

# EXPERIMENTAL AND THEORETICAL BASIS OF CURRENT NATO STANDARDS FOR SAFE STORAGE OF AMMUNITION AND EXPLOSIVES

M.M. van der Voort<sup>1</sup>, E. Deschambault<sup>2</sup>, J.A.J. de Roos<sup>3</sup>, T.N. Taylor<sup>4</sup>

<sup>1</sup>*NATO Munitions Safety Information Analysis Center (MSIAC), B-1110, Brussels, Belgium*

<sup>2</sup>*formerly US Department of Defense Explosives Safety Board (DDESB)*

<sup>3</sup>*formerly Belgian MoD*

<sup>4</sup>*formerly NATO MSIAC and US Army Europe*

## ABSTRACT

NATO standards for the safe storage of ammunition and explosives contain tables with so-called Quantity Distances (QDs). These distances are aimed to provide an acceptable protection level to surrounding Exposed Sites (ES) in the event of an accidental explosion of a Potential Explosion Site (PES). The development of the standards took place over many decades by explosives safety experts. The QDs are based on the analysis of a large number of explosives tests- and accident data. Based on additional testing and analysis accomplished in recent years, a comprehensive and transparent overview of the basis for the QDs is necessary in order to validate them and to eliminate inconsistencies.

The Munitions Safety Information Analysis Center (MSIAC) conducted a study on the experimental and theoretical basis of QDs. This paper presents a structured approach to QDs, starting with the amount of munitions involved in the munitions response, and then treating each explosion effect separately.

Relevant references that support the standards have been analyzed. QDs have been compared to state-of-the-art prediction models for blast wave propagation and observed damage. The basis of those QDs that are dominated by fragments and structural debris is discussed as well. Planned changes to the NATO standards, such as the implementation of QDs for small quantities of explosives, are taken into account. Knowledge gaps have been identified and recommendations for long term development have also been made. A more detailed report as well as a repository of all references will be completed towards the end of 2016.