16.20 HANDOUT #1

Fall, 2002

Review of Design Considerations

OVERVIEW OF STRUCTURAL DESIGN PROCESS

Purpose: Assure "structural integrity" while minimizing cost

Structural integrity: "Capability of a structure to carry out the operation for which it was designed"

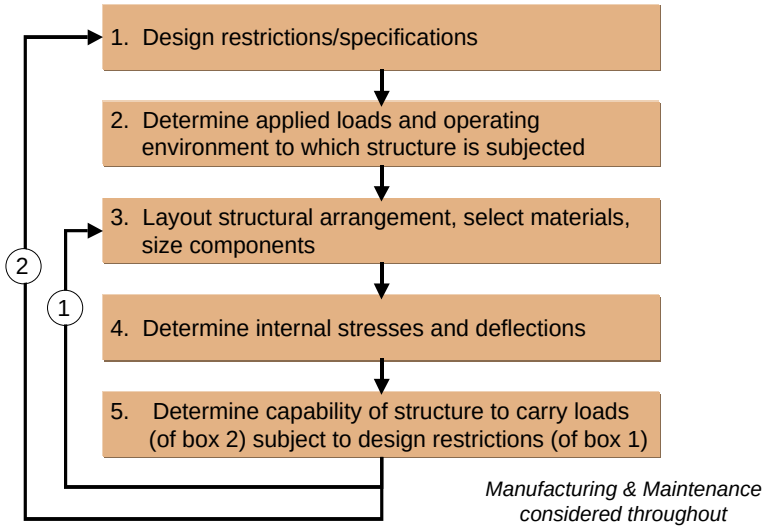
Aspects to consider:

- Loads
- Deformations
- Corrosion
- Fatigue/Long life

Factors in Determining cost:

- Material
- Waste amount
- Manufacturing
- Weight
- Subassembly/Assembly
- Durability and maintenance
- Useful life
- Repair

STRUCTURAL DESIGN PROCESS



SOURCES OF APPLED LOADS *(and resulting stresses and strains)*

- Normal operative environment
- Environmental effects
- Isolated effects/special conditions

TERMINOLOGY

Limit load/stress/condition: maximum load/stress/condition where structure shows no permanent deformation (operationally defined as maximum condition the structure is expected to see under normal operation)

Ultimate load/stress/condition: maximum load/stress/condition where structure does not "fail" (operationally defined as limit condition times factor of safety).

Ultimate Factor of Safety = $\frac{\text{Ultimate Condition}}{\text{Limit Condition}}$
(design value)

Margin of Safety = $\frac{\text{Tested Value} - \text{Design Value}}{\text{Design Value}}$
(experimental reality)

Definition of "failure" depends on operational requirements.