



Shooting Range Acoustics: Intent & Regulations

The intent of the acoustics for any shooting range is to protect the shooters and instructors in the shooting range from the hazardous sound levels produced by the weapons fired in these ranges. The gunfire sound level of a typical M4 weapon ranges between 164dB-167dB. Most off the shelf acoustically named materials will not protect the users of this range from the hazardous gunfire sound levels. The justification for a higher quality acoustical material is per:

1. Department of Defense Instruction (0001) 6055.12
2. Department of the Army Pamphlet (DAPam) 40-501,
3. NIOSH REL 1998
4. OSHA regulations, section 29 CFR 1910.95
5. US Air Force ETL 11-18 Section 7.2.9
6. AFOSH STD48-20 May 2013

The above stated regulations are written and enforced with the intent to protect users of ranges. All of the above mentioned regulations include a "Noise Exposure Limit" time, and a "Not to Exceed" noise level and a reverberation time for in the range. They are as follows:

1. For noise exposure, the OSHA **Personal Exposure Limit** is 90 decibels, A-weighted (dBA), and the action level is 85 dBA both as an 8-hour TWA using a 5-dB exchange rate [29 CFR 1910.95].
2. The OSHA occupational noise standard states that exposures to impulsive noise should **not exceed 140 dB** peak sound pressure level (SPL).
3. The NIOSH REL for noise (8-hour TWA) is 85 dBA using a 3-dB exchange rate [NIOSH 1998].
4. NIOSH also recommends that peak SPL **not exceed 140 dB**. TWA using a 5-dB exchange rate [29 CFR 1910.95].
5. The US Air Force ETL states "Therefore, sound-absorbing materials should be used to reduce the reverberation rate to below 1.5 seconds."
6. Per the AFOSHSTD48-20, which states "Compliance with this Publication is Mandatory". Section 6 - "Noise Control", sub-section 6.1 Hierarchy of Controls: "Engineering Control are the first choice to reduce hazardous noise exposure existing in the workplace."

When a weapon is fired in these ranges, the muzzle blast energy is immediate, about 4-7 micro seconds. The peak level of the weapons used by these operators, range between 154dB-168dB. This particular type of noise is known as impulse noise. A



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secondary source of impulse noise is generated when the muzzle blast energy REFLECTS off the exposed concrete walls, concrete slab floor, steel overhead baffles and steel bullet trap. The initial muzzle blast energy level is sometimes exceeded by the direct reflections of the exposed overhead steel baffles. Concrete, Steel or Rubber in the ranges will not absorb, nor reduce this muzzle blast energy.

It should be kept in mind that the shooters are exposed not only to the muzzle blast energy from their own weapons, but to the intense sound level and over blast pressure from all the other shooters' weapons as well. This noise, although somewhat less intense, is generally more frequent. Much of the muzzle blast energy can be greatly reduce with acoustical treatment applied to the all exposed surfaces in the range except the concrete slab floor and bullet trap. This acoustical coverage with certified high absorptive materials approved for shooting range use, will reduce the reverberation time through the absorption of the materials. The reduced reverberation time, will insure to be within the "Noise Exposure Limit" of the 85dB 8 hour weighted average. This further protects the operation and maintains the intent of protecting the operators of the range from the hazardous sound levels of the weapons fired in these ranges.

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