

TÜV Rheinland Functional Safety Program Training: Process Hazard and Risk Analysis

The TÜV Rheinland Functional Safety Program is a unique opportunity to provide evidence of competency in functional safety from an internationally recognized organisation. The PH&RA FS Engineer (TÜV Rheinland) certificate program demonstrates competency in the early lifecycle phases with respect to achieving functional safety and provides a skill set enabling staff to fulfill responsibilities and to perform activities to recognised standards of competence, in order to:

- *reduce risks*
- *satisfy legal and regulatory requirements*
- *meet the organisation's safety and business objectives*

By understanding:

- The PH&RA principles and concepts in the internationally agreed standards IEC 61508 and IEC 61511
- The concepts and principles behind international standards that cover the area of PH&RA and how and when to apply them including:
 - Hazard and operability study (HAZOP) – IEC 61882
 - Security Risk Assessment – IEC 62443-3-2
 - Event Tree Analysis – IEC 62502
 - Fault Tree Analysis – IEC 61025
 - Failure Mode and Effect Analysis – IEC 60812
- Defining Tolerable risk criteria for Safety, Environment and Commercial
- The concept and principle of reducing risks to As Low As Reasonably Practicable (ALARP)
- Understanding how and when to apply qualitative, semi quantitative and quantitative risk assessment techniques and methods
- How to calibrate, prepare and apply the most popular safety integrity level (SIL) risk assessment methods such as Risk Matrix, Risk Graph and Layers of protection analysis (LOPA)
- The Interface between PH&RA and the Safety Requirements Specification

Course Objectives

The objective of the course is to provide participants with the knowledge and understanding for mastering the application of the techniques and methods for identifying, assessing, analysing and managing the risks in process operations, as well as the confidence to take a more active role in the PH&RA process.

Successful participants, who have sufficient experience and pass the exam, will be eligible for the prestigious PH&RA FS Engineer (TÜV Rheinland) certificate.

The course is based around a practical case study that will be developed across the three days of the course taking the delegate from hazard identification through SIL Determination, Security Risk Assessment to developing the Safety Requirement Specification (SRS). The course is a modular structure of classroom tuition followed by a case study practical, which will take the participant through the PH&RA process as identified in IEC 61511-1.

Day four consists of a four-hour two-part examination based on a seven-part case study.

Day 1 Agenda

Provides the introduction to the background, concepts and principles to be applied to process hazard analysis, risk assessment, allocation of safety functions and process, functional safety and competency compliance and management and the relevant international standards. The HAZID, HAZOP and Security Risk Assessment using the risk matrix will be discussed as well as the introduction to the case study

The topics covered are:

- Introduction to TUV Rheinland Functional Safety Program
- PHRA background - IEC 61508 and IEC 61511
- Process, Functional Safety & Competency Management
- Introduction to Concepts and Principles of Hazards, Risk and ALARP
- Application of Risk Reduction Techniques
- Hazard Identification (HAZID)
- Hazard and Operability Study (HAZOP)
- Introduction to the Case Study
- HAZOP Case Study – Session 1
- Security Risk Assessment (IEC 62443)
- SRA Case Study – Session 2

Day 2 Agenda

Further develops on the concepts, principles and techniques carried out in day one and the case study work by taking the output from the HAZOP and SRA case studies in terms of cause/consequence pairs and safeguards and applying them to risk analysis techniques, Risk Matrix FTA, ETA and FMEA.

The topics covered are:

- Risk Matrix for Determining Risk Reduction Requirements
- Risk Matrix Case Study – Session 3
- Fault Tree Analysis (ETA)
- FTA Case Study – Session 4
- Event Tree Analysis (FTA)
- ETA Case Study – Session 5
- Failure Mode and Effect Analysis (FMEA)
- FMEA Case Study – Session 6

Day 3 Agenda

The third day includes an introduction to Human Error Analysis, using PHEA, PIF and HEART, to determine the human factors applied in Safety Integrity Level (SIL) Determination and develops on the case study work carried out in day one and two taking the outputs from the studies and applying them to HEA, Risk Graph, LOPA, developing the SRS and applying them to the course case study.

. The topics covered are:

- Human Error Analysis (HEA):
 - Predictive Human Error Analysis (PHEA)
 - Performance Influencing Factors (PIF)
 - Human Error Assessment and Reduction Technique (HEART)
- HEART Case Study – Session 7
- Risk Graph Calibration and Application
- Risk Graph Case Study – Session 8
- Layers of Protection Analysis (LOPA)
- LOPA Case Study – Session 9

- Developing the Safety requirements Specification (SRS)
- SRS Case Study – Session 10
- Format of Exam and preparation and close.

Day 4 Agenda

A four (4) hour two part competency examination comprising:

Part 1 = 30 multiple-choice questions (1 mark each question);

Part 2 = Case Study with 7 milestones for questions (10 marks each question).

The pass score criterion is 75%

Who Should Attend?

Process Engineers, Process and Technical Safety Engineers, Instrument Engineers and managers, Operations personnel and managers, maintenance staff, consultants, advisors and persons involved in management, engineering, operations and safety of process operations as well as persons with PH&RA experience and who are involved in any of the early lifecycle phases for process hazard and risk analysis, allocation of safety layers and safety requirements specification.

Participant eligibility requirements

In accordance with the TÜV Rheinland Functional Safety Program:

- A minimum of 3 to 5 years experience in the field of functional safety.
- University degree or equivalent engineering experience and responsibilities as certified by employer or engineering institution.

Course Provider

Colin Easton MSc, CEng, FInstMC, MIET,
FS Senior Expert (TÜV Rheinland) PH&RA ID 145/09

Prices: From £1950 GBP per participant

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