

EVALUATION OF CIVILIAN BLAST DAMAGE CLAIMS

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US Army military installation activities include firing guns and detonation of explosives generating blast waves which propagate to neighboring communities and cause complaints of damage. This brief paper discusses some aspects of claim processing and explains damage assessment methods.

The most common cause of complaints is artillery fire. Training exercises and weapons testing at numerous military bases include the firing of 105 mm, 120 mm and 8" artillery. Depending upon the complainant's location, the noise source may be either from muzzle blast or explosion of the artillery shell. Other reasons for complaints are the destruction of outdated munitions buried in shallow pits that vent explosive energy to the surface, aerial bombing practice, and high explosive charges fired on the surface. Complaints are received for both single events and multiple events occurring over long time periods. People are very sensitive to noise and vibration, and blast effects are annoying at levels far below the damage threshold.

Sometimes there may be months or even years between the time when the blast event(s) has occurred and a damage complaint is received. Variations in weather conditions, terrain, exact firing point and impact area locations, precise propellant weight, depth of burial and net explosive weight when munitions are destroyed, and the condition of property before the incident(s) occurred make accurate measurements impossible. There may also be other causes for the damage such as house settlement, poor construction, or natural deterioration caused by weather and use.

Sound waves may be focused by an inversion layer when cold air near the surface has a warmer air layer above, or when wind speed near the surface increases with altitude. Either of these conditions refract sound back to the surface some distance away from the blast source although at intermediate distances the sound may not be heard. Terrain effects need to be considered. For example, blast noise may be enhanced on a rising slope, attenuated by forest, or remain unimpeded by a smooth lake.

Alleged affects may be minor, such as, objects falling from shelves or pictures dropping to the floor. Common complaints are nail popping, paint flaking, failed window seals, and cracks in plaster. Occasionally, at higher blast levels, windows may crack. More serious complaints are cracks in above ground brick and cement work, foundations, and patios.

Because of the nuclear threat and military systems survivability requirements, large scale blast experiments using military and civil defense test items have helped to quantify the damage threshold for typical targets and have provided data that is used in the damage assessment process.

From many tests over the years, the Army has developed pressure versus distance curves for muzzle and shell blasts for typical artillery. The blasts from bare high explosive bursts, bombs, and demolitions operations can be calculated using standard one pound TNT curves and blast scaling laws.

Computational techniques, incorporating experimental blast data, quantify blast effects and make the damage assessment process uniform. Weather and terrain effects are also considered in the calculations.