



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

Advance Notice of Building Selection Guidelines
Construction, Lighting/Electrical, Mechanical, and Structural Students

All students must register their building or at a minimum present a short list of possibilities to Professor Bowers by July 1.

Each student in Senior Thesis must select a building *prior to returning to Penn State in the Fall*. Assignments will be given the first day of class that will require building plans and other information. While we are willing to help and provide advice, the AE Department will not be responsible to provide you with a building. *Any student who does not have a building by the end of the first week of class Fall Semester will be required to drop the course.*

Note that all students will be doing work in their option as well as in most of the other AE options. Therefore, you will need to make sure that multidisciplinary information is available. In other words, you should try to get a complete set of building plans.

You may discuss or correspond with any faculty member concerning your building selection and it is probably a good idea to talk to someone in your option. Final approval by Professor Bowers is required (pab125@psu.edu). Professor Bowers will coordinate the entering of names and approved projects into the master database to minimize the chance for duplicate building selections.

In the event of duplicate choices, the student that has made contact with an owner or “sponsor” and who contacts Professor Bowers first will receive approval for the building. Each year we have multiple requests for some of the same buildings, so it is very important that you start early and make contact with Professor Bowers to get your building approved or at least reserved.

Note: Upon receiving building approval from Prof. Bowers, you should begin to process your OWNER PERMISSION FORM (a copy of which is available on the e-Studio website

<http://www.engr.psu.edu/ae/thesis/course.htm>

All OWNER PERMISSION FORMS are due NO LATER THAN THE FIRST DAY OF CLASS.

When corresponding with any faculty member about your building, you should have as much of the following information available as possible:

1. Architect, Engineers and Contractor or CM.
2. Size (sq. feet) and cost
3. Number of stories
4. Occupancy type
5. Building owner
6. Location
7. Special Conditions (Zoning limitations, difficult site conditions, etc.)
8. Architectural features
9. A photograph or rendering of the building
10. Actual or planned construction start and completion dates.

Important Note:

E-thesis has been implemented as an integral part of the thesis course. Your reports and much of the general project information will be posted on the e-Studio web site via your Capstone Project Electronic Portfolio. You must make sure that your sponsor and the building owner does not object to posting of existing conditions as well as information and reports prepared as part of AE 481W/482.

Building Requirements and Selection Guidelines:

1. **Buildings should be selected** based on the student's capabilities, likes and option. Many different types and sizes of buildings are acceptable but it is essential that you select one that comes with a good source of information (plans, specs, soils report, cost information, someone willing to answer questions, etc.) Plans are required as a minimum. Specifications are **very** helpful as is other back-up information. We can sometimes operate without specifications, but it will be much harder on you. The more information you obtain, the easier it will be for you and the more you will understand the requirements of the building.
2. **Contacts:** You will require an individual to provide you with information about the **project cost, schedule, and the types of contracts used to build the building** in addition to the other information and approvals noted below. Ideally, at least a rough system budget for the major building by systems should be obtained. (Note that some owners will not want to release detailed bids or detailed breakdowns of costs. This information will be more important to the CM students but in many cases, we can work around this limitation if necessary). You will also be required to produce a summary schedule of both the design and the construction of the project, and should seek this information from the building contractor and / or other individuals involved in this part of the construction process for your particular building.
3. **Minimum size buildings** should be in the 50,000 to 100,000 square foot range. More specific information is contained below and in the option sections at the end of this document. In the past, students have indicated that a larger building generally gives you more options to work with in your project. Building size is most important for structural, CM, mechanicals and those Lighting/Electrical students who would like to emphasize Electrical. Lighting/Electrical students, who plan to emphasize Lighting, will benefit by selecting buildings with a variety of types of spaces or one with special activity spaces (museums, larger churches, high end show rooms etc).
4. **Structural students must select a building that is at least 5 stories and 60 feet high above grade (not counting the basements or underground spaces)** unless it has some type of unusual structural feature that will make a good project (i.e. space frames, long spans, unusual shape etc.). Taller buildings allow you to better explore wind and seismic design features. We have had extremely large buildings (one million square feet or more). These buildings are OK if there is a fair amount of repetition and you are prepared for extra work due to size alone **but are not recommended without a consultation with faculty prior to selection.** However, a 20 or 30 story building would be manageable.

Building Selection Guidelines - AE Senior Thesis

This document can be found at: <http://www.engr.psu.edu/ae/thesis/> - AE 481W link

5. **Consider your interests.** If you want to get a job designing high rise buildings when you graduate, then look for at least a 20 story building now. If you want to specialize in mechanical design for medical facilities, look into a hospital or research lab. If you want to work for a large General Contractor, consider a larger or more complicated construction project. The point is to learn new things from Senior Thesis, not just repeat things that were done in the classroom. Careful selection of the building will be critical to the learning process.
6. **Thesis can be expensive** due to travel, photographs and duplication costs etc. Don't make it worse by paying a lot for your plans. Ask firms to sponsor you by donating the plans and specifications. A set of prints on a major building can cost several hundred dollars. **Start early** so you can find a thesis project that will not cost you a lot from this standpoint. ***Last minute selections usually cost you*** because you don't have time to be selective. There are a lot of Penn State friendly companies out there so look to them for help and hopefully reduced costs.
7. **Your building does not have to be built but we have certain requirements and restrictions on this. (See below for more information.)** *Be careful of buildings that are not yet started in design or are moving slow in the design process.* We do not approve them! Sometimes they get canceled or delayed. Don't hinge your selection on a promise or a "vapor building".
8. **You do not have to visit** the building as a requirement of senior thesis. Most people feel a visit helps orient them and get off to a good start, but it is not required. Again, if you can't visit or your building is not yet constructed, make sure you have a good source for information and questions. See specific option requirements below but overall we highly encourage you to visit your building at some stage.
9. **Try to find a building that is fairly recent.** Stick to buildings that are not more than 4 or 5 years old or at the very least have undergone a recent renovation. (Note that CM students need a building under construction) It is usually very difficult to locate plans etc. for older buildings. Often this info is stored or archived and the people who worked on it are no longer around. **Buildings of historical interest or significance will be reviewed on a special case basis relative to the student's interests and option.** Watch out for renovation projects. Find out in advance how much information on the existing building is available to you.
10. **Avoid chasing buildings where the owners have security concerns** about releasing the plans. If you get resistance, look for another building. Some buildings of this type include banks, prisons, high tech labs, military installations or military related office structures, etc. We have used these types in the past, but you need to be careful. Virtually every year, someone comes in with a building that gets pulled by the owner or architect at the last minute because of the sensitive nature of the facility and the fact that the student has not gained permission from all the parties involved. (see below)
11. **Approval from the building owner is REQUIRED! You will need to produce a signed permission form by the fall from the owner approving the use of the building.** Save copies of all correspondence, they will be reviewed the first week of class.

Approval Process:

There is a multiple step approval process as follows:

1. Check the master list of student buildings on Google Sheets to be sure your building is available.
2. Using the search features on the e-Studio site, confirm that your building has not been used in the past. The search feature is located under Quick Links on the first page.
3. To confirm your building selection and to insure that no other student has already selected or reserved the same building, you must register your selection on Google Sheets. Professor Bowers will maintain the master list. All students must register their by July 1. Discussing your building with another faculty member, while useful, does not constitute registering your choice. When you reserve your building on Google Sheets, confirm that you have checked for duplicates and past use of the project.
4. If you have not done so by the time you register your building, you must obtain written approval from the **Building Owner** to use the project for Senior Thesis. **NO EXCEPTIONS. Use the Owner Permission Form that can be downloaded from the e-Studio main page.**

Senior Thesis Option Specific Requirements, Exclusions and Hints:

All Students – All Options

1. Only buildings located in the United States will be accepted for Thesis Projects. We will entertain a request for an exception to this rule from those students who have studied or worked out of the US or those students from other countries. Keep in mind that these buildings are difficult to visit and may be using different codes that are not available at Penn State. These and related issues must be worked out in advance.
2. Stadiums or arena structures without roofs will not be accepted for any of the design option students. CM students may consider these buildings only if they contain enough enclosed space to satisfy the breadth aspects of the Senior Thesis.
3. Design – Bid – Build projects **must be bid** prior the start of class. You will need cost information that will be easier to obtain after the bid process.
4. Design – Build projects must be at least 75% complete with the design and have initial contractor or professional estimator cost figures available for your use.

5. Avoid buildings that have only one solution in your option area. (This can be the case with relatively simple buildings but sometimes also applies to buildings that are extremely unique and specialized.) **In other words, avoid buildings where there is no other practical or economical solution other than the one that exists.** For example, a multistory apartment building in a downtown like State College in an area with a zoning height limitation with individual leases is likely to have generic lighting, be a precast plank structure on block bearing walls and have individual through wall mechanical units. That type of buildings doesn't leave you much to work with under those circumstances. If you watched any of the presentations, you should be able to tell which buildings provided more material for creative solutions.
6. You are not permitted to use buildings that have been used in previous years and are posted on the CPEP sites. You are responsible to use the search feature of the e-Studio site to check prior to submitting your building to Professor Bowers. This is another reason why it is important to know the official name of your building and to have an exact address.

Individual Option Requirements and Recommendations:

Structural

1. Structural Students must have a building that is a **minimum of 5 stories and 60 feet tall** (not counting underground basements and garages) unless there are other special structural features such as long spans and complex framing etc.
2. Simple rectangular buildings that are not very tall (5-6 story range) usually do not present much of a structural challenge. If you select this type of project, you will most likely be involved in a economic based thesis comparing different framing types and floor systems. Consider a more challenging building by going to a taller building, a building in a higher seismic zone, or one that has unique structural needs or solutions.
3. If you pick a building that has post tensioned concrete slabs or frames or is precast frame construction, (or a building where you think one of these systems will be a good option), you should start to learn about those types of systems during the summer. Many students will get limited exposure to those systems. *Most students selecting this type of building in the past have felt that they did not have a strong enough background in post tensioning to work with this type of building in Fall Semester.* If you are considering a post tensioned building, you should discuss this with a member of the structural faculty before making it the final selection.
4. Ask for a copy of the geotechnical report or other soils information as you will have to address the foundations for the building.

Lighting / Electrical

1. Spec Office Buildings are not permitted for Lighting/Electrical students. The variety of spaces is usually not very good and often there is no space layout or requirements for initial evaluation. Corporate offices are fine. Specialty buildings usually work better for lighting. Museums, courthouses, multiuse buildings etc.
2. Students who want to emphasize electrical are encouraged to select buildings that are about 100,000 sq. ft. in size or larger as those will give you the most options to explore new ideas.

Mechanical

1. Spec Office Buildings or other buildings where a detailed mechanical system is not planned or not designed are not encouraged for Mechanical Option students. If the building does not have a space layout, it can be difficult to determine the occupancy requirements etc. Mechanical systems are sometimes geared toward lowest first cost passing the expense on to the future occupants. It can make it difficult to formulate a more general life cycle approach or to design to specific requirements. Check this with one of the AE mechanical professors before getting too far into the process.

Construction Management

1. A contractor must have been selected for the project.
2. The ideal range of cost for CM thesis projects is \$5-\$40 million
3. The project should be under construction, or have not yet begun construction. Completed buildings will not be approved as thesis projects for CM Option students.
4. You should plan to visit the project site at least once during the Fall semester.
5. Plans, specifications, a budget, and a schedule for design and construction will be required.
6. You should select a project that you will be able to comprehend fully in terms of construction methods, size, and technical systems. You will be asked to perform a detailed estimate for the building's structure. If the building is too large, this will be difficult. If the building is too small, your thesis will be boring or limited.
7. You will be asked to obtain feedback on your work from the contractor on the project, so make sure you have a good contact
8. You will also be asked to profile the owner of this project in terms of their priorities and experience, so look for a contact that can provide you with this information.
9. The project must not have been the subject of a prior CM thesis student.

What Else Do You Need?

Two of the earliest assignments you will be required to complete in Fall Semester are the **Building Statistics** section and the **Abstract**. You can view examples of completed assignments on any of the student CPEP web pages from last year by going to the portfolio section of the *eStudio* web site. You can view the instructor's assignment sheet for these exercises looking at the requirement on the *e-Portfolio* section of the site:

For the Building Statistics assignment, you will need basic information about the building, including a paragraph type description of the primary engineering systems. For the Abstract, you will need a photo or rendering of the building. It is highly recommended that you obtain this information prior to returning to Penn State since there will be very limited time to obtain this information prior to the due dates.

Final Comments

It is extremely helpful for students to look at the type of projects and assignments that were completed last year before attempting to find a building. A complete list of projects, access to individual student *e-portfolios*, semester schedules, and copies of actual assignments can be reviewed at the AE Department *e-Studio* web site .

Assignments and other information on the website are subject to change each year but most items will be the same or very similar.

When looking for a building or requesting permission to use a building, it may be helpful to provide copies of some of the information on the *e-Studio* site to your contacts or even better, have then go to the site direct and look at the type of work you will be doing with your project.

Finally, one of the best things you can do to prepare is to attend as many of the senior projects in your option area as you can in April at either the faculty jury presentations or at the invited industry Awards Jury. Check the *e-Studio* site for locations and times.