

**Nuclear and Facility Safety  
Programs Workshop  
Fire Safety Track  
May 5th, 2015**



## Overview

# NQA-1 Commercial Grade Dedication Critical Characteristics

Department of Energy  
Nuclear and Facility Safety Programs Workshop  
Fire Safety Track  
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## Overview

CGD Definition

Safety Function / DSA Requirements

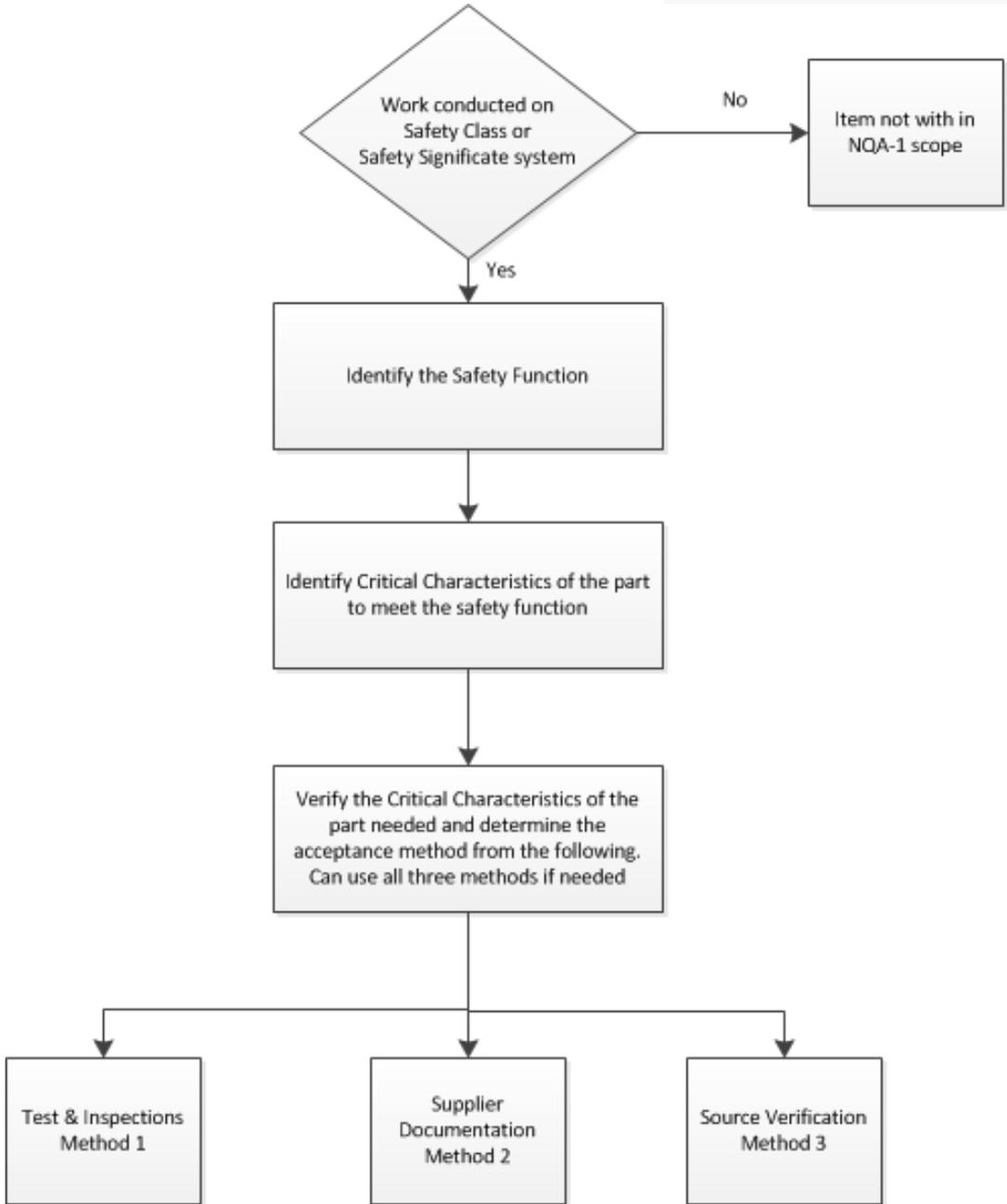
Example of CGD for items

Example form

Questions

**Commercial-Grade Dedication (CGD) for acceptance of commercial grade items procured under an ASME NQA-1 Quality Program.**

# CGD Process



## CGD Process

**Overview:** CGD consists primarily of an Engineering evaluation to establish critical characteristics for acceptance based on the safety function(s) of an item. Dedication is performed on items obtained from a Supplier who does not have a Nuclear QA Program.

**Major Steps in the Dedication Process:**

- Clearly identify the item
- Bound the application.
- Research the design to identify the safety function(s), the service conditions and the design margin.
- Clearly identify the safety function(s) as it relates to the item.

# CGD Process

## Key Elements:

1. Clear identification of the safety function(s) and their importance to nuclear safety.
2. A listing of critical characteristic(s) of the item necessary to ensure performance of the safety function(s).
3. Clear and specific identification of acceptance criteria and how the item will be verified.
4. Which method(s) will be used to verify each critical characteristic.
5. Documentation of the commercial grade item dedication process must be traceable to the item.

## CGD Process

The Dedication Method(s) Chosen:

- Should be the most cost-effective means for verifying the selected critical characteristics.
- Determine when and how the critical characteristics will be verified.
  - How much is enough?

The extent of the technical evaluation and the rigor applied to the acceptance process are both commensurate with the importance of the item to nuclear safety. This decision is based on engineering judgment. It is important to document this basis.

## CGD Process

The output of the dedication planning should include specific information that is able to be directly used by the organization performing the acceptance activity.

**DON'T** – State “Test valve to NFPA 13”

**DO** – State “Perform a hydrostatic test of the valve body at 200 psi. Hold the pressure for 2 hours then inspect for leakage. No leakage is allowed.”

# Safety Function

- Safety function(s) of structures, all systems, and some components is determined during hazard and accident analysis during the development of the design basis.
- Safety function(s) are based on the design basis and regulatory requirements to prevent/mitigate radiological and chemical releases to the public and collocated worker.
- The safety function(s) of parts of assemblies are evaluated based on the contribution of the part to the host component's safety function(s).

# Safety Function

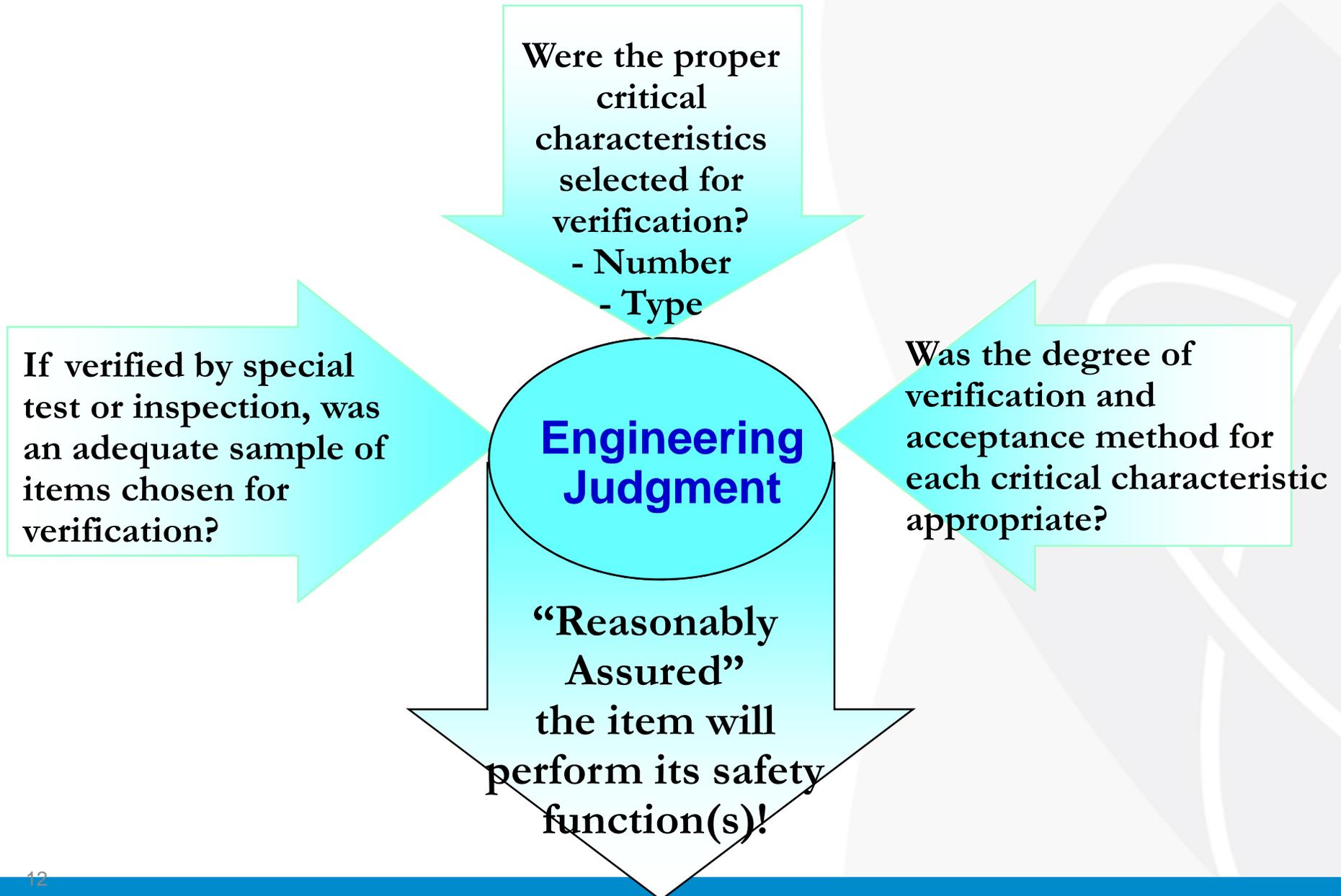
- **Recommended Methodology for Determining Safety Function(s):**
  - Review documents such as Technical Safety Requirements (TSR)s, System Design Descriptions (SDDs), Criticality Safety Evaluations (CSEs), Documented Safety Analyses (DSA), supporting Design Analyses and Calculations (DACs)
  - Engage Subject Matter Experts (SMEs) when questions arise or when safety function(s) are not clearly defined
  - Failure Modes and Effects Analysis and/or Single Point Failure Analysis

# Safety Function

For each item:

- Determine the importance of the item to nuclear safety.
- Consider the consequences of the degradation or failure of the item on the safety function(s) of the host component, system, or structure.
- Consider the likelihood of failure, degradation, or failure evaluation
- The likelihood of failure is based on the severity of the application, the environmental and seismic service conditions, and the design margin.

## Reasonable Assurance



## Reasonable Assurance

Is it reasonable that the acceptable performance of the critical characteristic(s) ensures the performance of the safety function(s)?

Example 1:

Is it reasonable that fire penetration seal material is valid and perform its function?

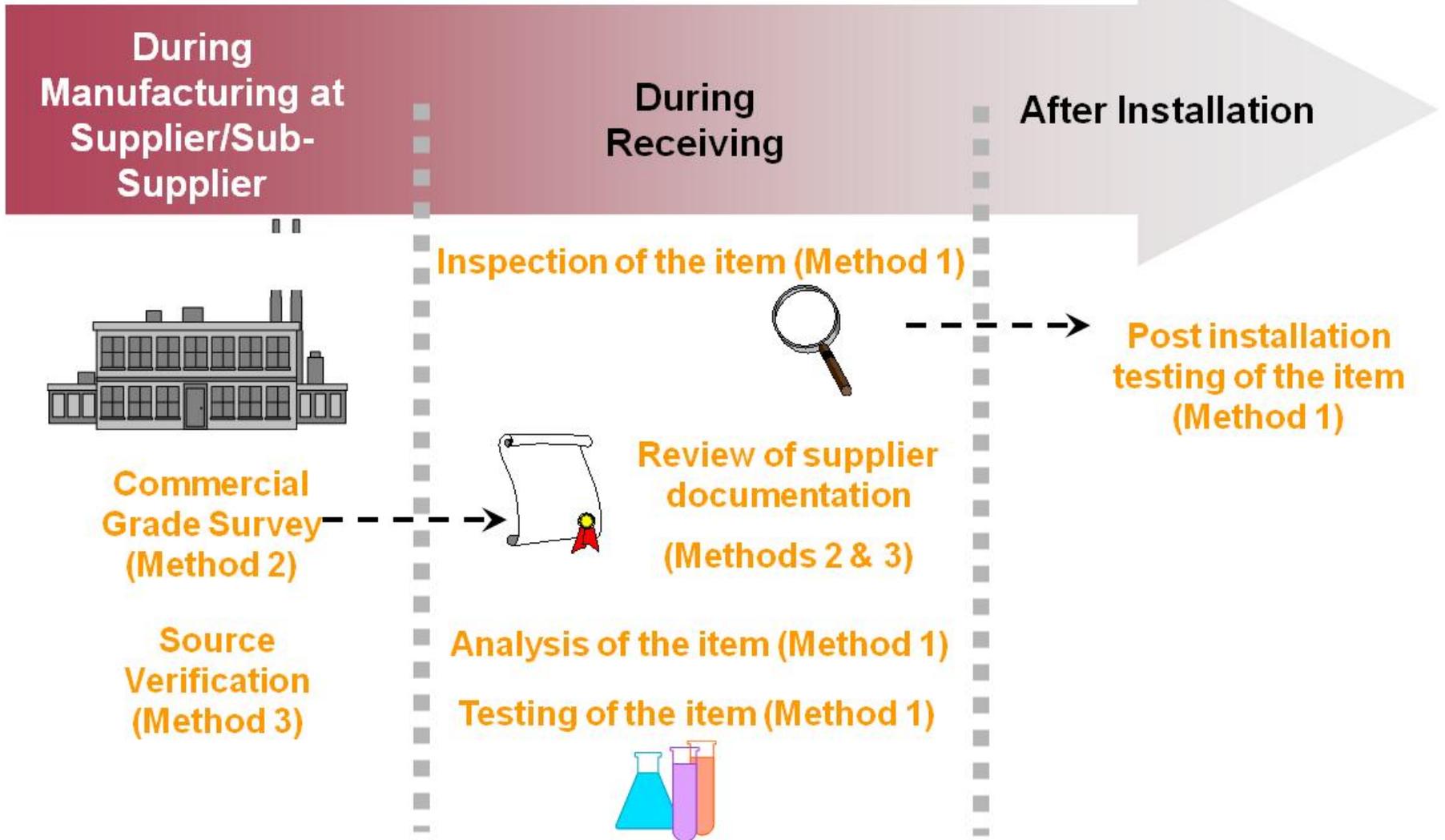
Verify test method meets need of fire barrier. 2 hours for temperature or just flame or smoke penetration?

What is the needed safety function?

Verify third party testing? NRTL.

Verify listed when item is procured from third party? Eliminates need to validate documentation from manufacture.

# Technical Evaluation



## Technical Evaluation

Concentrate on failure mechanisms of items directly related to the safety function(s).

- If the safety function is pressure boundary, consider mechanical failure mechanisms.
- If the safety function is fire suppression vs. control

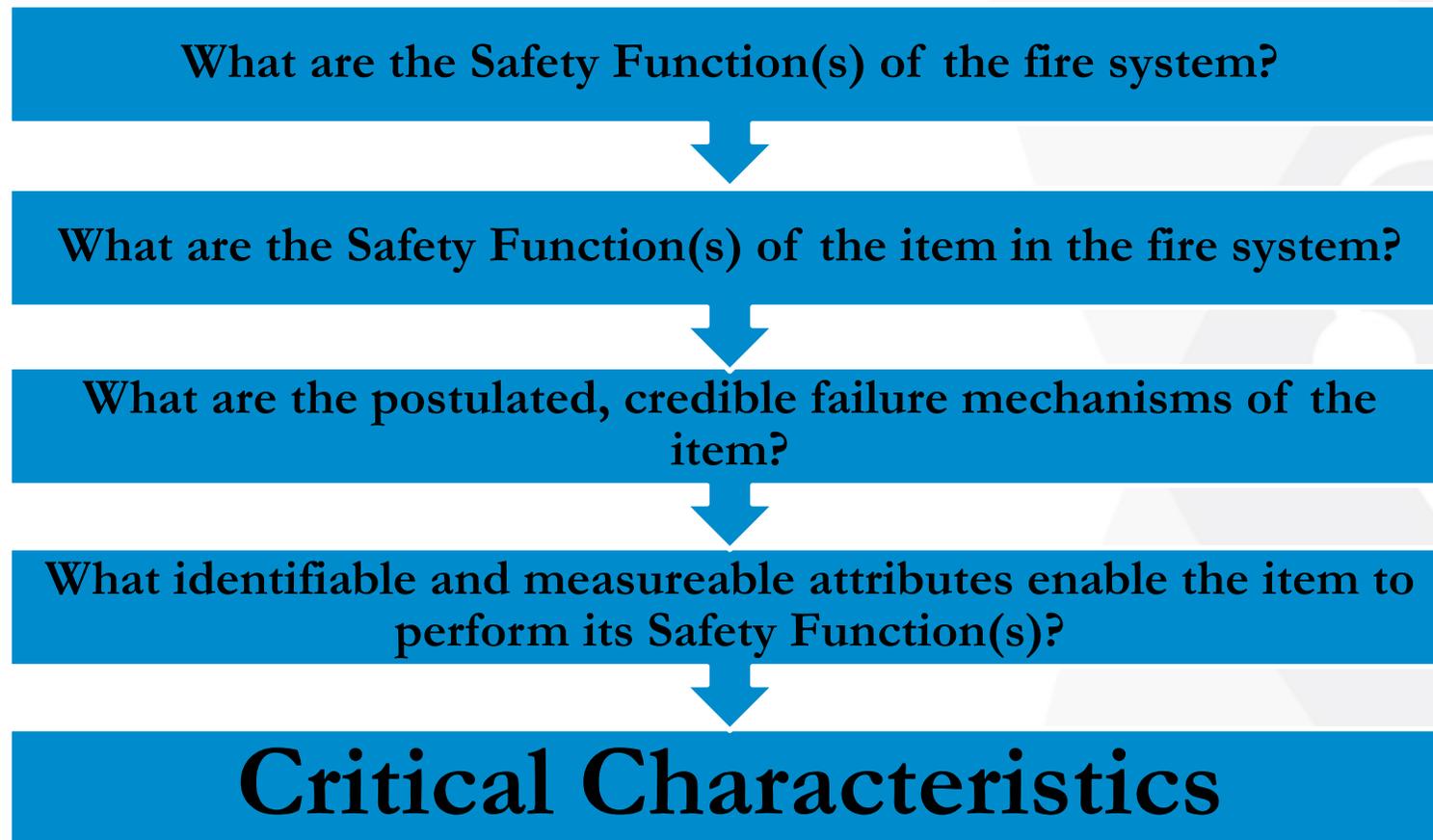
What design densities are needed?

What tolerance does the design have compared to the Documented Safety Analysis/FHA?

What is needed for temperature activation and time for fire suppression/controlled?

## Technical Evaluation

Process for determining Critical Characteristics that must be verified under CGD:



# Technical Evaluation

## Critical Characteristics

- Important design, material, and performance characteristics of a commercial grade item, once verified, will provide reasonable assurance that the item will perform its intended safety function(s).
- General Types:
  - Product Identification
  - Physical Characteristics
  - Performance Characteristics
  - Dependability

## Technical Evaluation

### Critical Characteristics (CC) GOOD EXAMPLE

OS&Y valve on safety class system

**Safety Function:** Water flow to sprinkler and Pressure boundary

**CC:** Valve fully opens and meets design flow

**Validation of CC:**

1. Operate valve to verify valve fully opens before installation
2. Verify size of valve meets calculation

**CC:** Valve does not have external leaks

**Validation of CC:**

Hydrostatic testing after installation valve does not leak.

# Technical Evaluation

## Critical Characteristics

### BAD EXAMPLE

Safety Function: Material required to be non combustible

Only CC was to Receive Certificate of Conformance on material.

No requirement to validate the CoC

### RESULT

Manufacture provided CoC of material from supplier not actual testing results.

## Technical Evaluation

### Critical Characteristics

#### GOOD EXAMPLE

Safety Function: Piping supply adequate water

CC: HDPE Piping required bend test after welding.

During the bend test to verify material and weld was acceptable the pipe failed.

Pipe did not pass testing and was rejected before ever going in the ground.

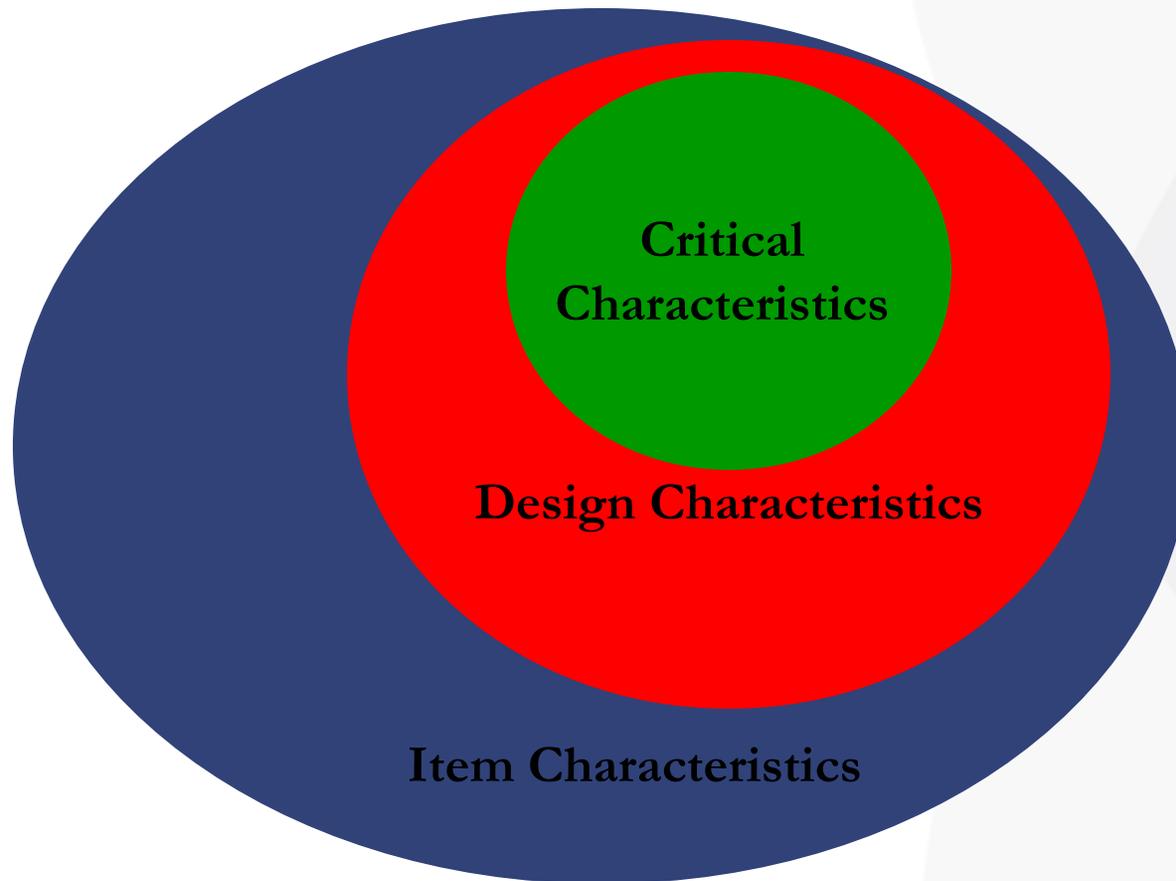
The CC worked to provide the safety function of the system.

Pipe was UL listed.

# Technical Evaluation

## Critical Characteristics (Cont.)

Adequate Selection of Critical Characteristics



## Technical Evaluation

### Critical Characteristics

Be very specific in the CC.

Be specific on the safety function.

Post installation/Per startup testing maybe your most affective CC.

# Exampe CGD Form

**ACRONYMS:** ALD, Acquisition Level Determination; CGD, Commercial Grade Dedication; IDs, Identification(s); SSC, Structures, Systems, and Components

Dedication Report		
<b>ALD Number(s):</b> <input type="checkbox"/> Released for use <input type="checkbox"/> Released with Restrictions <input type="checkbox"/> Not Released	<b>Work Order/Project:</b>	<input type="checkbox"/> In stock item <input type="checkbox"/> Item currently on order <input type="checkbox"/> New item IDs and Requisitions <input type="checkbox"/> Construction Projects
<b>Safety Function:</b>		
<b>Technical and Failure Modes Evaluation:</b>		
<b>Sample Plan/Basis:</b>		
Critical Characteristic Attribute	Method of Acceptance	Method of Completion

## Questions / Comments

?

## Additional Resources

Important Free Documents at [www.epri.com](http://www.epri.com):

- EPRI 1008256, Rev. 1 “*Guidelines for the Technical Evaluation of Replacement Items in Nuclear Power Plants*”
- EPRI 1016157, “*Information for Use in Conducting Audits of Supplier Commercial Grade Item Dedication Programs*”
- EPRI 1016157, “*Information for Use in Conducting Audits of Supplier Commercial Grade Item Dedication Programs*”
- EPRI NP-5652, “*Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications*”
- EPRI TR-017218-R1, “*Guideline for Sampling in the Commercial-Grade Item Acceptance Process*”
- EPRI TR-102260, “*Supplemental Guidance for the Application of EPRI Report NP-5652 on the Utilization of Commercial Grade Items*”

## Additional Resources (Cont.)

Free Reference Documents at [www.epri.com](http://www.epri.com):

EPRI 1001452, *“Generic Qualification of Commercial Grade Digital Devices: Lessons Learned from Initial Pilots”*

EPRI 1003105, *“Dedicating Commercial Grade Items Procured from ISO 9000 Suppliers”*

EPRI 1003585, *“Generic Qualification/Dedication of Digital Components: Lessons Learned Beyond Initial Pilots”*

EPRI 1006842, *“Generic Qualification/Dedication of Digital Components”*

EPRI NP-6629, *“Guidelines for the Procurement and Receipt of Items for Nuclear Power Plants”*

EPRI NP-6896, *“Guidelines for Determining In-Storage Maintenance of Items for Nuclear Facilities”*

EPRI NP-7484, *“Guideline for the Seismic Technical Evaluation of Replacement Items for Nuclear Power Plants”*

## Additional Resources (Cont.)

MORE Free Reference Documents at [www.epri.com](http://www.epri.com):

EPRI TR-106439, *“Guideline on Evaluation and Acceptance of Commercial-Grade Digital Equipment for Nuclear Safety Applications”*

EPRI TR-107330, *“Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants”*

EPRI TR-107339, *“Evaluating Commercial Digital Equipment for High-Integrity Applications: A Supplement to EPRI Report TR-106439”*

EPRI TR-112579, *“Critical Characteristics for Acceptance of Seismically Sensitive Items (CCASSI)”*

## Additional Resources (Cont.)

Reference Documents Requiring Purchase at [www.epri.com](http://www.epri.com):

EPRI 1008034, *“JUTG Commercial Grade Item Technical Evaluations”*

EPRI 1009659, *“Generic Qualification and Dedication of Digital Components: Project Status and Lessons Learned”*

EPRI 1011383, *“Generic Qualification/Dedication of Digital Components: Summary of 2004 Generic Qualification Activities”*

EPRI TR-101752, *“Guideline for Using Items Manufactured to Other Industry Standards in Nuclear Safety-Related Applications”*

## **Additional Resources (Cont.)**

**NRC Generic Letter 89-02, *Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products***

**NRC Generic Letter 91-05, *Licensee Commercial-Grade Procurement and Dedication Programs***

**NRC Inspection Procedure 43004, *Inspection of Commercial-Grade Dedication Programs***

**NRC Inspection Procedure 38703, *Commercial Grade Dedication***