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

Structural Proposal Assignment

Grade Weighting and Due Dates: See Syllabus for your section

Develop a proposal that describes your intentions for your Senior Project Investigation (thesis) to be conducted in the Spring Semester. In general, the proposal should address a rational structural design alternative for your building and the proposed method of solution for the design alternative. Additionally, every proposal must contain a minimum of two breadth investigations. Finally, students enrolled in the MAE version of Senior Project (AE 897G) must include a description of how they will satisfy the MAE requirements.

The proposal should generally contain the following elements:

- Cover page, including your name, option, name of your primary AE faculty Consultant (section instructor), building name, building location, date of submission, title of report.
- Executive summary
- Table of contents
- Introduction, including purpose.
- Background: A sufficient discussion of the existing building, including its structural design, to put the rational design alternative into context.
- A detailed statement of the structural design alternative, including a justification for the choice.
- Methods to be used and/or research to be conducted
- Tasks and tools to be used
- Schedule to be followed See example attached.
- Description of breadth topics to be studied, minimum of two.
- Discussion of meeting MAE requirements (if applicable)
- Discussion of Honor’s requirements (if applicable)
- Concluding remarks
- References and appendices, as necessary.

As part of the writing requirements of AE 481W, the proposal should be primarily in narrative form. See below for more detailed guidance on content.

Deliverables: A technical report in narrative form submitted as a PDF. Unless otherwise noted by your section instructor, the submission should be e-mailed to your section instructor by 5pm on the due date and posted to your CPEP web site. Please limit .pdf file size to 10 Mb, unless other arrangements have been made with your section instructor.
Additional Guidance on Proposal Content

Below is some additional guidance about specific parts of the report:

Executive Summary
An executive summary is a stand-alone document. It should provide the information given in the body of the document, without requiring the reader to leaf through the full document! The only difference between the summary and the body of the report is that fewer details are furnished in the summary.

Don’t say: Proposals are then given as to what I will be concentrating on for the coming semester

Say: The proposed thesis will include an investigation of a steel rigid frame structure, a steel frame with reinforced concrete masonry shear walls, and a monolithic cast in place reinforced concrete rigid frame structure.

Introduction/Background:
The Introduction/background is provided to orient the reader to the specific design alternative that will be addressed. They should be focused on providing enough information that the subsequent discussion can be placed in context. It should be accessible to a general, technically literate reader. In the case of a thesis proposal, it is a discussion of the important aspects of the building considered in the later thesis proposal

• The Executive summary is not an introduction. Do not refer to it as part of your introduction.
• The Introduction should provide a more thorough description of the building than the one in the Executive summary. Include some figures like a rendering or a picture, a typical architectural floor plan, a map of the location, etc.
• The proposal should be able to stand alone as a document. The contents should not rely on the assignment description to have purpose. Introduce the scope and purpose of the proposal.

Existing Conditions
Include your Existing Conditions Report (Tech 1), corrected in accordance with the comments received as the initial section of the proposal.

Structural Design Alternative
All proposals should focus on a design alternative with a purpose. In your case, you can recognize a problem with the existing design, or a problem that faced the designers of the original system. Similarly, your design alternative can relax a design constraint that restricted certain options. Additionally, you can propose a learning or financial goal. Probably the most important component of the proposal is a clear, concise statement of the problem or goal that you are proposing to address. In general, most proposed design alternatives must address a complete redesign of both the gravity and lateral systems. Finally, it is a good idea for all students to consult with their instructor about their proposal ideas prior to submission.
Proposed Solution(s) of the Problem/Goal

At the time of writing the proposal, you must be able to present, in sketch form, a solution or a set of solutions to the problem you are investigating. You must also be able to outline the method, and a detailed task by task description of the solution procedure, but these will be discussed in a later paragraph. The solutions you propose should be specific. A generic listing of design criteria is not a solution.

*Don’t say:* The proposed structure will comply with the loadings in the BOCA National Building Code, the ACI Building Code Requirements for Reinforced Concrete, ....

*Say:* Alternative #1 will be a reinforced concrete flat slab system, as illustrated in Figure___. The floor will consist of an 8” reinforced concrete slab, 11” thick at drop panels. The floor will be provided with a 12”×18” edge beam at the perimeter. The columns will be 14”×14”. The floor to floor height will be 10’-6”. The lateral load resisting system will consist of reinforced concrete masonry unit shear walls at the exterior stair towers and the interior elevator shafts. Floor loads will be computed on the basis of the live loads in the BOCA National Building Code as shown in Table___ below.

Solution Method

This section will demonstrate whether you are qualified to solve the problem or achieve the goal you have presented. The reader must be provided with detailed, specific information on the proposed method of solving the problem you have outlined. This section will include a discussion both analysis and design methods. If computer programs are to be used, discuss how the inputs will be prepared and how the outputs will be presented.

*Don’t say:* I will use spSLAB to determine reinforcement in the flat slab system.

*Say:* The design of the flat slab system will be based on Chapter 13 of ACI 318-11 Building Code Requirements for Reinforced Concrete, Equivalent Frame Method. Analysis for gravity loads will be completed on the computer program spSLAB, an implementation of the Equivalent Frame Method. Trial sizes, as outlined above will be input into the computer program. Live load patterns, including full live load on all spans, full and half live load on adjacent spans, and 75% full load and no load on adjacent spans will be investigated....

Tasks and Tools

In this section, provide the reader with further evidence of your qualifications to solve the problem by showing detailed understanding of all steps necessary to arrive at a satisfactory solution. This section will also lay the groundwork for the timetable that follows by identifying and elaborating the items that will be shown on the schedule. This section is best kept in outline form.

Example:
I. Concrete Beam and Two Way Slab Alternative
   Task 1. Establish trial member sizes
      a) Determine beam sizes based on ceiling height requirements and ACI 318-95 Table 9.5(a). Determine whether detailed deflection calculations will be necessary
      b) Establish slab thickness by ACI 318-95; Section 9.5.3.3
      c) Determine most economical balance between beam and slab thickness based on costs in Means Building Construction Cost Data
   Task 2. Determine floor loads
a) Find self-weight based on member sizes from Task 1
b) Find superimposed dead loads based on building plans
c) Find live loads on the basis of BOCA National Building Code; Table 1606
d) Find wind loads based on BOCA National Building Code; Section 1609

Task 3. Complete initial frame analysis

etc.

Timetable
Using the task numbers assigned above, develop a week by week summary of the remaining semester and target dates for the completion of each of the tasks discussed above. This should be presented in graphic form, as a bar chart, a flow chart, or a calendar with benchmark dates. See example timeline attached.

Breadth Topics
See the Breadth Proposal Ideas for CM, LE, ME linked on the Senior Thesis Web Site:
http://www.engr.psu.edu/ae/thesis/course.htm

MAE Requirements
Provide a paragraph describing how graduate level coursework will be incorporated into your work. This section only applies to students registered for AE 897G in the Spring.

Honor’s Thesis Requirements
If your report from your work in the Spring will be utilized to satisfy the Honor’s thesis requirement, the statement as to how you will satisfy the Honor’s College requirements be incorporated into the proposal.

Additional Issues
It is preferable to write in the third person, although it becomes a little trickier to avoid the passive voice.

Don’t say: I will investigate a steel rigid frame structure....
Say: the proposed thesis will include an investigation of a steel rigid frame structure....

Format
The proposal should be presented in a professional manner. Use headers and subsections as appropriate. In most cases, it will be helpful to include sketches, drawings/plans, and photographs in the body of the proposal or as an appendix. See writing assessment grading rubric attached.

Sections of the Report:
● Each section of the report should have a purpose defined.
● For example, sections that include general information like codes, and materials, etc. should be introduced as having purpose in the remainder of the report or future calculations.

Appendices:
● The appendix is supplemental. The body of the proposal should not need the appendix to be understood. Do not put figures in the appendix that are essential to understanding the discussion.
For example, a picture or rendering of the building is helpful to understanding the description as is a floor plan and should not be in the appendix.

- Do not put anything in the appendix that is not referred to in the body of the proposal. For example, one might show a typical floor plan in the body of the text and note that other plans are included in the appendix.
Proposed Thesis Semester Schedule

January 2013 - April 2013

Milestone 1: 1/28/2013
Milestone 2: 2/11/2013
Milestone 3: 3/1/2013
Milestone 4: 3/25/2013

Task 1: Revise
Task 2: RAM model (gravity)
Task 3: Redesign gravity system
Task 4: Write-up
Task 5: RAM model (lateral)
Task 6: Redesign lateral system
Task 7: Cost analysis
Task 8: Breadth 1
Task 9: Breadth 2
Task 10: Make final presentation
Task 11: Submit report
Task 12: Present to jury
Task 13: Update CPEP

Key:
- Structural Depth Tasks
- Breadth 1: Façade redesign
- Breadth 2: Mechanical Duct Layout
- Submission Tasks

Milestones:
1. RAM Model (gravity) completed
2. Gravity analysis completed
   - Go | No Go Check
3. Depth Completed
4. Breadths Completed

Final Report: April 13
Faculty Jury Presentation: April 13
ABET Assessment
Senior Banquet: April 26
<table>
<thead>
<tr>
<th></th>
<th>Excellent (7)</th>
<th>Good (6)</th>
<th>Fair (5)</th>
<th>Poor (4)</th>
<th>(&lt;=4)</th>
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<tr>
<td>Professional Appearance,</td>
<td>Work product is of the highest quality. Makes frequent and excellent use of</td>
<td>Work product is well prepared and presented and, with a few exceptions,</td>
<td>Work product is average or inconsistent. Not likely acceptable in</td>
<td>Work product is of very low quality and would be rejected or frowned upon in a professional environment. Few figures and tables are used and are often not linked or discussed in the text. Many items such as headings, subsection titles, table of contents, figures, photographs, etc. are missing or not well executed in some fashion. Graphics and charts may be present in some areas but are poorly executed, sloppy, and hard to read or follow.</td>
<td>Unacceptable</td>
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<td>Presentation, Documentation</td>
<td>graphics, charts, photographs, etc., all of which are labeled as figures. All</td>
<td>would be well received in the AEC profession. Makes effective use of all types of figures and tables which are</td>
<td>professional environment. May contain problems such as infrequent use of figures and tables, excessive description of items that can be covered by photos and graphics. Report may contain missing or poorly prepared items such as headings, table of contents, and Appendices. Example: Report may be printed in B&amp;W but it references colored lines in a figure. Print quality is below average containing streaks, faded sections etc. Hand calculations need improvement in readability, organization, and completeness.</td>
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<td>and Following Instructions</td>
<td>figures and tables are numbered, titled and referenced in the text. Report</td>
<td>connected or referenced in the report. Report is organized with proper heads</td>
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<td>contains numbered pages, table of contents, and well organized and documented</td>
<td>and structure are clear. Major points are separated into paragraphs and</td>
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<td>Appendices (as appropriate). Hand calculations are neatly prepared and easy to</td>
<td>signaled by transitions. Paragraphs are built on related sentences that</td>
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<td>follow. Report heading or cover page contains all information noted in Thesis</td>
<td>logically develop. Content is supportive of the conclusions. Executive</td>
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<td>report format requirements.</td>
<td>summary is clearly stated.</td>
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<td>Organization and Flow of</td>
<td>Information is presented in a logical, interesting sequence. Organization</td>
<td>Information presented in a logical sequence. Organization and structure</td>
<td>Organization and structure are mostly clear, but the reader may have some</td>
<td>Sequence of information is generally difficult to follow. Organization and structure often must be inferred. Few major points are set off by paragraphs or subsections or connected by orderly transitions. Report contains few logically connected points. Major digressions exist. Conclusions are ineffective or misleading. Reports in this category often contain Executive Summaries (if present) that are essentially copies of the stated assignment in lieu of actual results and conclusions.</td>
<td>Unacceptable</td>
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<td>Report</td>
<td>and structure are very evident. Major categories of the report are divided into</td>
<td>are clear. Major points are separated into paragraphs and signaled by</td>
<td>difficulty following the line of thought in a number of areas. Major</td>
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<td>subsections that are connected with logically clear transitions between topics.</td>
<td>transitions. Paragraphs are built on related sentences that logically</td>
<td>points are separated into paragraphs and most sections are logically</td>
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<td>Conclusions are effectively supported by the content of the report. Executive</td>
<td>develop. Content is supportive of the conclusions. Executive summary is</td>
<td>developed and documented. Minor digressions exist but do not overly</td>
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<td>summary information matches the report conclusions and concisely captures the</td>
<td>clearly stated.</td>
<td>detract from the overall flow of the report. Conclusions are somewhat</td>
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<td>key elements of the study.</td>
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<td>vague and/or are not fully supported by the report documentation or</td>
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<td>calculations. Document may be hard to follow or find relative to specific sections or conclusion in the report.</td>
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<td>Grammar and Style</td>
<td>Full variety of sentence structures used correctly. Minimal use of sentences</td>
<td>Variety of sentence structures used correctly despite an occasional flaw.</td>
<td>Predictable sentence and word choice, often with much use of passive</td>
<td>Errors in sentence structure, usage and mechanics sometimes interfere</td>
<td>Unacceptable</td>
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<td>that begin with &quot;The&quot;. Word choice is varied, interesting, accurate, and</td>
<td>Avoids excessive use of &quot;The&quot; to start sentences. Accurate and varied</td>
<td>voice. Occasional errors in sentence structure, usage and mechanics.</td>
<td>with the writer’s ability to communicate the purpose. Writing is</td>
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<td>contributes to an understanding of the report. Few, if any, spelling errors.</td>
<td>word choice. Only minor errors in sentence construction, usage, grammar,</td>
<td>Confusing or convoluted sentences. May include frequent use of</td>
<td>frequently not understandable. May include excessive use of</td>
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<td>or mechanics. Minimal spelling mistakes.</td>
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<td>sentences starting with &quot;The&quot;. Reports often contain frequent spelling</td>
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<td>and/or word misuse.</td>
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