

Course No. 1517

Safety Integrity Level (SIL) Assessment Training Course

**PROCESS SAFETY & LOSS PREVENTION
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS**

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Safety Integrity Level (SIL) Assessment Training Course provides a comprehensive and practical framework for understanding, evaluating, and determining the required Safety Integrity Level for safety-related functions in industrial and process environments. The course focuses on structured risk assessment methodologies, risk reduction requirements, protection layers, and safety-related functions, enabling organizations to make consistent and technically sound decisions regarding functional safety and industrial risk management.

The program examines the relationship between hazard identification, risk assessment, independent protection layers, Safety Instrumented Functions, Safety Instrumented Systems, and required risk reduction. Participants will learn how to move from identifying hazardous scenarios and potential consequences to determining the appropriate performance requirements for safety functions and evaluating whether existing protection systems provide the required level of risk reduction.

A strong technical emphasis is placed on the factors that influence safety function performance, including probability of failure, proof testing, test intervals, diagnostic capabilities, redundancy, common cause considerations, and maintenance practices. The course also introduces qualitative, semi-quantitative, and quantitative approaches to risk assessment and explains how assessment results can support engineering decisions and the design of safety-related systems.

The course uses practical industrial scenarios and analytical exercises relevant to oil and gas, petrochemical, energy, manufacturing, utilities, and process industries. By the end of the program, participants will be able to analyze hazardous scenarios, evaluate Safety Instrumented Functions, determine SIL requirements, review assessment assumptions and inputs, evaluate assessment results, and prepare professional recommendations supporting functional safety management and the lifecycle of safety-related systems.

Objectives

- Analyze the fundamental principles of Safety Integrity Levels and their role in reducing industrial risk during the course.
- Evaluate the relationship between hazard identification, risk assessment, protection layers, and safety functions.

- Apply qualitative and semi-quantitative methodologies to determine risk reduction requirements.
- Analyze industrial hazardous scenarios and identify safety functions requiring defined integrity performance.
- Evaluate the relationship between risk reduction requirements and the design of safety-related protection systems.
- Apply principles for evaluating Safety Instrumented Function performance considering failure probabilities, testing, diagnostics, and maintenance.
- Assess the influence of proof-test intervals, diagnostic coverage, redundancy, and operational conditions on safety system performance.
- Analyze SIL assessment results and verify the consistency of key inputs, assumptions, and methodologies.
- Develop a structured approach for documenting SIL assessment results and technical decisions.
- Prepare an actionable plan for improving SIL assessment and management throughout the lifecycle of safety-related systems.

Who Should Attend

The Safety Integrity Level (SIL) Assessment Training Course is designed for engineers and professionals working in functional safety, process safety, instrumentation and control, engineering, risk management, reliability, maintenance, and industrial protection systems. It is particularly relevant to functional safety engineers, process safety engineers, instrumentation and control engineers, automation engineers, electrical engineers, process engineers, safety specialists, reliability professionals, and technical specialists involved in the assessment or management of safety-related systems.

The course is also suitable for engineering managers, process safety managers, operations managers, maintenance managers, reliability managers, project managers, asset managers, technical authorities, assurance professionals, auditors, and decision makers involved in approving, reviewing, or managing safety-related systems. It is especially relevant to government entities, ministries, oil and gas companies, petrochemical facilities, energy organizations, utilities, manufacturing plants, chemical processing facilities, and other industrial organizations that rely on functional safety systems to reduce operational risk.

Learning Outcomes

- Explain the concept of Safety Integrity Levels and their relationship to functional safety and risk management.
- Analyze the relationship between hazards, consequences, protection layers, and Safety Instrumented Functions.
- Determine risk reduction requirements associated with defined industrial hazardous scenarios.
- Apply structured methodologies to perform preliminary SIL assessment activities.
- Distinguish between qualitative, semi-quantitative, and quantitative risk assessment approaches.
- Evaluate factors affecting Safety Instrumented Function performance, including failure probability, diagnostics, proof testing, and maintenance.
- Analyze the effect of proof-test intervals and system redundancy on safety performance.
- Review SIL assessment results and verify the validity of key inputs and assumptions.
- Identify gaps between required safety performance and the performance of an existing protection system.
- Prepare a professional SIL assessment report covering methodology, assumptions, results, limitations, and recommendations.

Course Outline

DAY 01

Safety Integrity Level Fundamentals and Risk Analysis

- Introduction to functional safety and Safety Integrity Levels
- Role of SIL assessment in industrial risk management
- Relationship between functional safety and process safety
- Hazard, risk, consequence, and risk reduction concepts
- Hazard identification and hazardous scenario development
- Principles of risk reduction
- Protection layers and Independent Protection Layers
- Safety Instrumented Functions and Safety Instrumented Systems
- Relationship between Basic Process Control Systems and protection systems

DAY 01 — CONTINUED

PRACTICAL APPLICATION

Analyze an industrial hazardous scenario and identify hazards, protection layers, and required safety functions

DAY 02

Determining SIL Requirements

- Risk assessment methodologies and risk reduction requirements
- Qualitative risk assessment methods
- Semi-quantitative risk assessment approaches
- Fundamentals of quantitative risk assessment
- Process risk analysis and hazardous event evaluation
- Identification of required Safety Instrumented Functions
- Linking safety functions to hazardous scenarios
- Establishing risk reduction targets
- Evaluating the independence of protection layers

PRACTICAL APPLICATION

Perform a structured assessment of an industrial hazardous scenario and determine the required SIL for a defined protection function

DAY 03

Safety Function Performance and SIL Evaluation

- Principles of Safety Instrumented Function performance assessment
- Probability of failure on demand and probability of dangerous failure
- Safe and dangerous failure concepts
- Failure modes and their influence on system performance
- Diagnostic capabilities and fault detection
- Proof testing and its effect on safety performance
- Proof-test intervals and maintenance requirements

DAY 03 — CONTINUED

- Redundancy and independence in safety function design
- System architecture and its influence on safety performance

PRACTICAL APPLICATION

Analyze a Safety Instrumented Function and evaluate the factors affecting its performance and assessment results

DAY 04

SIL Assessment Review, Verification, and Validation

- Structured review of SIL assessment methodologies
- Verification of assessment inputs and assumptions
- Review of failure and reliability data
- Evaluation of proof-test assumptions and results
- Review of diagnostic and maintenance requirements
- Identification of gaps between required and achieved performance
- Relationship between SIL assessment and engineering design
- Management of changes affecting SIL requirements
- Documentation of technical assumptions and decisions

PRACTICAL APPLICATION

Review a simulated SIL assessment study and identify methodological gaps, incorrect assumptions, data issues, and improvement opportunities

DAY 05

Advanced SIL Applications and Lifecycle Management

- SIL assessment for complex industrial systems
- Relationship between SIL assessment and Safety Instrumented System design
- Managing SIL requirements throughout the safety lifecycle
- Periodic testing and ongoing safety performance monitoring
- Maintenance, failures, and their effect on safety performance

DAY 05 — CONTINUED

- Management of change and SIL reassessment
- Functional safety auditing and technical assurance
- Preparation and review of SIL assessment reports
- Developing recommendations for risk reduction and safety performance improvement

FINAL WORKSHOP

Complete a SIL assessment for an industrial hazardous scenario covering risk analysis, safety functions, risk reduction requirements, performance factors, testing, maintenance, documentation, and technical recommendations

Register or Request More Information

Course page: <https://quest-training.com/courses/safety-integrity-level-sil-assessment-training-course>

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