Senior Thesis Program
The Department of Architectural Engineering
The Pennsylvania State University
University Park, PA

Structural Technical Report 2
Pro-Con Structural Study of Alternate Floor Systems

Prepare a study and comparison of at least four different alternative floor framing systems for your building (one must be the original system). At least one must be a different framing material. In addition, no more than one system can be a variation on the same floor system. (for example, changing beam spacing but keeping the same basic frame layout.) If possible, (this is important) select systems that have a reasonable chance of being considered as part of your end of the semester structural proposal.

Your report should include the following:

1. An executive summary paragraph of the findings/conclusions/results of the overall assignment.
2. Preliminary sizes of the framing members and slabs for the alternative framing systems. Be sure to check stress and deflections. Use computer programs and approximate methods as appropriate to save time. This is not intended to be an exhaustive analysis assignment. It is to be considered schematic/preliminary design so you can gather information for decisions.
3. A sketch (hand drawn on grid paper is OK or CAD if you prefer) of the layout of each system labeled with typical sizes, appropriate notes (ie material strengths) and any exclusions or restrictions.
4. A brief written comparison of the various systems and how they relate to your building. Your comparison should address such items as fire protection and fire ratings, durability, weight (for example, if you have poor foundation conditions, a heavy structure may be at a disadvantage), susceptibility to vibration, costs, least depth, etc. Note that we do not necessarily expect you to have all this information at this time but we do expect you to question everything and list it as a factor until proven otherwise.
5. Make it clear in your evaluations if you feel the particular framing system is still viable for use in your building now that you have investigated it or if it should be eliminated from consideration and why. Note: Opinion alone is not enough here. You need data to back up your decision. Otherwise, you need to keep the system in the running.
6. A summary comparison chart of features of the three systems (and a fourth listing which is that of the existing floor), including a category that indicates if the system has potential for more in depth investigation.

Senior Thesis Program
The Department of Architectural Engineering
The Pennsylvania State University
University Park, PA

Structural Technical Report 3
Lateral System Analysis and Confirmation Design

Prepare an analysis and confirmation design study of the lateral system in your building. Loads obtained from Technical Assignment 1, with any appropriate revisions should be used for this study. This assignment should be viewed as an extension of previous reports but appropriate background material, framing plans, sketches etc. from previous reports should be included.

Specifically, address the following:

1. Describe the lateral system used in the existing system.
2. Determine which lateral loads or combination of loads will control the design of your lateral resisting system.
3. Determine how the computed lateral loads should be distributed to the lateral resisting elements in a logical and rational method.
4. Confirm that a logical load path for distribution of the calculated loads exists in the real structure and note any weak links or areas of concern.
5. Include a check of strength, drift, story drift, overturning and impact on foundations as appropriate.
6. Strength check is to include spot checking of critical members.
7. Compare drift values to allowable code or industry accepted values and discuss results.
8. Incorporate overall building torsion issues as part of design check. Complicated buildings and lateral systems may approximate this if necessary for this assignment and go into more detail as part of the end of semester proposal.
9. Provide a discussion of any results that do not appear to match the existing results or that do not meet standard criteria for lateral systems.
10. Provide a summary and conclusions section in the report.

It is anticipated that a fairly detailed an accurate study will be necessary in most cases to confirm the design for such items as computed drift. Most students will find it worth while to incorporate computer modeling. Students with large (tall) or complicated buildings or loading conditions should discuss their approach with their consultant prior to starting the assignment. Your consultant may give you permission to simplify the models or to look at lateral loads in one direction only for these special case buildings.