

Formula 1

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Formula 2

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Formula 3

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Related Content

Title	Type	Slug
Seismic Monitoring Setup and PPV Interpretation	lesson	seismic-monitoring-ppv-interpretation
Blast Design Excel Template v4.2	resource	blast-design-excel-template
Drill Rig Maintenance Inspection Checklist	resource	drill-rig-maintenance-checklist
Rock Mass Rating (RMR) Field Survey Sheet	resource	rmr-field-survey-sheet
Drilling Energy Benchmarking Dashboard (Power BI)	resource	drilling-energy-dashboard

Detailed Explanation

Microseismic monitoring detects and locates low-magnitude seismic events (typically ?2 to 3 ML) generated by rock fracture and stress redistribution in mine walls, pillars, and stopes. Accurate setup and calibration are critical because errors in sensor geometry, clock drift, or velocity assumptions propagate

directly into location uncertainties—often exceeding hundreds of meters if uncorrected. The guide emphasizes a systems-based approach: starting with site-specific geological and geomechanical characterization, followed by optimal array design (e.g., minimum 4–6 well-distributed sensors per monitoring volume), precise surveying of sensor positions (± 5 cm spatial accuracy), and rigorous time-synchronization using GPS-disciplined oscillators or PTP (Precision Time Protocol). Calibration involves iterative refinement of the 1D or 3D P-wave (and optionally S-wave) velocity model using controlled-source tests (e.g., shot firings, hammer blows) and statistical residual analysis (e.g., RMS traveltimes residuals < 10 ms). It also addresses environmental and operational noise mitigation—such as filtering out blast harmonics, conveyor vibrations, and pump cycles—through spectral analysis and adaptive thresholding. Finally, the guide outlines performance validation metrics, including detection threshold estimation, location repeatability testing, and blind calibration event analysis, ensuring long-term data integrity for hazard assessment and pillar stability management.

Key Components

#	Component
1	Sensor Array Geometry & Deployment
2	Time-Synchronization Infrastructure
3	Velocity Model Calibration Procedure

Applications

#	Application
1	Real-time rockburst early warning
2	Post-blast damage zone mapping
3	Long-term pillar and stope stability assessment

Related Concepts

#	Concept
1	Seismic Source Mechanism
2	Geophone Sensitivity & Frequency Response
3	Tomographic Velocity Inversion

Tags

rock mechanics, mine safety, seismic monitoring, calibration protocol, ground control

Microseismic Monitoring Setup & Calibration Guide (PDF)