COURSE OVERVIEW IE0236-4D
Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA)

Course Title
Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA)

Course Date/Venue
November 11-14, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

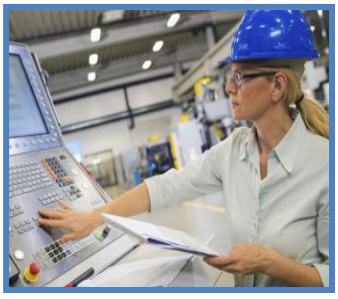
Course Reference
IE0236-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA). It covers the concepts, importance, methodology and applications of safety integrity level (SIL) and layer of protection analysis (LOPA); the risk assessment and management, hazard identification techniques, consequence analysis, severity assessment, likelihood assessment, frequency analysis and risk matrix and risk ranking methodologies; the significance of safety integrity level (SIL), concept of tolerable risk and risk reduction, SIL classification levels, SIL selection criteria and SIL determination methods; the layer of protection analysis (LOPA) methodology and scenario identification; and collecting relevant data and information, documenting scenarios and initiating events, consequences and safeguards.



During this interactive course, participants will learn the frequency of initiating events; the sources of data and information, analyzing historical data and incident databases; the uncertainty factors and calculating event frequencies; the consequences of potential incidents and consequence estimation methods and models; calculating initial risk for each scenario and risk estimation methods and techniques; the risk reduction measures, selecting appropriate safeguards and protection layers and documenting risk reduction measures and their effectiveness; preparing LOPA reports and documentation; reviewing and verifying the LOPA analysis and independent assessment; and auditing, implementing and maintaining LOPA results.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on safety integrity level/layer of protection analysis (SIL/LOPA)
- Discuss the concepts, importance, methodology and applications of safety integrity level (SIL) and layer of protection analysis (LOPA)
- Carryout risk assessment and management, hazard identification techniques, consequence analysis, severity assessment, likelihood assessment, frequency analysis and risk matrix and risk ranking methodologies
- Discuss the significance of safety integrity level (SIL), concept of tolerable risk and risk reduction, SIL classification levels, SIL selection criteria and SIL determination methods
- Recognize layer of protection analysis (LOPA) methodology and apply scenario identification
- Collect relevant data and information, document scenarios and identify initiating events, consequences and safeguards
- Estimate frequency of initiating events, identify the sources of data and information, analyze historical data and incident databases, apply uncertainty factors and calculate event frequencies
- Evaluate the consequences of potential incidents and apply consequence estimation methods and models
- Calculate initial risk for each scenario and apply risk estimation methods and techniques
- Identify and evaluate risk reduction measures, select appropriate safeguards and protection layers and document risk reduction measures and their effectiveness
- Prepare LOPA reports and documentation, review and verify the LOPA analysis, apply independent assessment and audit, implement and maintain the LOPA results

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides a complete and up-to-date overview of safety integrity level/layer of protection analysis (SIL/LOPA) for senior process control engineers, process control engineers, senior control systems engineers, senior control systems engineers, control systems engineers, reliability and integrity engineers, process engineers, safety engineers, professionals and regulators.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **2.4 CEUs** (Continuing Education Units) or **24 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Sydney Thoresson, PE, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **40 years** of extensive experience within the **Power & Water Utilities** and Other **Energy Sectors**. His specialization highly evolves in **Electrical Safety**, **Power System Equipment**, **Electrical Drawing**, **Electrical Forecasting**, **Transmission Networks**, **Substation**, **Distribution Networks**, **Substation Automation Systems & Application**, **Electrical** System, **HV/LV Electrical** Authorisation, **Variable Frequency Drives** (VFD), **HV/LV Equipment**, **Circuit Breaker**, **Motor Controllers**, **Hazardous Area Classification**, **Intrinsic Safety**, **Electrical Power Systems** Quality & Troubleshooting, **Protection & Relay**, **Electric & Control** System Commissioning, **Liquid & Gas Flowmetering**, Fault Analysis in **Electrical Networks & Distribution Cables**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Gas Measurement**, **Process Control Instrumentation**, **Compressor Control & Protection**, **Control Systems**, Programmable Logic Controllers (**PLC**), **SCADA**, Distributed Control Systems (**DCS**) especially in **Honeywell DCS**, **H&B DCS**, **Modicon, Siemens**, **Telemecanique**, **Wonderware** and **Adrioit**. Moreover, he has vast experience in the field of Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Flowmetering & Custody Measurement**, **Multiphase Flowmetering**, **Measurement and Control**, **Mass Measuring System Batching** (**Philips**), Arc Furnace Automation-Ferro Alloys, Walking Beam Furnace, Blast Furnace, Billet Casting Station, Cement Kiln Automation, Factory Automation and Quality Assurance Accreditation (**ISO 9000** and **Standard BS 5750**).

During Mr. Thoresson's career life, he has gained his thorough and practical experience through various challenging positions such as a **Project Manager**, **Contracts Manager**, **Managing Director**, **Technical Director**, **Divisional Manager**, **Plant Automation Engineer**, **Senior Consulting Engineer**, **Senior Systems Engineer**, **Consulting Engineer**, **Service Engineer** and **Section Leader** from several international companies such as **Philips**, **FEDMIS**, **AEG**, **DAVY International**, **BOSCH** Instrumentation and Control, **Billiton**, **Endress/Hauser**, **Petronet**, **Iscor**, **Spoornet**, **Eskom** and **Afrox**.

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **National Higher Diploma** (**NHD**) & a **National Diploma** in **Radio Engineering** from the **Witwatersrand Technikon**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an active member of the International Society of Automation (**ISA**) and the Society for Automation, Instrumentation, Measurement and Control (**SAIMC**).

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 4,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Monday, 11th of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introductions*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to SIL/LOPA*** *Safety Integrity Level (SIL) & Layer of Protection Analysis (LOPA) Concepts • Importance of SIL/LOPA in Risk Management & Process Safety*
0930 - 0945	*Break*
0945 - 1030	***Introduction to SIL/LOPA (cont'd)*** *The SIL/LOPA Methodology & Its Application • Relevant Standards & Guidelines (IEC 61508, IEC 61511, Etc.)*
1030 - 1230	***Risk Assessment Fundamentals*** *Principles of Risk Assessment & Management • Hazard Identification Techniques (HAZID, HAZOP, Etc.) • Consequence Analysis & Severity Assessment • Likelihood Assessment & Frequency Analysis • Risk Matrix & Risk Ranking Methodologies*
1230 - 1245	*Break*
1245 - 1420	***Introduction to Safety Integrity Level (SIL)*** *Safety Integrity Level (SIL) & Its Significance • The Concept of Tolerable Risk & Risk Reduction • SIL Classification Levels & Their Corresponding Risk Reduction Targets • SIL Selection Criteria & SIL Determination Methods • Introduction to Safety Instrumented Systems (SIS) & Their Role in Achieving SIL*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 12th of November 2024***

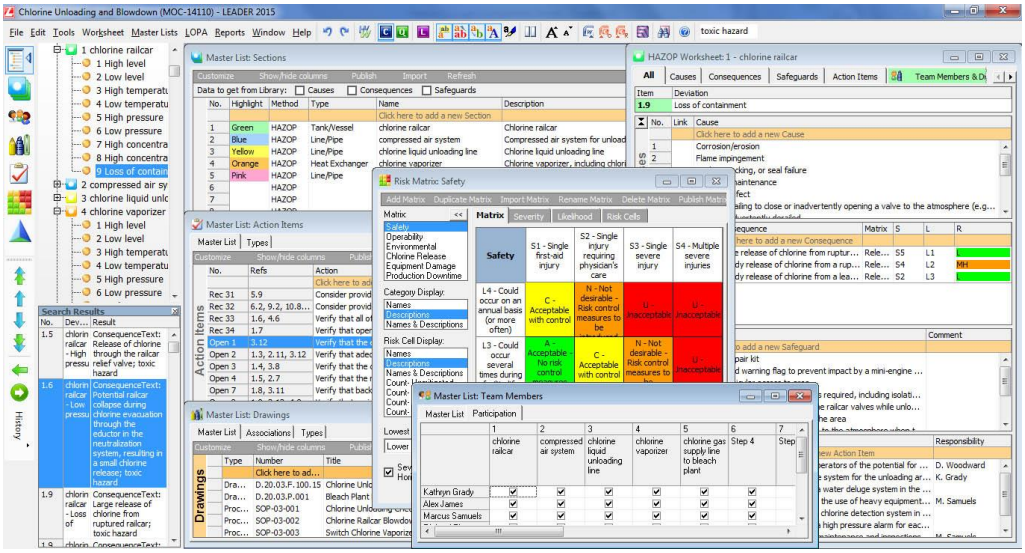
0730 – 0930	***Layer of Protection Analysis (LOPA) Methodology*** *Introduction to Layer of Protection Analysis (LOPA) Methodology • The Layers of Protection & Their Effectiveness*
0930 – 0945	*Break*
0945 – 1100	***Layer of Protection Analysis (LOPA) Methodology (cont'd)*** *LOPA Terminology & Definitions • LOPA Workflow & Step-By-Step Approach • Roles & Responsibilities in LOPA Analysis*
1100 – 1215	***LOPA Step 1: Scenario Identification*** *Identifying Scenarios for LOPA Analysis • Criteria for Scenario Selection Collecting Relevant Data & Information*
1215 – 1230	*Break*
1230 – 1420	***LOPA Step 1: Scenario Identification (cont'd)*** *Documenting Scenarios & Their Context • Identifying Initiating Events, Consequences, & Safeguards*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3:	Wednesday, 13th of November 2024
0730 – 0930	***LOPA Step 2: Frequency Analysis*** *Estimating the Frequency of Initiating Events • Sources of Data & Information for Frequency Estimation • Analyzing Historical Data & Incident Databases*
0930 – 0945	*Break*
0945 – 1100	***LOPA Step 2: Frequency Analysis (cont'd)*** *Considerations for Human Error Probabilities • Applying Uncertainty Factors & Calculating Event Frequencies*
1100 – 1215	***LOPA Step 3: Consequence Analysis*** *Evaluating the Consequences of Potential Incidents • Consequence Estimation Methods & Models • Evaluating Potential Damage to People, Environment, & Assets*
1215 – 1230	*Break*
1230 – 1420	***LOPA Step 3: Consequence Analysis (cont'd)*** *Assessing Severity Levels & Their Impact on Risk • Documenting Consequence Analysis Results*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

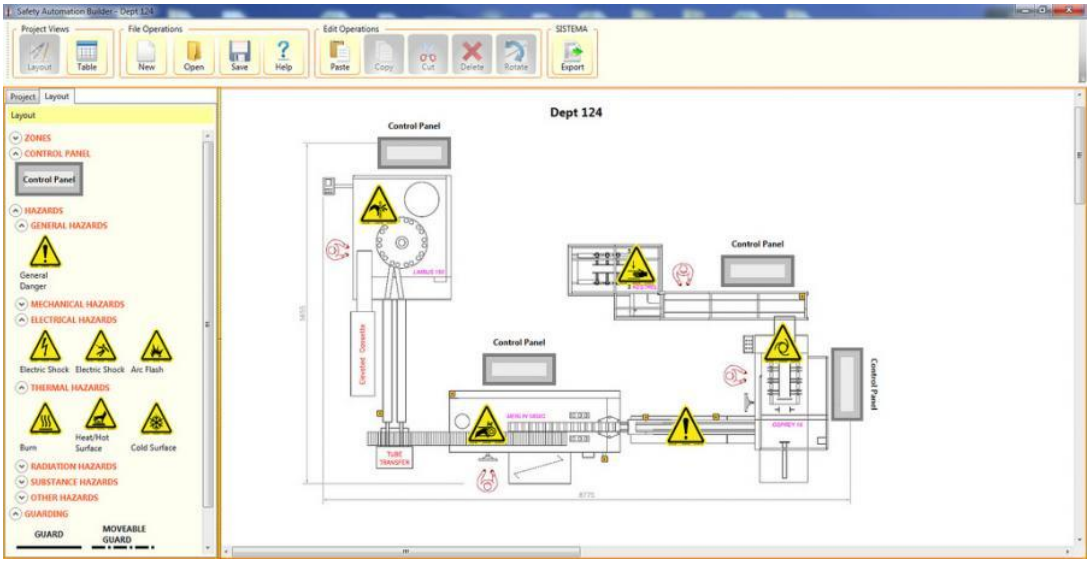
Day 4:	Thursday, 14th of November 2024
0730 – 0930	***LOPA Step 4: Risk Estimation & Comparison*** *Calculating the Initial Risk for Each Scenario • Risk Estimation Methods & Techniques • Determining the Target Risk Levels Based on Tolerability Criteria*
0930 – 0945	*Break*
0945 – 1100	***LOPA Step 4: Risk Estimation & Comparison (cont'd)*** *Comparing the Initial Risk to the Target Risk • Identifying Scenarios Requiring Further Risk Reduction*
1100 – 1215	***LOPA Step 5: Risk Reduction Measures*** *Identifying & Evaluating Risk Reduction Measures • Layers of Protection & Their Effectiveness • Determining the Required Risk Reduction for Each Scenario • Selecting Appropriate Safeguards & Protection Layers • Documenting Risk Reduction Measures & Their Effectiveness*
1215 – 1230	*Break*
1230 – 1345	***LOPA Step 6: Documentation & Verification*** *Documenting the LOPA Analysis & Results ● Preparing LOPA Reports & Documentation ● Reviewing & Verifying the LOPA Analysis • Independent Assessment & Audit of the LOPA ● Implementing & Maintaining the LOPA Results*
1345 – 1400	***Course Conclusion***
1400 - 1415	***POST-TEST***
1415 - 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

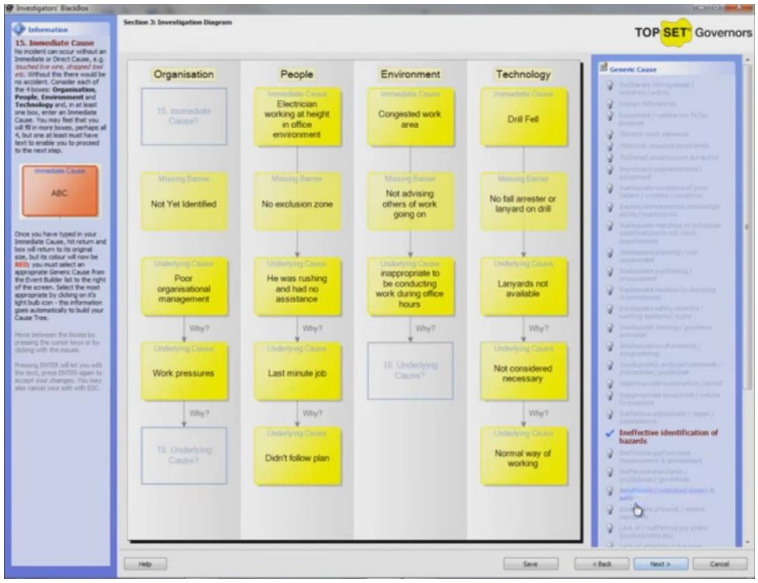
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art "PHA/HAZOP", "Safety Automation Builder Software (Rockwell Automation)" and "BlackBox" simulators.

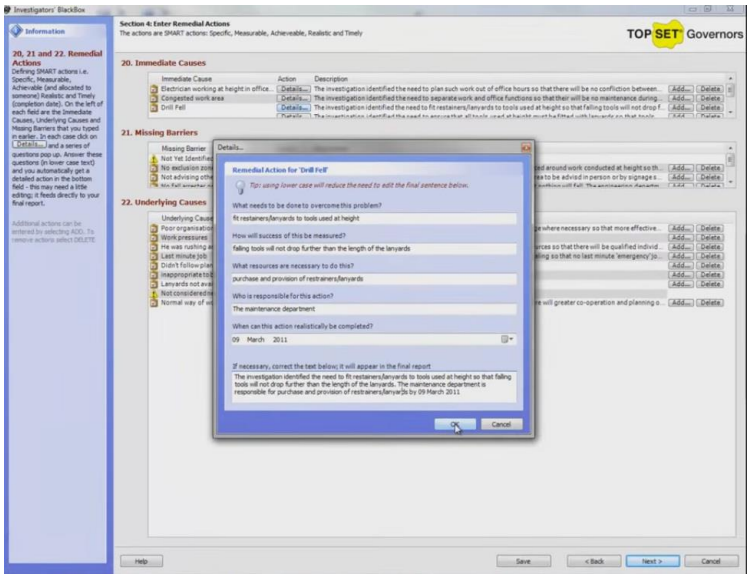


PHA/HAZOP Simulator



Safety Automation Builder (Rockwell Automation) Software





BlackBox Software Tool

Course Coordinator

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