

# Functional Safety A Reality Check in the World of Projects!



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*Thank you!*

- Nagappan Muthiah “Muthu”



**WOOD GROUP  
MUSTANG**

- 11 Years in Process Automation
- WGM - Functional Safety Discipline Technical Authority
- Licensed PE – Control Systems Engineering
- ISA 84 Committee - Voting Member
- CFSE Process Safety Advisory Board Member

# Wood Group Mustang – Functional Safety

## WGM Automation and Control Business Unit

- **Safety Lifecycle Services (ISA-84; IEC-61508/61511)**
  - Functional Safety Planning, Audits & Audit Compliance
  - PHA & LOPA Participation / Facilitation
  - LOPA, IPL Rationalization / Bowtie Analysis
  - Safety Requirements Specifications Development
  - SIL Verification Calculations, Fault Tree Analysis
  - Functional safety standards and procedures
  - Validation, Proof Testing Procedures
- **Safety Instrumented System Design and Integration**
  - Emergency Shutdown, Process Shutdown, Plant Protection
  - Fire & Gas Systems
  - Burner/Boiler Management
  - Testing and Commissioning
  - Operations Support



WOOD GROUP  
MUSTANG

# ISA84 - Functional Safety Standards

- ISA 84 / IEC-61511: Safety Instrumented Systems for the Process Industry Sector
- Performance based Specification
- Allows Operating Companies a measure of freedom to determine their own methodology in meeting the targets set by the standard.

Freedom also comes with its own Challenges!

# Challenges – Paper to Reality

1. Funding - ISA-84 SLC: Show me where it says we have to do all this?
2. S84 Compliance – Functional Safety Planning
3. S84 Compliance – Breaking the Silos
4. Safety Lifecycle is Continuous – Projects are Not!
5. Don't let “Best” be the enemy of “Good”

Challenges discovered based on Lessons Learned  
From executing Functional Safety Projects

# Challenge - 01) Show me where it says so?

Show me where it says,  
We need to do all this



ISA-84

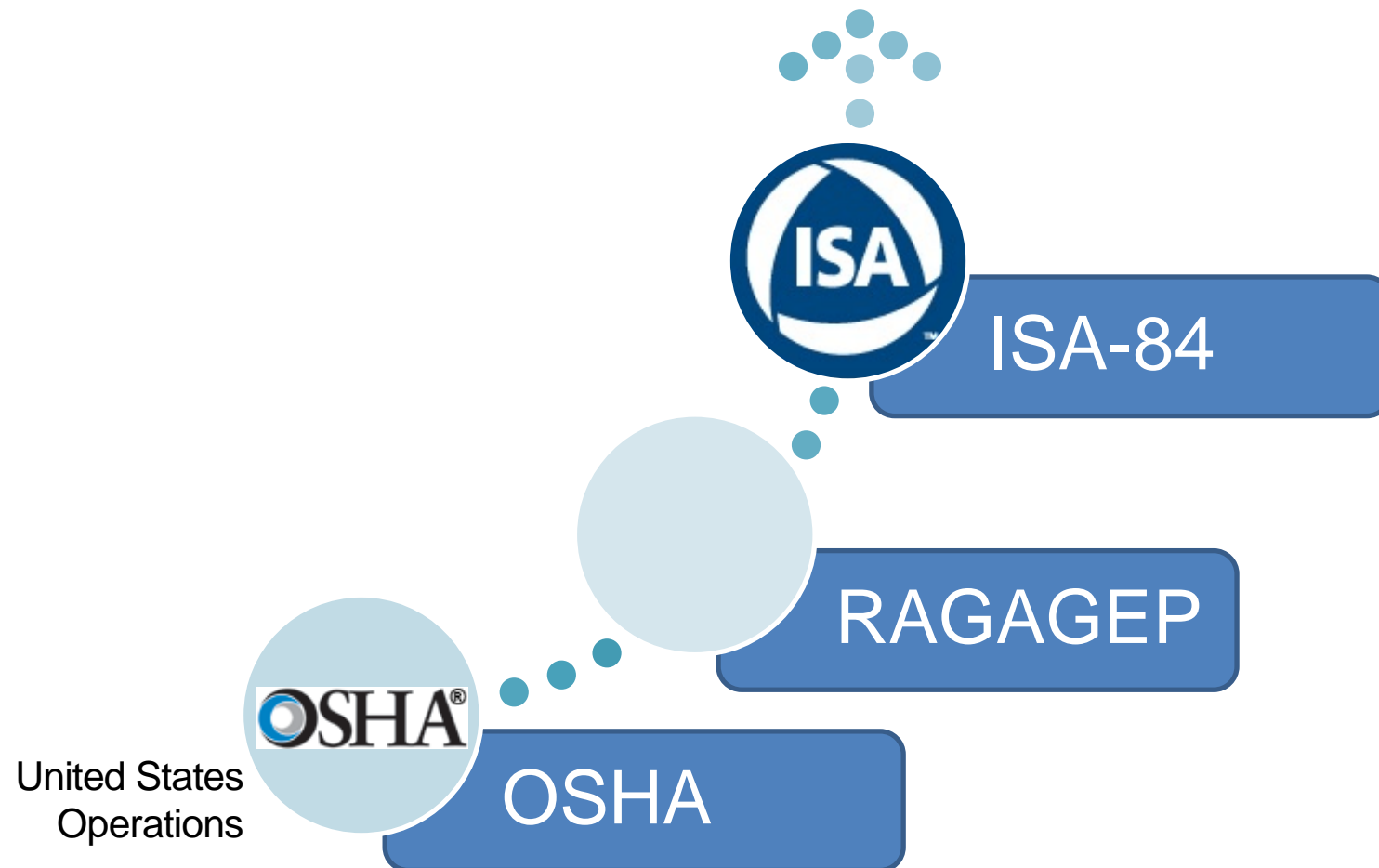


OSHA

United States  
Operations

# Challenge - 01) Show me where it says so?

Follow Safety Lifecycle Approach





# Challenge - 01) Show me where it says so?

## **1910.119(d)(3)(ii)**

The employer shall document that **equipment complies with recognized and generally accepted good engineering practices.**

## **1910.119(j)(4)(ii)**

Inspection and testing procedures shall follow **recognized and generally accepted good engineering practices.**

## **OSHA General Duty Clause:**

### SEC. 5. Duties

(a) Each employer --

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

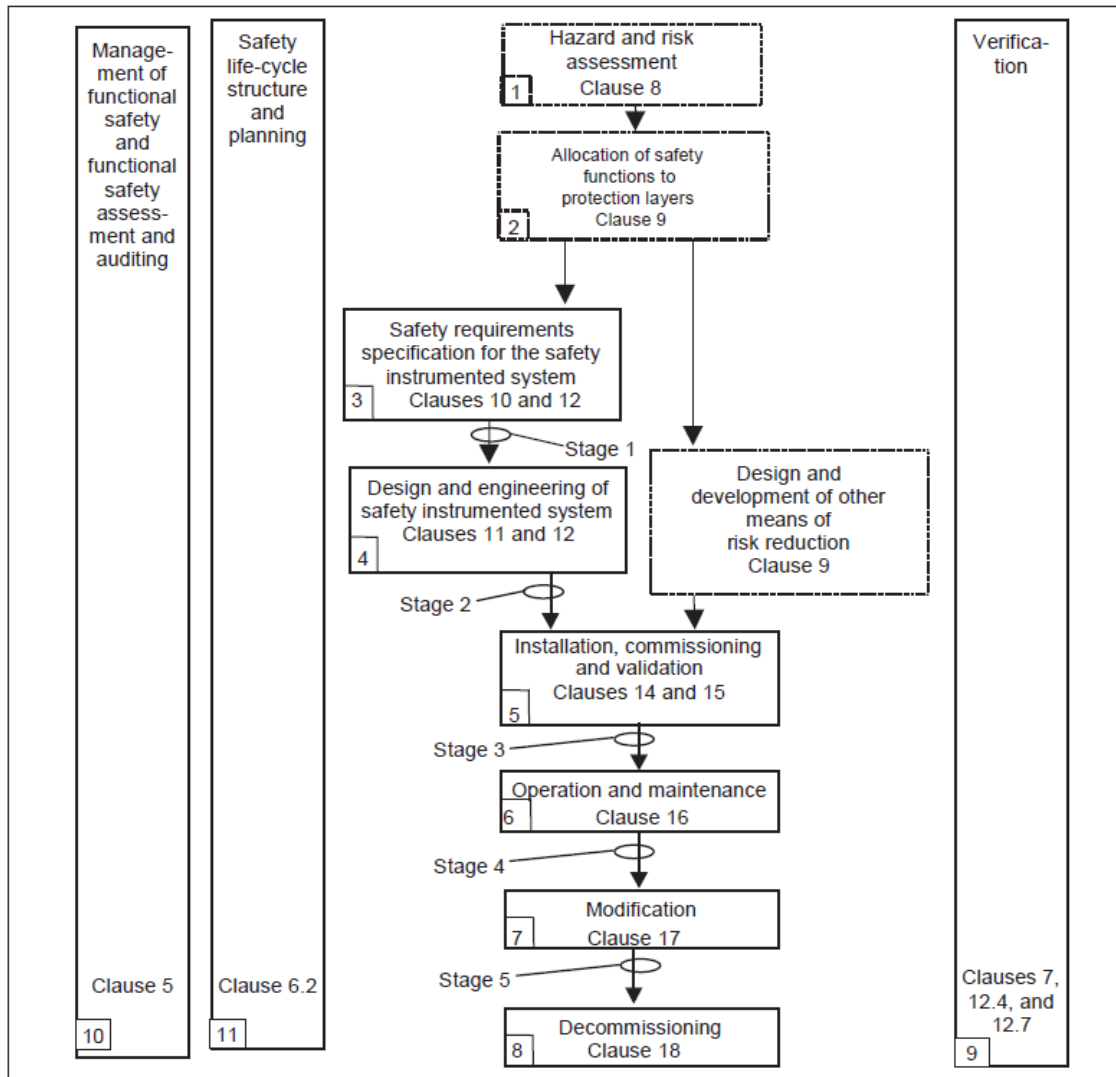
OSHA has sent letter to ISA conveyed that it considers ISA-84 as R.A.G.A.G.E.P

RAGAGEP: Recognized and Generally Accepted Good Engineering Practice

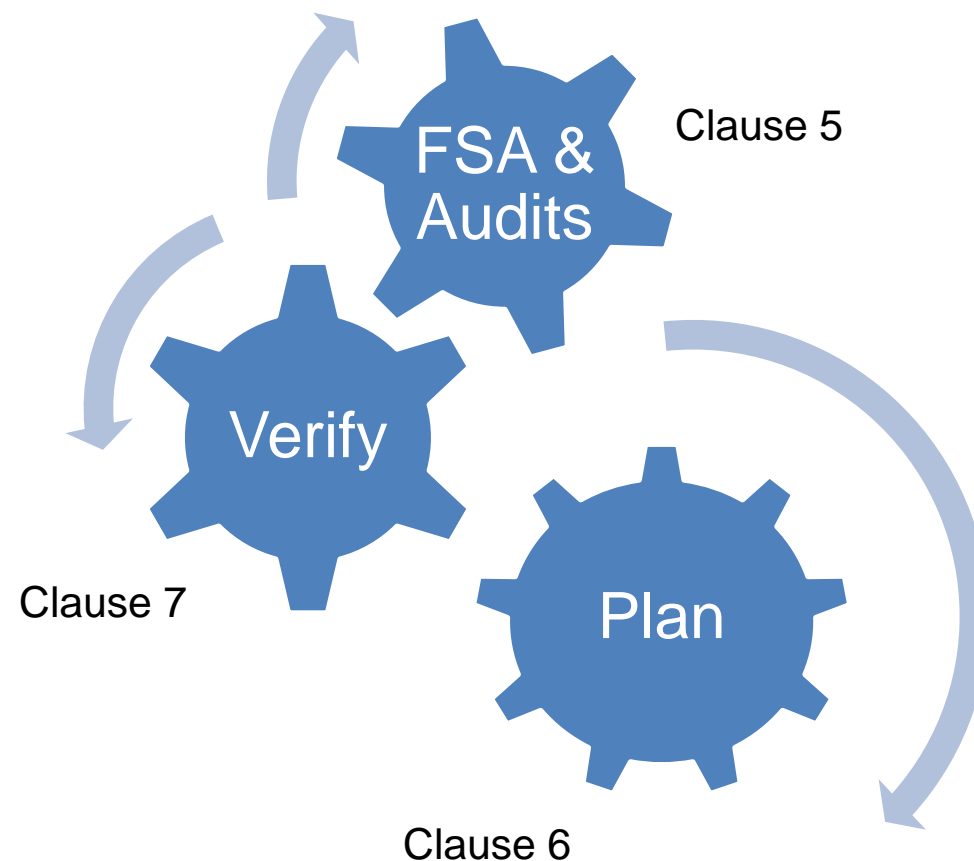
# Challenge - 02) Functional Safety Planning

ANSI/ISA-84.00.01-2004 Part 1 (IEC 61511-1 Mod)

4



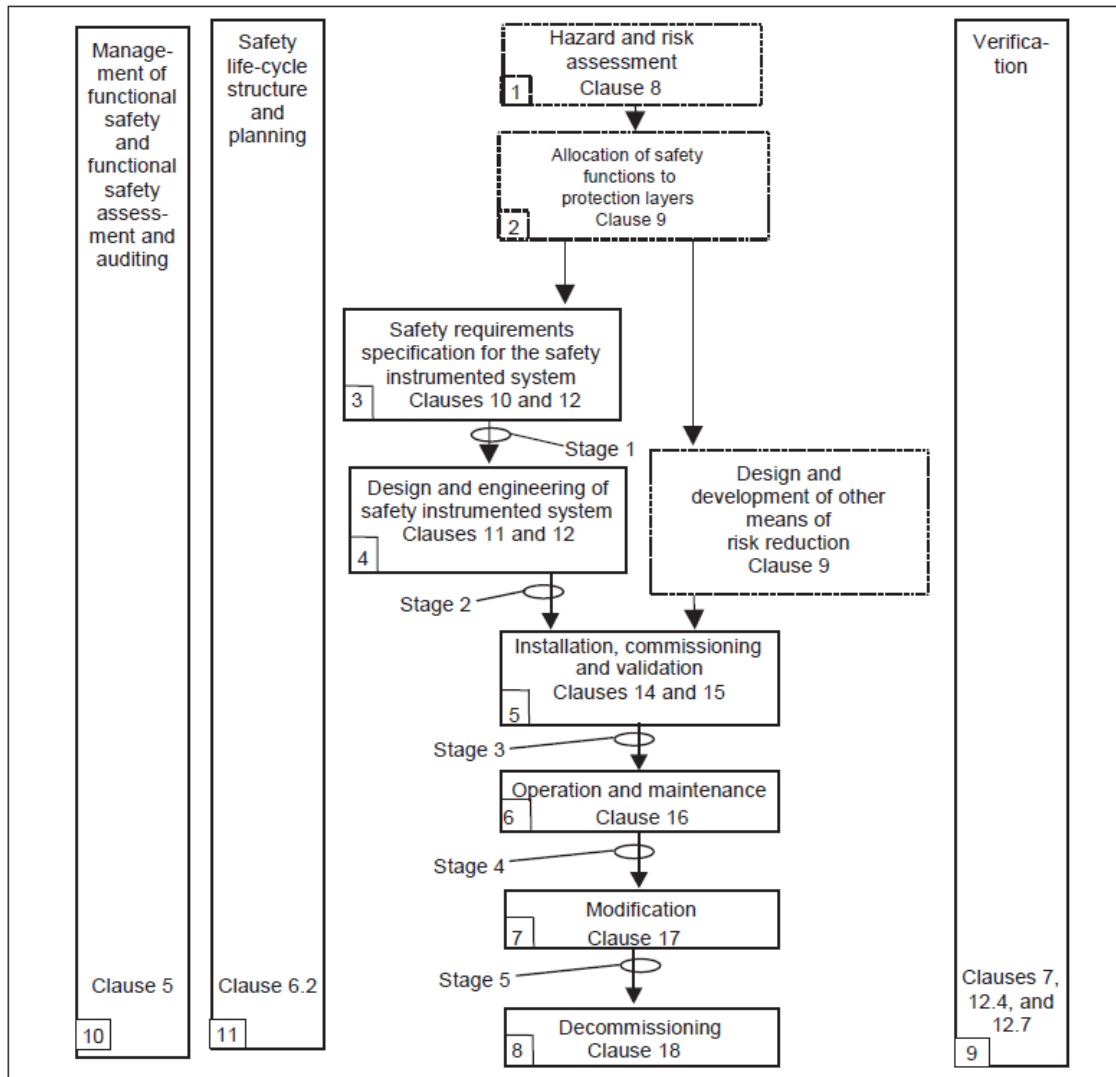
## Activities spanning the Entire Lifecycle



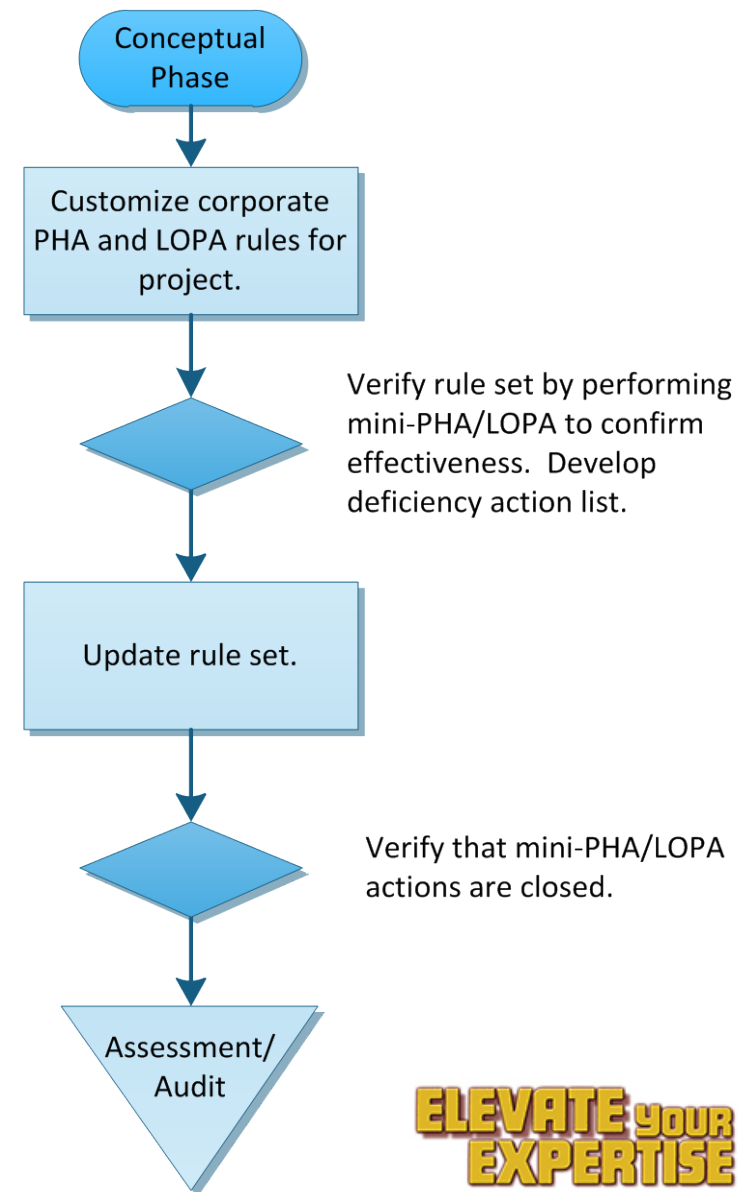
# Challenge - 02) Functional Safety Planning

ANSI/ISA-84.00.01-2004 Part 1 (IEC 61511-1 Mod)

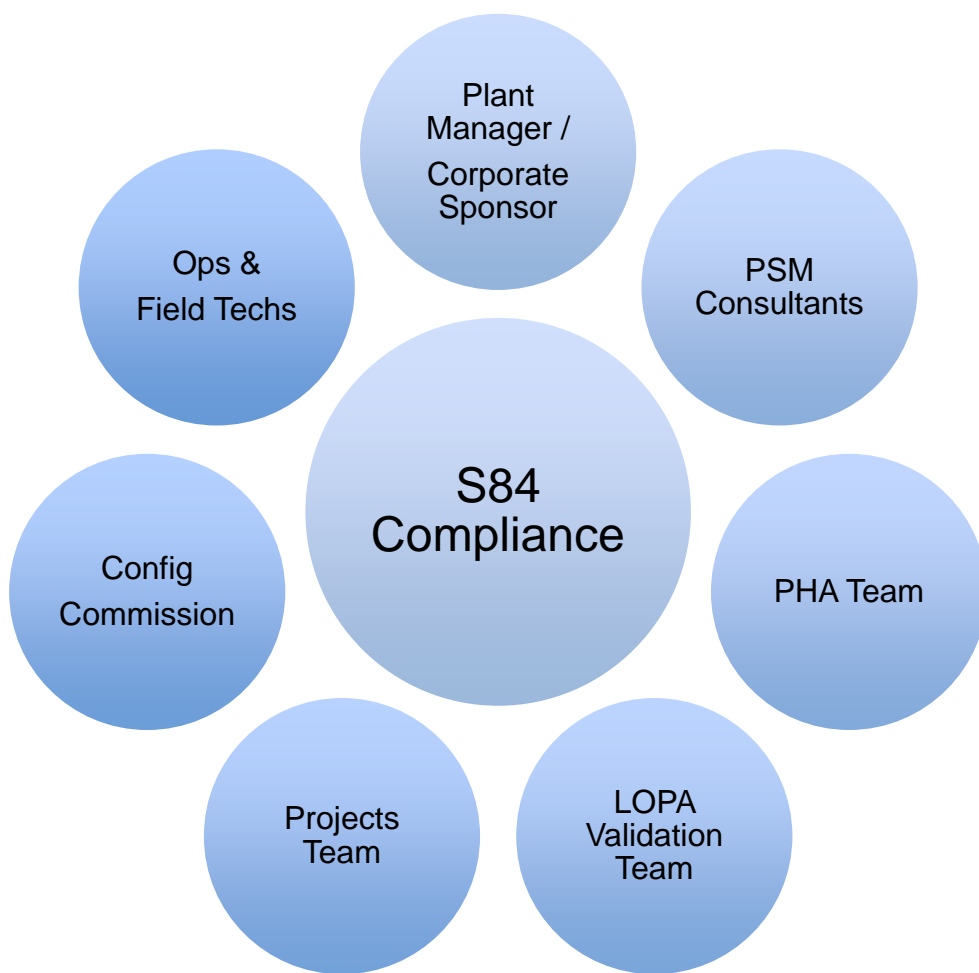
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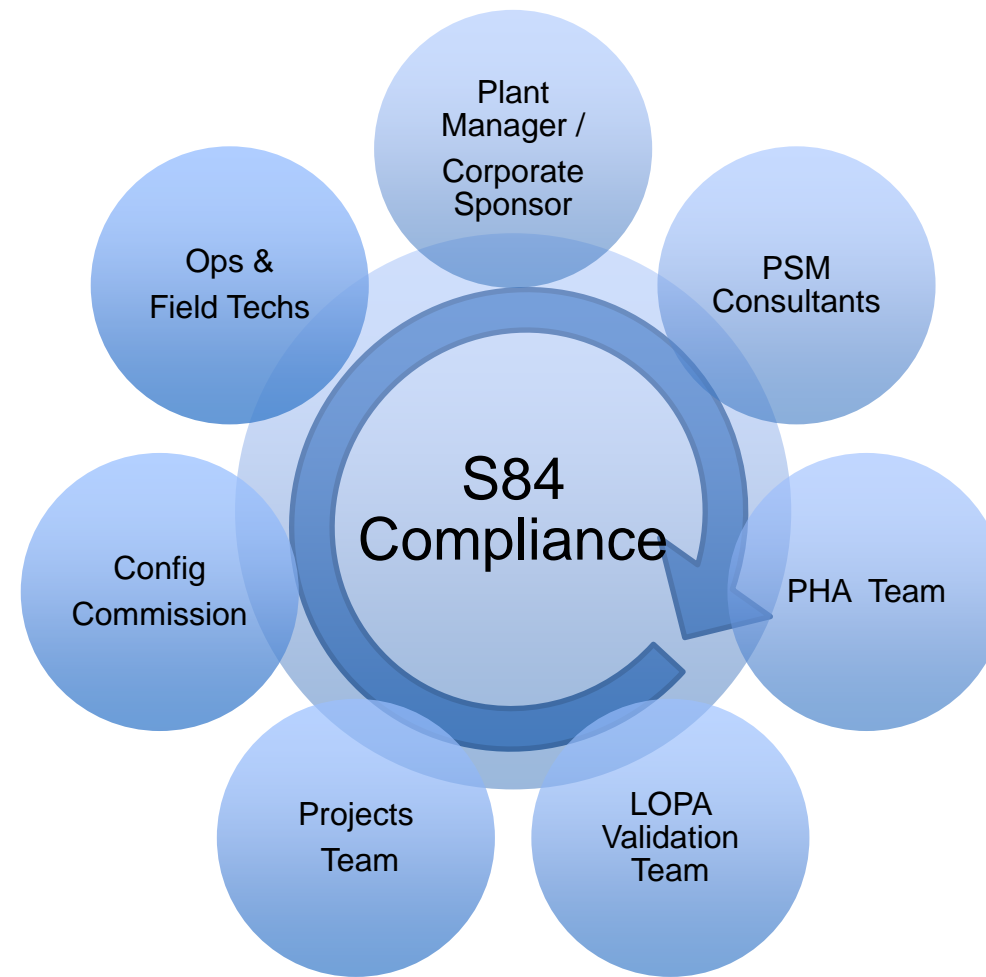
Convert Philosophical Requirements  
 To project specific Requirements



# Challenge - 03) Breaking the Silos

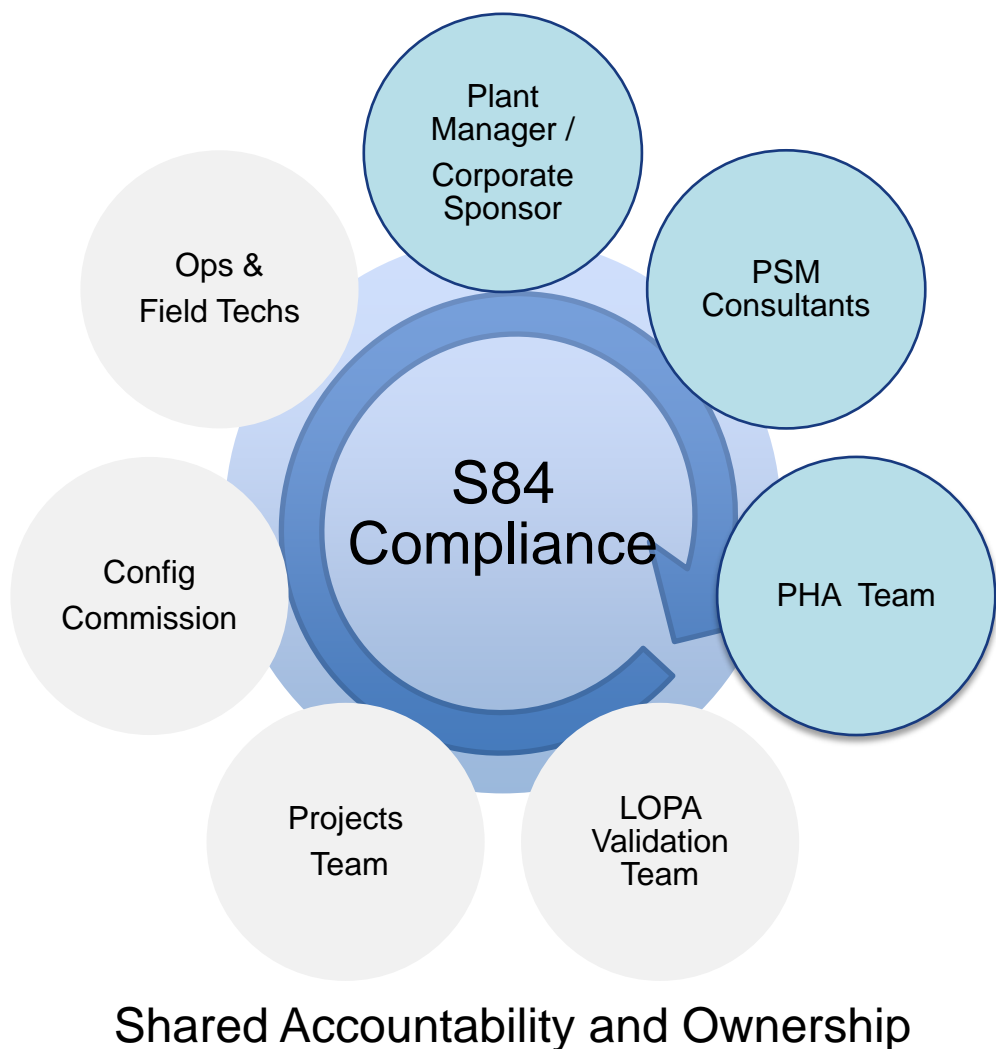


Silo Approach



Shared Accountability and Ownership

# Challenge - 03) Breaking the Silos



Management, PSM Consultants, PHA Team

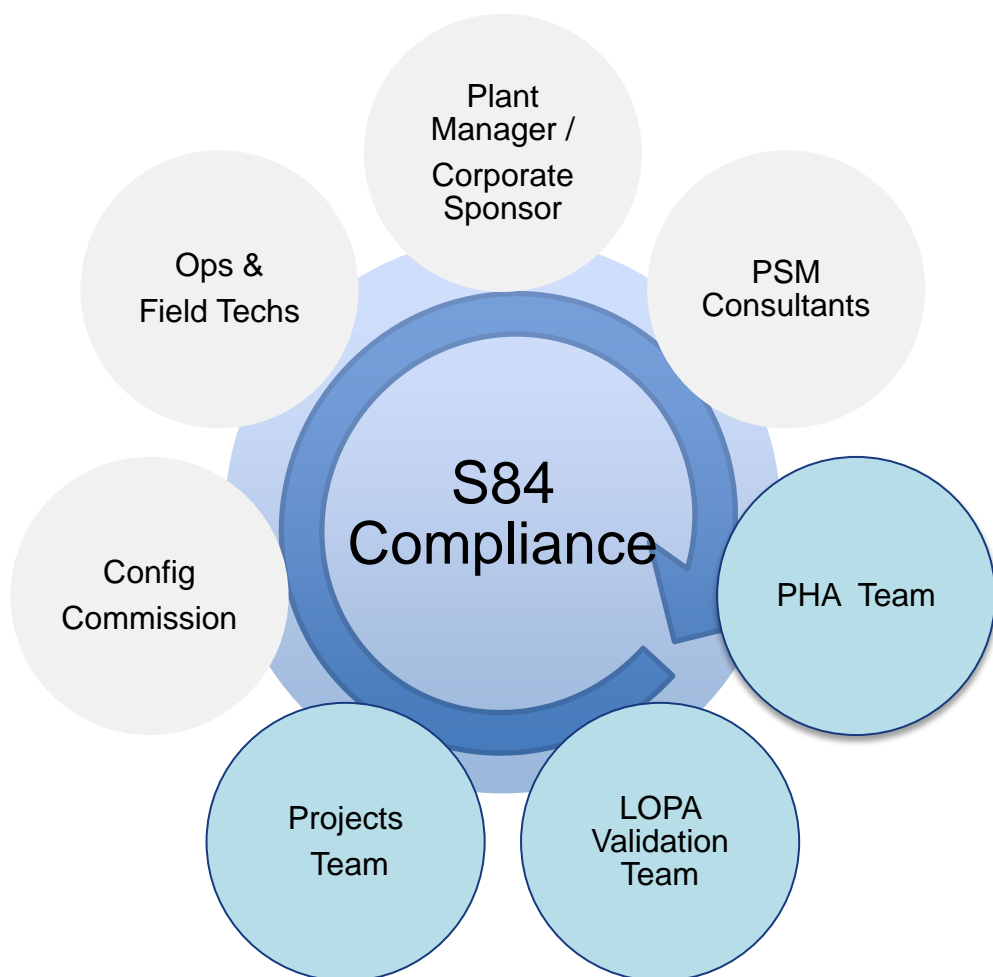
Establish Goals of PHA facilitation:

- 1) PSM Consultants to facilitate inputs from PHA Teams
- 2) All members of PHA team should contribute – Process, Operations, Safety Team

## Successful Results:

- PHA had better coverage
- Consequence categories better aligned with reality
- Invalid consequences eliminated

# Challenge - 03) Breaking the Silos



Shared Accountability and Ownership

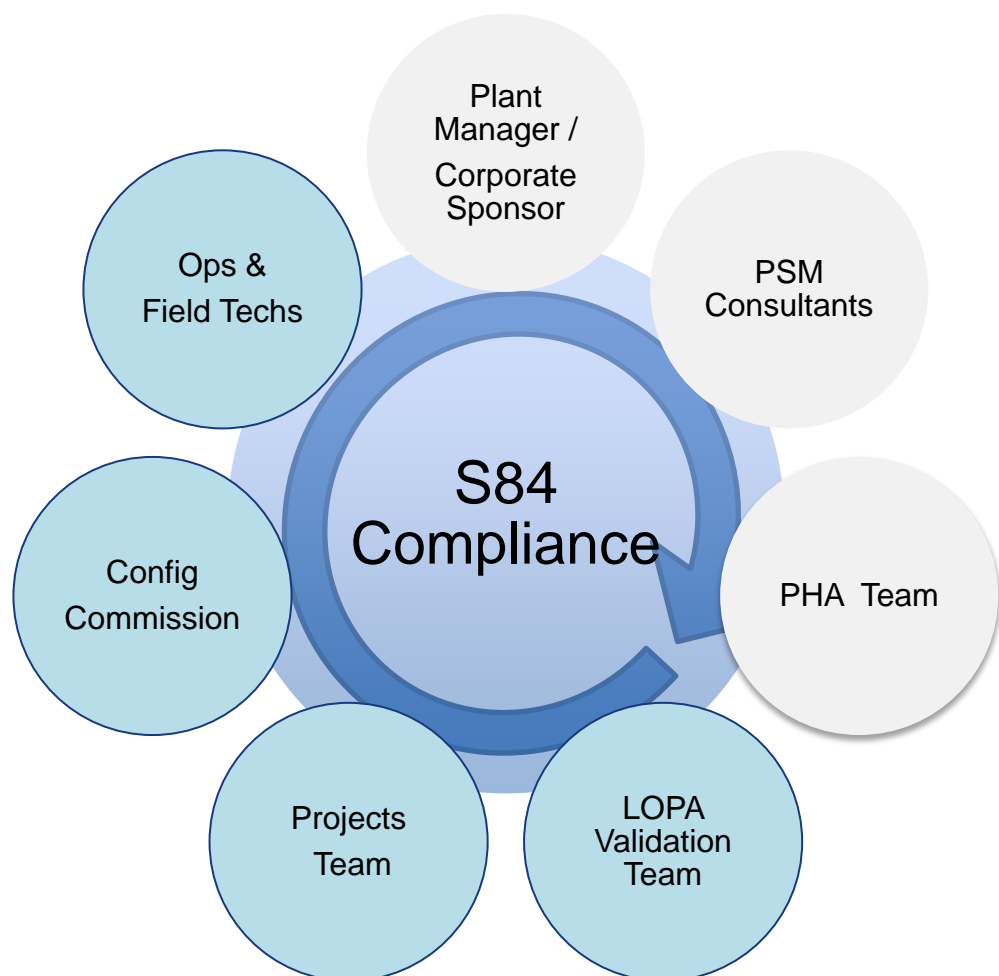
## PHA Teams and Projects Team

- 1) PHA / LOPA Documentation not just for passing OSHA Audits.
- 2) Documentation should be captured keeping Safety Lifecycle usability in mind.
- 3) Reports to provide useful information to Projects Team

## Successful Results:

- Project teams understood requirements faster
- HAZOP scenarios validity was not challenged
- Project scope was defined more effectively

# Challenge - 03) Breaking the Silos



Shared Accountability and Ownership

LOPA Validation Team, Projects, Configuration Team and Operations.

Always involve Process and Operations during SRS Definition.

- SIFs are not just about tripping
- Its important to keep the plant running!
- Consider Operability Factors
  - Reducing Spurious trips
  - Startup bypass requirements
  - Reset and Restart requirements

## Successful Results :

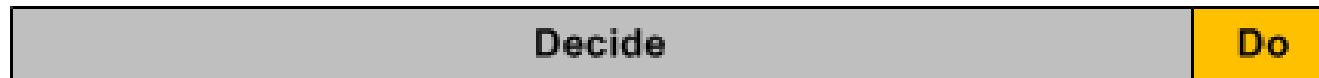
- Better SIF Design with reduced Spurious trip rate

# Challenge - 04) Safety Lifecycle vs. Projects

Safety Lifecycle is Continuous – Projects are Not!



The way it should be.



The way it usually is.

Miracle Required

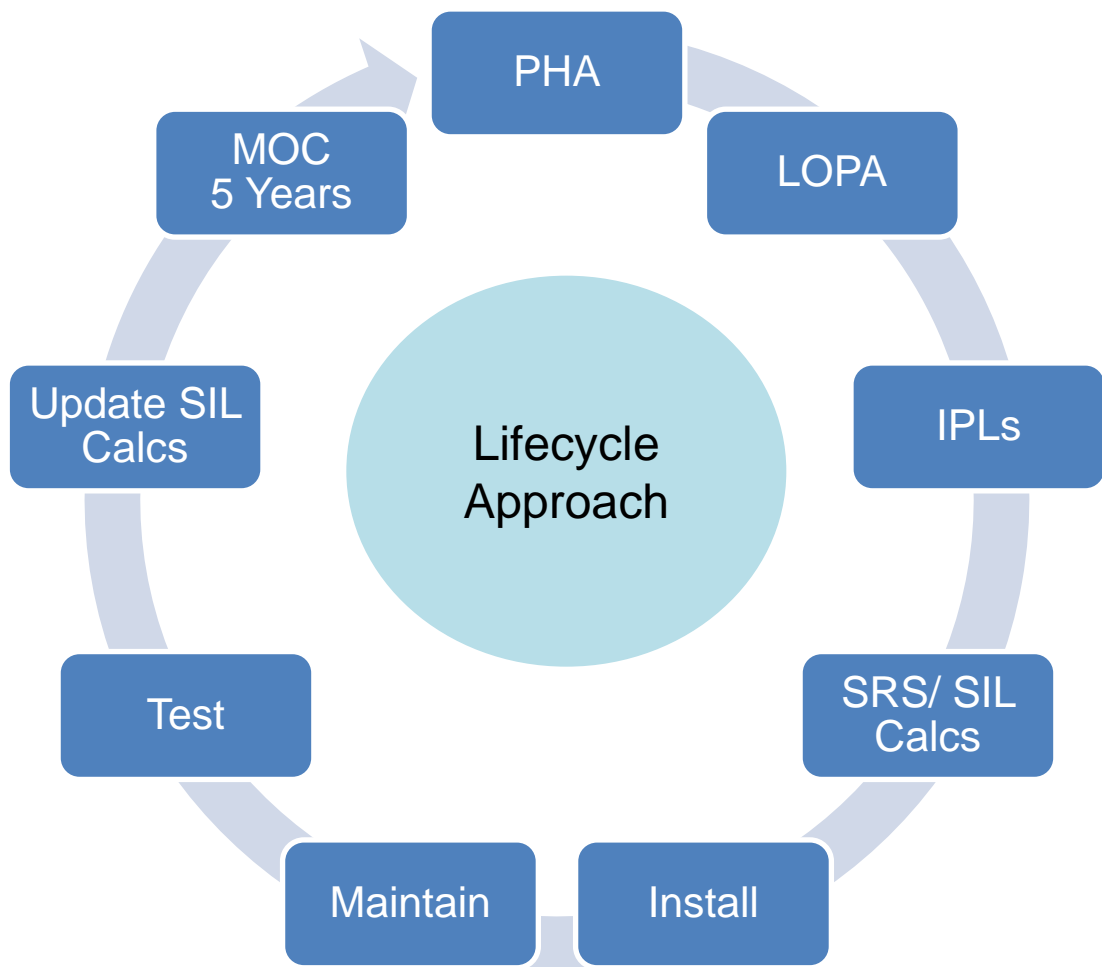
*Scott Adams (Dilbert)*

**Results:** Projects go Over-Budget with most of the money spent on Paperwork!

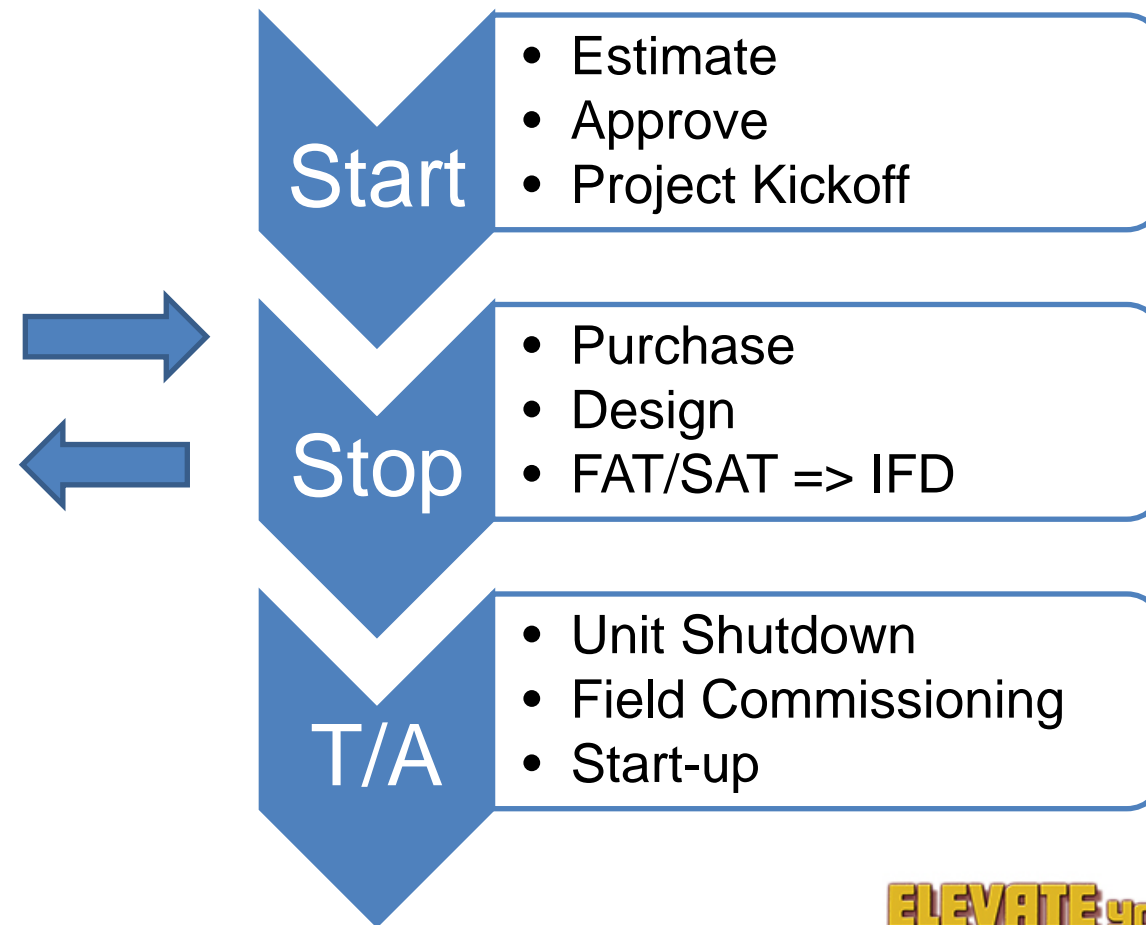


# Challenge - 04) Safety Lifecycle vs. Projects

## Safety Lifecycle Approach

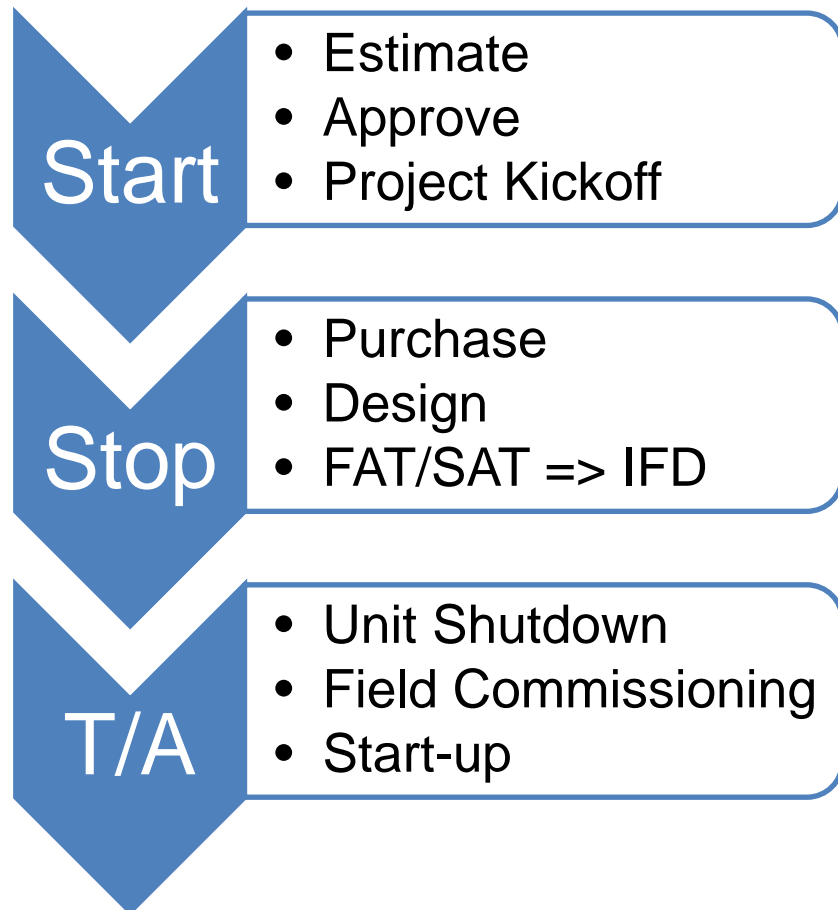


## Project Approach



# Challenge - 05) Best Design vs. Good Design

## Projects



Projects have finite budgets and finite schedule

Aiming for 100% Perfect Design on Paper and Stalling progress in Field

= 0% Safety

= Unsuccessful Project

Target Majority of SIF completion of Safety Design on Paper and Majority Safety Design in Field

= Majority of SIF's in place, process safety improved

= Successful Project

Address remaining Minority of SIFs in next project cycle

**Successful Results** : Projects on Schedule within Budgets!

# Business Results Achieved

- Successful in converting S84 philosophical requirements to work scope
- All Stakeholders Happy – Project Managers, PSM Compliance Team, Operators, Operations Manager
- Facilities are continuing to operate safely, meeting corporate risk targets, and effectively utilizing their resources

# Summary

1. S84 is considered RAGAGEP by OSHA
2. Functional Safety Planning => Project Specific Actions
3. Breaking the Silos => Start with the End in mind
4. Safety Lifecycle is Continuous – Projects are Not!
5. Don't let “Best” be the enemy of “Good” => Don't Stall Projects

# Where To Get More Information

- ANSI/ISA—84.00.01—2004 / IEC-61511 Series: Functional Safety: Safety Instrumented Systems for the Process Industry Sector
- [WWW.OSHA.GOV](http://www.osha.gov) – CFR 1910.119: Process safety management of highly hazardous chemicals.
- Process safety: Blind spots and red flags – Tom Shephard – WGM  
[http://www.woodgroup.com/SiteCollectionDocuments/news-tech-articles/2011-03\\_Process-safety-HydrocarbonProcessing\\_Mustang.pdf](http://www.woodgroup.com/SiteCollectionDocuments/news-tech-articles/2011-03_Process-safety-HydrocarbonProcessing_Mustang.pdf)
- Presenter Contact: [Nagappan.muthiah@woodgroup.com](mailto:Nagappan.muthiah@woodgroup.com)

# Thank You for Attending!

Enjoy the rest of the conference.



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