

situation. Nevertheless, the ultimate goal needs to be kept in mind: satisfaction that the residual risk which exists after risk reduction measures are implemented is acceptable.

TABLE 11 Risk Assessment Matrix in Z10

Example of a Risk Assessment Matrix				
Likelihood of OCCURRENCE or EXPOSURE For selected Unit of Time or Activity	Severity of Injury or Illness Consequence and Remedial Action			
	CATASTROPHIC Death or permanent total disability	CRITICAL Disability in excess of 3 months	MARGINAL Minor injury, lost workday accident	NEGLIGIBLE First Aid or Minor Medical Treatment
Frequent Likely to Occur Repeatedly	HIGH Operation not permissible	HIGH Operation not permissible		MEDIUM Take Remedial action at appropriate time
Probable Likely to occur several times	HIGH Operation not permissible	HIGH Operation not permissible		MEDIUM Take Remedial action at appropriate time
Occasional Likely to occur sometime	HIGH Operation not permissible		MEDIUM Take Remedial action at appropriate time	LOW Risk Acceptable: Remedial Action Discretionary
Remote Not likely to occur		MEDIUM Take Remedial action at appropriate time	MEDIUM Take Remedial action at appropriate time	LOW Risk Acceptable: Remedial Action Discretionary
Improbable Very unlikely – may assume exposure will not happen	MEDIUM Take Remedial action at appropriate time	LOW Risk Acceptable: Remedial Action Discretionary	LOW Risk Acceptable: Remedial Action Discretionary	LOW Risk Acceptable: Remedial Action Discretionary

There are no restrictions or rules with respect to the terms used to establish qualitative risk levels. But a matrix, as a minimum, should illustrate probability and severity categories and risk gradings. Tables 7–11 show a general acceptance of a group of terms for incident probability and severity, and for risk categories. However, I repeat: Safety professionals should draft matrices with which they are comfortable. Since risk assessment matrices are valuable communication tools, the terms used in them must be agreed on and the education time necessary to achieve an understanding of them must be allocated.

ON ACCEPTABLE RISK

In Chapter 6, “Achieving Acceptable Risk Levels: The Operational Goal,” I wrote that as every element of Z10 is applied, the outcome would be the achievement of acceptable risk levels so that the risk of harm remains at a practicable minimum. I also said that the risk assessment matrices in this chapter and the discussion of risk categories here will help in determining acceptable and tolerable risk levels.

from practical applications of the order of precedence. The descriptive material in 882E for the six elements in the “System safety mitigation order of precedence” is recommended reading.

THE HIERARCHY OF CONTROLS IN Z10

I said in Chapter 1 that although Z10 is a management system standard and not a specification standard, the provisions pertaining to a hierarchy of controls are the exception. Rather than presenting a performance statement that relates to the outcomes to be achieved through a risk reduction process, a specifically defined hierarchy of controls is outlined. This is the hierarchy of controls—the order of controls—in Z10:

- A. Elimination
- B. Substitution of less hazardous materials, processes, operations, or equipment
- C. Engineering controls
- D. Warnings
- E. Administrative controls
- F. Personal protective equipment

Note that this hierarchy of controls contains six elements. The first step, Elimination, is separated from the Substitution element. The logic for doing so is discussed later.

HIERARCHIES OF CONTROL: PREMISES AND GOALS

A hierarchy is a system of persons or things ranked one above the other. The hierarchy of controls in Z10 provides a systematic way of thinking, considering steps in a ranked and sequential order, to choose the most effective means of eliminating or reducing hazards and the risks that derive from them. Acknowledging that premise—that risk reduction measures should be considered and taken in a prescribed order—represents an important step in the evolution of the practice of safety.

A model of hierarchies of control may give examples of the types of actions to be taken for each of its elements, as does Appendix G in Z10. However, little is written about the purpose of and the goals to be achieved in applying a hierarchy of controls. An attempt to do so follows.

A major premise to be considered in applying a hierarchy of controls is that the outcome of the actions taken is to be an acceptable risk level, defined as follows:

Acceptable risk is that risk for which the probability of a hazard-related incident or exposure occurring and the severity of harm or damage that could result are as low as reasonably practicable, and tolerable in the situation being considered.