

# Willow Island Cooling Tower Collapse

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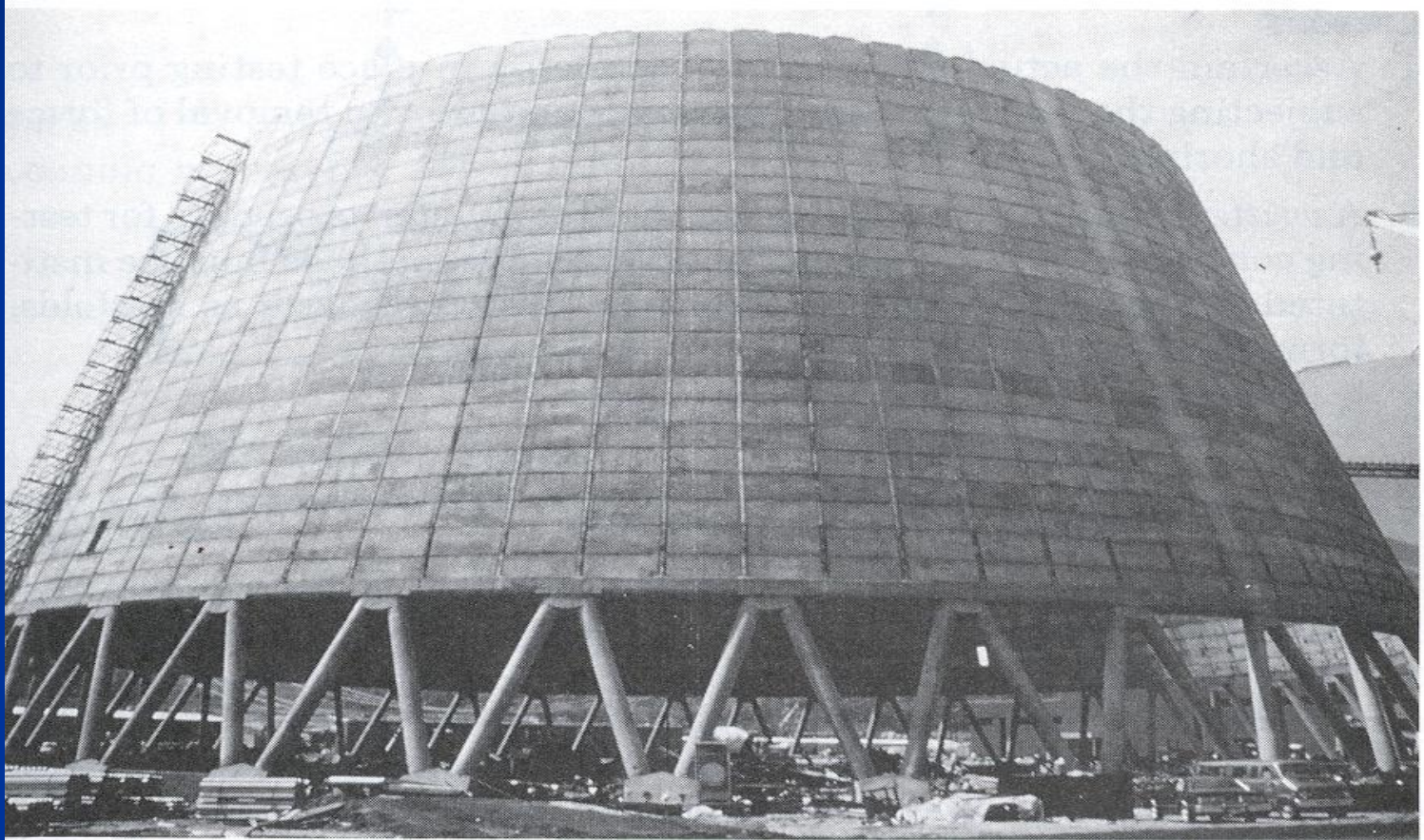
# Introduction

- Development of Failure Case Studies in Civil Engineering in US
  - N.Y. Times Square Scaffold Collapse
  - Chicago U. S. Post Office Construction Collapse
  - Harbour Cay Condominium Collapse
  - The John Hancock Tower Structural Failures
  - Rosemont Horizon Arena Roof Collapse
  - Northridge Effect on Welded SMRF
  - **Willow Island Cooling Tower Collapse**

# Background

- Why is Important to Study Failures as Well as Successes?
  - **Prevention**
- Literature Review

# Worst Construction Accident in American History

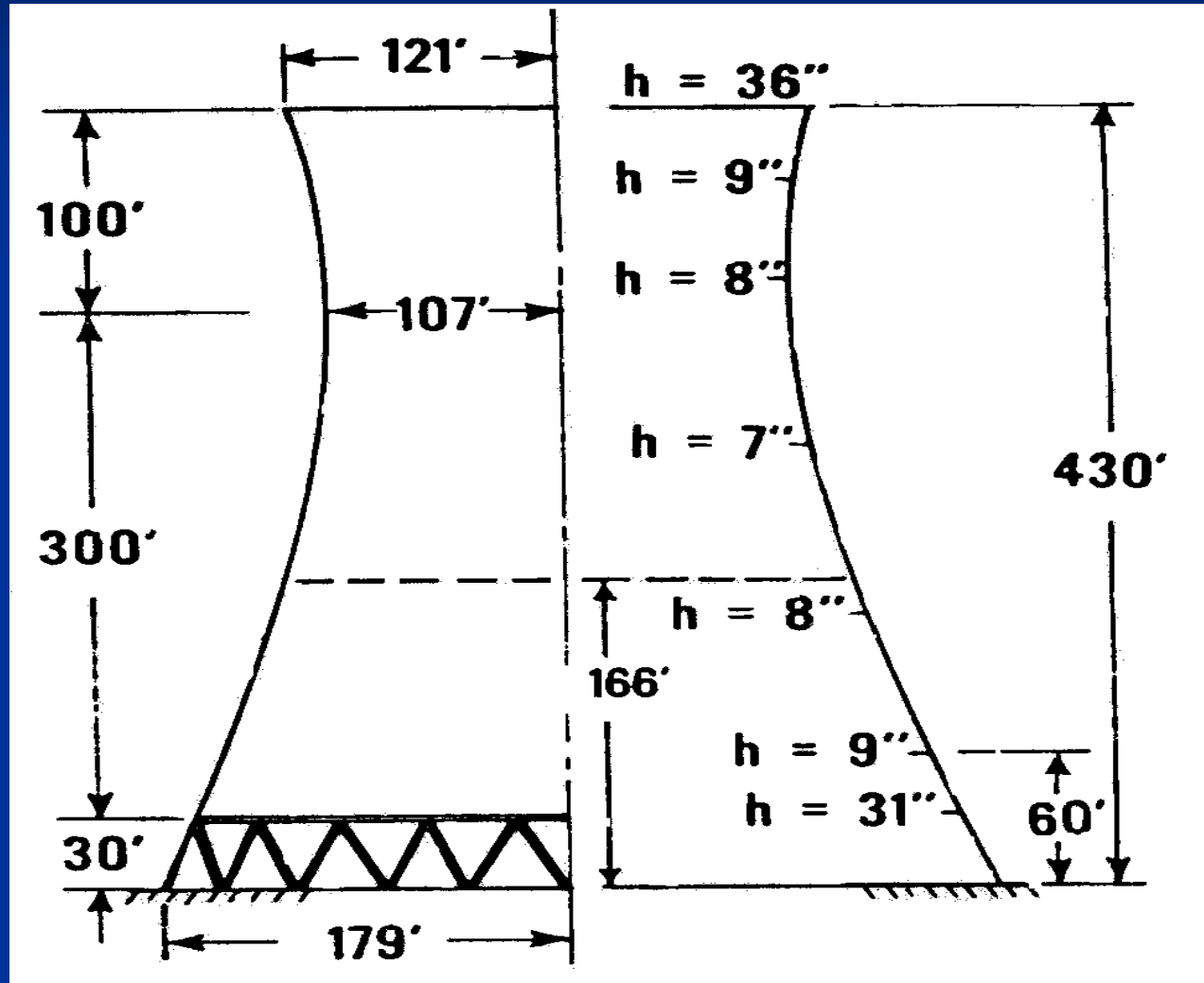


W. I. Cooling Tower Collapse

# Cooling Tower Description

- Coal Fired Power Plant
- Hyperbolic Shape
- Reinforced Concrete Shell
- 430 ft. Tall, 358 ft. Diameter

# Concrete Cooling Tower



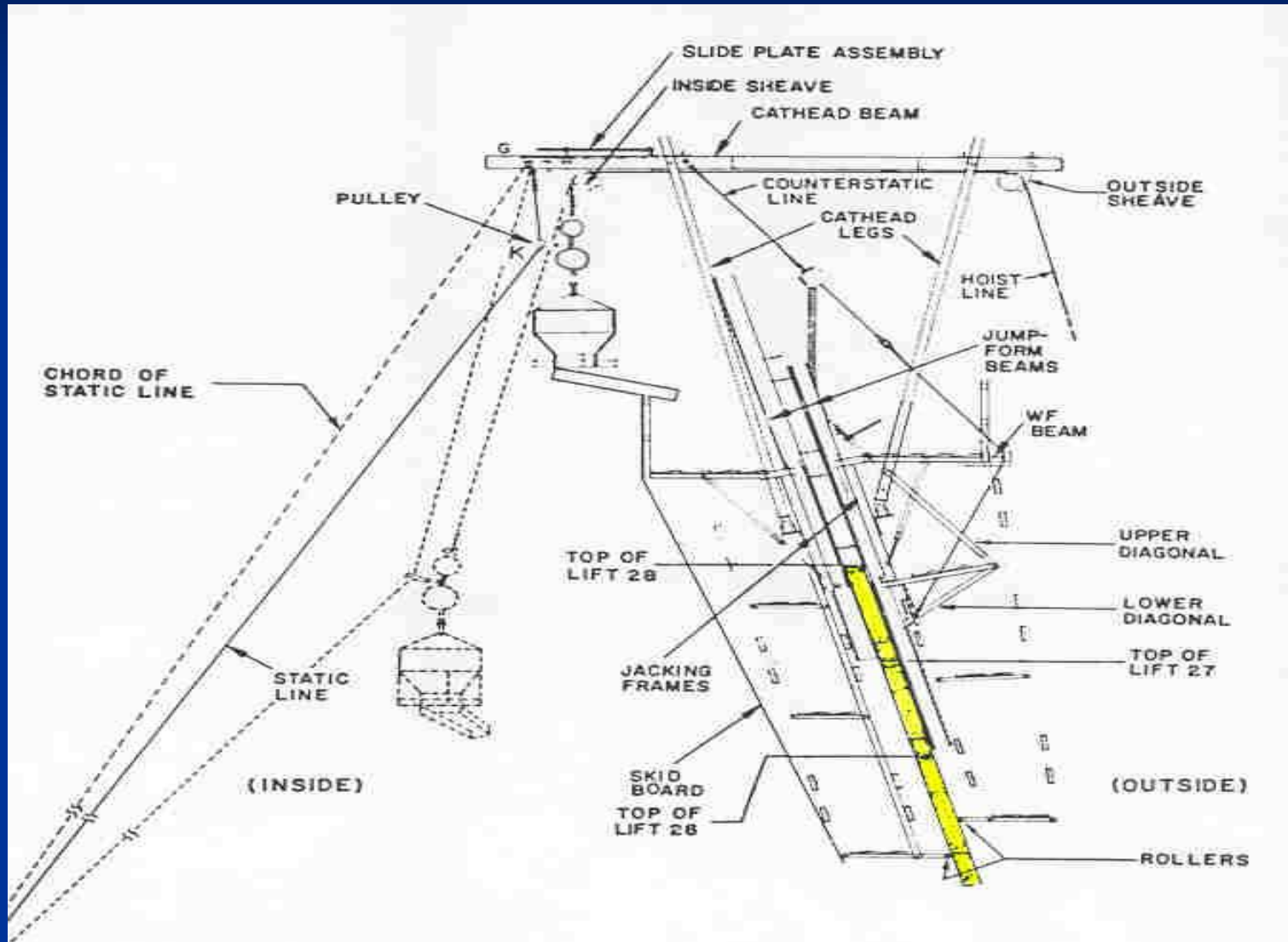


# Construction Method

## Willow Island Cooling Tower

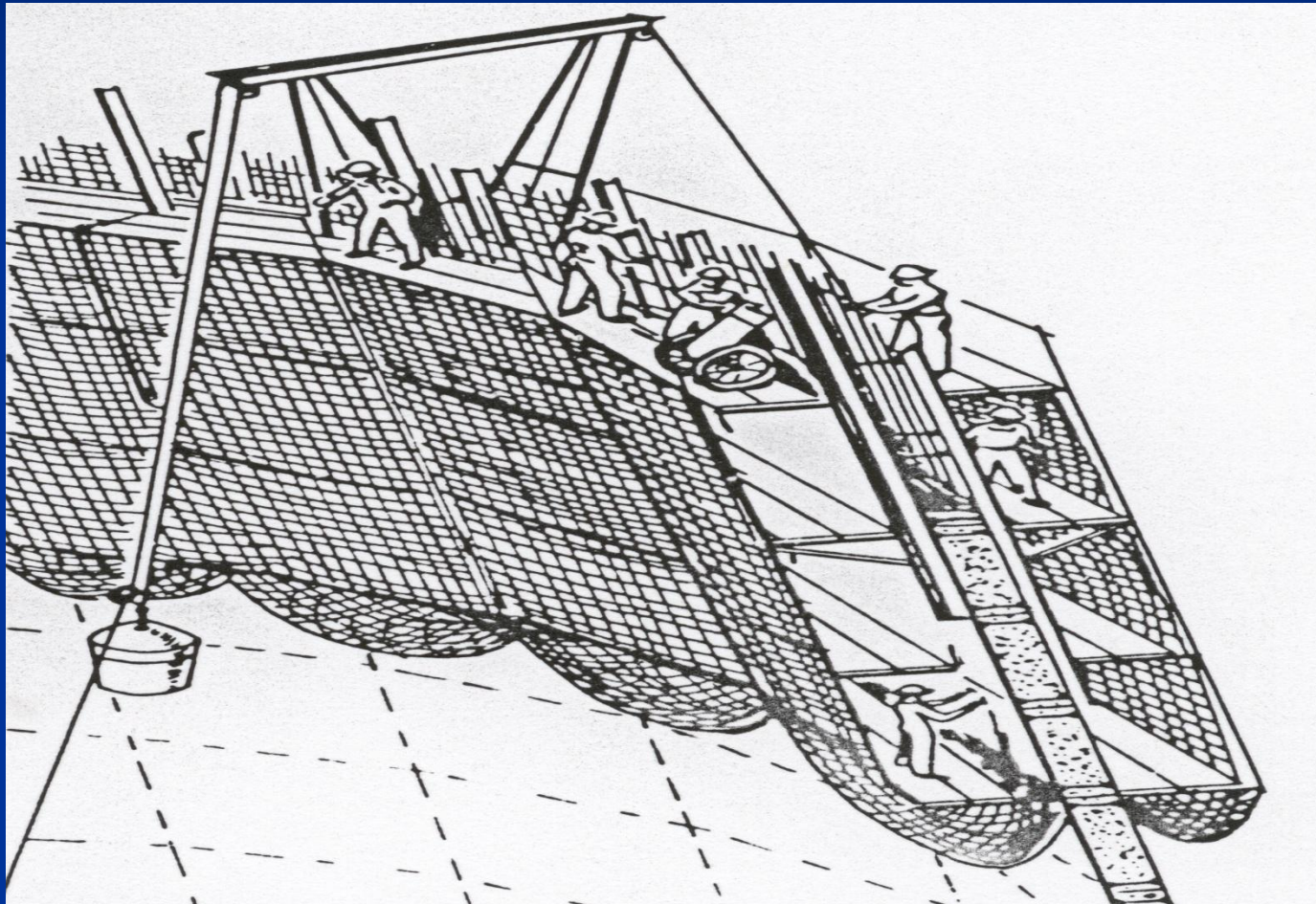
- Patented Lift-form Technique
- 5 foot Lift Per Day
- 28 lifts had been completed
- Anchoring of the temporary structure to recently poured concrete

# Construction Method





# Scaffolding Lift-form System



# Collapse

- April 27, 1978, 10:00 a.m.
- Top portion of the concrete shell collapsed inward
- Scaffolding and working platforms also collapsed
- All 51 workers were killed

# Collapse



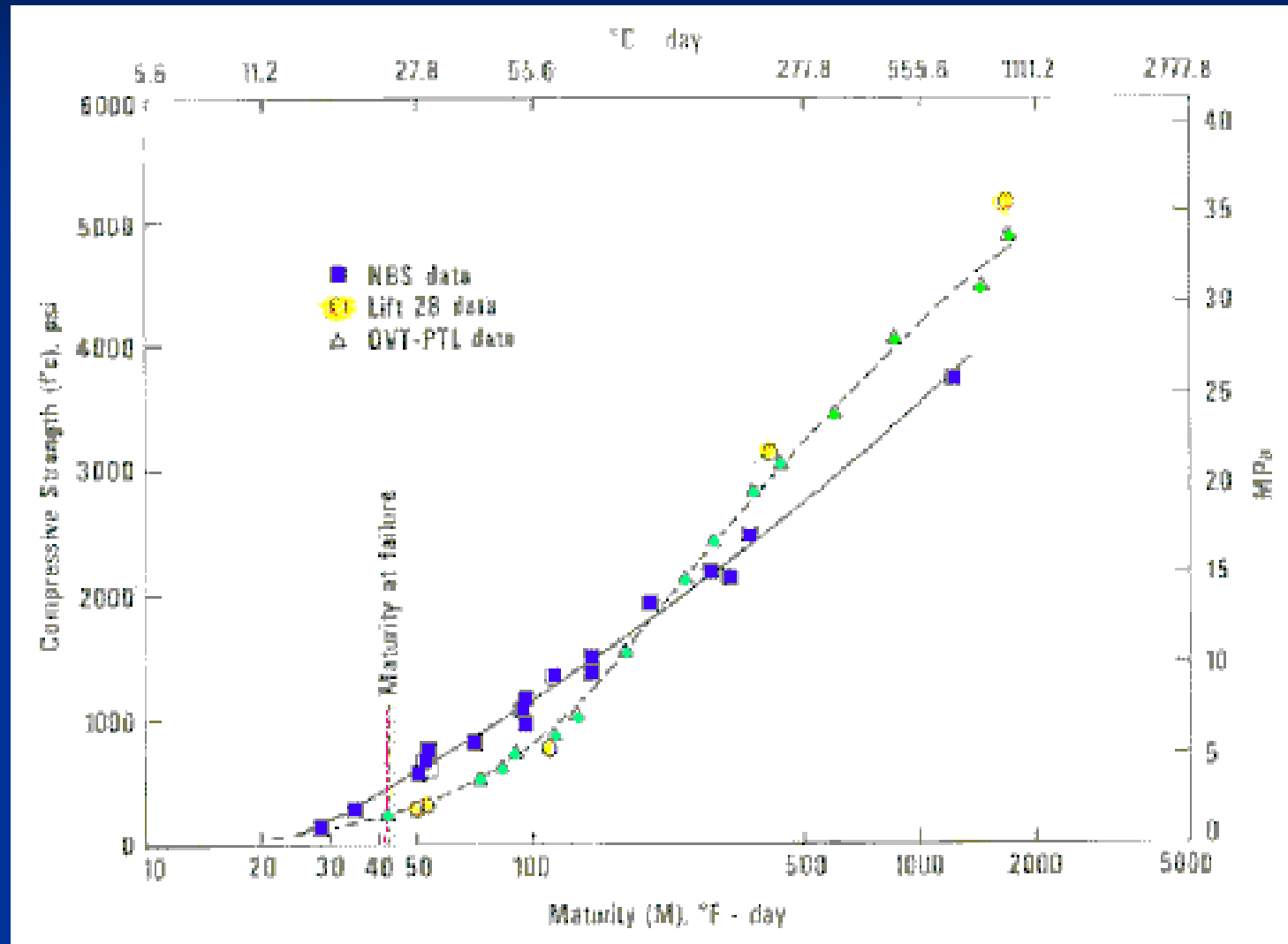
# Failure Investigation

## ■ On-Site Investigation

- Interviews
- Laboratory Tests
- Computer Analyses

## ■ Inadequate Strength of Lift 28 on Concrete Shell to resist Construction Loads

# Concrete Maturity



# Aftermath

## ■ Sanctions

- Tower Designer-Contractor
- General Contractor
- Testing Laboratories

## ■ Legal Actions

- Civil Suits
- Criminal Charges



# Lessons Learned

- Changes to Guidelines were made
- Importance of on-site concrete tests
- OSHA's Role
- Safety First

# Conclusions

Failures will happen but...

- *Human Nature of Engineers*
- *Discuss Failures, Learn from Mistakes...*
- *Prevent Future Accidents*
- *Learning Experience*