

Controlling Risks Hazard Reduction

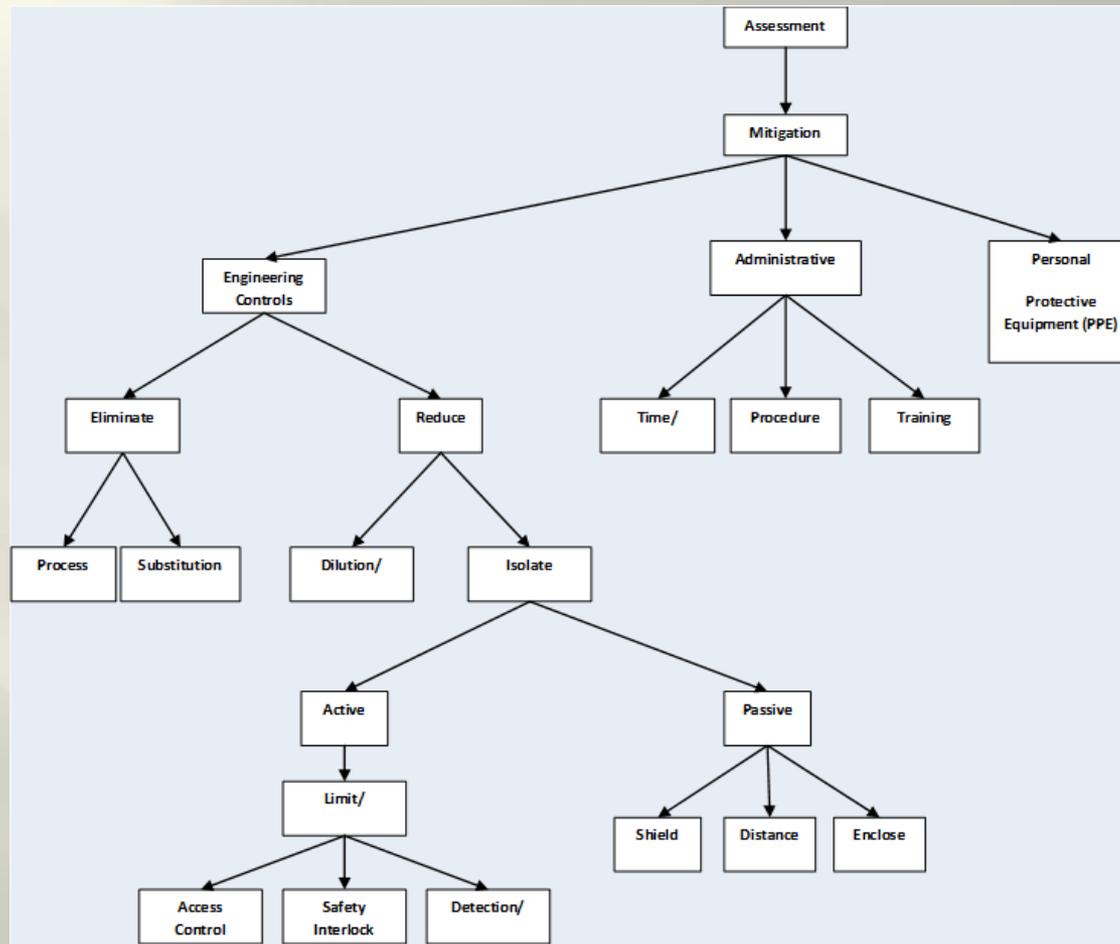


Layer of Protection Analysis (LOPA)

- Used to more realistically assign risk reduction factors to non-safety system functions
 - Operator Response
 - Dedicated control system safety functions



Layers of Protection



Hazards Control Precedence

- The accepted precedence for dealing with hazards is:
 - Eliminate the hazard (the most effective method but oftentimes incompatible with the mission objective)
 - Reduce the hazard in a manner that prevents or minimizes conditions that could lead to unacceptable risk



Hazard Elimination

- Eliminate hazards through design selection
 - Process change
 - Material substitution
- Reduce hazards by using
 - safety features or devices
 - detection and warning systems
 - procedures and training (may involve use of personal protective equipment)



Classes of Hazard Controls

- Engineering - methods of controlling employee exposures by modifying the source or inherent design of the process or work configuration
- Administrative – Procedural controls which depend upon employee awareness and compliance for their effectiveness
- Personal Protective Equipment (least preferred)



Two Types of Controls

- Active Controls - require some action to prevent or mitigate the hazard.
 - Safety interlock system
 - Access control system
- Passive Controls - relies on basic physical principles to prevent/minimize a hazard's effects
 - Shielding
 - Labyrinths
 - Barriers – locked doors & enclosed fencing
 - Distance



Residual Risk

- The risk that remains after all planned risk management measures have been implemented:
 - Must be documented along with reasons why it exists
 - Must be reviewed and accepted by management
 - Management review must be documented
 - Generally managed by administrative controls



Hazard Controls Verification

- Verify effectiveness of controls through
 - ✓ Analysis – design reviews, computer modeling
 - ✓ Testing – commissioning activities, system certification/functional testing, readiness reviews
 - ✓ Inspection
- Look for new hazards during testing that may have been overlooked



Documentation

- Records of hazard reviews should be incorporated into the overall project design documentation.
 - It preserves your methods and rationale so that you are able to undertake a comparable review more efficiently in the future.
 - It provides a defensible basis for your system during a permitting or agency review.
 - It augments the customary discipline found in good engineering and architectural design practices



Tracking Systems

- System performance over its life cycle
 - System failures and corrective actions
 - Maintenance and certification tests
 - Inspection findings
 - Change control
 - Modifications
 - Upgrades
 - System “add-ons”



Communication

- Managers
- System managers
- System integrators
- System support staff
- System operators
- EH&S staff
- Affected workers

