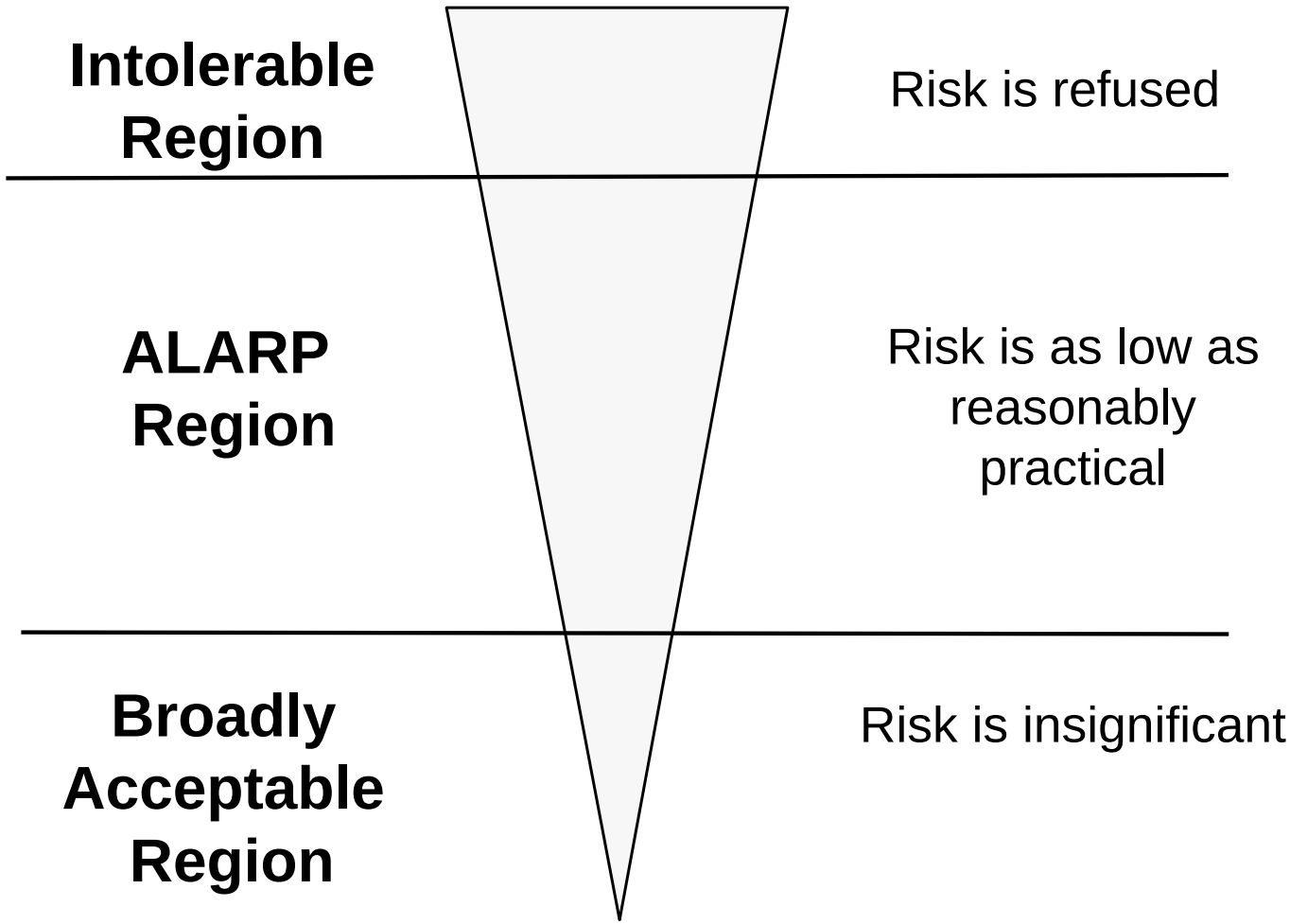
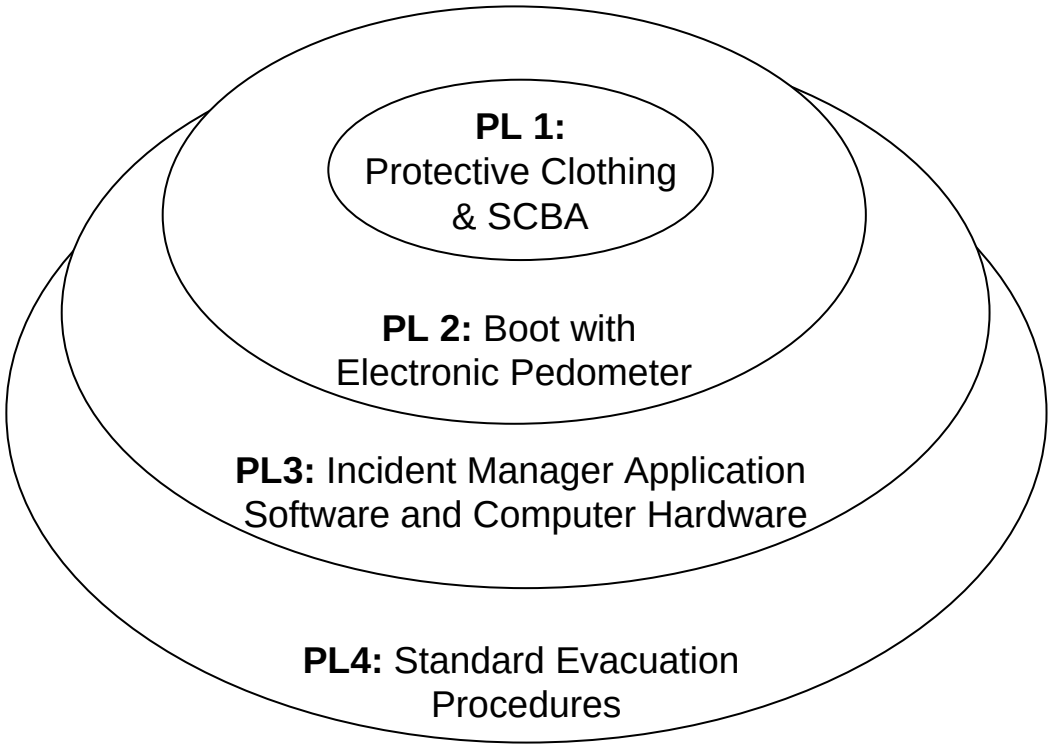
Reduced Risk

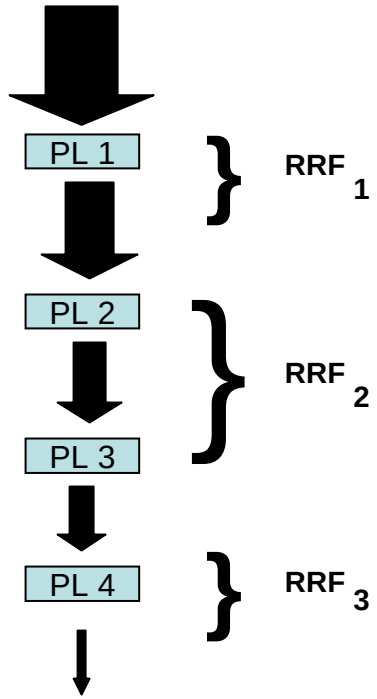


Layer of Protection (PL)

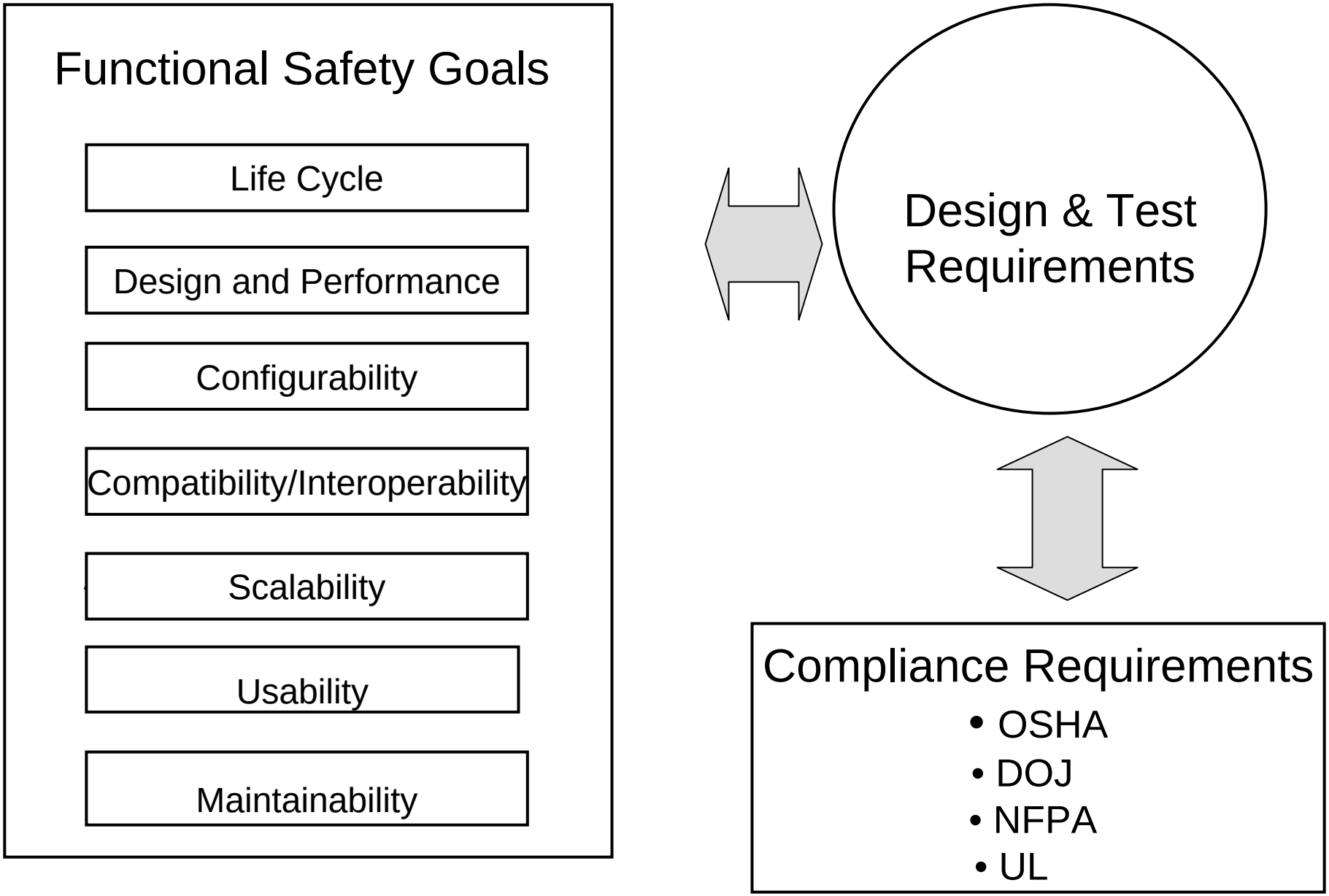


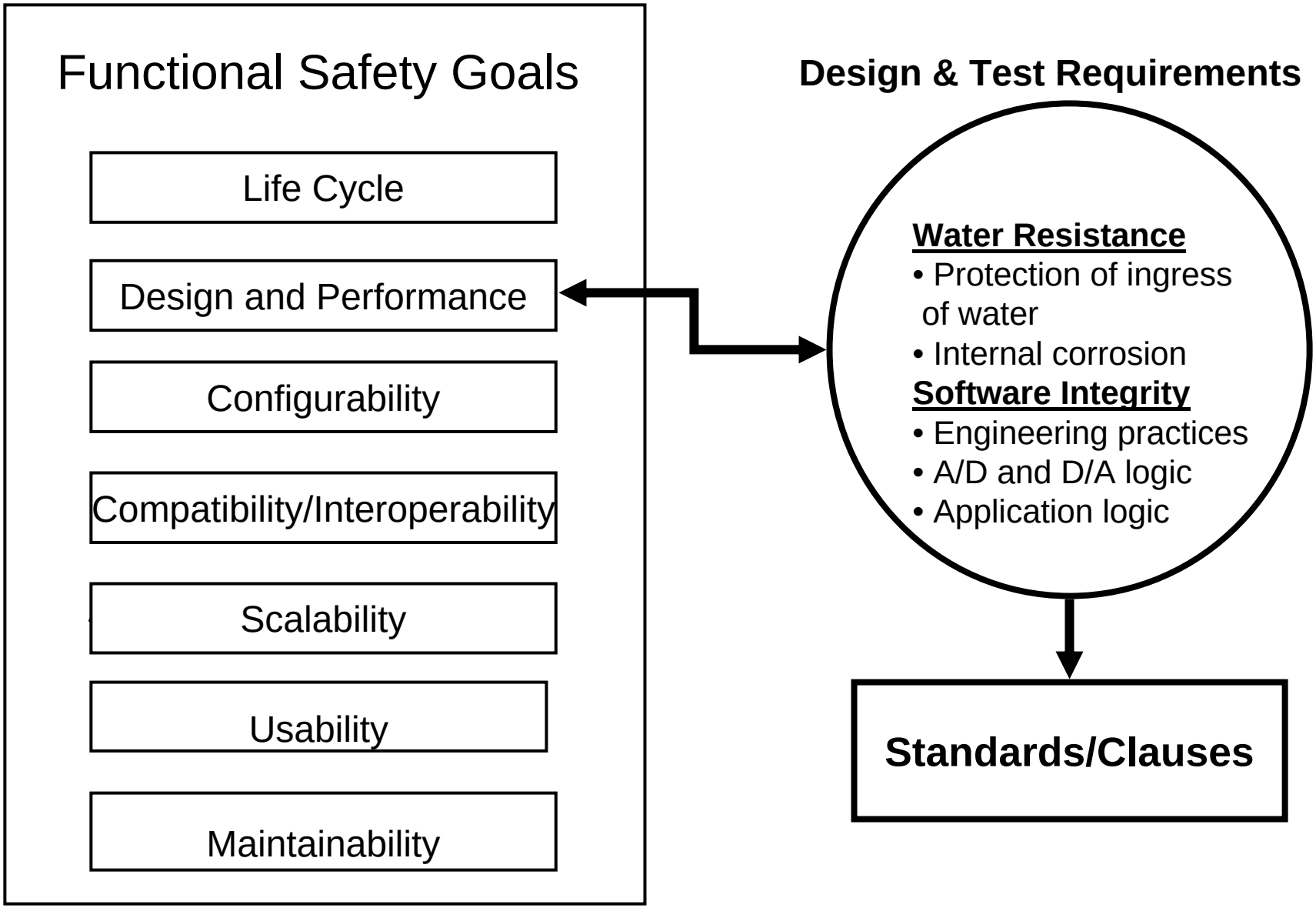
Risk Reduction Factors (RRFs)

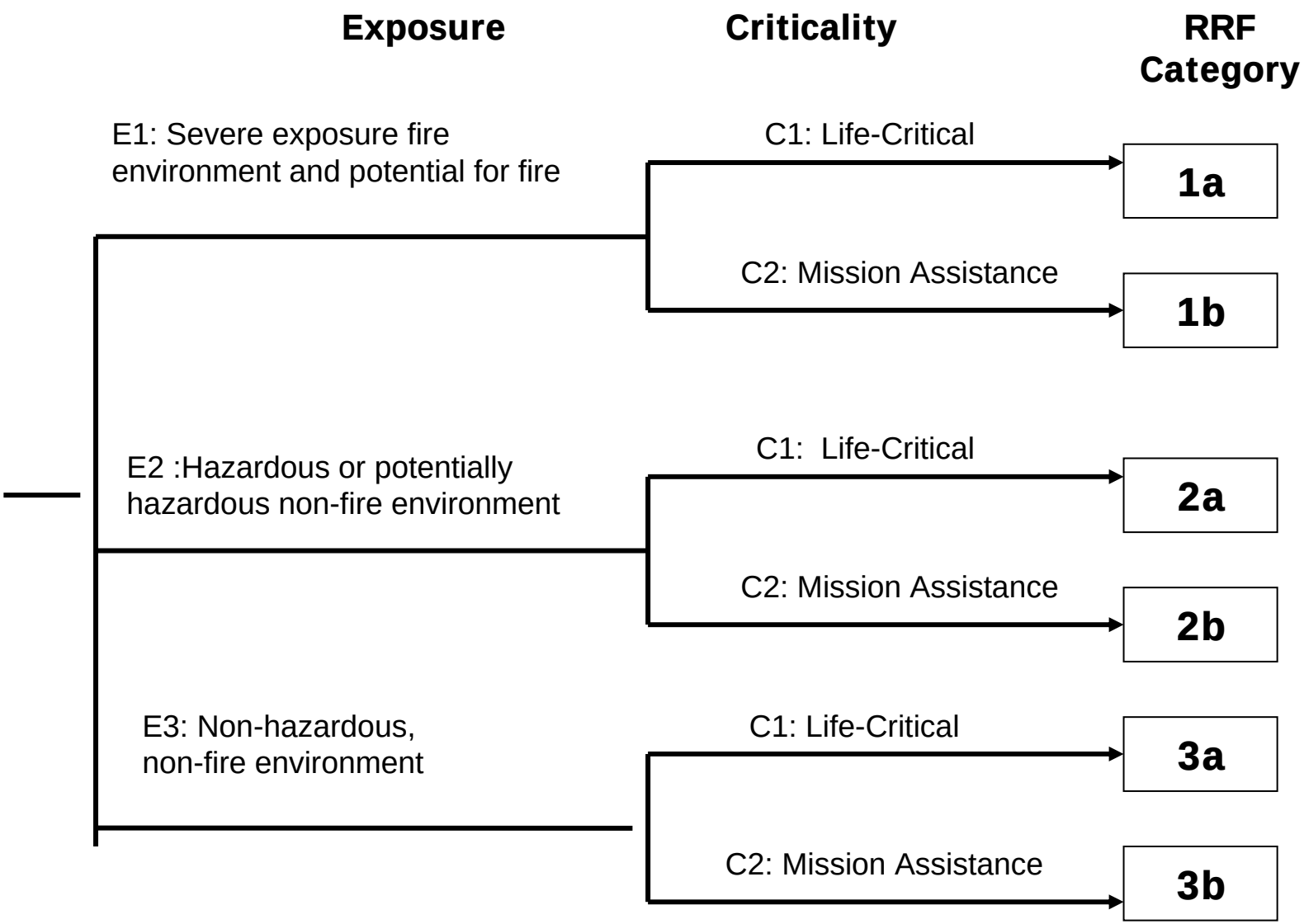
Initiating Event: rapidly rising temperature

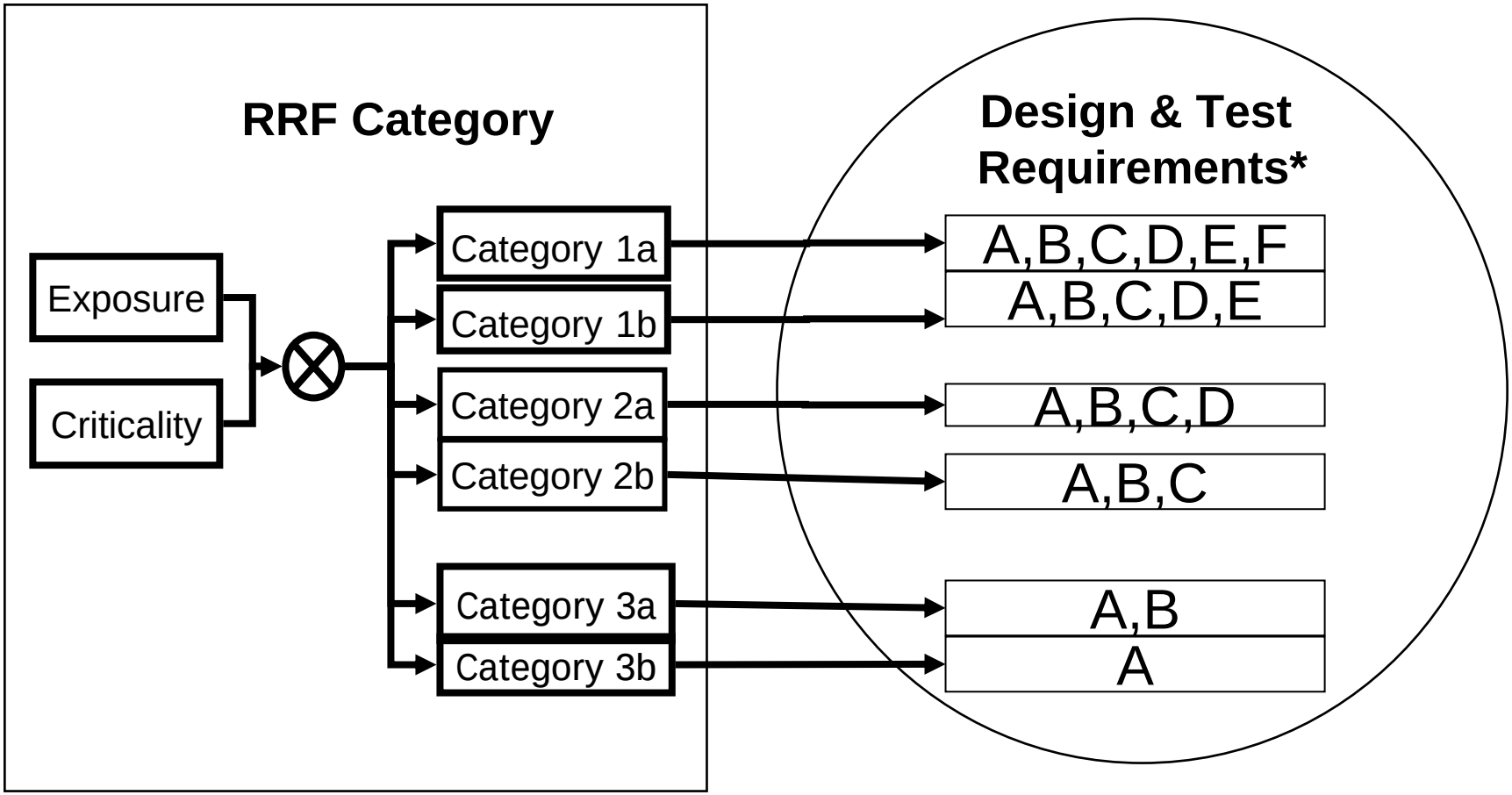


Impact Event: Loss of first responder's life due to rapid-fire progression

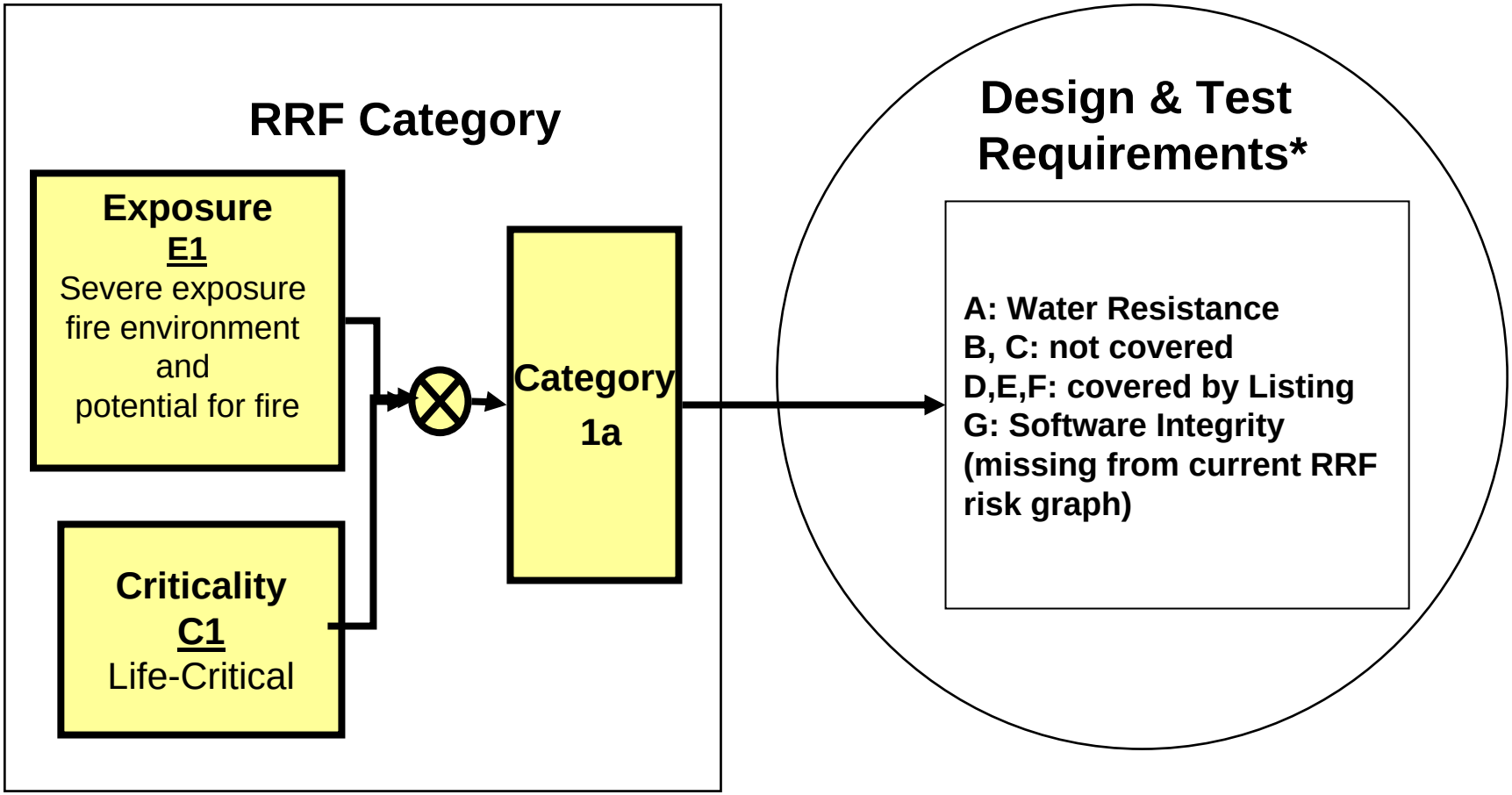

Functional Safety Goals
Life Cycle
Design and Performance
Configurability
Compatibility/Interoperability
Scalability
Usability
Maintainability
Design & Test Requirements
Compliance Requirements
• OSHA
• DOJ
• NFPA
• UL

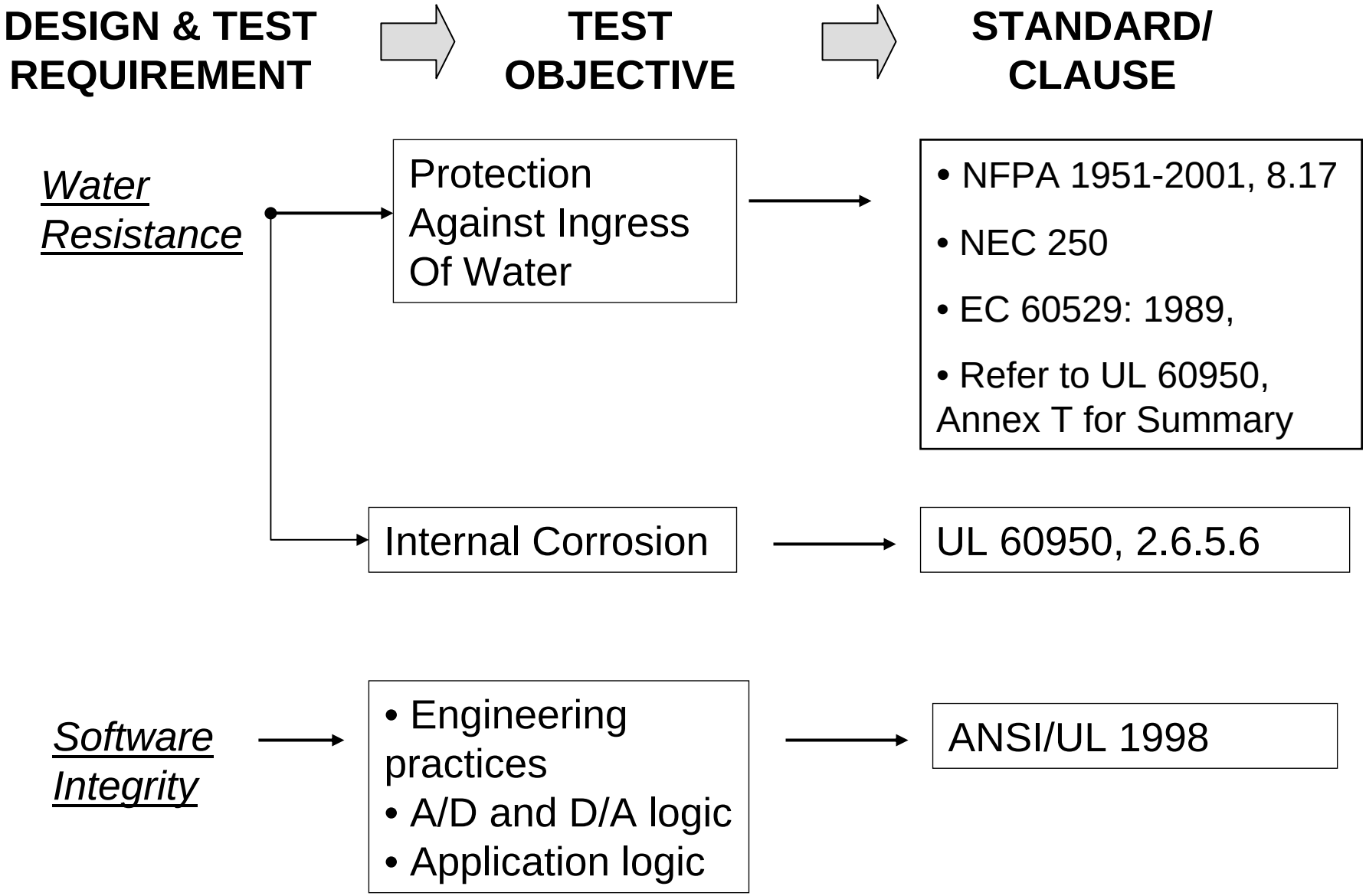

Functional Safety Goals
Life Cycle
Design and Performance
Configurability
Compatibility/Interoperability
Scalability
Usability
Maintainability
Design & Test Requirements
Water Resistance
• Protection of ingress of water
• Internal corrosion
Software Integrity
• Engineering practices
• A/D and D/A logic
• Application logic
Standards/Clauses

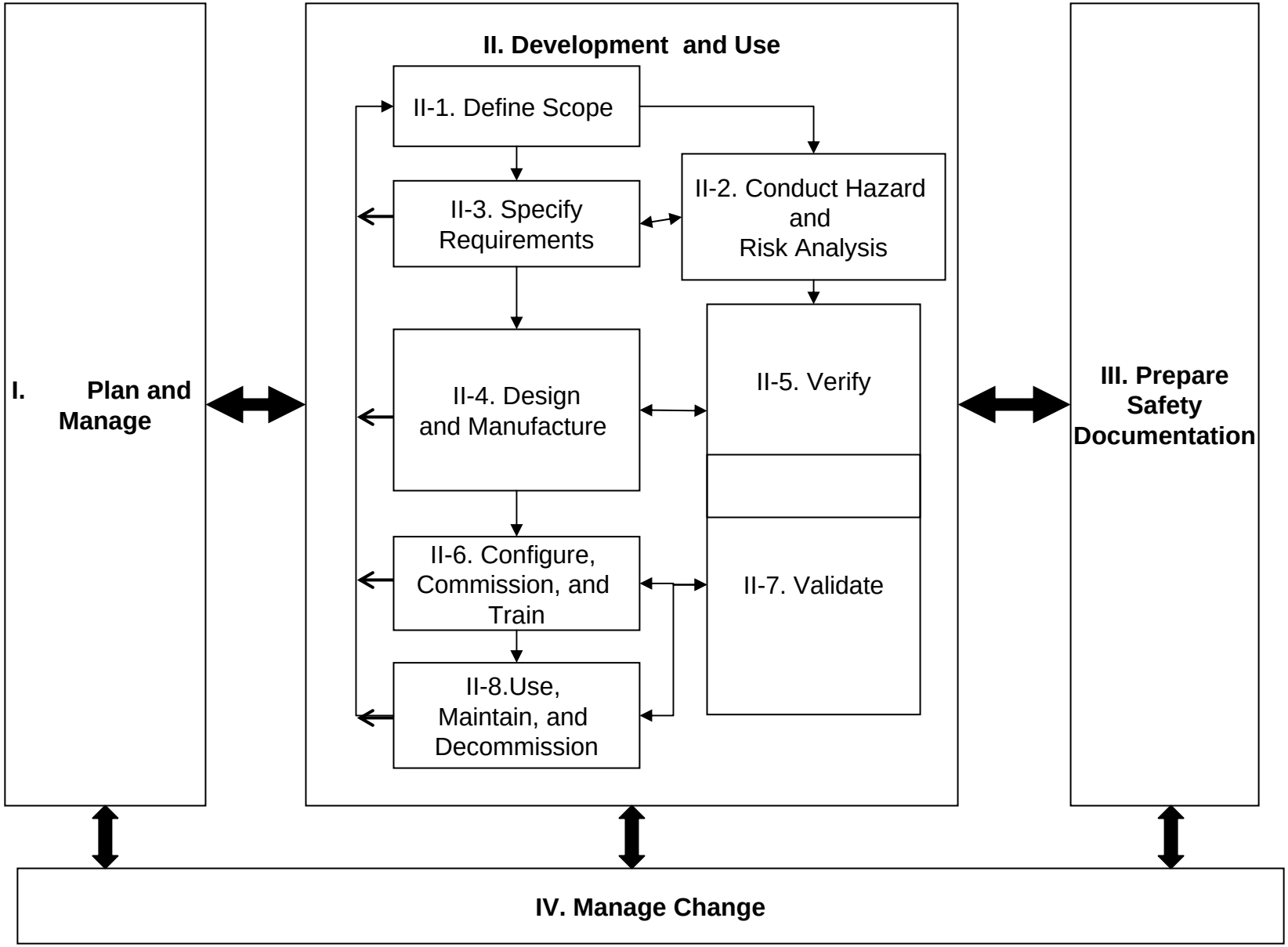

Exposure
Criticality
RRF Category
E1: Severe exposure fire environment and potential for fire
C1: Life-Critical
1a
C2: Mission Assistance
1b
E2 :Hazardous or potentially hazardous non-fire environment
C1: Life-Critical
2a
C2: Mission Assistance
2b
E3: Non-hazardous, non-fire environment
C1: Life-Critical
3a
C2: Mission Assistance
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.*


RRF Category
Exposure
E1
Severe exposure fire environment and potential for fire
Criticality
C1
Life-Critical
Category 1a
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)


DESIGN & TEST REQUIREMENT
TEST OBJECTIVE
STANDARD/ CLAUSE
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


I. Plan and Manage
II. Development and Use
II-1. Define Scope
II-2. Conduct Hazard and Risk Analysis
II-3. Specify Requirements
II-4. Design and Manufacture
II-5. Verify
II-6. Configure, Commission, and Train
II-7. Validate
II-8.Use, Maintain, and Decommission
III. Prepare Safety Documentation
IV. Manage Change