Reduced Risk

- Intolerable Region: Risk is refused
- ALARP Region: Risk is as low as reasonably practical
- Broadly Acceptable Region: Risk is insignificant
Layer of Protection (PL)

PL 1: Protective Clothing & SCBA

PL 2: Boot with Electronic Pedometer

PL 3: Incident Manager Application Software and Computer Hardware

PL 4: Standard Evacuation Procedures

Risk Reduction Factors (RRFs)

Initiating Event: rapidly rising temperature

Impact Event: Loss of first responder’s life due to rapid-fire progression
Functional Safety Goals

- Life Cycle
- Design and Performance
- Configurability
- Compatibility/Interoperability
- Scalability
- Usability
- Maintainability

Design & Test Requirements

- Compliance Requirements
  - OSHA
  - DOJ
  - NFPA
  - UL
Functional Safety Goals

- Life Cycle
- Design and Performance
- Configurability
- Compatibility/Interoperability
- Scalability
- Usability
- Maintainability

Design & Test Requirements

**Water Resistance**
- Protection of ingress of water
- Internal corrosion

**Software Integrity**
- Engineering practices
- A/D and D/A logic
- Application logic

Standards/Clauses
Exposure

E1: Severe exposure fire environment and potential for fire

C1: Life-Critical

E2: Hazardous or potentially hazardous non-fire environment

C1: Life-Critical

C2: Mission Assistance

E3: Non-hazardous, non-fire environment

C1: Life-Critical

C2: Mission Assistance

RRF Category

1a

1b

2a

2b

3a

3b
*Listed products may already have been demonstrated to meet some or all of the design and test requirements for the NFPA Safety Integrity category.
Design & Test Requirements*

A: Water Resistance  
B, C: not covered  
D, E, F: covered by Listing  
G: Software Integrity (missing from current RRF risk graph)
**Water Resistance**

**Protection Against Ingress Of Water**

- NFPA 1951-2001, 8.17
- NEC 250
- EC 60529: 1989
- Refer to UL 60950, Annex T for Summary

**Internal Corrosion**

- UL 60950, 2.6.5.6

**Software Integrity**

- Engineering practices
- A/D and D/A logic
- Application logic

- ANSI/UL 1998