BSCI-4990 THESIS RULES & REGULATIONS

Effective for: Fall Semester - 2013

All thesis students are responsible for compliance with the requirements in this document. Specific requirements contained within this handout may not be omitted. Your thesis advisor must approve changes in the physical scope of the project in writing.

PRELIMINARY REQUIREMENTS

Project Approval

Prerequisites specified in the Auburn University Bulletin will be enforced. No course can be taken during the final term that conflicts with the scheduled Thesis course time: 8:00 am to 11:50 am MWF. The Thesis student is responsible for completing a “Graduation Check” and verifying that all of the required course work has been satisfactorily completed.

The student must submit Project Plans with a Thesis Approval Form to the School of BSCI Office no later than the last class day of the preceding academic term. No Project Plans will be approved during semester break. A copy of the Approval form is located in Appendix A. Written approval is required prior to starting any thesis work. The approval form must be included in the thesis submittal as noted in the Thesis Assembly section of this document. Any project scope changes must be approved and noted on the approval form by the thesis reviewer at time of submission. Only one set of plans will be approved for each student. A student may apply for approval of a project up to two academic terms before graduation.
GENERAL REQUIREMENTS

Course Administration

Thesis Lab is in session 8:00 am to 11:50 am, Monday, Wednesday, and Friday; attendance will be taken during that time period. It is anticipated that during the term, seminars will be conducted by industry professionals on selected construction topics and will be announced by e-mail. Attendance is mandatory for all seminars. Also, a series of one-hour lectures relative to thesis will be conducted periodically by BSCI faculty and will be announced by e-mail. Attendance is mandatory for all thesis lectures. The lectures cover the following topics: Estimating, Recap Sheets and Bid Forms, Scheduling, Contract Documents, Structural Assessments, Materials, Erosion Control and other related thesis topics as requested by the class.

Three unexcused absences will be allowed without penalty. More than three will be reported to your thesis jury and will affect your final thesis grade. Absences will be excused at the discretion of your thesis advisor only as stated in the Tiger Cub.

The BSCI Thesis Laboratory is a space set aside for the use of the thesis students. The School of BSCI acknowledges the effort it takes to complete an exceptional thesis project. Thesis students will have access to the Thesis Laboratory 24 hours per day, seven days per week unless the University schedules otherwise. A library atmosphere shall be maintained in the BSCI Thesis Laboratory. Eating, drinking, smoking and spit cups are not permitted in Gorrie Center. Radios without headsets are not permitted in the BSCI Thesis Laboratory.

For most Thesis class sizes, each student is entitled to one desk to work on. Desks and computer equipment are to remain as arranged by the thesis faculty so that the rooms can be used for an occasional class or exam. The computers in the Thesis Laboratory are protected by a fiber optic security system. This system does not allow for rearrangement of furniture or computers.

Computing Support

The computer is a valuable tool in the preparation of the thesis. The McWhorter School of BSCI recognizes that the students rely on computing to complete their thesis. Computers, printers, and plotters are available in Gorrie Center. The McWhorter School of BSCI maintains this equipment and will respond as quickly as possible to any problems. However, it is the student’s responsibility to complete the project in a timely manner. Any failure of computer equipment is not an acceptable excuse for a late or incomplete thesis project. Students must make periodic backups to protect their respective progress. Students are completely responsible for their backup strategies.

The School will provide all printing and plotter supplies. Each student should exercise caution and print only when necessary. The printer is not a copy machine. The more it is used, the more likely it will crash. Each student will be allowed $300 for printing. Once the student has reached that amount his/her account will be terminated. Do not open the printer for any reason! The printers are monitored 24/7. The cost of repairs due to student damage will be charged to the student and will have to be paid to be cleared for graduation.
Job Placement Assistance

The industry recognition and appreciation of Auburn University Building Science is what attracts top construction firms to recruit. Your participation in the process is important to all of us. Companies will be making presentations and conducting interviews in Gorrie Center. Cassandra Calloway will make a presentation to the Thesis class on ___________ to explain the interviewing process. Honor your job interview commitments or cancel well in advance. Broken commitments can result in problems with the contractors returning to campus in the future. For more information, see Cassandra Calloway on the first floor of Gorrie Center.

BSCI maintains an electronic job board cataloging jobs those firms that have job openings are available. Your communication with these firms should be professional and open. We also have current AGC and ABC national directories for your use. Contact Cassandra Calloway for further information regarding job placement and opportunities.

BSCI Graduate Exit Interview

All students are REQUIRED to complete the graduate survey and participate in the exit interview process. The purpose is to continue to improve our program in all aspects; the input of our "most recent alumni" is to ascertain their perspective on their experience in Building Science and to solicit their input and comments on the program and its future. A copy of the graduate survey must be completed on line.

THESIS SUBMITTAL REQUIREMENTS

General Requirements

Thesis projects will be accepted until 10:00 a.m. on Friday, November 15th, 2013. The thesis will be turned in to the thesis instructor in the Faculty Conference Room, where a drawing will be held to determine thesis juries. Thesis jury hearings will be completed on or before dead day of that academic term (Time & Location, TBA). Submit your approved drawings and specifications with your completed thesis for grading. Drawings and specifications will be returned after jury hearings. Your name should be clearly marked and easily found on the outside of all your documents. Theses receiving a passing grade will be made available for pick-up on graduation day in the School of Building Science. All remaining theses will become property of the School of Building Science. The School reserves the right to retain copies of Theses for quality control and accreditation requirements. The jury is a formal presentation and defense of the student’s work. The student should be dressed as if making a formal presentation to a major prospective client. The student should take the Means BCCD used for pricing to the jury meeting.

The Thesis presentation should be of professional quality, as if you were presenting your company to a prospective client. Your thesis document shall be in 8½” x 11” page format submitted in a “D” ring binder. Your work should be neat, thorough and original. Improper grammar and misspelled words will lower your grade. Although all thesis work is to be your own, you may exchange ideas and discuss problems with other students. The faculty is available
to answer questions appropriate to the courses they teach. The faculty will not, however, take the time to re-teach course materials. Nor will the faculty “pre-grade” portions of your thesis to “check if it has been done correctly.” Refer to your class notes for any necessary review. You may also ask questions of contractors, architects, suppliers, and building industry officials, preferably those associated with your project.

THESIS ASSEMBLY

Assemble the thesis in logical order (i.e., chronological). Number all pages, in ink, including assumptions, worksheets and summary sheets, documents, and other information. A complete Table of Contents is required listing the sections, titles and page numbers. It should show all divisions of work contained in the worksheets and summary sheets. Worksheets and summary sheets will have a dual numbering system; one number system for the estimate itself and one for the thesis document. The typical work sheet and summary sheet heading areas should be complete.

Carefully plan sequencing and dating of all documents; i.e., Bid, Agreement, Bonds, Billing, etc., so that they are reasonable and consistent. You may assume any dates required to complete the thesis such as the bid date, project start date and company start date. A project time line is required.

Include your full name, as registered with the university, and thesis semester on both cover and title page. Anticipate binding room on each sheet of paper when copying or printing. Do not submit a machine copy of your thesis. All documents must have original hand written signatures.

Minimum Requirements / Thesis Assembly Model

The minimum requirements and recommended assembly for a complete thesis are as follows (do NOT use Appendix B – Thesis Evaluation & Grading Criteria as your Thesis Assembly outline):

**Preliminary**
- Title Page
- A Complete Table of Contents w/ page numbers
- Thesis Proposal Approval Form
- Assumptions
- Detailed Project Time Line of Events
- List of Student Selected Work w/ page numbers

**Company**
- Company History, Philosophy and Goals
- Organizational Chart
- Duties of Key Personnel
- Contractor’s Licenses
- Business Licenses (state and local)

**Financial**
- Contractor's Qualification Statement
- Balance Sheet
Income Statement - current and projected
Financial Narrative including business position and strategies consistent with financial statements
Financial Ratios and a thorough analysis of each: Net and Gross Margins, ROI, Current Ratio, Fixed Asset Newness, and Average Ages of Receivables and Payables
Labor Burden Determination (home office and field)
General Overhead Determination

**Project Estimate**
- Specification Take-off / Drawing Notes Issues
- QTO Worksheets (*including Site Utilities*)
- Pricing Sheets *including Site Utilities and unit prices (if required)*
- Job Site Overhead
- Recap Sheet
- Bid Calculation Worksheets (base bid, alternates and unit prices)
- Explanation/Analysis of MEP systems
- Subcontract Scope Statement for MEP systems

**Project Documents**
- Master Surety Agreement
- Proposal Form with at least one alternate bid item
- Bid Bond
- Power of Attorney for Bond Agent
- Agreement Form (per your specs.) w/acceptance of one alternate Bond Application Form
- Performance and Payment Bonds
- Certificate of Insurance
- Project Specific Safety Plan
- Construction Waste Management Plan (LEED)
- Subcontract Agreement Short Form (AGC) w/ detailed scope of Work and listing of project documents as attachments.
- Building Permit (not the application)
- Project Cash Flow Projection
- Submittal/shop Drawing Control Document
- CPM Activity Worksheets
- Schedule of Values Reports showing Period Costs for first three months, from which the pay applications are generated
- Change Order prompting, i.e. RFI, Architect’s directive, etc.
- Change Order QTO, Pricing, Recap sheets, and cover correspondence to Architect
- Change Order (executed in first 3 months)
- Payment Requests (for first 3 consecutive months)
- Substantial Completion Documentation
- Consent of Surety to Release of Retainage (when appropriate)
- Affidavit of Release of Liens
- Affidavit of Payment of Debts & Claims
- Consent of Surety to Final Payment
Certificate of Occupancy
List of all required Warranties and at least two actual Warranties

Structural
Structural Analysis

Project Schedule
Color plot of original Bar Chart (with logic arrows), cost loaded, clearly indicating a timeline, all appropriate activities, their durations, total float, and ALL logic/lag ties [front and end] for each activity.
Inclusion of Schedule Draft; to be returned to student upon submission of final project

Appendix
Site Utilization Plan (graphic and written narrative)

References
Reference all sources used in Thesis
Attach a complete copy of the Thesis Instructions

Grading

Completing all the minimum requirements listed in the preceding section does not mean an automatic grade of “A”. If all items are included and most of the items are reasonably correct, then the student can expect a grade of “C”. Significant omissions and/or errors will result in a grade in the “D” range or an “F”. Additional copies of the items listed in minimum requirements will not be considered “Student Selected Work”. Per the University’s definition, an “A” is for superior work.

Thesis projects will be presented to and defended before a faculty jury. The jury will evaluate the projects for:

1. Meeting the minimum requirements listed in the Thesis Instructions in a manner appropriate to the student’s thesis project.
2. The accuracy and applicability of student selected work.
3. The integration of the minimum requirements and the student selected work into a cohesive whole.
4. The professional quality of the thesis document.
5. The professional quality of the student’s presentation and defense.
6. The student’s ability to explain the reason and meaning of each part of the thesis. (If you don’t know what it is, how it was developed, why it’s there, and what it means, it lowers your grade!)

The jury will assign a letter grade based on this evaluation. Possible grades are A+, A, A-, B+, B, B-, C+, C, C-, D+, D, D- and F.

If the thesis is graded as an "F" (failure), the thesis will be retained. The School Head will determine whether the student is allowed to retake the course using another approved set of drawings and specifications. An "IN" (incomplete) will be assigned only if extenuating
circumstances warrant and requires the School Head's approval and per University mandated criteria.

A thesis that is submitted on time but that is not complete, will be evaluated and given a grade appropriate to the degree of completion and the quality of the work submitted. A thesis that is submitted after the designated time, but prior to 11:00 am on the due date, will be penalized by a letter grade reduction. Theses will not be accepted for grading after 11:00 am on the date due and an "F" will be assigned.

**Company and Project Documents**

All documents are to be fully executed as if real, and dated, signed and notarized where appropriate. The student is required to comply with all requirements contained within the contract documents by:

a. Compliance with the requirements, or
b. Written assumption concerning the requirement approved by the Thesis Professor.

The student may have to provide additional documents to meet the minimum requirements depending on their project.

The student is required to set up an organization that is capable of constructing their project. Be realistic in relating organization and overhead to annual construction volume, and use good management principles in staffing your organization.

An analysis and determination of the unique annual overhead, fee objectives, and labor burden for field and office employees must be clearly demonstrated and explained for the most recent complete year as well as the projected values for the duration of the thesis project.

The faculty strongly requests that multiple copies of forms or reports such as subcontracts and state licenses should be omitted. All information included should have a purpose and only one example of an executed document is required. However, pay requests are required for three months. Any additional pay requests are not considered extras and should not be included.

Students are encouraged to be creative and original in the development of forms, letterheads and other documentation. However, the creation of these items can have a negative impact if they cause excessive paper use or do not add to the overall appearance of the document. Remember, "Fluff is not a substitute for substance."
COST ESTIMATE - All scope changes must be approved by the Thesis Instructor and noted on the plans. Verbal approvals are not acceptable.

Each thesis will include a comprehensive, detailed cost estimate for the selected thesis project. Generally, the project will be taken-off manually and priced manually using the “productivity” pricing method (the normal Pricing Sheet pricing method).

Takeoff

You may design your own worksheets, summary sheets, and recap sheets as long as they are similar to those used in Project Controls. **Site work is a required item** and must be estimated and priced in a detailed manner. In addition, it should be noted that site utilities and erosion control are to be taken off and priced as Site Work “subcontract” work. Proper analysis of the site work requirements is critical to the successful completion of a project. The student should understand the grading operations and the effects of shrinkage and swell. Using a cut/fill program is acceptable. However, the appropriate reports showing existing layers and volumes, proposed layers and volumes, structures, total cut and fill, existing elevation data and proposed elevation data must be included and incorporated in the thesis in an organized manner.

Do not take off demolition work, trees and shrubs in landscaping, lawn sprinkler systems, fire alarm and/or sprinkler systems, or any low voltage wiring. Include these items in the bid amount by estimating a **lump sum** price for each item. The thesis faculty will provide limited guidance in this area. Do not assume this work will not be accomplished. Be prepared to explain your approach to these lump sum prices.

Worksheets, Summary Sheets, Job Overhead Sheets and Recap Sheets may be completed in pencil, but must be neat and legible. All estimating work should be self-explanatory to a reviewer and demonstrate an easy-to-follow audit trail throughout the estimate. Be sure to highlight totals on worksheets which are carried forward to summary sheets and totals on summary and job overhead sheets which are carried to the recap sheet indicating the page number of the destination in the appropriate manner. You will be required to justify your methodology, waste and conversion factors, and all computation in your estimate.

Pricing

You may use spreadsheet software to price all items in a format similar to the pricing sheets. Provide the pricing guide page number and line number after each item priced on the summary sheet. The reference column is for the work sheet number and should be provided for all items on the pricing sheets.

Timberline, MC², On-Screen Take-off, or other estimating software may be used to take-off and price all sections except **Divisions 3, 4 and 5, which must be done by hand (on Excel)**. All computer estimate reports should be produced in a manner to easily review the information. The student's documentation shall include take-off, pricing and sub-contractor’s recap. It will be the student’s responsibility to clearly present the information in a format that shows the accuracy of the take-off (listing each entry), audit trail, crew designations and makeup, systems/work
groups procedures, the pricing according to the current Means being used, and proper calculation of unit prices and subcontractor mark-ups.

**Develop "raw" (raw means no general contractor markup) prices for all work done at the project site including subcontracted work other than roofing.** Use reference production rates, crew sizes, with local wage rates to determine work that is self-performed. You may estimate each subcontractor's total markup at 22% to 32% if the work is totally subcontracted; the mark-up is 40% and 45% if only labor and equipment are subcontracted. **While these markup rates are somewhat arbitrary for this exercise, you have to show in some form (and be prepared to defend) what factors are included in the markup.** Show subcontractor markup on the final summary sheet of all subdivisions. Highlight the subcontractor quote (including markup) and carry to Recap sheet.

The bid must include **at least two** alternates with the estimate and on the proposal form. If no alternates are listed in the specifications, the student is required to submit an addendum to the bid documents that creates the alternates. **One (1) alternate must be accepted in the agreement with the owner.**

**Use the proposal form and the Bid Bond form from the project specifications.**

As in industry, the alternate is accepted after bid day and before the contract is written. The student must prepare the prices for these items separately for the owner to select. The student can select which will be accepted.

**You are required to show the calculations of any unit prices required on your bid for additive or deductive work.** These unit prices should include markup. Also, show the calculations for contract change orders and alternate bid items including markup.

**Special Pricing Considerations**

Price all concrete by the cubic yard, brick by thousands, block by each, and rebar and structural steel by the ton. The only exception is that the square foot/square yard pricing can be used for sidewalks and paving.

Connections for steel, wood, etc., may be estimated on the summary sheet as an adjustment to the quantity (additional materials). Use proper judgment by interpolating or adjusting Means line items.

Determine the quantity and type of all wood and light gage metal roof trusses. Use the Means pricing data for your truss pricing or an actual truss manufacturer quote. The contractor/subcontractor will still need additional material for bracing and labor to erect the trusses.
**PROJECT SCHEDULE**

The work plan and project schedule must correspond to the project's cost estimate. You must include CPM Activity Worksheets to justify activity costs. A single page schedule with 6-10 activities is recommended (but not required) to be complete prior to beginning your estimate.

A *draft project schedule* shall be submitted no later than 9:00 am Wednesday, September 25th, 2013. It should contain a calendar timeline, and milestone activities with durations for the complete project including construction. The schedule should be represented in a clear, legible, organized manner, and it should follow standard CPM drawing conventions, contain a title block, date and legend, and not exceed a sheet size of 36” x 48”. It will be submitted in a 9” x 12” manila envelope with the student’s name, project name, and thesis semester neatly and legibly written on the cover. This schedule will be inserted into the thesis when the thesis is submitted. **While this submission should be complete, it should be a draft that demonstrates your understanding of how the building will be assembled, and its relativity to your pricing of equipment, crews, and overhead.** The draft should be in bar-chart form, should include a time scale plus all activities and logic ties. Obviously, your final schedule may (and likely should) reflect refinements to this draft. Make sure you retain or make a copy of the draft, as you will not be allowed to reference it after it has been submitted. Time-based items in the estimate must agree with the scheduled time frame of the project. The pay requests are derived from the cost loaded CPM schedule and are representative of the planned progress of the work.

Each category of work must be planned and scheduled. The schedule should contain a sufficient number of activities (100 activities +/-, excluding procurement activities) for the Project Manager to coordinate the work on a weekly basis. The sequence of activities should represent the Project Manager's plan and follow standard construction practices. In addition, the schedule should show procurement activities including fabrication and delivery of critical and other time-sensitive materials to the jobsite in time not to delay the project.

Each activity must be assigned an earned value in order to produce an anticipated "Early Start Earned Value Curve." The student must include on this diagram an anticipated "Income Curve" based on the Early Start Earned Value Curve, as well as an anticipated “Actual Costs Curve”. The student will then produce and include a report showing the cash flow projection of the project based on the plotted curves.

The student will assign a "Schedule of Value" code to each activity and produce a SOV report. The codes in this report will correspond with the G703 pay request cost items and agree with the pay request amounts. Therefore, if the schedule is updated, the earned value should equal the pay request amount without the stored material.

The student is required to update the schedule for the first three months of the project and produce a SOV report that verifies the pay request amounts based on “costs this period” as well as “costs to date.”
For scheduling-related reports, the student shall include only the following: 1.) a Classic Schedule Report and a Detailed SOV Report for the initial, as-planned schedule, 2.) an updated Detailed SOV Report for each of the three updates.

Schedule Activity Worksheets should be sorted by activity and include totals for each activity as well as an overall total. A list of items not assigned to activities and included in the markup must be included as part of the schedule activity worksheets. The individual and total $ value of these items must be shown on the list.

**PROJECT MANAGEMENT**

Use the forms (Proposal, Bond, Contract, Pay Request, etc.) furnished with your specifications. If none are provided, use the latest version of AIA forms.

It is required to complete the pay request documents for the first three months of the project. Show stored materials on each request. It is not realistic for a job not to have stored materials in the early months.

The "Schedule of Values" for the pay request is a breakdown of the work for the owner to approve payments. The breakdown should identify the major subcontractors and/or work areas. **SOVs limited to the 16 CSI Divisions are not acceptable.**

Execute all documents (fill in all blank spaces including correct signature, stamps and seals). Clearly identify the drawings and specifications in the contract agreement. Do not include any documents that are not required by your project. Use the AGC subcontract agreement form rather than the AIA document for your required subcontract.

The thesis is to include a list of submittals and shop drawings for the project with identification of the vendor/party responsible for originating each and the scheduled/required delivery date for each submittal. This list is to be developed from the submittal requirements given in the project specifications. Major procurement items (+/- 10 each) should be included in the schedule.

The student is required to execute a change order during the first three months of the project. This change order will be reflected in the pay request(s) as is appropriate. The change order amount and scope of work will be at the student’s discretion. The actual work required in the change order does not have to be accomplished during the first three months. The scope of the change order must be such that the contract duration and/or the contract sum is/are changed. Worksheets and Summary Sheets showing the changes are required.
**STRUCTURAL ASSESSMENT**

**Structural System:**

Include a conceptual assessment of the structural systems of the building. The assessment must provide a detailed explanation and identify the following:

**a.** The basic structural system for carrying vertical loads. Include diagrams that trace the path of vertical loads in the structure from roof to ground. A section view through a major axis of your building would be used for this. Make use of gravity force vectors of differing weights to indicate accumulation of load from roof to ground. A detailed verbal description must accompany the graphic one.

**b.** The basic structural system for carrying lateral loads (wind). Include diagrams that trace the path of lateral loads applied to the structure. A plan view of your building indicating the reacting structural elements for wind load striking each of the major building axes is required. You should use different colors or separate diagrams for each wind direction. Show section views with wind load vectors for clear demonstration of how wind loads travel to the ground. A detailed verbal description must accompany the graphic one.

**c.** Temporary compression ground brace for wall or truss system: size and spacing of braces must be determined considering lateral (wind) loads, slenderness ratio, strength analysis, connectors and anchorages,

**Temporary Structure:**

Students must provide one detailed structural analysis of a temporary structure such as that identified below, such as the concrete formwork for one of the major building components, elevated slab, wall, beam or slab. The analysis must include detailed load determination, selection of appropriate materials, and structural analysis, including strength, stiffness and stability considerations.

- **Example 1:** Trench shoring: determine soil lateral loads, design sheeting, wales and shores considering slenderness, strength, and deformations.

- **Example 2:** Elevated slab formwork design: determine all sources of gravity loads to design sheathing, joists, stringers, and shores, considering strength and stiffness. Stability must be considered in slenderness of shores and system stability in lateral bracing of overall shoring system.

- **Example 3:** Wall or column form: determine all loads to calculate lateral form pressures, and design sheathing, studs, wales and ties considering strength and stiffness. Determine lateral stability.
MECHANICAL, ELECTRICAL AND PLUMBING

Provide a complete scope of work for HVAC, Plumbing, and Electrical contracts.

Provide descriptions of the HVAC, Plumbing, and Electrical systems shown in your project. Include the following as a minimum:

HVAC System:
  (1) Describe the components of the system or systems (AH, VAV, RTU, Chiller, cooling tower, piping, pumps, type of duct, etc.).
      A. The purpose of each component.
      B. How the component works.
      C. How the components work together.
  (2) Discuss the controls of the system and who installs the controls.
  (3) Discuss the process of the cooling cycle through the system.
  (4) Discuss the process of the heating cycle through the system.
  (5) Discuss the energy conservation measures, if any, for the building.
  (6) Why was this system used as compared to another?
  (7) Discuss the impact of the HVAC system on the schedule.

PLUMBING System:
  (1) Potable water supply source, waste discharge point for sanitary and storm.
  (2) Type and location of water pipes.
  (3) Type and location of sanitary sewer pipes.
  (4) Discuss the pumps in the systems.
  (5) Discuss any controls in the system.
  (6) Discuss the hot water source and distribution (re-circulation or non-re-circulation)
  (7) Discuss the impact of the plumbing system on the schedule.

ELECTRICAL System:
  (1) List service amperages and voltage to the MDP.
  (2) List operating voltage(s).
  (3) Describe the control systems.
  (4) Describe the electrical from the entrance, meter, and/or MDP through the sub-panels.
  (5) Describe the building equipment needs other than lights and receptacles (pumps, AH, Chiller, RTU, elevators, etc.).
  (6) Describe the types and locations of conduit.
  (7) Describe the emergency power system.
  (8) Discuss the impact of the electrical system on the schedule.

The estimate for the MEP portion of the project may be completed with a cost per square foot price (from Means) for the MEP subcontracts.
SAFETY

The student should provide a safety assessment that is specific to the site and building of the student’s project. This assessment should include a list of specific safety concerns for your thesis project and the specific steps to ensure worker safety for each item. Do NOT attach your general “company safety plan”.

LEED Assessment – Construction Waste Management Plan

LEED credits are available to encourage contractors to reduce the amount of waste that is deposited in landfills which is produced during the construction process. On average commercial construction projects generate between 2 and 2.5 pounds of solid waste per square foot, for a standard thesis project that equates to between 10 and 15 tons of solid waste. Much of this waste can be salvaged and/or recycled. This credit measures the percentage of waste which is recycled or salvaged and diverted from landfills. The calculation for this credit is a percentage based on the amount of waste diverted from a landfill divided by the total amount of waste generated on-site. Excavated soil, land clearing debris and hazardous waste are excluded from the calculation.

Required Waste Management Plan Submittal:
Develop a construction waste management plan which is specific to your project and which contains the following:

- Description of the implementation process;
- Listing of responsible parties and description of duties;
- Description of project specific waste and which materials will be targeted to be either salvaged or recycled;
- Description of handling and transportation methods;
- Listing of local recycling and salvage yards including the materials types they accept;
- Site utilization plan highlighting key features specific to waste management (i.e. dumpsters, salvage material lay down); and
- A summary log for waste diversion containing the following columns at a minimum:
  - Give material description
  - List recycling hauler and/or recycling yard (List actual recyclers in the project area)
  - Quantity of waste

Related References:
SPECIFICATION TAKE-OFF / DRAWING NOTES ISSUES

The student shall provide an analysis of all items that impact time, money, or other risks that are associated with, but not be limited to, supplemental conditions, general notes on drawings, and all specifications. The analysis shall be presented in the form of an internal memorandum directed toward company employees affiliated with this project.

STUDENT SELECTED WORK

Students are required to add relevant information into their thesis document. The information should be insightful and provide the faculty with additional understanding concerning the project or the construction process as seen by the student. You may enhance your thesis by taking photos, including work on related items that interests you, and adding originality where it enhances your total project. The Student Selected Work submitted should involve approximately 40 hours of work completed by the student. Examples of “Student Selected Work” are listed below:

Cost Analysis:

The student can identify a component of the building and do a value analysis to determine which system may be better to use. The analysis needs to address the cost of the item, its effect on the schedule and the life cycle cost. The important thing to remember is to identify and analyze various systems. The project can remain the same.

Temporary Structures:

In addition to the information required in the Building Stability section, the student could do in-depth investigations of several areas. Trenching, bracing wood trusses, bracing masonry walls, structural steel bracing and shoring could all be studied as they relate to your specific project. The complete design could include sketches, citations from applicable codes or OSHA sections, connection details, construction sequencing and other relevant information.

Scheduling:

Project planning is an area that the student could explore. Creating a detailed Work Breakdown Structure which represents the organization of the project is acceptable. This plan should be reflected in the actual schedule that is required.

Creating a detailed Two-week Schedule that deals with a specific operation or area of the project could also enhance the thesis. This schedule could be used by the superintendent to direct field personnel or coordinate subcontractors. This could also represent a project meeting schedule where the actions of the last week and the next two weeks would be discussed. This schedule would be more detailed that the overall project schedule, but represent the activities that need to be completed during the time period.
This form is to be submitted directly to the BSCI Office, along with drawings and separately bound specifications. The student is encouraged to submit the drawings and specs. on a USB drive in PDF format. The Thesis Instructor will make notations on this sheet as to their approval and any special requirements. After the project has been approved, the BSCI Office will return a copy of this form and the plans/specs/cd to you and retain a copy of this form for filing. If disapproved, the plans/specs/cd and form will be returned to you. The Building Science Office phone number is (334) 844-4518.

Today’s Date: ____________  Semester & Year you will take Thesis: ________________

Full Name of Student (as in AU Banner): ___________________________________________ AU e-mail: _______________________

Exact Title of Project on Plans/Specs: ____________________________________________________________________________

Name of Architect: __________________________________________________________ Date of Plans: ___________

Architect’s Project #: ___________ Location of Building, City: ______________________________ State: ___________

Cost of Project: _________________________________ (Should be between $1,000,000 and $3,000,000)
Use actual bid figures or A/E’s or G.C.’s estimate/budget.

Building Floor Area (should be approximately 9,000 - 12,000* s.f.) ________________ No less that 7,000 s.f. of the area must have finished floors, partitions, walls and ceilings. * BIM Thesis is a minimum of 15,000 s.f.

Types of buildings that do not lend themselves to be good Thesis projects and will not be approved:

| • Pre-engineered roof trusses and wall systems | • Wal-Mart or supermarket type buildings |
| • Pre-engineered metal buildings or pre-cast walls | • Drug Store projects (CVS, Walgreens, etc.) |
| • Branch banks | • Houses or Apartments |

Select Yes or No to the following questions.

**Required Items for Thesis Proposal Approval:**
- Do you have a complete set of bound Specifications, Division 0 thru Mechanical/Electrical/Plumbing? Yes No
- Do you have the following forms in the General Conditions: Bid Proposal, Agreement? Yes No
- Do you have complete Civil drawings (u.g. utilities, grading, parking, elevations, erosion control, etc.)? Yes No
- Do you have complete Architectural drawings (doors & windows, interiors, ceiling, elevations, etc.)? Yes No
- Do you have complete Structural drawings (foundations, floor & roof framing, wall sections, etc.)? Yes No
- Do you have complete Mechanical drawings (HVAC, ductwork, equipment schedules, piping, etc.)? Yes No
- Do you have complete Electrical drawings (lighting fixture schedule, power, panel board schedule, etc.)? Yes No
- Do you have complete Plumbing drawings (non-pressure & pressure piping, fire protection, etc.)? Yes No

**Required Items for Thesis Class (strongly recommend inclusion in Thesis Proposal):**
- Do you have a Geotechnical Report? Yes No
- Do you have any Formwork required such as retaining wall, elevated slab, columns, etc.? Yes No
- Do you have a Finish Hardware schedule in the specifications or listed on the drawings? Yes No
- Do you have any Alternates in the Bid Proposal and/or specifications? Yes No
- For BIM Thesis only: Do you have CAD drawings and digital specifications? Yes No

Student Comments Regarding Proposal: ____________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

**BSCI Office Approval:** ___________________________________________ Date: ____________

**BIM Thesis Faculty Approval:** ___________________________________________ Date: ____________

**Thesis Instructor Approval:** ___________________________________________ Date: ____________

Thesis Instructor Comments & Special Requirements for approval: __________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

_____________________________________________________________________________
## Thesis Evaluation & Grading Criteria (updated 1-9-12)

### General Overview
- **Understanding the Plans**
- **Understanding the Specifications**
- **Understanding Materials**
- **Understanding Methods**
- **Organization of the Book**
- **Appearance of the Book**
- **Misc. Factors**

## The Thesis & Company Items

<table>
<thead>
<tr>
<th>5%</th>
<th>LEED Assessment</th>
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<tbody>
<tr>
<td></td>
<td>Waste Management Plan</td>
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</table>

## Project Administration

<table>
<thead>
<tr>
<th>15%</th>
<th>Project Administration</th>
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<tbody>
<tr>
<td></td>
<td>Proposal Form with at least one alternate bid item</td>
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<tr>
<td></td>
<td>Agreement Form (per your specs.) w/ acceptance of one alternate</td>
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<tr>
<td></td>
<td>Change Order (executed in first 3 months)</td>
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<td></td>
<td>Change Order prompting, i.e. RFI, Architect’s directive, etc.</td>
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<tr>
<td></td>
<td>Change Order QTO, Pricing, Recap sheets, and cover correspondence to Architect</td>
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<tr>
<td></td>
<td>Schedule of Values Reports showing Period Costs for first three months, from which the pay applications are generated</td>
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<td></td>
<td>Payment Requests [for first 3 consecutive months]</td>
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<tr>
<td></td>
<td>List of all required Warranties and at least two actual Warranties</td>
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<tr>
<td></td>
<td>Subcontract Agreement Short Form (AGC) w/ detailed scope of Work and listing of project documents as attachments</td>
</tr>
<tr>
<td></td>
<td>Explanation/Analysis of MEP systems</td>
</tr>
<tr>
<td></td>
<td>Subcontract Scope Statement for MEP systems</td>
</tr>
<tr>
<td></td>
<td>Project Cash Flow Projection &amp; Analysis</td>
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</table>

## Project Documents

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<thead>
<tr>
<th>5%</th>
<th>Project Documents</th>
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<tbody>
<tr>
<td></td>
<td>Master Surety Agreement</td>
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<tr>
<td></td>
<td>Bid Bond</td>
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<tr>
<td></td>
<td>Power of Attorney for Bond Agent</td>
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<td></td>
<td>Bond Application Form</td>
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<tr>
<td></td>
<td>Performance and Payment Bonds</td>
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<tr>
<td></td>
<td>Certificate of Insurance</td>
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<tr>
<td></td>
<td>Building Permit (not the application)</td>
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<td></td>
<td>Submittal/shop Drawing Control Document</td>
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<tr>
<td></td>
<td>Substantial Completion Documentation</td>
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<tr>
<td></td>
<td>Consent of Surety to Release of Retainage (when appropriate)</td>
</tr>
<tr>
<td></td>
<td>Affidavit of Release of Liens</td>
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<tr>
<td></td>
<td>Affidavit of Payment of Debts &amp; Claims</td>
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<tr>
<td></td>
<td>Consent of Surety to Final Payment</td>
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<td></td>
<td>Certificate of Occupancy</td>
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## Financial

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<tr>
<th>10%</th>
<th>Financial</th>
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<tbody>
<tr>
<td></td>
<td>Contractor’s Qualification Statement</td>
</tr>
<tr>
<td></td>
<td>Income Statement - current and projected</td>
</tr>
<tr>
<td></td>
<td>Financial Narrative including business position and strategies consistent with financial statements</td>
</tr>
<tr>
<td></td>
<td>Financial Ratios and a thorough analysis of each: Net and Gross Margins, ROI, Current Ratio, Fixed Asset Newness, and Average Ages of Receivables and Payables</td>
</tr>
<tr>
<td></td>
<td>Labor Burden Determination (home office and field)</td>
</tr>
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<td></td>
<td>General Overhead Determination</td>
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## Project Estimate

<table>
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<tr>
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<th>Project Estimate</th>
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<tbody>
<tr>
<td></td>
<td>QTO Worksheets, include Site Utilities</td>
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<tr>
<td></td>
<td>Pricing Sheets, include Site Utilities and if required, unit prices. <em>(Demonstrate an easy-to-follow audit trail throughout the estimate and include appropriate backup for QTO.)</em></td>
</tr>
<tr>
<td></td>
<td>Job Site Overhead</td>
</tr>
<tr>
<td></td>
<td>Recap Sheet</td>
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<tr>
<td></td>
<td>Division 2 Analysis / Subsurface Investigation</td>
</tr>
<tr>
<td></td>
<td>Bid Calculation Worksheets (base bid, alternates and unit prices)</td>
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## Structural

<table>
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<tr>
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<th>Structural</th>
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<tbody>
<tr>
<td></td>
<td>Vertical Load Diagrams</td>
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<tr>
<td></td>
<td>Vertical Load Text Explanation</td>
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<tr>
<td></td>
<td>Lateral Load (wind) Diagrams</td>
</tr>
<tr>
<td></td>
<td>Lateral Load (wind) Text Explanation</td>
</tr>
<tr>
<td></td>
<td>Temporary compression ground brace for wall or truss system</td>
</tr>
<tr>
<td></td>
<td>Temporary structure analysis including load determinations, selection of materials, and analysis of strength, stiffness, and stability. Choose 1 of the following: Trench shoring, Elevated slab formwork, Column formwork, or Wall formwork.</td>
</tr>
</tbody>
</table>

## Student Selected Work

<table>
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<tr>
<th>10%</th>
<th>Student Selected Work</th>
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<tr>
<td></td>
<td>Requires 40 hours of work for full credit</td>
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<tr>
<td></td>
<td>(i.e., LEED, BIM, pictures with narrative, etc)</td>
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</tbody>
</table>

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*Thesis Document McWhorter School of Building Science Auburn University Fall 2013 Page 17*