National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

Discussion Platform

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Standards-based Education

Gaithersburg, MD – U.S.A.

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Underwriters Laboratories Inc.

Agenda

- UL's Special Advisory Services
- The Initial Problem – Case Specific, SLAC, a U.S. NRL
- Solution – Standards-based Education Model (HBSE, RISK and RE)
- Expansion – Other U.S. National Laboratories (See LLNL)

UL West Coast

Our testing laboratories around the world …

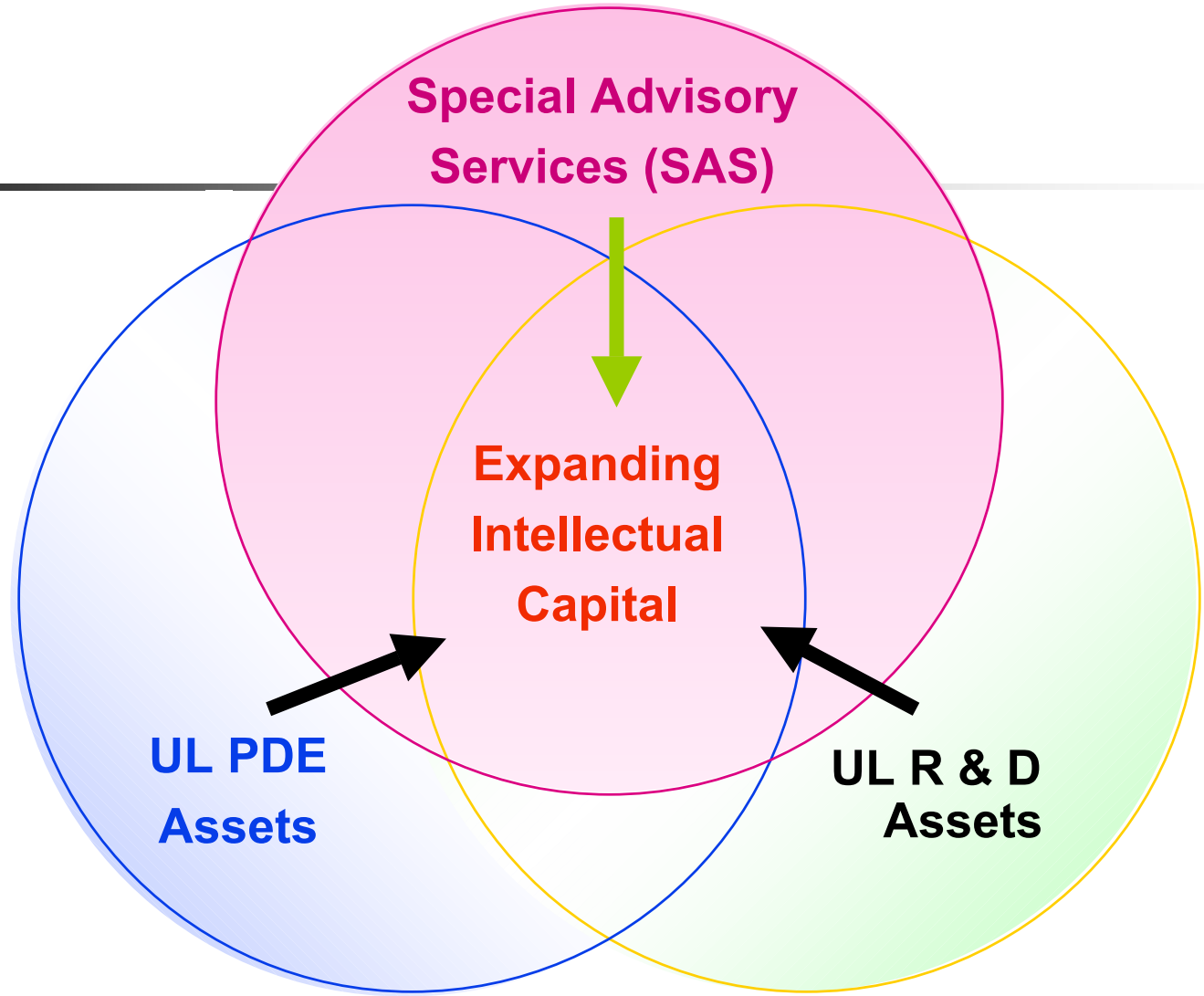
The Mission of Underwriters Laboratories

“ … [To] add to the public’s knowledge and understanding of the hazards of various materials, devices, products, equipment, construction, methods, and systems affecting life and property; and to provide information tending to reduce or prevent bodily injury, loss of life, and property damage from such hazards.”

G.L. Maatman, Chairman of the Board of Trustees, Underwriters Laboratories Inc. (UL) May, 2002 Address

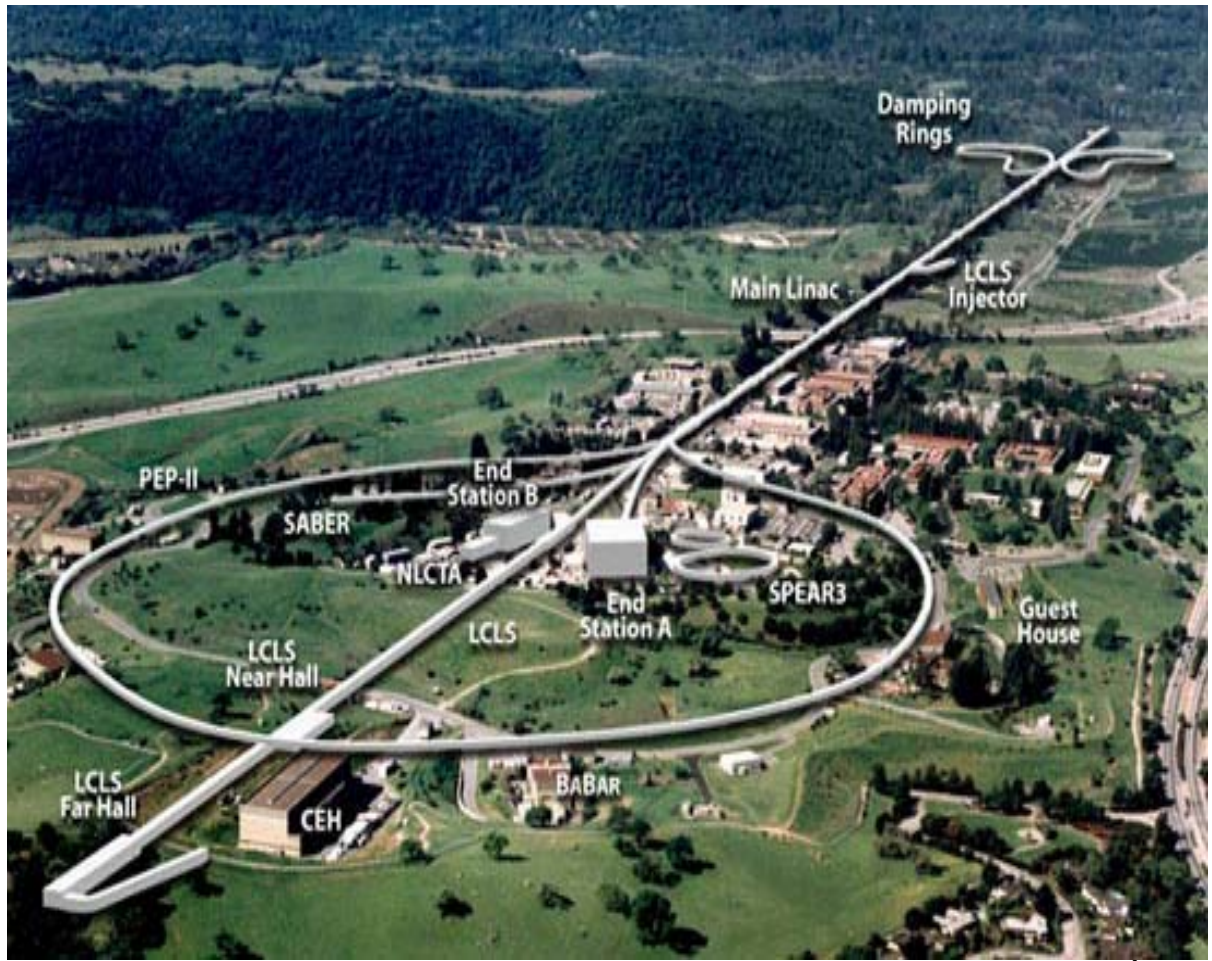
A Not-for-Profit Public Safety U.S. Corporation Founded in 1894

UL's Intellectual Capital



Problem:

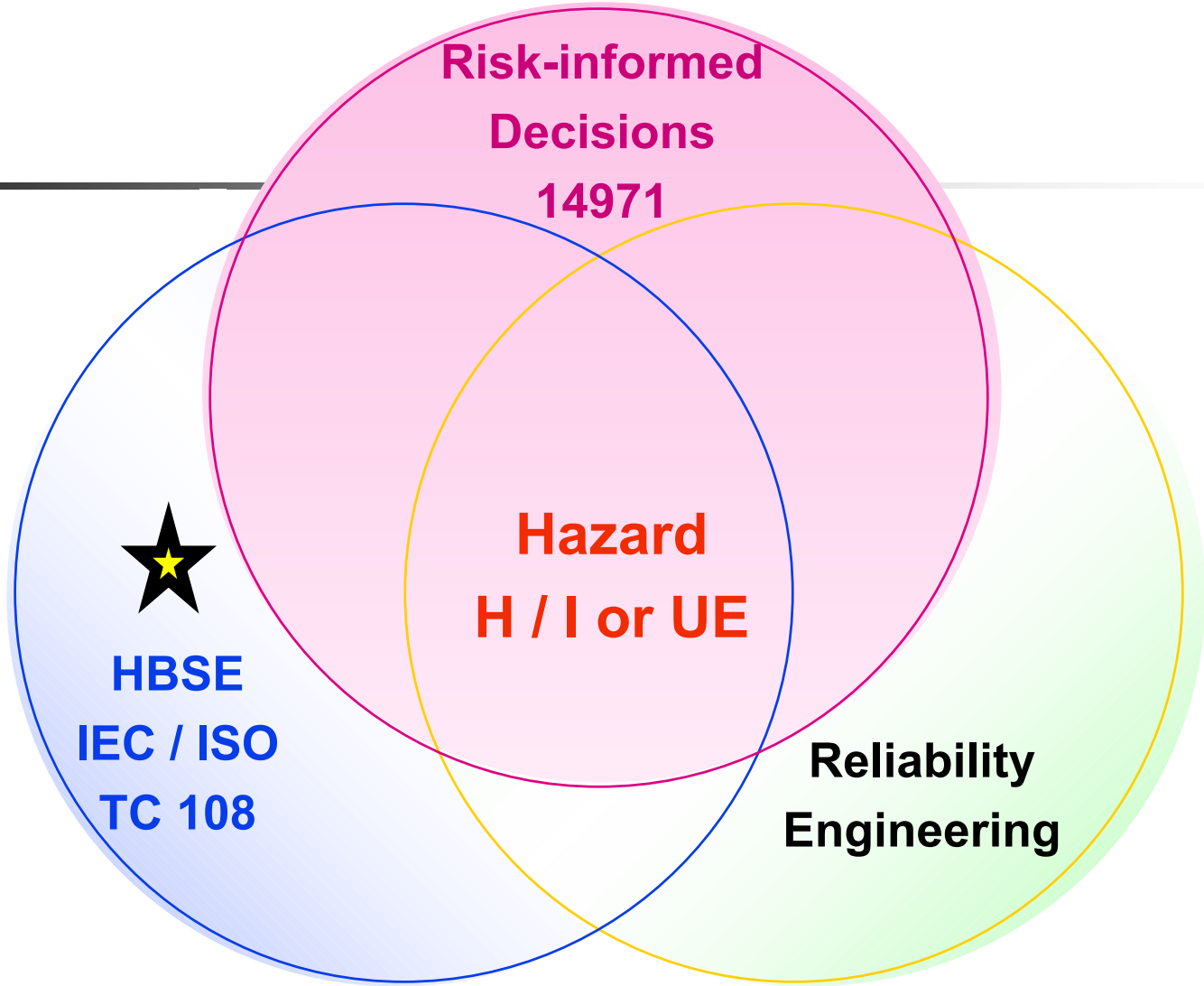
- ESAP Findings
- DoE Report
- OSHA Inspection
- Accident



ESAP / ESRT Findings

- Staff Errors (multiple, across-the-board and significant)
- Obvious Work Control Problems
- Configuration Management Weaknesses (system-related)
- Intrusion (Q / nQ) HAZLOC
- Vehicles (ANSI / C2 – NESC)

Stanford's Needs Assessment & Solution



Task: 100 Level 1 Inspectors by 01.2006

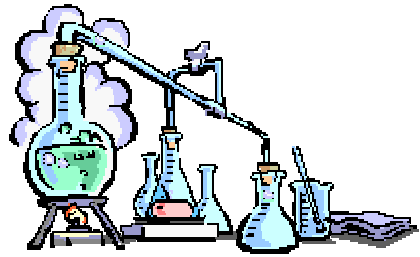
HBSE Motivations

1. Moral duty to prevent injury
2. Corporate policy to prevent injury
3. A legal duty to prevent injury
4. Compliance with laws and regulations
5. Compliance with safety standards
6. Safety certification by 3rd parties

Why HBSE?

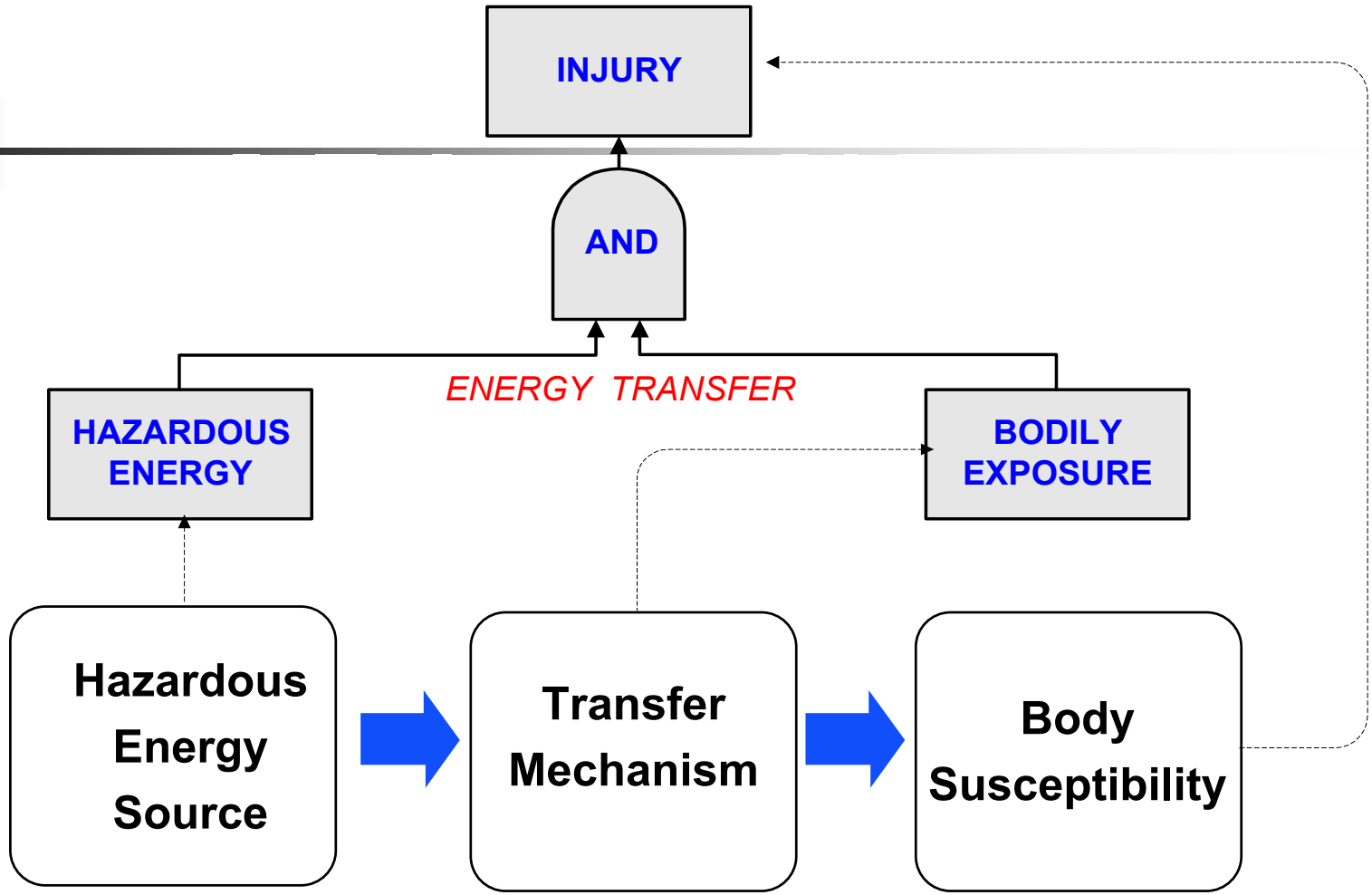
- A common sense approach to an important topic - the creation of an analytical model and systemic process for mitigating the risk of human injury
- A tool for balancing product design, performance, and functionality given a critical necessity for human safety
- An analytical tool helping to ensure that safety is built into the front-end of workplace production
- A valuable instrument for design engineers, safety engineers, facility managers, regulatory compliance engineers and certainly, students

RE Analysis - DFMEA



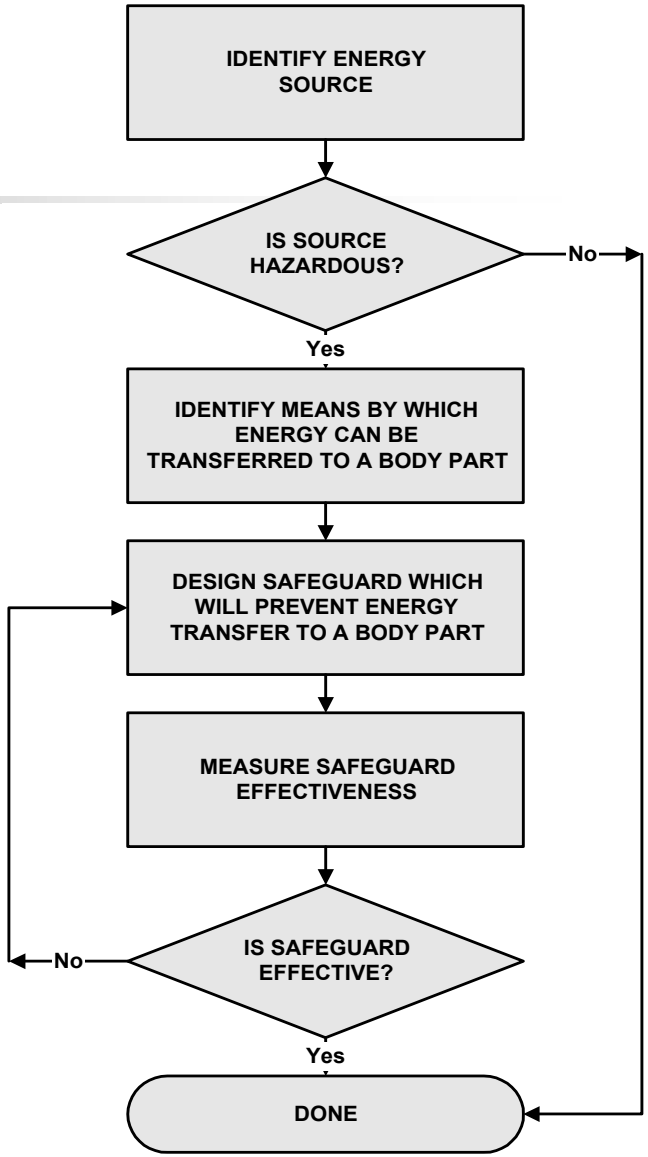
- Method for deductive failure analysis
- Analytical technique describing credible ways an event can occur
- Cause and effect relationships leading to an undesirable event
- Qualitative model that can be quantitatively evaluated

Energy Transfer Model



The HBSE Model (See Annex F of 70E)

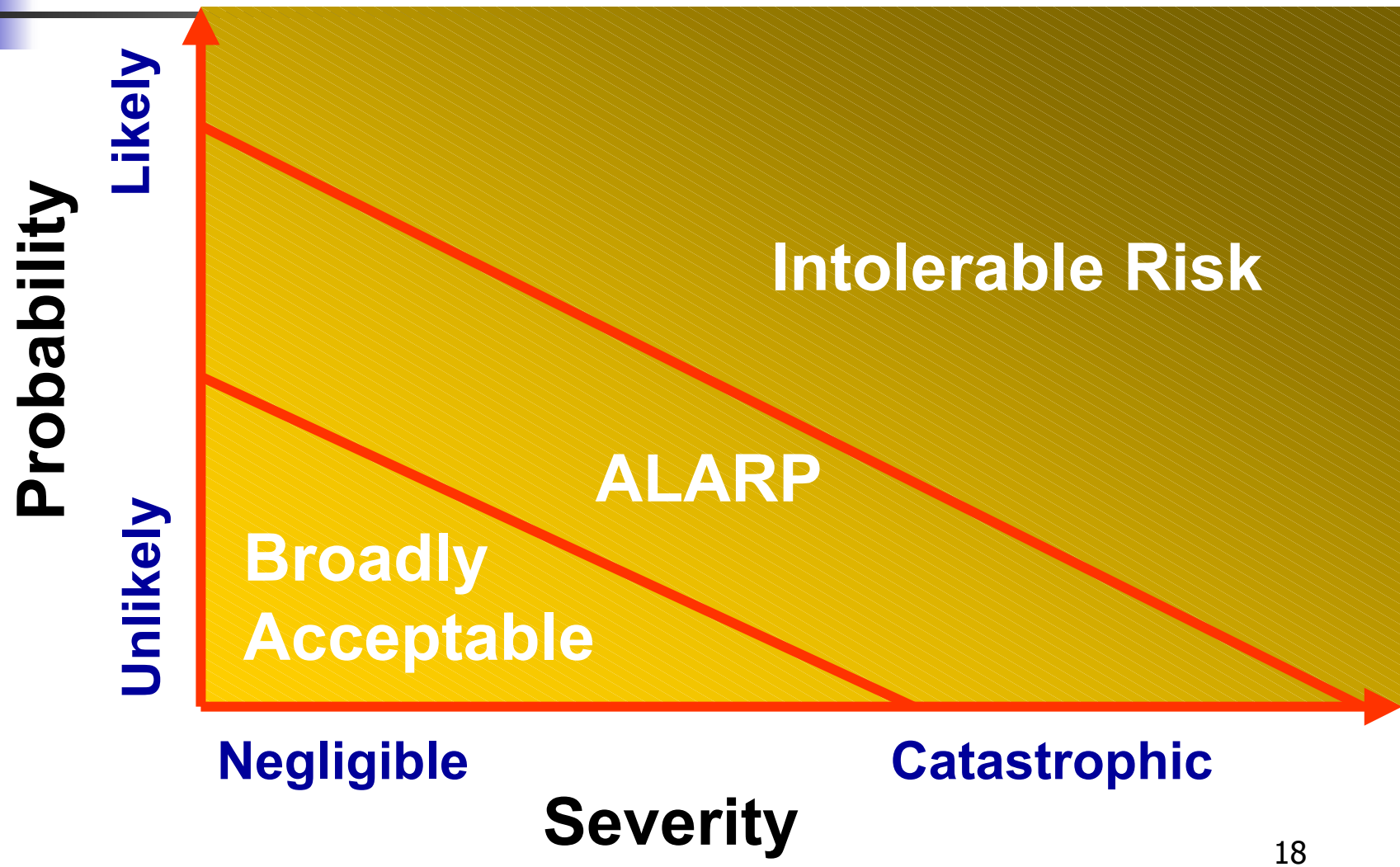
- **Test to confirm existence of hazardous energy sources**
  - **What form of energy is supplied to or contained within the utilization equipment?**
  - **Are any of these energy sources converted to other forms of energy during the operation?**
- **Test to determine effectiveness of a safeguard**



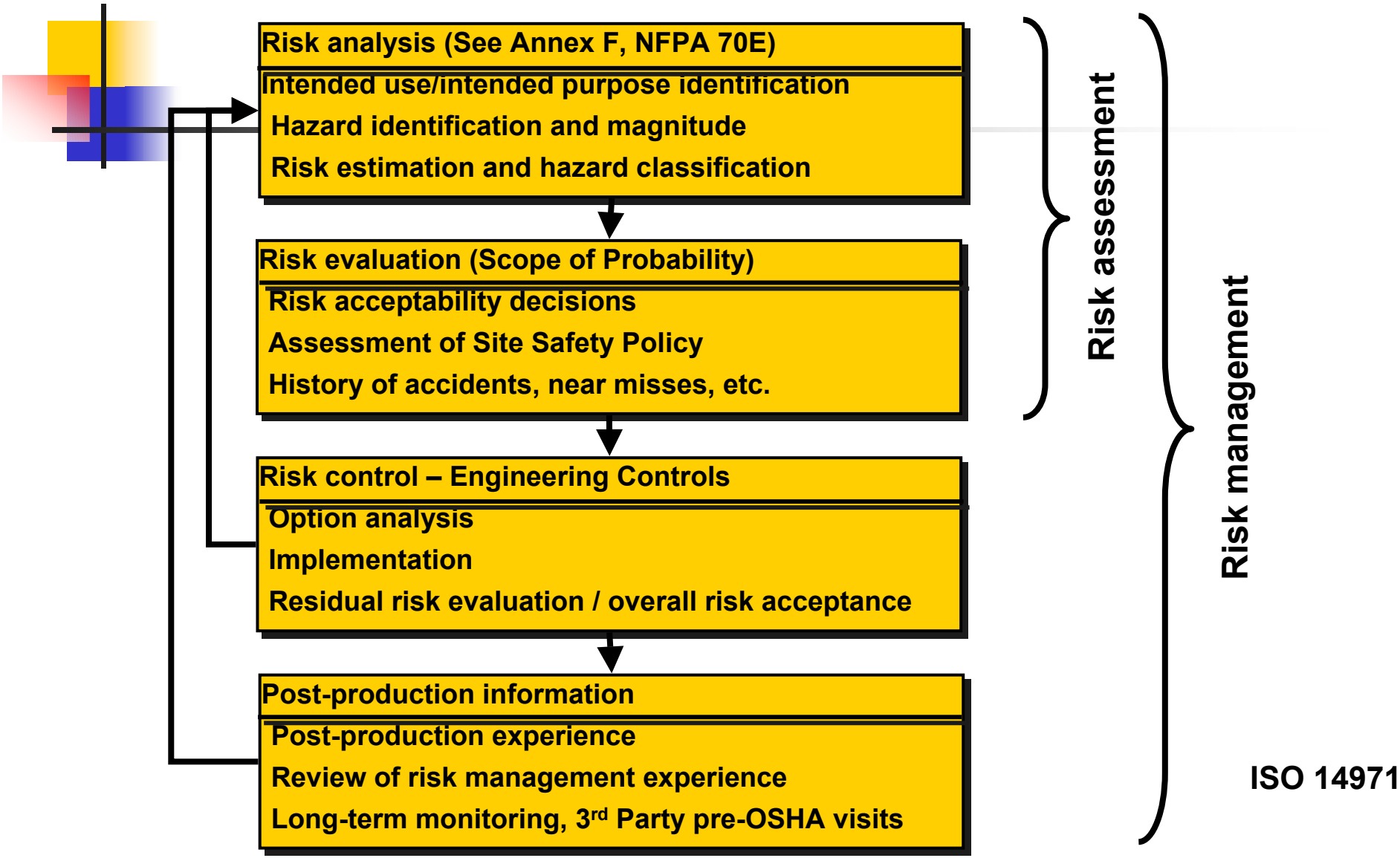
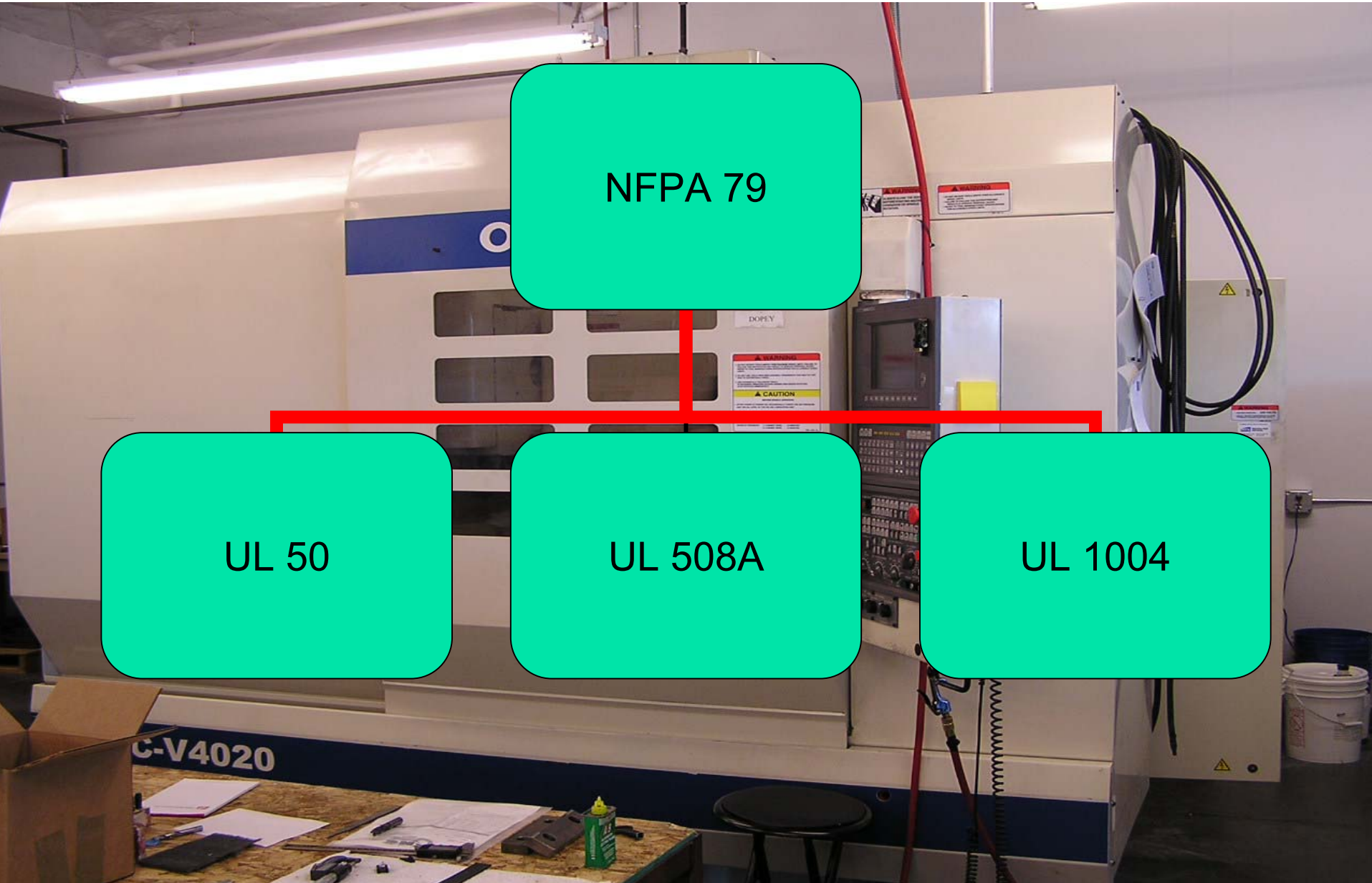
Risk Analysis

- **Hazard: "potential source of harm"**
- **Risk = (Probability • Severity)**
- **Harm: "physical injury or damage to health and / or property"**
- **Engineering Controls (EC)**

Risk Regions



Risk Management



Extending Standards-based Education LLNL