

ISEE Performance Specifications For Blasting Seismographs 2011 Edition



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ISEE Performance Specifications For Blasting Seismographs

International Society of Explosives Engineers (ISEE) Standards Committee

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Disclaimer: These performance specifications are intended to provide design guidelines for blasting seismograph manufacturers. It is incumbent on the blasting seismograph operator to evaluate field conditions, identify the appropriate field criteria and select the proper blasting seismograph for the field application. The operator is responsible for documenting the field conditions and setup procedures in the permanent record for each blast.

Preface: Blasting seismographs are used to establish compliance with regulations that have been established to prevent damage to public and private property. The disposition of the rules is strongly dependant on the accuracy of ground vibration and air overpressure data. One goal of the ISEE Standards Committee is to ensure consistent recording of ground vibrations and air overpressure between all blasting seismographs.

Part I. General Guidelines

Blasting seismographs are deployed in the field to record the levels of blast-induced ground vibration and air overpressure. Accuracy of the recordings is essential. These guidelines define the manufacturers' responsibilities when building blasting seismographs for outdoor field use to measure ground vibrations and air overpressures that will be suitable for comparison to limiting criteria presented in United States Bureau of Mines RI 8507 and RI 8485 which often form the basis of regulations for blast vibrations. Blasting seismographs should be deployed in the field according to the ISEE "Field Practice Guidelines for Blasting Seismographs" (ISEE 2009). The following specifications are considered minimums.

Digital sampling rate.....	1000 samples/sec or greater, per channel
Operating temperature range.....	10 to 120F (-12 to 49C)
Electrical cross-talk	Less than 2% of the input signal appears on any other channel

Part II. Ground Vibrations Measurement

Ground vibration sensor response characteristics should conform to the following minimum values:

Frequency range.....	2 to 250 Hz, within zero to -3 dB of an ideal flat response
Accuracy.....	±5 pct or ±0.5 mm/sec (±0.02 in/sec), whichever is larger, between 4 and 125 Hz.
Phase response.....	Phase shift between 2.5 Hz to 250 Hz shall not cause an error of more than 10% to the maximum absolute value of two superimposed harmonic vibrations.
Cross-talk response.....	Less than 5% of the excited axis indication on either of the mutually perpendicular channels when excited at the natural frequency of the sensor or at 10 Hz for sensors with a natural frequency greater than 250 Hz.
Density of sensor	< 2405 kg/m ³ (150 lbs/ft ³) (should be reported for user consideration).

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Part III. Air Overpressure Measurement

Air overpressure microphones should conform to the following minimum values:

Frequency range.....	2 to 250 Hz, -3 dB at 2 and 250 Hz, ± 1 dB
Accuracy.....	± 1 dB between 4 and 125 Hz.
Microphone seismic sensitivity....	Microphone response to a mechanical vibration of 50 mm/s (2 in/s) at 30 Hz, from any angle, must be less than 40 dB below the maximum microphone output, or 106 dB whichever is lower.

Part IV. Calibration

To ensure proper operation, blasting seismographs should be calibrated annually by a facility authorized by the manufacturer.

Frequency.....	Annually
Traceability.....	Calibration equipment accuracy must be traceable to National Institute Standards and Testing, National Research Council or equivalent.
Certificate	Issued with each calibration and signed by the authorized service representative.
Documentation.....	List the frequencies tested along with input and output values at each frequency. Provide documentation of measured frequency response characteristics.
Ground Vibration Sensor	Calibration must be of the assembled sensor. Component calibrations of individual sensors are not appropriate.

Part V. Measurement Practices

In addition to the Performance Specifications described above, blasting seismograph setup or installation in the field is crucial for accurate defensible data acquisition. These measurement practices are specified in the ISEE Field Practice Guidelines for Blasting Seismographs (2009).

Furthermore, some blasting seismograph field needs are specific to an operator, an application, or a region. For example, blasting seismograph use in arctic-type conditions may require good performance at low temperatures or for close-in construction blasting extended frequency ranges might be necessary.

It is the responsibility of the operator to confirm that the blasting seismograph selected for measurement of ground vibrations and air overpressure in conditions not specifically covered by this standard, has performance characteristics to record data consistent with the tolerances described herein.

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References:

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3. International Society of Explosives Engineers. ISEE Field Practice Guidelines for Blasting Seismographs, 2009.
4. Siskind, D. E., Stachura, V. J., Stagg, M. S., Kopp, J. W. Structure Response and Damage Produced by Airblast From Surface Blasting. US Bureau of Mines Report of Investigations 8485, 1980.
5. Siskind, D. E., Stagg, M. S., Kopp, J. W., Dowding, C. H. Structure Response and Damage by Ground Vibration From Mine Blasting. US Bureau of Mines Report of Investigations 8507, 1980.
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