

## Examples of Hazard Controls

Engineering Controls (Eliminate)	Administrative Controls (Reduce)
<p><b>Isolation</b></p> <ul style="list-style-type: none"> <li>• Control rooms or restricted access areas</li> <li>• Guarding (ex. machinery guards, fall protection/guardrail systems/parapet walls on roofs)</li> <li>• Barriers/shielding (ex. welding shields, plastic for P-32 radiation sources)</li> <li>• Locking out hazardous energy sources</li> </ul>	<p><b>Housekeeping</b></p> <ul style="list-style-type: none"> <li>• Regular cleaning of work area</li> <li>• Dry, clean floors</li> <li>• Proper storage of tools, materials, chemicals, radioactive substances</li> <li>• Proper spill response</li> <li>• Surplus old machinery/equipment</li> <li>• Vacuum instead of sweeping</li> </ul>
<p><b>Design</b></p> <ul style="list-style-type: none"> <li>• Proper access (ex. stairways, ramps)</li> <li>• Height (ex. hazard located above employee access, typically 8 feet)</li> <li>• Impervious work surfaces</li> <li>• Seamless flooring</li> <li>• Safety interlocks on equipment</li> <li>• Automatic shutoff</li> </ul>	<p><b>Training</b></p> <ul style="list-style-type: none"> <li>• Hazard recognition</li> <li>• Hazard controls</li> <li>• Safe work practices</li> <li>• Safe operating procedures</li> <li>• Emergency procedures</li> <li>• Machinery and equipment</li> </ul>
<p><b>Substitution</b></p> <ul style="list-style-type: none"> <li>• Dipping/brushing instead of spraying</li> <li>• Bolting together instead of welding</li> <li>• Hacksaw use instead of grinding</li> <li>• Wet processes instead of dry processes</li> <li>• Using non-hazardous chemicals</li> <li>• Using less hazardous radioactive substances (ex. P-33 instead of P-32)</li> <li>• Soap and water instead of solvents</li> <li>• Automation instead of manual eqpt.</li> </ul>	<p><b>Reduction</b></p> <ul style="list-style-type: none"> <li>• Perform hazardous tasks less frequently</li> <li>• Rotate employees in hazardous areas (not permitted for respiratory hazards)</li> <li>• Minimize on-hand stock of hazardous materials</li> <li>• Minimize waste products by recycling or redistribution (donate chemicals to university surplus)</li> <li>• Decrease time/increase distance (rad)</li> </ul>
<p><b>Elimination</b></p> <ul style="list-style-type: none"> <li>• On-demand supply instead of on-site storage</li> <li>• Maintenance-free batteries</li> <li>• Purchase premixed products</li> </ul>	<p><b>Preventative Maintenance</b></p> <ul style="list-style-type: none"> <li>• Regular inspections</li> <li>• Regular service and maintenance</li> </ul>
<p><b>Work Area Layout</b></p> <ul style="list-style-type: none"> <li>• Separating non-compatible work tasks</li> <li>• Routing high-traffic paths away from hazardous areas</li> <li>• Minimize size of radioactive work areas</li> <li>• Segregating radioactive work</li> </ul>	<p><b>Exposure Monitoring</b></p> <ul style="list-style-type: none"> <li>• Quarterly review of personal radiation doses</li> <li>• Investigation at 10% and 25% of occupational exposure limits (radiation)</li> <li>• Identify radiation contaminated areas</li> </ul>
<p><b>Ventilation</b></p> <ul style="list-style-type: none"> <li>• Increase air flow</li> <li>• Use fume hoods for mixing</li> <li>• Local exhaust ventilation</li> <li>• Filtration (ex. HEPA-filtered Biosafety cabinets, charcoal filtering for radioactive substances such as I-125)</li> </ul>	<p><b>Safe Work Practices and Procedures</b></p> <ul style="list-style-type: none"> <li>• Identify and develop for hazardous processes</li> <li>• Perform radiological hazard analysis</li> <li>• Label equipment as radioactive</li> <li>• Container labeling (chemical, radioactive, biohazardous)</li> </ul>