

**Criteria Selection for Risk-Based Explosives Safety Standards**

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**Abstract**

This document reviews work performed by the Risk-Based Explosives Safety Criteria Team (RBESCT) during 1999 toward U. S. implementation of risk-based explosive safety standards. The authors summarize the research, precedents, and existing information which led to the selection of draft explosives safety criteria to be used by the DoD Explosives Safety Board (DDESB). The RBESCT developed the data under the sponsorship of the DDESB and the United States (U.S.) Army, Navy, Air Force, and Marines.

**Introduction**

The Risk-Based Explosives Safety Criteria Team (RBESCT), a team of government and industry professionals sponsored by the Department of Defense Explosives Safety Board (DDESB) and the four U.S. military services, has been chartered to develop and implement risk-based criteria for explosives safety in the U.S. An important part of their work is to gather background data and document selected personnel protection criteria. This paper addresses the background data. It includes an assessment of comparable risks in other human endeavors, accident experience from the performance of common tasks, as well as a survey of comparable standards used in other areas of safety. Accident data, regulations, and legal precedents have been reviewed for applicability to Universal Risk Scales and used as a baseline from which the international explosives safety community, as well as other safety communities who are using risk-based analyses and numerical risk criteria, can benefit.

In December 1999, the U.S. military services began a three-year trial implementation period of the draft explosives safety criteria. The criteria are primarily being used, in conjunction with a companion modeling software program, to evaluate potential sites for explosives storage and use.

**Draft Criteria**

The draft criteria shown in Figure 1 are for use as a supplement to the practice of applying quantity-distance (Q-D) measurements to determine explosives safety hazards. Nations participating in a The North Atlantic Treaty Organization (NATO) Risk Analysis Working Group are considering adopting similar risk-based approaches.

Risk to:	Draft Criteria
Any 1 worker (Annual $P_f$ )	<ul style="list-style-type: none"> <li>Limit maximum risk to <math>1 \times 10^{-4}</math></li> </ul>
All workers (Annual $E_f$ )	<ul style="list-style-type: none"> <li>Attempt to lower risk to <math>1 \times 10^{-3}</math></li> <li>Accept above <math>1 \times 10^{-2}</math> with significant national need only</li> </ul>
Any 1 person (Annual $P_f$ )	<ul style="list-style-type: none"> <li>Limit maximum risk to <math>1 \times 10^{-6}</math></li> </ul>
All public (Annual $E_f$ )	<ul style="list-style-type: none"> <li>Attempt to lower risk if above <math>1 \times 10^{-5}</math></li> <li>Accept above <math>1 \times 10^{-3}</math> with significant national need only</li> </ul>

**Figure 1 - Draft Criteria**

The goal of criteria selection is to establish a standard that will have broad based understanding, strong legal precedents, and support within the technical community. The RBESCT used a combination of information from other regulations, historical precedents, and risk statistics to define each criterion chosen. The aim was to achieve a broad consensus of support for the criteria, recognizing that universal acceptance would not be initially possible. Figure 2 shows the different rationales that can be used to support criteria selection. As the number of rationales used to support a criterion increases, the level of acceptance also increases.

Risk measures define who or what is at risk, the consequences of the risk, and the time period of the risk. As shown in Figure 3, numerous measures were considered by the RBESCT. Each measure has merit and would serve in varying degrees to achieve the desired purpose of assessing safety.



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