THE SAFETY / CYBERSECURITY LIFECYCLE

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MANAGEMENT	INPUTS	LIFECYCLE	OUTPUTS	ASSESSMENTS	TOOLS

Process Safety Management Program; Policy, Standards, Procedures, Training (Functional Safety, Alarm Management, Cyber Security)

Analysis Phase

- **Inputs:** Process Flow Diagrams & Application Specific Regulations
- **Lifecycle:** Process / Plant Design & Scope Definition
- **Outputs:** Process Safety Information (PSI) for alarms & interlocks, Zone & Conduit Drawings

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- **Lifecycle:** Process Hazard Identification
- **Outputs:** HAZOP, LOPA, Consequence Analysis, Cyber Risk Assessment, Alarm Rationalization

Likelihood Analysis — Consequence Analysis

- **Inputs:** Tolerable Risk Criteria
- **Decision:** Corporate Risk Criteria Met? — NO / YES

- **Lifecycle:** Document Requirements
- **Outputs:** Safety Requirements Specification (SRS), Alarm Management Requirements, Cybersecurity Requirements Spec (CSRS)

Design & Implementation Phase

- **Inputs:** Safety Requirements Specification (SRS), Alarm Management Requirements, Cybersecurity Requirements Spec (CSRS)
- **Lifecycle:** Perform Conceptual Design
- **Outputs:** Proof Test Requirements
- **Assessments:** Functional Safety Assessment (FSA) 1 / Cyber Functional Safety Assessment (CFSA) 1

- **Inputs:** Realistic λ Data
- **Lifecycle:** Safety Integrity Level (SIL) / Security Level Verification
- **Outputs:** SIL Verification Report, SL Verification Report

- **Decision:** Defined Risk Reduction Achieved? — NO / YES
- **Outputs (NO):** Updated SRS "Design"

Detailed Design — Develop Inspection & Test Procedures

- **Outputs:** Detailed design documentation. SIS / SIF, alarm, cyber countermeasure inspection & testing procedures

- **Inputs:** FAT Test Procedures for BPCS, Alarm, SIS, & Cybersecurity
- **Lifecycle:** Factory Acceptance Test (FAT)
- **Outputs:** FAT Proof of Functionality Results
- **Assessments:** Functional Safety Assessment (FSA) 2 / Cyber Functional Safety Assessment (CFSA) 2

- **Inputs:** Inspection & Test Procedures for BPCS, Alarm, SIS, & Cybersecurity
- **Lifecycle:** Installation / Commissioning / SAT
- **Outputs:** Proof of Functionality Report

- **Inputs:** Mechanical Integrity Program Inspection & Proof Test Procedures for Alarm, SIS, & Cybersecurity Countermeasures
- **Lifecycle:** Initial Validation
- **Outputs:** Inspection and Test Records

- **Inputs:** Requirement Checklists for BPCS, Alarm, SIS, Cybersecurity
- **Lifecycle:** Pre Startup Safety Review (PSSR)
- **Outputs:** Documented Evidence Plant is Ready for Start-up
- **Assessments:** Functional Safety Assessment (FSA) 3 / Cyber Functional Safety Assessment (CFSA) 3

- **Inputs:** Startup Procedures
- **Lifecycle:** Startup
- **Outputs:** Plant Startup

Operation & Maintenance Phase

- **Lifecycle:** Operation
- **Outputs:** Plant with Saleable Product

- **Inputs:** Validation, Inspection & Test Procedures for Alarm, SIS, & Cybersecurity Countermeasures
- **Lifecycle:** Execute Mechanical Integrity Program
- **Outputs:** Mechanical Integrity Program Records with Data (Proof Testing)

- **Lifecycle:** Analyze Test Results
- **Outputs:** Performance Metrics For SIS, LOPA Validation, Cybersecurity Countermeasures, etc.

- **Inputs:** Process safety information, Process incident / near misses, MOC's, Alarm metrics, Analyzed SIS failure metrics, Cybersecurity metrics, Cyber security vulnerability assessment
- **Decision:** MOC? — YES / NO
- **Outputs (YES):** Technical PHA Review & Approved MOC Documentation
- **Assessments:** Functional Safety Assessment (FSA) 4 / Cyber Functional Safety Assessment (CFSA) 4

- **Decision:** Time for Periodic Assessment? — YES / NO
- **Outputs (YES):** PHA Revalidation & Cybersecurity vulnerability assessment reports
- **Assessments:** Functional Safety Assessment (FSA) 5 / Cyber Functional Safety Assessment (CFSA) 5

- **Decision:** Decommission? — NO / YES

TOOLS

exSILentia®
- PHA
- CYBER PHAx
- LOPA
- SILect
- ProcesSRS
- CYBERequirements
- SIL-Alarm

ProcesSRS
- CYBERequirements
- ALARM Requirements

SILver
DESIGN SRS

SIL-Alarm
SILstλt

exSILentia®
- PHA
- CYBER PHAx
- LOPA
- SILver
- ProcesSRS
- CYBERequirements
- SIL-Alarm
- SILstλt