



HSE234

Layers of Protection Analysis (LOPA) for Process Safety Management

Course Introduction:

LOPA is a simplified form of risk assessment. It assists in compliance with PSM and RMP regulations and with the ANSI/ISA S84.00.01-2004 / IEC 61511 standards, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*.

LOPA is often used as an extension of process hazard analysis (PHA). PHA teams use engineering judgment to decide if additional safeguards are needed to protect against accident scenarios they identify. This subjective approach can lead to disagreements and possibly inappropriate measures to reduce risk. A more rational and objective approach is needed, at least when considering risk remediation measures for high risk scenarios or those that are expensive to implement. Layers of Protection Analysis (LOPA) was developed for this purpose.

LOPA is also used to comply with the IEC 61511 / ISA 84 standards. IEC 61511 / ISA 84 requires the allocation of safety functions to protection layers, the determination of required Safety Instrumented Functions (SIFs) and the determination of their Safety Integrity Levels (SIL). LOPA is one method used for this purpose. The required SIL of a SIF is derived by taking into account the required risk reduction to be provided by that function. IEC 61511 / ISA 84 notes that this is best accomplished as part of a process hazards and risk analysis (i.e. a PHA) to benefit from possible synergies and the information developed.

LOPA is used to evaluate scenario risk and compare it with risk tolerance criteria to decide if existing safeguards are adequate, and if additional safeguards are needed. Without risk tolerance criteria, there is a tendency to keep adding safeguards in the belief the more the safer. This can be a false assumption. Eventually safeguards will be added that are unnecessary and may add complexity that can result in new unidentified hazard scenarios. LOPA helps focus limited resources on the most critical safeguards.

This course describes each step in performing LOPA and provides experience in its use. A detailed manual is provided for use as a reference after you have completed the course.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- Perform a LOPA study to evaluate the effectiveness of process safeguards
- Understand the concepts of process safety as well as the overview and use of LOPA
- Select hazard scenarios and identify the consequences and events
- Identify IPL's and discuss the estimation of scenario risk, failure data and risk decisions
- Explain protection layers IPL documentation and implementation of PHA/LOPA and its uses

Who Should Attend?

This course is intended for process safety personnel, PHA analysts, control systems engineers, project engineers and others who need to apply or understand LOPA.

Course Outline:

Day 1:

Pre-Test

- Process Safety Concepts
- Overview of LOPA
- Use of LOPA
- Documentation and example application

Day 2:

- Selection of hazard scenarios
- Definition of scenario consequences
- Identification of initiating events
- Consideration of enablers

Day 3:

- Identify IPL's
- Estimation of scenario risk
- Failure data
- Making risk decisions

Day 4:

- Remaining Steps
- Understanding protection layers
- IPL documentation

Day 5:

- Implementation
- Conducting PHA to facilitate LOPA

- Other uses of LOPA

Course Summary

Post Test

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

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Course Fees:

To be advised as per the course location. This rate includes participant's manual, Hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee/Tea
08:20 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Coffee/Tea/Snacks)
13:30 - 15:00	Last Session