ON THE USE OF DIFFERENTIAL PRESSURE GAGES FOR LOW PRESSURE BLAST MEASUREMENTS

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It is often necessary to make accurate overpressure measurements in the region well below one psi (6895 Pa) for purposes of off-site blast damage claim mitigation as well as high explosive test diagnostics. Standard, absolute pressure, piezo-resistive gages typically have very low sensitivity in this region. In most cases off the shelf microphones have very limited response characteristics below 20 Hz or so as do most sound pressure level meters. Some research grade laboratory microphones do provide suitable low frequency response but may be quite expensive, require 110 volt power, and may not be suitable for all weather field use. With modifications, off-the-shelf industrial pressure transducers (with typical response ranges of 0 – 200 Hz) offer a suitable rugged and economical alternative. In order for a differential pressure transducer to measure transient overpressure, a reference volume with a very small, controlled leak to ambient must be connected to one side of the diaphragm. The leak eliminates gage response to barometric pressure changes as well as changes in elevation. The other side of the gage is left open to the atmosphere. The low frequency cut-off point of the gage is determined by the size of the leak. We have found that a length of small diameter capillary tubing provides a more stable and rugged arrangement. The degree of the leak, and the low frequency cut-off point, are controlled by the length of the tubing. Dynamic calibration of the system with respect to low frequency cut-off point is accomplished by means of a step function pressure source provided by breakage of a membrane. The leak is typically adjusted to provide a value of 0.05 Hz or lower. Typical gage sensitivities are of the order of 60 volts per psi. Coupled with portable 24-bit seismic recorders these gages provide a rugged, economical microbarograph system.