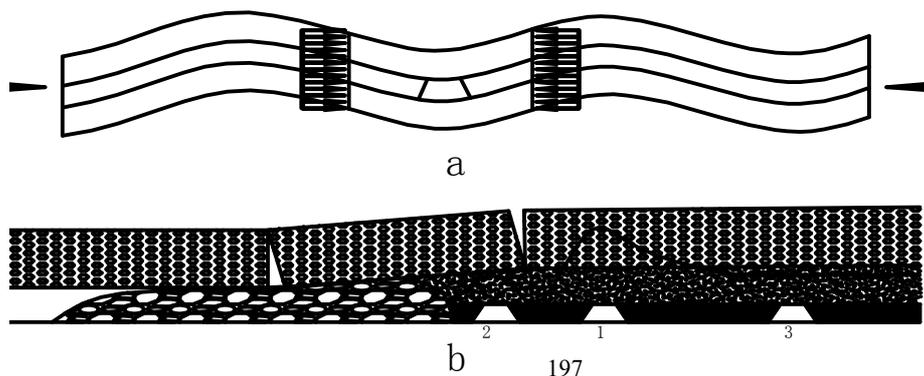


Fig.3 The law of rock burst occurrence during the first mining of working face

For the presence of tectonic stress conditions, the open Cut arranged in adjacent mining face has formed in the stress field, only to achieve the goal of early release of tectonic stress safe driving. But exclude Recovery working face mining accident early stage.

(2) Normal advance stage of bumping the development of the law

After the stope into the normal advance stage, the possibility of bumping the differences occur, includes the following two sections: "danger zone": Includes the impact from increased stress concentration limit damage to the coal wall began to destroy the coal wall destruction ahead have been deep enough to slow the formation of charge-width site. I.e., FIG. 4 (b) to (c) position. "Stable range": that is, after the coal front wall buffer zone formation. I.e. initially to FIG. 4 (c) position. To face advancing until the completion of the entire length .In the absence of tectonic stress field of the original stress Cut open layout, face advancing the process, rock burst time and place of the law of the difference can be used Expressed in Figure 4.

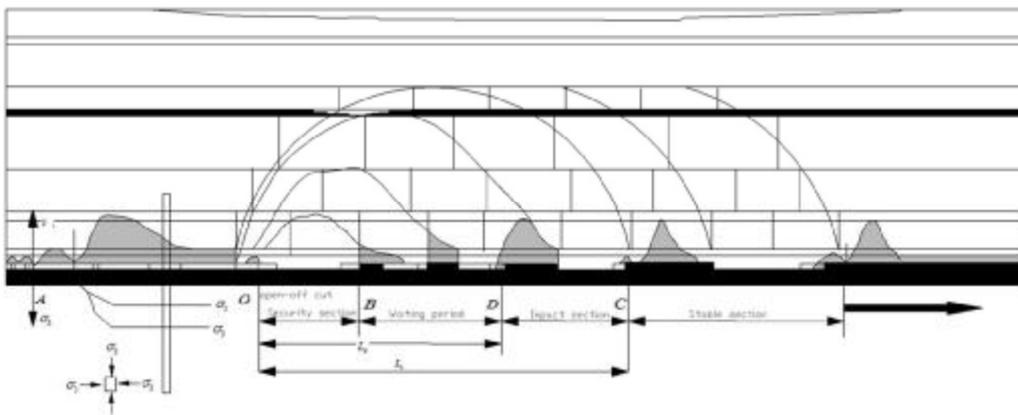


Fig.4 The law of rock burst occurrence during normal advancing stage

Bumping prevention and control methods

The possible impact occurred Face Pressure should take the following measures to control disasters: the(1) the use of "underground rock dynamic observational study methods" (if necessary, use the "cuttings stress analysis"), obtaining the following relevant information based on the realization of rock burst possible time, place and intensity forecast. ① bearing pressure distribution, especially the "stress field" range, bearing pressure peak with stope advance propagation law. ② roof fracture to the pressure of the law, including the lower roof rock beam, the host rock beam with no bending elastic energy release threatening hard roof breaking the time, location and the corresponding face in pushing progress from other information. As a basis for prediction of fracture-induced roof rock burst occurred time, place and impact energy.(2) is expected to occur in high-strength rock burst dangerous place, measures to reduce the stored elastic energy and induce energy measures, and strive to reduce the impact pressure range to a minimum.(3) the use of the correct way to support the maintenance of security in the work space has to withstand the impact of the destruction of the working surface and ground pressure roadway.

Conclusions

Pressure comprehensive study of the impact of classification results, you can clearly see, the stress controlled conditions to achieve rock burst, the key is to control the coal mine rock burst occurred. Mining face must promote the process may induce the release of elastic compression energy, enough to cause a restriction in the scope of the impact of the destruction occurred.

Acknowledgements

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