

# **PROFESSIONAL PRACTICE/ OCCUPATIONAL HEALTH AND SAFETY**

Course MIME 221

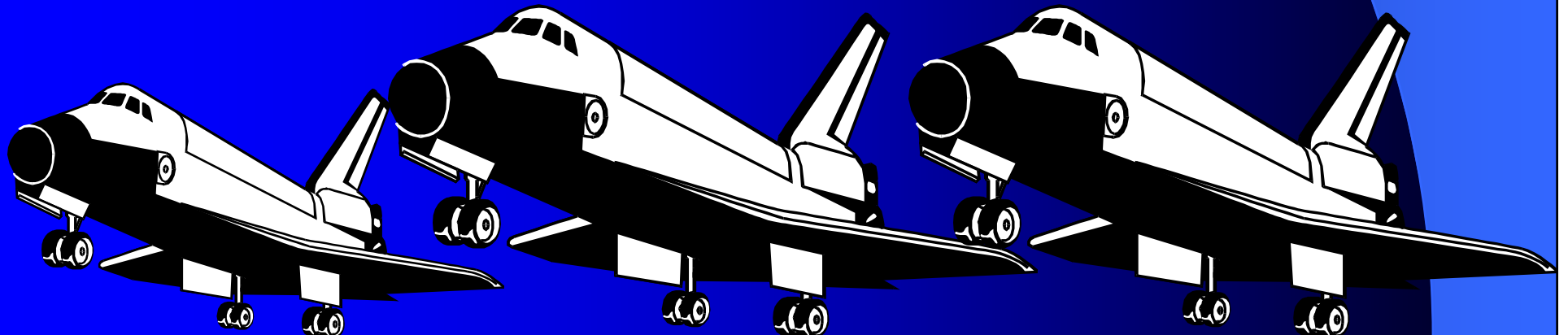
# **Engineering Disasters**

**Perhaps disaster is too strong  
a word to apply to some of  
the engineering projects.**

# Engineering Disasters

Perhaps disaster is too strong a word to apply to some of the engineering projects.

Consider the Challenger disaster, for example. Few would argue the NASA's the Shuttle Program has not been extremely successful, even with the incredible, even unbelievable, set back of the loss of the Challenger



# Challenger



# Engineering Disasters

## *what of Apollo 13?*

- Is it not possible to argue that the safe return of the Apollo 13 astronauts was an engineering triumph?
- The fact that the mission's objectives were unfulfilled doesn't diminish the engineering designs, and real-time engineering work that resulted in recovery of the crew.

# Engineering Disasters

**Some seek to assign blame for disasters on others; politicians, managers, social scientists, and so on.**

The Challenger disaster is a case in point. Some remind us that the Thiokol engineers recommended not flying the mission precisely because of the danger to the fuel cell o-rings-managers overrode their recommendation..

# Engineering Disasters

if engineers want to assume the credit for projects considered triumphs, shouldn't they also assume responsibility for projects that go wrong?

# Words of Wisdom





# STRUCTURAL FAILURE

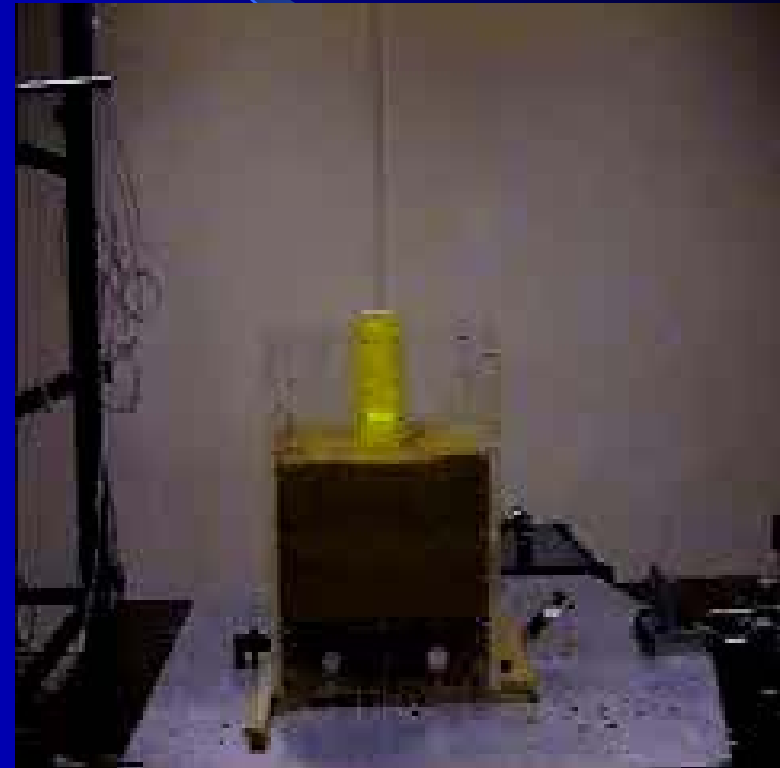


SETTLEMENT



LIQUEFACTION

# Liquefaction





# COALINGA BRIDGE FAILURE

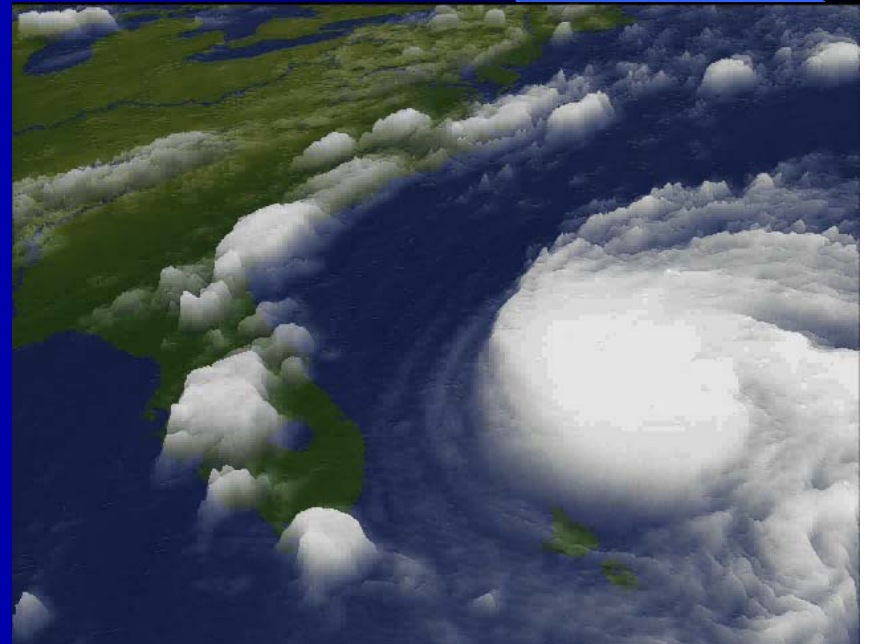


On the evening of March 10, 1995, in Southern California near Coalinga, the twin bridges carrying Interstate 5 over the Arroyo Pasajero collapsed, killing seven people. The sandy-bottomed arroyo, which is normally dry, was no match for the swiftly flowing floodwaters, and the resulting scour around the bridge foundations led to their failure.



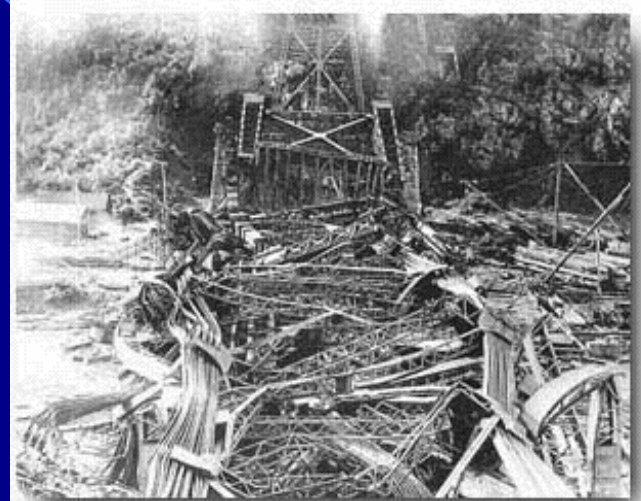
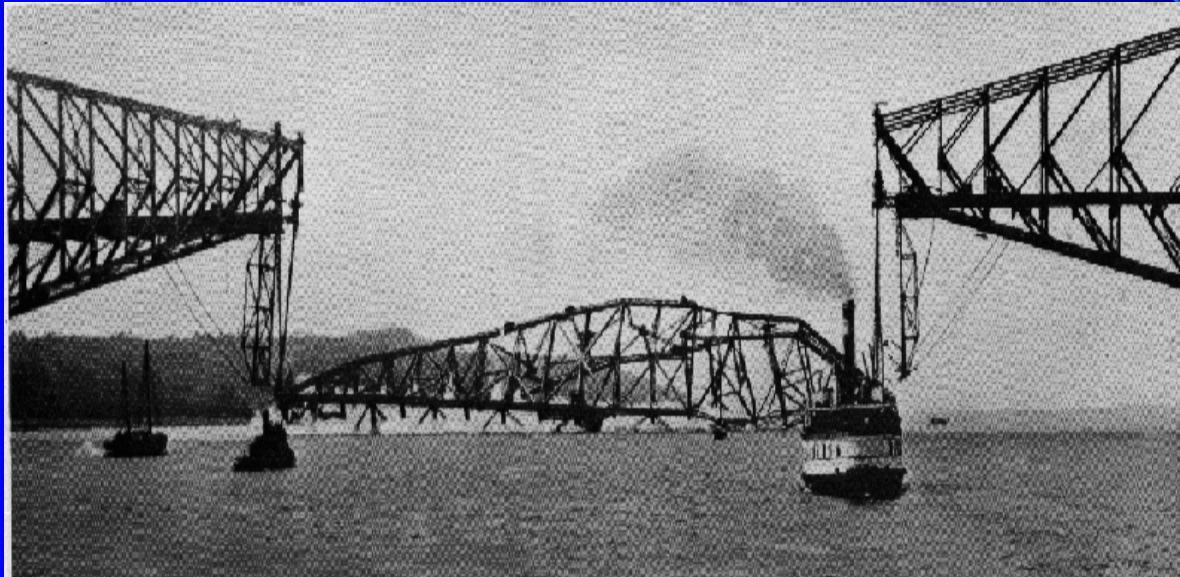
Shieh Ming-tso / AFP

Act of  
God???



# Quebec Bridge Failure

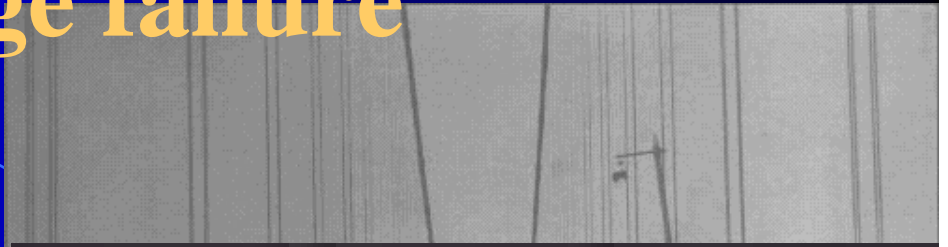
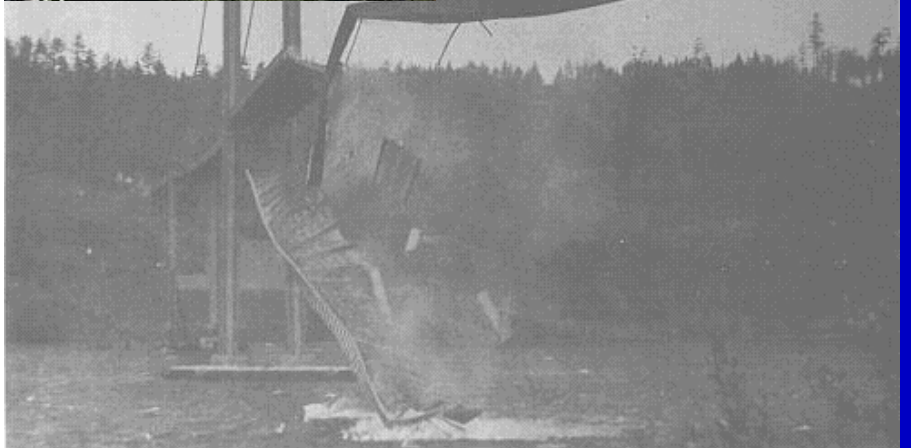
## 75 lost lives



It took only fifteen seconds for the massive south arm of the Quebec Bridge to fall into the St. Lawrence River in 1907.

The nineteen thousand tons of the south anchor and cantilever arms and the partially completed center span thundered down onto the banks of the St. Lawrence River and into the water .

# U.S. TACOMA Bridge failure



**DISASTER!**  
The Greatest  
Camera Scoop  
of all time!

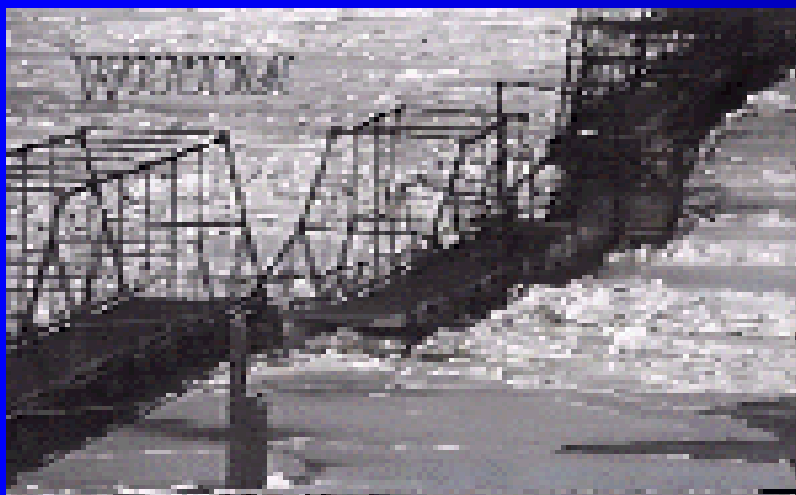
**EARLY FILMS**



Lets hope that we learn



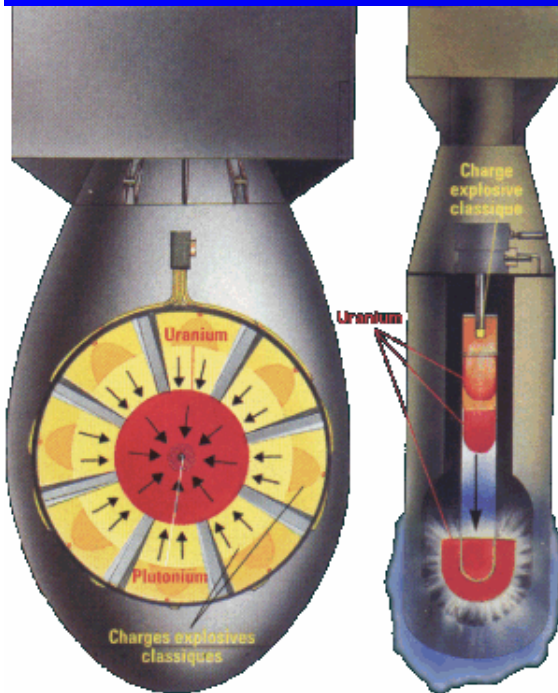
# HARISSBURG BRIDGE FAILURE



# Silver Bridge Failure



# Bombe atomique

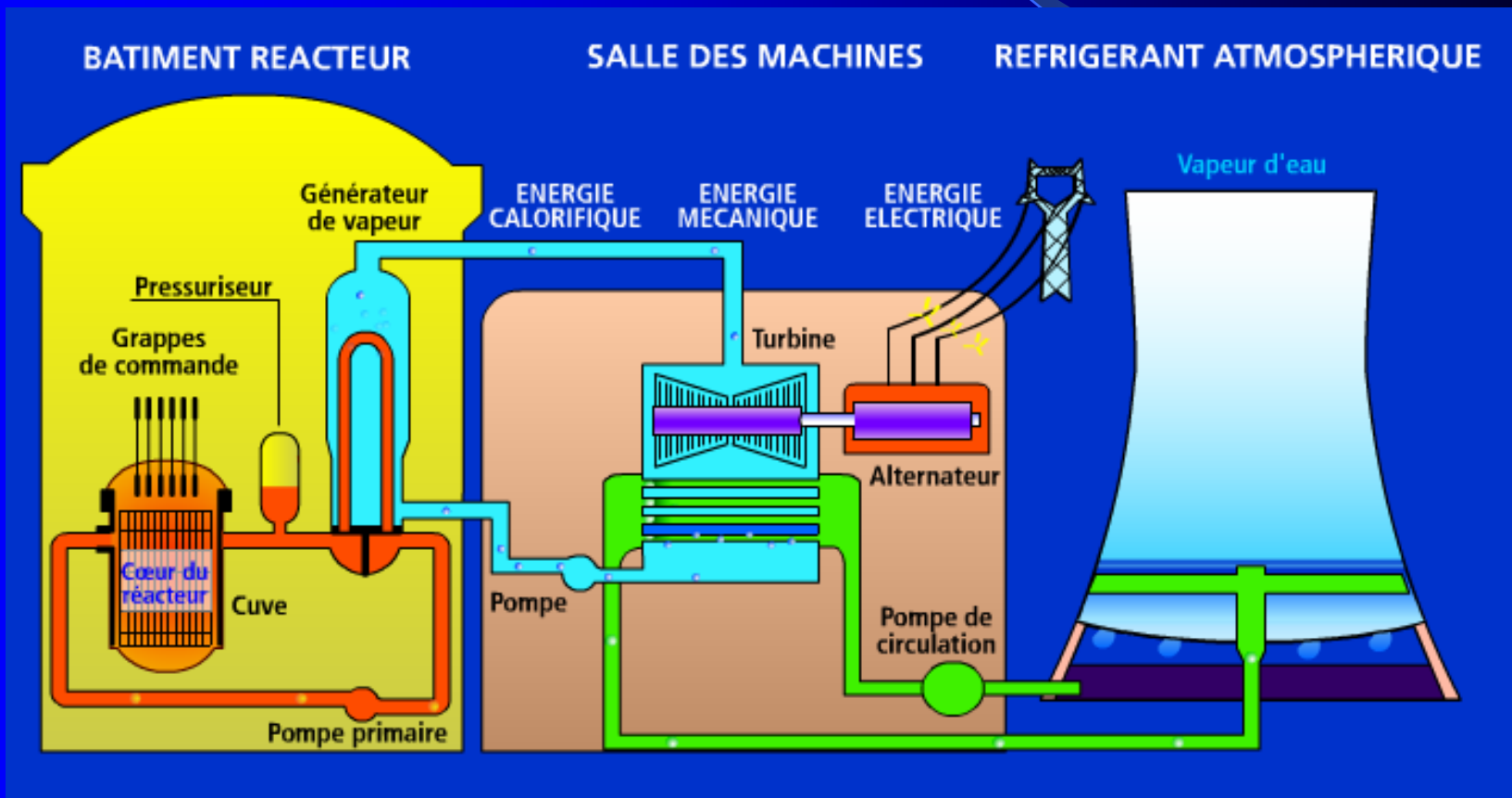


**Bombe atomique (little boy) ayant servi à Hiroshima.**

# Nuclear Bomb



# Nuclear power station



# CANADIAN EXPERIENCE WITH NUCLEAR POWER STATIONS



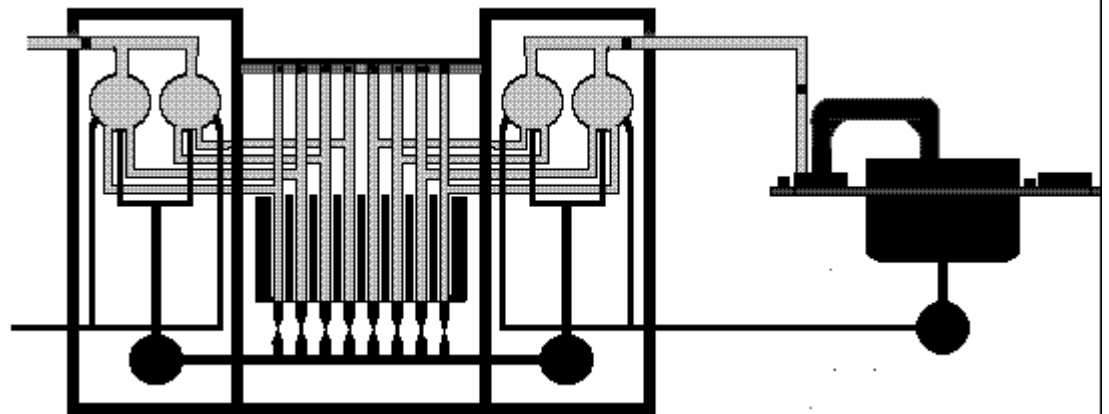
# CHERNOBYL DISASTER ELECTRICAL, MECHANICAL ENGINEERING



# CHERNOBYL



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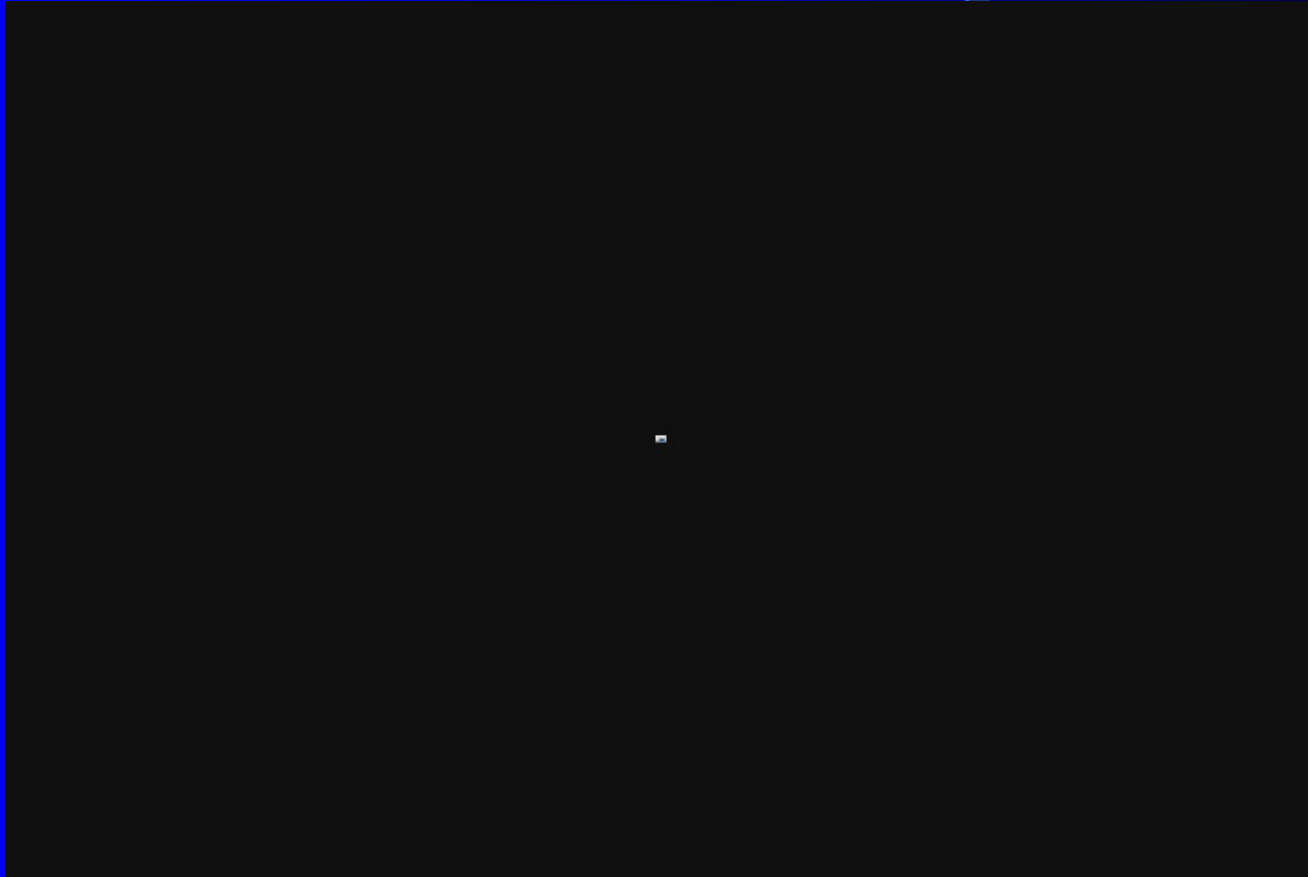




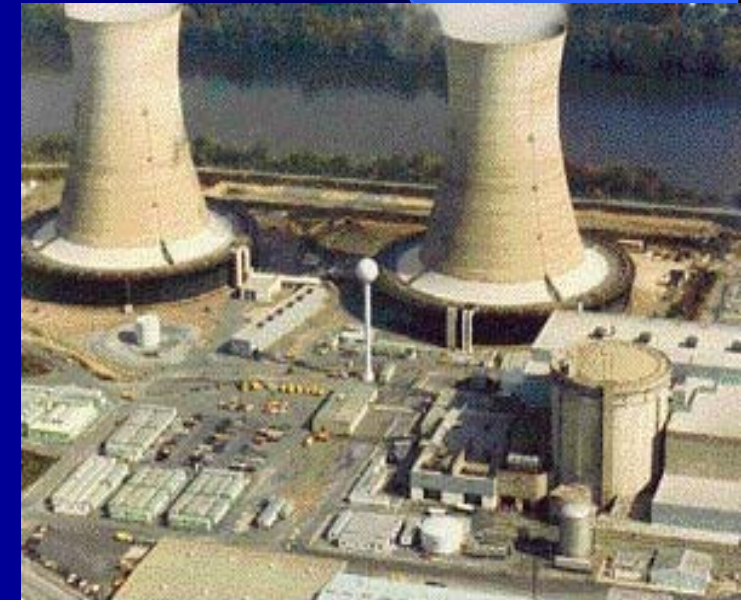
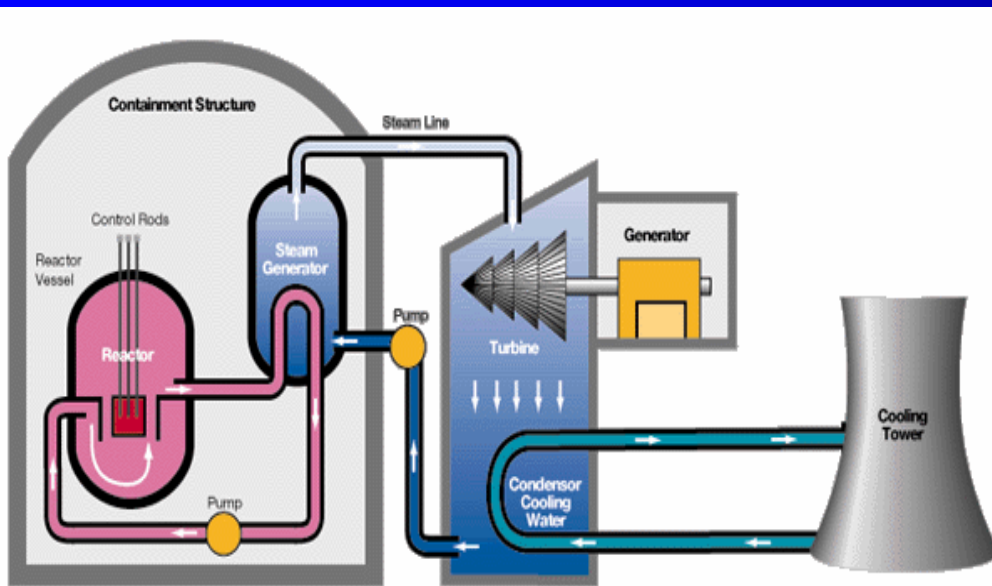
# CONTAINMENT OF CHERNOBYL REACTOR



# CHERNOBYL DISASTER



# Three Mile Island disaster



Nuclear Regulatory Commission

# BHOPAL INDIA CHEMICAL ENGINEERING DISASTER



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**UNION CARBIDS**



**UNION  
CARBIDE**

**SIMPLY GREAT CHEMISTRY**

# UNION CARBIDE



Thousands of familiar products that help to make our lives healthier, cleaner, safer, more convenient and more enjoyable depend on chemicals made at Union Carbide plants.

Shatterproof plastic bottles, antifreeze, medicine, plastic bags, crayons, cosmetics and personal care products -- and so many other conveniences we enjoy -- require the chemicals produced by the men and women of Union Carbide.

**At Union Carbide great chemistry is  
chemistry that works to improve the quality of our lives.**

# Bhopal

## The aftermath



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UNION CARBIDE  
FACTORY  
BHOPAL, INDIA





# Disasters are real Stadium Collapse



# DAM FAILURE CHICOUTIMI QUEBEC



# CHINA Dam Failure



# ENVIRONMENTAL DISASTER



EXXON VALDEZ



# Tower

- Redundant Structures
- Communication tower!!!!
- Prestige/Pride of the nation!!!!
- Total stupidity or job for the old boys√√
- Disaster In Waiting

# SAFETY

Absolute safety ,in the sense of a degree of safety which satisfies all individuals or groups under all condition, is neither attainable nor affordable.



# Expect Unexpected





# Responsibility

**The engineer as a responsible experimenter.**

**In general who other than engineers can assume responsibility for Engineering projects?**

- **Avoiding responsibility diminishes the engineering profession.**
- **Avoiding responsibility encourages "escape goating".**
- **Codes of ethics need to be considered as statements of engineering Responsibility.**

# Responsibility

- **Engineers have learned that to rely on others to think through the Potential consequences of engineering projects leads all too often to Disaster.**
- **Usually the projects don't result in total disaster, but, Unintended consequences diminish engineering triumph.**

# Responsibility

Ultimately, we hope to understand, if not answer, the following questions:

- Is failure an essential ingredient of engineering progress?
- Can methodology be developed aimed at avoiding unintended consequences?
- The willingness of engineers to assume responsibility for the work,
- Indeed, the engineers to be responsible for their work, is inextricably a part of the answers to these questions.



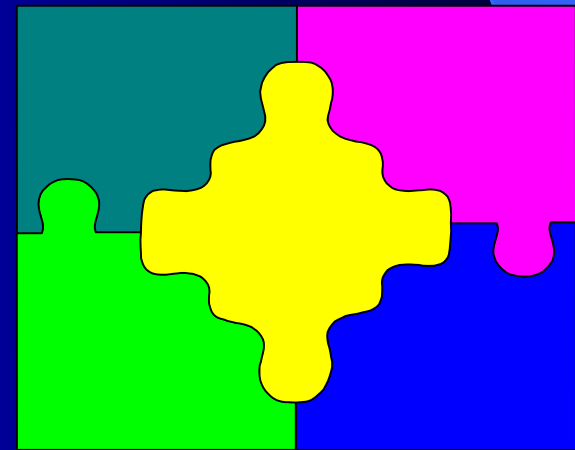


# BROTHERHOOD



**Agricultural Engineering**  
**Aeronautical Engineering**  
**Chemical Engineering**  
**Computer Engineering**  
**Civil Engineering**  
**Electrical Engineering**  
**Geological Engineering**  
**Metallurgical Engineering**  
**Mining Engineering**  
**Petroleum Engineering**  
**Mechanical Engineering**

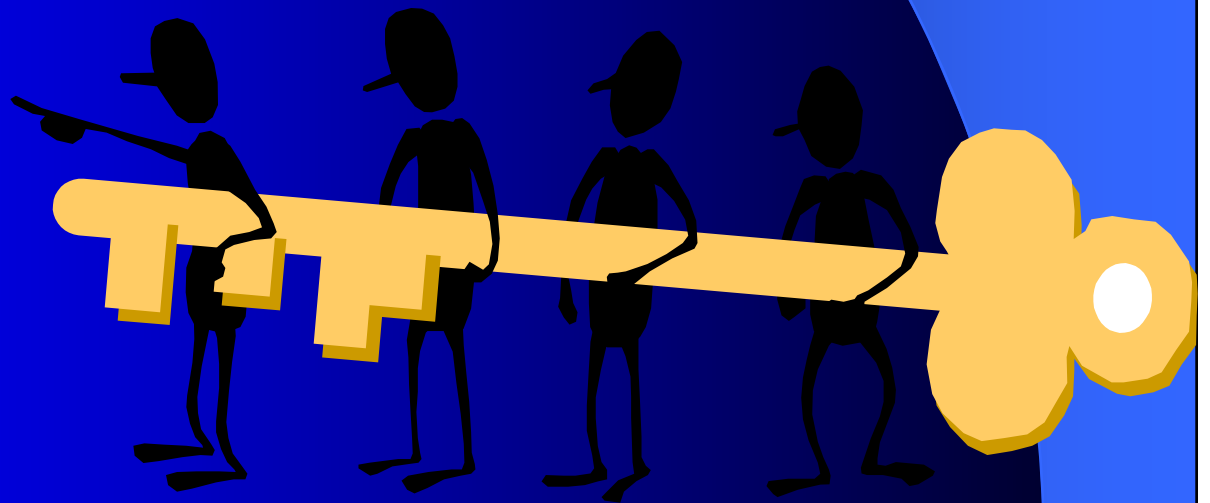
Acknowledge and  
Respect other  
disciplines



*Key to Success*

**Engineering Code of  
Practice**

**OCCUPATIONAL HEALTH AND SAFETY**



# References

- This presentation is put together from, course books , other presentations as well as various websites in the forms of text, photos, audio and video clips.
- All the references will be given in the general reference section on the web Ct



THE END