

# **UNDERWATER SHOCKS FROM BLASTING**

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## **Abstract**

Underwater blasting causes not only ground shock but water-shock. Underwater shock attenuates less with range from the explosive source than ground shock and has the potential for killing fish or marine mammals or for damaging marine structures. The collapse and subsequent oscillation of the gas cavity surrounding the detonation can sometimes produce a greater impulse than the initial shock wave from the detonation. The airblast from underwater detonations can range from nuisance levels to damaging levels.

Underwater shock has been studied for military purposes for decades. The shock phenomena are governed by the diverging waves from the explosive source, tensile reflections from the surface, and compression or tensile reflections from the bottom. Methods to measure the shock phenomena involving a very high-frequency response to monitor the short rise times (sometimes on the order of pico-seconds) of the waveforms, have been developed.

Water-shock, some of the other phenomena associated with underwater blasting, the use of bubble screens to mitigate water-shock, and the traditional methods used to measure the pressure fields produced by underwater detonations, are discussed.