

**Program Content:**

Layers of Protection Analysis (LOPA) is a popular risk analysis technique. It is conducted after a process hazards analysis has identified hazardous events needing further analysis to better understand the functional and risk reduction requirements for the safeguards. This course discusses the quantitative assessment of initiating event frequencies and the robustness of safeguards.

The course stresses understanding of event propagation, the attributes required for safeguards to be qualified as Independent Protection Layers (IPL), and the proper determination of hazardous event frequencies. Evaluating enabling conditions and the appropriate use of frequency modifiers in PHA and LOPA are discussed, as well as the interrelationship of risk criteria and analysis boundaries. The course addresses how to document risk gaps in LOPA recommendations, including using LOPA to assign the target Safety Integrity Level (SIL) to identified Safety Instrumented Systems (SIS). Workshop examples are used to illustrate the methodology and emphasize key learning points.

- Risk management
- Risk criteria
- Independent Protection Layers (IPL)
- Core attributes
- LOPA methodology
- IPLs and side effects

**Day 1:**

- Risk management
  - Process risk measurements
  - PHA workshop
- Risk criteria
  - Hazardous and harmful events
  - Enabling conditions and conditional modifiers
  - LOPA criteria
  - Frequency workshop
- Independent Protection Layers (IPL)
  - Types
  - Assessing independence
  - Independence workshop
- Core attributes
  - Core attributes workshop

**Day 2:**

- LOPA methodology
  - Initiating cause frequency
  - IPL risk reduction
  - Independence of control and instrumented safety functions
  - LOPA IPL workshop
- IPLs and side effects
  - Understanding secondary Consequences
  - Multiple LOPA workshop examples

**Who Should Attend?**

Process safety managers, process safety specialists, process engineers, operations personnel, instrumentation and electrical personnel, LOPA facilitation trainees, LOPA facilitators, and PHA facilitators .