



Training for Process Safety, Security and Risk Management



TRAINING COURSE CATALOG

PHA • PSM / RMP • LOPA • Functional Safety • Risk Criteria • DHA • MOC • MI
Competency • Procedure Writing • Human Factors • Cyber Security • Software

www.primatech.com | 614.841.9800

PrimaTech Training Institute

Comprehensive Training

Primatech Inc. specializes in safety, security and risk management for the process industries. We offer consulting, training courses, software, and certifications to assist our clients in identifying and reducing the risk of catastrophic accidents posed by hazardous materials used in their operations. Primatech is the longest-operating privately-owned US company specializing in process safety and risk management.

Our **Primatech Training Institute (PTI)** provides comprehensive and up-to-date open-enrollment educational courses for professionals in the process industries.

Our objective is to teach participants how to satisfy the regulatory requirements mandated by OSHA and EPA, meet other federal, state and industry process safety and risk management standards and promote safe process operations.

Many process industry companies look to Primatech to help interpret, develop and implement their process safety management (PSM) and risk management programs (RMP) through our professional consulting services.

Our PTI courses are the training extension of these expert services. Primatech keeps the process industries informed of the latest technical approaches, industry best practices and regulatory clarifications with continually updated course content. This ensures that participants always receive the best, most up-to-date technical instruction possible.

In-House Training Available

All training courses are available for delivery at your site or a nearby location. This is often more economical if you have a number of participants. In-house courses can also be customized to include company-specific information and process examples for workshops.

Please see page 35 for additional details.

U.S. Training Discounts

Receive a 15% discount off the total price when three or more employees from the same company attend the same course(s) at the same time.

Take any two courses within the same week and receive a \$150 discount off the total course fees.

Attend both the *Designing and Implementing a Process Safety Management (PSM) Program* and *Auditing Process Safety Management (PSM) Programs* courses in the same week at a discounted tuition fee of \$2,200 (a \$390 savings).

Primatech reserves the right to change and/or end the discounts at any time and without notice. Discounts are limited to one per registration.

The Best Public Training Available

Comprehensive Training

Primatech Training Institute offers over 30 training courses on process safety, security and risk management topics. These courses are all designed by industry experts who are recognized leaders in process safety. Primatech courses are continually updated with the latest technical information and regulatory clarifications.

Courses range from one-day to one-week in duration. Many of our courses are publicly offered for open enrollment to companies in various cities in the U.S. and worldwide throughout the year.

Expert Trainers and Advanced Training Delivery

Our instructors use the latest advances in training delivery and adult learning techniques.

Convenient Locations

Open enrollment courses are available throughout the year in popular cities in North America, Europe, Asia, and the Middle East.

Examples, Exercises and Hands-On Workshops

Examples, exercises and hands-on workshops are used to provide practical experience and reinforce the training.

Course Manuals and Resources

You will receive a detailed course manual that is included with every Primatech training course, along with resource materials, handouts, job aids, and checklists to help you apply what you have learned after the course.

Learn More

For more information about the Primatech Training Institute or a customized in-house training delivery, please contact a Primatech representative directly at +1-614-841-9800, or by email at: training@primatech.com, or visit www.primatech.com.

International Training Discounts

Receive a 10% discount off the total price when three or four employees from the same company attend the same course(s) at the same time.

Receive a 15% discount off the total price when five or more employees from the same company attend the same course(s) at the same time.

Take any two courses within the same week and receive €185 Euros, £155 GBP, or \$250 USD off the total price.



Courses

PROCESS HAZARD ANALYSIS (PHA) Page

PHA for Team Leaders.....	2
Principles of PHA for Team Members	3
PHA for Scribes	3
PHA for Batch Processes and Procedures	4
HAZOP Studies for Process Safety.....	5
PHA Revalidation	6
Refresher Training for PHA Team Leaders	6
Advanced PHA for Team Leaders	7
Managing Psychological and Human Aspects of PHA Facilitation.....	8
Dust Hazard Analysis (DHA) and Risk Assessment	9

PROCESS SAFETY AND RISK MANAGEMENT Page

Designing and Implementing a PSM Program	10
Auditing PSM Programs.....	11
Process Safety Essentials Boot Camp for Facility Personnel.....	12
Management of Change (MOC) for Process Safety.....	13
Mechanical Integrity (MI) for Process Safety and Risk Management	14
Developing and Implementing a Competence Management Program for Process Safety.....	15
Applying Creative Thinking and Critical Thinking in Process Safety.....	16
Developing and Implementing an EPA Risk Management Program (RMP).....	17
Updating Risk Management Plans (RMPs)	17

HUMAN FACTORS AND HUMAN ERRORS Page

Understanding and Applying Human Factors for Process Safety	18
Job Hazard / Safety Analysis – Assessing Workplace Hazards	19
Understanding and Applying Human Factors for Control Systems	20
Human Error and Reliability Analysis for Process Safety.....	21

PROCEDURES DEVELOPMENT Page

Principles of Procedure Writing for the Process Industries. .	22
Advanced Procedure Writing for the Process Industries . .	23

LAYERS OF PROTECTION ANALYSIS (LOPA) Page

Layers of Protection Analysis (LOPA) for Process Safety Management	24
Safety Integrity Level (SIL) Determination Using LOPA and Other Methods to Comply with IEC 61511 and ISA 84	25
Risk Tolerance Criteria for Process Safety.....	25

SAFETY INSTRUMENTED SYSTEMS (SIS) Page

Understanding IEC 61511 / ISA 84 and Developing a Safety Requirements Specification	26
Safety Integrity Level (SIL) Verification for Safety Instrumented Systems (SISs)	27

CYBER AND PHYSICAL SECURITY Page

Understanding and Applying Cyber Security for Manufacturing and Computer Control Systems.....	28
Cyber Security Vulnerability Analysis (SVA) for Manufacturing and Computer Control Systems.....	29
Security Vulnerability Analysis (SVA).....	30

SOFTWARE Page

Using PHAWorks® RA Edition Software	31
Using PHAWorks® 5 Software	32
Using LOPAWorks® Software	33
Using Tracker™ Software.....	34

OTHER SERVICES & PRODUCTS Page

In-House Training / Advantages	35
Management Briefings	36
Primacert Certification Services	37
Consulting Services / Advantages	38
Software Products	39-41

Process Hazard Analysis (PHA) for Team Leaders

Course Length: 5 Days **Accreditation:** 3.5 CEUs or 35 PDHs awarded

Learn to organize and lead process hazard analysis studies, including PHA Revalidations, using the HAZOP and "What-If" techniques.

Course Description

OSHA expects that PHA team leaders be qualified to lead PHAs using such methods as the hazard and operability (HAZOP) study.

This course helps prepare team leaders to facilitate PHA study teams. You will receive expert instruction on the technical and managerial procedures involved with leading a PHA team. The course provides you with specific detailed guidelines for facilitating PHA studies, including PHA Revalidations, which you will practice in workshop sessions with other participants. These workshops are overseen by an instructor who will give feedback on your performance. Participants discover the tactics and success factors that help ensure a successful study.

Upon completing this course you will receive certification of training to satisfy OSHA's requirements for PHA team leaders.

You will learn:

- How hazard scenarios are defined
- Regulatory requirements for PHA
- How hazards are identified
- Pros and cons of different PHA methods
- Why defining a study charter is important
- What information to collect in advance
- Requirements for PHA facilities
- How to node process diagrams
- Requirements for team leaders, scribes, and team members
- Rules for team behavior
- How to manage PHA teams
- How to conduct a PHA study
- How to manage study quality
- Use of PHA software
- Meaning of design intent in HAZOP studies
- Use of guidewords and parameters in HAZOP studies
- Guidelines for completing PHA worksheets
- Use of risk matrices to rank risks
- Importance of addressing common cause failures
- Meaning of enabling events / conditions
- How to address human factors and facility siting in PHA studies
- How to address utilities in PHA
- Importance of including all modes of operation
- How to perform PHA for process changes
- How to perform PHA on batch processes
- Procedures for updating and revalidating PHA studies
- Requirements for study documentation and reporting
- Importance of follow-up for studies
- Cautions in using PHA

“Essential course for new or experienced PHA team leaders.”

– PSM Coordinator,
TransCanada

Target Audience

Engineers, Process Safety specialists, and others responsible for leading PHA studies.

Prerequisite

Familiarity with P&IDs is required.

Course Contents

- Overview of PHA
- Hazard scenarios
- PHA regulatory requirements
- Hazard identification, HAZID
- PHA methods overview
 - Checklist
 - What-if studies
 - HAZOP studies
 - Hazard and Operability (HAZOP)
 - Failure Modes and Effects Analysis (FMEA)
 - Fault Tree Analysis (FTA)
 - Major Hazards Analysis (MHA)
 - Preliminary Hazard Analysis (PrHA)
 - Event Tree Analysis (ETA)
 - Cause/Consequence Analysis (CCA)
 - Bow Tie Analysis (BTA)
 - Process Hazard Review (PHR)
- Preparing and organizing PHA studies
- Subdividing the process for study
- Inherent safety review
- The first session
- Completing the PHA worksheet
- Meeting regulatory requirements
- Leadership skills for managing the team
- Management of PHA studies
- Multiple failures in PHA
- Human failures and human factors in PHA
- Facility siting in PHA
- Utilities and support systems in PHA
- Modes of operation in PHA
- PHA of process changes
- PHA for batch processes
- Quality control in PHA studies
- PHA revalidation overview
- Preparing for PHA revalidations
- Conducting and documenting PHA revalidations
- PHA report preparation
- Managing the follow-up of PHA results

Principles of PHA for Team Members

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Become a valuable and instrumental member of a PHA team.

Course Description

Principles of PHA for Team Members teaches attendees to be an effective contributor to PHA team sessions using methods such as the hazard and operability (HAZOP) study. Participants gain an understanding of the regulatory and technical requirements that govern the performance of PHA. Guidelines for their participation in PHA sessions are provided and explained. Attendees practice participating in the performance of a PHA led by the PHA training course instructor.

Target Audience

Operations, engineering, maintenance and other technical personnel who will serve as members of PHA teams.

Prerequisite

None.

Course Contents

- Overview of PHA
- Understanding hazards
- What-if and what-if / checklist studies
- Hazard and Operability (HAZOP) studies
- Major hazards analysis
- Guidance for team members

PHA for Scribes

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Be able to effectively and efficiently record PHA studies.

Course Description

The scribe or technical secretary for process hazard analysis (PHA) studies, using methods such as the hazard and operability (HAZOP) study, plays a vital role. The work of the PHA team must be recorded accurately and completely to ensure the study is worthwhile. Scribes must understand the process of performing PHA and be able to work effectively with team leaders and other members of the team.

This training course explains the role of the PHA scribe, teaches guidelines that should be followed in recording studies, and provides guidelines for working with team leaders. Part of the class time is spent in workshop sessions practicing scribing and receiving feedback from the instructor.

You will learn:

- Why PHA studies must be recorded
- What roles are played on a PHA team
- What content is required in PHA worksheets
- How to record worksheet entries efficiently
- How to understand team discussions
- How team dynamics affects studies
- How to work effectively with study leaders
- How to ensure the quality of study records

Target Audience

Individuals who act as scribes or technical secretaries for PHA study teams.

Prerequisite

None.

Course Contents

- Understanding PHA
- Regulatory requirements for PHA
- Common PHA methods
- PHA procedures
- Means of recording studies
- Guidelines for working with the team leader
- Guidelines for scribing



PHA for Batch Processes and Procedures

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn how to perform PHA on non-steady-state processes, such as batch processes, and procedures, such as operating procedures.

Course Description

The performance of process hazard analysis (PHA) on batch and other non-steady-state processes involves aspects that are not encountered for continuous processes. The status and hazards of the process change with time, there is more human involvement and greater potential for human failures, and interactions may occur between batch steps. A knowledge of how to address procedures in PHA is required to perform PHA studies on batch processes. However, the explicit performance of PHA on procedures for continuous processes, in addition to the performance of a normal equipment-based PHA study, also is valuable. Usually, it identifies additional hazard scenarios involving human failures.

This course teaches participants how to use the What-If, and Hazard and Operability (HAZOP) study methods to conduct PHA studies for batch processes and procedures. Preparation, organization and conduct of studies are covered. Attendees participate in workshops to practice use of the methods taught.

You will learn:

- How to perform PHA on batch processes and procedures using the What-If and HAZOP methods
- What types of human failures are important for batch processes
- What information is needed for batch PHA studies
- How to address batch recipes
- How to node batch processes
- What process deviations should be addressed
- How to manage the risk of batch processes
- When to conduct PHA on procedures
- What are typical problems with procedures
- How to improve procedures

Target Audience

Facilitators and team members for batch and procedural PHA studies. Personnel responsible for studies.

Prerequisite

Experience or formal training as a PHA team leader or team member, such as Primattech's training courses, *PHA for Team Leaders* or *PHA for Team Members*.

Course Contents

- Overview
- Special features of PHA for batch processes
- Need for PHA on procedures
- Design intent for procedures and batch processes.
- HAZOP and What-If for batch processes and procedures
- Study preparation
- Information requirements
- Team composition
- Noding for batch processes
- Guide words for procedural PHA
- Conducting studies
- Managing the risks of batch processes
- Ways to improve procedures



HAZOP Studies for Process Safety

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Be able to perform hazard analysis for control systems at your facilities.

Course Description

Many processes today are automated and computer control systems play vital roles in their safe operation. The importance of computer control systems merits the performance of hazard analysis explicitly on them. Special techniques, such as the computer hazard and operability (HAZOP) study, have been developed for this purpose.

This course teaches participants how to use HAZOP, What-If, and Failure Modes and Effects Analysis (FMEA) to identify hazard scenarios originating in control systems. Preparation, organization and conduct of studies are covered. Attendees participate in workshops to practice use of the methods taught.

You will learn:

- Why hazard analysis is needed for control systems
- How HAZOP, What-If and FMEA are used for control systems
- What types of failures occur in control systems
- Who should participate in HAZOP studies
- What information is needed for HAZOP studies
- What process deviations should be addressed
- How control systems should be noded
- How risk can be reduced in control systems

Target Audience

Personnel who are responsible for hazard analysis of control systems, participants in HAZOP studies, and automation professionals.

Prerequisite

Experience or formal training as a PHA team leader or team member, such as Primattech's training courses, *PHA for Team Leaders* or *PHA for Team Members*.

Course Contents

- Overview
- Characteristics of control systems
- HAZOP, What-If and FMEA for control systems
- Failures in control systems
- Study preparation
- Design representations for control systems
- Design intent for control systems
- Use of HAZOP guide words for control systems
- Information requirements
- Team composition
- Noding for HAZOP studies
- Conducting studies
- Risk reduction for control systems



PHA Revalidation

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn how to revalidate existing PHAs to account for process modifications and omissions and deficiencies in the previous PHA.

Course Description

This advanced course teaches participants how to revalidate previous PHA studies, such as hazard and operability (HAZOP) studies, in accordance with the OSHA PSM and EPA RMP regulations. Participants will learn the most effective approaches to use in PHA updates and revalidations.

This course provides information on recent regulatory interpretations and clarifications to assist in the identification and correction of possible omissions and deficiencies in the previous PHA.

Target Audience

Managers and team leaders responsible for satisfying regulatory requirements for PHA, including PHA revalidation.

Prerequisite

A thorough understanding of PHA regulatory requirements and experience or training as a PHA team leader.

Course Contents

- Overview of PHA revalidation
- Planning PHA revalidations
- Conducting and documenting PHA revalidations
- Regulatory update on PHA

Refresher Training for PHA Team Leaders

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Brush up on your skills as a PHA facilitator. Learn the latest regulatory and technical developments in PHA.

Course Description

Refresher Training for Process Hazard Analysis (PHA) Team Leaders is intended for PHA facilitators who were trained more than two years ago. The course covers the latest PHA regulatory clarifications and current best practices in conducting PHAs. It addresses the performance of both initial and revalidation PHA's. Examples, exercises and workshops are used to reinforce the material covered.

“Excellent instructor with excellent knowledge of PHA and PSM.”

— PSM Manager, Husky Energy - Lima Refinery

Target Audience

PHA facilitators who have previously been trained as PHA team leaders.

Prerequisite

Prior attendance at Primatech's training course, *PHA for Team Leaders*, or equivalent.

Course Contents

- Key PHA concepts
- Regulatory clarifications
- Getting ready
- Preparing and organizing
- Process subdivision
- Completing the worksheet
- Special topics
- Human factors
- Facility siting
- Multiple modes of operation
- PHA revalidation
- Overview
- Preparation
- Conducting and documenting

Advanced PHA for Team Leaders

Course Length: 3 Days **Accreditation:** 2.1 CEUs or 21 PDHs awarded

Learn advanced methods in process hazard analysis and be able to apply them in studies.

Course Description

This PHA training course goes beyond the fundamentals of performing and facilitating PHAs covered in Primatch's *Process Hazard Analysis (PHA) for Team Leaders* course, and deals with more advanced issues. Topics such as PHA quality control, PHA for batch, non-steady-state processes and procedures, control systems HAZOP (CHAZOP), domino effects, and the competence of PHA study teams, are addressed in this course. The performance of PHA to facilitate LOPA is described.

Improved PHA methods have been developed recently to address these topics and others, such as reactive chemical hazards. Traditional PHA methods can be time consuming and onerous for the people who conduct them. The major hazards analysis (MHA) method was developed to overcome these problems and it provides an efficient and effective method for identifying the hazard scenarios for a process. Another recent innovation is the development of bow-tie diagrams to depict graphically the hazards of a process and the barriers that protect against them. They are used as a communication tool with management and operations and maintenance personnel.

All of these topics are addressed in the course. Examples are provided of the application of the PHA approaches described and attendees participate in workshop sessions to gain experience using them.

Target Audience

PHA Team Leaders / facilitators; PHA participants; process safety coordinators.

Prerequisite

Experience or formal training as a PHA team leader, such as Primatch's training course, *PHA for Team Leaders*, or equivalent.

Course Contents

- Competence of PHA teams
- Understanding and addressing weaknesses in PHA methods
- Major hazards analysis
- Understanding domino effects
- Domino effects and PHA
- PHA for batch and non-steady state processes
- PHA for procedures
- IEC 61511 / ISA 84 standard and LOPA
- LOPA and PHA
- Overview of reactive chemical hazards
- Identifying reactive chemical hazards
- Addressing reactive chemical hazards in PHA
- Characteristics of control systems and their failures
- CHAZOP and PHA for computer control systems
- Bow-tie diagrams



“If you want to take your PHA to a whole new level, this course is a must. It will challenge and enhance your leadership skills”

—PSM Manager, Rayonier Advanced Materials

Managing Psychological and Human Aspects of PHA Facilitation

Course Length: 3 Days **Accreditation:** 2.1 CEUs or 21 PDHs awarded

Be able to understand human behavior and PHA team chemistry in order to productively facilitate meaningful PHA studies.

Course Description

Most training courses on process hazard analysis (PHA) focus on the technical aspects of performing studies. However, managing a team of people effectively and efficiently often poses a greater challenge to team leaders / facilitators than understanding the technical aspects of PHA. Typical technical personnel assigned to lead studies are not always adept at managing the human issues and interactions that occur between the multi-disciplinary team members who participate in studies. Consequently, training in managing teams and understanding the factors that influence team performance is vital for PHA team leaders / facilitators. Lack of skill in addressing human and psychological factors likely will lead to poor quality studies.

This training course describes the various human and psychological factors that influence the behavior and chemistry of teams and provides guidelines for dealing with them. Issues such as groupthink, peer pressure, and the compatibility of different personality types are addressed. Course attendees' understanding of the factors influencing PHA teams is enhanced using exercises and workshops. One third of the class time is spent in PHA workshop sessions practicing the people management methods taught in the course.

You will learn:

- How leadership styles affect the team
- How to select competent participants
- Psychological factors that influence participant performance
- Psychological phenomena that affect teams
- How to maintain the pace and keep the focus of studies
- How to avoid digressions and distractions
- How to keep team members involved and energized
- How to motivate team members
- How to ensure the team works together effectively
- How people make incorrect decisions
- How to deal with difficult people
- Nature and sources of conflict
- How to manage conflict
- How to avoid psychological pitfalls in PHA

Target Audience

Individuals who act as leaders and/or facilitators of PHA study teams.

Prerequisite

Experience or formal training as a PHA team leader, such as Primatech's training course, *PHA for Team Leaders*, or equivalent.

Course Contents

- How leadership styles affect the team
- How to select competent participants
- Psychological factors that influence the performance of participants
- Psychological phenomena that affect teams
- How to maintain the pace and keep the focus of studies
- How to avoid digressions and distractions
- How to keep team members involved and energized
- How to motivate team members
- How to ensure the team works together effectively
- How people make incorrect decisions
- How to deal with difficult people
- Nature and sources of conflict
- How to manage conflict
- How to avoid psychological pitfalls in PHA



Dust Hazard Analysis (DHA) and Risk Assessment

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn how to perform dust hazard analysis and risk assessment for industrial facilities.

Course Description

Many facilities manufacture materials in the form of powders and some facilities generate powders through handling and processing solid materials. Such facilities may be subject to combustible dust hazards. A combustible dust is a finely-divided particulate solid that presents a flash-fire hazard or explosion hazard when suspended in air, or another oxidizing medium. A wide variety of industries pose combustible dust hazards from various materials including chemicals, metals, wood, plastics, rubber, coal, flour, sugar, and paper.

This course teaches participants how to perform a Dust Hazard Analysis (DHA) and Dust Risk Assessment (DRA) to comply with the requirements of NFPA 652:2016, Standard on the Fundamentals of Combustible Dust. A DHA is a systematic review to identify and evaluate the potential fire, flash fire, or explosion hazards associated with the presence of one or more combustible particulate solids in a process or facility. A DRA estimates the likelihood, vulnerability, and magnitude for incidents that could result from exposure to hazards. Course attendees participate in workshops to practice use of the methods taught.

You will learn:

- Basics of combustible dust safety
- NFPA standards requirements for DHA and DRA
- Which additional standards may apply
- Qualifications for study facilitators
- Pre-requisites for DHA
- Scope of DHA
- Key DHA elements
- Methods for DHA and DRA
- How to prepare for studies
- What information to assemble
- Who should participate in studies
- How to partition facilities for study
- What scenario information should be recorded
- What steps are involved in performing studies
- What should be documented in a study report
- What follow-on studies are needed



Target Audience

Personnel responsible for conducting or participating in dust hazard analysis and risk assessment studies for industrial facilities.

Prerequisite

A technical background is valuable.

Course Contents

- Overview
- NFPA standards
- Requirements for DHA and DRA
- DHA methods
- Collection of needed information
- Assembling the study team
- Recording studies
- DHA and DRA procedures
- Documenting studies
- Follow-on studies

Designing and Implementing a Process Safety Management (PSM) Program

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Be aware of what is required for compliance with PSM regulations and understand how to ensure programs are properly implemented.

Course Description

OSHA's Process Safety Management (PSM) Standard (29 CFR 1910.119) and EPA's Risk Management Program (RMP) rule (40 CFR Part 68) both require the development and implementation of a program to prevent catastrophic accidents for covered processes. These are performance-based regulations and are subject to ongoing interpretations and clarifications from the regulatory agencies. The prevention programs are wide-ranging and cover virtually every aspect of a company's operations. Companies are often unsure on what constitutes full compliance with the regulations.

This course explains how to ensure your prevention program is designed to meet the requirements of these performance-based regulations and implemented through an effective management system.

Documented examples are provided and discussed and workshops are used to enhance understanding of the details of implementation for key PSM elements.

Course attendees receive a detailed course manual, workshop materials, and electronic copies of regulatory standards and resource materials.

Target Audience

Managers, process safety and risk management coordinators and others responsible for satisfying OSHA PSM regulatory requirements.

Prerequisite

None.

Course Contents

- Introduction
- Overview of prevention program regulations
- Requirements for compliance
- Employee participation
- Process safety information
- Process hazard analysis
- Operating procedures
- Training
- Contractors
- Pre-startup safety review
- Mechanical integrity
- Hot work permit
- Management of change
- Incident investigation
- Emergency planning and response
- Compliance audits
- Trade secrets
- Management systems for implementation of prevention programs

“The course covered all PSM elements and emphasized the purpose and importance of the regulation. It covered the necessary details of each element for management to appreciate why PSM exists.”

— Process Safety Manager,
Energy Transfer Partners



Auditing PSM Programs

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to plan, prepare, perform, and follow-up on a compliance audit against OSHA's PSM and EPA's RMP regulations and/or other environmental and quality standards.

Course Description

OSHA's Process Safety Management (PSM) and EPA's Risk Management Plan (RMP) regulations specify that companies must perform periodic compliance audits and require documentation of audit findings and action plans. Audits carry great significance, and must be planned and performed with consideration of many factors.

Attendees will learn how to plan, prepare, perform, and follow-up on a compliance audit for OSHA's PSM and EPA's RMP regulations and/or other environmental safety and quality standards. This course provides a systematic, step-by-step approach to conducting an objective, accurate audit. Workshop exercises are used to develop auditing skills.

Course attendees receive a detailed course manual, workshop materials and electronic copies of regulatory standards and resource materials.

“This class gives great advice on auditing PSM programs – a lot of the material is applicable to other types of audits.”

— EHS Engineer, EMD Millipore

Target Audience

Managers, supervisors and EH&S coordinators responsible for conducting or managing compliance audits.

Prerequisite

An understanding of the prevention program requirements of OSHA PSM or EPA RMP regulations. Alternatively, attendance at Primatch's course *Designing and Implementing Process Safety Management (PSM) Programs*.

Course Contents

- Regulatory requirements for PSM / RMP auditing
- Overview of PSM / RMP auditing
- Developing an audit program
- Preparation for an audit
- Conducting an audit
- Evaluating compliance with OSHA's PSM standard and EPA's RMP rule
- Recording audits
- Reporting on audits
- Follow-up on audit findings
- Quality control in auditing
- Issues in using audit findings



Process Safety Essentials – Boot Camp for Facility Personnel

Course Length: 3 Days Accreditation: 2.1 CEUs or 21 PDHs awarded

Learn the fundamentals of all aspects of process safety.

Course Description

Facilities that implement process safety management (PSM) programs to comply with government regulations or follow industry guidelines must ensure that their personnel understand process safety and their role in its ongoing implementation. This course is targeted at personnel who work at facilities that have existing programs but who need to gain knowledge and experience with process safety so they can play their part in its implementation. Personnel who are involved in setting up a new process safety program will also benefit from the course.

The course begins with a brief review of process safety and regulatory and industry programs. It moves quickly to hands-on workshops and exercises to assist attendees in understanding vital aspects of addressing key PSM elements. Videos are used to emphasize and illustrate key points. Instructor-led discussions are a key part of the course and allow our highly experienced instructors to communicate their wealth of experience and knowledge and tailor it to the needs of each class.

Customized versions of this course are available for in-house delivery to managers, engineers and operations/maintenance personnel.

Target Audience

All facility personnel who may play a part in the ongoing implementation of a facility's PSM program including management, engineering, operations, and maintenance personnel.

Prerequisite

None.

Course Contents

- Overview of process safety
- Process safety management programs
- Management systems
- Personnel competency and training
- Process information and knowledge
- Standards compliance
- Personnel involvement
- Stakeholder outreach
- Performance indicators
- Process safety culture
- Human and organizational factors
- Alarm management
- Facility and stationary source siting
- Hazard identification and risk analysis
- Damage mechanism review
- Safeguards protection analysis
- Hierarchy of controls
- Bow tie diagrams
- Procedures
- Safe work practices
- Operational readiness
- Operational discipline
- Management of change
- Asset integrity
- Contractor management
- Emergency management
- Incident investigation
- Auditing
- Management review

“This course taught me so much more about process safety from any other material or class I've had.”

— PSM Coordinator, Apache Corporation



Management of Change (MOC) for Process Safety

Course Length: 1 Day Accreditation: 0.7 CEUs or 7 PDHs awarded

Learn how to establish a new or improve an existing MOC program.

Course Description

The objective of a Management of Change (MOC) program is to ensure changes to a process are properly reviewed and hazards introduced by the change are identified, analyzed, and controlled prior to resuming operation. MOC often seems deceptively simple in concept but can be one of the most difficult elements of PSM to implement effectively.

The course begins with a discussion of the types of changes that could have adverse impacts on process safety, including some that may not be obvious. Examples are provided of how changes, including even very simple ones, have caused accidents. Regulatory requirements for managing change are reviewed, including interpretations and clarifications that have been provided by OSHA since the PSM standard was issued.

Management systems for managing changes are described and an example system is provided. Keys to successful implementation of a MOC program are discussed and guidelines on establishing an effective MOC program are presented and applied in workshop exercises. Interfaces with other parts of the facility PSM program are identified.

The course manual includes resource materials to assist in developing a new MOC program and reviewing/ auditing and revising an existing MOC program.

Target Audience

PSM Managers / Coordinators, MOC Coordinators, Engineering and Maintenance Personnel, and others who participate in decisions about process changes.

Prerequisite

Experience in PSM and/or managing change is desirable. A background in Plant Engineering (Operations and/or Maintenance) is helpful.

Course Contents

- Overview
- Regulatory requirements
- Management systems
- Designing and developing a MOC program
- Types of changes
- Personnel roles and responsibilities
- Interface with other facility programs
- Elements of a MOC program
- Implementation guidelines



“This course provided me with an excellent understanding of the requirements associated with implementing MOC. The course instructor's experience and knowledge helped to provide clarity and insight to the OSHA regulation and its interpretation and application.”

— Special Projects Director,
Oklahoma Gas and Electric

Mechanical Integrity (MI) for Process Safety and Risk Management

Course Length: 3 Days **Accreditation:** 2.1 CEUs or 21 PDHs awarded

Learn how to develop and implement a mechanical integrity program for critical process equipment, while satisfying regulatory requirements.

Course Description

This course explains how to establish a program for maintaining the integrity of critical process equipment to improve reliability and satisfy government regulations. Participants will learn how to satisfy regulatory requirements and improve reliability by establishing management systems, procedures and training programs for mechanical integrity (MI).

The course includes instruction on management systems for MI, determining what equipment to include, identifying applicable codes and standards, deciding what repairs and preventive maintenance should be performed, developing procedures, establishing requirements for training MI personnel, how to handle equipment deficiencies, what types of quality assurance should be performed to ensure equipment is properly fabricated and installed, and which spare parts and materials are suitable for their intended application. Also described are computerized maintenance management systems and their selection.

Course attendees receive a detailed course manual, workshop materials, and electronic copies of regulatory standards and resource materials.

Target Audience

Operations and maintenance managers, engineers, and other staff responsible for mechanical integrity.

Prerequisite

A background in engineering.

Course Contents

- Overview of mechanical integrity
- Regulatory requirements for mechanical integrity
- Mechanical integrity management Systems
- Equipment covered
- Codes, standards and practices
- Maintenance tasks
- Procedures
- Training and qualification of personnel
- Preventive maintenance tasks
- Preventive maintenance frequencies
- Corrosion and non-destructive testing
- Handling equipment deficiencies
- Quality assurance
- Computerized maintenance management systems



“The course provided a sound outline for developing an MI program.”

— Reliability Engineer, INVISTA

Developing and Implementing a Competence Management Program for Process Safety

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Understand how to ensure the competence of personnel whose job performance can impact the safety of process facilities.

Course Description

The competence of personnel is crucial to process safety as it helps to ensure that tasks are carried out satisfactorily to achieve adequate levels of safety and tolerable levels of risk. Competence implies appropriate qualifications, experience, training, skills, physical and mental capabilities, knowledge, understanding, fitness for duty, behavior and attitudes as well as the ability to perform tasks according to defined performance standards. Often assumptions of competence are made based on the adequacy of experience or training, possession of qualifications, or the availability of a procedure. Not only may such assumptions be incorrect, but they do not capture all the key aspects of competence.

Competence should be managed; otherwise poor performance and accidents may result. Indeed accidents have occurred when competencies other than knowledge and experience were absent. Competence management is particularly important when an organization relies heavily on the skills, knowledge and capabilities of its personnel, such as in the process industries. The importance of competence is compounded in the face of the re-engineering, downsizing, and multi-tasking that can occur in the process industries. Personnel are often expected to take on a wider range of tasks with less supervision thus increasing the need to manage competence effectively. Competence management should be planned, proactive and systematic.

This course explains how a competence management program for process safety can be developed and implemented. Course attendees participate in workshops to reinforce the material presented.

You will learn:

- Meaning and importance of process safety competence
- Benefits of a competence management system (CMS)
- Purpose, goals and applicability of a CMS for process safety
- Elements and requirements of a CMS
- How to design and implement a CMS
- Issues to address in developing a CMS
- Differences between individual, group and organizational competence
- Levels and stages of competence and competence profiles
- Issues that affect competence
- Relationship between competence, procedures and training
- How to establish performance standards and selection criteria for process safety roles
- How to use competency matrices
- How to assess competence
- Ways to monitor competence
- Methods for maintaining competence
- Which roles should require certification of competence

Target Audience

Personnel with responsibilities for process safety.

Prerequisite

None.

Course Contents

- Overview
- Competence management system
- Establish competence requirements
- Competence matrices
- Design CMS
- Implement CMS
- Maintain competence
- Audit and review CMS



Applying Creative Thinking and Critical Thinking in Process Safety

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Improve your ability to develop imaginative solutions to problems and evaluate your own judgements and those of others, for example, in identifying hazard scenarios during PHA studies to improve their completeness and quality.

Course Description

Many aspects of process safety require practitioners to think creatively about issues and to critically evaluate their own judgments and those of others. For example, process hazard analysis (PHA) methods rely on the ability of the PHA team to identify scenarios using judgment in a brainstorming process that necessarily is subjective in nature. The ability of team members to think creatively is critical, particularly when trying to identify rare, consequential events which are of the greatest concern. Also, the ability of team members to constructively critique suggestions by other team members during the brainstorming process is essential to ensuring that the best possible decisions are made. The completeness of scenario identification and the veracity of judgments regarding scenarios are crucial to the validity of PHA study results. Thus, creative thinking and critical thinking are essential for PHA study teams. They are also important for other elements of process safety such as incident investigation, managing changes, and auditing. This course teaches the application of these two different but complementary types of thinking.

People are not required to think creatively for much of what they do in life. Routine thought works well for most activities and becomes habitual for many people. Indeed, our educational system largely encourages such thinking. These habits interfere with the need to think creatively in process safety, for example, when trying to identify hazards scenarios in PHA studies. Furthermore, psychological factors also can impair creativity, for example, the desire to avoid looking foolish when suggesting possible scenarios during PHA studies. These habits and factors can be overcome with the right approaches.

Conventional thinking can be incomplete, unclear, uninformed, distorted, biased, or prejudiced resulting in judgments that are false. Important considerations may be overlooked and conflicting viewpoints ignored. Flawed reasoning often is not recognized. Indeed, it has been found that people who are not naturally good at reasoning are the most likely to overestimate their reasoning ability. Furthermore, when people try to persuade others to their views, they may use emotion or personal attributes such as their reputation, rather than logic. Critical thinking can be taught and it helps people to overcome these issues.

Examples and workshop exercises from both everyday life and process safety are used to teach attendees to use creative and critical thinking.

Target Audience

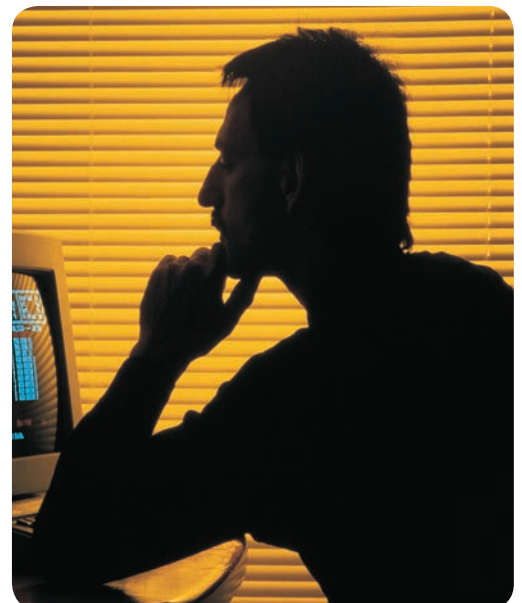
Process safety practitioners.

Prerequisite

An understanding of process safety and experience in its use.

Course Contents

- Key decisions in process safety
- Types of thinking
- Creative versus critical thinking
- Characteristics of creative thinkers
- Characteristics of critical thinkers
- Productive thought and creativity
- Overcoming mental blocks
- Do's and don'ts of brainstorming
- Development of creativity
- Pro and con arguments
- Deductive and inductive arguments
- Evaluating arguments
- Assessing the credibility of claims
- Use and abuse of persuasion
- Recognizing fallacies
- Impact of emotion, self-interest, and wishful thinking
- Addressing cognitive biases



Developing and Implementing an EPA Risk Management Program (RMP)

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Understand the requirements of EPA's RMP regulation, and know how to integrate RMP with OSHA PSM and other programs.

Course Description

This course explains how to comply with the requirements of EPA's 112(r) Risk Management Program rule (40 CFR Part 68). There are different requirements depending on whether the facility qualifies for Program 1, 2 or 3 status. We'll explain which of these apply to you, and show you how to develop the appropriate program.

All of the requirements are explained, along with the many issues that they raise. You'll learn how to develop prevention plans appropriate for each of the different program levels. We'll also show you how to save money by incorporating your existing programs and procedures.

Target Audience

Managers and environmental, health and safety coordinators responsible for satisfying regulatory requirements for EPA's RMP.

Prerequisite

None.

Course Contents

- Overview of EPA's risk management program rule
- Differences between OSHA PSM and EPA RMP program regulations
- Conducting a hazard assessment
- Offsite consequence analysis
- Source terms
- Dispersion and consequence modeling
- Model risk management plans
- Requirements for emergency response programs
- Risk communication to the public
- EPA clarifications on the RMP rule

Updating RMPs

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn how to prepare a Risk Management Plan for submission to EPA.

Course Description

EPA's Risk Management Program rule (40 CFR Part 68) requires submission of a Risk Management Plan (RMP) to the EPA. Risk Management Plans must be updated and submitted to the EPA at least once every five years.

Risk Management Plans contain data elements relating to facility registration information, worst case and alternative release scenarios, 5-year accident history, prevention program and the facility's emergency response program.

This course explains how to ensure your RMP meets the requirements of the Risk Management Program rule and discusses steps in the updating and resubmission of your RMP to the Environmental Protection Agency (EPA).

Target Audience

Managers, process safety coordinators and others responsible for updating RMPs.

Prerequisite

None.

Course Contents

- Background of EPA risk management program rule
- Summary of requirements for compliance
- Management system for implementation of risk management program
- Hazard assessment
- Program level determination
- Prevention program
- Emergency response program
- Amendments to the risk management program rule
- Updating requirements for RMPs
- Contents of the RMPs
- Methods for conducting offsite consequence analysis
- Methods for submitting RMPs
- Updates other than 5-year submissions

Understanding and Applying Human Factors for Process Safety

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Gain an understanding of how improving the human factors design of a process can produce not only improvements in safety and health but also gains in quality, productivity and employee job satisfaction.

Course Description

Government regulations and industry recommended practices are focusing attention in the process industries on human factors. OSHA's PSM standard, EPA's RMP rule and API's recommended practice for Safety Environmental Management Programs (SEMP), RP75, all address this topic. Human error as a cause of hazard scenarios must be identified and the factors that influence human errors must be considered. This latter topic falls within the field of human factors engineering. It deals with the person-process interface and how it influences the performance of people.

People are key components of processes. They are involved in process design, operation, maintenance, etc. No step in the process life cycle is without some human involvement. Based on human nature, human error is a given and will arise in all parts of the process life cycle. Also, processes are generally not well-protected from human errors since many safeguards are focused on equipment failure. Consequently, it is likely that human error will be an important contributor to risk for most processes. This is evidenced by the number of major accidents that have been attributed to this cause. Therefore, it is vital that the factors influencing the likelihood of errors be identified and assessed to determine if improvements in the human factors design of the process are needed and possible.

Usually, in process safety management the topic of human factors is addressed during the performance of a process hazard analysis. However, PHA team members often have no background in human factors and are challenged by the assignment. This course is intended to provide process safety personnel with a better understanding and appreciation for the types of human factors issues that can impact on process safety so that improvements can be recommended.

This course explains what is meant by human factors in the context of process safety. Regulatory requirements are discussed and clarifications provided. Explanations are provided and examples are given for the various aspects of human factors involved in the interaction of people with processes so that attendees will be better able to identify such issues in their own processes in the future. Attendees are taught how to perform an assessment of the current human factors design of their processes. The importance and availability of design standards for human factors is also covered. A detailed manual is provided for use as a reference after you have completed the course.

Target Audience

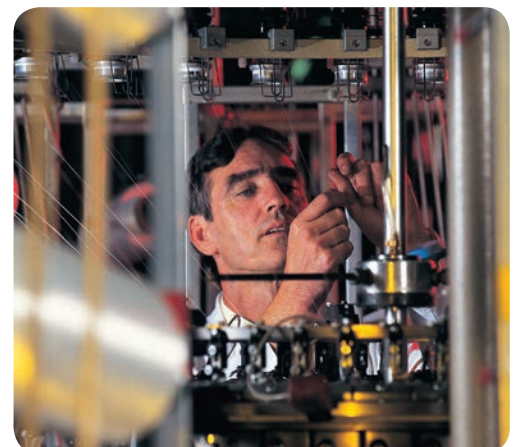
This course is intended for process safety personnel, human factors engineers and others who need to understand the subject of human factors as it applies to process safety and be able to identify human factors issues in processes.

Prerequisite

A general background in process safety, process engineering, and / or design engineering.

Course Contents

- Overview
- Regulatory requirements for human factors
- Model of human factors in processes
- Human factors issues in processes
- People
- Communications
- Process equipment and tools
- Displays, controls and alarms
- Computer hardware
- Computer software
- Procedures / operating instructions
- Rules and practices
- Job tasks
- Workplace / workstation
- Control room / station
- Environment
- Organization
- Supervision / management
- Human factors assessment approaches
- Human factors design guidelines



“This course is an eye opener focusing on Human Factors that every employee should receive; from the front line to top management.”

— Safety Manager, HollyFrontier Corporation

Job Hazard / Safety Analysis – Assessing Workplace Hazards

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Be able to use Job Hazard Analysis (JHA) and Job Safety Analysis (JSA) to evaluate hazards in the workplace.

Course Description

Providing a safe workplace for employees is a fundamental responsibility of employers. Workers must be protected against industrial injuries and illnesses. Job Safety Analysis (JSA) is a proactive method for identifying the potential for injuries and incidents before they occur. It is often performed by first-line supervisors. As a predictive technique, JSA is a highly desirable adjunct to compliance-based safety programs or programs that are based on merely reacting to the occurrence of injuries and incidents. It should be part of effective occupational safety and health programs.

The course provides instruction on the use of JSA, sometimes called Job Hazard Analysis (JHA). Attendees are taught how to identify jobs and tasks for analysis. In order to perform a JSA, users must understand the various workplace hazards which are discussed in the course. The stages and steps in performing a JSA are described in detail with examples provided throughout. Attendees will practice what they are taught by performing exercises and participating in a workshop session where they conduct a JSA to gain experience using the method.

The course concludes with a discussion of how to implement a program for performing JSAs within an organization. The use of the results of JSA to reduce workplace risk is explained and examples are provided.

Target Audience

Individuals involved with or responsible for occupational health and safety in an organization.

Prerequisite

Knowledge and/or experience with safety, health and environmental issues in the workplace are desirable.

Course Contents

- Overview
- Understanding workplace hazards
- Performing a JSA
- Follow-up
- Implementing a JSA program

“I left this class knowing the importance of JHA and wanting to do them.”

— Production Engineer, Valent Biosciences



Understanding and Applying Human Factors for Control Systems

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to design and improve the interface between operators and control systems to improve safety and operability.

Course Description

The design of control systems in process and manufacturing plants directly impacts the likelihood of human errors by operators. Human error is much more likely than equipment failure. Consequently, the development of an optimized interface between the operators and the processes and equipment being controlled is vital for ensuring safety and operability.

People control processes by interacting with process equipment. Human factors issues for process equipment relate to how people interact with and use equipment. This entails studying the match between the attributes of people and those of equipment that are involved in the interactions. Control rooms must be organized so that control room personnel are provided with an appropriate working environment. The likelihood of human errors in the control room and the likelihood that control room personnel will be exposed to ergonomic hazards can be reduced by effective human factors control room design.

The human/computer interface (HCI) deals with how people interact with computer systems. Human failures in interacting with control systems can result in loss of control and serious incidents. Various human factors issues are important in developing procedures. Also, a variety of documentation is used. Documentation design can have a major impact on process safety and operability. Procedures that are not followed, guidelines that are not used, diagrams that are misleading, and records that are not completed properly can all increase the likelihood of accidents.

This course identifies and describes tools available to address these important human factors issues and provides instruction in their use.

Target Audience

Personnel with responsibility for safe and reliable plant operations.

Prerequisite

Knowledge of plant operations.

Course Contents

- Human factors in control system design and operation
- Aspects of control systems
- Equipment design and use
- Control center design and operation
- Human / computer interface
- Operating procedures development and use
- Documentation design and use



Human Error and Reliability Analysis for Process Safety

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to how to perform human factors and human error studies to improve the effectiveness of plant design and operation to minimize accidents.

Course Description

People will always make mistakes when interacting with processes. That is the nature of humans. Fortunately, human errors can be anticipated and protective measures taken against their occurrence. This requires the application of human factors engineering. It can yield major benefits in risk reduction and improved operability for processes.

In this course you will learn how to identify the potential for human errors in processes and how to determine the human factors that control their likelihood. Types of human errors are described and illustrated with examples and the factors influencing human errors are discussed. Classification schemes for use in the identification of human errors are provided. The classical human-machine model is described and an improved person-process model is presented. Approaches to protect against human error are provided and their effectiveness discussed.

The techniques described are presented in a step-by-step format together with guidelines on how to perform the analyses. Examples are provided and attendees participate in workshop sessions to practice the techniques taught.

Target Audience

Personnel with responsibility for safe process operations.

Prerequisites

Prior experience or knowledge in process safety is useful.

Course Contents

- Understanding human error
- Regulatory requirements for the treatment of human factors
- Overview of human factors and human errors in PSM
- Error likely situations
- Human error causes
- Human error in an aging workforce
- Human error models
- Uncertainty, error predictability, and analytical methods

“Very good class, excellent instructor and course material.”

— Operations Staff, Formosa Plastics Corporation



Visit www.primatech.com/training to register online or inquire about our in-house training.

Principles of Procedure Writing for the Process Industries

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to develop and implement effective operating, maintenance, and other procedures, and improve existing procedures.

Course Description

The development and use of effective and user friendly Operating and Maintenance procedures in process facilities is essential for safe and efficient operations. Written procedures are also a requirement of OSHA's Process Safety Management (PSM) Standard, CFR 1910.119. Procedures can have as much impact on process safety as the process equipment. The Operating Procedures element of the PSM Standard is one of the most frequently cited elements by OSHA.

Many companies assume their employees can write procedures simply by documenting what they do. However, this approach often produces ineffective procedures. There are much better approaches that can be used to write procedures that do not require any more work than the traditional "write what you do" approach. These methods produce procedures that are much more effective and usable.

This course covers the fundamentals of writing effective procedures. You will learn how to design and develop procedures according to established principles and best practices and how to write procedures for their users. The regulatory requirements for procedures are explained together with clarifications and interpretations from OSHA. Throughout the course, examples and workshops are used to illustrate properly (and improperly) designed procedures. While the emphasis in this course is on operating and maintenance procedures, the course also applies to other facility procedures such as Safe Work Practices, Emergency Procedures, and Safety Procedures.

The course manual includes resource materials to assist in designing and developing new procedures and reviewing and modifying existing procedures.

“Even though our refinery already has fully developed procedures, I was able to have many questions answered and discovered great ideas for moving forward.”

— PSM Technician, Sinclair Refining

Target Audience

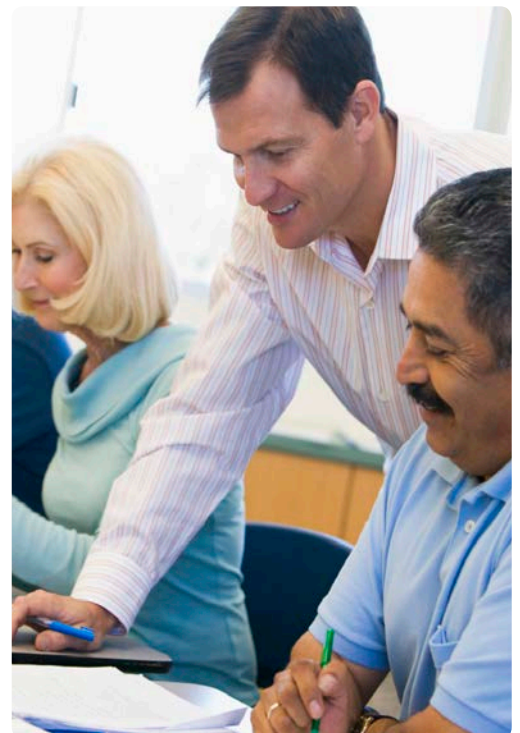
Operations and Maintenance Personnel, Process Engineers, Process Safety Personnel and others who are responsible for the design and development of procedures.

Prerequisite

Experience in process operations, maintenance, or process safety is desirable.

Course Contents

- Overview
- Regulatory requirements
- Desirable characteristics
- Contents
- Organization and structure
- Writing procedure steps
- Format
- Level of detail
- Selection of procedures to develop



Advanced Procedure Writing for the Process Industries

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn advanced aspects of developing and implementing effective operating, maintenance, and other procedures, and improving existing procedures.

Course Description

The development and use of effective and user friendly operating and maintenance procedures in process facilities is essential for safe and efficient operations. Written procedures are also a requirement of OSHA's Process Safety Management (PSM) Standard, CFR 1910.119. Procedures can have as much impact on process safety as the process equipment itself. The Operating Procedures element of the PSM Standard is one of the most frequently cited elements by OSHA.

This course moves beyond the fundamentals of writing effective procedures covered in the course *Principles of Procedure Writing* and covers more advanced issues in designing and developing procedures. The role of a management system for procedures is explained covering procedure design, development, implementation, maintenance and control. You will learn how to decide when procedures are needed. You will also learn how to design procedures to ensure their usability.. Guidelines are provided on various matters such as the appropriate use of language, numerical information, graphics, lists and tables. The writing of special types of procedural steps such as non sequential, continuous and time dependent is explained. Guidelines for drafting, evaluating and validating procedures are also covered. Procedure maintenance, control and training are explained.

The course provides guidelines for preparing several specific types of procedures including standard operating procedures, safe work practices, emergency operating procedures, and maintenance procedures. Throughout the course, examples and workshops are used to illustrate and apply the guidelines presented.

The course manual includes resource materials to assist in designing and developing new procedures and reviewing and modifying existing procedures.

Target Audience

Operations and Maintenance Personnel, Process Engineers, Process Safety Personnel and others who are responsible for the design and development of procedures.

Prerequisite

Attendance at Primatch training course, *Principles of Procedure Writing*, or an equivalent. Experience in process operations, maintenance, or process safety is desirable.

Course Contents

- Principles of procedure writing
- Human factors in the design of procedures
- Use of syntax, vocabulary and punctuation
- Presentation of numerical information
- Lists and tables
- Conditional statements
- Notes, cautions and warnings
- Cross references
- Use of graphics
- Special types of procedural steps
- Drafting procedures
- Evaluating procedures
- Validation of procedures
- Accessibility and use of procedures
- Control of procedures
- Training personnel using procedures
- Implementation of procedures
- Guidelines for preparing specific types of procedures
- Management systems



“I feel I will now have a complete and well written policy for our operating procedures.”

— MFG EXC Coordinataor,
Huntsman Corporation

Layers of Protection Analysis (LOPA) for Process Safety Management

Course Length: 3 Days Accreditation: 2.1 CEUs or 21 PDHs awarded

Learn how to perform a LOPA study to evaluate the effectiveness of process safeguards.

Course Description

Layers of Protection Analysis (LOPA) is a simplified form of risk assessment. It assists in compliance with PSM and RMP regulations and with the IEC 61511 / ISA 84 standard, *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. LOPA was developed for this purpose.

LOPA is also used to comply with the IEC 61511 / ISA 84 standard. 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.

“This course is great even if you have no SIL level systems in your plant. It will change how you view risk in your PHAs and likely re-evaluate your methods / matrices.”

— Process Safety Superintendent, Kaneka North America

Target Audience

Process safety personnel, PHA analysts and others who need to apply or understand LOPA.

Prerequisite

An understanding of PHA and PSM and a technical background are desirable. If you are learning LOPA to comply with IEC 61511 / ISA 84, attendance at Primattech's IEC 61511 / ISA 84 course or equivalent is recommended.

Course Contents

- Process safety concepts
- Overview of LOPA
- Use of LOPA
- Documentation and example application
- Selection of hazard scenarios
- Definition of scenario consequences
- Identification of initiating events
- Consideration of enablers
- Identify IPL's
- Estimation of scenario risk
- Failure data
- Making risk decisions
- Remaining steps
- Understanding protection layers
- IPL documentation
- Implementation
- Conducting PHA to facilitate LOPA
- Other uses of LOPA



Safety Integrity Level (SIL) Determination Using LOPA and Other Methods to Comply with IEC 61511 and ISA 84

Course Length: 1 Day Accreditation: 0.7 CEUs or 7 PDHs awarded

Be able to determine required SILs for SIFs using LOPA and other methods such as risk graphs and risk matrices.

Course Description

The international and US standards for Safety Instrumented Systems (SISs), IEC 61511 and ISA 84, require that Safety Integrity Levels (SILs) be determined for Safety Instrumented Functions (SIFs) to meet tolerable risk criteria. The standards identify several methods that can be used for this purpose including Layers of Protection Analysis (LOPA), risk graphs and risk matrices. This course explains how these methods can be used. Course attendees participate in exercises to practice SIL determination.

“Intense training, covering a range of specialized subject matter. Very well done!”

— Manager, Cheniere Energy

Target Audience

Facility personnel who are involved in implementing standards for safety instrumented systems.

Prerequisite

An understanding of LOPA is required. Attendance at Primatch's training course, *LOPA for Process Safety Management*, meets this requirement. Knowledge of IEC 61511 / ISA 84 and a technical background are desirable.

Course Contents

- Process safety concepts
- Overview of IEC 61511 / ISA 84
- Process hazard and risk analysis
- Allocation of safety functions
- SIL determination
- Risk matrices and graphs
- LOPA
- Quantitative methods

Risk Tolerance Criteria for Process Safety

Course Length: 1 day Accreditation: 0.7 CEUs or 7 PDHs awarded

Set numerical risk tolerance criteria and use them with risk analysis methods such as Layers of Protection Analysis (LOPA) to comply with standards such as IEC 61511 / ISA 84 for safety instrumented systems.

Course Description

Process safety decisions must be made with reference to risk tolerance criteria. Increasingly, risk analysis methods and codes, standards and regulations around the world are moving towards the use of numerical criteria, for example, with the use of Layers of Protection Analysis (LOPA) and standards for safety instrumented systems such as IEC 61511 / ISA 84. Various issues must be addressed if such criteria are to be set correctly and used meaningfully.

This training course covers the issues that must be addressed in setting risk tolerance criteria and the pitfalls that can be encountered in using them. Participants are taught a procedure to use in setting criteria for their process safety studies.

“An excellent addition to the LOPA class to understand how risks are established.”

— PSM Program Specialist, ERI Solutions, Inc.

Target Audience

Facility personnel who are responsible for establishing risk tolerance criteria for a company and personnel involved in conducting or using studies that employ them.

Prerequisite

A technical background is necessary.

Course Contents

- Overview
- Risk to people
- ALARP principle
- Establishing a foundation for criteria
- Procedure for setting criteria
- Allocation of criteria
- Calculation of risk

Understanding IEC 61511/ISA 84 and Developing a Safety Requirements Specification

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Gain an understanding of the requirements of the IEC 61511 /ISA 84 standard for Safety Instrumented Systems (SISs), and how to prepare a Safety Requirements Specification (SRS) for each SIS.

Course Description

Safety instrumented systems (SISs) play a key role in process control to achieve safety and productivity. Their purpose is to take a process to a safe state when predetermined set points are exceeded. SISs are also called emergency shutdown systems, safety shutdown systems, and safety interlock systems.

The IEC 61511 /ISA 84 standard, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*, addresses the reliability of SISs. In March 2000, OSHA issued a letter, reaffirmed in November, 2005, stating that the ISA 84 standard is considered "good engineering practice" for safety instrumented system design. This effectively makes the ISA 84 standard part of process safety management (PSM) since paragraph (d)(3)(ii) of the OSHA PSM standard specifies: "The employer shall document that equipment complies with recognized and generally accepted good engineering practices."

IEC 61511 /ISA 84 identifies three Safety Integrity Levels (SILs) for the process industries and specifies site performance requirements for each level. Different levels of risk require different levels of safety system performance.

This course teaches the important concepts and terms needed to understand the IEC 61511 /ISA 84 standard and it describes the requirements and their relationship to PSM. The specific requirements for a Process Hazard and Risk Assessment (PHRA) and the allocation of safety functions to protection layers are discussed. A key requirement of IEC 61511 /ISA 84 is the development of a Safety Requirements Specification (SRS). The course explains how to prepare the SRS and attendees develop a SRS in a workshop session.

A detailed manual is provided for use as a reference after you have completed the course.

Target Audience

Process safety personnel, control and instrumentation engineers, project engineers and others who need to apply the IEC 61511 /ISA 84 standard.

Prerequisite

Experience in process safety is helpful.

Course Contents

- SIS concepts and terms
- Standards and regulations applicable to SIS
- PHRA and the allocation of safety functions
- Preparation of a Safety Requirements Specification (SRS)



“The quality of the material and the presenter are, as always, excellent. Instructor's ability to explain material helped to relate to work being done.”

— Engineering Manager, National Grid

Safety Integrity Level (SIL) Verification for Safety Instrumented Systems (SISs)

Course Length: 3 Days **Accreditation:** 2.1 CEUs or 21 PDHs awarded

Learn how to perform calculations to verify SILs for Safety Instrumented Functions (SIFs) using a variety of methods.

Course Description

IEC 61511/ISA 84 standard, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*, requires that claimed Safety Integrity Levels (SILs) be verified by calculation. Calculation modeling methods are chosen based on the circumstances and include simplified equations, fault tree analysis and Markov modeling.

Factors that should be included in the modeling include architecture; technology; field device configuration; susceptibility to common cause failures; component failure rates; level of redundancy and voting; proof tests and intervals; diagnostics including reliability, test intervals and coverage; repair times and susceptibility to external influences. Workshops are used to practice the methods taught.

A detailed manual is provided for use as a reference after you have completed the course.

Target Audience

Process safety personnel, instrumentation engineers, reliability engineers and others who need to perform or understand SIL verification calculations.

Prerequisite

A degree in engineering or another technical discipline is required. Familiarity with control systems and experience in process safety is helpful.

Course Contents

- Terms and concepts
- Requirements for SIL verification
- Reliability metrics
- SIL determination
- SIS components and their failures
- Diagnostics
- Common cause failures
- Systematic failures
- SIS architectures
- Test interval
- Failure rates
- Simplified equations
- Sources and use of failure rate data
- Failure modes, effects and diagnostic analysis
- Fault tree analysis
- Markov modeling
- Uncertainty, sensitivity and correlation analysis
- SIL verification



Understanding and Applying Cyber Security for Manufacturing and Computer Control Systems

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Gain an understanding of cyber security and knowledge and tools that can be used to manage the risk of cyber attacks.

Course Description

Cyber security is an established discipline for computer systems used for business management. Its focus is the protection of valuable information stored on those systems from adversaries who want to obtain, corrupt, damage, destroy or prohibit access to it. Cyber security for manufacturing and control systems must also include protection against cyber or physical attack on computer systems and their support systems by adversaries who wish to disable or manipulate them to cause harm. Examples of manipulation include opening/closing valves, starting/stopping equipment, and overriding alarm and trip settings. Traditional IT cyber security countermeasures are not adequate to protect against attacks on control systems. Furthermore, such countermeasures may even compromise the safety or operability of manufacturing processes.

Historically, computer control systems have been kept separate from business and enterprise computer systems but increasingly they are being connected through networks, driven by the need to communicate process information to business groups and the opportunity to intervene in manufacturing processes through an intranet or the Internet. Control systems are exposed to penetration when they are connected to other networks or when there are provisions for remote access. Existing control systems were not designed with public access in mind, and often have poor security and are vulnerable to attack. Furthermore, much of the technical information needed to penetrate these systems is readily available.

This course provides attendees with an understanding of cyber security and knowledge and tools that can be used to manage the risk of cyber attacks. It includes an overview of the basics of computer networks and control systems for those attendees who may not be familiar with them. Sources and types of attack, vulnerabilities, attack techniques and countermeasures are described. The course concludes with a discussion of how to implement a program to manage cyber security within an organization.

Target Audience

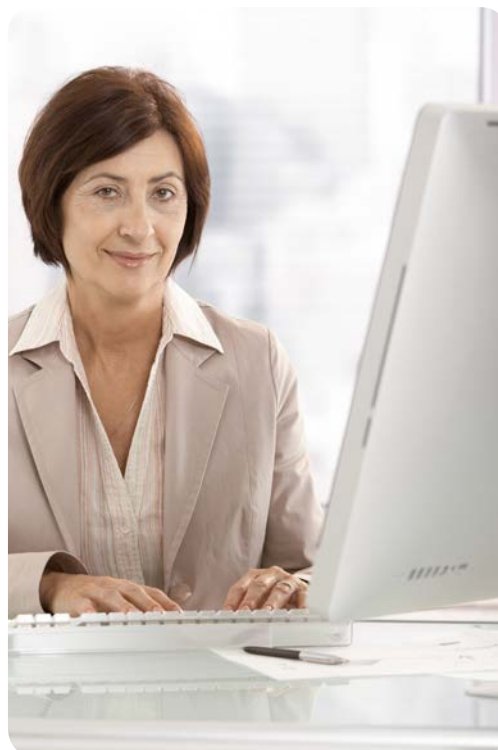
Individuals involved with or responsible for securing manufacturing and computer control systems from attack.

Prerequisite

Knowledge and/or experience with either computer networks or manufacturing and computer control systems are helpful.

Course Contents

- Overview
- Current initiatives
- Computer networks and control systems
- Sources and types of attack
- Vulnerabilities to attack
- Attack techniques and tools
- Cyber security countermeasures
- Cyber security principles
- Human factors in cyber security
- Assessment methods
- Cyber security program



Cyber Security Vulnerability Analysis (CSVA) for Manufacturing and Computer Control Systems

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to perform target and threat analysis and how to screen facilities for vulnerability analysis. Receive instruction in the use of vulnerability analysis to manage the risk of cyber attacks.

Course Description

Many companies have conducted security vulnerability analyses (SVAs) to evaluate the risks of physical attacks on their facilities and many have been hardened since September 11, 2001. However, the importance of cyber security for manufacturing and computer control systems has been recognized more recently. Appropriate security measures must be taken to avoid events which could have impacts as tragic as those of September 11, 2001. Lesser cyber attacks have already occurred. Action is needed now to deal with this threat. Companies must conduct cyber security vulnerability analyses (CSVAs) to identify threats to their computer control systems, determine if vulnerabilities are present, and evaluate existing countermeasures to determine if they need to be strengthened or new ones implemented.

This course provides step-by-step instruction in the use of scenario-based, asset-based and sneak-path CSVA methods. Preparation, organization, recording, conducting, reporting, and follow-up of CSVA studies are covered. Attendees apply CSVA techniques in workshop sessions.

These methods can be used to conduct stand-alone CSVAs, CSVA as adjuncts to existing physical SVAs, or combined physical and cyber SVAs. They can be used to address cyber (and physical security) not only for manufacturing and control systems but also for IT computer systems used in business management and computer systems used in the value chain (encompassing activities associated with the design, procurement, manufacturing, marketing, distribution, transportation, customer support, use, recycle and disposal of products).

Target Audience

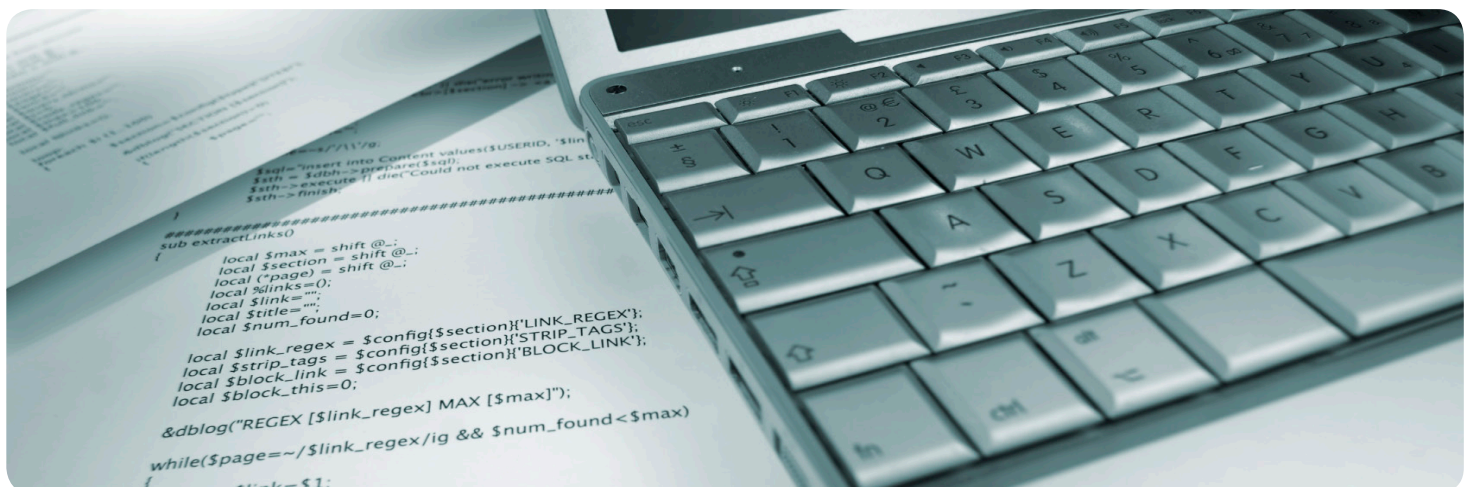
Individuals who will participate in or lead cyber security vulnerability analyses.

Prerequisites

Familiarity with computer networks and control systems. Knowledge of cyber security. Completion of Primotech's training course, *Understanding and Applying Cyber Security for Manufacturing and Computer Control Systems*, meets the prerequisites.

Course Contents

- Overview
- Target analysis
- Threat analysis
- Risk-based prioritization (facility screening)
- Preparing and organizing for CSVA
- Subdividing the system
- Recording studies
- Vulnerability analysis methods
- First CSVA session
- Vulnerabilities
- Consequences
- Countermeasures
- Risk ranking
- Recommendations
- Evaluating countermeasures
- Reporting
- Follow-up



Visit www.primotech.com/training to register online or inquire about our in-house training.

Security Vulnerability Analysis (SVA)

Course Length: 2 Days **Accreditation:** 1.4 CEUs or 14 PDHs awarded

Learn how to assess terrorist and criminal threats to facilities and how to perform threat and vulnerability analysis for facilities.

Course Description

Process security management addresses threats from terrorist and criminal acts against plants that may result in the release of hazardous materials. The risk of such threats must be assessed to determine if existing security measures and safeguards are adequate or need improvement. Both threat analysis and vulnerability analysis are needed.

Threat analysis is used to identify the sources and types of threats. Once specific threats have been identified, vulnerability analysis is used to identify how threats could be realized. Recommendations for consideration by management are made for improvements to reduce the likelihood and severity of terrorist and criminal acts based on the nature of the threat, process vulnerabilities, possible consequences, and existing security measures and safeguards.

This course describes asset and scenario based SVA methods. Attendees participate in workshop sessions where threat and vulnerability analyses are conducted.

Target Audience

Process safety and security personnel and others who may be responsible for assessing and managing the risk of threats to process facilities.

Prerequisite

Experience in qualitative risk analysis or process hazard analysis is desirable.

Course Contents

- Overview
- Risk and decision-making
- Threat analysis
 - Intelligence
 - Source of threats
 - Types of threats
 - Ways to realize threats
 - Guidelines for identifying threats
 - Factors affecting threat likelihood
 - Assessment of threat likelihood
 - Threat levels
- Vulnerability analysis
 - Meaning of vulnerability
 - Steps in vulnerability analysis
 - Preparation
 - Conducting studies
 - Follow-up
 - Lessons learned
- Strategies for security measures and safeguards
- SVA Methods
- Rings of Protection Analysis (ROPA)
- Study documentation and reporting
- Follow-up on action items
- Cost-benefit analysis for security improvements



Using PHAWorks® RA Edition Software

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn the full range of capabilities of the software.

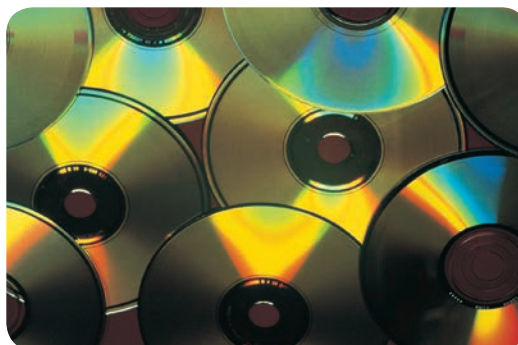
Course Description

Thousands of studies have been completed using PHAWorks 5 worldwide. *PHAWorks® RA Edition* is the successor product that will help you even more in facilitating your PHA studies. The new software complements the old version while seamlessly providing new capabilities to enhance the completion of not only PHA studies, but LOPA studies too.

Even if you are a seasoned PHAWorks® 5 user (or a new user), to fully appreciate how to use *PHAWorks® RA Edition*, understanding the tool is key. As with most programs used, you are most likely using only a limited set of the software capabilities. Why not take advantage of fully understanding how you can use the software to better document your studies? In addition, the training is hands-on, plus with fellow attendees also taking the training, you can learn from others.

The course provides detailed and hands-on explanations of all the capabilities in *PHAWorks® RA Edition*. The course starts with an overview of the software, moving into creating PHA and Checklist studies, entering data, using the capabilities designed to help document your studies, and ending with generating reports. With a hands-on approach, you are using the software throughout the training.

This course will benefit current users of PHAWorks® 5 who are upgrading to *PHAWorks® RA Edition*.



Target Audience

Individuals responsible for using PHAWorks® RA Edition to record PHA and/or LOPA studies. These individuals may include the PHA Team Leader, PHA Scribe, PHA Coordinator, PSM Manager or other people involved in completing PHA studies.

Prerequisite

Attendees should have a basic understanding of Windows-based software applications. Knowledge of PHA techniques (plus LOPA) is helpful, but not required. Students should come to the course with PHAWorks® RA Edition installed on a laptop computer (a limited number of computers are available for rental from Primotech).

Course Contents

- Overview of software
- Creating new projects (PHA, checklist)
- Quick start guide
- Review of tabs and information under each tab
- Entering data outside of the worksheet
- Navigating through a project
- Entering data in the worksheet
- Common features – find/replace, spell check, formatting, undo/redo, zoom
- Customize the worksheet (sidebar, banner, columns)
- Using quick entry, quick copy and pick from lists
- Automatic worksheet numbering
- Using references in the worksheet
- Master safeguard and recommendation databases
- Templates
- Completing LOPA
- Using scenario groups
- Generating customized reports
- Printing reports to HTML and PDF
- Review checkmarks
- Use of passwords to protect projects
- Configuring software preferences

Using PHAWorks® 5 Software

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn the full range of capabilities of the software.

Course Description

Recording the results of PHA studies is a vital part of performing such studies. PHAWorks® is a Windows-based computer software application that facilitates the electronic recording of studies.

As with most Windows software, PHAWorks® is designed to allow its use right out of the box without reading the User Guide. However, users will then only employ a fraction of the software's capabilities. Great improvements in the speed and efficiency of performing studies are possible with an investment to understand the software's capabilities. Attendees learn the ropes of using the software from Primatch instructors who are highly experienced in using it themselves. The instructors provide numerous "tips and tricks" of using the software.

This course first provides PHAWorks® users with an understanding of more commonly used features, including creating new studies, entering text into dialogs and worksheets, use of special features, navigating through projects, and generating reports. Users then learn more advanced features which increase efficiency and reduce the total time spent recording studies. Attendees learn how to use Quick Entry lists and Quick Copy to speed up data entry. Use of the Sage feature to automate PHA studies is also covered. This course will benefit both those who are just beginning to use PHAWorks®, and those who are more familiar with the software.



“Valuable introduction to software; excellent knowledge and presence of the instructor.”

— Process Specialist,
PolyOne Corporation

Target Audience

Individuals responsible for using PHAWorks® to record PHA studies. These individuals may include the PHA Team Leader, PHA Scribe, PHA Coordinator, PSM Manager or other people involved in completing PHA studies.

Prerequisite

Attendees should have a basic understanding of Windows-based software applications. Knowledge of PHA techniques is helpful, but not required. Students should come to the course with PHAWorks® 5 installed on a laptop computer (a limited number of computers are available for rental from Primatch).

Course Contents

- Creating PHA projects
- Entering information and data in dialogs and the worksheet
- Navigating project files and the worksheet
- Commonly used features including find/replace, spell check, formatting, undo/redo
- Generating customized reports
- Using quick entry lists and quick copy to speed up data entry
- Adding notes to worksheet entries
- Customizing the appearance of the worksheet
- Use of analysis tools and the library
- Creating master lists of team members
- Use of passwords to protect projects
- Using hyperlinks
- Configuring projects
- Converting projects from other formats
- Exporting projects to other applications
- Copying files from other projects
- Automatic worksheet numbering
- Use of references in the worksheet
- Using Sage and its database
- Revisions to worksheets
- Tracking worksheet changes
- Revalidating studies
- Archiving projects
- Using protocols for PHA revalidation
- Configuring software preferences

Using LOPAWorks® Software

Course Length: 1 Day **Accreditation:** 0.7 CEUs or 7 PDHs awarded

Learn how to use LOPAWorks® most effectively.

Course Description

Layers of Protection Analysis (LOPA) is used with the results of process hazard analysis (PHA) studies to help resolve PHA recommendations and comply with international standards on Safety Instrumented Systems (SISs) such as IEC 61511 and ISA 84. LOPAWorks® is a software tool used to document LOPA studies and perform risk evaluations and summations.

The course covers creating new studies, entering information into LOPA worksheets, use of special software features, navigating through projects, and generating reports.

This course will benefit those who have a basic familiarity with LOPAWorks®, or those who are using LOPAWorks for the first time.

Target Audience

Individuals responsible for using LOPAWorks® to perform LOPA studies. These individuals may include the Team Leader, Scribe, or other people involved in completing LOPA studies.

Prerequisite

Attendees should have a basic understanding of Windows-based software applications. Prior knowledge of LOPA is desirable. Ideally, students should come to the course with LOPAWorks® installed on a personal computer.

Course Contents

- Creating LOPA projects
- Entering study information
- Using risk tolerance criteria
- Entering scenario information
- Using failure data
- Calculating scenario risk
- Evaluating scenario risk
- Using risk summations
- Identifying dominant contributors to risk
- Using LOPAWorks® to comply with SIS standards
- Importing scenarios from PHAWorks®
- Navigating worksheets
- Generating reports
- Customizing reports
- Software functions including pick-from lists, quick entry lists, formatting, undo/redo, etc.
- Creating and using project templates
- Customizing the software user interface



Using Tracker™ Software

Course Length: 3 Days **Accreditation:** 2.1 CEUs or 21 PDHs awarded

Learn the full range of capabilities of the software.

Course Description

Tracking recommendations and action items is a vital part of managing your businesses. Indeed, process safety regulations usually require that a management system be used to track and implement PHA recommendations. Tracker™ is a Windows-based computer software application for tracking action items that is the most powerful and comprehensive software available.

Tracker™ users would benefit from training; not only would it show the users what features are available to them, the training would allow users to see the full use of its capabilities allowing more efficiency in the use of Tracker™. Primatech instructors who are thoroughly versed in Tracker™ will be able to captivate the attendees with "ins and outs" of using the software and providing numerous "tips and tricks" for using Tracker.

This course will benefit those who have a basic familiarity with Tracker™ and those who are using Tracker™ for the first time.



Target Audience

Individuals responsible for tracking action items using Tracker™.

Prerequisite

Attendees should have a basic understanding of Windows-based software applications. Computers with the latest version of Tracker™ is required. There is a limited number of computers available for rental from Primatech. Contact Primatech for details.

Course Contents

- Use of list and activity views
- Sending e-mails
- Responding to e-mails
- Receiving e-mails
- Scheduler – setting up reminders for action
- Reports and options for their creation
- Column capabilities
- Deleting entries, moving columns, expanding/contracting entries, changing column names, adding columns
- Creating and customizing forms
- Importing data
- Creating a project from PHAWorks® data
- Updating PHAWorks® projects
- Creating and using an address book
- Exporting data
- Setting software options

“Great hands-on training for new software that will save me time at work.”

— Safety Engineer, Westlake Chemical Corporation

In-house Training – Schedule a Training Course at Your Site

The Primatch Training Institute can deliver any Primatch training course to a group of employees at or near your facility, including all of our publicly available courses. In-house training can be customized to include your company's specific process examples. Please contact Primatch for additional details and assistance in meeting your process safety educational requirements.

Benefits of In-house Courses

Businesses choose to bring Primatch training courses into their workplace to avoid incurring travel expenses for attendees and minimize their time away from work. Many companies prefer this approach as a cost-effective way to educate multiple individuals without the need to leave their facility. Groups of people can be trained at a significantly reduced per-person price. Primatch can conduct any of our courses at your plant or offices in the U.S. and internationally. Dates and times of the course offerings can be structured to meet client needs.

Courses available for in-house delivery include all of our publicly available classes plus specific courses which are taught on an in-house basis only. Course durations typically range from one day to one week but can be adapted to your preferences.

Customization of In-house Courses

In-house courses can be tailored to include examples, exercises and workshops specific to your company's process operations. Special topics can be added to or removed from the standard course curriculum, to accommodate your training needs. Your company-specific policies and procedures and other materials specific to your company may be included and, at your option, your own staff may present them.

Advantages of Primatch In-house Training

Many of the world's leading process industry companies look to Primatch to help them develop and implement their process safety, security, and risk management programs (PSM and RMP) through our training courses. Our courses:

- Include the latest technical approaches, industry best practices and regulatory clarifications.
- Teach participants how to satisfy the complex requirements from OSHA, EPA, and other regulatory agencies.
- Cover compliance with industry codes, standards, practices and guidelines.
- Provide specific, detailed guidelines to implement the approaches presented.
- Include course manuals with all the details you need to apply the methods being taught.
- Use examples, exercises, and hands-on workshops to reinforce the training.
- Create a friendly, fun and enjoyable environment to facilitate learning.



Visit www.primatch.com/training to register online or inquire about our in-house training.

Management Briefings

Management at all levels from Executives to Supervisors must understand the technical programs for which they are responsible at their facilities. Primatech has designed a series of briefings on various topics in process safety and security to meet this need.

Process Hazard Analysis (PHA)

PHA studies are the foundation for process safety and risk management programs. They help companies identify potential accidents that could adversely affect people, property, or the environment, as well as the process and the company. The financial costs of catastrophic accidents is exceptionally high and PHA is an inexpensive form of insurance. Consequently, it is critically important that managers understand key issues in the performance of PHA.

Process Safety Management (PSM)

PSM is a regulatory requirement in many parts of the world. They help to reduce process downtime, ensure process operability, maintain product quality, and avoid adverse publicity from accidents. As technical improvements are made, regulators' expectations increase and companies must stay abreast of these developments in order to adjust their programs accordingly.

OSHA Chemical National Emphasis Program (NEP)

On November 30, 2011, OSHA issued a National Emphasis Program (NEP) for chemical facilities that replaces the 2009 pilot program that covered several regions around the country. The nationwide NEP establishes policies and procedures for inspecting workplaces that are covered by OSHA's PSM standard. The inspection process includes detailed questions designed to gather facts related to PSM compliance. Companies should prepare for inspections to avoid citations.

Mechanical Integrity (MI)

The MI element of a process safety management (PSM) program is intended to ensure equipment does not fail and cause a release of hazardous materials. MI covers the proper design, fabrication, construction / installation, and operation of equipment throughout the entire process life cycle. OSHA typically issues the most PSM citations for the MI element. Consequently, it is essential that it receives careful attention.

Human Factors

People are key components of industrial processes. They are involved in process design, operation, maintenance, etc. and the potential impacts of human failures are of concern. process and its impact on human failures. Improving the human factors design of a process can produce not only improvements in safety and health but also gains in quality, productivity and employee job satisfaction.

Layers of Protection Analysis (LOPA)

LOPA is the technique of choice for many companies to determine Safety Integrity Levels (SILs) to comply with the IEC 61511 / ISA S84 standard. It is also used to make decisions on recommendations for corrective action from Process Hazard Analysis (PHA) studies. Pitfalls in implementing LOPA await the unwary and care must be taken to ensure meaningful use of LOPA to avoid incorrectly estimating process risks and wasting precious resources.

Cyber Security

Cyber attacks on computer control systems can result in events producing catastrophic human, environmental and financial impacts. Companies must take steps to protect themselves against such attacks. The International Society of Automation (ISA) is developing a set of standards on manufacturing and control systems security (ISA-99) which represent good engineering practice for the manufacturing and process industries.

Functional Safety / Safety Instrumented Systems

The international standard IEC 61511 / ISA 84, Functional Safety: Safety Instrumented Systems for the Process Industry Sector, is being adopted by companies around the world as good engineering practice. The requirements of the functional safety standard are extensive and complex. Companies must carefully plan and manage the implementation of the standard.

Why *PrimaTech* ?

Primatech is experienced in providing management briefings on many aspects of process safety, security and risk management for all levels of management.

Briefings are delivered at your facility or offices and can be tailored to the individual needs of your company.

Typically, briefings are of 2 - 4 hours duration. Shorter or longer briefings can also be provided.

Primacert Certification Services

Primacert was founded by Primatech Inc. as an independent organization to certify the competence of process safety personnel. Primatech has driven the process safety field with innovative approaches and has established a reputation for excellence. Primacert continues this tradition by promoting competence management in process safety. Certification is a formal process to verify competence. Primacert offers certification to individuals who have met a defined standard of competency through education, experience, practice, training, and knowledge in specific technical areas.

Primacert certifies the competence of personnel in process safety and risk management. The work of process safety practitioners is critical to managing the risks posed by hazardous materials to protect employees, the public and the environment, as well as prevent damage to facilities, process equipment and company reputations, and improve productivity and quality. Consequently, it is essential that practitioners meet standards of performance in their work.

Primacert offers certifications in PHA, LOPA, process safety auditing, procedure writing and process safety. Certifications are offered at three increasing levels of competence: Practitioner, Specialist, and Expert, with the exception of procedure writing.

Why Certification?

Both individuals and companies benefit from certification of personnel who perform safety-critical work. Such work includes process hazard analyses (PHAs), layers of protection analysis (LOPA), and audits. In most professions, becoming certified is an increasingly important and recognized measure of competence. While certification is not a license to practice, it does indicate that you have achieved a predefined minimum standard. Whether you plan to apply for a promotion or a position with a new employer, or simply want to enhance your credentials, being a Primacert certified professional adds to your value as an employee.

Benefits to You:

- Demonstrates that you have achieved a defined performance standard
- Provides recognition of your capabilities and enhances your credentials
- Promotes life-long professional development and value
- Companies depend on competent people to perform effective process safety and risk management studies. In today's world of high turn-over rates, ensuring that safety-critical work is performed competently challenges even the best managed companies. Incorporating certification into safety management systems is increasingly becoming standard practice.

Benefits to Companies:

- Promotes efficient and high-quality work practices
- Provides assurance that personnel are suitably qualified
- Demonstrates to regulators a commitment to process safety and risk management compliance
- Provides verification that studies have been performed by competent personnel

PrimaCert
Certifications in Process Safety

Visit www.primacert.com for more details or contact:

Primatech Certification Services
50 Northwoods Boulevard
Columbus, Ohio 43235
info@primacert.com
Tel: +1.614.841.9800



Consulting Services – Schedule a Consulting Project at Your Site

Primatch provides consulting services to help companies that use hazardous materials to reduce the likelihood and consequences of release events. Our services and products enable our clients to achieve their risk, safety and security objectives more efficiently and effectively.

Consulting Services offered:

- Process Hazard Analysis (PHA)
- Audits and Assessments (PSM / RMP)
- Process Safety Management (PSM)
- Risk Management Programs (RMP)
- OSHA Chemical Facility PSM NEP Assistance
- Hazard Identification (HAZID)
- Layers of Protection Analysis (LOPA)
- Safety Instrumented Systems (SIS)
(IEC 61511 / ISA 84)
- Dust Hazard Analysis (DHA)
- Dust Hazards Management
- Process Security Management
- Security Vulnerability Analysis (SVA)
- Cyber Security
- Competency Management
- Human Factors and Human Failures
- Procedures Development
- Mechanical Integrity (MI)
- Management of Change (MOC)
- Emergency Response Programs
- Facility Siting
- Consequence Modeling
- Probability Modeling
- Quantitative Risk Assessment (QRA)
- Management Consulting
- Expert Witness and Litigation Support
- Due Diligence Reviews for Mergers and Acquisitions

Advantages of Primatch Consulting

Advantages offered by Primatch for individual consulting services are:

- Our consultants have served in a wide range of industries and have participated in a various types of projects.
- Our projects are led efficiently and facilitated using Primatch's software products.
- Primatch provides comprehensive project reports.
- Projects are managed and deliverables are produced out of our corporate offices to facilitate effective project performance and to maintain a high level of quality control.
- Project deliverables are subjected to comprehensive peer review to ensure quality.
- Primatch provides highly specialized assistance that is not easily obtained elsewhere.
- Primatch is an independent company with no vested interests and, therefore, is seen to deliver work recognized as objective and unbiased.



Software Products – PHAWorks® RA Edition

PHAWorks® RA Edition is the next generation of PHA / LOPA software

PHAWorks® RA Edition allows you to conduct both PHA and LOPA studies together in the same worksheet. Scenario risks are calculated and compared with risk tolerance criteria to determine if any risk reduction is needed. By assigning scenarios to groups with one or more common characteristics, you can complete a risk summation for each defined group.

Key Benefits of Using PHAWorks® RA Edition:

- Conduct both your PHA and LOPA studies in the same worksheet
- Intuitive user interface
- Use multiple PHA methods including HAZOP, What If, MHA, FMEA, HAZID, PrHA, Checklist, CHAZOP, JSA/JHA, Task Analysis, Facility Siting Review, Human Factors Review, Inherent Safety Review and SIMOP
- Perform LOPA worksheet math automatically
- Assign scenarios to groups to calculate different risk measures
- Link common entries throughout your project
- Drag-n-Drop entries in the worksheet
- Use pick-from list for worksheet entries
- Navigate easily between worksheets
- Customize template files to use for future studies
- Create and apply multiple risk rankings to consequence types using lookup or calculation methods
- Create a master database of safeguards, scenario groups and recommendation
- Select from standard customizable reports or create and configure your own
- Import your current PHAWorks® 5 project files
- Unique Quick Start Guides provide guidance on how to conduct studies.

The screenshot displays the PHAWorks RA Edition software interface. The main window is titled 'Toluene Example (HAZOP - Traditional) - PHAWorks RA Edition'. The interface includes a menu bar (File, Edit, Format, Worksheet, Utilities, Help) and a toolbar. The main workspace is divided into several sections:

- Views:** Radio buttons for '1' and '2', and checkboxes for 'LOPA View' (checked) and 'LOPA Scenarios Only'.
- Navigation:** Tabs for 'Lists' and 'Columns'.
- Nodes:** A tree view showing '1. Toluene Storage Tank'.
- Parameters:** A list of parameters including Flow, Temperature, Pressure, Composition, Phase, Level (selected), and Addition.
- Guidewords:** A list of guidewords.
- Deviations:** A list of deviations.
- Main Worksheet:** A table with columns for Causes, Frequency, Consequences, LOPA?, Safeguards, Type, IPL?, PFD, Enablers, Value, S, L, R, Frequency, Tolerance, and RRR. The table contains two main rows of data for different scenarios.
- Quick Start Guide:** A sidebar on the right titled 'HAZOP (Traditional)' with a 'Set-up Project' section containing a numbered list of instructions.

Table Data from Main Worksheet:

Causes	Frequency	Consequences	LOPA?	Safeguards	Type	IPL?	PFD	Enablers	Value	S	L	R	Frequency	Tolerance	RRR
1. Level transmitter LT, TK-104 fails to detect high level	1×10^{-1}	1.1.1. Explosion with public impacts	<input checked="" type="checkbox"/>	1.1.1.1. Plant fire brigade	HUM	<input type="checkbox"/>		Level of PM on level transmitter LT TK-104	5	1	4	6	5×10^{-4}	1×10^{-6}	2×10^{-3}
				1.1.1.2. High level shutoff for tank, TK-104	SIF	<input checked="" type="checkbox"/>	1×10^{-1}	Probability of ignition	1×10^{-1}						
				1.1.1.3. Deluge system	ENG	<input checked="" type="checkbox"/>	1×10^{-1}	Probability of personnel in affected area	1						
2. Pump P-100 fails on	1×10^{-2}	2.1.1. Fire with employee impacts	<input checked="" type="checkbox"/>	2.1.1.1. Plant fire brigade	HUM	<input type="checkbox"/>		Level of PM on Pump P-100	2	2	3	6	1×10^{-4}	1×10^{-4}	None
				2.1.1.2. High level shutoff for tank, TK-104	SIF	<input checked="" type="checkbox"/>	1×10^{-1}	Probability of ignition	5×10^{-1}						
				2.1.1.3. Deluge system	ENG	<input checked="" type="checkbox"/>	1×10^{-1}	Probability of personnel in affected area	1						

Quick Start Guide (HAZOP (Traditional)) - Set-up Project:

1. Enter project information in Project / Information / General and, optionally, the process revaledation history.
2. Record the study purpose, scope, and objectives in Project / Charter.
3. Record the names of reference sources in Project / Documents.
4. Record the names of team members in Project / Team.
5. Record any information about the project in Project / Project Notes.
6. Configure settings and enter risk ranking(s), if using, in Project / Risk Ranking. Ensure you

Software Products – PHAWorks® 5

Perform PHA Studies Quickly and Efficiently

PHAWorks® is a specialized tool for conducting Process Hazard Analysis (PHA) studies, such as HAZOP and What If studies. The software is designed to allow you to start conducting studies straight out of the box, leading you through each step of data entry. Within minutes, you can start documenting your PHA studies more quickly and efficiently while keeping the team focused on the task at hand. PHAWorks® will not get in the way of conducting the study. It is a tool designed to help, not hinder, the performance of the study.

PHA studies, such as HAZOP, What If, and FMEA, have become easier, quicker and more cost effective with PHAWorks®. With the time and cost savings it provides, PHAWorks® is a tool that is essential to your company. No PHA software is used or trusted more throughout the world than PHAWorks®. Many thousands of studies have been completed using PHAWorks®.

Free PHAWorks® Viewer is available. PHAWorks Viewer allows you to view, but not edit or print, any PHAWorks® project or a project from predecessor DOS-based PHA software (e.g., HAZOP-PC, WHAT IF-PC). With PHAWorks® Viewer, anyone can review projects, and PHAWorks® features that don't alter or print any of the project information can be used. PHAWorks® Viewer is free and can be distributed without any limitations.

Key Benefits of Using PHAWorks®:

- Conduct your PHA studies more quickly and efficiently.
- Use a consistent framework to help improve the quality of your studies.
- Choose from various PHA techniques to conduct your studies, such as HAZOP, WHAT If, FMEA, PrHA, and Checklist.
- Customize the software (add / delete / rename columns) for other uses.
- Use Libraries of technical information to assist in the completion of your studies.
- Create custom reports in HTML, Word, Excel and PDF format.

Software Products – Tracker™

Track, Implement and Manage Action Items

For years companies have attempted to track and manage action items using programs not specifically designed for tracking. As a result, action items were often either overlooked, not implemented, or forgotten. Tracker™ was specifically designed to facilitate easy electronic tracking. No longer do you need to use paper and pencil, multiple programs, or inadequate systems for managing action items.

Tracker™ is a fully integrated and automated application for tracking action items from conception to completion. It includes full email capability along with scheduled automated tasks such as reporting, sending emails, reminders, and archiving. Tracker™ is designed to simplify the workflow of tracking any type of action item that needs to be managed such as PHA recommendations PHAWorks® and audit findings.

The workflow can include the use of one or multiple modes, providing you with the flexibility to customize the software for your tracking requirements. Tracker™ users enter information on tracked items, assignments, costs, and due dates and these are managed in a completely automated system. Tracker™ provides exactly what many companies are lacking – a reliable, consistent, automated, and integrated tool for tracking and managing action items.

Key Benefits of Using Tracker™:

- Automate action item tracking.
- Track action items from multiple, different sources in one tool.
- Create custom tracking forms.
- Send email reminders automatically.
- Escalate email reminders to three different levels.
- Schedule reports for automatic generation.
- Generate custom reports.
- Archive action items for future reference.

Software Products – LOPAWorks®

Conduct Layers of Protection Analysis and Evaluate Process Risk

LOPAWorks® allows users to conduct Layers Of Protection Analysis (LOPA) for hazard scenarios. The software calculates scenario risks and compares them with risk tolerance criteria to determine what, if any, risk reduction is needed. Scenarios may be associated with hazardous events to facilitate compliance with the IEC 61511 / ISA 84 standards for Safety Instrumented Systems (SISs). Dominant contributors to scenario risk may be identified easily using the software.

Analyses are performed for individual hazard scenarios. However, risk criteria may be used that require scenario risks to be aggregated. The software provides various types of summations for risk aggregation, for example, by consequence type, hazard type, hazardous event, and process mode. No other software has the capabilities of LOPAWorks®.

New in LOPAWorks® 3:

- Link your IPLs and Safeguards to facilitate determining the overall impact on risk and removing the need to update IPL or Safeguard entries that occur in multiple locations.
- Document your LOPA study using either the CCPS or PHA spreadsheet format, and customize each form.
- Optional worksheet fields have been provided for approvals, QC checks, and importing scenarios from any type of PHA Study.
- Highlighted risk reductions allow you to easily see what is required.
- Export your LOPA recommendations to other programs including Primattech's Tracker™.
- Data entry has been simplified.
- A video tutorial has been provided.
- Redesign of data locations for ease of access.
- Improved interface and navigation.
- Improved copy control to add flexibility for how you can use the software.

Key Benefits of Using LOPAWorks®:

- Improve the efficiency and reduce the time needed to complete LOPA studies.
- Simplify the performance of LOPA studies by separating them from PHA studies while preserving their connection.
- Use a PHA spreadsheet or CCPS form, or a combination of both, for data entry.
- Import hazard scenarios from PHAWorks® (V5 onwards) or enter them individually.
- Import or enter scenarios into a single LOPA study from multiple PHA projects to allow risk summation for entire facilities.
- Select failure data from an internal database or use your own.
- Perform worksheet math automatically.
- Make changes to the worksheets and immediately see the impact on overall risk.
- Customize the fields used for data entry.
- Create a database of scenario analyses that can be updated at any time.
- Employ different types of risk criteria.
- Use the ALARP principle and establish both primary and secondary risk criteria.
- Automatically aggregate risk by summing over hazard scenarios.
- Conduct sensitivity studies to determine immediately the risk impact of changing values of failure data.
- Generate full documentation of LOPA to comply with IEC 61511 / ISA 84 requirements.
- Select from standard reports which you can customize or create and configure your own reports.

Advantages of Using Primattech Software

- Primattech has been developing software for over 30 years. This wealth of experience produces tools ideally tailored to help you comply with industry standards and regulatory requirements for safety and security.
- Primattech software is designed by people who use the software as you do resulting in easy-to-use software with intuitive user interfaces.
- As one of the leading consulting companies in our field, Primattech regularly uses its software in projects for clients thus giving us a user's insight into software needs.
- Our products have benefitted from the feedback of thousands of users throughout the world as well as our own consultants who use our products daily.
- Our products are rich in features and capabilities yet are designed to allow novice users to master them quickly.
- Primattech supports all programs and all versions of our software.

Visit www.primattech.com for more information and to receive a 15-day evaluation copy of any Primattech software program.

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