

adverse results, and a risk category (e.g., - high, serious, moderate, or low). Using a risk assessment matrix for that purpose assists in communicating on the risk level.

9. Risk prioritization. A risk ranking system should be adopted so that priorities can be established. Since the risk assessment exercise is subjective, the risk ranking system would also be subjective. Prioritizing risks gives management the knowledge needed for intelligent allocation of resources with respect to risk avoidance, elimination, or control.

10. Select and implement risk reduction and control methods. When the initial risk assessment indicates that elimination or reduction measures are to be taken to achieve acceptable risk levels:

- Alternative proposals for the design and operational changes necessary would be recommended.
- In their order of effectiveness, the actions outlined in Chapter 14, "Hierarchy of Controls", would be the basis upon which remedial proposals are made.
- If informal judgments on costs are considered inadequate for a risk situation, formal action would be taken to establish remediation cost for each proposal and an estimate would be given of its effectiveness in achieving risk reduction to an acceptable risk level.
- Risk avoidance, elimination, or reduction methods would be selected and implemented.
- A tracking system should be put in place to assure completion of the actions undertaken.

11. Assess the residual risk. *Residual risk* is defined as the risk remaining after preventive measures have been taken. No matter how effective the preventive actions, there will always be residual risk if a facility exists or an activity continues. Attaining zero risk is not possible.

- If the residual risk is not acceptable, the action outline set forth in this hazard analysis and risk assessment process would be applied again.
 - The risk assessment process is to continue until an acceptable risk level is attained.
 - If an acceptable risk level cannot be achieved, operations should not be continued, except in unusual and emergency circumstances or as a closely monitored and limited exception and with the approval of the person who has the authority to accept the risk.
 - Information on residual risks is to be communicated to relevant downstream stakeholders so that they can use this information in their own risk assessments.
- Even though the residual risk may be acceptable, management should consider taking additional risk reduction measures if the cost is reasonable, particularly if so doing resolves concerns of employees.

12. Risk acceptance decision making. Risk acceptance decisions shall be made at the appropriate management levels.

- Temporary acceptance of high and serious risks shall be made at the top management level.
- Responsibility for moderate or low risks may be assigned to lower management levels.

13. Documentation. To the extent appropriate for a given risk situation, documentation should include the:

- The names and job titles/qualifications of the persons who did the risk assessment
- The risk assessment method(s) used
- Hazards identified
- Risks deriving from the hazards
- Avoidance, elimination, reduction, and control measures taken to attain acceptable risk levels

In certain cases, consideration would be given to additional documentation that includes relevant information about the use, effectiveness of design, problems during startup and continued use, and changes to designs over the life cycle of the design.

The foregoing applies whether the documentation is done directly under the direction of management or by a supplier of services.

14. Reassess the risk: follow up on actions taken. This step is a part of all effective problem-solving exercises. Follow-up activity would determine that the:

- Problem was resolved, only partially resolved, or not resolved, and that acceptable risk levels were or were not achieved.
- Actions taken did or did not create new hazards.

If acceptable risk levels were not achieved or new hazards were introduced, the risk is to be reevaluated and other countermeasures are to be proposed and taken.

DESCRIPTIONS: PROBABILITY AND SEVERITY

Examples follow in Tables 11.1 to 11.5 to show variations in the terms and their descriptions as used in a variety of applied risk assessment processes for the probability of occurrence and severity of consequence. There is no single correct method of selecting probability and severity categories and their descriptions. Tables 11.4 to 11.6 show how severity of harm or damage categories can be related to several types of adverse consequences and levels of harm or damage.