


2016

# AE 2250: Construction Graphics and Design—A Peer Review of Teaching Project Benchmark Portfolio

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2016

# CONSTRUCTION GRAPHICS & DESIGN



## *Peer Review Teaching Portfolio*

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## 1. Introduction

This portfolio is anticipated in improving student learning, documenting, assessing and making visible of teaching as part of the Peer Review Teaching Evaluation program at the University of Nebraska-Lincoln. This portfolio is developed for AE 2250 course (Construction Graphics & Design) through a series of steps to identify the course objectives or concerns; design activities to address these concerns/meet the objectives; determine means and methods to assess the effectiveness of the designed activities and/or outcomes of the objectives on the different aspects of teaching: intellectual content, teaching practices, and student understanding. These essays are integrated into reflective document or portfolio in empowering teaching style, organizing the curriculum and learning objectives in continuous improvement and design of the next version of the course.

## 2. Overview

*Construction Graphics and Design (AE 2250)* is a second year course offered in the Durham School of Architectural Engineering and Construction (DSAEC) as core course of the Architectural Engineering program. Primarily, the course is intended for Architectural Engineering (AE) students with the goal of introducing students to construction graphics in better understanding and reading of construction drawings, descriptive geometry and drawing conventions; use of computer applications such as Computer Aided Design (CAD); and conceptual review of engineering design and problem-solving processes where the course is offered in both Omaha and Lincoln campuses once a year. However, with the advancement in digital technology, the evolution and integration of the design and construction industry and the fact that three programs; Architectural Engineering (AE), Construction Engineering (CONE) and Construction Management (CM) laying under the same umbrella has led the school's perspective to shift gears in equipping our students with up-to-date knowledge and information where they will be competitive and rank on top in the engineering and construction industry. With this respect, the course goal, its content and target audiences are in the transformation process where it can introduce students to Building Information Modelling (BIM) which can be offered twice a year for the College of Engineering in both campuses.

Currently, students ranging from architectural engineering, construction engineering, construction management and civil engineering including freshman, sophomores and juniors are the target audience. Enrollment in the course does not require any prerequisites. The course is now being offered in both campuses twice a year starting Fall 2015. However, the course is offered as *Introduction to BIM (CM 2250)* in the Fall Semester and *Construction Graphics and Design (AE 2250)* in the Spring Semester to meet students need and ABET accreditation purposes. Although these two courses have the same goals, eventually they are expected to be cross-listed and offered as one course considering the fact that both use the same content and syllabus and as such the course title "*Construction Graphics and Design*" can be at times misleading. Presently, the course is being taught by two faculties in collaboration with an industry fellow. Typically, there are three sections with approximately fifteen to thirty

students in each section where one faculty is responsible for two sections and another faculty being responsible for the third section. The industry fellow comes in as-part time and/or co-teaches with faculties which is a great addition to the faculty in providing students with real life experience and hands on practice. The course is offered twice a week with a total of four hours and thirty minutes' contact hours. The course is designed with the intention of providing one hour and forty minutes' lecture and the remaining hours for laboratory sessions where students can practice on computer application and perform in-class exercises. [Appendix A](#) and [Appendix B](#) show the course syllabus and schedule for Spring 2016. The goal of this course portfolio is to re-design and modify the course in introducing our engineering and management students to Building Information Modelling (BIM) that aligns with the Architectural/ Engineering/ Construction industry and socio-economic trends which will suit all students and the School and College's vision and effort.

This transition process has been interesting and challenging at the same time in setting goals and objectives to meet various stakeholders' needs especially from student's perspective, faculties, departmental and college level. Teaching the course for the first time in Spring 2015 has opened my eyes to re-design the course where I faced challenges or per se weaknesses and keep the ones that turned positive in terms of student learning goals, objectives, assessment methods and techniques. As part of this effort, one of the challenges associated with the course, as mentioned earlier is the wide student audience. Since the course is originally designed for Architectural Engineering (AE) and the concept and utilization of BIM is more practiced by designers and consulting engineers, the course goals weighed more on the AE side of building or vertical design where even one of the major assessment techniques used in the course was a final project of designing an architectural building that comprised of 40 percent of student's final grade. However, in reality, BIM is practiced by wide variety of engineers and students including civil engineers and construction managers which I have seen a less interest. With this challenge, one of the course goals I would like to address in this design is to *"Introduce the use of BIM in structural (ST), mechanical, electrical, and plumbing (MEP) works and applications in real world"*.

Secondly, students' perception of the class is more about computer applications and enhancing their soft skills. For example, the course uses BIM software program called Autodesk Revit® which is one of the commercial products of Autodesk. However, in reality once students join the industry, they will be working with various types of commercial BIM products including Autodesk, Bentley and Rhino provided by multiple vendors and depending on the engineering firm they will be employed at. At this course, we would like to change this understanding and perception by *"Illustrating BIM is a process rather than a software product or tool"*. Thirdly, the diverse student background and major makes it more fun and there is a need to take advantage of this opportunity. With the engineering and construction industry comprises of various stakeholders which highly involves team work to succeed in a project. In this course design, the intent is to *"Promote team-work in advancing their communication, public speaking and leadership skills"*.

Fourthly, currently a system is not in place to track student performance and document their efforts except the typical course exams. In this portfolio, it is planned to *“Incorporate innovative means to track and analyze student performance”*. Fifthly, in a typical scenario, students’ feedback is obtained after the semester is done. This is late to make any changes or improve the teaching means and methods. Thus, there needs to be a mechanism to understand their needs and meet their expectation. This course will *“Facilitate in developing a system to understand students need throughout the semester based on their background and requirement that aligns with the course learning goals and objectives”*. In this portfolio, various teaching methods and means will be implemented to improving student learning outcomes and tracking and analyzing student performances in lieu of improving the course for upcoming semesters. The following section describes the objectives in detail and how it will address the objective through a design of a course activity, discusses the assessment techniques and how the assessment will impact student learning outcomes.

### 3. Course Design & Teaching Methods

The course is designed to address some of the research questions based on the course activity that will be conducted during the semester associated with the assessment techniques that will be employed along with the impacts the assessment will have on student learning. In this portfolio, seven activities are designed as primary teaching methods to address current concerns and/or questions.

#### 3.1 Method 1: *How do I create a collaborative environment in promoting one of the learning objectives: understanding BIM as a process rather than a software tool?*

- a. **Course Activity:** Students will research on various BIM topics and prepare a 15-minutes presentation to share their findings at the start of the class where each member of a group is required to speak. These topics include *“What is BIM, A BIM Case Study, Why is BIM good for Designers? Owners? Contractors? Quantifying BIM, The Legal Challenges of BIM, Why BIM is Failing? and Global BIM and Where is BIM going?”* The students will be grouped randomly based on their last name to foster working with a class mate they may have never met. **Appendix C** shows the student group and their BIM topics which are presented on a weekly-basis. In addition, lectures are designed to instruct the BIM process and construction management aspects which ranges from specifications and contract documents to project delivery and design process.
- b. **Assessment Technique:** The presentation will be evaluated by the professor and the teaching assistant through a rubric to assess their efforts based on four items: i) the content of their work (logic and understanding of their findings); ii) how it is organized (includes introduction, body, conclusions, references); iii) the clarity of their presentation (easy to read and uses graphics), and iv) their ability to answer questions (how well they address them). Refer to **Appendix D** for sample group presentations and the rubric used for assessment.

- c. **Impact:** This will allow me to synthesize their understanding of BIM based on the questions they will be asked from the floor and the amount of effort they have put in to learn about the process. In addition, this will allow me to evaluate the student's team work and project collaboration in understanding the concept and their findings. This will also help me assess student's communication skill and speaking in front of a design team.

### 3.2 Method 2: *How do I meet the various student audiences need and keep students excited about the class?*

- a. **Course Activity:** Three activities will be involved to address this concern i) Experts or industry speakers will be invited in the form of seminars and guest lectures. In this activity, multiple speakers from respected design and engineering and construction firms including Leo A Daly, Kiewit and International Masonry Institute (IMI) will bring their skills and real-world experience in structural (ST), mechanical, electrical, and plumbing (MEP) and construction works associated with BIM. ii) Research journals and up-to-date articles on BIM will be given as special assignments and group discussions. iii) Videos of cutting edge technology will be shown. A sample of the guest lectures is attached as **Appendix E**. These guest lectures are assessed as integral part of the quizzes and exams where a few questions will be incarnated from the lectures. In addition, the students are expected to write a one-paragraph summary for each article which will be graded as part of an in-class exercise/homework. Upon submittal, there will be a group discussion about the articles and what they have learned from it. An example of a video and reading assignment is shown in the following hyperlinks:

<https://vimeo.com/107291814>

<http://www.pocket-lint.com/news/126681-google-x-explained-what-s-really-going-on-at-google-s-secret-lab>

- b. **Assessment Technique:** A separate assessment technique is not designed as it is part of the quizzes and exams except their writings which will be assessed based on submittal.
- c. **Impact:** This will provide me an understanding of students thinking process and linking the subject with the learning goals and objectives. In addition, this will give opportunities to look into research activities and real world applications by extending their knowledge beyond BIM.

### 3.3 Method 3: *How do I make sure that students have met their expectations and the learning goals?*

- a. **Course Activity:** Use pre, during and post survey: The best way to meet students' expectations and the learning goals of this course is to first understand their backgrounds and know where they are on day 1. The pre-survey will assess the students

background, name, major and experience through a brief biographical information. This pre-survey is provided as the first assignment of the semester. Secondly, conducting one-one meetings, discussing and interacting with them to identify what they expect to learn from the class is beneficial to shape the course that aligns with the learning goals. Thirdly, a series of surveys (during and post-survey) is necessary to follow up with the students and I, if we are all on the same page. This second survey will be performed through the middle of the semester to get student feedback on how the semester is going and if they like the teaching methods, course materials and work load. It will also ask students to a set of questions ranging from the pace of the class to listing the things they enjoy in the class, things they think needs improvement or want to learn and how many hours they spend on the class. Refer to [Appendix F](#) and [Appendix G](#) for illustrations of the pre- and mid-survey. The post survey will be part of the course evaluations that students perform at the end of the course.

- b. Assessment Technique:** A quantitative and qualitative analysis will be used to analyze the findings in meeting student needs and expectations.
- c. Impact:** The pre-survey will allow me to know the students name and background on the second week of class to create a good relationship right at the start of the semester and understand their experience and levels in designing the course. The during-survey will help me understand students need and shift my gears to adjust the pace of the class, keep the things students liked and change some methods that needs improvement for the remaining of the semester. The post-survey will be a great feedback on how the semester went and make the necessary changes and adjustments for the upcoming semester. However, it should be noted that, the post-survey may not be included in this portfolio as it might take some time to get all the feedback by the time this work is compiled.

#### *3.4 Method 4: How do I make sure that students apply what they have learned in class and during demonstration of the lab session?*

- a. Course Activity:** This course highly involves the use of Autodesk Revit software. In a typical setting, students seem to understand or nod their head if they have understood the course material and the modeling aspect when demonstrating various function of the program. However, students have the tendency not to ask questions where they are not clear due to a number of reasons including being shy or thinking that it is not a good question or feel like they can figure it out by themselves or will ask their friend after class. In order to avoid this scenarios, individual in-class exercise and assignments will be offered weekly right after the lecture where they will have to submit by the end of the class unless the exercise is lengthy and they have to turn it in on the next class. This will allow students to get hands on experience by working on in-class exercise or without taking it home and trying to find time work on it before the due date. I always believe that practice will make anyone perfect. An example of a typical exercise is shown in [Appendix H](#).

- b. **Assessment Technique:** A quantitative evaluation of their weekly exercise will be made based on a rubric that is created to easily identify the goals of the exercise and make sure that they learned the ideas that we want them to know as part of the learning goals. The rubric is inserted in Blackboard so that students will see their efforts and how they are evaluated to create a more transparent evaluation system. **Figure 1** and **Figure 2** show an example of a rubric in a grid and list view.

**Rubric Detail**  
You can interact with a rubric to grade in [Grid View](#) or [List View](#). [More Help](#)

Name: **Ex1** Edit

**Grid View** List View

	Novice	Competent	Proficient	OK
Dimensions	0 (0%)	2 (20%)	2.5 (25%)	1.5 (15%)
Wall type	0 (0%)	2 (20%)	2.5 (25%)	1.5 (15%)
Wall location (see Break Box)	0 (0%)	2 (20%)	2.5 (25%)	1.5 (15%)
Wall face	0 (0%)	2 (20%)	2.5 (25%)	1.5 (15%)

Name: **Ex1** Edit

Figure 1 In-Class Exercise 1 Rubric Example (Grid View)

**Rubric Detail**  
You can interact with a rubric to grade in [Grid View](#) or [List View](#). [More Help](#)

Name: **Ex2** Edit

**Grid View** List View

Show Descriptions  Show Feedback

**Interior walls**

- Novice 0 (0%) points
- Competent 2 (15.38%) points
- Proficient 7 (46.07%) points

**Doors**

- Novice 0 (0%) points
- Competent 2 (15.38%) points
- Proficient 4 (26.07%) points

**Windows**

- Novice 0 (0%) points
- Competent 2 (15.38%) points
- Proficient 4 (26.07%) points

Name: **Ex2** Edit

Figure 2 In-Class Exercise 2 Rubric Example (List View)

- c. **Impact:** This will allow catching up any difficulties that they faced and experienced while working on their exercise and we can go through it in the upcoming class before moving to the next subject. This will also help me in identifying how I am conveying the intended message efficiently. In addition, the in-class exercise will allow to interact with the student and work one-on-one in helping them out with their understanding and learning the course.

### 3.5 Method 5: *How do I evaluate my students understanding of BIM and the materials covered in class?*

- a. **Course Activity:** In order to assess if students are following up with the course materials, 2 quizzes and 2 exams are designed that is spread through the semester. The quizzes consist of multiple choice, brief answers, fill in the blanks and matching on material that are covered prior to the quiz date. The exams consist of two sections: a written part and modeling part. The written part covers lecture notes and has a similar content to the quizzes, while the modeling part will cover the lab session and working on Revit model. The modeling section are also designed similar to the in-class exercises. [Appendix I](#) illustrate an example of a quiz and exam along with a revision of contents.
- b. **Assessment Technique:** A quantitative evaluation is made based on an answer sheet developed for the quizzes and written part of the exam, and a rubric for the modeling part of the exam that is similar to the in-class exercise.
- c. **Impact:** Even though I believe exams and quizzes may not be the most practical way of evaluating a student's performance, this course activity and assessment will be more of a standard form of evaluation to determine how well students are performing and understand the materials that are covered in class. Students can perform well in in-class exercises, participate and put the time and efforts, but may not do good in exams and similarly, students who do not perform well in class may do a better job in exams. Thus, quizzes and exams will help in determining who is doing well and who is not and understanding the student better and see if they need help.

### 3.6 Method 6: *How do I track if students are using and accessing the course materials and exercises posted for them?*

- a. **Course Activity:** Materials were prepared in PowerPoint to assist students in following up the lecture and labs. A Blackboard (BB) feature is used in tracking measures to see how many students have accessed the lecture notes, labs, assignments and announcements, and determine when they accessed it and at what time.
- b. **Assessment Technique:** A blackboard statistical analysis and reporting is used to assess the tracking.
- c. **Impact:** This will justify if students have put the required amount of time and efforts to go through course materials and at what stages students accessed them.



### 3.7 Method 7: How do students learn about modeling and appreciate the difference between a 2D/3D CAD model and a parametric object model in BIM?

- a. **Course Activity:** Students can learn about the BIM model and appreciate the difference by designing a final project. Primarily, before jumping into the final project, students are put into groups using CATME (Comprehensive Assessment of Team Member Effectiveness) a web-based survey to collect data on team-member effectiveness. This tool is implemented with a focus to develop student teams that will work together and help each other out throughout the semester even though the final project is an individual work. This tool helped in making the team by matching different backgrounds, majors, level of BIM knowledge, and gender. **Figures 3 - 5** shows a screenshot of CATME.

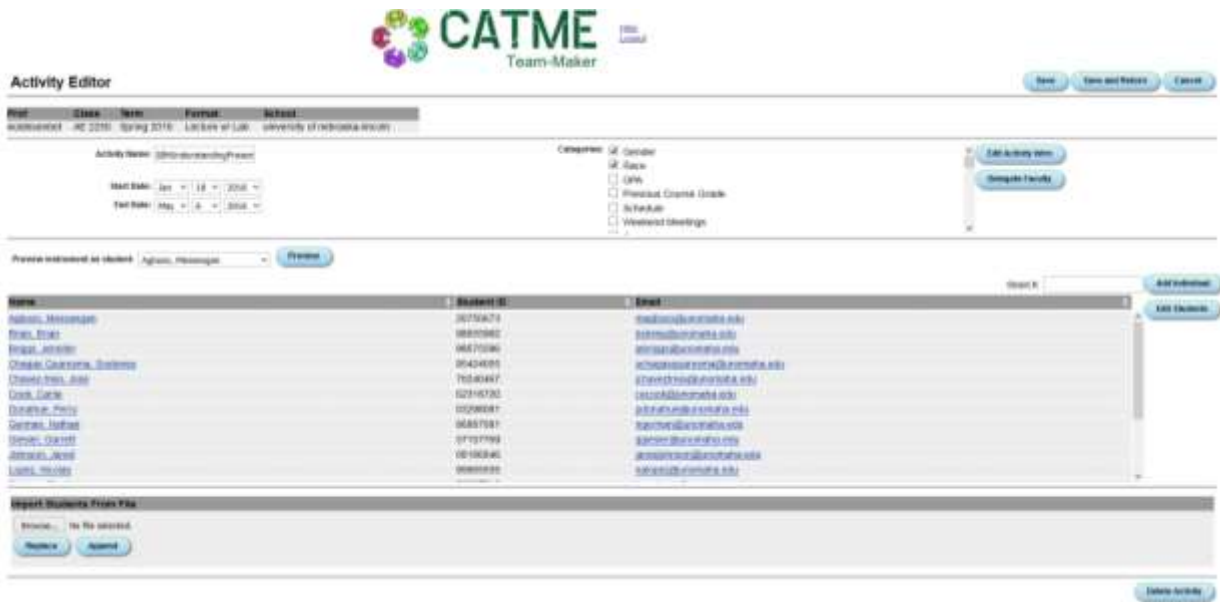


Figure 3 CATME Activity Editor

Name	Student ID	Email	Comment
Agbozo, Messangan	20750673	<a href="mailto:magbozo@unomaha.edu">magbozo@unomaha.edu</a>	this class is going to be a good experience for me.
Basil, Michael	12684514	<a href="mailto:mabasil@unomaha.edu">mabasil@unomaha.edu</a>	
Brian, Brian	96655992	<a href="mailto:bshirpo@unomaha.edu">bshirpo@unomaha.edu</a>	I look forward to learning how to use Revit this semester.
Briggs, Jennifer	99575596	<a href="mailto:jbriggs@unomaha.edu">jbriggs@unomaha.edu</a>	
Chagas Quaresma, Sosthenes	95424055	<a href="mailto:schagasquaresma@unomaha.edu">schagasquaresma@unomaha.edu</a>	
Chavez-Trejo, Jose	70240467	<a href="mailto:jchaveztr@unomaha.edu">jchaveztr@unomaha.edu</a>	
Cook, Carlie	62518720	<a href="mailto:ccook@unomaha.edu">ccook@unomaha.edu</a>	
Donahue, Perry	03298081	<a href="mailto:pdonahue@unomaha.edu">pdonahue@unomaha.edu</a>	
German, Nathan	66887061	<a href="mailto:nqerman@unomaha.edu">nqerman@unomaha.edu</a>	
Giesler, Garrett	57157769	<a href="mailto:ggiesler@unomaha.edu">ggiesler@unomaha.edu</a>	Took CAD I, II, and III in High School. Did 5 semesters of AutoCAD and 1 semester of Revit, therefore, mostly familiar with AutoCAD and somewhat familiar with Revit.
Johnson, Jared	08186546	<a href="mailto:jaredjohnson@unomaha.edu">jaredjohnson@unomaha.edu</a>	I hope to obtain more experience working as a team through the design process and getting hands-on experience for the future.
Lopez, Nicolas	90665535	<a href="mailto:nlopez@unomaha.edu">nlopez@unomaha.edu</a>	
Scherer, Brooke	02527746	<a href="mailto:bscherer@unomaha.edu">bscherer@unomaha.edu</a>	
Swoboda, Nicholas	67278928	<a href="mailto:nswoboda@unomaha.edu">nswoboda@unomaha.edu</a>	
Tapia-Vasconinos, Uniel	27758056	<a href="mailto:utapia@unomaha.edu">utapia@unomaha.edu</a>	
Trouba, Daniel	74200630	<a href="mailto:dtrouba@unomaha.edu">dtrouba@unomaha.edu</a>	My experience in software is only in AutoCAD. I took several classes in the software in High School and from what I can see so far, the two softwares are similar.
Weidner, Mark	01022156	<a href="mailto:mweidner@unomaha.edu">mweidner@unomaha.edu</a>	

Figure 4 CATME Student Textual Data



### Student Data

Activity	Class	Term	Format	Prof	School
BIM Understanding Presentations	AE	Spring 2250	Lecture w/ Lab	woidesenbet	University of Nebraska-Lincoln

Display options:  Enable page controls  Show detailed data [Re-Display](#)

Name	Student ID	Email	Sex	Race	Year	Major 1	BIM Experience
Agboco, Messangan	20750673	magboco@unomaha.edu	Male	Black	Junior	CVE	Zero
Basil, Michael	12664514	mabasil@unomaha.edu					
Brian, Brian	98655992	bshimp@unomaha.edu	Male	White	Sophomore	CVE	Zero
Briggs, Jennifer	99575596	jbriggs@unomaha.edu	Female	White	Freshman	AE	1-2
Chagas Quaresma, Sostenes	95424055	schasquaresma@unomaha.edu					
Chavez-trejo, Jose	70240467	jchaveztrejo@unomaha.edu	Male	Hispanic	Freshman	CVE	Zero
Cook, Carrie	62318720	cccook@unomaha.edu	Female	Native	Sophomore	CVE	Zero
Donahue, Perry	03298091	pdonahue@unomaha.edu	Male	White	Junior	CVE	Less than 1
German, Nathan	86887081	ngerman@unomaha.edu	Male	White	Freshman	AE	Zero
Giesler, Garrett	57157769	ggiesler@unomaha.edu	Male	White	Freshman	CM	1-2
Johnson, Jared	08186846	jaredjohnson@unomaha.edu	Male	White	Freshman	CVE	1-2
Lopez, Nicolas	95665535	nlopez@unomaha.edu					
Schener, Brooke	52527746	bschener@unomaha.edu	Female	White	Senior	AE	Less than 1
Swoboda, Nicholas	67278928	nswoboda@unomaha.edu	Male	White	Freshman	CVE	Zero
Tapia-Valdovinos, Unel	27758056	utapiavaldovinos@unomaha.edu	Male	Hispanic	Junior	AE	2-3
Troubat, Daniel	74200630	dtroubat@unomaha.edu	Male	White	Sophomore	CVE	1-2
Weidner, Mark	01022156	mweidner@unomaha.edu					

Make team with only selected students [Select](#)

Figure 5 CATME Student Categorical Data

Once the student groups are assigned, the final project is assessed through multiple efforts. Primarily, there are three project progresses throughout the semester where students are expected to meet certain deliverables at each point. Then, the student is expected to prepare a report, final design and present his work to the client as final exam at the end of the semester. The intent of the project progress is to keep the student work on their final project by inputting new additions and features into their projects as they learn every week. One of the traditions practiced by students say either a homework, a project or an exam is to work at the last minute when the due date is approaching. This approach will allow the student to work on their projects throughout the semester and implement what they learned right away. In addition, with the critical learning objective of this course is to teach the student that BIM is a design process that follows a progressive procedure that entails discussions, brainstorming, and researching in coming up with a good final product and rather not just a software where you put together in one night.

### Project

The intent of the project is to design and construct a new 3-story Architectural Engineering building that is adjacent to the Peter Kiewit Institute (PKI) building as PKI is approaching capacity and new space is required. The new spaces are to be designed for adaptability and flexibility for future research and learning concepts. It should also incorporate innovative processes for taking the “pulse” of the built environment to test and monitor effects on

building systems and the human experience. Special attention is necessary to develop social and collaborative spaces for students and faculty, a vibrant and active place encouraging students to stay. Containing portions of science and focusing on sustainability the building should make use natural sunlight, as well as the latest in high tech infrastructure and amenities. The detailed objectives and purpose of the project, facility requirement, space needs and functionality is attached as RFP in [Appendix J](#).

**i. Project Progress I**

Students are required to start working on their project with a rough sketch and refine it before modeling it on Revit program. Once they have an approval of their sketches, they can start working with Revit model by adding exterior walls and choosing main entrance to come up with an approximate required total area of the building based on the RFP. In this progress, the student is required to deliver a refined sketch, floor plan level with at least one main entrance and a floor plan (Revit model) as deliverable.

**ii. Project Progress II**

Based on the input they receive from Project progress I, students need to modify their sketches and models in Revit. In addition, the student is expected to continue working on its model. In this project progress, the student is expected to place interior walls, doors, windows and curtain walls; put structural gridlines, reference planes, levels and columns; install stairs, roofs and ceilings. Additional points will be given if the student incorporates different views with respect to elevations and sections.

**iii. Project Progress II**

In this progress, the student will continue working on their project and include everything that is expected of project progress II with the addition of floors, lightings, dimensions, site topography and site components. Elevations and sectional views are a must at this stage. A floor plan with half furnishings should also be incorporated in this progress. The three project progresses and its deliverables are attached as [Appendix K](#).

**b. Assessment Technique:** A quantitative assessment will be made using a rubric that is developed to cross check each deliverables at the various project progresses. In addition, a rubric is also designed to evaluate the overall project, final report and presentation. [Appendix L](#) illustrates the rubrics.

**c. Impact:** The group making will allow in creating matchup of students and work as a team, while the project progress will help in continuous tracking of the students and makes sure the student is not left behind and trying to catch up at the last minute.

## 4. Analysis and Findings

### 4.1 Background and Pre-Survey Analysis

One of the primary activities that was performed to assess the various course activities are making up of team and determining the background of students through a pre-survey. Based on the CATME team maker, the class is made of 10 males and 3 females, with racial distribution of 52% whites, 11% hispanic and 5% native and black each respectively. Of the class, 6 are freshman, 3 are sophomore and juniors each and 1 senior where these students comprise of three majors: architectural engineering (23%). These students BIM experience range from zero to two to three years with the majority (46%) have no or less than one year experience working with BIM, while 5 students (23%) have 1-3 years experience. It is important to note that 4 students (23%) did not respond to the survey. The student distribution statistics which is generated by CATME and the team-maker results are shown in [Figure 6](#) and [Figure 7](#).



Figure 6 Student Distribution

The distribution is fair enough where you will see a group has a combination of students with diverse background such that a team consists of a female, a different race, major, college level and BIM experience. This classification greatly enhances team work by promoting communication and team building skills based on the fact that the design and construction industry consists of multiple stakeholders and parties that are involved through a project lifecycle. This will allow students to brainstorm ideas and criticize their work and help each other in their final projects, which is the intent of this activity.

Based on a pre-survey, students come from various backgrounds. The majority of the students are local students from the Omaha area, except for a few students that are from Oklahoma, Minnesota, Mexico, and Togo. Half of the students have somehow worked in construction-related work (concrete work, carpentry, remodeling, and maintenance) while others do not have any

experience. The reason they joined the course range from being a core for their major and professional career and line of work; learning the basic of architectural engineering, understanding new systems and building programs and they expect to learn a lot from the course. Some students have experience working in CAD or construction graphics and design in high school, while some have worked on Rhino 3D program.

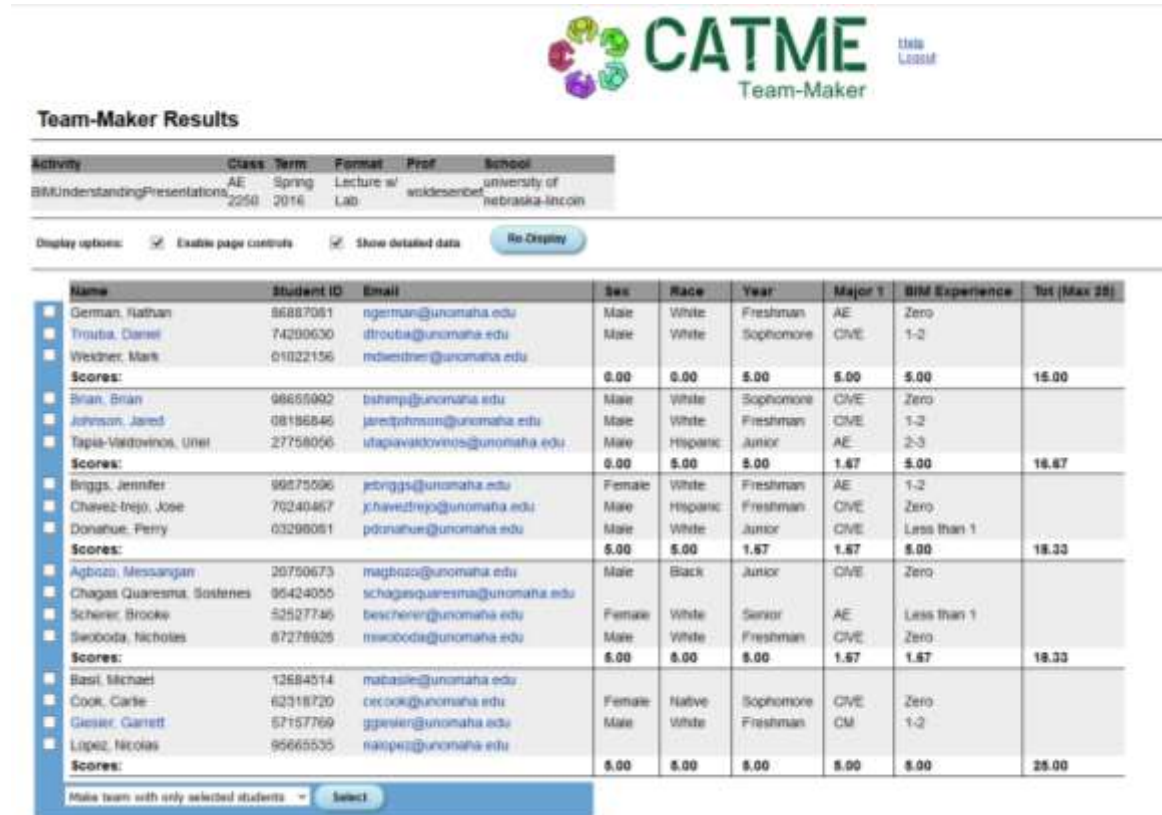


Figure 7 Teams

Although most students are full-time students, the setting is more of non-traditional as students have either transferred from community colleges or work full or part-time in the Omaha campus. Few students have changed their major from petroleum engineering to civil engineering and electronic engineering to architectural and construction engineering. Their extracurricular activities range from playing various sports (football, baseball, soccer, hockey, gym, hiking) and reading books to participating in robotic competitions, working on cars, watching TV shows and playing video games and music instruments. An example of the biographical information that was designed as homework is shown in Figure 8.

Nathan German

Major: Architectural Engineering

Level: 2<sup>nd</sup> Semester Freshmen

Hometown: Omaha, Nebraska

High School: Millard west High School



**Background:** Employment wise, I have no experience in construction. I have worked at Hy-Vee Inc. for three years as a produce clerk. I also tutor in math and science during the week for middle and high schoolers. I have plenty non-professional construction work. My family owns two rental houses, so over the past 15 years I have assisted in many remodel, and maintenance projects.

**Interest in this Course:** This course is important to me, because this class introduces BIM to me, and I will be using BIM a lot over the next four years, and my professional career. It's a process that will evolve and shape the industry that I am going into. All of the other courses that I am in now pertain to my degree. Mainly I am in math and science course which I prefer.

**Hobbies:** I enjoy being outdoors year-round. I enjoy hiking, climbing, and biking. I am an avid camper, and go camping at least once a month. My favorite outdoors experience would be the time when I went to northern New Mexico for three weeks to hike in the mountains. I had no interaction with civilization during this time, and had to carry everything I used during this time on my back. At the end of the trek, I ended up hiking a little over 90 miles in twelve days. (Of those twelve days, it ended up raining eleven days.)

*Figure 8 Biography*

## 4.2 Research Topic, Quiz and Exam Analysis

One of the activities that was designed to promote the understanding BIM as a process rather than a software tool is researching on a BIM topic. The different student groups presented their work based on the schedule they were provided. The assessment for the project presentation were beyond my expectation was quite impressed. Students shared their findings based on case studies, research projects, actual projects on the BIM related topics they were assigned. Overall, the students have prepared well and can see that they have to put good efforts in terms of the content, the organizations and the use of graphics and videos. In addition, students were active and asking questions in which the presenters addressed the questions well that was coming from their peers. Minor suggestions that could be improved in their presentations were the organizations of some slides lack clarity and are cramped which makes it hard to read and few students were directly reading from their slides which shows their unpreparedness.



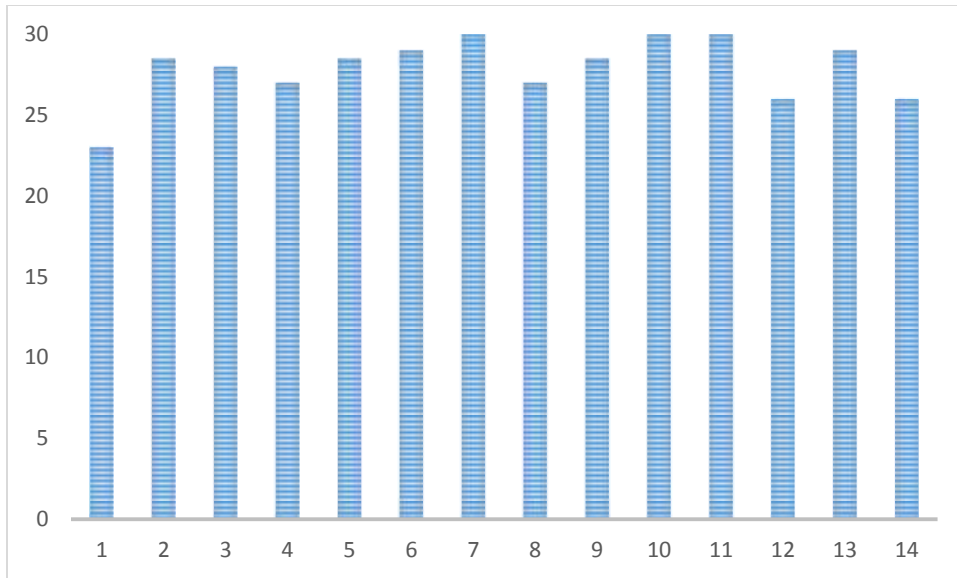


Figure 9 Project Presentation Grade

The grade distribution came up to be fairly above 25 points out of 30 points with average score of 27.5, minimum of 23 and maximum of 30. This points were 15% of their overall grade. It should be noted that some students presented solo due to the small class number. **Figure 9** shows the grades distribution of the various groups.

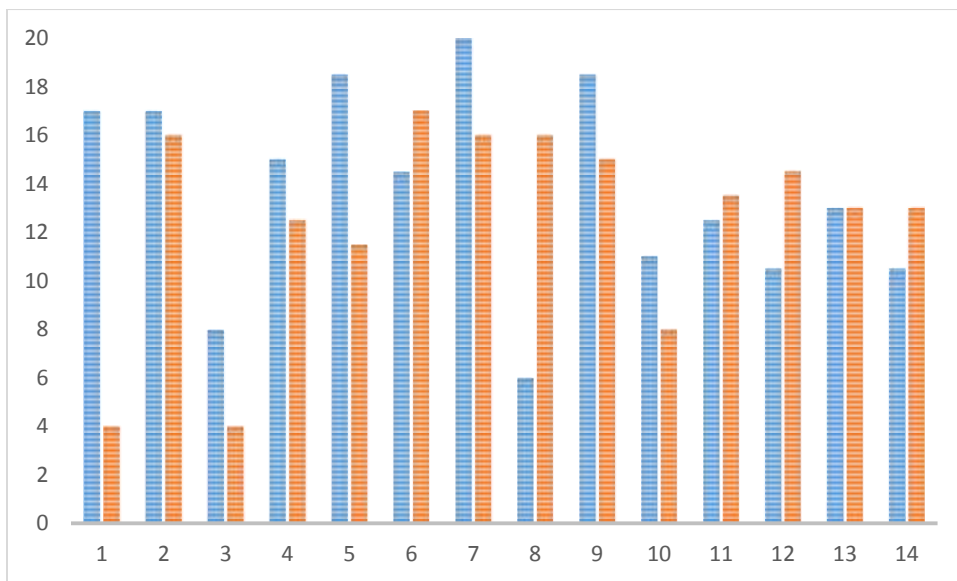


Figure 10 Quiz Result

As discussed in the course activity, quizzes were offered to evaluate if students are following up with the course materials and lectures offered in class. **Figure 10** shows the results of two quizzes. The results show that students performed well in Quiz 1 with a maximum grade of 20 points, minimum of 6, average of class being 13.7 as compared to Quiz 2 which has a maximum grade of 17 points, minimum of 4, average of class being 12.4. On average, there is a 6% decline

in student performance. The results are somewhat consistent in such a manner that student's performance are relatively similar or within a close range for both quizzes except a couple of students who either have a lower (student #1 with 65% decrease) or higher grade (student #8 with 50% increase) than quiz 1.

A second assessment used in measuring student performance was exams. The results of exam is shown in **Figure 11**. In exam 1, students performed well in the modeling section as compared to the written section which have equal weightage of 50%. Students scored a max of 45 points and a minimum of 12 points for the written part, while a maximum of 50 points and minimum of 12 points was scored for the modeling part. Overall, the students did well with an average score for exam 1 was 77.63%. The student that scored the lowest is a student who did not pursue the course as he is an exchange student who would like to change his major and did not finish up the course. Students were not very fond of the writing and the quizzes as I later found out during the mid-term or during survey feedback which will be discussed in the next analysis section.

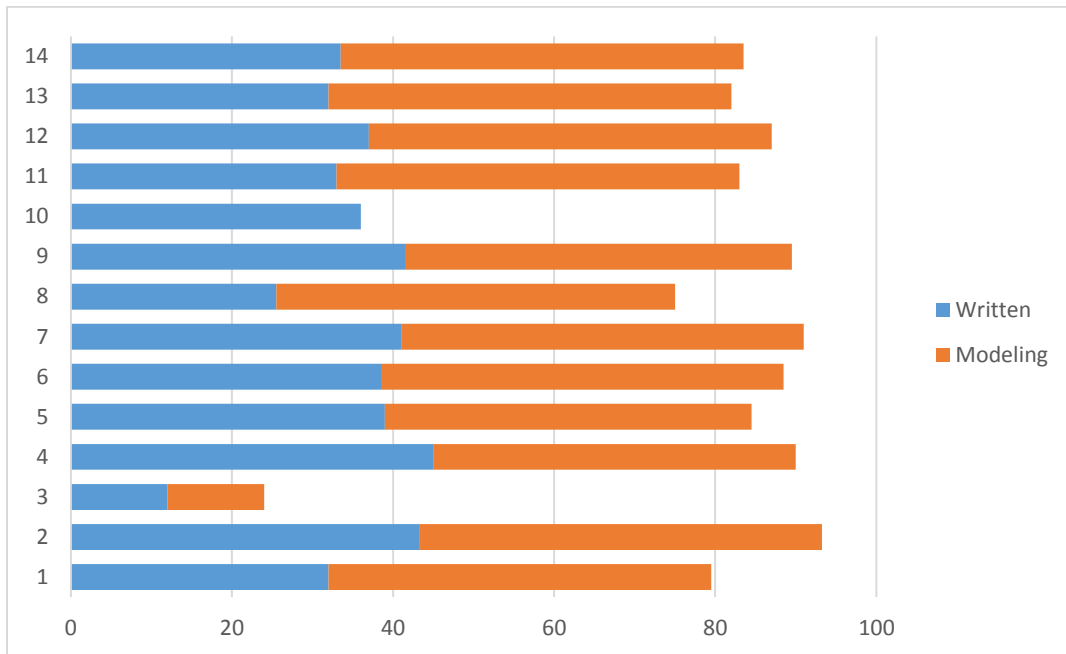


Figure 11 Exam I Grade

The second exam has a similar content except the fact that the modeling part has more weight with 80% and the written part has 20%. This is due to the fact that the course is designed to focus more on the modeling side as compared to the lecture. Based on the analysis, students have done a decent job in their models meeting the required tasks of adding a sub-region and placing parking lots, trees, placing 18" soffit wall, incorporating stacked wall, and creating a table family. Based on their grades, the students average grade was 77.9 out of 80, maximum grade of 80 and minimum of 62 with standard deviation of 5.17. Their grade was much improved than exam 1 with respect to the modeling part.

## Rubric Statistics Report

Rubric Analysis  
exam 2

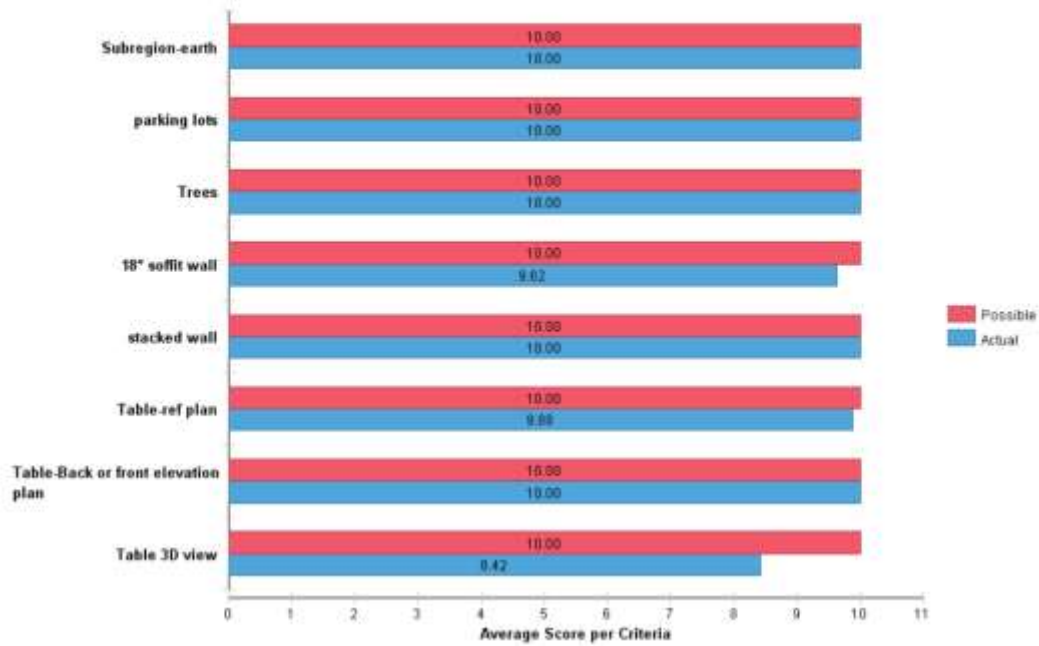


Figure 12 Exam 2 Grades (Model)

However, students have scored lower when it comes to the written part with a maximum score of 18.5 out of 20, minimum of 0, average score of 12.1 which has a standard deviation of 6.4. Six students have a grade above 80%, while three students are in the range of 60-80% and five students are below 50%. **Figure 12** and **Figure 13** show the statistics and distribution of exam 2 model and written part respectively.

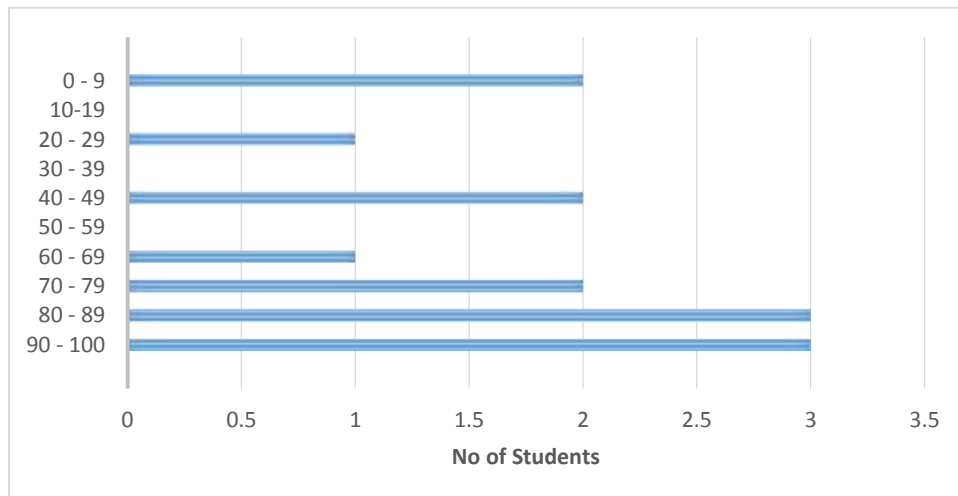


Figure 13 Exam 2 Grades (Written)



### 4.3 Mid-term Evaluation & Content Usage Analysis

A mid-term evaluation resulted in acquiring some feedback how the first-half the semester went. Some of the things that students enjoyed about this class include the independence, freedom and small class size to make an own and free design that fosters creativity (4), the application of what they learn through in-class exercises, designing and understanding the building process which provides hands-on experience (3), working on project all semester (2), the professor knowing their name, flexibility and getting help which allow to interact with him (4) and the designs and presentations with feedback were informative (2). In regards to the pace of the class, 86% of the students agree it's the right one while 14% feel it is sometimes fast or lectures are long. More than 90% of the students seem to like the teaching methods, course materials provided and the work load associated with the course.

Some of the lists that students mentioned as an improvement of the class or things they would like to learn in the remaining semester were having a clearer and detailed RFP for final project (2), better help with questions (1), incorporation of mechanical or structural component of Revit (1), ease on lecture quizzes (2) and provision of more time to work on projects (2). Students spend on average spend 6 hours outside class to work on class materials and their design (Figure 14). Additional comments that were provided by the student include the challenges of a night class and possibly incorporate the construction management lectures with the BIM topics.

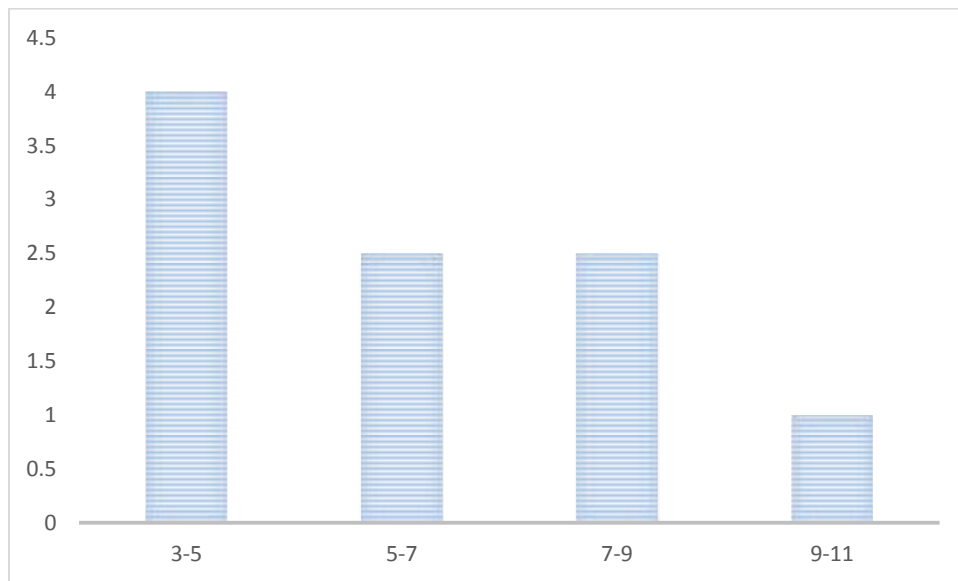


Figure 14 Hours Spent Per Week

### Content Usage

Blackboard has interesting features and tools including user progress, tracking and statistical reports in analyzing student performance. One of this features is the use of statistical tracking, that can be used to track the number of views for a specific course material. This will provide a

feedback if students have accessed the materials during which month, on what time of a day and what days in a week. I have barely used this feature in my previous semesters and found interesting results.

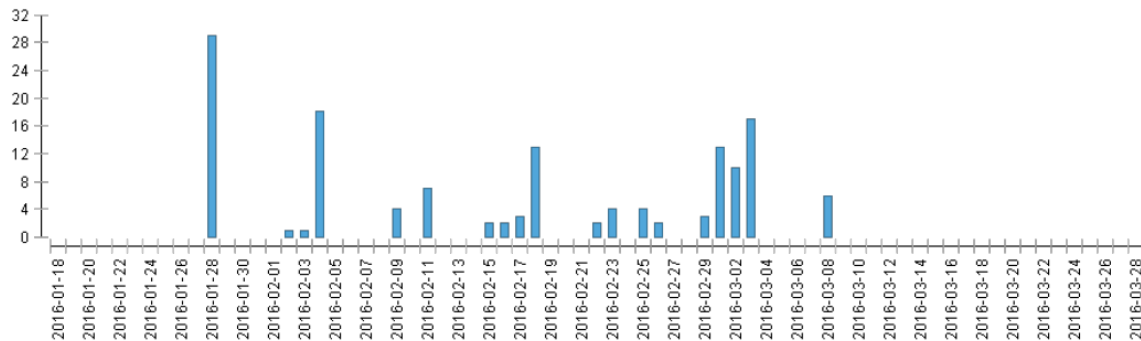


Figure 15 Access of Material During a Three-Month Period

On a monthly basis, students have accessed the material well enough. **Figure 15** and **Figure 16** show an example of a course material tracking analysis. Since the posting of the material on January 28<sup>th</sup>, students have randomly referred the material till March 08. Students to look into the material more in the early months of the March as exam was approaching (which was planned for March 3<sup>rd</sup>). In most cases, students access course materials in the afternoon between 12 pm to 6pm (with 75%) and morning (15%). On a weekly basis, students access materials on Tuesdays (21%) and Thursdays (62%) which are on class days. This illustrated the students have put some efforts in going through the material which is a very optimistic sign. A typical course content analysis which is exported from the Backboard feature is shown in **Appendix M**.

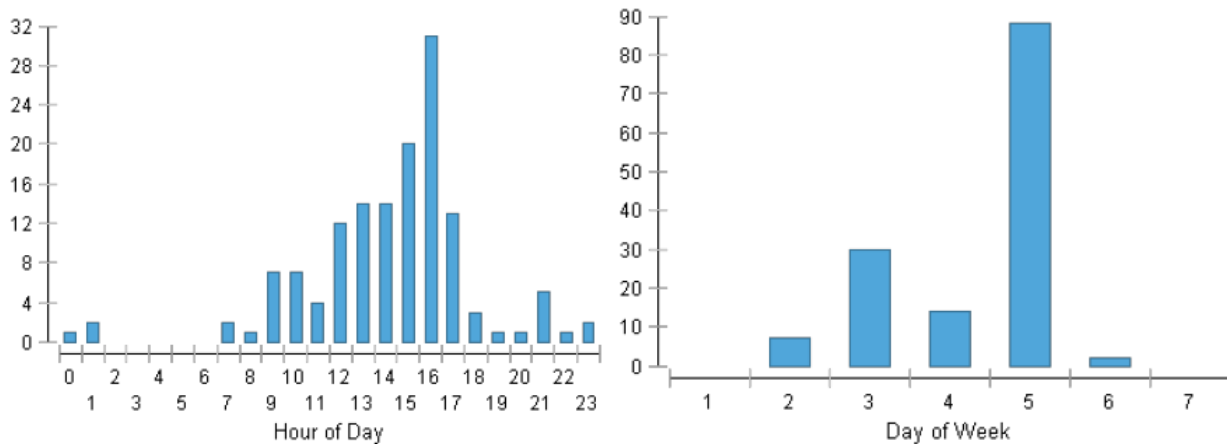


Figure 16 Access of Material During Hour of a Day and Weekly Basis

This is a great tool to identify if students are putting efforts to look into the course material that are provided for them. However, tracking the analysis for each item that is posted can be time intensive and a daunting task. Thus, special consideration must be taken to track critical course elements.

#### 4.4 In-Class Exercise Analysis

Most exercises were graded out of 20 points except two that had 15 and 25 points. A total of seven exercises on various topics were designed as in-class exercise. The in-class exercise includes contents that are covered in the lecture and lab sessions and students are provided with instructions and a Revit model to perform some missing activities. An example of students in-class exercise 3 solutions are shown in [Figures 17 – 19](#) based on Appendix H.

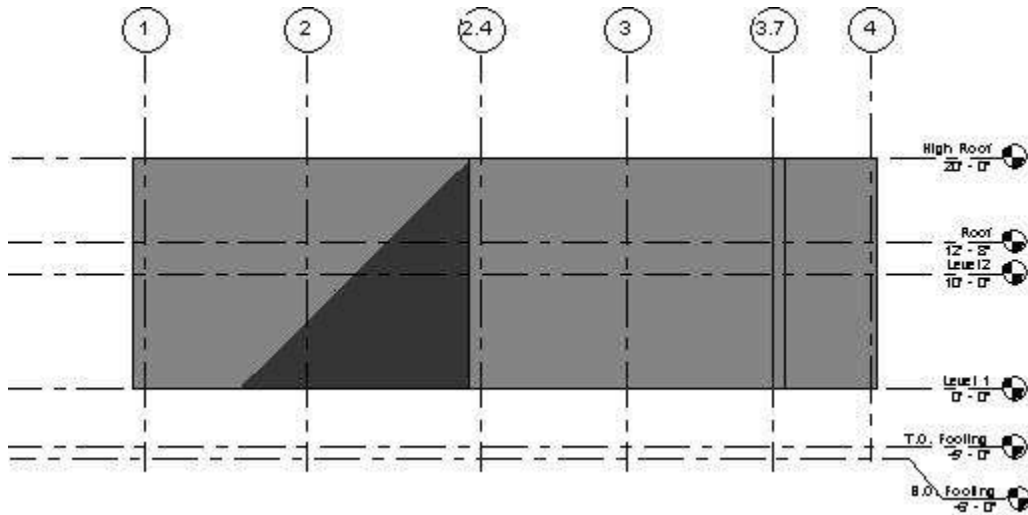


Figure 17 Elevation View

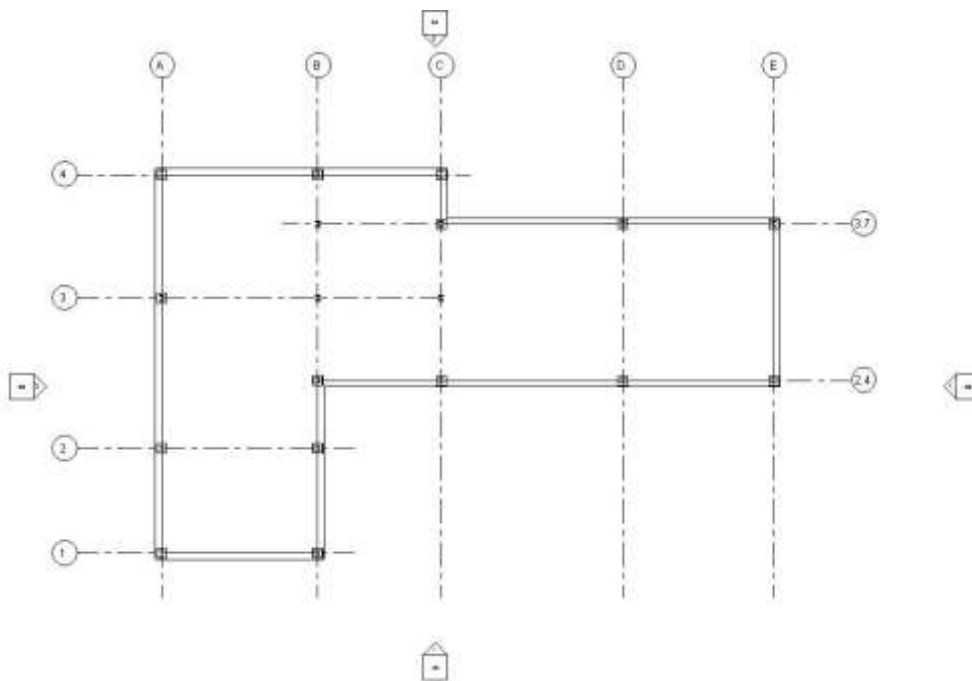


Figure 18 Floor Plan

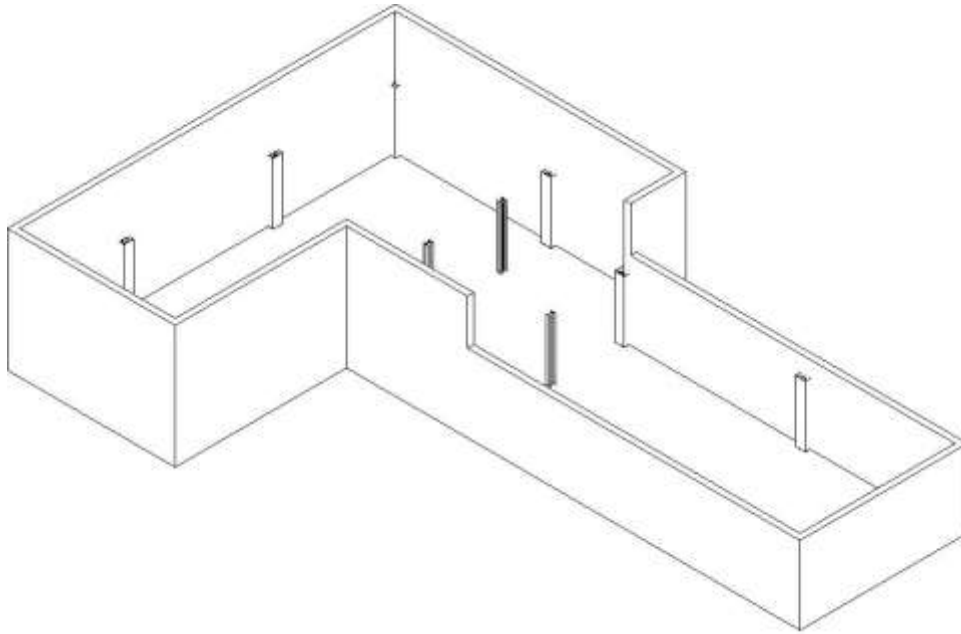


Figure 19 Isometric View

Figure 20 shows the grade distribution for all seven exercises. Based on the distribution, most students relatively performed very well scoring above average value of 17.8 out of 20 with the exception of two students (student # 3 and #5). After discussion with student 3, he is planning to switch major and is not actively participating in the class. The in-class exercise is intended to provide students a hands-on experience working on Revit models and students will have the whole lab session to work on their exercise and submit it before the end of the session unless it is a lengthy one where they will submit by the end of the day.

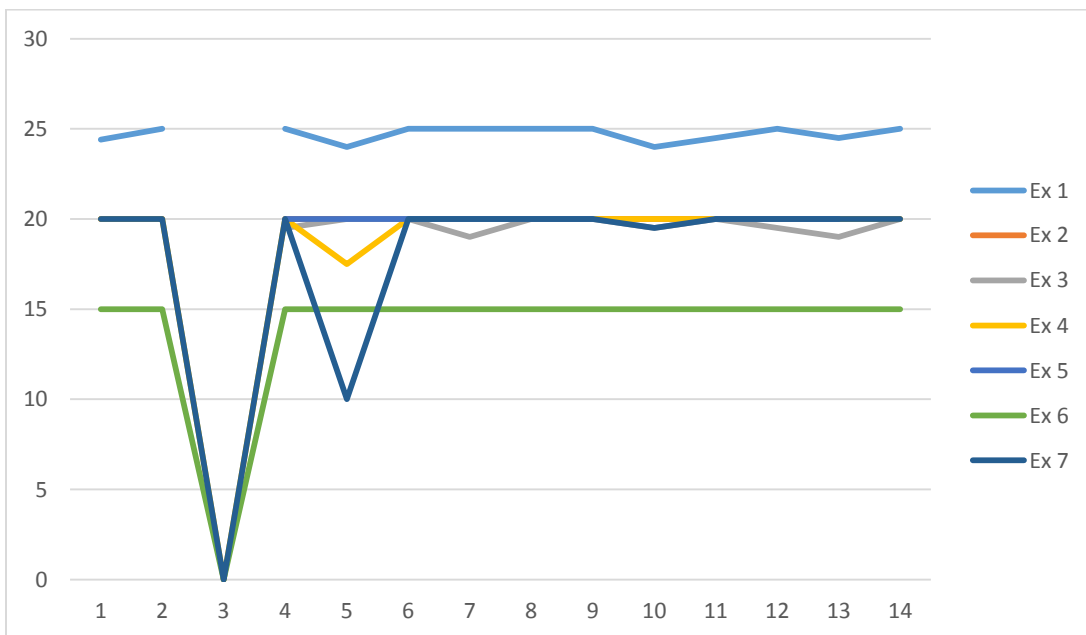


Figure 20 In-Class Exercise Grade Distribution

With respect to reading assignments, if students have written a summary of their understanding, full points were given and all students have done a good job. The in-class exercise is an individual exercise, but is more open for question and answer where students can help each other out and create discussions with the instructor and teaching assistant.

#### 4.5 Project Progress Analysis

##### Project progress I

An example of the model and rubric used to evaluate the project progress is shown in [Figure 21](#) and [Figure 22](#). Based on the rubric, this student has adequately met the RFP's area requirement, showed the floor plan with main entrance and the rooms, doors and windows. The only missing elements are the lack of feature such as grids and reference lines and minor details on the refined sketches. This is considered as a medium performance.

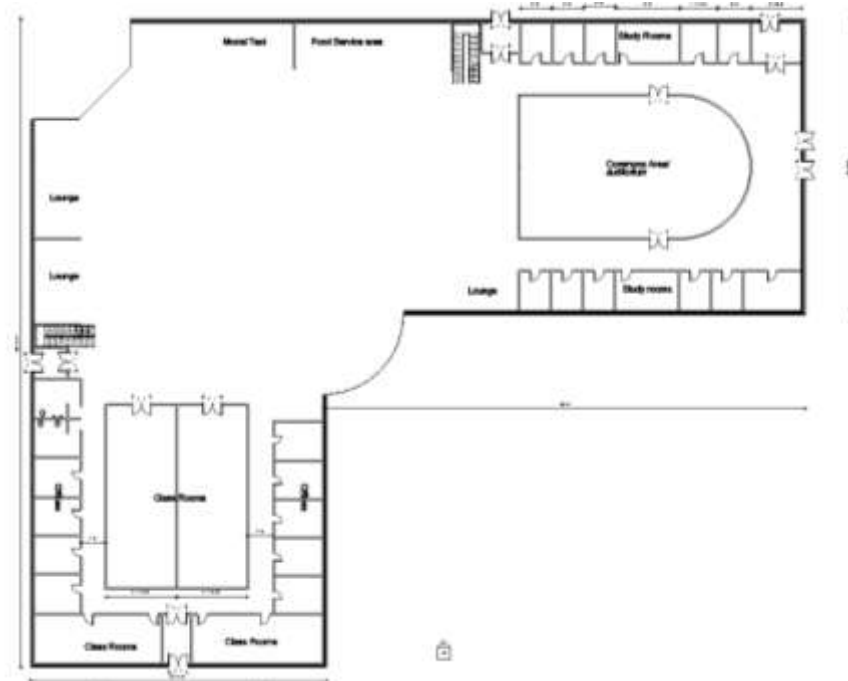


Figure 21 project Progress I Example

Name: **Progress1** TOP

Grid View List View

	None	OK	Proficient	Competent	OK2
Refined sketches	0 (0%)	5 (16.67%)	10 (33.33%)	9.5 (31.67%) Feedback: read more details	8 (25.67%)
Floor Plan with main entrance	0 (0%)	5 (16.67%)	10 (33.33%)	9.5 (31.67%)	8 (25.67%)
Area requirement	0 (0%)	2.5 (8.33%)	5 (16.67%)	4.5 (15%)	3.5 (11.67%)
Features: grids,ref planes,levels	0 (0%) Feedback: no grids/levels created	1 (3.33%)	2.5 (8.33%)	2 (6.67%)	1.5 (5%)
Features: Rooms,doors,windows	0 (0%)	1 (3.33%)	2.5 (8.33%)	2 (6.67%)	1.5 (5%)

Raw Total: 27.00 (of 30.0)

Name: **Progress1** EXIT

Figure 22 Project Progress I Rubric Example 1

A second example is shown in **Figures 23**. Based on the rubric, this student has adequately met the RFP’s area requirement, but lacks minor details on the refined sketches and did not show the floor plan with main entrance. In addition, the progress lacks feature such as grids, reference lines, rooms, doors and windows. This is a critical step as the students shows its creativity before putting together his idea into the Revit model. This is considered as a low performance.

Name: **Progress1** TOP

Grid View List View

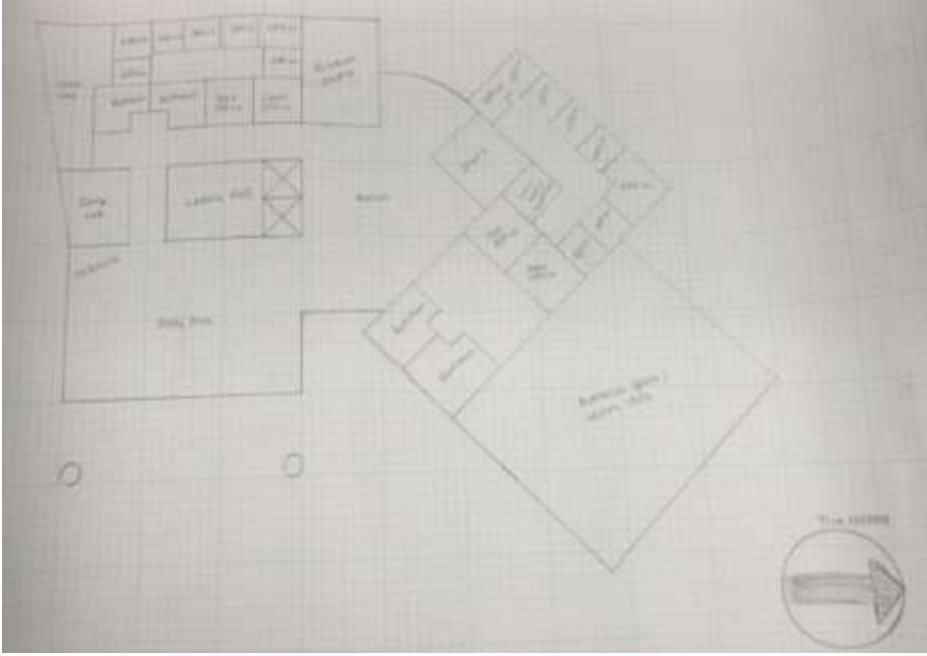
	None	OK	Proficient	Competent	OK2
Refined sketches	0 (0%)	5 (16.67%)	10 (33.33%)	9.5 (31.67%)	8 (25.67%) Feedback: details
Floor Plan with main entrance	0 (0%)	5 (16.67%)	10 (33.33%)	9.5 (31.67%)	8 (25.67%)
Area requirement	0 (0%)	2.5 (8.33%)	5 (16.67%)	4.5 (15%)	3.5 (11.67%)
Features: grids,ref planes,levels	0 (0%)	1 (3.33%)	2.5 (8.33%)	2 (6.67%)	1.5 (5%)
Features: Rooms,doors,windows	0 (0%)	1 (3.33%)	2.5 (8.33%)	2 (6.67%)	1.5 (5%)

Raw Total: 21.00 (of 30.0)

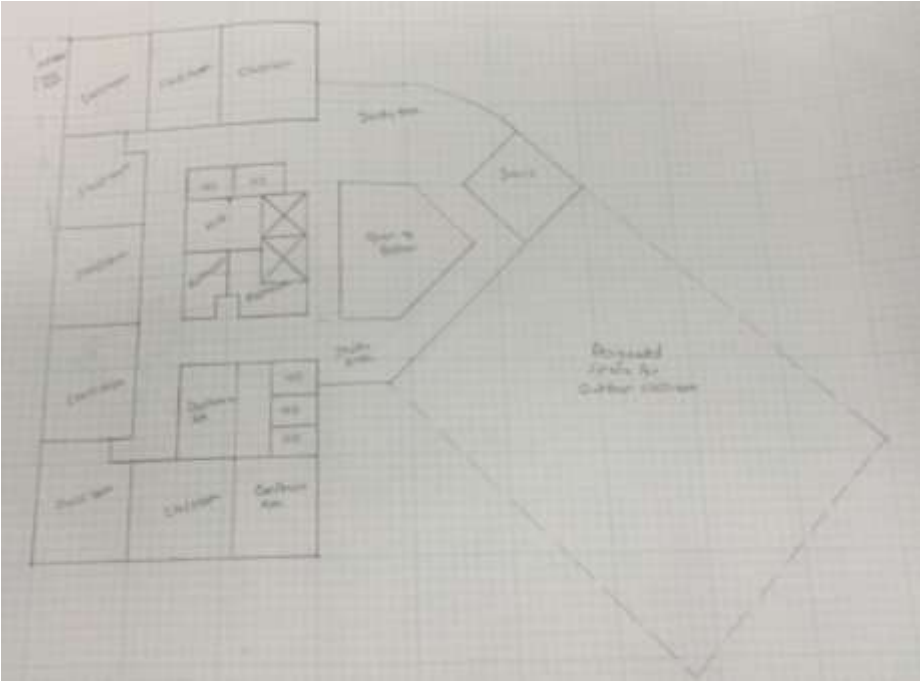
Name: **Progress1** EXIT

Figure 23 Project Progress I Rubric Example 2

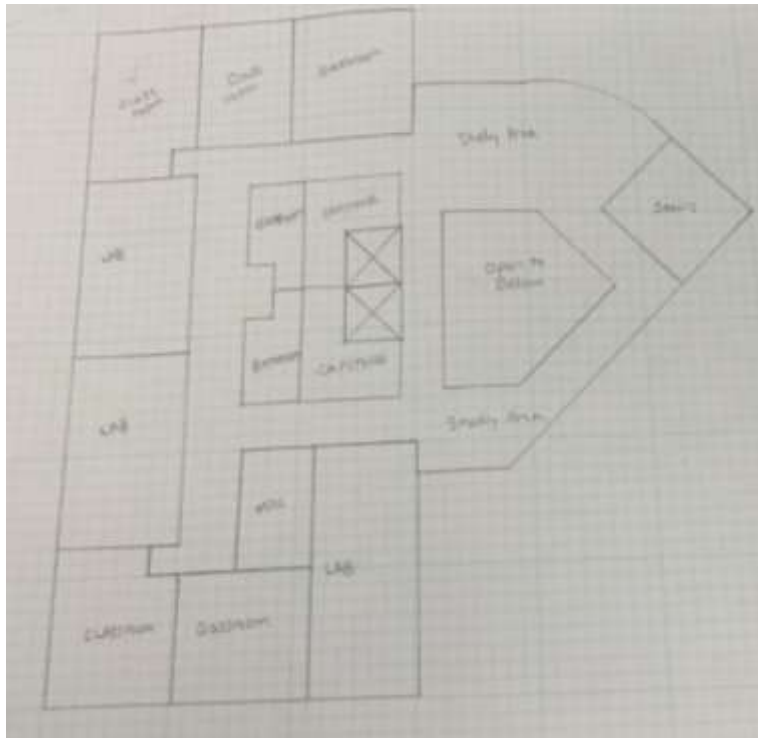
A good example of project progress I is shown in **Figure 24**. The progress portrays the student's idea into a detailed sketch illustrating its vision by meeting the area requirement, showing the various floor plans, north direction, an isometric view (3-D model), expected elevations, views and roof plans. This is a critical step as the students shows its creativity before putting together their ideas into the Revit model. This is considered as a high performance.



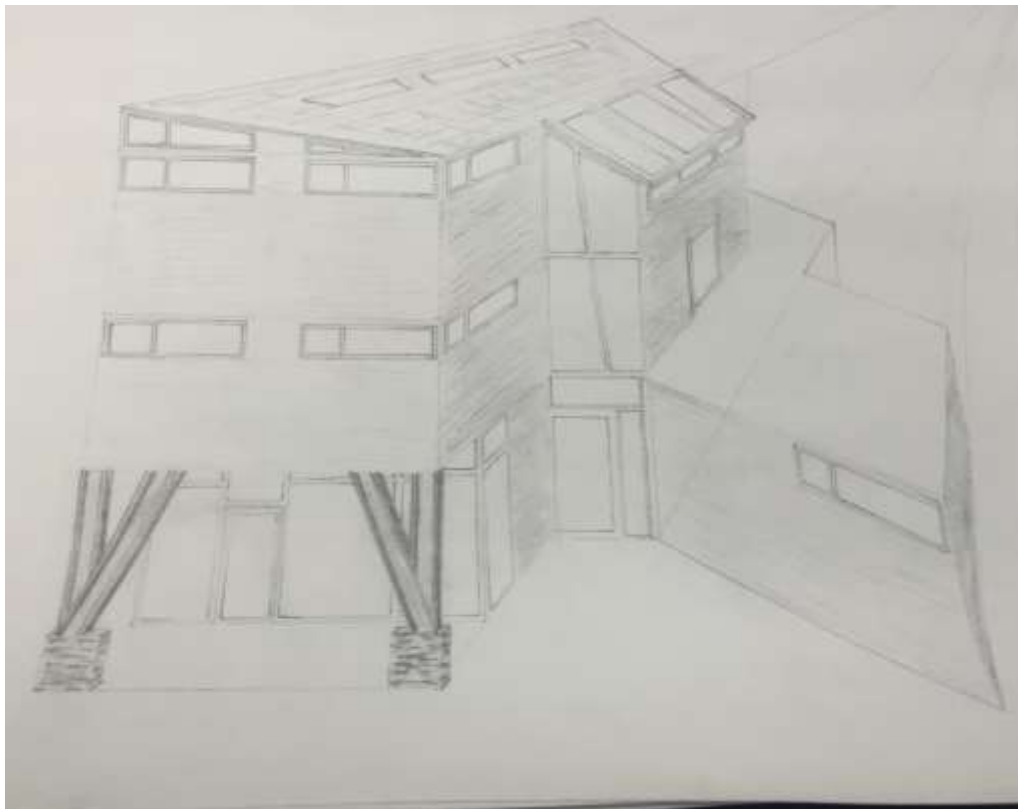
First Floor



Second Floor

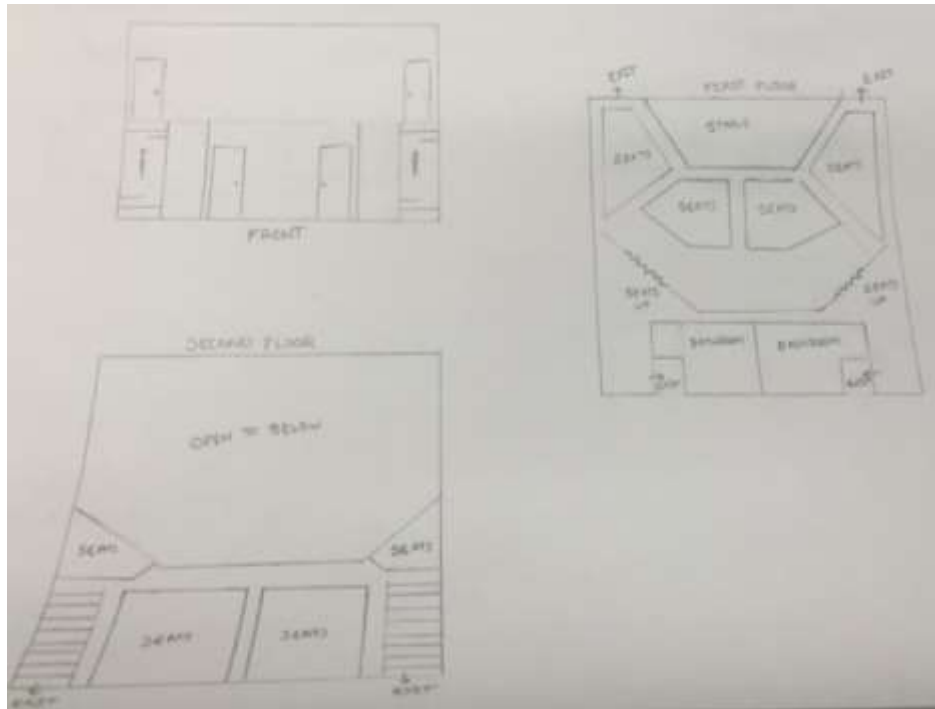


Third Floor

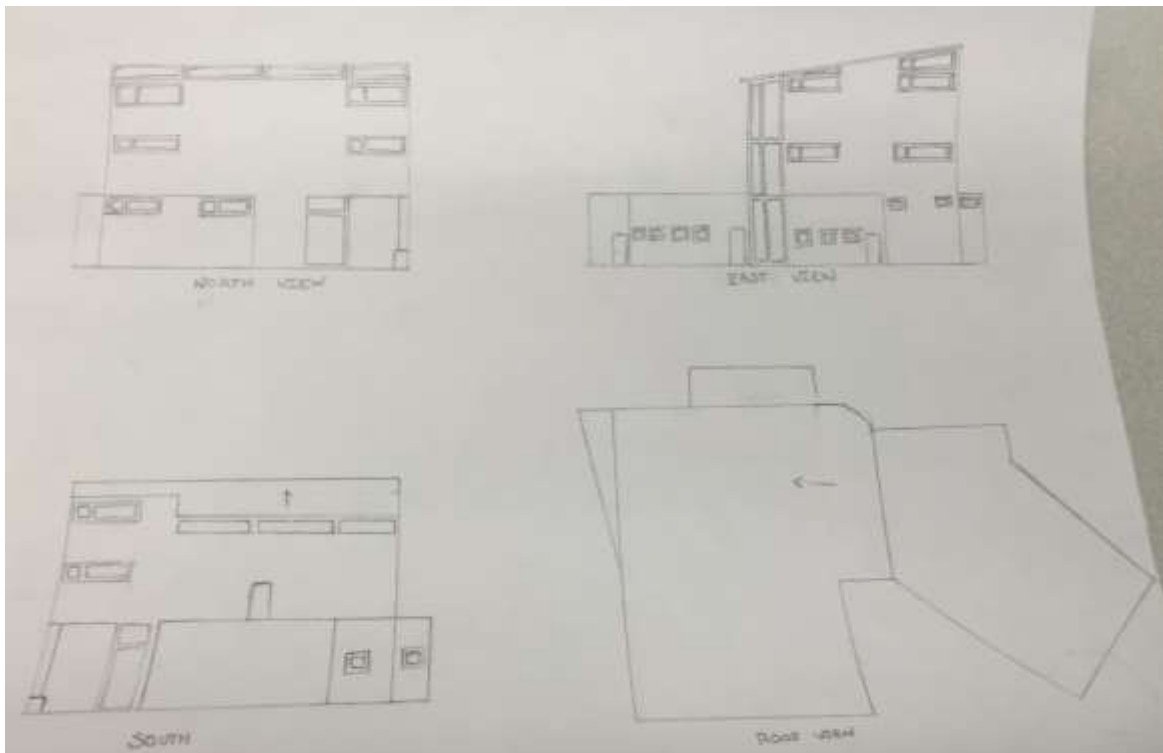


Front Isometric View





Auditorium



Elevations & Roof Plan

Figure 24 Project Progress I Example 3 Detailed Sketch

## Quantitative Analysis of Progress I

Overall, students performed well in the first project progress with an average scores for refined sketches being 9.2 out of 10; floor plans with main entrance 9.8 out of 10; area requirements 4.96 out of 5; features (grids and reference lines) 1.42 out of 2.5; and features (rooms, doors and windows) score being 1.92 out of 2.5). **Figure 25** and **Figure 26** illustrate the statistics and distribution of project progress I.

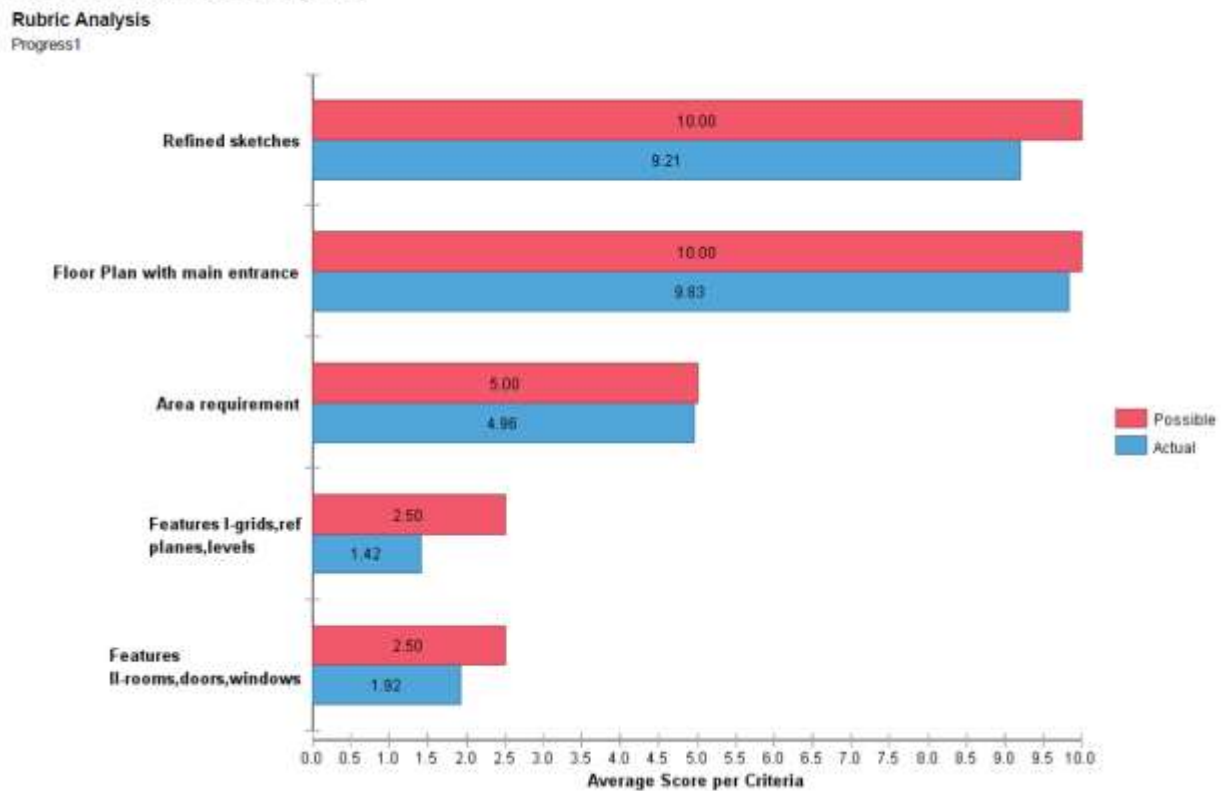


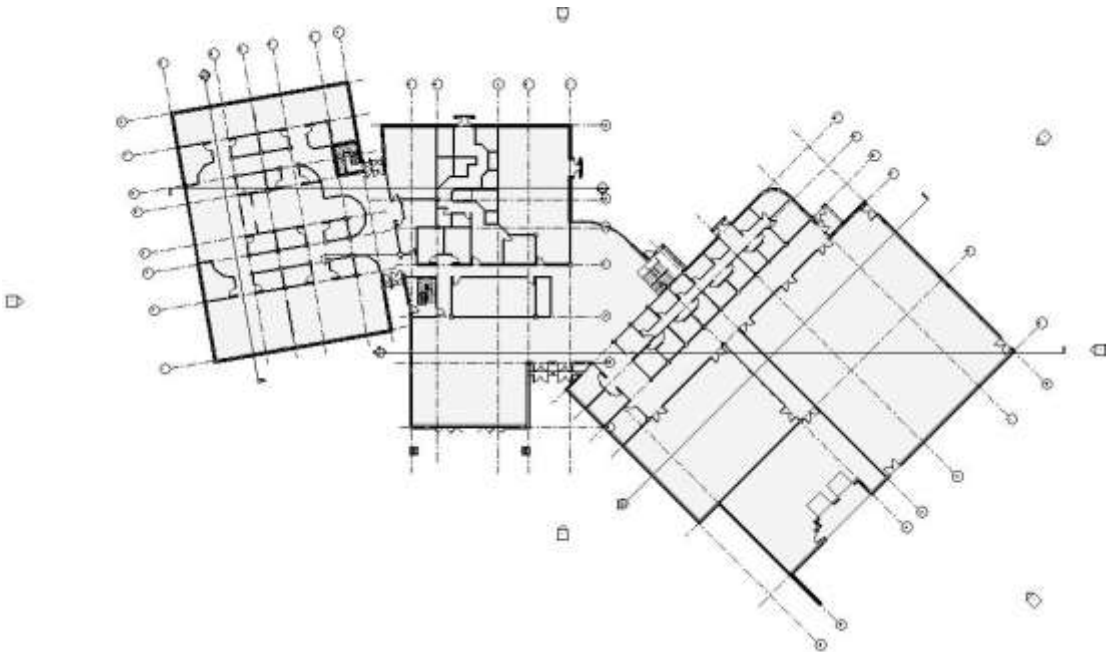
Figure 25 Rubrics Statistics: Average Score Analysis (Progress I)

Criteria		Performance Levels					Number Evaluation	Average	Median	Mode	Std. Deviation
		Novice	OK	Proficient	Competent	OK2					
Refined sketches	Points	0.00	5.00	10.00	9.50	8.00	12	9.21	9.50	10.00	0.92
		0%	0%	42%	25%	33%					
Floor Plan with main entrance	Points	0.00	5.00	10.00	9.50	8.00	12	9.83	10.00	10.00	0.58
		0%	0%	92%	0%	8%					
Area requirement	Points	0.00	2.50	5.00	4.50	3.50	12	4.96	5.00	5.00	0.14
		0%	0%	92%	8%	0%					
Features I-grids, ref planes, levels	Points	0.00	1.00	2.50	2.00	1.50	12	1.42	2.25	2.50	1.28
		42%	0%	50%	8%	0%					
Features II-rooms, doors, windows	Points	0.00	1.00	2.50	2.00	1.50	12	1.92	2.00	2.50	0.76
		8%	8%	42%	33%	8%					

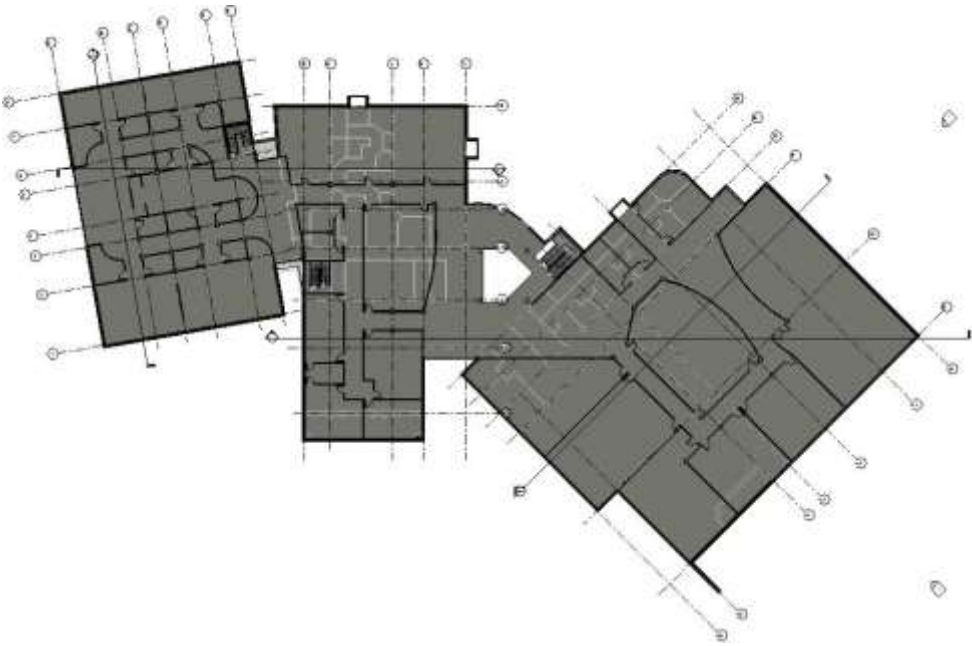
Figure 26 Rubrics Statistics: Frequency Distribution (Progress I)

**Project Progress II**

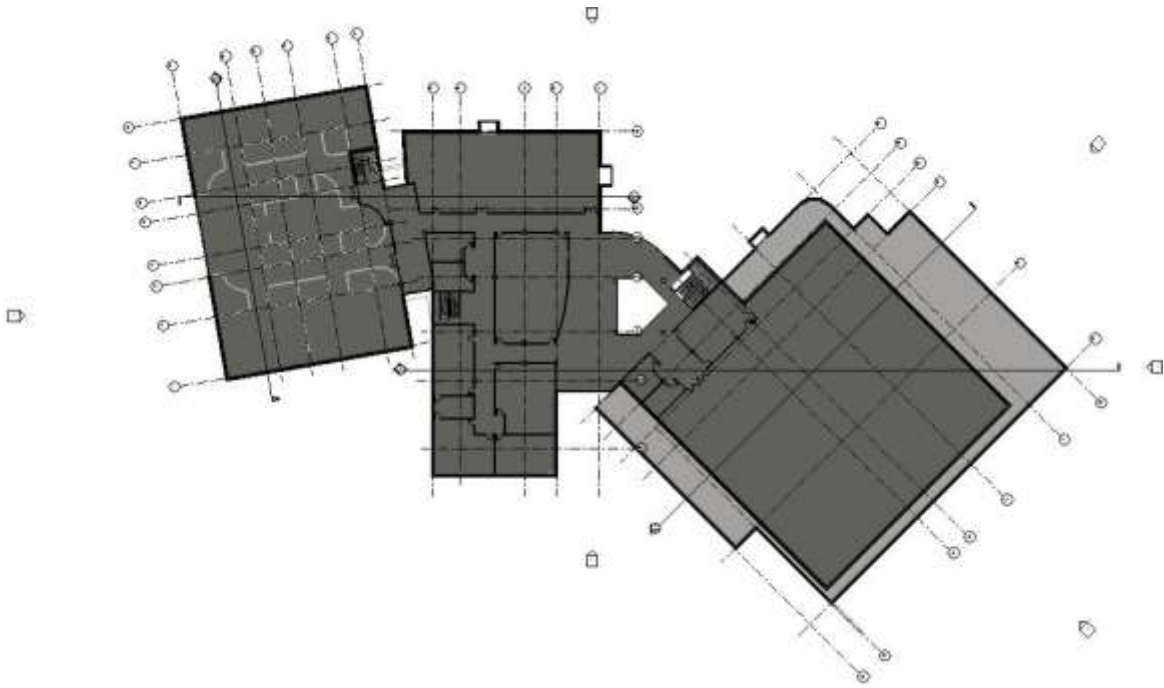
An example of a good project progress is used to track a student’s work based on the development from project progress 1. **Figure 27** illustrates the improvement of a student’s project which meets the expectation at this level of design. The figures show all three floors, ceiling plans, and 3-d model where one can easily capture the evolvement from rough design and sketches shown in progress I inserted into a Revit model.



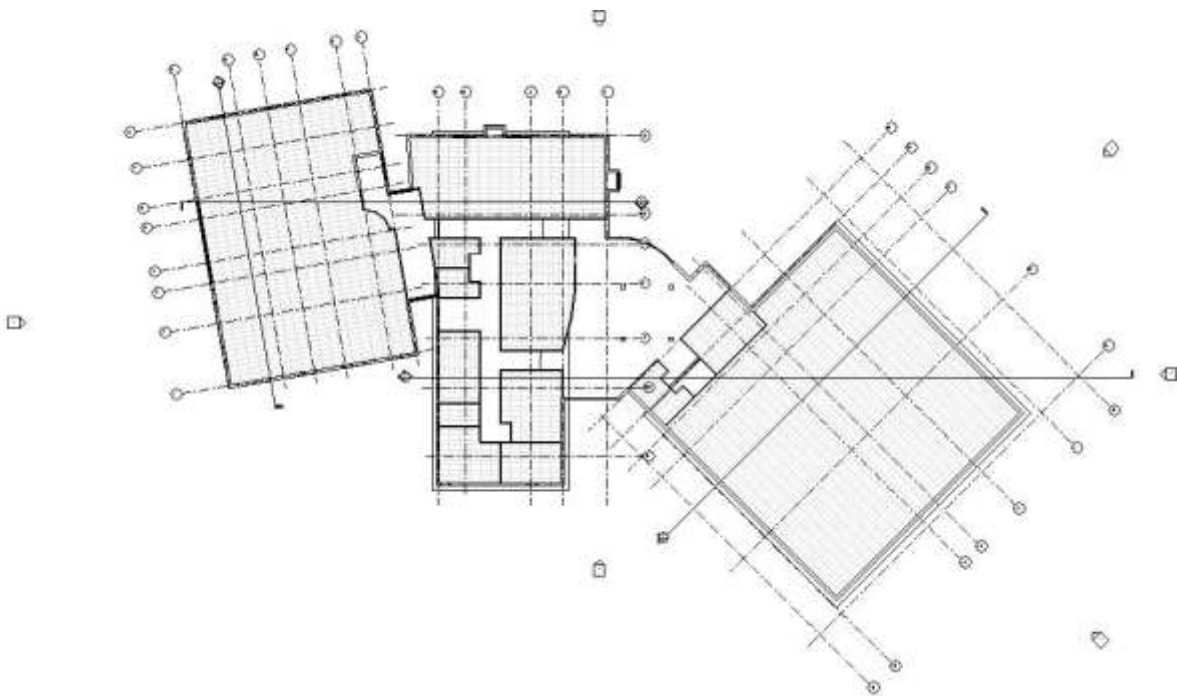
1<sup>st</sup> Floor Plan



2<sup>nd</sup> Floor Plan



3rd Floor Plan



Ceiling Plan



### 3-D Model

Figure 27 Project Progress II

Overall, students have made good progress in the second project progress with overall average of 27.2 out of 30. Average scores for features (rooms, doors and windows) being 8.92 out of 10 with standard deviation of 0.9; features (grids and reference lines) 9.25 out of 10 with standard deviation of 1.48; and features (stairs, roofs and ceilings) score being 8.83 out of 10 with standard deviation of 1.53. Figures 21 and 22 illustrate the statistics and distribution of project progress I. **Figure 28** and **Figure 29** illustrate the statistics and distribution of project progress II.

### Rubric Statistics Report

Rubric Analysis  
Project progress 2

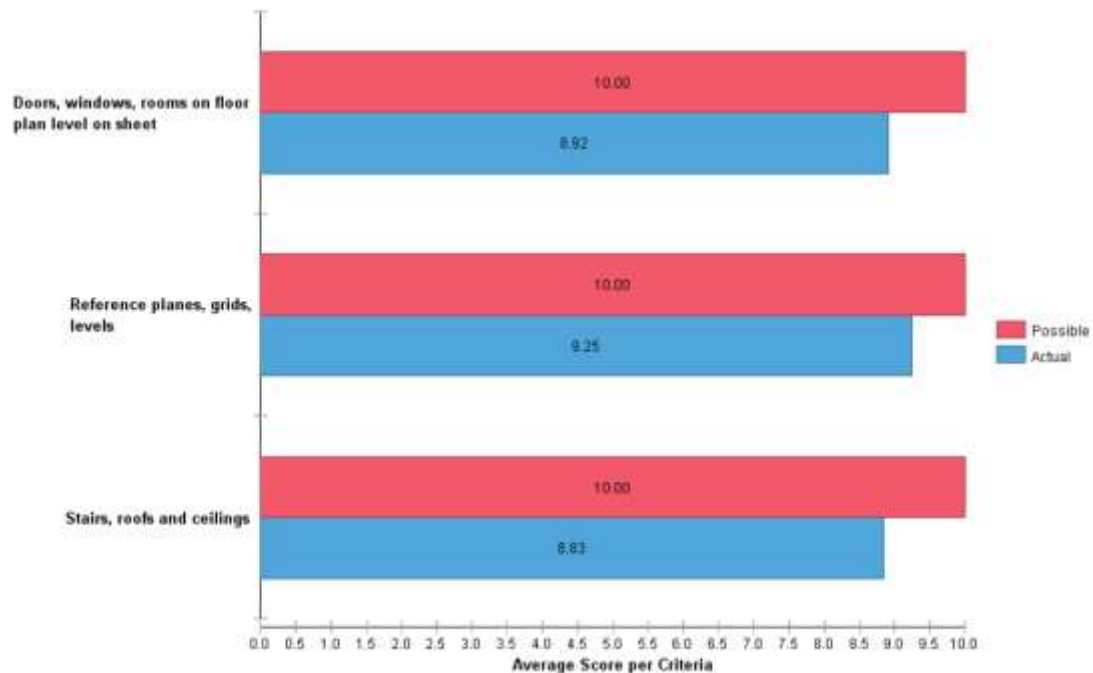


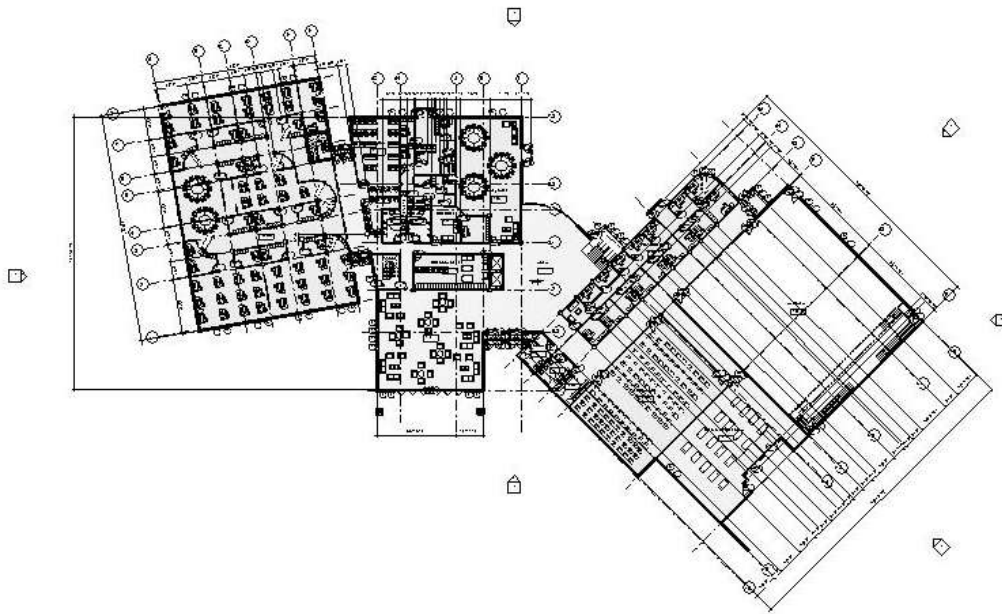
Figure 28 Rubrics Statistics: Average Score Analysis (Progress II)

Criteria		Novice	Competent	Proficient	OK2	OK	Number	Average	Median	Mode	Std.
							Evaluation				Deviation
Doors, windows, rooms on floor plan level on sheet	Points	0.00	9.00	10.00	8.00	5.00					
		0%	25%	33%	42%	0%	12	8.92	9.00	8.00	0.90
Reference planes, grids, levels	Points	0.00	9.00	10.00	8.00	5.00					
		0%	17%	67%	8%	8%	12	9.25	10.00	10.00	1.48
Stairs, roofs and ceilings	Points	0.00	9.00	10.00	8.00	5.00					
		0%	8%	50%	33%	8%	12	8.83	9.50	10.00	1.53

Figure 29 Rubrics Statistics: Frequency Distribution (Progress II)

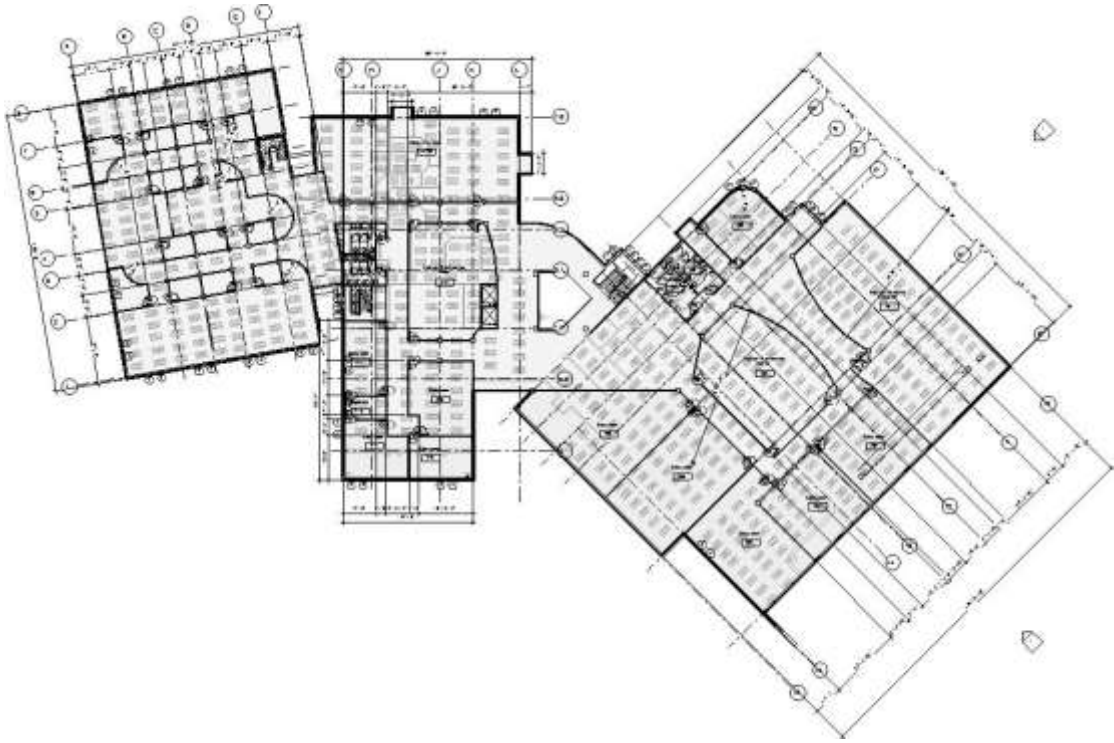
### Project Progress III

In this stage, the student has made improvements and added various features based on the requirements. The progress of the students' performance is shown in [Figure 30](#) and [Figure 31](#).

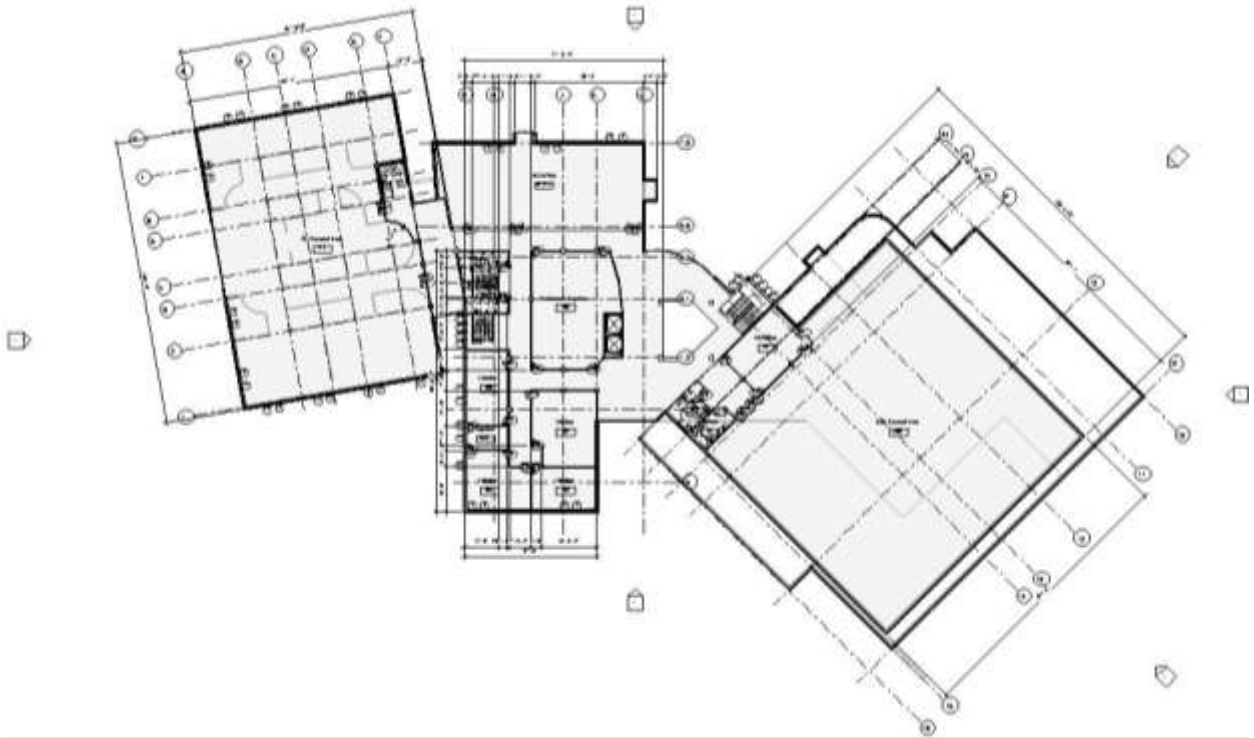


1<sup>st</sup> Floor Plan

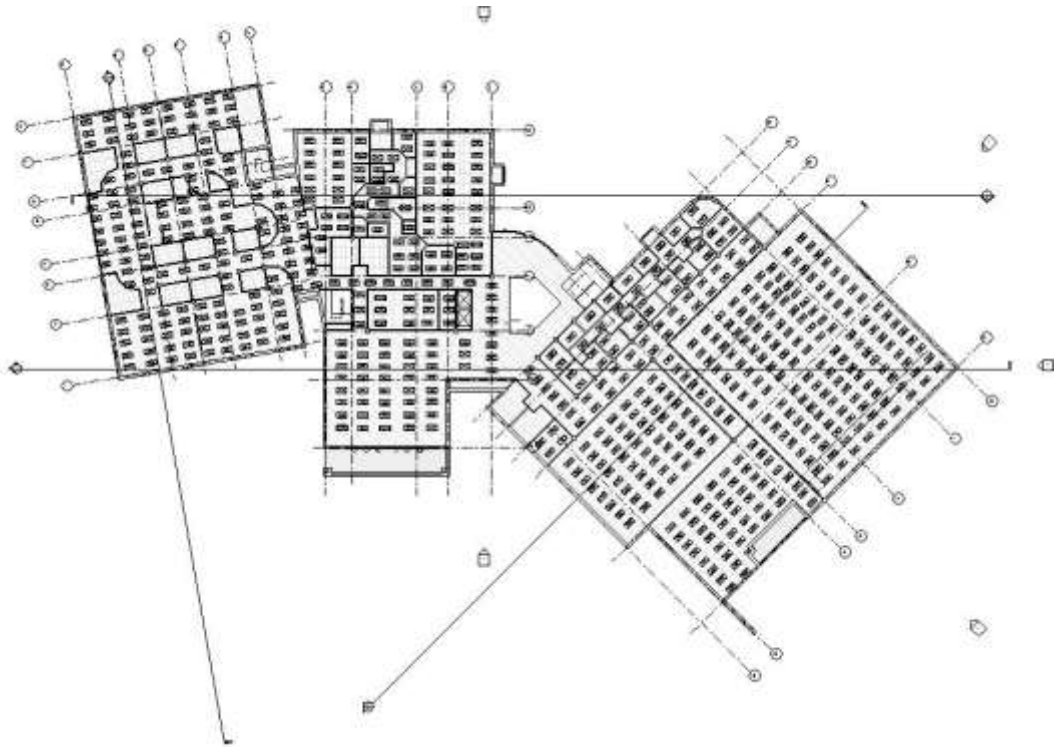




2<sup>nd</sup> Floor Plan



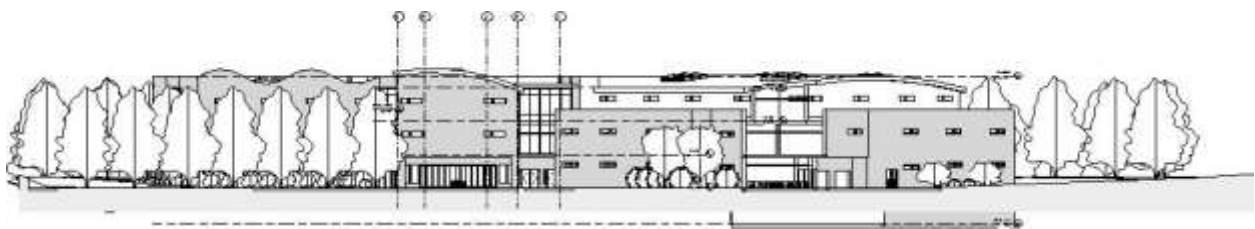
3<sup>rd</sup> Floor Plan



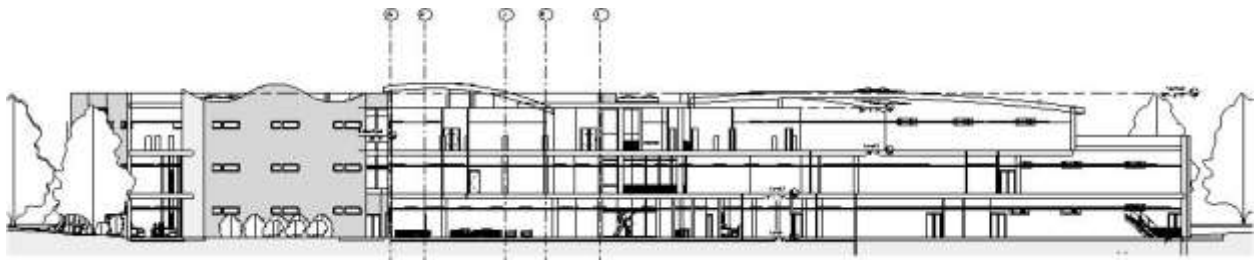
Ceiling Plan with Lighting



South Elevation

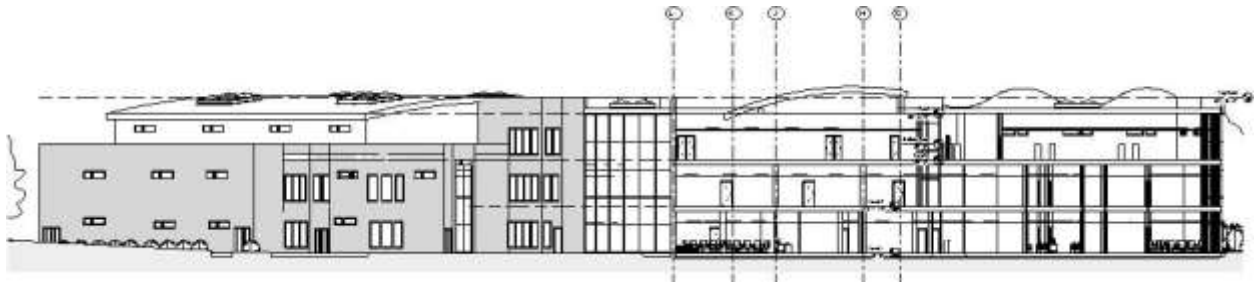


East Elevation



Atrium Section





Study room Section

*Figure 30 Floor Plans, Elevation and Sectional Views*

One can easily identify the development in floor plans, with the inclusions of dimensions, grids, furnishings, room placement or tags, area requirements. The ceiling floor is completed compared to progress II and has incorporated lightings. In addition, example of two elevation views (east and south) are added in this progress. Sectional views of two rooms, study room and the atrium is also shown.



Atrium 3-D View



Site Plan

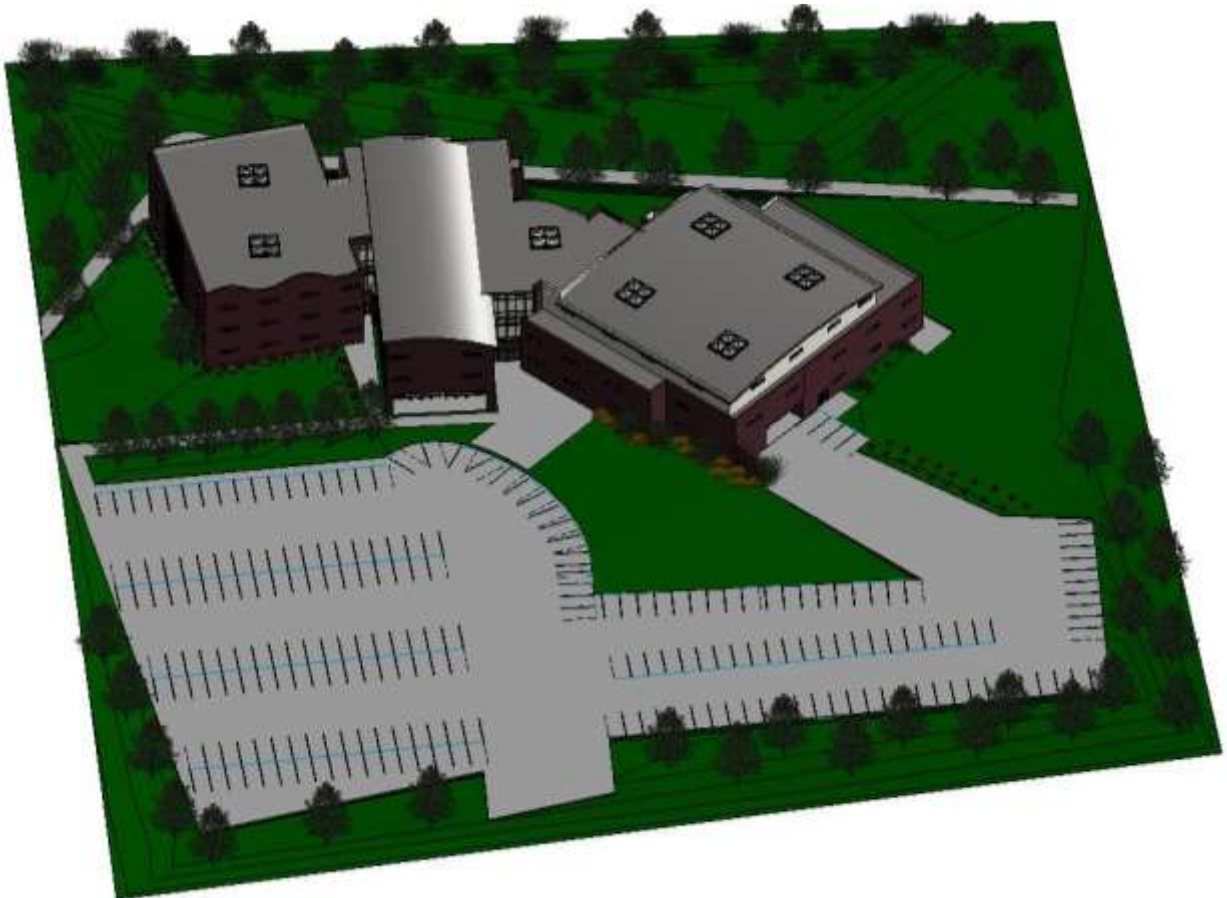


Figure 31 3-D Views and Site Component

In this progress, the student has captured 3-d model views of atrium and the whole model and site plan. The new incorporations with respect to parking, green area and landscape is reflected in this design stage.

Overall, students' progress is relatively lower when compared with the first and second progress. However, their overall average is 25 out of 30. Students did a good job on illustrating their four elevations with average scores of 5.95 out of 6 with standard deviation of 0.15 and longitudinal section which score 5.41 out of 6 with standard deviation of 0.92. Students scored lower in dimensioning and putting gridlines and symbols and finishing floors and placing room tags which each scored 4.91 out of 6 with standard deviation of 1.11 and 0.89 respectively. Students did not make much progress on the site components which includes sidewalks and parking area where they scored on average 3.8 out of 6 with standard deviation of 2.26. Figures 2 and 22 illustrate the statistics and distribution of project progress I. **Figure 32** and **Figure 33** illustrate the statistics and distribution of project progress II.

### Rubric Statistics Report

Rubric Analysis  
Project progress 3

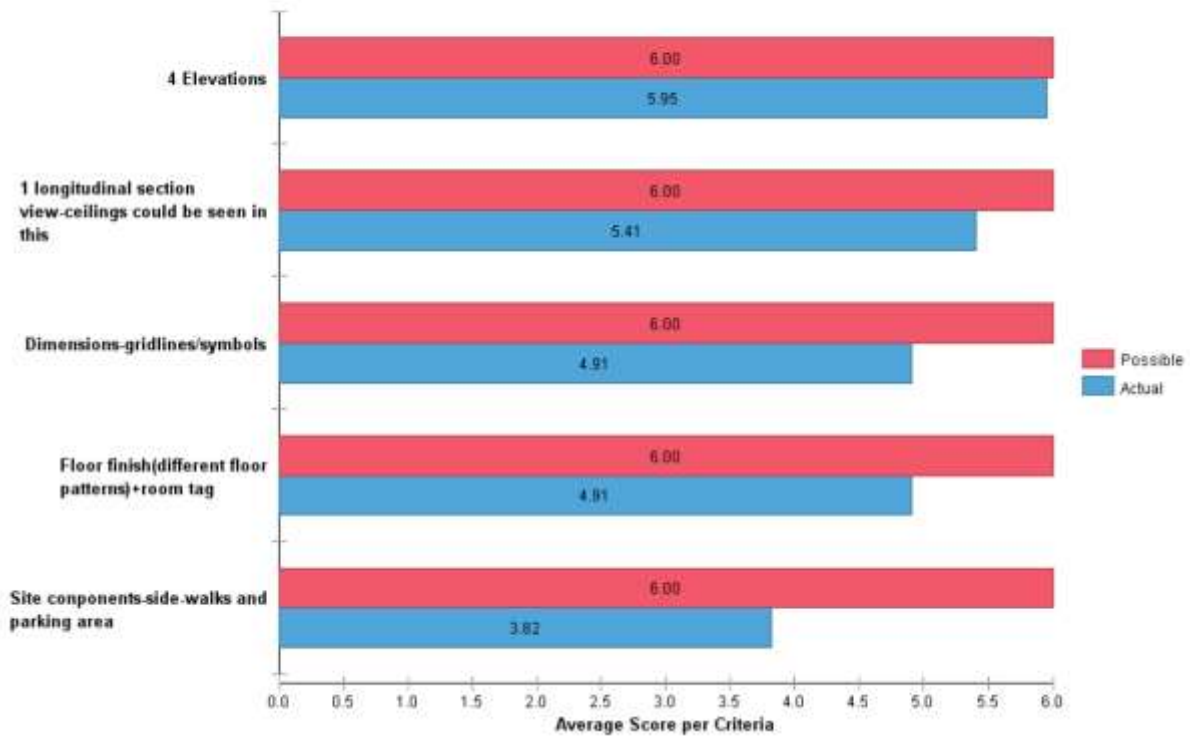


Figure 32 Rubrics Statistics: Average Score Analysis (Progress III)

Criteria	Points	Novice	OK	Competent1	Competent2	Proficient	Number Evaluation	Average	Median	Mode	Std. Deviation
		0.00	3.00	4.50	5.50	6.00					
4 Elevations	0%	0%	0%	9%	91%		11	5.95	6.00	6.00	0.15
1 longitudinal section view-ceilings could be seen in this section view	0%	9%	9%	36%	45%		11	5.41	5.50	6.00	0.92
Dimensions-gradlines/symbols	0%	18%	27%	27%	27%		11	4.91	5.50	4.50	1.11
Floor finish (different floor patterns)+room tag	0%	9%	45%	27%	18%		11	4.91	4.50	4.50	0.80
Site components-side-walks and parking area	18%	27%	18%	0%	36%		11	3.02	4.50	6.00	2.26

Figure 33 Rubrics Statistics: Frequency Distribution (Progress III)

#### 4.6 Final Project

The final project is a compilation of the students' work done throughout the semester. The project should comprise all the RFP's requirement and should incorporate all components and features covered in the course with additions to the three project progresses. The design of this project is evaluated based on three criteria: a) model, b) presentation and c) final report.

##### A. Model

Students performed well and beyond my expectations. Based on the grade rubrics, students overall average score was 181.8 out of 200 with maximum of 192 and minimum score of 165. However, students did extra work to get bonus points for doing rendering, walkthrough and full floor furnishings which raised their project model grades. **Figure 34** shows the grade distribution based on the rubric criteria.

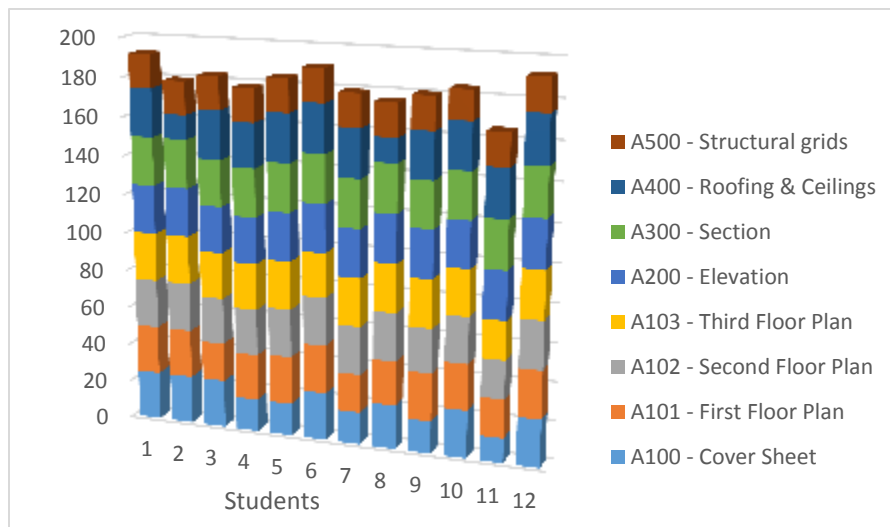


Figure 34 Final Project Model Grade

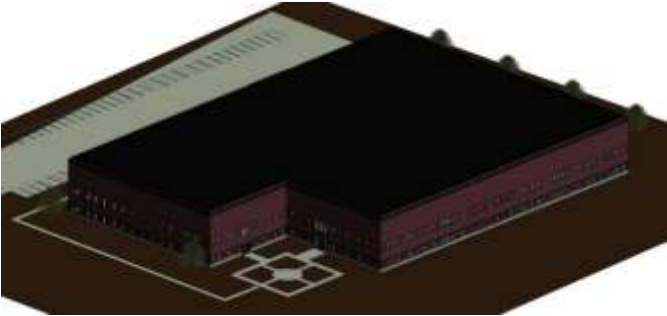
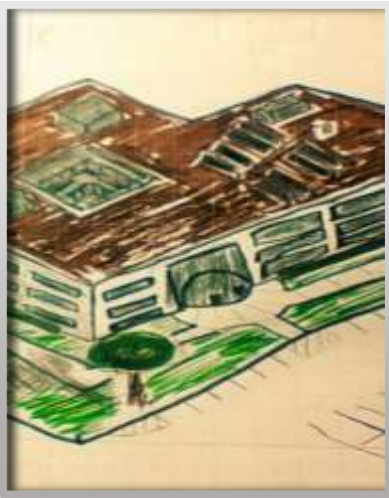
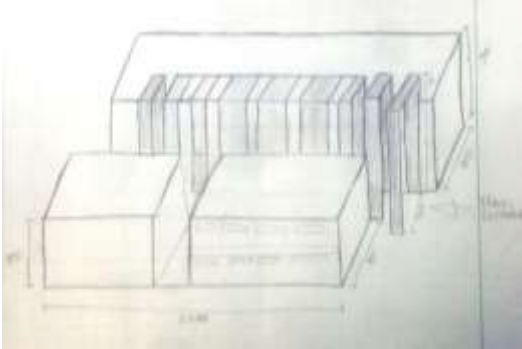


Based on the breakdown for each sheet, students floor plans were designed and meets the RFP, however most students missed placing structural grids (A500), while others have missed placing sheet list (A100) or scaling their design within the sheet, while other floor plan are congested with tagging of floor plan, furnishings and dimensions. For example, the student that has been tracked in this portfolio did a good job, but have minor errors or mistakes including having no sheet list on title block; A102 needs an editing on the view range to make the elements on other floors or lightings invisible; should adjust section and elevation plan scale to fit well within the sheet; some lines are shown in gray on roof plan: probably need to adjust the view range; and no structural grids. The student will receive a 20 points bonus for creating a walkthrough and furnishing floor plan fully. The evaluation rubric along with the comments is attached as [Appendix N](#). As integral part of the model, below are examples of images of various student design model options including lecture hall, comparison of students' conversion of their sketches into final design, rendering of a model and a walkthrough video.

### Lecture Hall



**Comparison of sketches with Final Design**

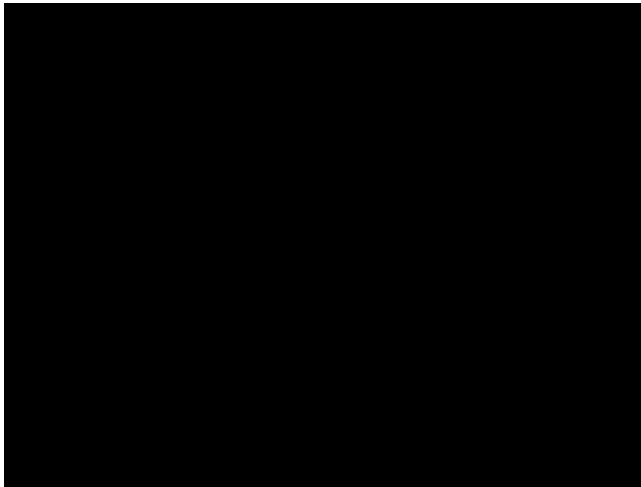


**Rendering**





## Walkthrough



*Figure 35 Design Models*

### B. Presentation

Students presented their work to class in 5-7 minutes and were asked questions from the floor for 2-3 minutes. The students have done a tremendous job to explain their work within the short amount of time provided. The students were creative in such a manner where most have put together a PowerPoint slides which showed a range of creativity ranging from a bookshelf to simplistic catwalk type of design. The discussion on various issues including cost analysis, sustainability, environmental aspects were interesting. Their design meets well the RFP's requirement and the slides were well designed and graphic where students showed their models with incorporation of walkthroughs using Revit model and video files. Overall, the students scored on average 46.3 out of 50 with a maximum of 50 points and minimum of 42.

In order to spice up the final project presentation, a peer evaluation system was also designed to provide feedback and comments and learn from each other. The evaluation was based on quality of design and completeness of project; design creativity, quality of presentation slides

and oral presentation which accounted for 10 points each totaling 40 points. This evaluation was originally planned to be incorporated into the project presentation grading. Although most students have given good feedback and a reasonable grading, some students favored their friends, while other have not provided genuine feedback. Thus, after careful consideration, the peer grades were not included as it will not be fair and reasonable for all. The peer evaluation sheet is attached as [Appendix O](#).

### C. Final Report

With respect to their final report, almost all have met the requirements and put their thought process, assumptions, challenges they faced, pictures of their models and placed in a title page, table of content and references. Overall, all students were given full points of 50 except one student who did not describe his design process well and 3 points were deducted. Three students final project work, report and presentations are attached respectively as an example in Appendix P.

### 5. Summary & Planned Changes

This portfolio has documented an AE 2250 (Construction Graphics and Design) course offered in the Spring of 2016. The portfolio identified objectives to address concerns and questions that based on previous offering of the course. The document designed seven course activities to meet the objectives of the portfolio. It also identified quantitative and qualitative assessment techniques to measure the outcome of the objective along with the impacts this assent will have on re-designing the course in the future.

The portfolio started by utilizing Blackboard (BB) features to easily meet the course objectives. One of this feature is tracking measure. Once an instructor posts materials, one can track whether students have accessed the material or not. This feature will allow the instructor who is putting the time and efforts to learn the material. It is the first time, I used it and find it beneficial to see at what time, day or week of the month students viewed the material. In addition, I utilized the rubric developer for the first time to easily assess the students' performance and create a transparent system for students to follow up what their mistakes are in their exercises, projects and quizzes. The incorporation of guest lectures, summarizing reading articles and showing of cutting edge technologies and process gave them a perspective of actual and real world experience and state of practice to the design and construction world. In addition, the group presentation of various BIM topics gave students the opportunity the research side of an education where they shared their findings with their peers which opened the doors for team work and speaking publicly and technical presentation. One activity that was designed to make up the team is a Web-based free team maker called, CATME. The program was able to group teams based on various characteristics of the student. This has allowed students to work on a team with different backgrounds and experience. Associated with the team-making, the first homework that was tailored for the course was a biographical sketch.



This was taken as a pre-survey to learn about the students' background, learn their names and identify their needs and expectation of the class.

A follow-up survey was also conducted to evaluate the students' perception of the class mid-way of the semester. This provided a valuable feedback on how the course materials are perceived, the pace of the class, the work load which will help us shift the direction in the second half of the semester. For, post survey analysis, the student's evaluation form will be used to acquire the overall feedback how the class went through the semester in improving future classes. However, this analysis may not be incorporated by the time this portfolio is compiled. One of the interesting activity that students enjoyed in this class was the project. The project has allowed them to portray their own vision into a design and documenting each step of project progress demonstrated the typical design process. The students liked the smaller class size which give them one-on-one interaction with the instructor and the open atmosphere and open discussion in working as a team allowed them to critic and help each other out in their design. In addition, the team work of the instructors including faculties, industry instructor and the teaching assistant made it smooth where ideas, syllabus and course materials were shared; frequent discussion of the progress of each section were made and the course was modified in a manner to suit all students and align with the overall objectives of the school and college.

One of the challenges that is not still well addressed in this course portfolio is the overall course curriculum and change of Syllabus. As mentioned in the introduction of this portfolio, with the diverse student audience and the course being offered with more AE focus, there is a need to modify the course. Even the course name of Construction Graphics and Design should be changed to Introduction to BIM and if you look at the syllabus, some of the learning objectives are designed for this course. Although this might take some time as it involves ABET accreditation and working at the school and college level, currently, faculties and the school are aware of this challenge and are working towards it. One of the discussions is to cross-list courses which are offered in Omaha and Lincoln. The second aspect is to design a three-level course of BIM which will be offered at a sophomore level (Intro to BIM), another at senior level (Incorporation of 4-D or 5-D) to illustrate the use of schedule and cost to 3-D and one advanced graduate course that can aid research. This is a working progress and hope to address this challenge soon. Overall, this portfolio will assist in documenting the course objectives, activities and assessment in planning changes in the course and designing the next version of the course that aligns with the school and college.

Appendix

Appendix A: Course Syllabus

*Course Syllabus*

*Spring 2016*

**AE2250-002**

***Construction Graphics and Design Processes***

***Tuesday and Thursday 4:00 – 6:00 PM***

***Room: PKI 248***

***Charles W. Durham School of Architectural Engineering and Construction***

***College of Engineering***

***University of Nebraska***

**Instructor:** Todd Shackelford, Dr. Asregedew Woldesenbet & Prof. John Bonsell

**Office:** PKI 105C

**Office Telephone:** 402-554-4191

**E-Mail:** awoldesenbet2@unl.edu

**Teaching Assistant:** Ri Na & Mohammad Bisadi

## **I. Course Description**

This course is an introduction to typical computer graphics and calculation applications used in a contemporary architectural engineering design office. It includes: fundamentals of descriptive geometry, extensive use of BIM software for solving typical design problems, use of drawing conventions common to construction design, basic and intermediate computer applications, and conceptual review of engineering design and technical problem-solving processes.

## **II. Course Goals and Objectives**

Goal: Align the Construction Management program with the Architectural/Engineering/Construction industry and socio-economic trends.

### **Objectives:**

1. This course explores visual communication in the building process between design professionals, clients, contractors, manufacturers and other stakeholders.
2. The course develops an understanding of the framework of the building design process along with an introduction to the associated construction documents.
3. Identify the features of BIM that support effective construction project team collaboration
4. Demonstrate how BIM can improve the effectiveness of construction project team collaboration and bring direct value to a project.
5. Describe challenges of implementing model-based collaboration and how they can be overcome.

After this course students will be able to:

- Appreciate the difference between a 2D/3D CAD model and a parametric object model in BIM.
- Have a greater awareness of creating construction documents automatically from BIM.
- Extract measurement data from BIM.
- Understand how to update any changes to design.
- Have ability to create various perspective views.
- Be capable of generating schedule tables.

## **III. Contribution of course to meeting the professional component**

AE 2250 - Construction Graphics and Design Process contributes to the required one and one-half years of engineering topics.

## **IV. Relationship of course to AE program outcomes**

This course integrates and develops the following program outcomes:

**Program Outcome 3:** “Demonstrate technical knowledge of computer-aided design software and engineering drawing conventions.”

**Program Outcome 5:** “Demonstrate ability to communicate concise drawing graphics using various tools, while specifically recognizing and illustrating building components and connections, following current industry standards.”

## **V. Course Texts**

“Autodesk Revit Architecture 2016: No Experience Required” by Eric Wing, Autodesk official Press. ISBN: 1118542743

## **VI. Equipment**

Each student must procure the following items:

1. Engineer's and architects' scale in common divided scales (3 sided). Metric scale optional.
2. A calculator
3. A flash drive

## **VII. Class Activities and Assignments**

### **1. Class Outlines\*\***

#### **a. Lectures Part 1: Construction Drawings**

- 1) Math
- 2) Contract Documents
- 3) Views
- 4) Scales
- 5) Lines and Symbols
- 6) Details
- 7) Elevation and Sections
- 8) Site Plans
- 9) Foundation Plans
- 10) Roof Framing
- 11) Electrical Plans
- 12) Steel and Concrete-Structural Drawings

#### **b. Lecture-Part 2: Building Information Modeling (BIM)**

- 1) The BIM concept
- 2) Computer modeling
- 3) Computer Visualization
- 4) Publication of work
- 5) Collaboration
- 6) Interoperability
- 7) Level of Development(LOD)
- 8) Construction Coordination
- 9) Calculation
- 10) Sustainable Design
- 11) Parametric Object Technology

#### **c. \*Laboratory:**

- 1) Introduction to Autodesk Revit
- 2) Modeling
- 3) Complete the BIM model
- 4) Annotations, Visualization
- 5) Documentation, Calculation
- 6) 3D PDF generation
- 7) Interoperability test with Revit
- 8) MEP Modeling
- 9) MEP collision detection (Constructability)
- 10) Navisworks

\*Lab assignments require your personal **flash drive** to save files.

**\*\*The outline contents are subject to change at the discretion of the instructor.**

### 2. Class notes and Lab assignment instruction

Most of class notes (pdf and ppt) and lab assignment instruction can be viewed from the course web page in Blackboard. Only registered students can access the Blackboard with their own user IDs and passwords.

### 3. Homework/Quizzes

Homework may be assigned each week. Students must be prepared to turn in all or part of the homework set to Blackboard. At the instructor's option you may be given a quiz in lieu of turning in your homework. Homework must be turned in **before the class begins**. No late homework will be accepted for credit. Blackboard will be mainly used to collect your lab assignments (electronic files).

### 4. Final Project

The final group project includes a detailed BIM of a building. Final submittals include electronic files of BIM and DWF sheets generated from the BIM model.

## VIII. Exams and Grading Procedures

Students will be evaluated by their performance on the assigned assignments and exams. Each class assignment grade will be based on class sections spent on it. Grade components will be weighted as follows in computation of the final course grade:

Participation (attendance + <b>Class activities</b> )	10%
Assignments/Quizzes	20%
Exams	30%
Final Project	25%
Presentation	15%

### Grading Scale:

A+	95-100	C+	73-75
A	90-94	C	70-72
A-	86-89	C-	66-69
B+	83-85	D+	63-65
B	80-82	D	60-62
B-	76-79	D-	56-59

**Final project presentation schedule:** The last week of the class.

## IX. Course Policies

### 1. Quizzes and Exams

Unless stated otherwise, all quizzes, tests, and examinations will be closed book without notes or any other mnemonic methods. Sufficient information will appear on these items to complete

them. Students not taking the required quizzes, tests, and examinations will receive a grade of zero for them.

## **2. Absences**

Class attendance is mandatory. All students are expected to attend class regularly, as well as, punctual to every class session. Sleeping in class, being late or leaving early may result in an unexcused absence. Each unexcused absence will result in two percentage points deducted from your final grade up to a maximum of 10%. Each excused absence requires prior approval. Greater than 3 unexcused absences will result in failure for this class. Also, using a computer (web search, email, homework, etc.) when it is not required will result in one percent point deduction each time from your final grade up to a maximum of 10%.

## **3. Academic Misconduct**

Students are responsible for the honest completion of representation of their work, for the appropriate citation of sources, and for respect of other's academic endeavors. Students who violate these standards must be confronted and accept the consequences of their actions. (see Undergraduate Catalog, <http://www.ses.unomaha.edu/pdf/ucat05-06.pdf>, Academic Integrity).

**Academic Misconduct is grounds for a failing grade as determined by the instructor.**

## **4. Disabilities**

Reasonable accommodations will be provided for students with physical, sensory, cognitive, systematic, and psychiatric disabilities. Please contact the UNO Disability Services (554-2872) and faculty to discuss.

## Appendix B: Course Schedule

AE-2250 -002 CONSTRUCTION GRAPHICS & DESIGN PROCESS					
COURSE CALENDAR					
Session	Date	Lecture Topic	Reading Chapters, Materials & Notes	Assignments Due	Exams
Week 1	January 12th	Course overview, Introduction to Sketching	Chapter 1		
	January 14th	Building Information Modeling Overview			
Week 2	January 19th	No class	Chapter 2		
	January 21th	Team #1 presentations – Revit Interface	Revit Shortcut Key	HW 1 - Sketches	
Week 3	January 26th	Technical Drawing	Chapter 3		
	January 28th	Team #2 presentations – Creating a Model		HW 2 - Biography	Quiz I
Week 4	February 2nd	The Design Process	Chapter 4		
	February 4th	Team #3 presentations – Creating Views		HW 3 - Inclass Exercise	
Week 5	February 9th	Construction Documents (General)			
	February 11th	Team #4 presentations – Dimensioning and Annotating	Chapter 5	HW 4 - Inclass Exercise	
Week 6	February 16th	Stairs, Floors, Roofs & Ceilings	Chapter 6, 7 and 9	HW 5 - Inclass Exercise	
	February 18th	Team #5 presentations –			Quiz II/Project Progress I
Week 7	February 23rd	Guest lecture - BIM for Masonry			
	February 25th	Team #6 presentations - Curtain Walls and Wall Joins	Chapter 10 and 18	HW 6 - Inclass Exercise	
Week 8	March 1st	Specification/ Site Component	Flux Video	HW 7 - Inclass Exercise	
	March 3rd	Team #7 presentations - Exam I			Exam I
Week 9	March 8th	BIM Contracts and Documentation/Sheets and Printing	Chapter 14		
	March 10th	Team #8 presentations – Advanced Wall Topics	Chapter 16	HW 8 - Inclass Exercise	
Week 10	March 15th	Miscellaneous Revit Topics			
	March 17th	Team #9 presentations - Construction Documents (AIA)		HW 9 - Reading Review	Project Progress II
Week 11	March 22nd	Spring Vacation -- no UNO classes – March 20th -27th	-	-	-
	March 24th				
Week 12	March 29th	Families I	Chapter 17		
	March 31th	Team #10 presentations/Project Work			
Week 13	April 5th	Families II	Chapter 17		
	April 7th	Team #11 presentations – Phasing & Design Options	Chapter 21		Project Progress III
Week 14	April 12th	Structures/MEP (Guest Speaker from Leo A Daly)	Chapter 8		
	April 14th	Team #12 presentations/Project Work			Exam II
Week 15	April 19th	Schedules & Tags + Rooms, Area Plans, Rendering, Walkthrough	Chapter 11, 15	HW 10 - Inclass Exercise	
	April 21st	Team #13 presentations/Project Work			
Week 16	April 26th	Prep Week April 25th – May 1st (Additional Topics)			
	April 28th	Prep Week April 25th – May 1st			Final Report & Design
Week 17	May 3rd	Final Presentation			Presentation
	May 5th	-	-	-	

## Appendix C: BIM Topics Presentation Group

### **Team #1 "What is BIM?"**

Name: Agbozo, Messangan

### **Team #2 "A BIM Case Study"**

Name: Scherer, Brooke

### **Team #3 "Why is BIM Good for Designers?"**

Name: Basil, Michael

Name: Shimp, Brian

### **Team #4 "Why is BIM Good for Owners?"**

Name: Swoboda, Nicholas

Name: Briggs, Jennifer

### **Team #5 "Why is BIM Good for Contractors?"**

Name: Chagas Quaresma, Sostenes

Name: Tapia-Valdovinos, Uriel

### **Team #6 "A BIM Case Study"**

Name: Chavez-trejo, Jose

Name: Trouba, Daniel

### **Team #7 "Where is BIM Going?"**

Name: Donahue, Perry

### **Team #8 "Quantifying BIM?"**

Name: Cook, Carlisle

Name: Weidner, Mark

### **Team #9 "A BIM Case Study"**

Name: German, Nathan

### **Team #10 "The Legal Challenges of BIM"**

Name: Giesler, Garrett

### **Team #11 "Why BIM is Failing"**

Name: Lopez, Nicolas

### **Team #12 "Global BIM"**

Name: Johnson, Jared



## Appendix D: BIM Topics Presentation Samples (3)

### Balfour Beatty and BIM; A Case Study

By Nathan Green

### Balfour Beatty Introduction

Challenging projects, projects and problems

Facility at Queen Elizabeth Park

### Proposal

- Create a luxury hotel in the heart of Dallas, Texas.
- The hotel will be able to cater the roughly 100,000 people who visit each year.
- The hotel will be justly named, but not named for Jack Ruby.
- 22 story, 1,261 rooms.



### Challenges

- Use a design-build project delivery
- Incorporate the pre-existing convention center
- Best value- Must be cost effective and ahead of schedule
- Avoid RFI's (request for information)
- Slow decision making
- Avoid interferences between systems
- Manage the project from 4,740 miles away



### The Solution

- Developed intelligent 3D models of the building and site using Autodesk® software.
- Regard building a team effort, and then focused on how to make portions of the design.
- Better coordination with other critical tasks (lead to fewer RFIs)
- Seamless off-site fabrication, in-situ of the facility was created by us.



### Results

- Opened two months early- Construction was 10 months
- Came in under the \$80 million budget
- Less communication
- Allowed last-minute changes early on
- End-to-end helped in LEED accreditation



## Project Summary

- ▶ DeltaCare Health Construction relied on a standard building program when making BIM choices to help keep the total project on budget and on schedule.

"I'd allowed us to explore multiple options as design decisions were being made."  
- Steven Bellomo, a senior project engineer for DeltaCare Health Construction.



## Conclusion

- ▶ Risk averse for mobility in the program
- ▶ Better contracting
- ▶ Better communication
- ▶ Time management
- ▶ Fostered effective design choices
- ▶ Allowed more room for profit

## Planning/Construction



## Final Product



## Works Cited

- ▶ "BIM Customer Success: 'Hospitality Construction.'" Autodesk. @Autodesk. @Autodesk. "Hospitality Construction: The Room Is Ready-early B.I.M.," p. 48. Autodesk. Deloitte Insights, 2013. Web. 7 Mar. 2016.
- ▶ "Autodesk BIM 360 DeltaCare Health Case Study." Autodesk. YouTube, v.i.d. Web. 07 Mar. 2016.
- ▶ "Case Studies & Reports." Wikipedia. Wikimedia Foundation, 02 Feb. 2015. Web. 07 Mar. 2016.
- ▶ "DeltaCare Health Case Study." N.p., n.d. Web. 07 Mar. 2016.
- ▶ "Hotel and Travel Information." Delta Housing Authority Software. N.p., n.d. Web. 07 Mar. 2016.
- ▶ "Sustainable Hotel: Green-Corridor West Coast Luxury Brand." California Green. N.p., n.d. Web. 07 Mar. 2016.

# The Future of BIM

By Perry Gonzalez

## Review

- BIM is not just a system, it is a mindset
- BIM has benefits for designers, owners and contractors
- Many companies use BIM for all projects



## Preview

- Professional level opinion of BIM and what is next
- Other professional assessments of BIM
- Future solutions
- The future and where BIM is heading





## Video Recap

- BIM helps business manage quality information to their clients
- Government enforces the use of BIM on all 2016 projects
- Greater BIM towards environmental impacts and material life cycle assessment
- Promote better partnering




## Current Attitude Towards BIM

- BIM has promised a vast amount of benefits
- Growing pains when using BIM
- Communication issues
- BIM control issues
- Responsibility issues



### Future Solutions

- Fast track access to the construction and design contracts
- More precise agreements
- Enhanced responsibility levels
- More communication





### What Is Next?

- Affordable 3D laser scanning
- Initial laser scanner costs
- Fast Point 3D
- Savings: ~\$30,000 per job




### What Is Next?

- Fast energy performance evaluations
- Initial energy models took weeks to complete and added unnecessary steps
- Newer technology from Autodesk and Solibri



### What Is Next?

- The cloud
- Advanced data management
- Assembla Systems and Panzura
- Benefits of advanced data management




### What Is Next?

- Computer manufacturing
- CNC fabrication are becoming automated
- BIM and the production of a newer computer manufacturing




### Summary

- Professional views on BIM
- Current BIM benefits and drawbacks
- Future solutions
- What is next for BIM

### Works Cited

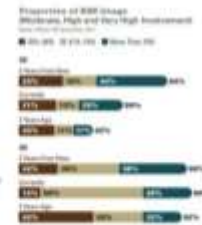
*[The text in this section is extremely small and illegible.]*

# Why BIM is good for Owners

By: Jennifer Briggs and Nick Swoboda

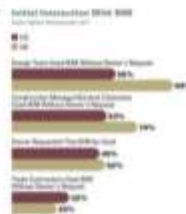
## Recap

- BIM is a process for designing and creating a building
- Moves decision making to a cheaper period
- Case studies show the vulnerability of BIM in a cloud-based system
- Allows designers to visualize their design and perform the process in a faster, more efficient manner



## Owner's First Interaction with BIM

- Owners aren't initially familiar with BIM applications
- Necessary for owners to understand the BIM process
- More information can be made accessible by the owner



## BIM Knowledge is a Necessity

- Today's industry is revolving around BIM's shareable data
- Owners are the one component that stays the same throughout the lifecycle of a building



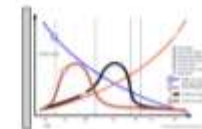
## Benefits of Owners using BIM

- Owners have access to BIM consultants
- Direct interaction with consultants
- Provide strategic, guidance, and using BIM
- Owners learn how to use BIM software themselves
- Able to see what the architect is doing
- A new skill
- Allows transfer of building control between contractors and facility managers to quicken



## Quickens the process to a Completed Project

- Allows changes to be made early in design
- Saves time and money
- Allows for complete satisfaction with the project
- Minimizes problems during construction
- Increases communication
- Increases the workflow
- Creates clarity
- Breaks down language barriers



## Conclusion

- Most owners aren't usually familiar with BIM
- Their involvement in the process ensures satisfaction and a cost-effective process
- Buildings constructed faster due to increased communication with the owner and a streamlined workflow

Owners' Perceptions on the Single Greatest Benefit of BIM

Benefit	Design	Construction	Operation
1. Better Risk Management (100%)	100%	100%	100%
2. Cost to Quality Relationship and Risk Management (100%)	100%	100%	100%
3. Better Risk Management (100%)	100%	100%	100%
4. Better Risk Management (100%)	100%	100%	100%
5. Cost to Quality Relationship and Risk Management (100%)	100%	100%	100%

## Citations

- <http://www.enr.construction.com/resources/special/2014/bim-10-owners-08-14/>
- <http://www.enr.construction.com/resources/special/2014/bim-10-owners-08-14/>
- <http://www.enr.construction.com/resources/special/2014/bim-10-owners-08-14/>
- <http://www.enr.construction.com/resources/special/2014/bim-10-owners-08-14/>

## BIM Topics Presentation Rubric

Spring 2016

Team No. \_\_\_\_\_

Name: \_\_\_\_\_

### Project Presentation Evaluation (30 Points)

Team # or members name: \_\_\_\_\_

Please grade presentations based on the following criteria:

1. Content (15 Points) - logic, well thought, good understanding and findings and well explained
  
  
  
  
  
  
  
  
  
  
2. Organization (5 Points) – Presentation is well organized, has good content (introduction, content and summary, includes summary/findings and cites references)
  
  
  
  
  
  
  
  
  
  
3. Clarity (5 Points) – Presentation is clear and easy to read, uses graphical presentation
  
  
  
  
  
  
  
  
  
  
4. Questions (5 Points) – The team addressed questions well

Total Points (30 Points)

\_\_\_\_\_



## Appendix E: Guest Lecture Example

**Nebraska Engineering**  
THE DURHAM SCHOOL

**team**

**Mark Swanson, AIA, CSI, LEED BD+C**  
Director of Industry Development and Technical Services

mswanson@imiweb.org

About me...  
wheels, motorcycles, and buildings

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University of Minnesota School of Architecture Materials and Methods Class

**UNIVERSITY EDUCATION**  
University of Minnesota School of Architecture BDA Masonry Workshop

**UNIVERSITY EDUCATION**  
The Mulligins  
The Mosaic  
University of Minnesota Masonry Workshop  
Lighter & Finer Brick

**UNIVERSITY EDUCATION**  
University of Minnesota Masonry Workshop Design Build - BIM Process

**BUILDING RENDERINGS**

**INITIAL VIRTUAL MODELS**  
University of Minnesota Masonry Workshop Design Build - BIM Virtual Mockup

**INITIAL CONSTRUCTION**  
University of Minnesota Masonry Workshop Design Build - Masonry Mockup



- BIM is a process
- Build it before you build it.
- Build, Adapt, Innovate, Change, and keep changing...

Operating in a BIM Environment

"The only constant is change."

We Meet Again Doctor!

Heracles 500 BCE

Disruptive Innovations:  
...change the way we do business.

BIM is a Disruptive Innovation

Disruptive innovations - are less easy to plan for and potentially more devastating to companies that do not pay enough attention to them.

"We have always done it that way."  
The 7 most expensive words in business

Stratasys Direct Manufacturing  
3D printed car bodies  
Eden Prairie, MN

Car Manufactures are becoming mobility service companies

The Economist  
The sharing economy

Mass Customization

Computational Design - Adaptive Wall Covering  
http://www.gt.p.com/2014/03/04/computational-design-adaptive-wall-covering/



### Digital Fabrication



Santiago Calatrava's St. Nicholas Church  
in Glogow Zoo, Ohio (Patrick M. Kelly)

Santiago Calatrava's Fostus Palestra  
University

M/S Michael Steven Merla, Mappwood, M.S., Digital Fabrication

### Digital Fabrication



M/S Michael Steven Merla, Mappwood, M.S., Digital Fabrication

### Digital Fabrication



Henry & DeWitt's Water Art Center  
Champaign

M/S Michael Steven Merla, Mappwood, M.S., Digital Fabrication



### Operating in a BIM Environment

"Build it before you build it."

Mark Swanson

### BIM is just a tool: for coordinating construction projects



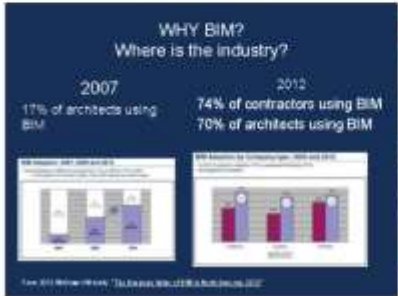
### Operating in a BIM Environment

Plan the Work  
Work the Plan

### BIM is just a tool: There is no one size fits all



- ### BIM allows the contractors to:
- Collaborate with design team.
  - Visualize the work.
  - Quantify the work.
  - Schedule the work.
  - Clash Detection.
- 

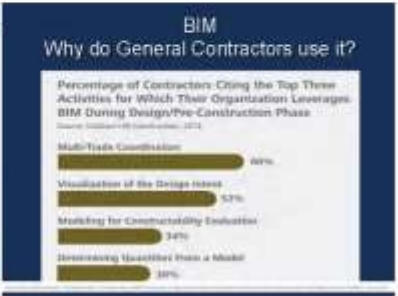


### BIM This is where the industry is now.

2014  
82% of U.S. contractors using BIM



Source: McGraw-Hill Construction Research & Analytics, 2014





### BIM Required for Team Formation

Completion in the state construction process. Any requests or updates to BIM models shall be submitted to Gilbane / GC-Schmitt within 10 days of changes made to the sign-off model. **There is a Revit Model-to-Build requirement for all trades and many contain data requirements to be built in to them, further described in the following section.** Achieving the client's expectations is a means and methods approach.

### MASONRY SUB CONTRACTOR PROCESS BIM Standards & Specification

All subcontractors will be required to comply with the agreement attached for the respective members of the design team.

1. **System Model:** The design team will provide a system model to the subcontractor. The system model will be based on the Autodesk Revit 2012 AutoCAD 3D 2012 (or highest and latest version 2012). Each subcontractor for each application provides a system model to the design team. All system models will be developed using the Revit system consistent design documents. All system models shall be developed in accordance to the project schedule and to be submitted for completion at least 30 days prior to construction proceeding of the project.

- ### BIM Why do Contractors use it?
- Identify and resolve design clashes before construction
  - Decrease number of RFIs
  - Accelerate Project Schedules
  - Improve productivity, efficiency, quality and safety

### BIM Why use it?

- Create an alignment between expectations and the resultant design.

- ### Project Delivery Methods- Which of these is best for BIM?
1. Design-Bid-Build
  2. Construction Manager at Risk
  3. Design/Build
  4. Integrated Project Delivery (IPD)

- ### Basic types of BIM models
- Architectural
  - Structural
  - Mechanical
  - Electrical
  - Plumbing
  - Energy
  - Trades
- 

- ### BIM: Software
- AutoDesk:
- Revit
  - Navisworks
  - Recap
  - 360 Glue
  - 360 Field
- Other:
- TradeWorx (3D)
  - CAD BLOX
  - Timberline
  - Primavera
  - Inroadaya
  - SketchUp
  - Rhino
  - Bentley
  - Tekla
- 



### Autodesk Education Community GET FREE SOFTWARE

Software	Version	Download	License
Autodesk Revit	2012	Download	Free
Autodesk Navisworks	2012	Download	Free
Autodesk Recap	2012	Download	Free
Autodesk 360 Glue	2012	Download	Free
Autodesk 360 Field	2012	Download	Free
Autodesk TradeWorx	2012	Download	Free
Autodesk CAD BLOX	2012	Download	Free
Autodesk Timberline	2012	Download	Free
Autodesk Primavera	2012	Download	Free
Autodesk Inroadaya	2012	Download	Free
Autodesk SketchUp	2012	Download	Free
Autodesk Rhino	2012	Download	Free
Autodesk Bentley	2012	Download	Free
Autodesk Tekla	2012	Download	Free

<http://www.autodesk.com/education/free-software/all>

**Reviewing a BIM Model**



Communicating with the design team with PDFs

**Reviewing a BIM Collaboration Model: FREE Software**



**Bluebeam VU 360**

- PDF reader
- Area take offs
- Mark up and annotate

[www.thebluebook.com/project-solutions/take-off-and-markup-documents.html](http://www.thebluebook.com/project-solutions/take-off-and-markup-documents.html)

**Reviewing a BIM Collaboration Model: FREE Software**



**Autodesk Viewports Viewer**  
Exports as Free WebViews, 3D views

**Features:**  
Free, 7-year license for an unlimited number of 2D and 3D DWG files

Enables viewing of model frameworks, object properties, and embedded source data including relationships, annotations, schedules, and comments. Supports full range display of materials and lighting.

<http://usa.autodesk.com/support/viewers/>

**Reviewing a BIM Collaboration Model: FREE Software**



**Autodesk Viewports Viewer**

<http://usa.autodesk.com/support/viewers/>

**Reviewing a BIM Collaboration Model: Design Team Collaborate**



**AUTODESK 360**

Autodesk 360 enables project teams to efficiently work together in one central workspace.

2D and 3D model view

Supports over 100 file formats

<http://usa.autodesk.com/support/viewers/>

**Reviewing a BIM Collaboration Model: Construction Team Collaborate**



**BIM 360™ Glue®**  
**BIM 360 Field**

BIM coordination and collaboration is a cloud-based BIM coordination service.

**Revitto EDITOR**

Convert BIM and CAD models into navigable 3D and share 11 for visual collaboration



**Visual Collaboration**  
Easy walkthroughs

**MASONRY SUB CONTRACTOR BIM Software Solutions**



**Trimble SketchUp (FREE)**  
**Trimble SketchUp Pro (\$590)**

**IMI Masonry Details are Sketchup details**



[Imiweb.org](http://imiweb.org)

**Sketchup 3D Warehouse loaded with free IMI Masonry detail content.**



**IMI**

**MASONRY SUB CONTRACTOR BIM Software**



**REVIT Building Suite Premium (\$6,825)**  
**REVIT Building Suite Ultimate (\$12,075)**

**MASONRY SUB CONTRACTOR BIM Software**



**TRADESMEN'S SOFTWARE**



Work Flow Process: Way Finding

- BIM Execution Plan
- Level of Detail (LOD)

Expectations – Questions to ask

- Owner Goals
- Project Team Goals
- BIM Execution Plan
- Defined Levels of Development

BIM: LEVEL OF DETAIL (LOD)

AIA G202 (2013)  
Building Information Modeling  
Protocol Form

BIM for Masonry

- IMI
- IUBAC
- Georgia Tech
- MCAA
- NCMA
- WSCPA
- CSI
- BIA

Level of Development-LOD for Masonry

Current REVIT Software  
LOD 100-200

BIM-M – raising the bar

Figure 1: Model view of masonry masonry construction. All details modeled separately. Customized Bar and Bond Beams develop with 3D BIM Building elements.

BIM –M Recommended LOD for Masonry is **350**

BIM-M  
LOD 350: Bond Beams, vertical bar-grouted cells, control joints

Level of Development-LOD for Masonry

BIM-M  
LOD 300: Coursing, Insulation, Wythes modeled independently

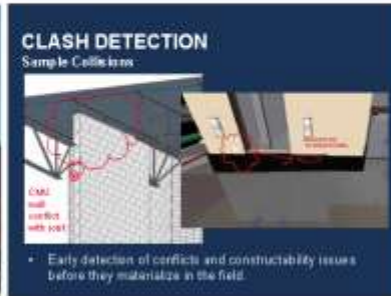
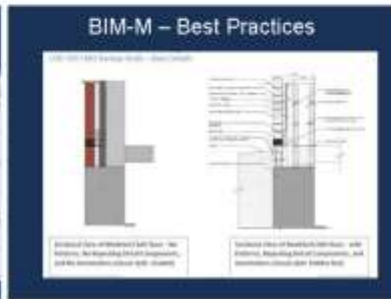
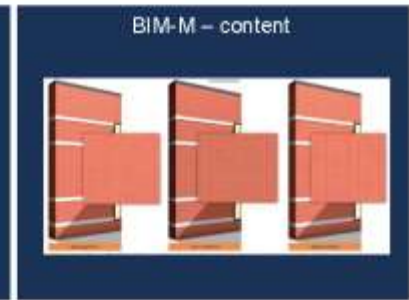
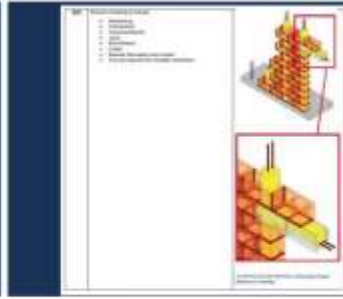
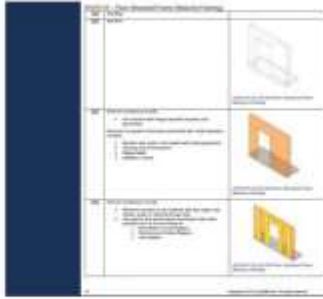
Level of Development-LOD for Masonry

BIM-M  
LOD 350: Bond Beams, vertical bar-grouted cells, control joints

Level of Development-LOD for Masonry

BIM-M  
LOD 400: Flashing, weeps, control joint material, horiz. reinforce

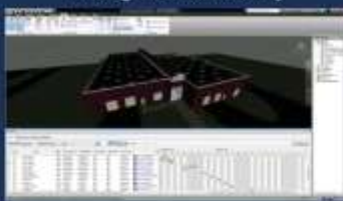
2015 BIM FORUM



### BIM: Quantification & Estimating Model based estimating

- Model based estimating allows us to supplement the Estimating process.
- Accuracy is directly related to the level of development of the model
- Not all Scope appears in the model. Human analytics. Notes in drawings for quantities.
- Only 30% of all the costs are shown in the model.

### BIM: 4D Schedule Visualization Linking Time with Activity



- Scheduling sequence that everyone can see.


### Construction Schedule: Steel



18 months


Structural Steel Lead times

### Construction Schedule: CMU



14 months


### Area of 4D Construction Sequence



Site Plan

### 4D BIM scheduling

- Scheduling sequence that everyone can see.



CMU LOAD BEARING WALLS  
STEEL ROOF JOISTS

STEEL FRAME  
STEEL STUD BACKUP WALLS

### GENERAL CONTRACTOR BIM PROCESS



BIM turns into VDC

VDC = VIRTUAL DESIGN AND CONSTRUCTION

### GENERAL CONTRACTOR BIM / VDC PROCESS: MORTENSON CONSTRUCTION



### MASONRY SUBCONTRACTOR VDC USES:

1. Site Logistic Planning (site utilization)
2. Phase Planning (visual sequencing)
3. Virtual Mockups (constructability)
4. Construction System Design – Lift Work drawings
5. Digital Fabrication (prefab)

### BIM: Site Logistics & Staging



### General Contractor BIM Process



- Virtual Mockups – Trades input and coordination
- Leverage the Design Model
- Put separate design models together in Navisworks
- Run a Clash Detection on Collaboration Model
- On going Virtual Coordination meetings with team to identify and clear design clashes
- Glue 360 – push back up to cloud and distribute

### VDC PROCESS: VIRTUAL MOCKUPS

- Communication Tool
- Constructability
- Who has what and when?
- Sequencing
- How are all systems working together?



### VDC PROCESS: VIRTUAL MOCKUPS

### VIRTUAL MOCKUPS

Virtual Mockups  
Building Information Modeling

### VDC PROCESS: INTEGRATED WORK PLAN (IWP)

- Go through each step of the wall construction.
- Field use drawings.
- Right of Reliance – dimensioning from models.

### VDC PROCESS: INTEGRATED WORK PLAN (IWP)

Legend

- IDENTIFYING MASONRY WALLS

### VDC PROCESS: CLASH DETECTION WITH BOND BEAMS

- IDENTIFYING STRUCTURAL MASONRY

### Masonry Sub-Contractor BIM Applications

Figure 1. Bricklayers constructed the masonry on this new laboratory building using BIM technology and tablet computers.

- GC: Power Construction
- Mason Sub-Contractor: Richards and Weyer

### Masonry Sub-Contractor BIM Applications

Figure 3. The coordination model shows MEP pipes and ducts passing through the masonry walls. See Figure 4 caption for the color coding legend.

- GC: Power Construction
- Mason Sub-Contractor: Richards and Weyer

### Masonry Sub-Contractor BIM Applications

Figure 5. This partial elevation view of the coordinate model shows the BIM views preparation for the mockups. Each element has a unique number and each is color-coded per trade. See Figure 4 caption for the color coding legend.

- 1,500+ Sleeves in masonry walls
- Trades shared BIM model info and space

### Masonry Sub-Contractor BIM Applications

Figure 6. A bricklayer (left) works in alongside a plumber (right) to simultaneously construct the brick wall and the plumbing contained within it.

- 1,500+ Sleeves in masonry walls
- Trades shared BIM model info and space

### MASONRY SUB CONTRACTOR BIM Workflow Process


R&D MASONRY, Marysville, WA

- Request CAD floor plans for the background
- SWITCHUP: Create walls and relevant materials and input into the model.
- Put doors on floors that make sense so they can be turned on and off as needed.
- Make screens, sections and views that can be easily transferred to the 2D drawing.
- The RDM Mock-Up Shops are linked to the model.
- Convert to 2D plan program for the client (AutoCAD Layout).
- Export to PDF for subscribe or printing.
- Export to DWG for sharing with Front/Backpacks.


### CASE STUDY: UW Maple & Terry Halls

### CASE STUDY: UW Maple & Terry Halls BIM Workflow Process: Pattern Layouts

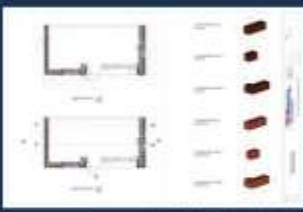
**CASE STUDY: UW Maple & Terry Halls**  
 BIM Workflow Process: **Virtual Mockups**




UW MAPLE AND TERRY HALLS MOCK UP

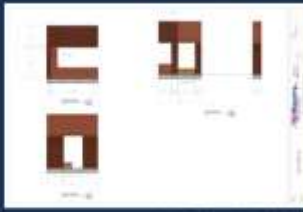
Maple by AEC Technology (www.aec-tech.com) 


**CASE STUDY: UW Maple & Terry Halls**  
 BIM Workflow Process: **Masonry Units**



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY: UW Maple & Terry Halls**  
 BIM Workflow Process: **Wall Elevations**



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY: BIM Workflow Process:**  
**Communication with Design Team**




Maple by AEC Technology (www.aec-tech.com) 


**CASE STUDY: UW Maple & Terry Halls**  
 BIM Workflow Process: **Shop Drawings**




Maple by AEC Technology (www.aec-tech.com) 


**CASE STUDY:**  
 UW Maple & Terry Halls Seattle, WA



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY:**  
 State Route 167 Sound Wall



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY: S.R. 167 Sound Wall**  
 BIM Workflow Process: **Virtual Mockups**



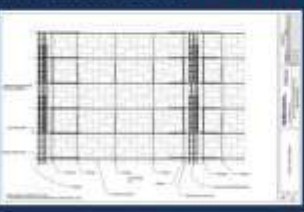
Maple by AEC Technology (www.aec-tech.com) 


**CASE STUDY: S.R. 167 Sound Wall**  
 BIM Workflow Process: **Wall Elevations**




Maple by AEC Technology (www.aec-tech.com) 


**CASE STUDY: S.R. 167 Sound Wall**  
 BIM Workflow Process: **Rebar Layout**



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY: S.R. 167 Sound Wall**  
 BIM Workflow Process: **Masonry Units**



Maple by AEC Technology (www.aec-tech.com) 

**CASE STUDY: S.R. 167 Sound Wall**  
 BIM Process: **Masonry Unit Layout**



Maple by AEC Technology (www.aec-tech.com) 



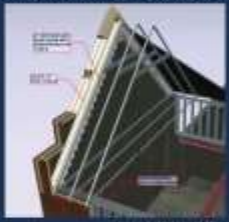
### MASONRY SUB CONTRACTOR BIM Workflow Process

**NORTHLAND CONCRETE & MASONRY, Burnsville, MN**

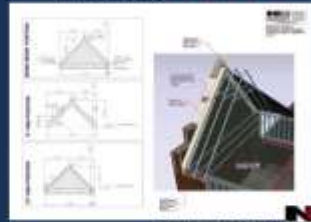


- Request CAD floor plate models for the base ground.
- Software used: AutoCAD Architecture, Revit, Mathworks (Gambit and Fluent).
- Autocad Architecture is primary software. Create 3D walls and relevant materials for any masonry wall.
- Use the models extensively for RFI process.
- Export to Sustainable Pro for integration coordination. All models in the field use same wall structure and hardware's Freedom loader.
- Export to PDF for submittal and RFI process.
- Autocad is already native. CADWorx great for interfacing with Revit/worksheets.

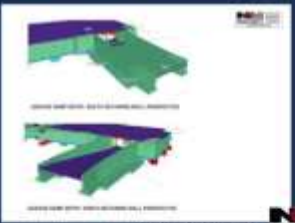
### CASE STUDY: Northland Concrete & Masonry



### CASE STUDY: Masonic Temple CMU Entry BIM Process: **Support Wall**



### CASE STUDY: Masonic Temple CMU Entry BIM Process: **Field Coordination**



### CASE STUDY: Masonic Temple CMU Entry BIM Process: **Field Coordination**



### New Technology



- Reality Capture
- Robotics
- Augmented Reality
- 3D Printing

### REALITY CAPTURE: LASER SCANNING



- STATIONARY - TOTAL STATION / LEICA
- AERIAL DRONES
- MOBILE MAPPING

### MASONRY APPLICATIONS: LASER SCANNING




### Robotics



### BIM Software: Augmented Reality



### NEW FABRICATION APPLICATIONS: 3D PRINTING



### FABRICATION APPLICATIONS 3D PRINTING: QUAKE COLUMN



- BIM is a process
- Build it before you build it.
- Build, Adapt, Change, and keep changing...



## Questions?

Mark Swanson, AIA, CSI, LEED BD+C, NCARB  
Director of Industry Development and Technical Services

[mbswanson@nibs.org](mailto:mbswanson@nibs.org)

Thank you!

### Operating in a BIM Environment



## Appendix F: Pre-Survey

AE 2250

Spring 2016

NAME: \_\_\_\_\_

---

### **Biography** Assignment #2

DUE: Jan. 28, 2016 (Thu)

**Instruction:**

- Provide a brief biographical information about your background and experience in a type written pages using 12-point font with maximum of 2 pages.
- The information should include your :
  - a. Name and Photo
  - b. Major and Level
  - c. High School and Hometown
  - d. Background (Work experience this last summer and past experiences in construction related employment. (If you have not worked in construction please indicate what type of employment experiences you have had)
  - e. Interest in this course and other courses or subject matter
  - f. Hobbies you enjoy, skills and talents you are proud of or other information about yourself you would like to share

|

## Appendix G: Mid-Semester Feedback

### Mid-Semester Student Feedback

Please list one or two things that you are enjoying about this class:

Is the pace of lectures too fast/too slow/about right?

Do you like the teaching methods, course materials and work load?

Did your previous experience and coursework prepare you sufficiently for the materials covered in this class?

Please list one or two things that could be improved in this class or would like to learn in the remaining of semester:

How many hours a week, on average, do you spend on this class?

Any ideas or comments:

## Appendix H: In-Class Exercise Example

### In-Class Exercise #3

#### Creating Views

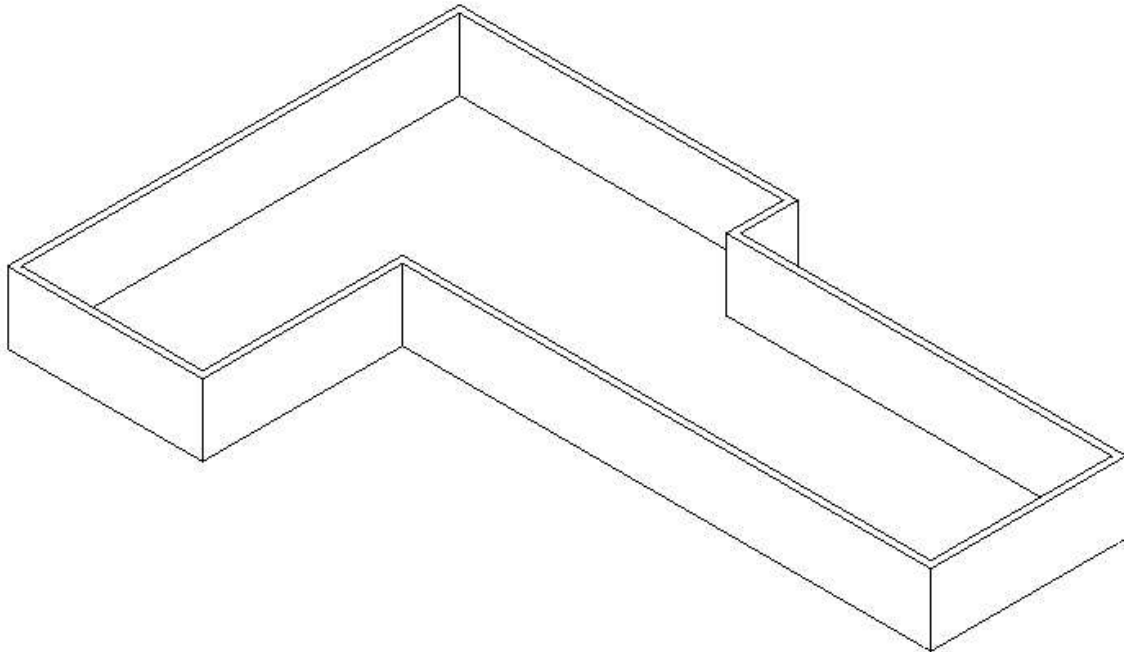
#### Adding Structural Grids and Columns

##### Description:

In this exercise you are going to add new levels, structural grids and columns.

##### How to do it:

One Revit file is available on blackboard. Download the file and open it in Revit. The file should look like Figure 36.



*Figure 36: Input image*

First you can go to level 1 and add all the grids. Notice that all the numbers and letters should be the same as figure 2 (At this point your model doesn't have the columns). Then, you need to go to one of the elevations (e.g. east elevation) from project browser and start to modify some of levels and add new ones. Figure 3 is east elevation.

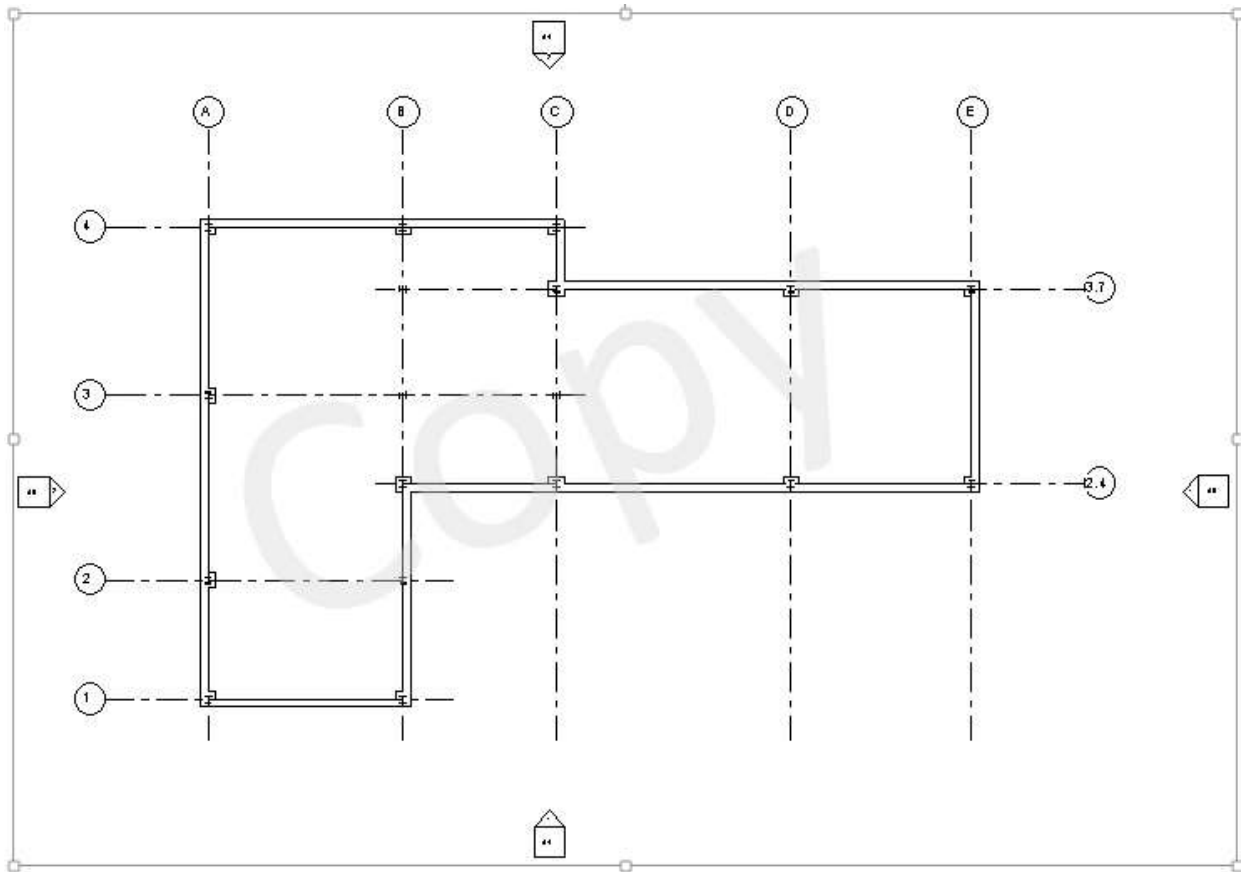


Figure 37: Output 1 – Level 1 with grids and columns

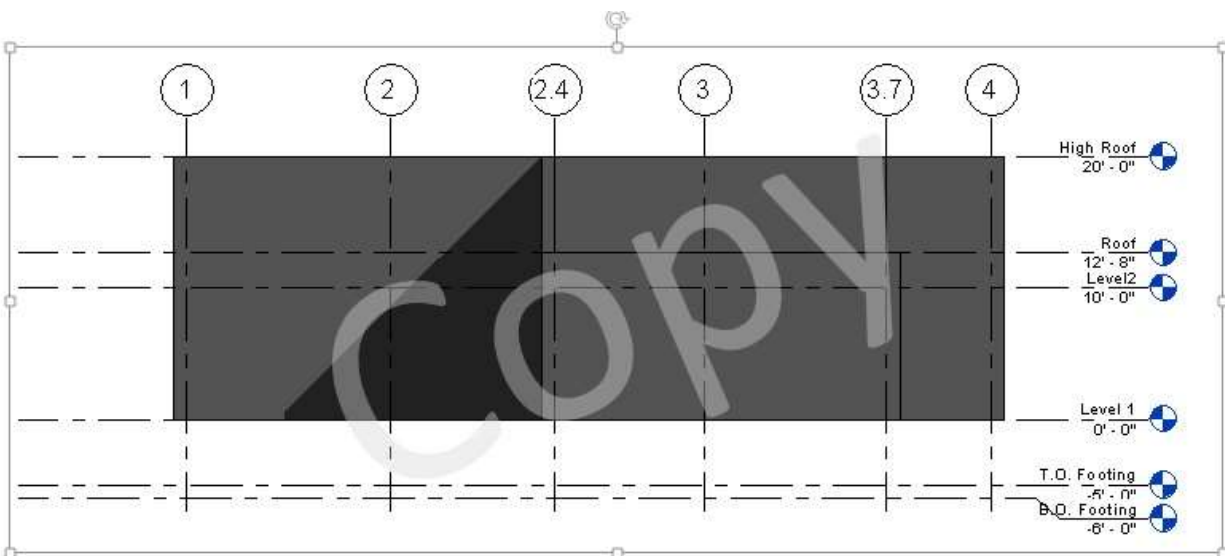


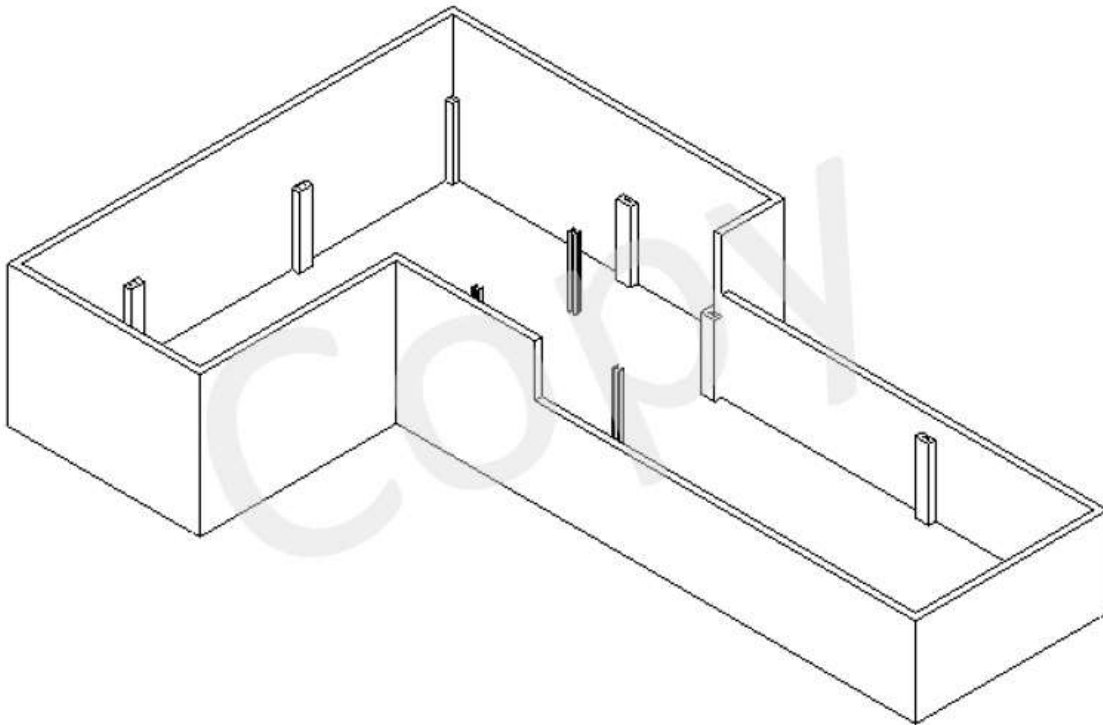
Figure 38: East elevation – visual style: Realistic and turn the shadows on

Now that we have all the levels, you can go back to level 1 and add both architectural (Rectangular column 24 \* 24) and structural (W-Wide Flange-Column W 10\*49) columns (Figure 2).

Finally, you should set the heights for different elements as follows:

- Tall walls are from “level 1” up to level “High Roof”;
- Short walls are from “level 1” up to level “Roof”;
- All columns are from “level 1” up to “level 2”.

After setting these heights the 3D view will be like figure 4.



*Figure 39: Final 3D output.*

**Deliverables:**

3 jpeg files: floor plan level 1, east elevation and 3D view. (Figures 2, 3 and 4)

## Appendix I: Quiz and Exam Example

### Exam Revision Sheet

#### Revision Exam I

##### Content

- I. **Written exam** – Lecture Notes (50%)
  - a. Fill in the blank, True/false, multiple Choice
- II. **Revit Model** – Lab Slides (50%)
  - a. Chap 1 – Chap 10 except Chapter 8

##### **I. Written Exam (WK. 1 – WK. 5)**

###### 1 – Sketches + Technical Drawing

- Visual Communication Medium – Sketching, Technical Drawing
- Sketching – Form, Perspective, Line, Tonal Value, Contrast, Shadow
  - o What do they represent?
- Stages of Refinement – Rough sketching, Developed Drawing/Composition, Final draw
- Effect of light – Shade, Shadow, Highlight, Reflection, Tone value, color, radiosity
- Drawing techniques – tones of lines, size & proportion

###### 2 – Technical Drawing + Construction Documents

- 2D (orthographic projection) and 3D representation (isometric, oblique and perspective)
- Architectural draws or views – plans, elevations, sections
- Type of lines – leader, extension, dimension, hidden lines, etc.
- Drawing Notations, dimensions, scale, units, graphic symbols

###### 3 – Design Process

- Process - Pre-Design, Schematic Design, Design Development, Construction Documents, Bid Negotiation, Contract Administration
- Example: Predesign phase -> Research the historic data and future projections; analyze topographic survey and develop context; develop ideas and plans
- Types of Project Delivery – CM, DB

###### 4 – Construction Documents

- Drawings and specifications
- Standard drawing order
- Contract documents, project manual and bidding documents
- Construction Specification Institute (CSI), Master format
- Performance specifications Vs Prescriptive specifications

##### **II. Revit Model (WK. 2 – WK. 7)**

- Revit Interface
- Creating Model/Views
- Walls, columns
- Floors, roofs, ceilings
- Stairs, curtain walls, rooms
- Dimensioning



Exam #1  
(Written Section)  
50 Points  
March 3, 2016 (Thu)

**Fill in the blank (1.5 Points)**

1. \_\_\_\_\_ are additional information provided to bidders during the bidding and negotiation process.
2. \_\_\_\_\_ are drawing notations represented by upper case letters arranged in an organized consistent column connected by a leader line.
3. \_\_\_\_\_ are types of dimensions used to call out angles at corners less than or greater than 90 degrees and for columns or walls on a radius.
4. \_\_\_\_\_ are a system of ordered marks at fixed intervals used as a reference standard in measurement or a proportion used in determining the relationship of a representation to that which it represents.
5. Construction documents are a combination of \_\_\_\_\_ and \_\_\_\_\_.
6. \_\_\_\_\_ type of specification tells what results the final construction assembly should achieve, but give the contractor choice in how they will be achieved
7. In a perspective view, parallel edge lines converge to a single point called \_\_\_\_\_ along the horizon.
8. \_\_\_\_\_ are type of lines used to either show detail or to shorten very long objects that do not change in detail

**Write short answers (3 Points)**

9. Least at least three tasks performed during a pre-design phase.
  
  
  
  
  
  
  
  
  
  
10. Draw the relationship of a construction management (CM) project delivery system.

**Select the best answer (1.5 Points)**

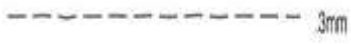



11. In sketches, uneven tonal surfaces indicate \_\_\_\_\_ type of forms.
  - a. Curvilinear
  - b. Linear
  - c. Perpendicular
  - d. Triangular
  
12. \_\_\_\_\_ is a type of drawing that represents the behavior of light on a subject adding realism.
  - a. Perspective drawing
  - b. Tone drawing
  - c. Form and proportional drawing
  - d. Contrast drawing
  
13. \_\_\_\_\_ is a type of design process where preliminary design documents such as plan drawings that are communicated with the client or design committee which may or may not end with an approval process.
  - a. Design development
  - b. Predesign
  - c. Schematics design
  - d. Bid negotiation
  
14. \_\_\_\_\_ are advertised to bidders once specifications and drawings are ready.

- a. Construction documents
  - b. Request for proposal
  - c. Contract administration
  - d. Bid negotiation
15. The Construction Specification Institute (CSI) Master Format is divided into \_\_\_\_\_ main categories called Divisions.
- a. 21
  - b. 36
  - c. 49
  - d. 54
16. \_\_\_\_\_ is a method of rendering based on detailed analysis of light reflections off diffuse surfaces which are characterized by soft gradual shadows.
- a. Tracing
  - b. Radiosity
  - c. Outline Sketching
  - d. Drafting
17. The combination of bidding requirements + contract forms + conditions of contract + specification excluding contract drawings and addenda is called \_\_\_\_\_
- a. Contract documents
  - b. Resources drawings
  - c. Bidding documents
  - d. Project manual
18. \_\_\_\_\_ is a type of projection that is used to create an image where only 2 of the 3 dimensions are seen.
- a. Orthographic
  - b. Isometric
  - c. Oblique
  - d. Perspective

**True or False (1 Points)**

19. \_\_\_\_\_ An architect's scale is based on inch fractions, while an engineer's Scale is based on ten.
20. \_\_\_\_\_ Elevations are labeled in relation to the compass points.
21. \_\_\_\_\_ Prescriptive specifications the contractor exactly what product or material to use by specifying brand names.
22. \_\_\_\_\_ An owner may or may not actually own the building.

**Match the following symbols (1.5 Points)**

23. \_\_\_\_\_  3mm
24. \_\_\_\_\_  3mm
25. \_\_\_\_\_  3mm
26. \_\_\_\_\_  3mm

- A. Cutting plane lines
- B. Section lines
- C. Hidden lines
- D. Center line
- E. Construction line

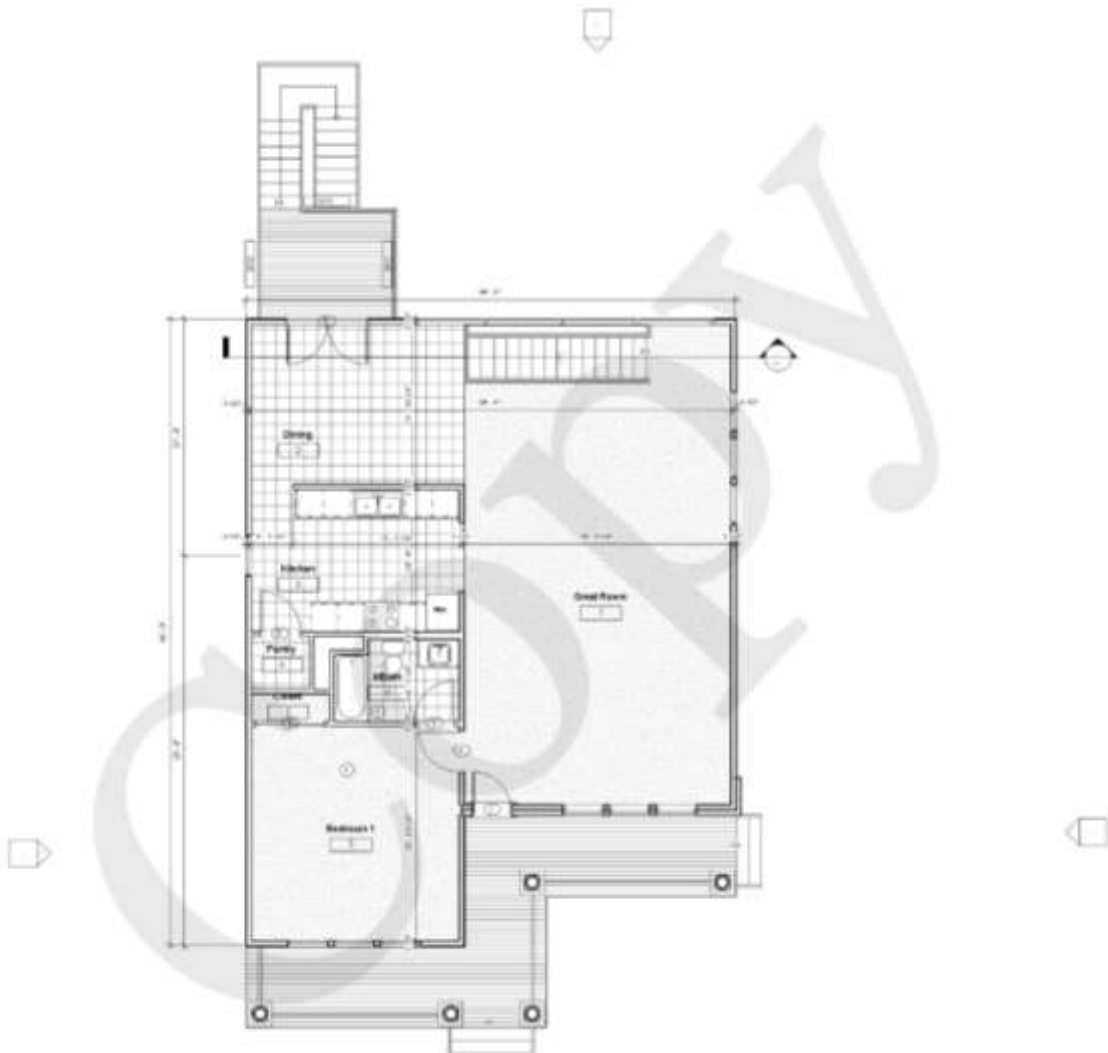
**Arrange the standard order of drawings from 1 – 6 (1 Point)**

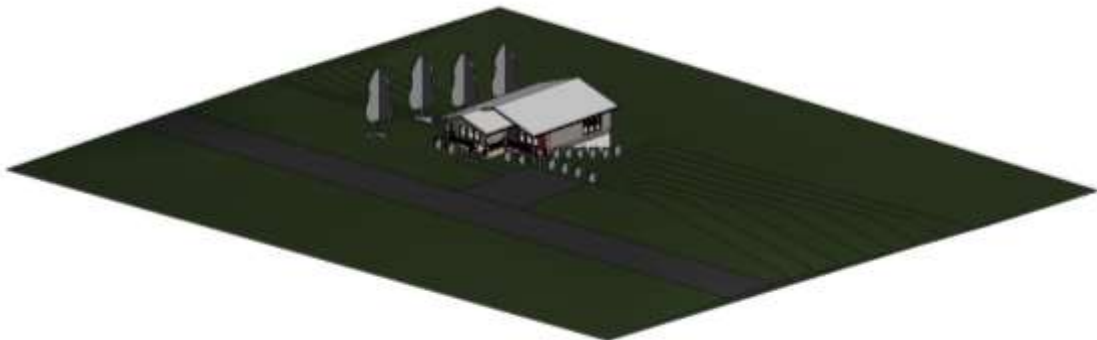
27. \_\_\_\_\_ Mechanical Engineering/Plumbing
28. \_\_\_\_\_ Title sheet/Abbreviations
29. \_\_\_\_\_ Structural Engineering
30. \_\_\_\_\_ Electrical Engineering
31. \_\_\_\_\_ Architectural
32. \_\_\_\_\_ Site/Civil Engineering/Landscape/Demolition

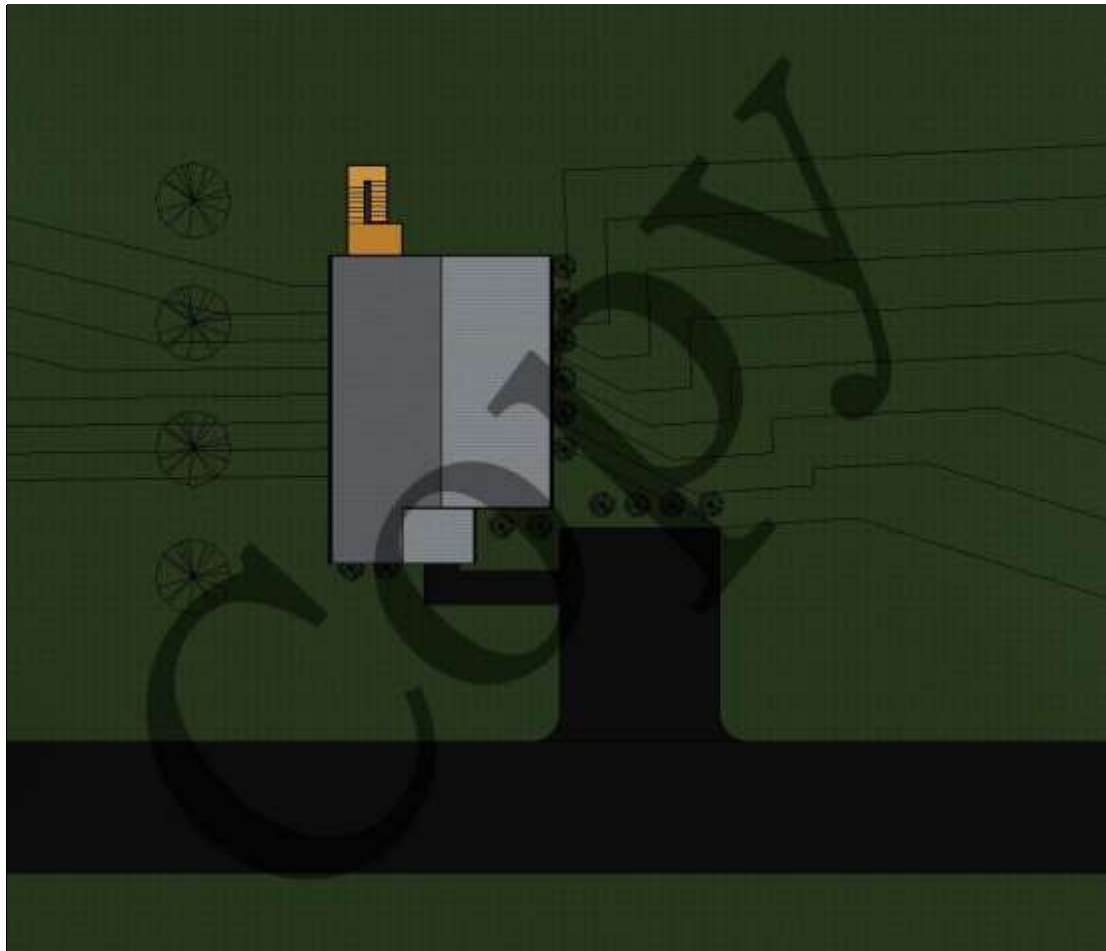
Exam #1  
(Model Section)

Download the Revit file and modify it, using the given pictures. Outputs are: Site, First floor plan and section. Change the pixels to 2048 when you want to export.

- First Floor: Add dimensions; Add columns: Columns are from first floor to TOP with base offset of - 0' 4" and top offset of -1' 4"; Add stair from basement to First floor: don't forget to add shaft; Add Rooms with room tags; Add Section; Add curtain walls in first floor: you can find it both in the given floor plan and section; Add the double door: Double Glass 72" \* 80".









## Appendix J: Project RFP

### **NEW Architectural Engineering Building**

#### **Project description**

The Peter Kiewit Institute building is approaching capacity and new space is required. To meet the projected space needs, a new three story Architectural Engineering building will be constructed. The new spaces are to be designed for adaptability and flexibility for future research and learning concepts. It should also incorporate innovative processes for taking the “pulse” of the built environment to test and monitor effects on building systems and the human experience. Special attention is necessary to develop social and collaborative spaces for students and faculty, a vibrant and active place encouraging students to stay.

Containing portions of science and focusing on sustainability the building should make use natural sunlight, as well as the latest in high tech infrastructure and amenities.

	USE	Square Footage	Notes
<b>Level 1</b>	Offices and classrooms	25,000- 32,500 sqft	Finished shared Lobby/Reception area
<b>Level 2</b>	Offices and classrooms	25,000 - 32,5000 sqft	Finished Core and Shell spaces including restrooms, stairs, and elevator lobbies
<b>Level 3</b>	Research Labs	25,000 – 32,500 sqft	Shared

#### **Purpose and Objectives**

The following are the overarching Goals/Objectives identified by the Planning team:

- Building as a Lab – Continuing with the concept of the original building this will allow:
  - Students to view various building systems
  - Gathering/documentation of data
  - Monitoring of building data for diagnostic and research purposes
  - Managed manipulation of building systems equipment and controls
- Support Education with Student focus
  - Improve Student services – advising and tutoring
  - Provide small group/collaboration spaces Support team projects
  - Support Capstone Program
  - Provide large classrooms to support large group learning environments
  - Provide privacy spaces for mentoring and advising
  - Provide high tech teaching and learning environment
- Increase dedicated research space
  - Increase per faculty projection in each respective college
  - Flexible /adaptable space
  - All dry lab space (power and data)
  - Modular planning
- Improve Community Outreach
  - Provide space to support summer camps, seminars, and workshops

- Provide large classroom/auditorium space
- Provide space to support increased STEM activities
- Promote Innovation and Entrepreneurship
  - Create a culture and supportive environment
  - Identify, stimulate and reward creativity
- Promote Integration
  - Create an environment that promotes and supports collaborative activities between colleges
  - Allow and promote integration of faculty office assignments to promote and support collaboration
- Provide Natural Lighting
  - Allow for as much natural lighting as reasonably possible to support the teaching, learning, collaboration and research environment as possible
- New Building to be LEED Certified
  - Identify and implement logical cost effective sustainable opportunities
  - Support “Building as a Lab” concept
  - Support the CoE and ISandT academic programs
  -



**Space requirements:**

<b>Code and Use</b>	<b>Square Feet Required</b>
<b>100 Classroom Facilities</b>	<b>9025</b>
110 Classroom 160-250 seats	6,250
110 Classroom and Seminar Rooms 24-100 seats	2,475
115 Classroom Service	300
<b>200 Laboratory Facilities</b>	<b>20,150</b>
210 Class Laboratory C.O.E.	
210 Class Laboratory I.S.T.	
215 Class-Laboratory Service	
Special-Class Laboratory C.O.E.	
220 Special-Class Laboratory I.S.T.	500
220 Special-Class Laboratory Capstone	
225 Special-Class Laboratory Service	150
230 Individual-Study Laboratory C.O.E.	
230 Individual-Study Laboratory I.S.T.	
235 Individual-Study Laboratory Service	
250 Research Laboratory C.O.E.	10,500
250 Research Laboratory I.S.T.	7,000
255 Research Laboratory Service	2,000
<b>300 Office Facilities</b>	<b>24100</b>
310 Office Facilities C.O.E.	2,400
310 Office Facilities I.S.T.	1,800
310 Office Facilities Grad. Assist. C.O.E.	8,100
310 Office Facilities Grad. Assist. I.S.T.	10,500
315 Office Service	400
350 Conference Room	900
355 Conference Room Service	
<b>400 Study Facilities</b>	<b>7550</b>
Reading/Study/Reference/Room (Small Group Study 410 (10 @ 6-8 chairs))	1,540
410 Reading/Study/Reference/Room (Study Cabins)	160
410 Reading/Study/Reference/Room (Video/Maker)	500
Open Reading Room (Landing and Gathering with 430 Café/Snack)	<b>2100</b>

Library-Support Space (Check out equip., schedule 430 Open Reading Room (Booths and Tables) 440 study rooms)	<b>1650</b>
455 Study Service (Student use Display)	<b>400</b>
<b>600 General Use Facilities</b>	
610 Assembly Multi-Purpose Center for Collaboration	<b>3000</b>
615 Assembly Service	<b>330</b>
620 Innovations Exhibition - Entrepreneurship, Multi-Discipline	<b>660</b>
625 exhibition Service	<b>4,500</b>
650 Lounge- Distributed Library annex	<b>900</b>
655 lounge Service	<b>1,250</b>
680 Meeting Room	<b>800</b>
685 meeting Room Service	<b>300</b>
<b>700 Support Facilities</b>	<b>1,500</b>

## **FACILITY REQUIREMENTS and THE IMPACT OF THE PROPOSED PROJECT**

### **Projected occupancy/use levels**

#### **College of Engineering Personnel Projections:**

<b>College of Engineering</b>	<b>Existing Headcount</b>	<b>5 year Projected Headcount</b>
<b>Personnel Classification</b>	<b>Full Time</b>	<b>Full time</b>
Faculty	43	73
Graduate Students	130	328
<b>Totals</b>	<b>173</b>	<b>401</b>

#### **College of Information Sciences and Technology Personnel Projections:**

<b>College of ISandT</b>	<b>Existing Headcount</b>	<b>5 year Projected Headcount</b>
<b>Personnel Classification</b>	<b>Full Time</b>	<b>Full Time</b>
Faculty	46	66
Graduate Students	359	602
<b>Totals</b>	<b>405</b>	<b>668</b>



# Project Progress 1

## Refined Sketches, Exterior Walls, Main Entry and Total Area

### Description:

You are going to start your project with a rough sketch and refine it before modeling it on Revit program. Once you have an approval of your sketch, start working with Revit by adding exterior walls and choosing main entrance to come up with an approximate required total area of the building based on the RFP.

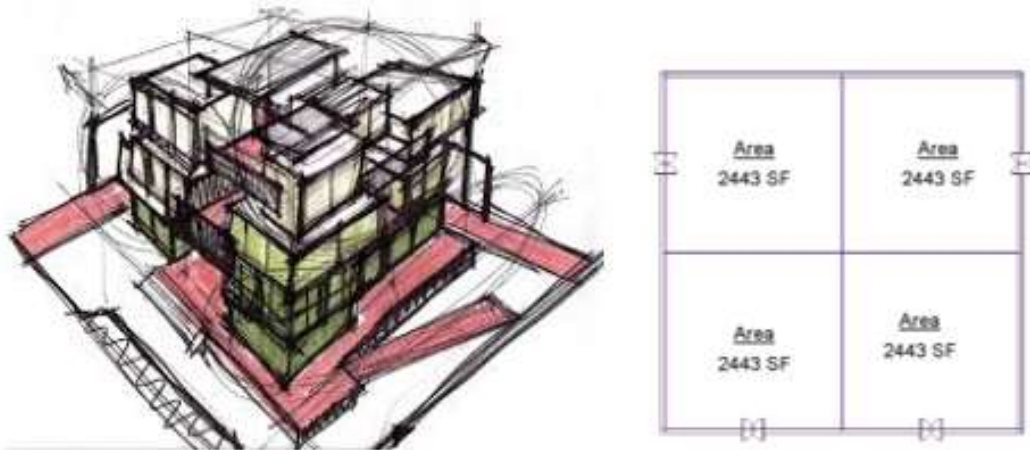


Figure 1: Sample output

### Deliverables:

1. Refined Sketch
2. Floor plan level one with main entrance (Revit file)
3. Total area

### Due Date:

Thursday, February 18<sup>th</sup> 2016

# Project Progress 2

Doors, Windows, Interior Walls, Stairs, Roofs & Ceilings

## **Description**

You are going to continue working on your project based on the feedback you will get from project progress I. This includes:

- Interior walls
- Doors for every room on the floor plan
- Windows and curtain walls
- Structural gridlines, reference planes, levels and columns
- Stairs, roofs and ceilings

## **Project design tips**

- Your project should meet all the requirements stated in the RFP.
- Please remember that all floor plans should contain all of necessary spaces to meet its function.
- Use different kinds of walls, doors and windows and try to add sufficient amount of details to your building to win the bid
- Incorporate views: elevations and sections for extra points

## **Deliverables:**

1. Doors, windows, rooms on floor plan level on sheet (Scale: 1/8" = 1')
2. Reference planes, grids, levels
3. Stairs, Roofs and Ceilings

## **Extra Points**

1. Views, Sections & elevations

Check the quality of your file before submission!

## **Due Date:**

Thursday, March 17<sup>th</sup> 2016



# Project Progress 3

Views, Sections, Room Tags, Floor Furnish & Site Component

## Description

You are going to continue working on your project based on the feedback you will get from project progress II. This includes:

- Views, Sections & elevations
- Dimensions
- Room tags
- Floor furnishings
- Ceilings + lightings
- Site topography and components

## Project design tips

- Floor plans should represent different floor materials (patterns) for different spaces (e.g. restrooms);
- Your project should have ceilings for some rooms (e.g. restrooms and kitchen and the areas that needs lighting), with various heights; however ceiling is not required in every space
- Use sub-region or split region tools to create side-walks and parking areas. Try to use different materials and components on site
- Check all the level and gridline symbols in plans, elevations and sections and make proper adjustments. Final documents should look clean and easy to read.
- Put “North arrow” in plans.

## Deliverables:

1. 4 elevations;
2. 1 longitudinal section view
3. Dimensions
4. Floor finish + room tags|
5. Site components

## Extra Points:

Logo & Sheet

Set the scale to  $1/8" = 1'$  for all views! Visual style for plans and section is “Hidden line” with medium level of detail and Shaded for elevations.

Check the quality of your file before submission!

## Due Date:

Thursday, April 7<sup>th</sup> 2016

Appendix L: Final Project Rubric

Evaluation Form													
AE 2250 Semester Project - Model													
SPRING 2016													
No.	Deliverable	Criteria	Points	Excellent			Good			Average			Poor
				A+	A	A-	B+	B	B-	C+	C	C-	D/F
			200	25	23	20	17	15	13	11	10	9	6.0
1	A100 - Cover Sheet	<ul style="list-style-type: none"> <li>o Fill out all the information as needed (6 points).</li> <li>o Add a sheet list sheet number and sheet name should be included (7 points).</li> <li>o Logo (6 points).</li> <li>o Project image site plan (6 points)</li> </ul>	25										
2	A101 - First Floor Plan	<ul style="list-style-type: none"> <li>o North arrow (5 points)</li> <li>o 1/8" scale (5 points)</li> <li>o Furnishings: 1/2 of the floor space including lecture hall (5 points)</li> <li>o Rooms tagged and numbered (5 points)</li> <li>o Overall Dimensions and grids (5 points)</li> </ul>	25										
3	A102 - Second Floor Plan	<ul style="list-style-type: none"> <li>o North arrow (5 points)</li> <li>o 1/8" scale (5 points)</li> <li>o Rooms tagged and numbered (7.5 points)</li> <li>o Overall Dimensions and grids (7.5 points)</li> </ul>	25										
4	A103 - Third Floor Plan	<ul style="list-style-type: none"> <li>o North arrow (5 points)</li> <li>o 1/8" scale (5 points)</li> <li>o Rooms tagged and numbered (7.5 points)</li> <li>o Overall Dimensions and grids (7.5 points)</li> </ul>	25										
5	A200 - Elevation	<ul style="list-style-type: none"> <li>o 1/8" scale (5 points)</li> <li>o North please adjust the range as needed (5 points)</li> <li>o South (5 points)</li> <li>o East (5 points)</li> <li>o West (5 points)</li> </ul>	25										
6	A300 - Section	<ul style="list-style-type: none"> <li>o 1/8" scale (5 points)</li> <li>o Typical Wall Section (6 points)</li> <li>o Long and short sections (6 points)</li> <li>o Staircases (6 points)</li> </ul>	25										
7	A400 - Roofing & Ceilings	<ul style="list-style-type: none"> <li>o Roofs (12.5 points)</li> <li>o Ceilings please show the different patterns as needed (12.5 points)</li> <li>o Structural grids (9 points)</li> </ul>	25										
8	A500 - Structural grids, columns (reference planes, etc.), schedules	<ul style="list-style-type: none"> <li>o columns (reference planes, etc.) (8 points)</li> <li>o schedules: room and door (8 points)</li> </ul>	25										
<b>Extra Points</b>													
	Rendering		10										
	Full floor furnishing		10										
	Walkthrough		10										

No.	First	Last	Evaluation Criteria (0-25 ) for each								Total	Comments
			A100 - Cover Sheet	A101 - First Floor Plan	A102 - Second Floor Plan	A103 - Third Floor Plan	A200 - Elevation	A300 - Section	A400 - Roofing & Ceilings	A500 - Structural grids		
1	Brian	Shimp									0	
2	Brooke	Scherer									0	
3	Carlle	Cook									0	
4	Daniel	Trouba									0	
5	Garrett	Giesler									0	
6	Jared	Johnson									0	
7	Jennifer	Briggs									0	
8	Jose	Chavez-trejo									0	
9	Messangan	Agbozo									0	
10	Nathan	German									0	
11	Nicholas	Swoboda									0	
12	Nicolas	Lopez									0	
13	Perry	Donahue									0	
14	Sostenes	Chagas Quaresma									0	

<b>Evaluation Form</b>											
<b>AE 2250 Semester Project - Presentation</b>											
<b>SPRING 2016</b>											
	Excellent			Good			Average			Poor	
	A+	A	A-	B+	B	B-	C+	C	C-	D/F	
	10	9.5	9.2	8.9	8.5	8.2	7.9	7.5	7.2	6-0	
Meets the needs of the Owner, as expressed in the RFP and class presentation.											
Quality and completeness of the design - Level of details - Readability and completeness of construction documents											
Creativity in design - Define creative challenge - Innovative design solution for defined challenges											
Oral Presentation - Professionalism, Time management, - Proper control/use of the REVIT model											
Quality of Slides - Use of visual layout with relevant graphs, charts and clear slides - references and addressed questions well											
TOTAL POINTS (Maximum of 50)											

No.	First	Last	Evaluation Criteria (0-10 for each)				Quality of slides	Total	Comments
			Meets the RFP?	Completeness	Creativity	Oral Presentation			
1	Brian	Shimp						0	
2	Brooke	Scherer						0	
3	Carlie	Cook						0	
4	Daniel	Trouba						0	
5	Garrett	Giesler						0	
6	Jared	Johnson						0	
7	Jennifer	Briggs						0	
8	Jose	Chavez-trejo						0	
9	Messangan	Agbozo						0	
10	Nathan	German						0	
11	Nicholas	Swoboda						0	
12	Nicolas	Lopez						0	
13	Perry	Donahue						0	
14	Sostenes	Chagas Quaresma						0	

<b>Evaluation Form</b>										
<b>AE 2250 Semester Project - Report</b>										
<b>SPRING 2016</b>										
	<b>Excellent</b>			<b>Good</b>			<b>Average</b>			<b>Poor</b>
	A+	A	A-	B+	B	B-	C+	C	C-	D/F
	10	9.5	9.2	8.9	8.5	8.2	7.9	7.5	7.2	6-0
a. Design Process (thought process of your design, logic for accomplishing the design, meeting RFP requirements, etc.)										
b. Assumptions taken to create integration with existing PKI building, project cost consideration, material selection, etc.										
c. Some discussion and challenges in your design and how you created solutions										
d. Some screen shots and images of your design to support your argument which will be presented for the client in an appendix.										
e. References, title page, table of content										
TOTAL POINTS (Maximum of 50)										

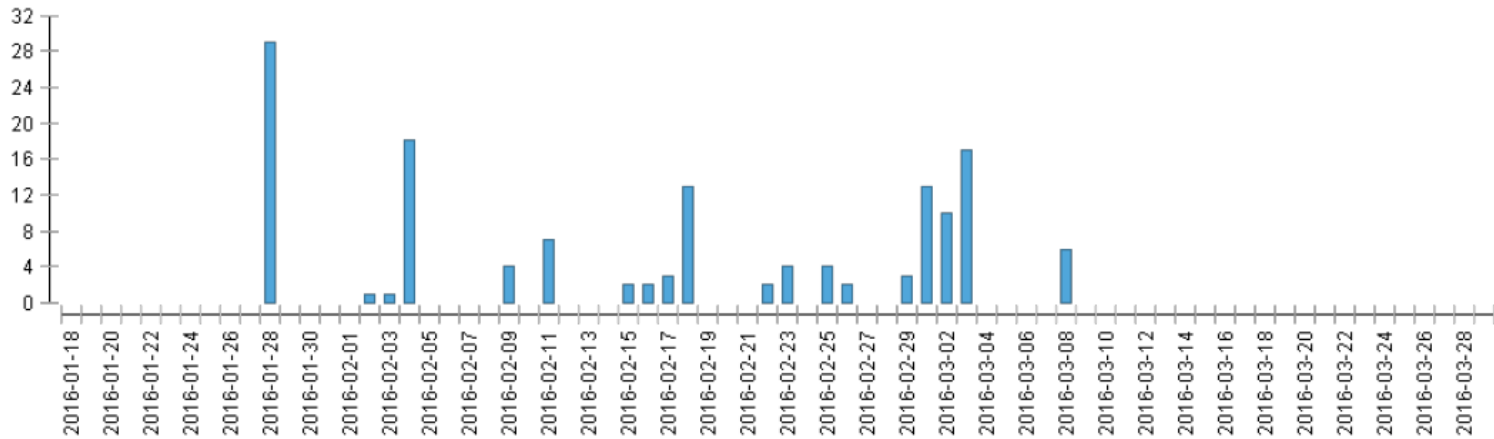
No.	First	Last	Evaluation Criteria (0-10 for each)					Total	Comments
			Design Process	Assumptions	Discussion	Screenshots	References		
1	Brian	Shimp						0	
2	Brooke	Scherer						0	
3	Carlie	Cook						0	
4	Daniel	Trouba						0	
5	Garrett	Giesler						0	
6	Jared	Johnson						0	
7	Jennifer	Briggs						0	
8	Jose	Chavez-trejo						0	
9	Messangan	Agbozo						0	
10	Nathan	German						0	
11	Nicholas	Swoboda						0	
12	Nicolas	Lopez						0	
13	Perry	Donahue						0	
14	Sostenes	Chagas Quaresma						0	

No.	First	Last	Model	Presentation	Report	Final
			200	50	50	300
1	Brian	Shimp	0	0	0	0
2	Brooke	Scherer	0	0	0	0
3	Carlie	Cook	0	0	0	0
4	Daniel	Trouba	0	0	0	0
5	Garrett	Giesler	0	0	0	0
6	Jared	Johnson	0	0	0	0
7	Jennifer	Briggs	0	0	0	0
8	Jose	Chavez-trejo	0	0	0	0
9	Messangan	Agbozo	0	0	0	0
10	Nathan	German	0	0	0	0
11	Nicholas	Swoboda	0	0	0	0
12	Nicolas	Lopez	0	0	0	0
13	Perry	Donahue	0	0	0	0
14	Sostenes	Chagas Quaresma	0	0	0	0
		<b>Average</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
		<b>Median</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
		<b>Max</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
		<b>Min</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

Appendix M: Content usage Report Example for a Course Material

**Content Usage Statistics**

Access / Date



2016-01	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Agbozo, Messangan (magbozo)																		0	0	0	0	0	0	0	0	0	0	5	0	0	0	5
Al dhabooni, Yousuf (yaldhabooni)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bartholet, Andrew (abartholet)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Basile, Michael (mabasile)																			0	0	0	0	0	0	0	0	0	2	0	0	0	2
Bonsell, John (jbonsell)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bonsell, Special Visitor (jbonsell_v4)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briggs, Jennifer (jebiggs)																			0	0	0	0	0	0	0	0	0	3	0	0	0	3
Chagas Quaresma, Sostenes (schagasquaresma)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chavez-trejo, Jose (jchaveztrejo)																			0	0	0	0	0	0	0	0	0	8	0	0	0	8
Clifford, Nicholas (nclifford)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cook, Carlie (cecook)																			0	0	0	0	0	0	0	0	0	1	0	0	0	1
Donahue, Perry (pdonahue)																			0	0	0	0	0	0	0	0	0	1	0	0	0	1
Eulie, Christian (ceulie)																			0	0	0	0	0	0	0	0	0	0	0	0	0	0
German, Nathan (ngerman)																			0	0	0	0	0	0	0	0	0	1	0	0	0	1



2016-01	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Giesler, Garrett (ggiesler)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Johnson, Jared (jaredjohnson)																		0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Lopes Siqueira, HENRIQUE (hlopesiqueira)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lopez, Nicolas (nalopez)																		0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Macheik, Augustino (amacheik)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Na, Ri (ma)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pratt, James (jamespratt)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rinderknecht, Seth (srinderknecht)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scherer, Brooke (bescherer)																		0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Shackelford, Todd (tshackelford)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shimp, Brian (bshimp)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swoboda, Nicholas (nswoboda)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tapia-Valdovinos, Uriel (utapiavaldovinos)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trouba, Daniel (dtrouba)																		0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Weidner, Mark (mdweidner)																		0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Woldesenbet, Asregedew (awoldesenbet)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
von Rentzell, Andrew (avonrentzell)																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guest																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>																		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>29</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>29</b>

2016-02	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Agbozo, Messangan (magbozo)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	
Al dhabooni, Yousuf (yaldhabooni)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bartholet, Andrew (abartholet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Basile, Michael (mabasile)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Bonsell, John (jbonsell)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bonsell, Special Visitor (jbonsell_v4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Briggs, Jennifer (jbriggs)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	2	0	0	0	0	0	0	0	0	7	
Chagas Quaresma, Sostenes (schagasquaresma)	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Chavez-trejo, Jose (jchavetztrejo)	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Clifford, Nicholas (nclifford)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cook, Carlie (cecook)	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	8	
Donahue, Perry (pdonahue)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	
Eulie, Christian (ceulie)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
German, Nathan (ngerman)	0	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	9	
Giesler, Garrett (ggiesler)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	4	
Johnson, Jared (jaredjohnson)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	6	
Lopes Siqueira, HENRIQUE (hlopessiqueira)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lopez, Nicolas (nalopez)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Macheik, Augustino (amacheik)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Na, Ri (ma)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pratt, James (jamespratt)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rinderknecht, Seth (srinderknecht)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scherer, Brooke (bescherer)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Shackelford, Todd (tshackelford)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Shimp, Brian (bshimp)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Swoboda, Nicholas (nswoboda)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	4	
Tapia-Valdovinos, Uriel (utapiavaldovinos)	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Trouba, Daniel (dtrouba)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	

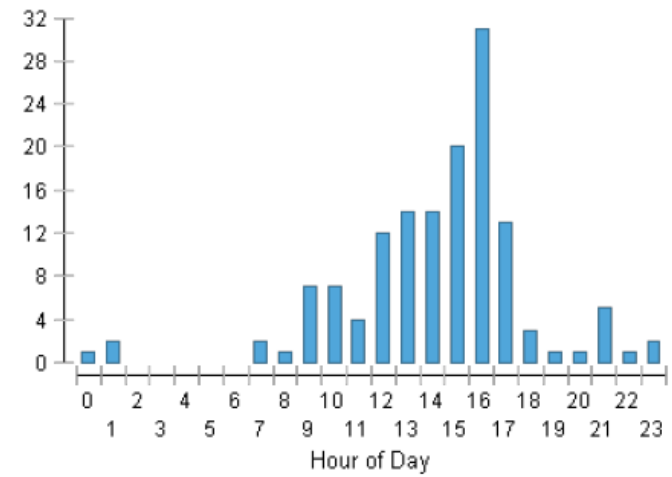
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Weidner, Mark (mdweidner)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woldesenbet, Asregedew (awoldesenbet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
von Rentzell, Andrew (avonrentzell)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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2016-03	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Agbozo, Messangan (magbozo)	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Al dhabooni, Yousuf (yaldhabooni)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bartholet, Andrew (abartholet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Basile, Michael (mabasile)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bonsell, John (jbonsell)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bonsell, Special Visitor (jbonsell_v4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briggs, Jennifer (jebiggs)	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Chagas Quaresma, Sostenes (schagasquaresma)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Chavez-trejo, Jose (jchaveztrejo)	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Clifford, Nicholas (nclifford)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cook, Carlie (cecook)	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Donahue, Perry (pdonahue)	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Eulie, Christian (ceulie)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
German, Nathan (ngerman)	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Giesler, Garrett (ggiesler)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Johnson, Jared (jaredjohnson)	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Lopes Siqueira, HENRIQUE (hlopesiqueira)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lopez, Nicolas (nalopez)	0	1	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Macheik, Augustino (amacheik)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Na, Ri (ma)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pratt, James (jamespratt)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rinderknecht, Seth (srinderknecht)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scherer, Brooke (bescherer)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Shackelford, Todd (tshackelford)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shimp, Brian (bshimp)	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Swoboda, Nicholas (nswoboda)	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Tapia-Valdovinos, Uriel (utapiavaldivinos)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trouba, Daniel (dtrouba)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2016-03	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Weidner, Mark (mdweidner)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woldesenbet, Asregedew (awoldesenbet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
von Rentzell, Andrew (avonrentzell)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>13</b>	<b>10</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>46</b>	

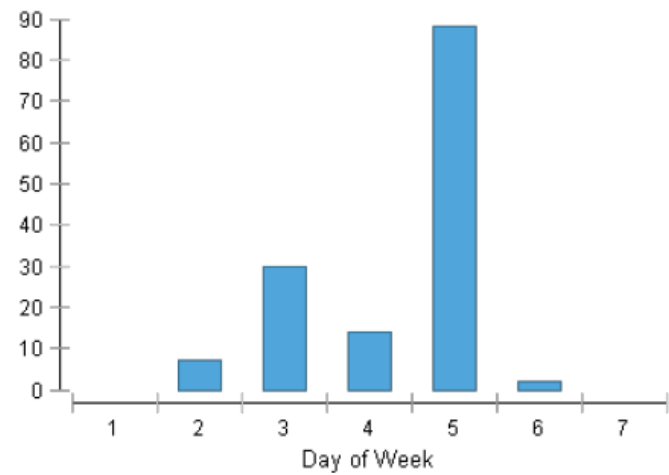
### Access / Hour of Day

Hour of Day	Hits	Percent
0	1	0.71%
1	2	1.42%
2	0	0.00%
3	0	0.00%
4	0	0.00%
5	0	0.00%
6	0	0.00%
7	2	1.42%
8	1	0.71%
9	7	4.96%
10	7	4.96%
11	4	2.84%
12	12	8.51%
13	14	9.93%
14	14	9.93%
15	20	14.18%
16	31	21.99%
17	13	9.22%
18	3	2.13%
19	1	0.71%
20	1	0.71%
21	5	3.55%
22	1	0.71%
23	2	1.42%
<b>Total</b>	<b>141</b>	



Access / Day of Week

Day of Week	Hits	Percent
SUN	0	0.00%
MON	7	4.96%
TUE	30	21.28%
WED	14	9.93%
THU	88	62.41%
FRI	2	1.42%
SAT	0	0.00%
<b>Total</b>	<b>141</b>	





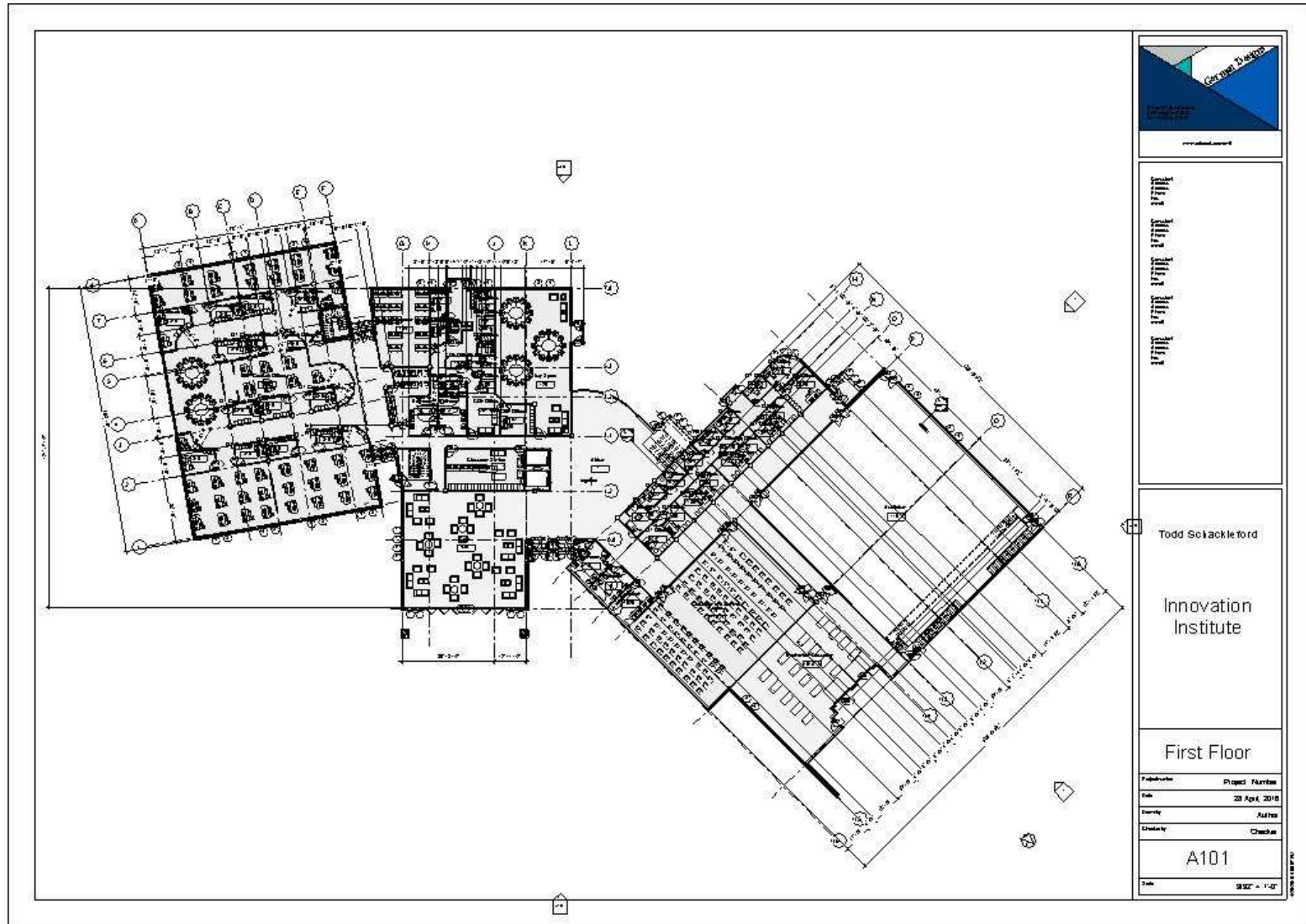
## Appendix N: Final Project Model Rubric Results

No.	First	Last	Evaluation Criteria (0-25 ) for each								Total	Bonus	Total	Comments
			A100 - Cover Sheet	A101 - First Floor Plan	A102 - Second Floor Plan	A103 - Third Floor Plan	A200 - Elevation	A300 - Section	A400 - Roofing & Ceilings	A500 - Structural grids				
1	Brian	Shimp	25	25	25	25	25	25	25	17	192	30	222	no structural grids; 30 bonus
2	Brooke	Scherer	25	25	25	25	25	25	12.5	17	179.5	30	209.5	no roof plan; no structural grids on A500; 30 bonus
3	Carlie	Cook	25	20	24	24	24	24	25	17	183	10	193	no north arrow; no furnishing; no structural grids; +10 bonus rendering
4	Daniel	Trouba											0	
5	Garrett	Giesler	17	24	24	24	24	25	23	17	178	8	186	no sheet list; patterns of ceiling; no schedules found; +8 points bonus fi furnish
6	Jared	Johnson	17	25	25	25	25	25	25	17	184	30	214	no sheet list; no structural grids; 30 bonus
7	Jennifer	Briggs	25	25	25	23	25	25	25	17	190	30	220	no structural grids; lightings shown on 3rd floor plan; 30 bonus
8	Jose	Chavez-trejo	17	20	25	25	25	25	25	17	179	30	209	no sheet list; no north arrow; should remove some trees on floor plan and elevations to make it clearer; structural grid missing;30 bonus
9	Messangan	Agbozo	23	23	25	25	25	25	12.5	17	175.5	30	205.5	furnishing-shown in different pattern; need more dimensions on curves abd other elemens no roof plan; no structural grids; 30 bonus
10	Nathan	German	17	25	23	25	25	24	24	17	180	20	200	no sheet list on your title block; A102 need to edit the view range to make the elements on other floors or lightings invisible; should adjust section and elevation plan scale to fit well within the sheet; some lines are shown in gery on roof plan: probably need to adjust the view range; no structural grids; 20 bonus-walkthrough and furnishing;
11	Nicholas	Swoboda	25	24	24	24	24	24	24	15	184	10	194	no structural grids, door schedule should within the boundary lines; 10 bonus furnishing (rendering pic is black)
12	Nicolas	Lopez	13	20	20	20	25	25	25	17	165	30	195	no sheet list; did not fill out the info on the sheets and layout not well fit; to many overlaps on your floor plans, too crowded; no structural grids; schedules too close to the boundary: probably need a bigger size sheet;30 bonus
13	Perry	Donahue	25	25	25	25	25	25	25	17	192	20	212	no structural grids on A500; 20 bonus-walkthrough and furnishing;

# Appendix O: Final Project (Model Sheets, Report and Presentation Examples)

## Model Sheet Examples

Example 3

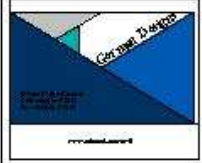
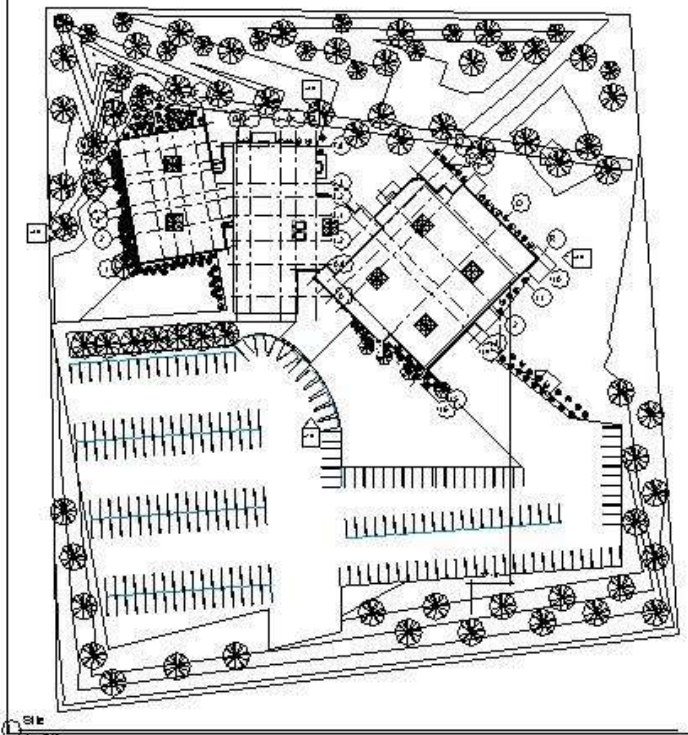












- 1.000
- 1.010
- 1.020
- 1.030
- 1.040
- 1.050
- 1.060
- 1.070
- 1.080
- 1.090
- 1.100
- 1.110
- 1.120
- 1.130
- 1.140
- 1.150
- 1.160
- 1.170
- 1.180
- 1.190
- 1.200
- 1.210
- 1.220
- 1.230
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- 1.680
- 1.690
- 1.700
- 1.710
- 1.720
- 1.730
- 1.740
- 1.750
- 1.760
- 1.770
- 1.780
- 1.790
- 1.800
- 1.810
- 1.820
- 1.830
- 1.840
- 1.850
- 1.860
- 1.870
- 1.880
- 1.890
- 1.900
- 1.910
- 1.920
- 1.930
- 1.940
- 1.950
- 1.960
- 1.970
- 1.980
- 1.990
- 2.000

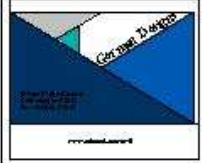
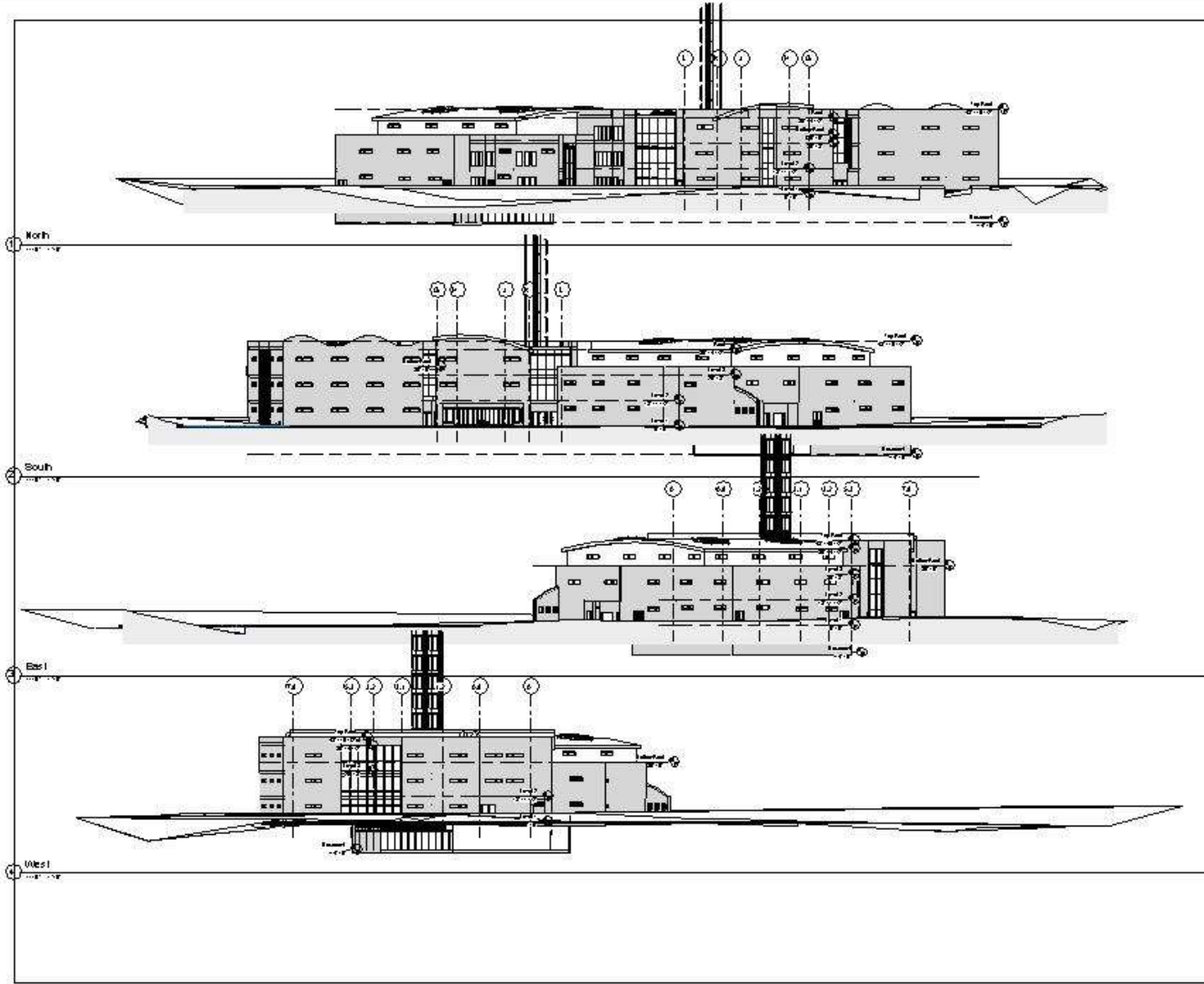
Todd Seackelford

Innovation  
Institute

Cover Sheet

Project Number	Project Number
Date	23 April, 2018
Drawn by	Author
Checked by	Checker
A100	
Scale	As indicated

KS-D-18-0000



Todd Solacke for  
 Innovation Institute

Todd Solacke for

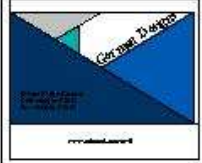
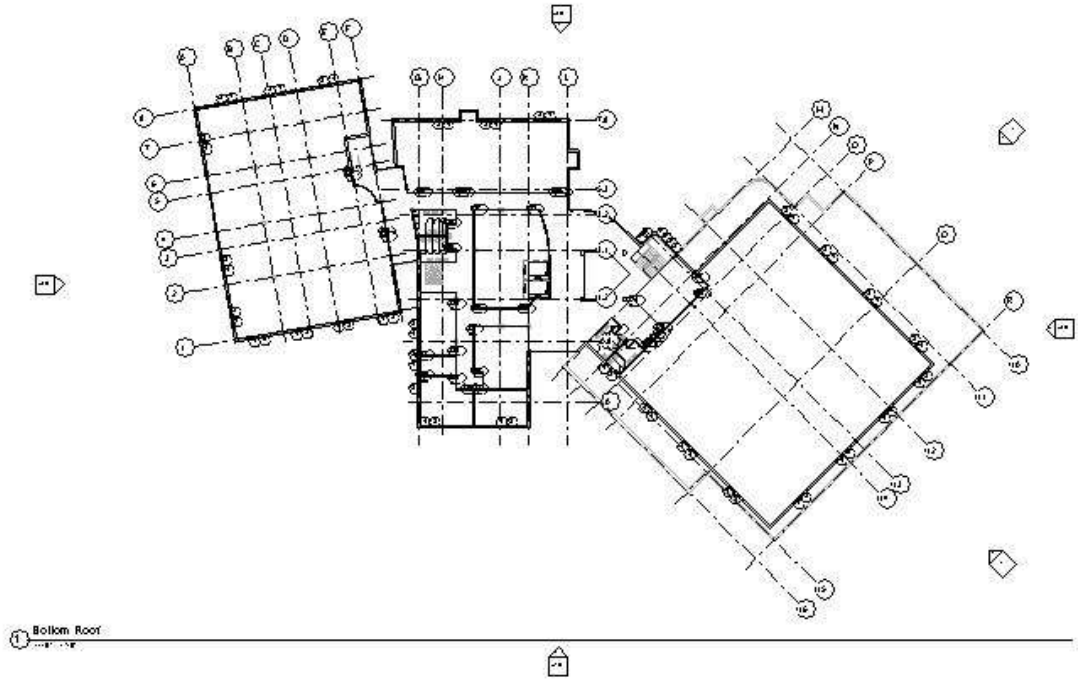
Innovation  
Institute

Building  
Elevations

Project Number	Project Number
Date	23 July, 2018
Drawn by	Author
Checked by	Checker
A200	
Scale	1/8" = 1'-0"

2018 07 23





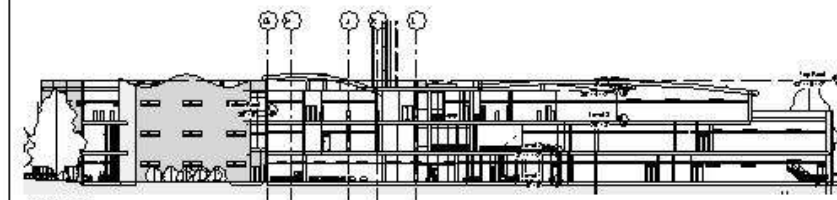
Todd Seackleford  
 Innovation Institute

Todd Seackleford  
 Innovation Institute

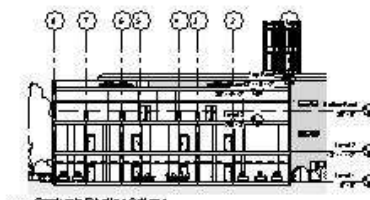
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Project Number	Project Number
Date	23 April, 2018
Author	Author
Checker	Checker
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2018.04.23

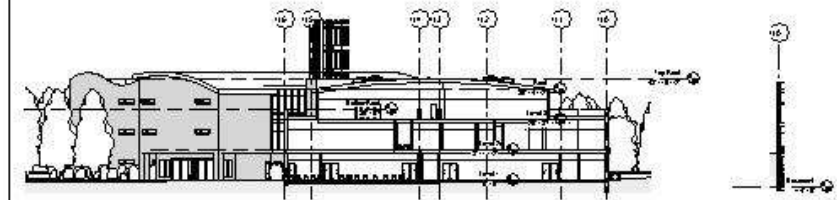




1 Alumni Center

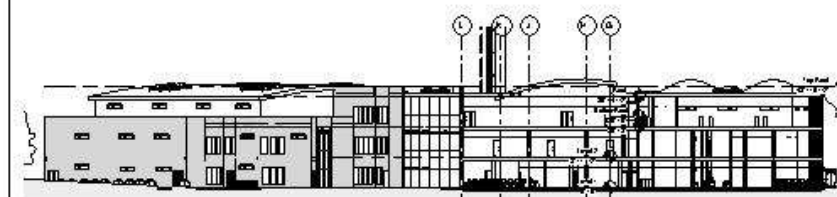


2 Graduate Studies Offices

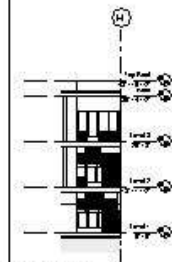


3 Lecture Halls

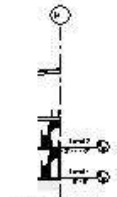
5 Typical Wall Section



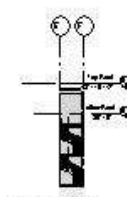
4 Offices/Study Spaces



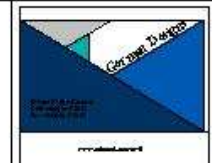
6 Staircase 1



7 Staircase 2



8 Staircase 3



Ceruzzi Design  
 1100 University Avenue  
 University Park, PA 16802  
 Phone: 717.863.1234  
 Fax: 717.863.1235  
 www.ceruzzi.com

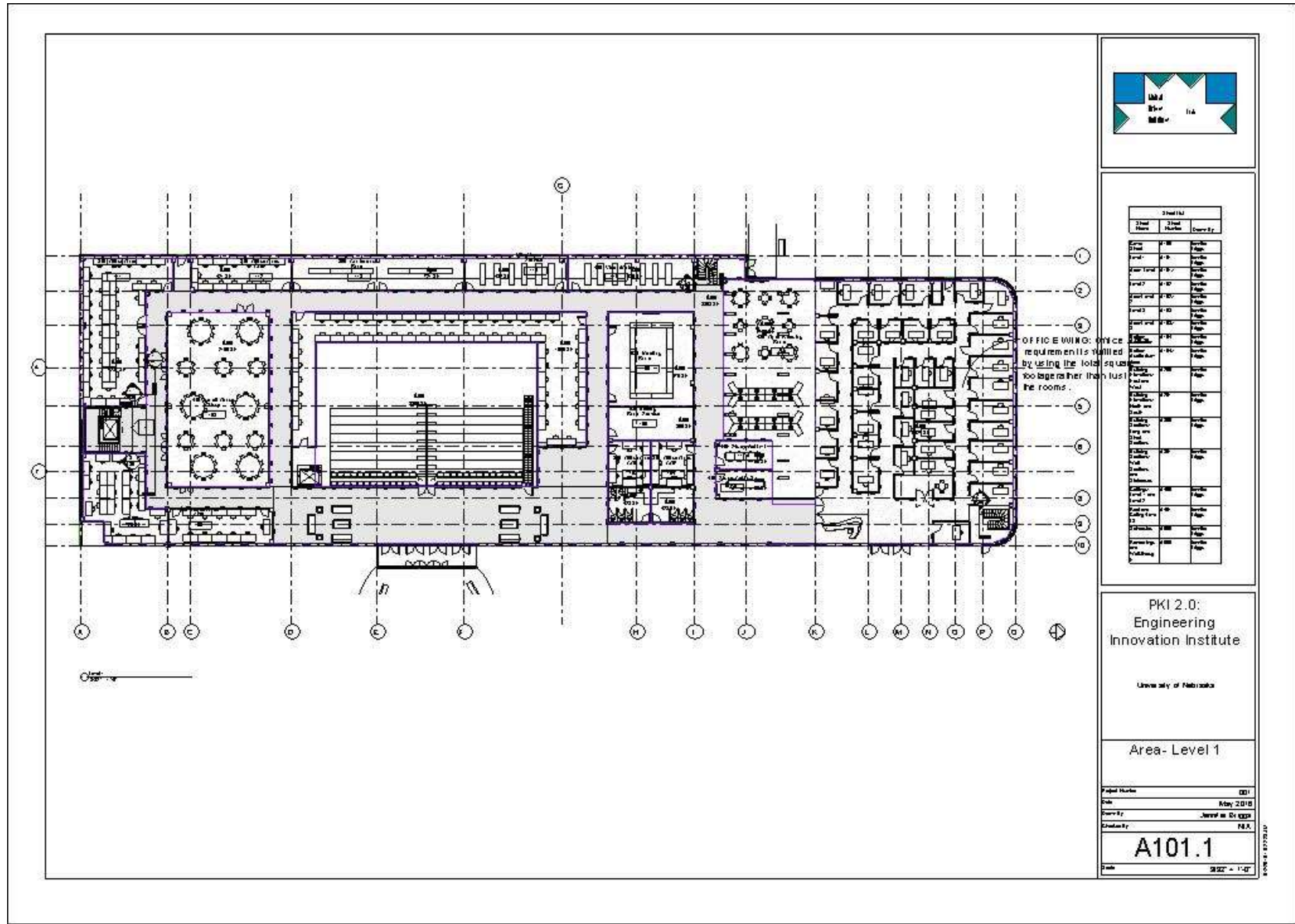
Todd Seibacke,ford

Innovation  
Institute

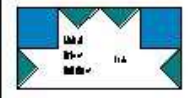
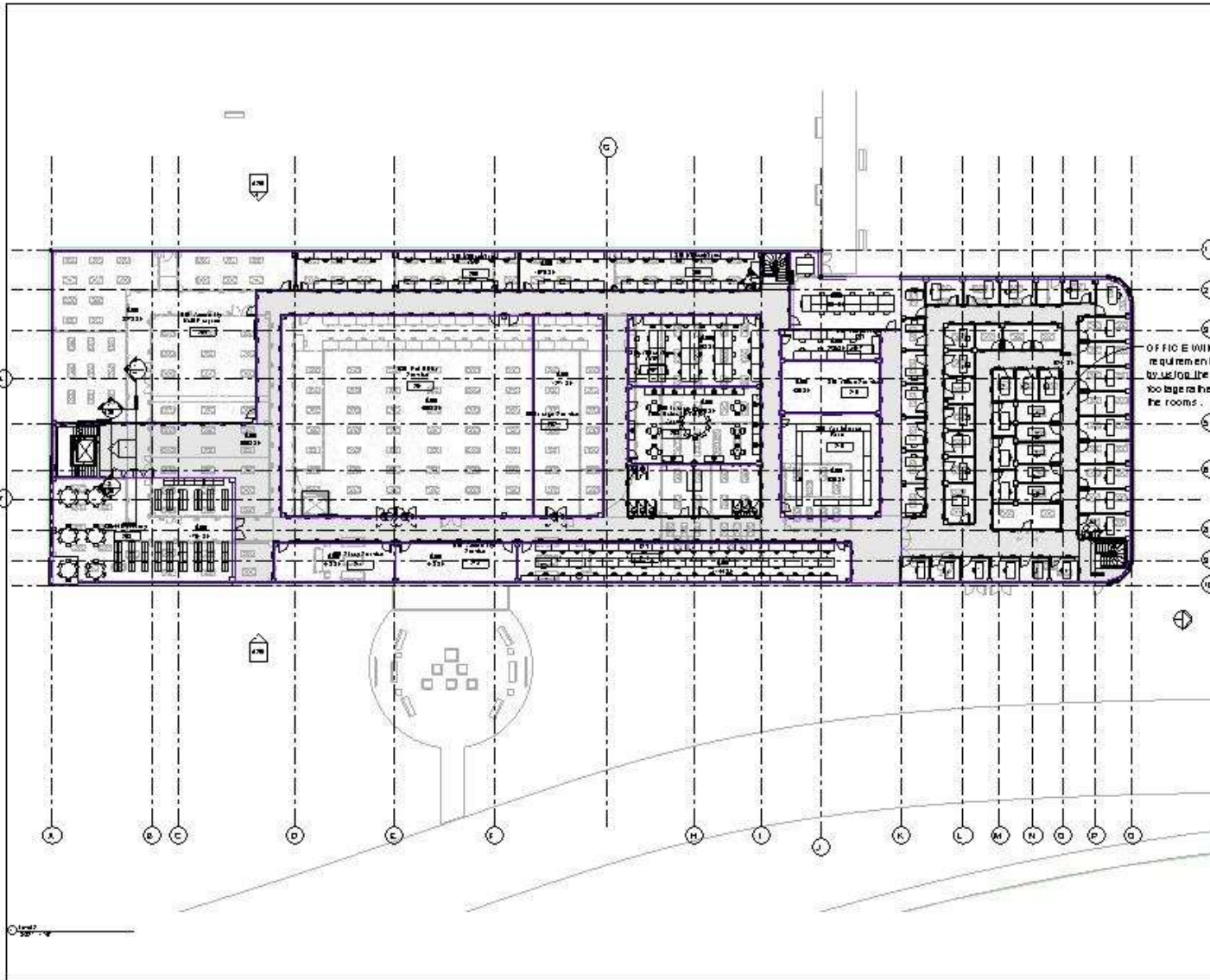
Building Sections	
Project Number	
Date	23 April, 2018
Drawn by	Autiss
Checked by	Chacko
A300	
Scale	As indicated

DATE PLOTTED: 4/23/18 10:58 AM

Example 2







OFFICE WORKING OFFICE requirements are fulfilled by adding the total square footage rather than just the rooms.

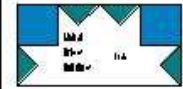
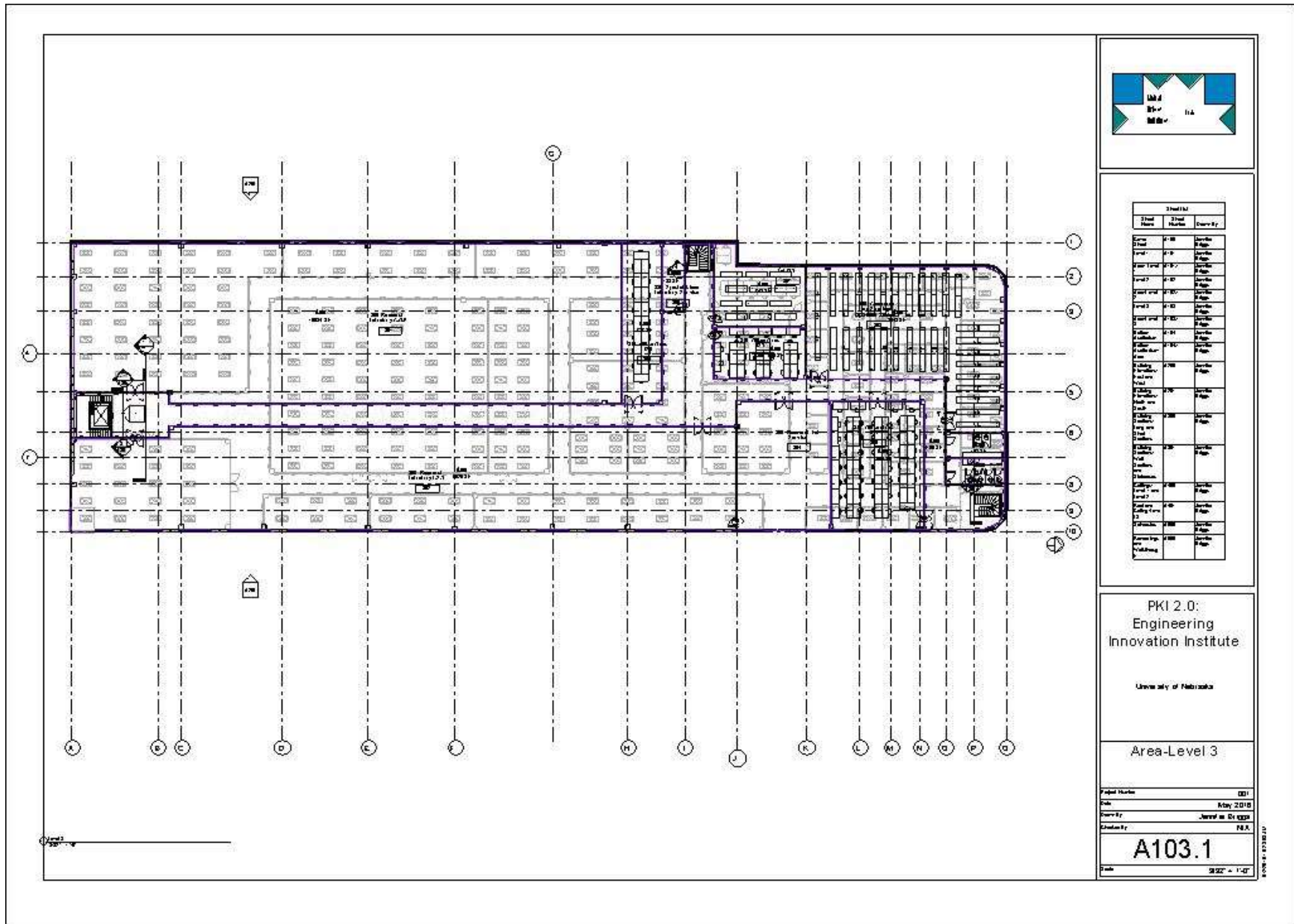
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Office	212	10
Office	213	10
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Office	294	10
Office	295	10
Office	296	10
Office	297	10
Office	298	10
Office	299	10
Office	300	10

PKI 2.0:  
Engineering  
Innovation Institute

University of Nebraska

Area-Level 2

Project Number: 021  
 Date: May 2018  
 Designer: Jerald W. De Groot  
 Designer: P.E.  
**A102.1**  
 Scale: 3/32" = 1'-0"



Room	Room Name	Area	Level
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104	104	104	104
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197	197	197	197
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Engineering  
Innovation Institute

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Area-Level 3

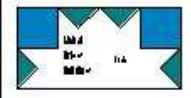
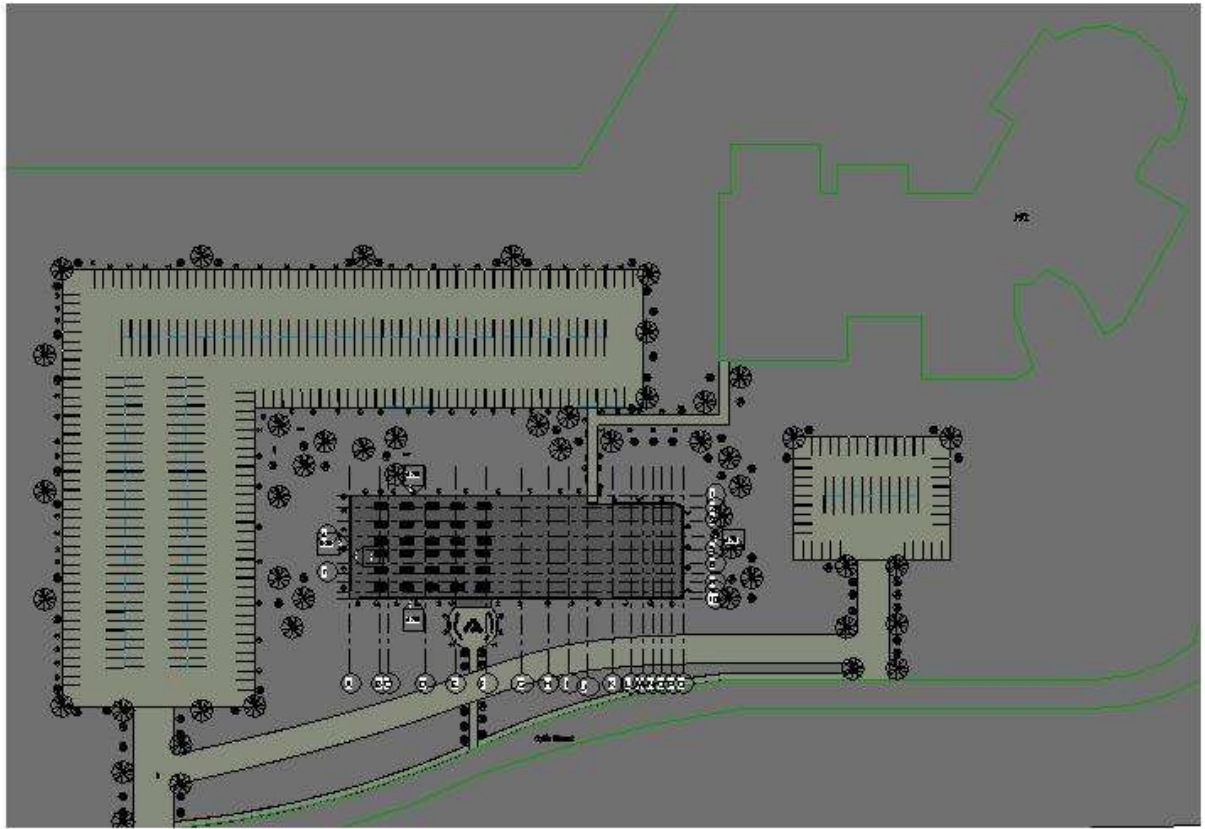
Project Number	021
Date	May 2018
Drawn By	Jessie M. De Groot
Checked By	FEA
<b>Area-Level 3</b>	
Scale	3/32" = 1'-0"

8/2018 10/2018









Sheet No.	Sheet Name	Sheet No.
001	Site Plan	001
002	Site Plan	002
003	Site Plan	003
004	Site Plan	004
005	Site Plan	005
006	Site Plan	006
007	Site Plan	007
008	Site Plan	008
009	Site Plan	009
010	Site Plan	010
011	Site Plan	011
012	Site Plan	012
013	Site Plan	013
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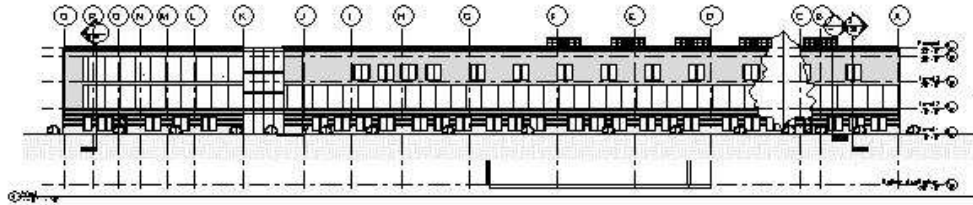
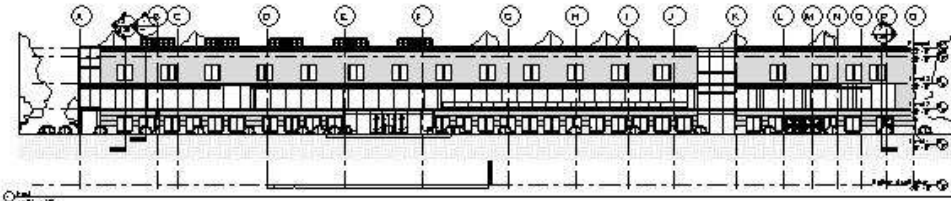
PKI 2.0:  
Engineering  
Innovation Institute

University of Nebraska

Cover Sheet

Project Number	001
Date	May 2018
Drawn By	Jessie M. De Groot
Checked By	P.E.
<b>A100</b>	
Scale	1" = 40'-0"

C:\Users\jessie\OneDrive\Documents\A100.dwg



Steel Deck		
Steel Deck	Steel Deck	Deck Elevation
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Deck 2	27.00	Concrete Slab
Deck 3	27.00	Concrete Slab
Deck 4	27.00	Concrete Slab
Deck 5	27.00	Concrete Slab
Deck 6	27.00	Concrete Slab
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Deck 48	27.00	Concrete Slab
Deck 49	27.00	Concrete Slab
Deck 50	27.00	Concrete Slab

PKI 2.0:  
Engineering  
Innovation Institute

University of Nebraska

Building Elevations-  
East and West

Project Number: 021  
 Date: May 2018  
 Drawn By: Jerald W. DeGroot  
 Checked By: P.E.  
**A200**  
 Scale: 1/8" = 1'-0"



01 - Elevasi 1 sisi dan Paving Area



02 - Elevasi 2 sisi



03 - Light 2, 3, 4, 5 dan 6



04 - Light 7 dan 8



05 - Light 9 dan 10



06 - Site Plan



07 - Walkthrough



Detail		
Detail	Detail	Detail
01	02	03
04	05	06
07	08	09
10	11	12
13	14	15
16	17	18
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PKI 2.0:  
Engineering  
Innovation Institute

University of Pabradja

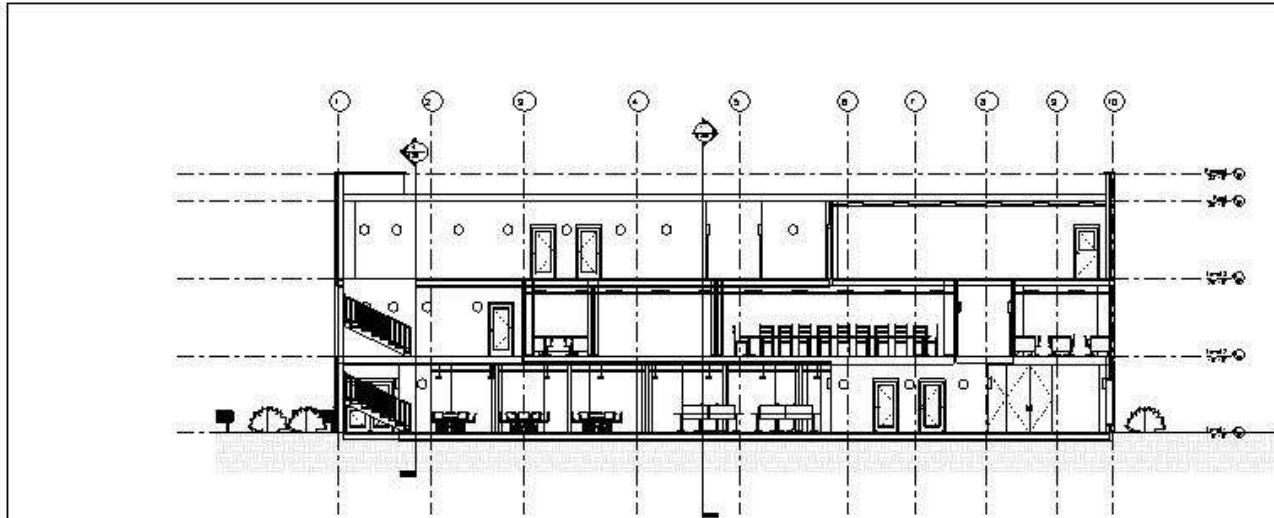
Renderings and  
Walkthrough

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Date	May 2018
Drawn By	Arif M. D. G. S.
Checked By	P.A.
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Scale	As indicated

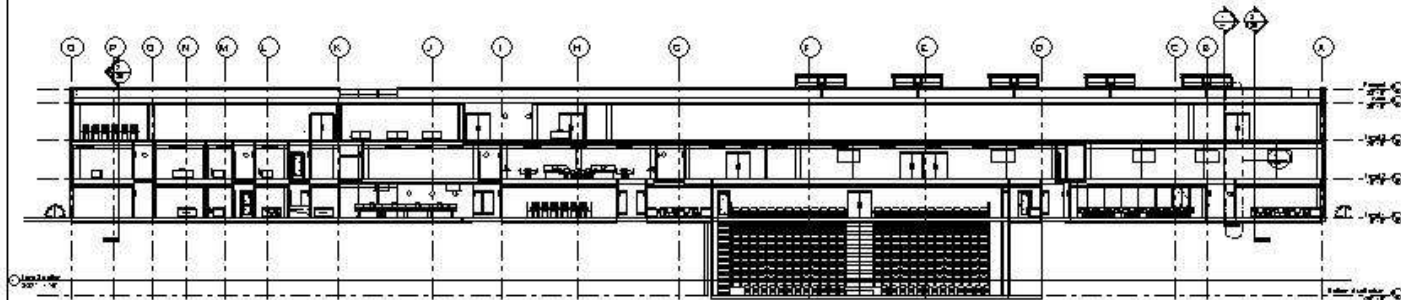
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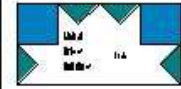




0/100' 1/4"



0/100' 1/4"



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Sheet Number	Sheet Number	Sheet Title
Sheet 1	1-01	Section
Sheet 2	1-02	Section
Sheet 3	1-03	Section
Sheet 4	1-04	Section
Sheet 5	1-05	Section
Sheet 6	1-06	Section
Sheet 7	1-07	Section
Sheet 8	1-08	Section
Sheet 9	1-09	Section
Sheet 10	1-10	Section
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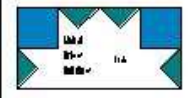
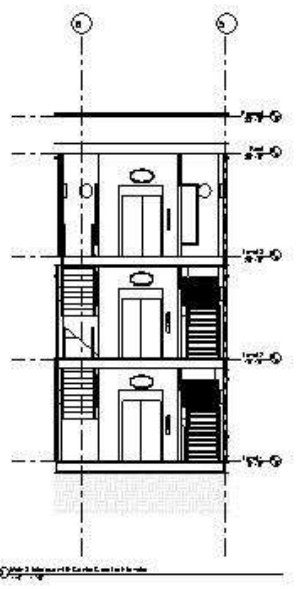
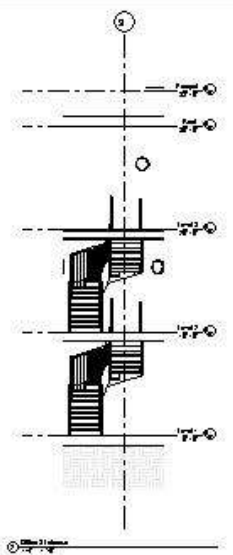
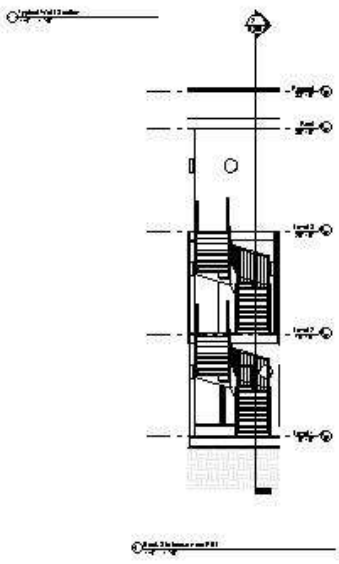
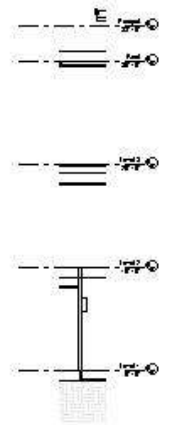
PKI 2.0:  
Engineering  
Innovation Institute

University of Nebraska

Building Sections-  
Long and Short  
Sections

Project Number: 021  
Date: May 2018  
Drawn by: Jerrid W. De Groot  
Checked by: P.E.A.  
**A300**  
Scale: As indicated

1000-1-2018-010



Item	Quantity	Unit
Concrete	1.00	cubic yard
Formwork	1.00	square foot
Steel Reinforcement	1.00	linear foot
Staircase	1.00	unit
Wall	1.00	square foot
Floor	1.00	square foot
Roof	1.00	square foot
Foundation	1.00	square foot
Interior Finish	1.00	square foot
Exterior Finish	1.00	square foot
Paint	1.00	gallon
Glazing	1.00	square foot
Hardware	1.00	unit
Lighting	1.00	unit
MEP	1.00	unit
Other	1.00	unit
Subtotal	1.00	unit
Contingency	0.10	unit
Total	1.10	unit

PKI 2.0:  
Engineering  
Innovation Institute

University of Nebraska

Building Sections-  
Wall Sections and  
Staircases

Project Number: 021  
Date: May 2018  
Drawn by: Jerald W. Dr. EGPA  
Checked by: P.E.A.  
**A301**  
Scale: 1/4" = 1'-0"

1008-1-2018-10



Example 3



**BES Engineering**  
Omaha Office

www.besengr.com

Consulted: **Eric Schaefer**  
Project: **UNO AE Building**

Sheet No.			
Sheet Name	Sheet Number	Drawn By	Checked By
Cover Sheet	A100	Eric Schaefer	Eric Schaefer
Basement Floor Plan	A101	Eric Schaefer	Eric Schaefer
1st Floor Plan	A102	Eric Schaefer	Eric Schaefer
2nd Floor Plan	A103	Eric Schaefer	Eric Schaefer
3rd Floor Plan	A104	Eric Schaefer	Eric Schaefer
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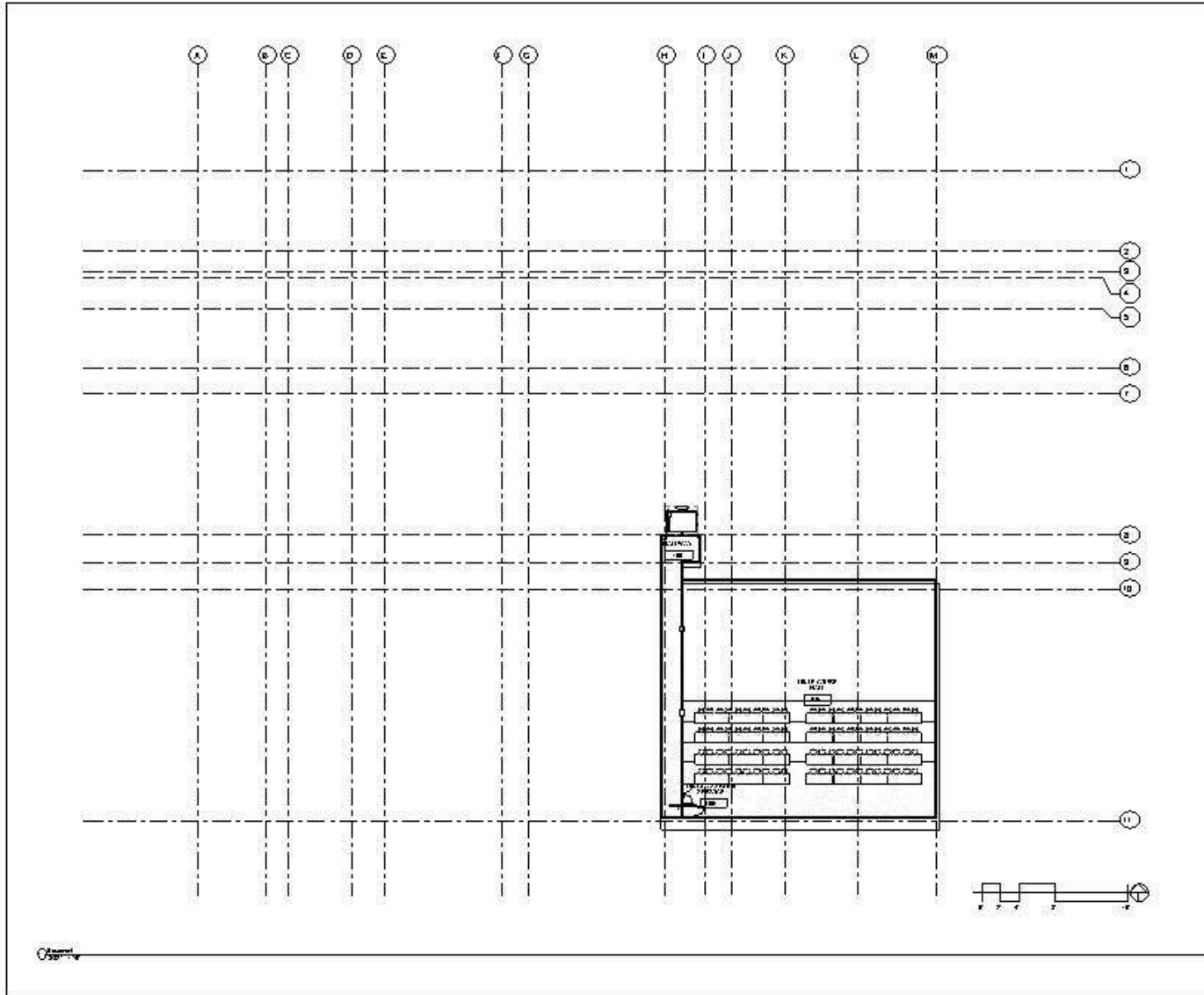
University of Nebraska - Omaha  
New AE Building  
Cover Sheet

Project Number: 100001  
Date: May 2018  
Drawn By: Eric Schaefer  
Checked By: Eric Schaefer

**A100**

Scale: 1" = 50'-0"

DATE PLOTTED: 5/15/18



Consult: 800 So. 24th Street  
7th Fl. Omaha, NE 68102

Sheet No.	Sheet Name	Drawn By	Checked By
001	Basement	J. Sullivan	J. Sullivan
002	1st Floor	J. Sullivan	J. Sullivan
003	2nd Floor	J. Sullivan	J. Sullivan
004	3rd Floor	J. Sullivan	J. Sullivan
005	4th Floor	J. Sullivan	J. Sullivan
006	5th Floor	J. Sullivan	J. Sullivan
007	6th Floor	J. Sullivan	J. Sullivan
008	7th Floor	J. Sullivan	J. Sullivan
009	8th Floor	J. Sullivan	J. Sullivan
010	9th Floor	J. Sullivan	J. Sullivan
011	10th Floor	J. Sullivan	J. Sullivan
012	11th Floor	J. Sullivan	J. Sullivan
013	12th Floor	J. Sullivan	J. Sullivan
014	13th Floor	J. Sullivan	J. Sullivan
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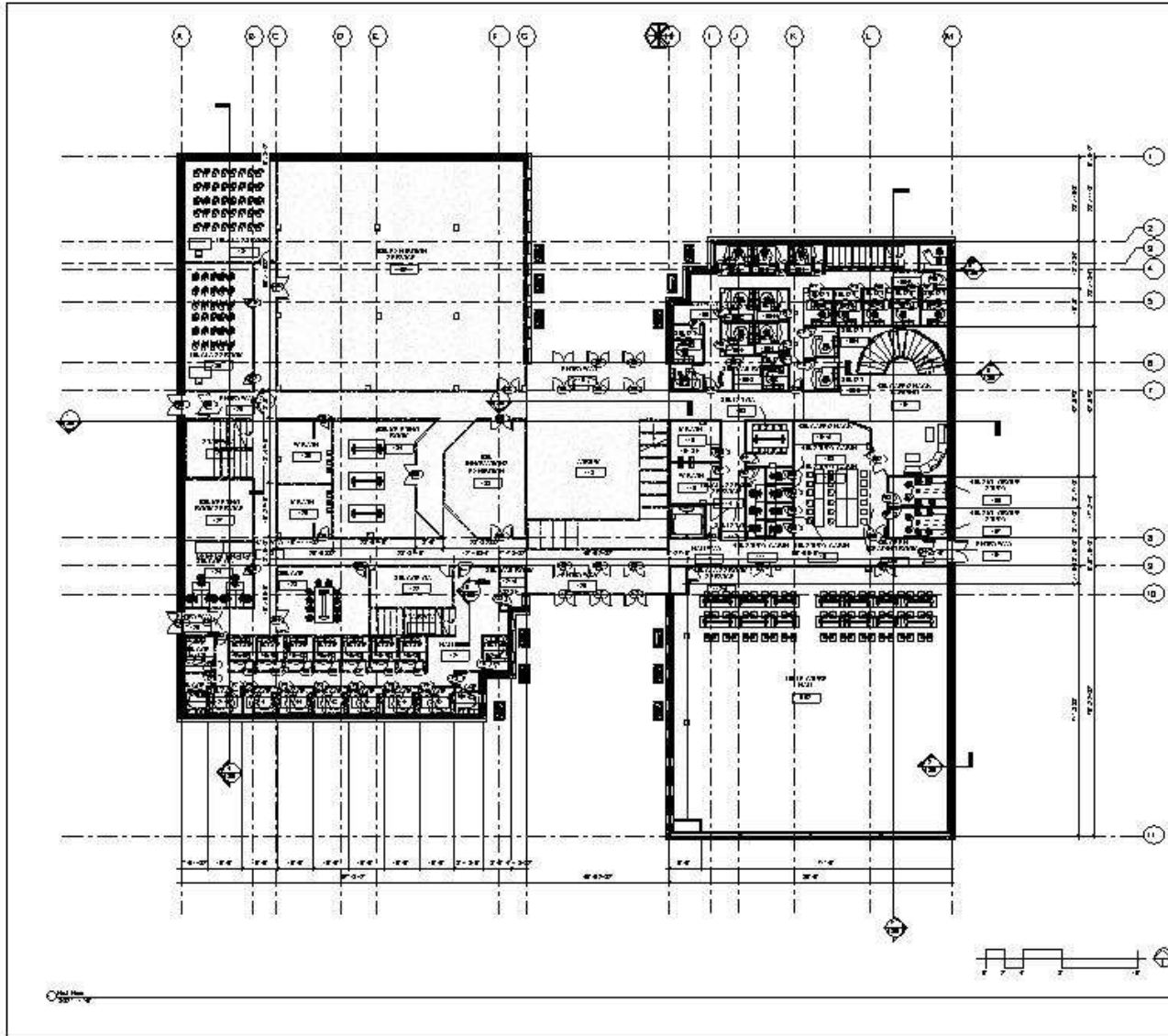
University of  
Nebraska - Omaha  
New AE Building  
Basement Floor  
Plan

Project Number: 100011  
Date: May, 2018  
Drawn By: Sullivan  
Checked By: Sullivan

**A101**

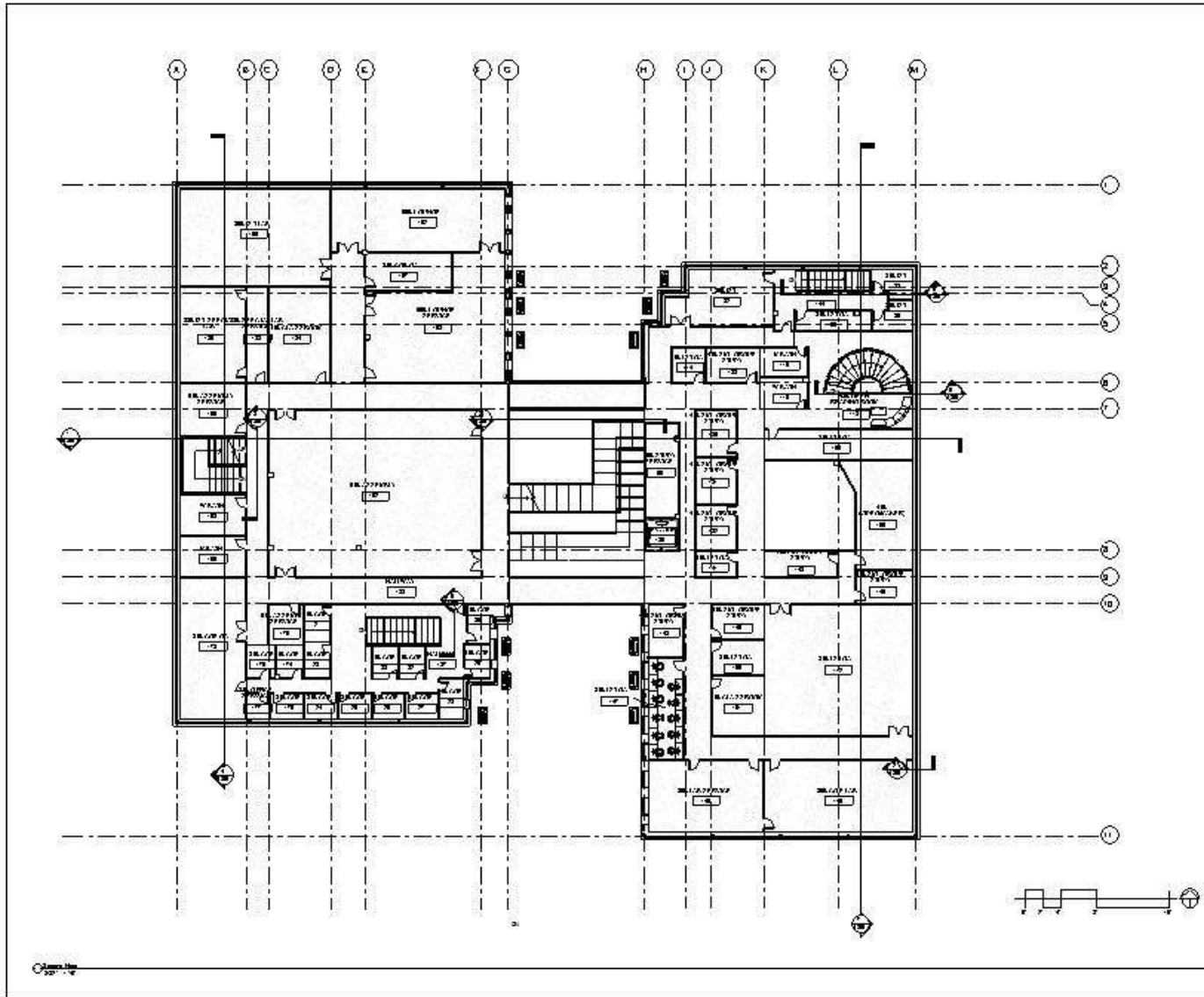
Scale: 3/32" = 1'-0"

1000011-001



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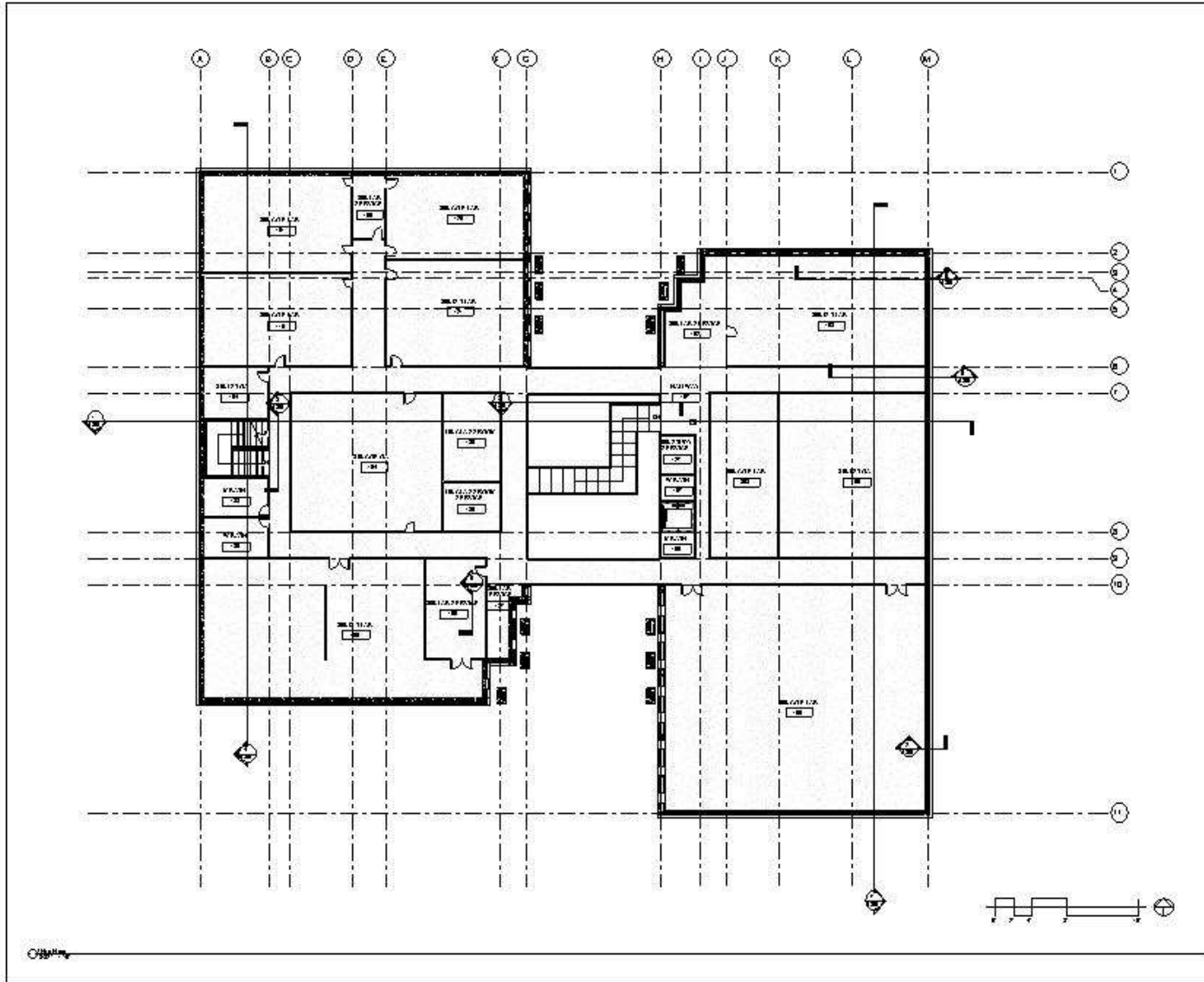
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University of  
 Nebraska - Omaha  
 New AE Building  
 Second Floor Plan

Project Number:	10001
Date:	May 2016
Drawn by:	Derek Schram
Checked by:	Derek Schram
<b>A103</b>	
Scale:	3/32" = 1'-0"





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701 So 24th St Omaha, NE 68102

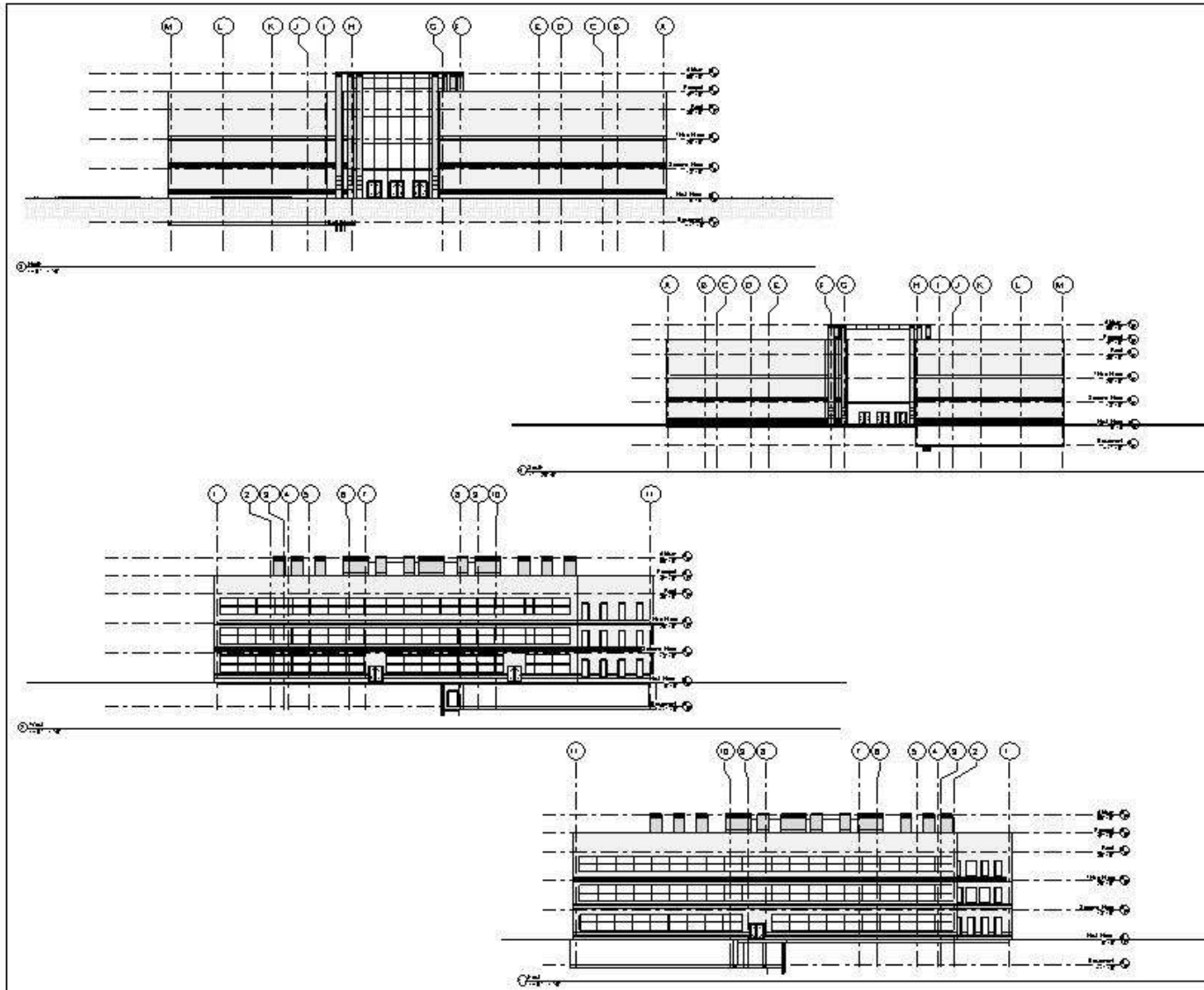
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University of  
Nebraska - Omaha  
New AE Building  
Third Floor Plan

Project Number:	100011
Date:	May 2018
Drawn By:	David A. Schram
Checked By:	David A. Schram
<b>A104</b>	
Scale:	AS SHOWN



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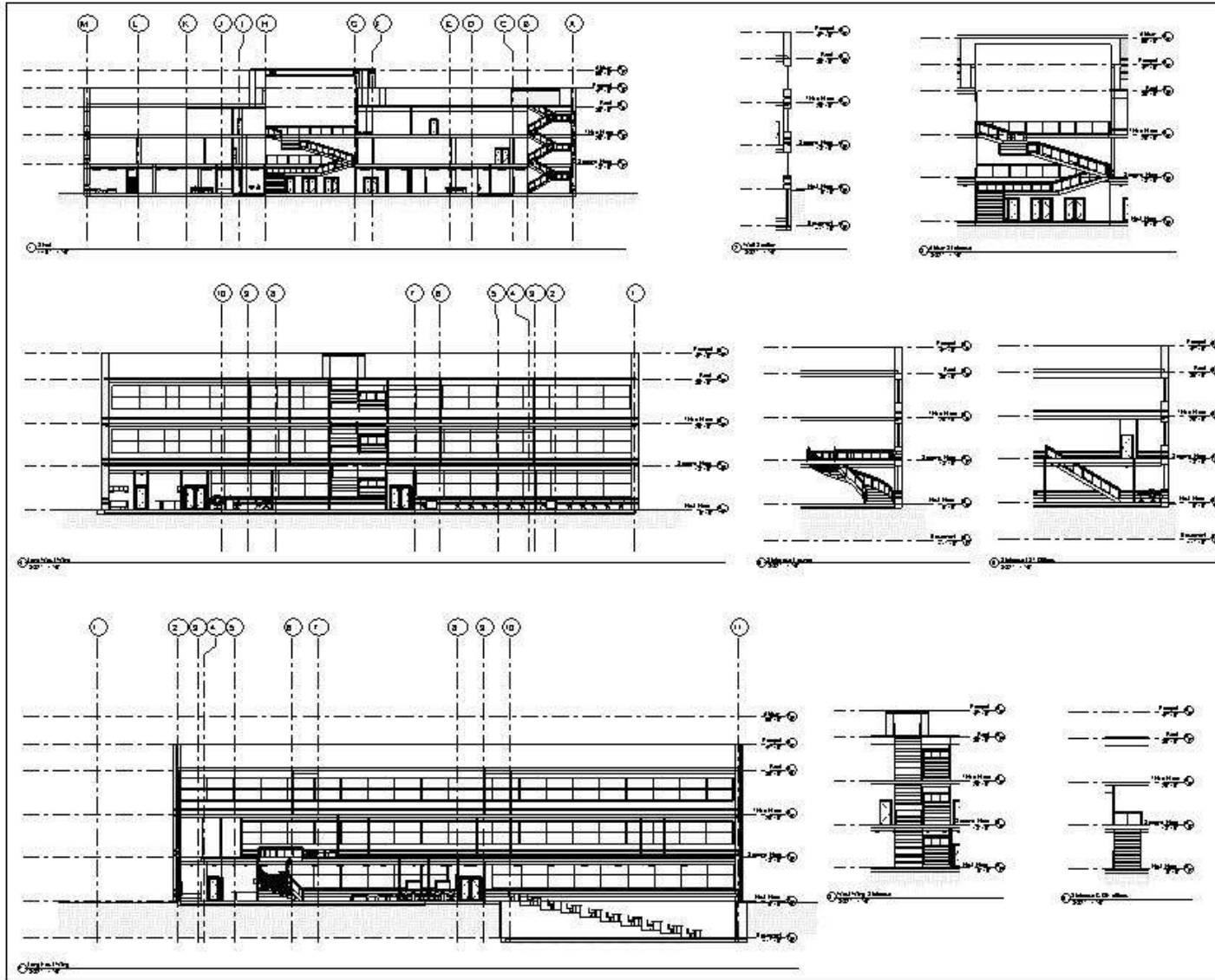
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University of  
 Nebraska - Omaha  
 New AE Building  
 Building Elevations

Project Number: 100011  
 Date: May 2014  
 Designer: Duane A. Schaefer  
 Checker: Duane A. Schaefer  
**A200**  
 Scale: As indicated

100011-001



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Sheet 133

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University of  
Nebraska - Omaha

New AE Building

Building Sections

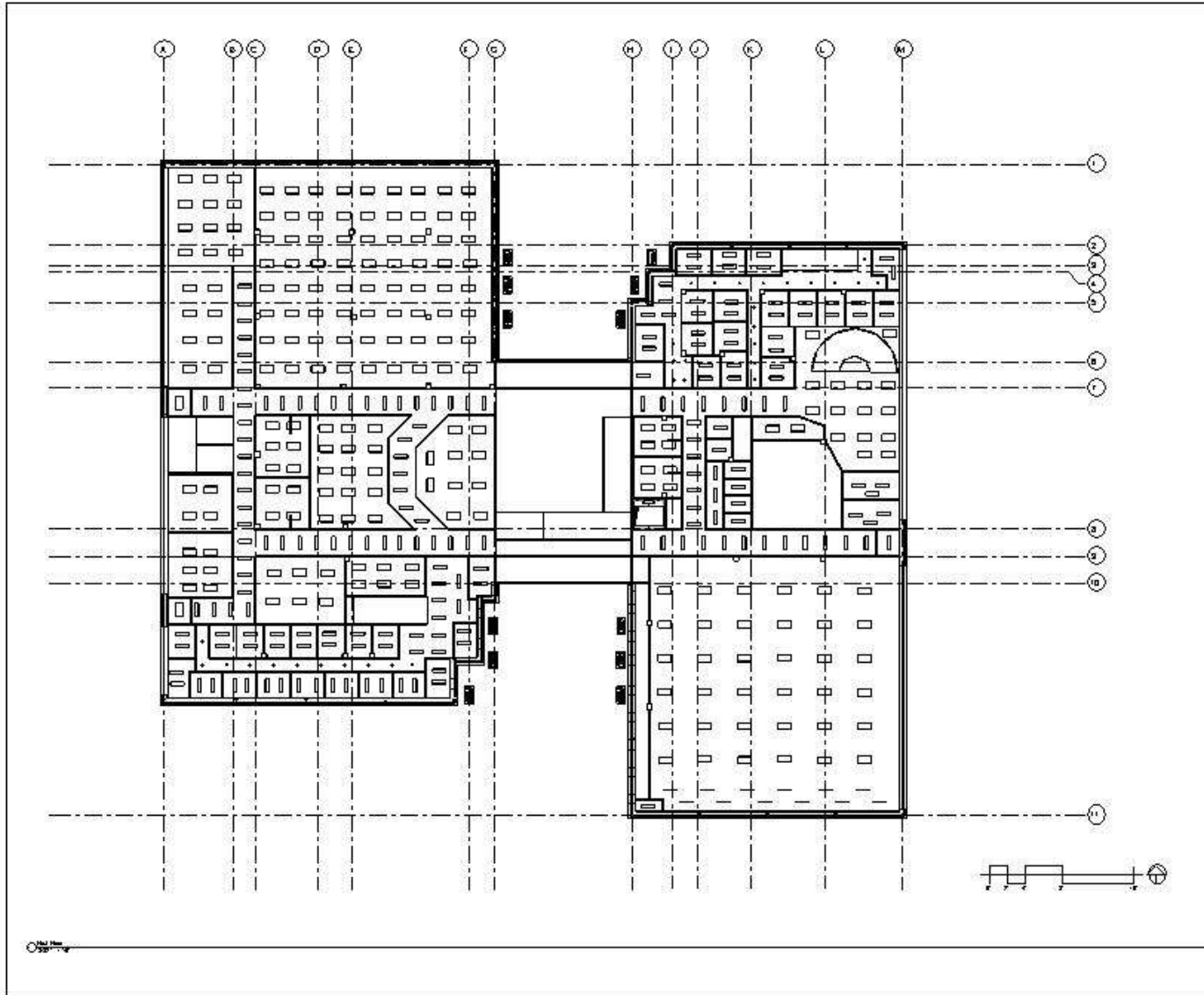
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Date: May 2018  
Drawn By: Derek A. Schlem  
Checked By: Derek A. Schlem

**A300**

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University of  
Nebraska - Omaha  
New AE Building  
Roofs and Ceilings

Project Number: 100011  
Date: May 2016  
Drawn By: Duane Schramm  
Checked By: Duane Schramm  
Contractor: Duane Schramm  
**A400**  
Scale: 3/32" = 1'-0"



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University of  
 Nebraska - Omaha  
 New AE Building  
 Renderings

Project Number: 10001  
 Date: May 2018  
 Drawn By: Brock Schlem  
 Checked By: Brock Schlem  
**A500**  
 Scale: 1/2" = 1'-0"

10001-01-A500



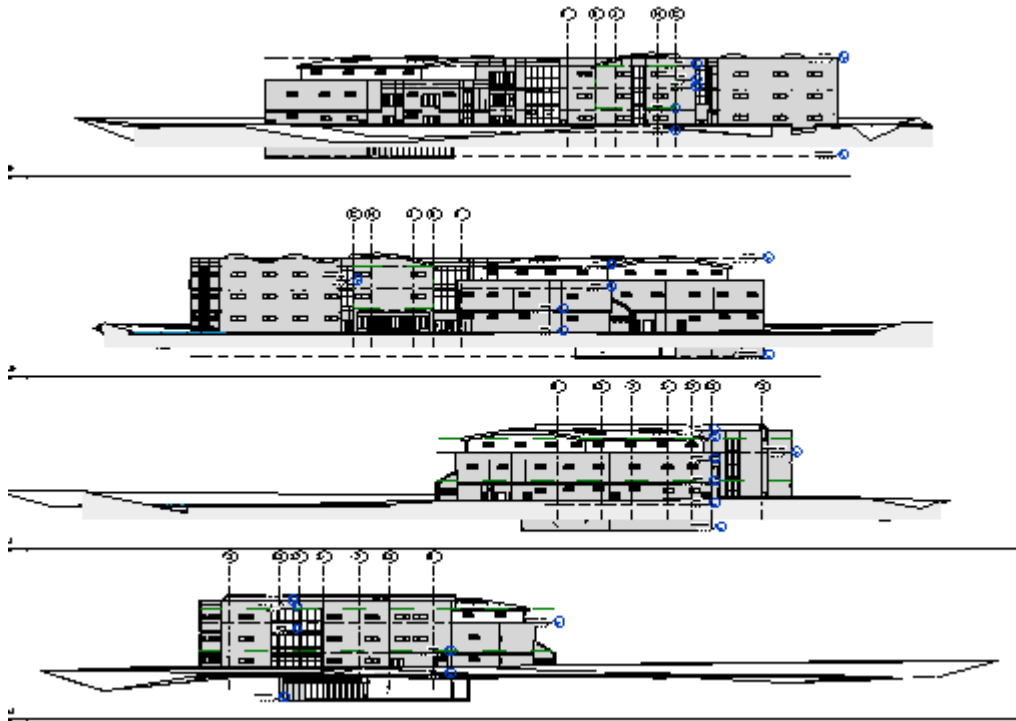
**Final Report Examples**

Final Report Example 1

University of Nebraska-Lincoln

College of Engineering Design Proposal;

Engineering a Brighter Future



Nathan German

AE 2250

Dr. Woldesenbet

04/28/16

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My major inspiration for this project, was to cater to the idea of incorporating a building into the existing landscape and give back as much as it takes from the land. In this I tried to create a building that is self-reliant in ways that incorporate contemporary ideas and practices towards a “greener” goal. With this in mind, I began with research. I found that buildings use up nearly 80% of energy consumption in the world. That not only is a negative environmentally, but is also an economic burden. To reduce a shocking figure like that, I tried to incorporate as much natural sunlight as possible, so during the day, classes and research can be carried out use more efficient means while not disrupting daily tasks.

Next, I wanted to incorporate the education of the green initiative to the students and faculty that will be using this facility. I tried to continue the building as a lab concept with this design. The things that I did differently in development would include roof top access, outdoor classrooms, efficient uses of energy, and a layout of the building that blends in with the landscape. I really wanted the students to understand the thought processes that went into this project. Allowing them new opportunities in the ideas that were just listed helps ensure better building practices and a better means in uses of materials in the future. Eventually the students that work and study in this school will design and develop the landscape around us and around the world. Wouldn't it be better if we teach and inspire them at a young enough age of how to be efficient in energy practices?

My design was also inspired by flow and accessibility. The building had to hold two different colleges. I wanted to separate them, but merge them in areas that were common. That is why I proposed them to be sectioned into levels and wings in the building. I started by creating a wing just right of the atrium. This wing houses the large auditorium spaces, and two large lecture halls that can be used by either the College of Engineering or the College of Information Science and Technology. To the left of the atrium, I developed my common areas. This would include the lounge, café, library services, student services, etc. Finally, I developed the offices of each of the college on each side of the atrium. This allowed separation, but areas to merge ideas.

After the flow was developed on the first floor, I continued with the same concept on the second and third floors. The only differences, was that the second floor is only classrooms, and the third floor is only research and lab areas. To address the accessibility function of my building, I created many entrances that section areas off of the building, yet don't disturb the flow of the design. I created an entire wing on the far left of my building that is used purely for graduate studies. I wanted this area to be portioned from the building, because I want the students to feel and preform professionally in their work, and to develop a perceived notion of “real world practices”. This will hopefully prepare students of how to function in the real world when they get an internship or a job. I also created separate entrances by each of the college offices for the faculty, and by the lecture halls. This will make it easier for students and faculty alike to get to where they're going faster.



Also, I developed my design through the help of the RFP. This especially took place when I created my third floor. The third floor houses all of the research and laboratory areas necessary. I wanted the students to have accessibility to third floor with the use of labs, while also having an area for research. I developed the idea of having the classrooms in the middle of the design, while research is carried out on each side of the building above their respective wings. The research space for each college is very diverse, so that is why I left each space blank. A “clean slate” perhaps. I wanted each space to be developed by the researchers who will be working in there and take on their own design. This will provide the best habitat for a productive and efficient design, while incorporating the idea of how the building and design is adapting and evolving to cater the occupancies wants and needs.

With the design of this project, I inferred a lot about development and ideas. I first inferred that the proposed land that I would be building on would not affect the current parking shortage on campus. I next inferred that there would be no need for additional parking for the students that would be enrolled in this school over the next ten years while also continuing to find space for the existing students and the new faculty that would be required. I also made many assumptions about the budget of this project. I made many design choices about this project assuming that my client had no financial bottom. In this, if there was a more stringent budget, my building and design would be more orthogonal with the landscape and the concept would be less organic in shape and more geometric.

I did make a few design choices with the material that inferred directly to the climate and conditions of Nebraska. I tried to stay with masonry materials, because the weather in Nebraska tends to be very unpredictable, so the exterior of the building offers the most protection in the case of any of the unpredictable weather. The lines of the building allow it to have less worry about wind and drainage issues. The roof is made out of corrugated steel in parts. This allows for a sleek and neat design, but also allow for the durability needed in dangerous weather conditions. I also inferred a lot about the landscape. Since the project would be developed so near to Mammal hall, PKI, the campus of First Data, and 67<sup>th</sup> St, I elevated the lands around the building, and added a lot of landscape on the edges of the lot so that the school can feel secluded yet offer all of the benefits of being so close to those areas.

I wanted to the design to mix with the other buildings surrounding it. I did not want the building to stick out like a sore thumb. To this, I needed the building to have similar exterior features of that of the buildings on Dodge and Pacific campuses while incorporating that contemporary feel through outdoor areas, landscaping, and choices in windows and doors. The windows, doors and current walls, really brake up all of the masonry components. This is great from the design stand point, because it allows natural sun-light and transparency of the college and its practices.

I had many obstacles that I had to overcome in my design. The first obstacle I met was how to position the building in the site without it feeling too crowded, or too close to

any sound pollution. I solved this problem by re-grading the lot. The lot as it stands now is fairly flat with little to no elevation change except in the front and in the back. Now, I have built up the front and back, by increasing the grade a few additional feet, and then I also created berms on the sides of the building to make the building feel more in place. Additionally I added a lot of tall mature trees and shrubs on the edges of the lot and around parking to feel more private from the street, and First Data's campus, while still being a part of Mammal hall and PKI.

The next obstacle I had to overcome was how to address in case of emergency evacuation in the offices. First, I created a curtain walled structure on the outer edge of each office group. Next, I repositioned fire exits to those structures, so that in case there was an emergency, that area could be easily accessible to reach from all of the offices instead of trying to go out of the front doors. This also works well in the flow of traffic. There will be less people going in and out of the front entrance and blocking the atrium.

I also had to address the best way for traffic to flow in and out of the auditorium. The auditorium had to have a sloped floor to incorporate all of the necessary chairs for the students. Since the floor is sloped, I had to create a way for people who are either on stage or in the front of the room to easily come in or leave. I developed a series of ramps and stair systems behind the stage that lead to the first floor (ground level) or even above the auditorium. This allows for better traffic flow and ease of movement for presentations and lectures.

Another obstacle I had to face was how to reposition parking since I was using part of the original parking lots from PKI and Mammal Hall. I found that if you position the parking spots with the tangent lines of the site rather than placing them orthographically, that you can squeeze more parking in less space. This is an efficient practice that urban planners have been using for decades.

Another obstacle that I had to face was how to break up the monotony of the brick exterior. Initially the exterior was all brick and kind of boring. I choose to bridge different materials together to create a cohesive and contemporary design. Adding curtain walls and tall windows and doors helped establish and embellish this idea.

Finally, I wanted to create a way for students to access the other buildings on campus without impeding their motion. To do this I created a lot of outdoor areas behind the school, and a nice shaded pathway that allows students to travel from Mammal, PKI, or my new proposed building. In essence, it is a "student highway that is shaded with lots of landscaping and is the fastest route. This path can be used for recreational purposes or to just travel from class to class.

In conclusion, the design of the building had evolved around the wants and needs of the RFP, but also through observation of the current structures surrounding the proposed site and their occupants. The design adapted and developed though out the process to incorporate many ideas and help evolve the building into the best that it could be.

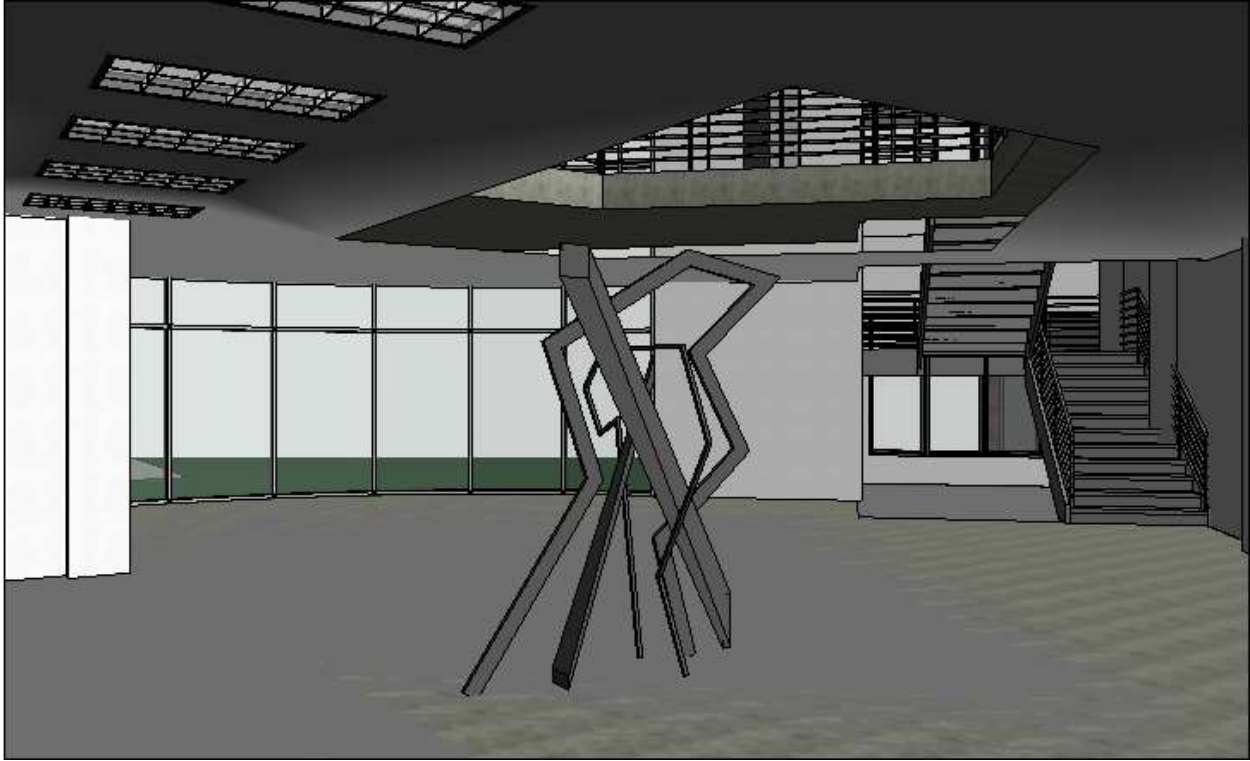


Figure 40 Atrium Facing Back Wall



Figure 41 Cafe/Lounge



Figure 42 Classroom Standing from Front Left Corner



Figure 43 Graduate Offices Meeting Area

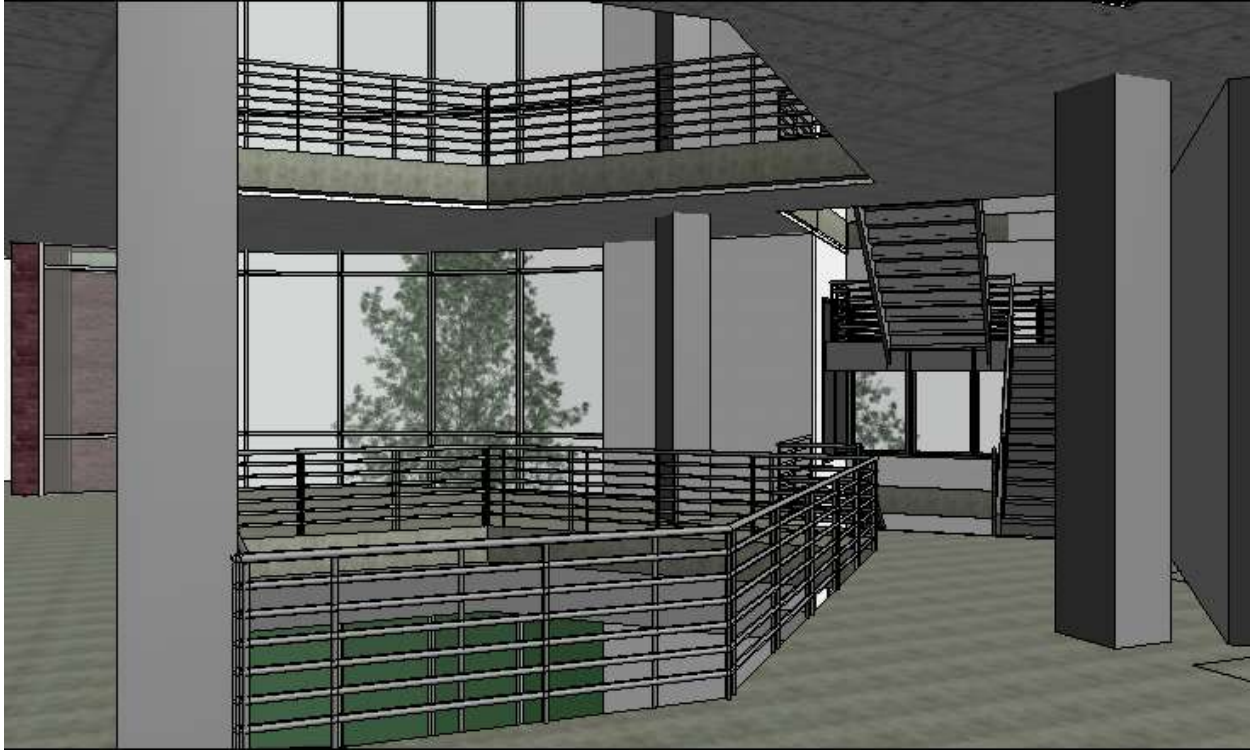


Figure 44 Second Floor Landing Looking at Back Wall

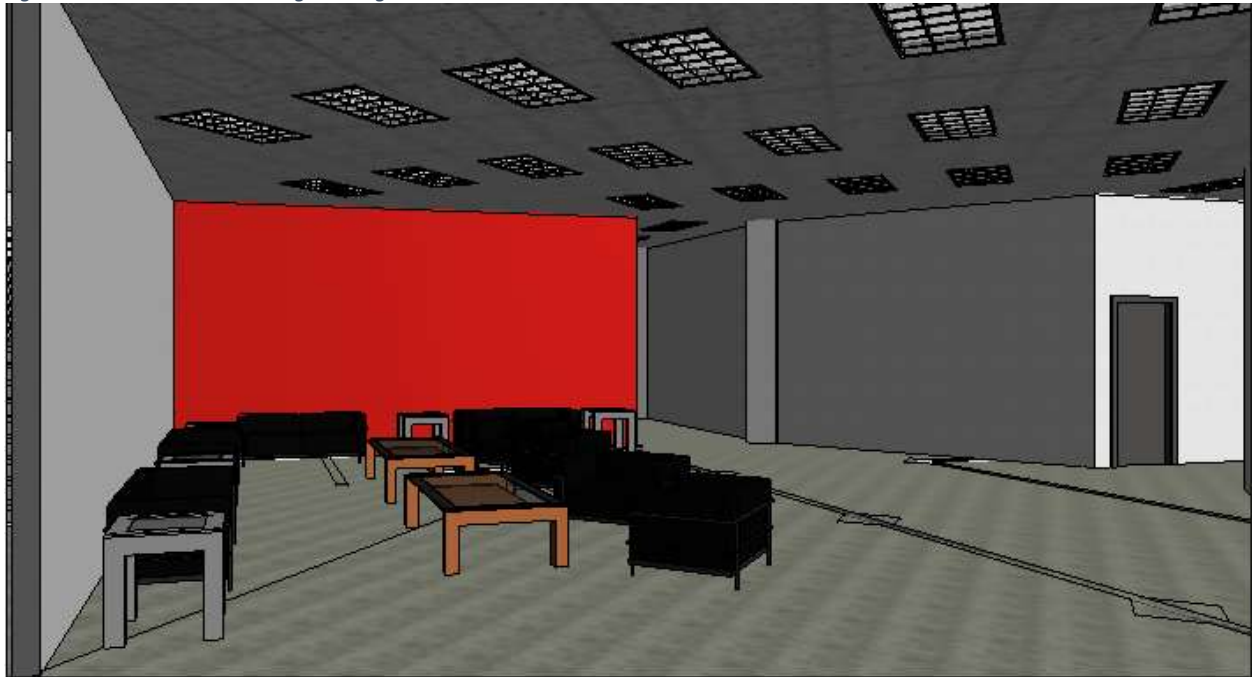


Figure 45 Second Floor Study Area



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PKI 2.0:  
ENGINEERING  
INNOVATION  
INSTITUTE

Jennifer Briggs                      Spring 2016  
AE 2250-002 Construction Graphics and Design  
Process

## Table of Contents

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## Introduction

In the spring of 2016, the University of Nebraska at Omaha course, Construction Graphics and Design, was presented with a proposal to design a new engineering building to assist in relocating and expanding the growing college. To understand what is needed, the current situation must be understood. The current engineering building, The Peter Kiewit Institute (PKI) is home to part of the University of Nebraska- Lincoln's engineering college and houses all of the Information Science and Technology facilities. PKI is situated on the corner of 67<sup>th</sup> Street and Pacific Street ("The Peter Kiewit Institute"). The proposal requests a new location to be developed next to the current facilities. This new building is being fueled by the rapidly expanding student and staff and the future projections that put the two colleges almost doubling current enrollment and staff.



*Output 1: 3-D Exterior*

## Design Process

### Design Intent

After accepting and receiving the request for proposal, the steps taken to design, plan, and execute the design were then completed in the weeks following. The initial brainstorming process went through multiple iterations going from abstract footprints to very simple footprints. After multiple iterations, the chosen design is a simple footprint because the building is nestled

in between the Peter Kiewit Institute and Mammel Hall, two very intricately designed buildings, and the new design is intended to compliment the two existing structures, not conflicted with them. The name of my new building is Engineering Innovation Institute because it's a center where new, innovative ideas are created from a new and innovative teaching environment. This site was selected because it is in between the two, nestled closer to the Peter Kiewit Institute because the two buildings are interrelated and should be closer to each other. Also, leaving the large parking lot by Mammel hall mostly intact will aid in the parking situation and keeping it close to how it is now. The common design elements between the Peter Kiewit Institute and the Engineering Innovation Institute are that the exterior will have the same brick finish, the Peter Kiewit Logo is represented on the south side of the building with a glass curtain wall in the shape of a triangle. I also designed my building based off of the assumption that I had an infinite budget. The initial interior design of the building went through multiple iterations, where the final product was cohesive and uniform while creating an environment that fosters creativity. The final details and design were based off of my design intent that is practical and over detailed. The building is used to foster creativity and is used for a specific purpose, so a simple design would not add too much to the building that would take away from its intended purpose.



*Output 2: Café/ Open Study Room Rendering*



### Meeting the Requirements of the Request for Proposal

The request for proposal stated that the square footage for each floor could not exceed 32,500 square feet. The request for proposal lays out all requirements and needs for the building so whoever is designing the building can achieve what the owner is looking for. The first floor overall square footage is 32,378 feet and the upper two floors have a square footage of 32,450 feet. The overall space requirement for the offices is met by using the entire designated office wing in the total square footage calculations meaning the hallways were used in the calculation to meet the square footage requirement before detailing the space and analyzing it. Part of the second level office wing is used for graduate studies and the rest of the graduate students have offices in large rooms spread throughout the building. The building can be viewed as an active learning lab because the whole building can be used to learn from. The classrooms, offices, and other similar facilities in the building have ceilings so the students can interact with the internal components of the building. This also assists in creating an education environment that is student focused. The relaxed atmosphere and the designated student space created allows for small group collaboration, supports a more interactive courses that lead to better capstone projects and keeps the space updated with the latest technology. The third floor of the building is designated for lab space, research, large classroom facilities and senior capstone projects. It's a separate place for a new form of collaboration with faculty, staff, and student. It creates a new atmosphere that harbors development and growth of new ideas and innovations. The large assembly hall, multi-purpose room, and large meeting spaces let the university house larger camps, and reach more students outside of the university. This building is designed with the idea that all of the interior walls are made out of the same material, the exterior would be the same

brick as the Peter Kiewit Institute, and use the same lights throughout the whole building. Using the same materials and products in multiple spaces helps eliminate the cost of ordering a lot of different materials and dealing with the added cost of installing assorted materials. If the budget needed to be consolidated, I would eliminate the large amount of curtain walls and trim costs in materials where I could.



*Output 3: Entry Rendering*

#### Building and Environmental Sustainability

The overall design of the building incorporates natural light, creating the environment where students can be more productive, stimulates mental and visual processes (Wymelenberg). The large green space allows students to have access to sit in an area with clean, outside air that also increases brain function and decreases stress levels, putting students into a better mental state (Wise). Also, the roof will have solar panels, letting the students experiment with green technology. In addition to it benefitting the students' knowledge, it is another form of energy, which gives the building credits to being LEED certified. Also, if there were mechanical systems designed, the mechanical and the electrical equipment be would be top of the line, LEED certified.





*Output 4: Exterior Rendering of Library*

### **Challenges in Design**

In executing this design, a few challenges that I faced dealt with organizing rooms, integrating green systems, and creating a fluid design. To start, fitting all the rooms in around the auditorium on the first floor was tricky at first because the size of the auditorium was rather large, but once seats were added to it, the design overcompensated for the amount of space needed. In addition, the desire for an open entry that walks in right by the auditorium was challenging having the right amount of space that fed into the two main areas: to the right being the office wing and to the left being the main stairwell and the elevator. Another challenge that was faced dealt with including green systems into the building while still keeping its structural integrity. The design intent wanted to add as much natural light as possible, without jeopardizing the structural integrity of the building, so the columns are used to reinforce the wall fit with the esthetic design. Also, since the building is used as a learning building, the exposed columns allows for structural students to see systems in action. Finally, creating a design that was not choppy was my other main challenge in the design process. The goas was for a cohesive and uniform design that felt natural and effortless. Balancing the want for a cohesive design this and fitting all of the requirements into the building was a challenge because everything needed to be place right so it did not seem like it all was forced to be inside of the building and not create

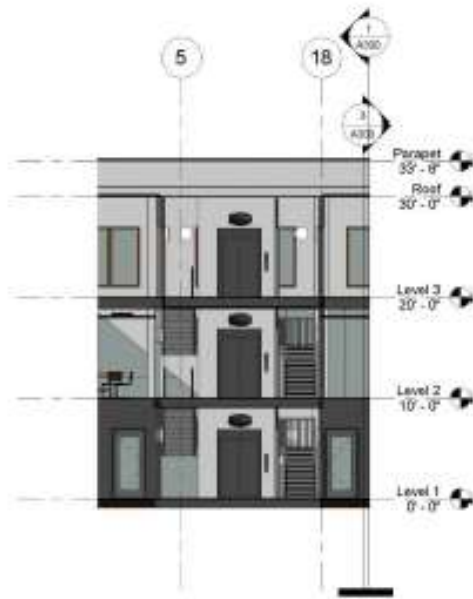
an environment that fosters creativity and encouragement. In the end, the final layout flows, is cohesive, and organized while utilizing the space to its full capacity.

### **Conclusion**

In summary, the Engineering Innovation Institute is designed as a place for innovative research and innovative learning. The collaborative community that is created in this building sets a standard that is unmatched at any other university. The design of the building is natural, flows, and does not take away from the learning environment created. This class has created an opportunity to investigate the benefits of Revit and complexity that comes with the software. Also, this class provides a new look at the designing process and how buildings are erected. In sum, the Engineering Innovation Institute is designed for sustainable usage, fostering learning, and creating an environment and workstyle that carries over into the professional world.



*Output 5: Exterior Rendering of Triangle Side Feature*



*Output 6: Elevator and Main Staircase*

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**FINAL PROJECT REPORT:**  
Proposed COE & IST Building Design

*Brooke Scherer*

AE 2250-002  
Asregedew-Woldesenbet  
University of Nebraska – Omaha

Due Date: April 28, 2016

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## Introduction:

The Peter Kiewit Institute, located on University of Nebraska – Omaha's South Campus, is approaching its maximum capacity. This requires a new building to be constructed for the College of Engineering (COE) along with the College of Information Science and Technology (IST) students, faculty, and staff. The building will provide adaptability and flexibility for future research and learning concepts. It will host offices, classrooms, and research labs. The three-story building will not only provide more space for the projected occupancy and use levels, it will also improve community outreach, serving as a space for summer camps, seminars, and workshops. Throughout the building a culture and supportive environment is supported by promoting innovation and entrepreneurship. The New Architectural Engineering Building will be located on UNO's south campus, in between the existing Peter Kiewit Institute and Mammel Hall as shown in Figure 1 below.



Figure 46: Site Location of New AE Building

## Design Process:

### Inspiration/Thought Process:

Focusing on the functionality and aesthetics of the building, and after many sketches, the overall shape of the building was designed. The shape was inspired by an open book set flat on its pages as in Figure 2.



Figure 47: Book shape used for building inspiration

The 'binding' of the book was originally planned to be a completely glass area in order to allow a lot of natural sunlight to enter the building. After browsing many university buildings on Archdaily.com for ideas on how to represent the book inspiration I ran across the School of Engineering at Lancaster University designed by John McAslan and Partners. This building has large framing surrounding a main entrance. The framing made me immediately think of the 'binding' I wanted to represent in my building. From there I added these binding-like frames into my sketches. My original axonometric sketch can be seen below in Figure 3.

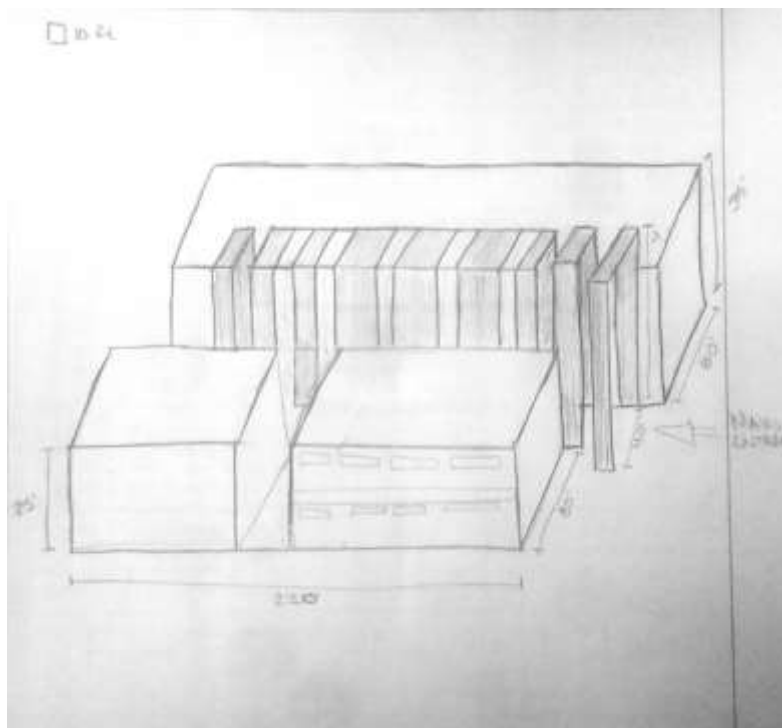


Figure 48: Original Sketch of Building

## **Design Process (continued):**

### **RFP Requirements:**

In the request for proposal, the building space requirements state that the maximum square footage is 32,500 per floor. In my design my square footage exceeds that at 32,405. The rest of the minimum square footage is met in each room. The projected occupancy/use levels show that there is a five-year projected headcount of a total of 50 more fulltime faculty members, and an increase of 441 fulltime graduate students. The increase in personnel, demands many more offices. This building requires 18,600 square feet in graduate assistant offices. In order to achieve enough room for these offices, I decided to put many of the offices in a large room with a large amount of tables and chairs. This gives graduate students multiple different work spaces. By doing this I also factored in that graduate students would share these spaces, in turn creating enough room for all the projected graduate students. Another RFP requirement for the expansion is a large lecture hall in order to house anywhere from 160-250 seats. In order to fit the lecture hall, designed to be 6,250 square feet, I decided to make it two-stories that way there are enough seats without forfeiting the square footage (a view of this lecture hall is shown in Figure 4).



*Figure 49: Two Story Lecture Hall (Realistic View)*

## Challenges:

Creating a floor plan that increases the dedicated research space, and provides enough office space for fulltime faculty and graduate assistants was a task that took up a large amount of time. A couple of the times the floorplans I had created was not flowing very well with the shape of the building. Therefore, I restarted in order to create floorplans that overlay each other floor-by-floor creating a path throughout the building. In the end I have created the floorplan shown in Figure 5 below. This floorplan allows for the glass atrium to connect the West Wing with the East Wing.

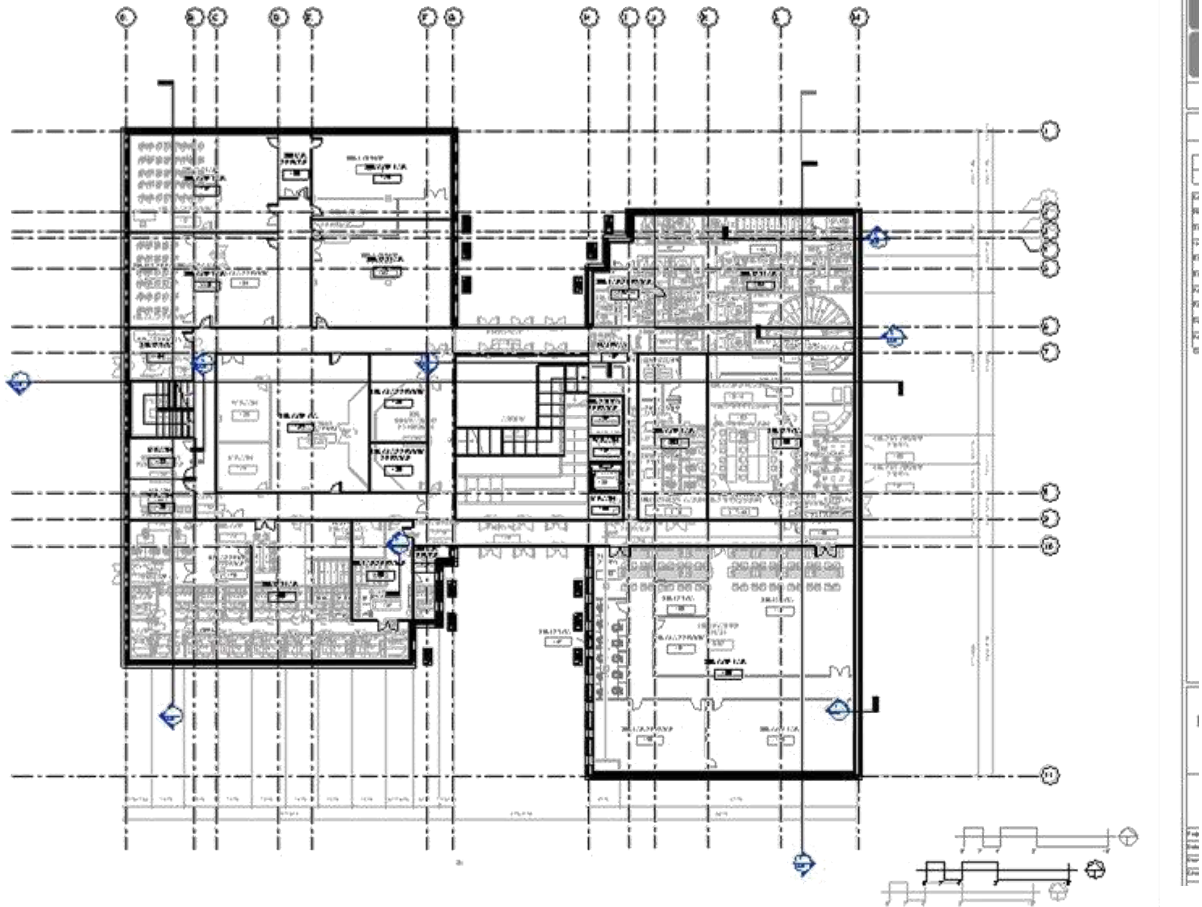


Figure 50: Each floorplan overlaid on top of each other to show how the floorplans stack up



### **Challenges (continued):**

Another design factor that caused me to try multiple designs, would be the window design. I would add a fixed window instance into the side of my building, then set them in a location that does not cut through a wall but is equal throughout the building wall, and it would resemble a jail or prison like structure. I did not want this type of design for my building, but I was trying to keep the structure very simple on the outside. I wanted to keep the philosophy to, “never judge a book by its cover” or theme throughout the building. In this case the theme relates to the building as to, “never judge a building by its exterior.” In my final design, I was able to keep this philosophy by adding curtain walls on the West and East walls of the building, and there are no windows located on the North and South ends. This allows for natural light to enter the building, but still gives the user a feel of a simplistic building structure when looking at the main and rear entrances. This is shown in the Figure 6 below.



*Figure 51: Exterior North Main Entrance*

### **Concluding Remarks:**

The design of the New AE Building on University of Nebraska – Omaha’s campus started off as an idea about designing a building similar to an open book, and it ended as an aesthetically pleasing, three-story building. This building has a floor plan that lets the user flow simply through each floor. There are five staircases located throughout the building, allowing maximum accessibility between each floor. The center stair case connects each wing together, but keeps the extremely open concept the glass atrium walls and ceiling provide. This glass atrium, along with the curtain walls on the West and East wall, allow natural light to enter the building. Leaving the North and South exterior walls empty of all windows, created the simplistic design I aimed to achieve, drawing the user towards the large main entryway. This allows the user to experience the “pulse” of the New AE Building encouraging them to stay.

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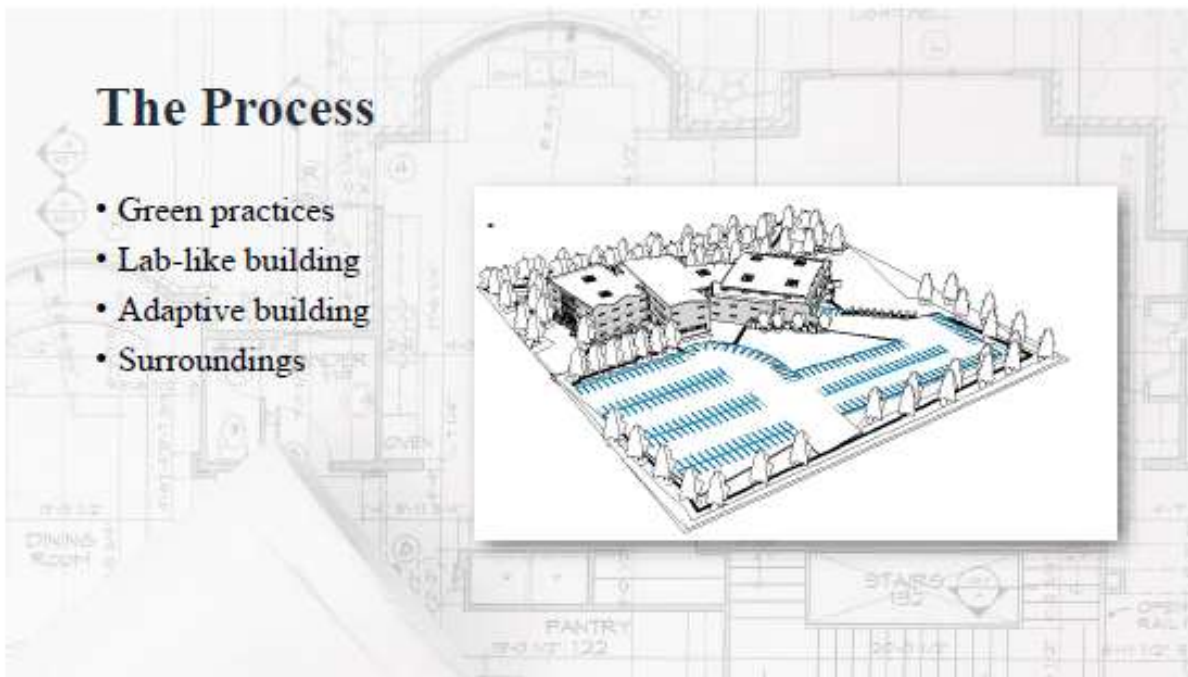
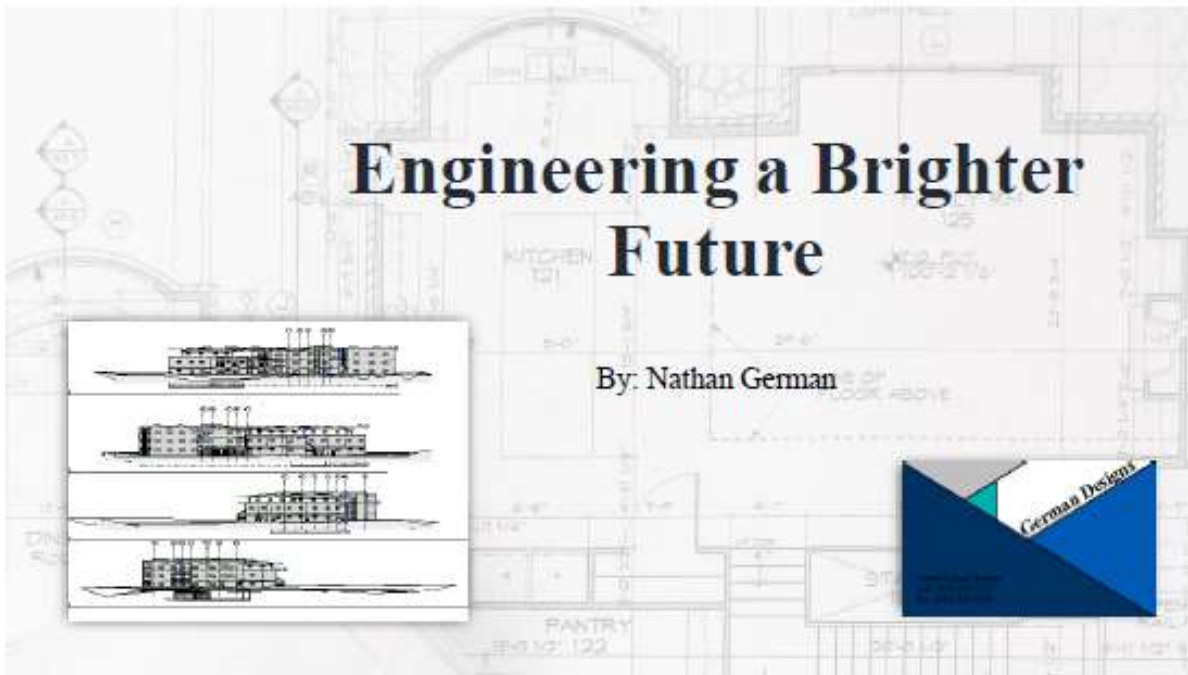
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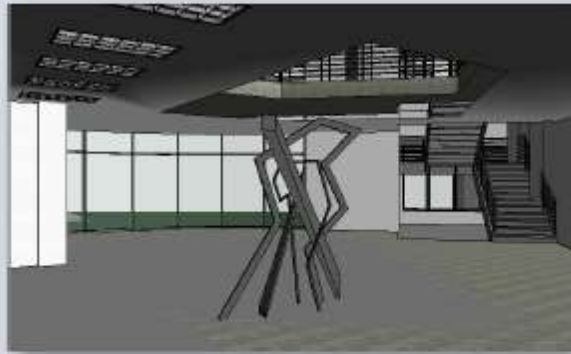


## Project Presentation Examples

### Project Presentation Example 1



**Atrium**



**Café/Lounge**



## Graduate Offices



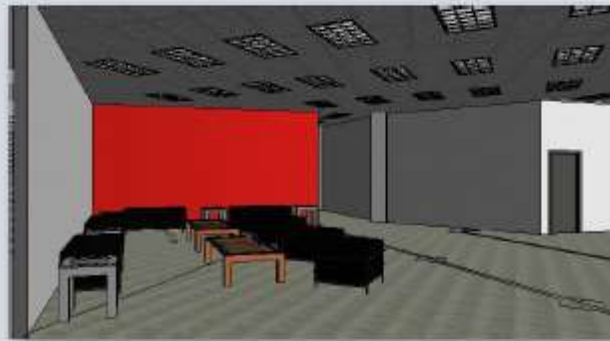
## Classroom



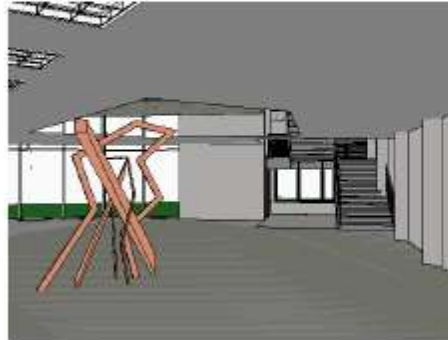
**Second Floor Landing**



**Study Space**



## Walk through



# PKI 2.0: Engineering Innovation Institute

Jennifer Briggs  
AE 2250-002 Spring 2016

## Design Process and Intent

- Simple exterior to contrast the two buildings around it
- Open floorplan, natural feel
  - Design went through multiple iterations
  - Goal is to foster creativity while being cohesive and not distracting to the learning environment
- Common details between PKI and the Engineering Innovation Institute
  - Same brick exterior
  - Triangle curtain wall carries over the PKI logo
- Cost Assumptions
  - Unlimited budget
  - Consistent materials to cut down on costs





## 3-D View of Building



## Meeting the Requirements

- First Floor Area: 32,378 ft
- Second and Third Floor Area: 32,450 ft
- An active learning lab
- Faculty offices focused in one area
  - Grad Students spread throughout the building
- Third Floor dedicated to research, collaboration, and senior capstone



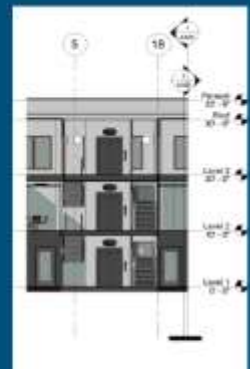
# Building Sustainability

- Natural lighting stimulates mental and visual processes
  - People are more productive
- Outside seating promotes brain function
  - Decreases stress levels
- Install solar panels
  - Benefits students
  - Decreases the use of coal



# Challenges

- Strategic placement of rooms
  - Using the square footage to its full capability
- Creating a fluid floor plan around the large rooms
  - A cohesive, uniform feel
- Adding a lot of natural light while still keeping its structural integrity
  - Mental and physical health benefits



## Summary

- Design intended to foster creativity, encourage collaboration, and spur innovation
- Open floorplan for a cohesive design
- Ties in specific features of PKI, while still being its own building



LINK TO GOOGLE SLIDES:  
[https://docs.google.com/a/unomaha.edu/presentation/d/1jEiv\\_S61VhrcJWmYz5cggIDkRAHcZyftnSm-TMPdq\\_GY/edit?usp=sharing](https://docs.google.com/a/unomaha.edu/presentation/d/1jEiv_S61VhrcJWmYz5cggIDkRAHcZyftnSm-TMPdq_GY/edit?usp=sharing)

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(Project Presentation Example 3)

# **NEW AE BUILDING**

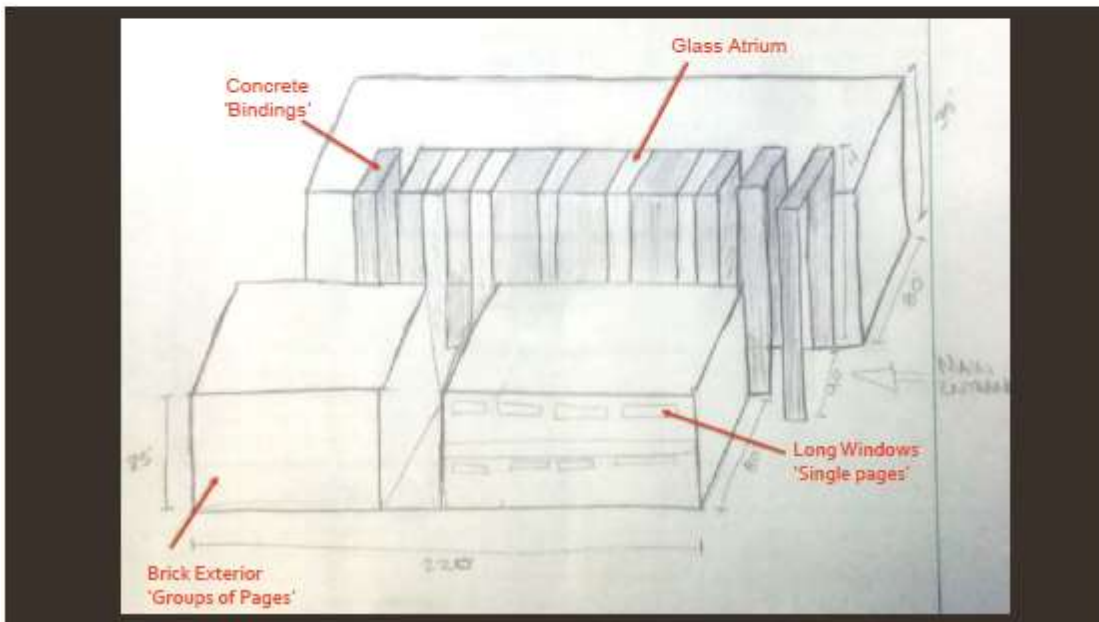
UNIVERSITY OF NEBRASKA - OMAHA

Brooke Scherer

## **ASSUMPTIONS**

- Site was a flat site
- Unlimited Project Budget
- Basement does not get added into overall square footage described in RFP
- Coexist with existing Peter Kiewit Institute (PKI), not replacing







© School of Engineering at Lancaster University  
Architect: John McAslan and Partners

Above photo from archdaily.com

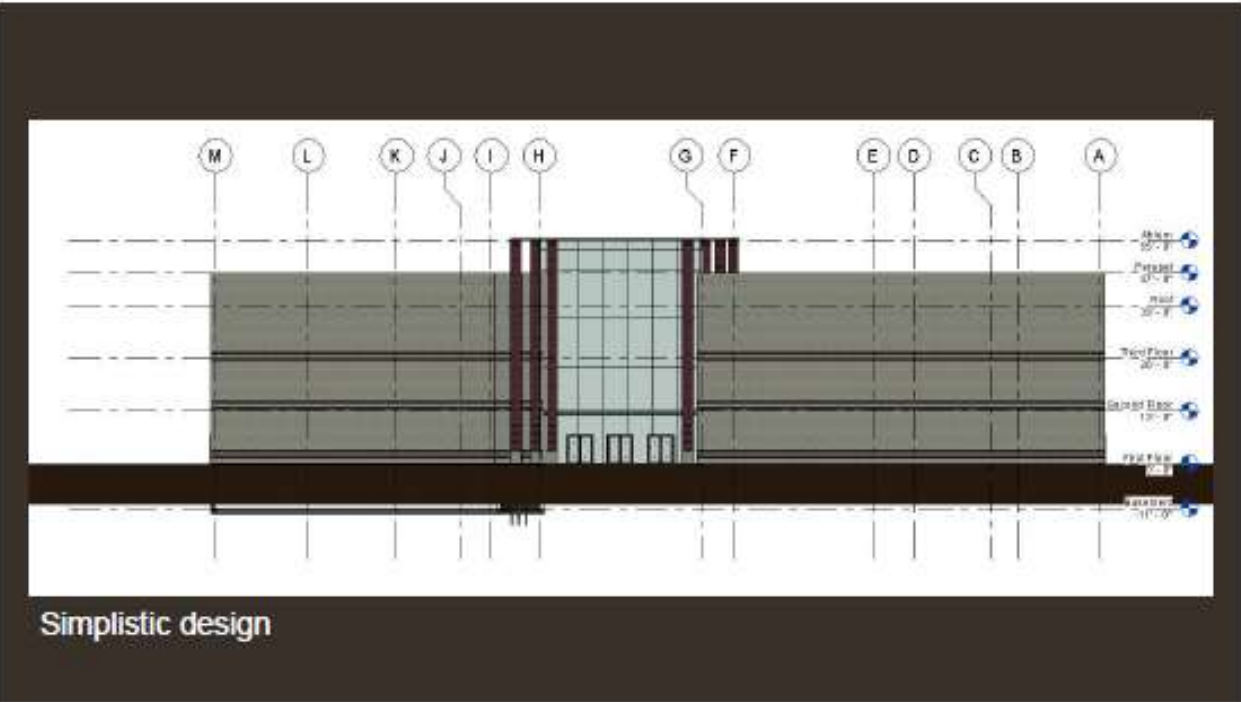
## DESIGN PHILOSOPHY

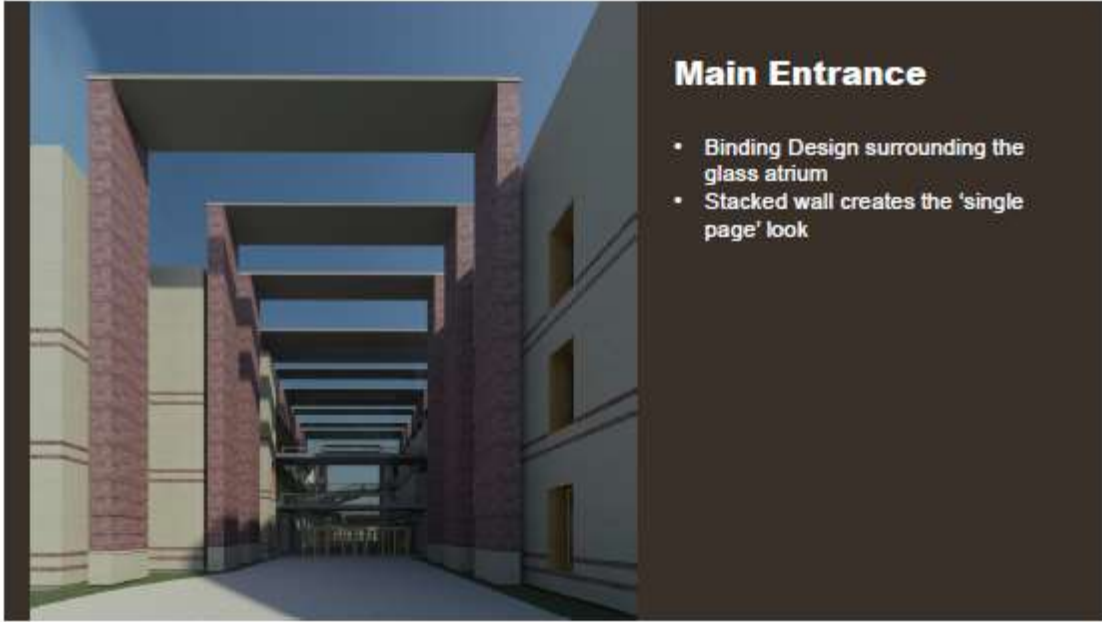
**“Never Judge a Book by  
its Cover”**

**“Never Judge a Building  
by its Exterior”**

- Floorplan that flows throughout each floor
- A general COE wing and a IST wing







## Appendix P Peer Evaluation Sheet

Name \_\_\_\_\_

No.	First	Last	Evaluation Criteria ( 0-10 for each)				Total	Feedback/Comment
			Quality of Design (10)	Creativity (10)	Presentation Slides (10)	Oral Presentation (10)	40 Points	
1	Brian	Shimp						
2	Brooke	Scherer						
3	Carlie	Cook						
4	Daniel	Trouba						
5	Garrett	Giesler						
6	Jared	Johnson						
7	Jennifer	Briggs						
8	Jose	Chavez-trejo						
9	Messangan	Agbozo						
10	Nathan	German						
11	Nicholas	Swoboda						
12	Nicolas	Lopez						
13	Perry	Donahue						
14	Sostenes	Quaresma						

- 1 Quality and completeness of the design- Level of details
- 2 Creativity in design - Innovative design solution for defined challenges
- 3 Quality of presentation Slides- Use of visual layout with relevant graphs, charts and clear slides
- 4 Oral Presentation- Professionalism, time management, address questions, sharing and selling their idea well