4th Chemical Process Safety Sharing (CPSS)

Fire and Gas System Design

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Design

Design *per*

International Standards
Good generally recognized engineering practices

Design *for*

Perform proper function
Required per performance characteristic

Studies & Risk Management & Design Criteria

Otherwise over designed /overpriced

SPECIFICATION

What equipment does?
How will it perform that function?

DERIVERABLES

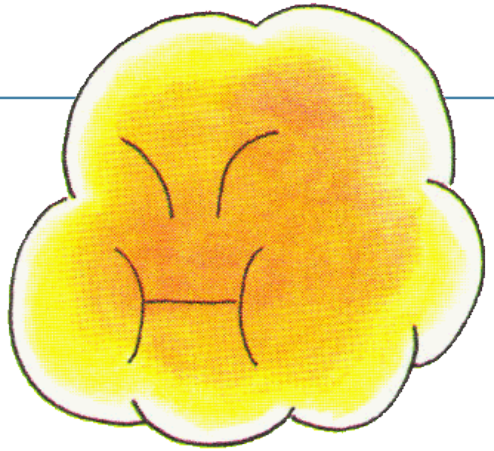
Datasheets
Drawings

Typical Design & Operation Practices



- Hazards must be recognized and Understood
- **Equipment must be “fit for purpose” ????**
- **Systems and procedures to maintain plant Integrity**
- **Competent staff**
- Emergency Preparedness
- Monitor Performance

FGS –WHAT/WHEN



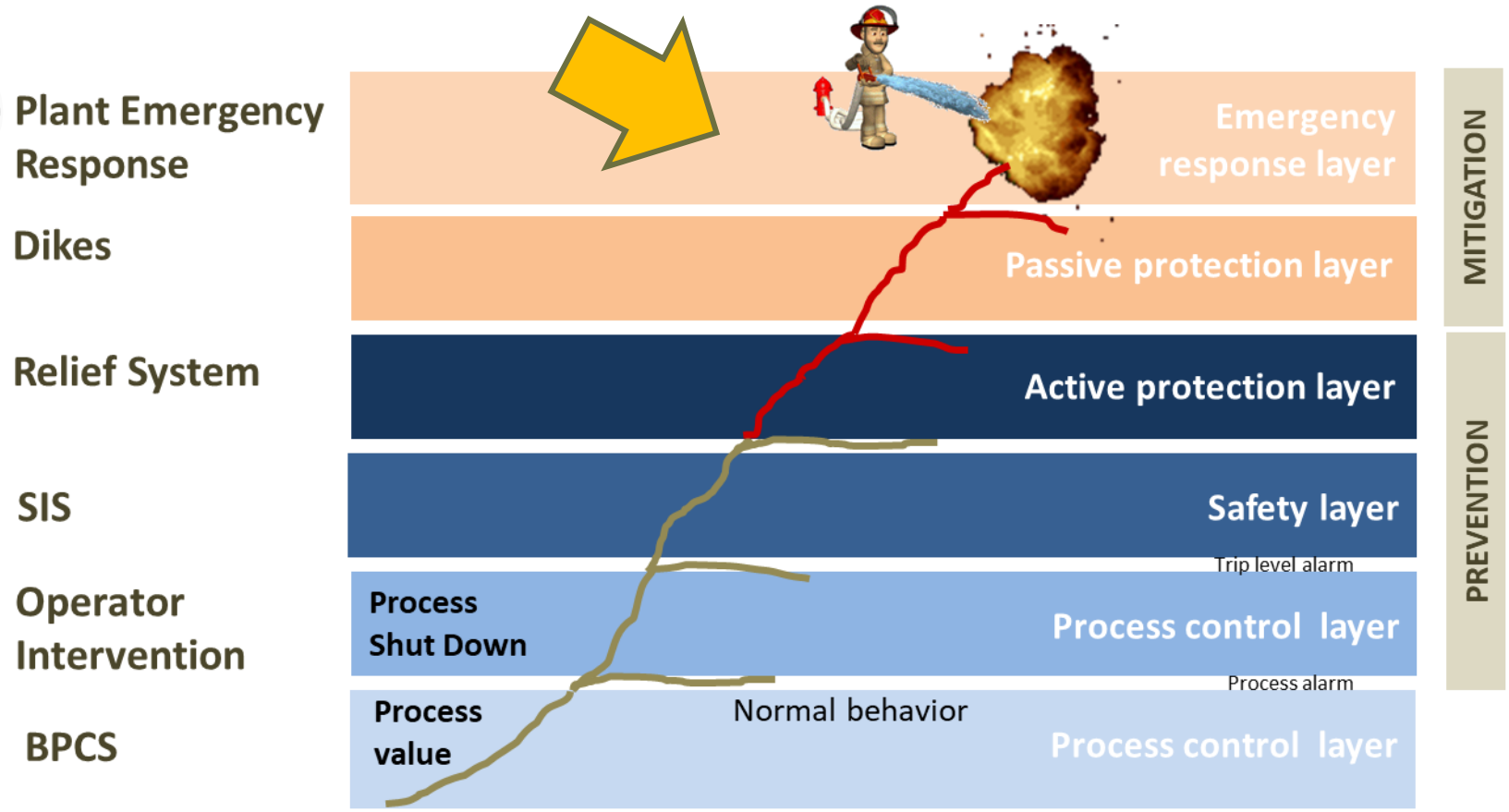
Fire and Gas System
Fire and Gas Detection System

Automation and control systems ..Safety Instrumented System??

Detecting LOC of hazard materials from process and initiating response to **MITIGATE** the release impact

FGS -WHERE

Layer of Protection Analysis (LOPA)



SIS maintains process variable within prescribed limited

BPCS maintains process variable and initiates actions when required

FGS-HOW

Additional Gas Detector Requirements

There is NO standard specifically address the exact requirements of location and installation for gas detectors, thus the code based design is used for general guideline to further determine the location based on PRACTICES and GO-BY from SPECIALIST.

BS 6959:1989: Detector Location Section 5.2.1

Sensors should be located in positions determined in consultation with those who have a specialist knowledge of gas dispersion, and those who have a knowledge of the process plant systems and equipment involved together with the safety and engineering personnel.



FGS-HOW

Typical Gas Detector Location

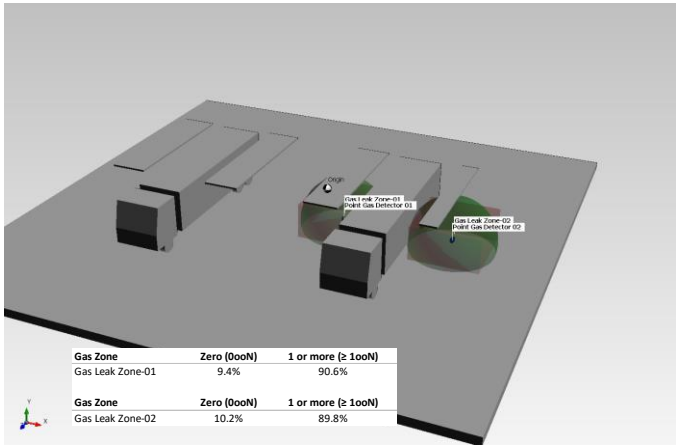
- Process location containing large volume and high pressure hydrocarbon gases- subject to effect of erosion/corrosion
- Pump handling high vapor pressure hydrocarbon
- Compressor House – seal, interior area
- All intakes HVAC system to building in an electrical classification area
- Cooling water/ Steam / Tempered water…
- UPS Room- H2 vapor
- Critical internal combustion mover subject to the possible ingestion of combustion vapor
- Enclosed water treating facilities that can release entrained combustible gas
- Monitor the purge gas from cold boxes and double walled insulated cryogenic storage
- Etc.

FGS-HOW

Design Process

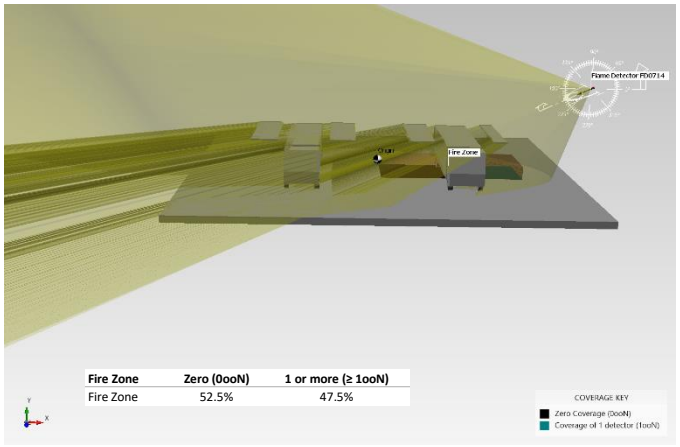
- **Identify hazards related to fire and gas events**
- **Set F&G system functional performance requirements.**
- **Assess level of system criticality for risk reduction.**
- **Determine implementation configuration (detector type, layout, executive actions and voting) and maintenance strategy (access and testing requirements).**
- **Map detectors to determine and/or verify optimum detector locations.**
- **Construct and commission.**
- **Operate and maintain.**

FGS Mapping



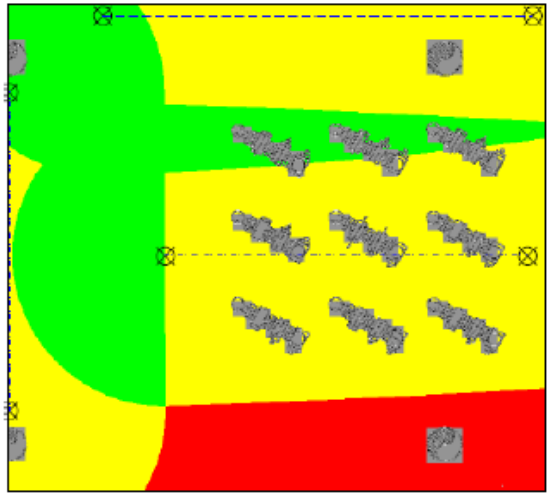
Gas Zone	Zero (0ooN)	1 or more (≥ 1ooN)
Gas Leak Zone-01	9.4%	90.6%

Gas Zone	Zero (0ooN)	1 or more (≥ 1ooN)
Gas Leak Zone-02	10.2%	89.8%



Fire Zone	Zero (0ooN)	1 or more (≥ 1ooN)
Fire Zone	52.5%	47.5%

ISA-TR84



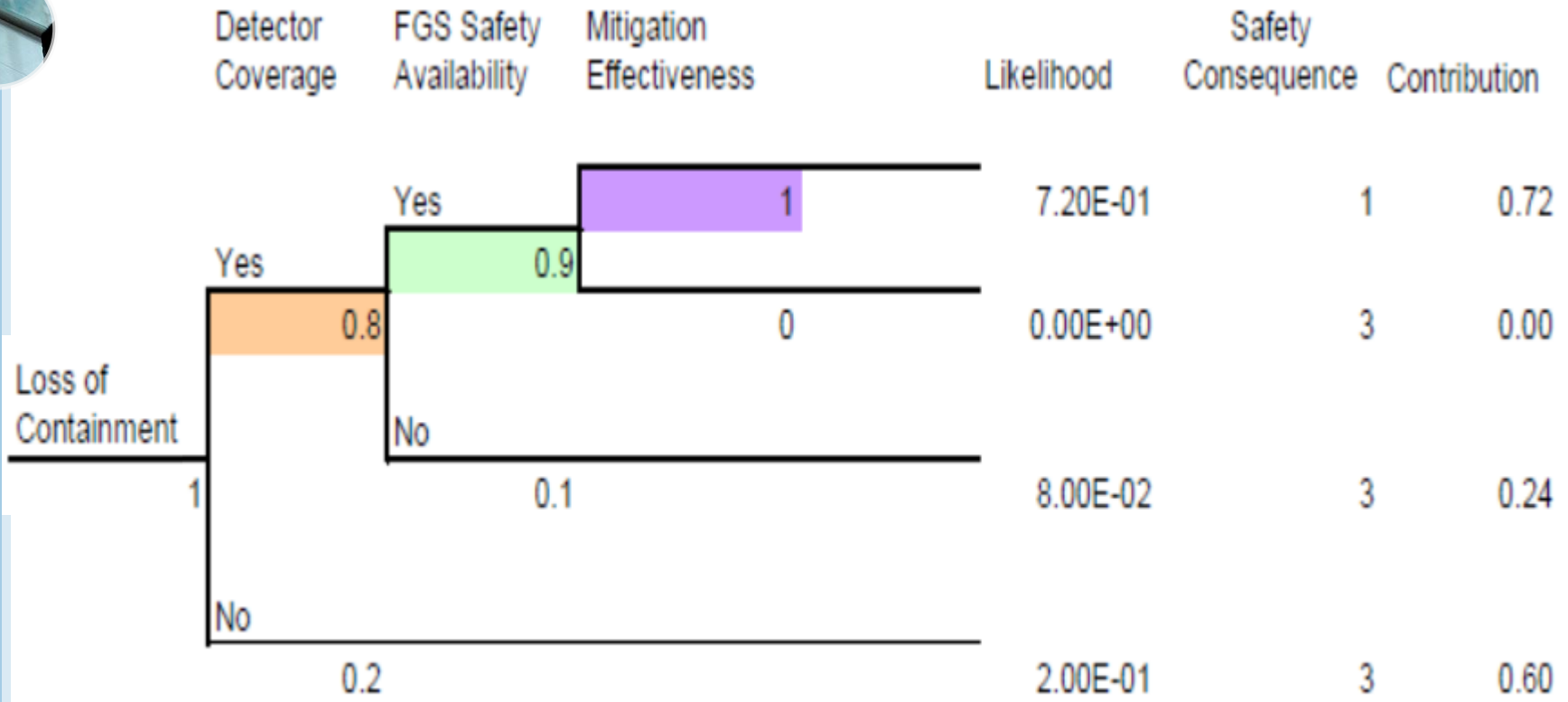
20.8% 2 or more Detectors Coverage

57.5% 1 Detector Coverage

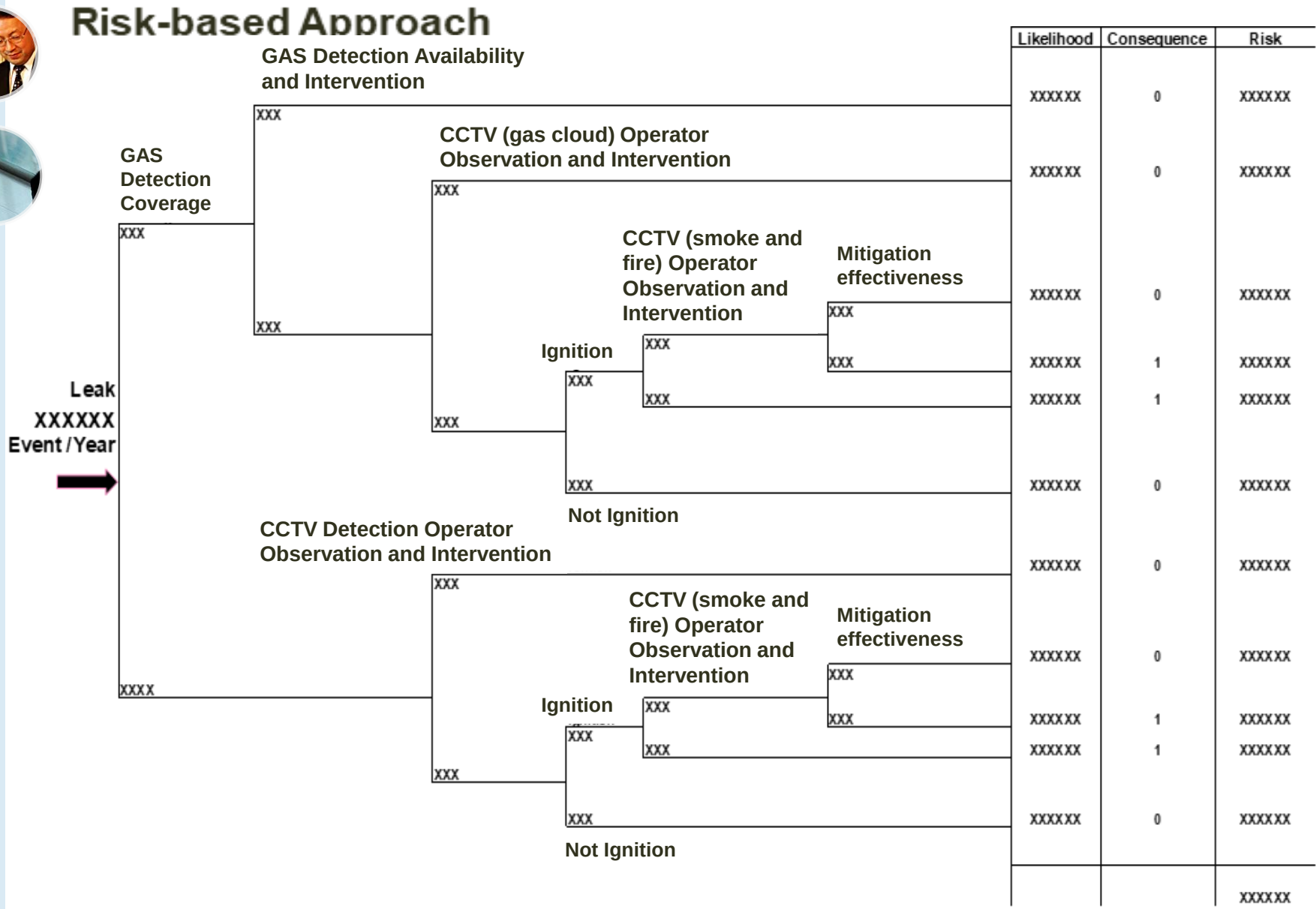
21.7% No Detector Coverage

FGS Performance Based Risk Assessment

ISA-TR84



FGS Performance Based Risk Assessment



Thank you for your attention