AECT 360 – Structural Theory
Fall 2011
Design Project – Control Tower

BACKGROUND (from Mr. Donald Wargi, President of PGM Logistics, Lima, Peru):

To give you a brief idea of what we are trying to do. We want to build a control tower that can be moved to & from temporary heliports or runways put in the jungle during seismic and pipe line work.

The tower height would need to be variable, to meet the different forest heights. It should be self-erecting and the **sections should not exceed 1500 Lbs**. in weight of any one modular section.

The floor of the control section would need to be a **minimum of 20 ft.** and elevate to at least a **maximum of 100 ft**. above the ground. (Reason; some areas are void of trees and only height above the aircraft is needed to see and control the aircraft movement on the ground. Other areas the trees are 100 ft. tall and to control the aircraft within the air space the tower personnel must be able to see over the tree tops to control the airborne traffic.)

The base of the tower should require minimal disruption to the environment. We try to remove and not disturb any more vegetation and dirt than is absolutely necessary. After we move to the next point we place crews in the last area to reforest the area, so the minimum disruption of the area requires minimal reforestation.

I think minimum control **room dimensions of 10 ft x 10 ft** (3m x 3m) and a maximum 12 ft x 12 ft (3.5m x 3.5m) basically it needs to accommodate two people working side by side, the windows need to slant out at 15° from their base normally there is a radio console between the two Workers so they have access to the same radios. The console is 12 - 18 inched wide.

SUBMITTALS:

1. Proposal (DUE Wed. Nov. 2nd 11:00 a.m.) – Prepare a bound "Proposal" of your project solution. Include the following in your discussion:
    a. At least three different 3-dimensional views of tower design (plotted on 11"x17" sheets), using SketchUp, AutoCAD, or some other software. Can be hand-drawn **if** neatly drawn using drafting equipment in lieu of CAD.
    b. General discussion of the structural frame scheme and frame member types (i.e., HSS, Angles, Channels, etc.) and connections of the members to each other and at base.
    c. Discussion of method of on-site field-assembly of tower sections. Include sketch(s).

d. Discussion of how to accommodate access up to control room located at top of tower (i.e., stairs). Include sketch(s).
e. Discussion of anchorage and transportability of entire tower. Include sketch(s).
f. Discussion of control room construction, (i.e., framing, materials, access, etc.).
g. Discussion of how you plan on building the actual ¼" = 1'-0" scale model of your design, including pieces and methods of construction of model

2. Basic Structural Analysis (DUE: Friday Nov. 25th 11:00 a.m.) – Prepare a graphical "Load Trace" of the fully-extended tower. Calculate the approximate lateral wind load, and approximate vertical load:
   a. Lateral Load Trace – Show arrows indicating graphically increasing loading
   b. Vertical Load Trace – Show arrows indicating graphically increasing loading

3. Physical Model (DUE: In regularly-scheduled Lab, week of Dec. 5th) – Construct a realistic scale model of the entire tower and control room at a scale of no less than ¼" = 1'-0". Be sure the model can be dis-assembled and re-assembled in coordination with the design criteria as stated. Show ALL framing members, as well as stairs and control room structure.

Assume the following Structural Considerations:

- Occupancy Category …….. See IBC 1605
- Tower Roof Live Load "L_r" …. See IBC 1607
- Tower Floor Live Load "L" …...See IBC 1607
- Tower Stairs Live Load ……. See IBC 1607
- Wind Loads…….. Basic Wind Speed = 100 MPH
- Seismic Loads……N/A
- Snow Loads……N/A