LAYER OF PROTECTION ANALYSIS

Audience: Process Safety, Process Engineering, Operations, and Instrumentation and Electrical
Time: 1st Day - 8:30am to 4:30pm
2nd Day - 8:30am to 3:30pm
CEUs: 1.4

Course Description: Layer 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 fundamentals of Layer of Protection Analysis, including the risk criteria, key work process elements, and methodology options. The course uses workshop examples to illustrate the methodology and emphasize key learning points.

1st Day	2nd Day
• Risk Management o Process Risk Measurements o PHA Workshop • Risk Criteria o Hazardous and Harmful Events o Enabling Conditions and Conditional Modifiers o LOPA Criteria o Frequency Workshop • Independent Protection Layers (IPL) o Types o Assessing Independence o Independence Workshop • Core Attributes o Core Attributes Workshop	• LOPA Methodology o Initiating Cause Frequency o IPL Risk Reduction o Independence of control and instrumented safety functions o LOPA IPL Workshop • IPLs and Side Effects o Understanding Secondary Consequences • Multiple LOPA Workshop Examples

About the Course Developer

Dr. Angela Summers is president of SIS-TECH, a specialty engineering and consulting company. She has more than 20 years of experience in safety instrumented systems (SIS), process engineering, and environmental engineering. She is an active participant in industrial practice's committees, such as CCPS, API, ISA and IEC, and has published over 50 papers on topics related to process safety and instrumented system design. She has written chapters on SIS for engineering handbooks and was lead editor for the Center for Chemical Process Safety book, *Guidelines for Safe and Reliable Instrumented Protective Systems.*