

Measuring, Analyzing, and Engineering Noise Controls For Indoor and Outdoor Shooting Ranges

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Situation/problem: Shooting range noise is a serious health hazard not only to hearing but to the whole person. Firing a weapon in the middle of nowhere with no manmade or natural barriers to reflect noise is as quiet as the weapon can be. As soon as you add walls, canopies, baffles, floors and roof decks, etc. the noise that is heard and felt by the shooter and personnel increases exponentially. The more shooters you add the louder it gets until you have a cacophony of damaging noise.

A root cause of noise buildup is reverberation. Reverberation is simply defined as the persistence of a sound after its source has stopped. It is the result of the sound, or with gunfire, the muzzle blast overpressure repeating numerous times as it hits opposing reflecting surfaces. The effects of reverberation and other causes of pressure buildup can be substantially reduced through engineering noise controls.

Resolution: To create the right engineering noise controls for a given situation one must first accurately acoustically measure the space to understand its problems. This is done by using multiple high-level instrumentation microphones, and a 192k, 16 channel recorder. A standardized Course of Fire and mic placements were devised including Personnel Mounted Microphones for consistency and repeatability. Metrics were developed for post-analysis, and before and after acoustic treatment comparisons.

Results: Using suitable engineering noise controls many indoor and outdoor shooting ranges have been successfully acoustically treated with a significant reduction of reverberation time and pressure on the body. Before and after results will be graphically presented.

Lessons learned: Even similar size and types of shooting ranges call for different forms and amounts of engineering noise control. Not all acoustic materials are suitable for sound absorption and noise abatement in the intense sound fields found on shooting ranges. Surfaces not parallel to the noise source can actually cause the first reflection to have a higher peak level than the initial muzzle blast. There are issues of noise transfer to adjacent classrooms, offices, and control rooms that have to be dealt with. With the use of tailored engineering noise controls and appropriate acoustic materials shooting range noise can be controlled for the health and safety of all.