2006-249: ADOPT A BUILDING PROJECT: UTILIZING THE EXISTING (CASE STUDIES) TO TEACH CONSTRUCTION

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Abstract

This paper focuses upon the discussion of using existing buildings to teach commercial construction. In this particular instance, class projects are developed around the study of an existing building project that the students "adopt". This creates a case study methodology that involves site visits and reviewing existing drawings as a method of learning about commercial construction. Students develop as-built drawings and then use these to create new designs and details. Photographic and journal entries also add to the understanding of how to build and renovate existing structures. The value of this method of learning is assessed through student feedback questionnaires. The data created from this is then analyzed to determine the effectiveness of this as a teaching method versus other, more traditional methods of learning about commercial construction.

Introduction

Teaching commercial construction to undergraduate students is a complex task as the subject matter is diverse and often intimidating to students when coupled with learning advanced CAD skills. This is compounded in teaching technical design as the incorporation of working drawings into design studios has historically been problematic. Building technology is often an appendage to the studio in many North American architectural schools. Added to this is the necessity of obtaining the complex technical knowledge of how to construct a building.

It has been noted by some (e.g., Grabow and Alexander)[1] that "there is the simple, plain, ordinary fact of the necessity for having a first-hand acquaintance with building and making things" when designing and in particular when developing a set of working drawings. This paper explores this notion and discusses the development of a commercial construction course that relies upon first hand experience to teach the fundamentals of renovation design. In doing so it involved students in an "adopt a building" program in which each student used an existing building as a case study for the development of their project. The research questions in this instance were:

1. Is using an *adopted building* an effective method for teaching commercial construction?
2. Does using an *adopted building* help in the production of a set of working drawings?
3. What specific drawings in a set of working drawings are most influenced by using an *adopted building* in a project?

Background Pedagogy

One of the most typical teaching methods found within architectural schools is the project based method, or more appropriately, the solution based method. An apt reference to this is Scott Brown who states: "Studio is the gem of our training"[2]. Studios with a specific project/solution

based focus have been used in architectural schools for decades and have proven to be an effective method of teaching design. This pedagogical method also mimics architectural practice. Students also often work on real projects which involve field studies and visiting sites of future projects. Yet often students in architectural schools only take their projects to the design development stage and the working drawings are either incompletely addressed or omitted.

Architectural technology courses or building science courses are often lecture based courses with applied problems. They are separated from the design studio because of content overload for design-focused students and the notion that technical drawings fall within the expertise of the technologist and not the designer. This particular project involved a commercial construction class whose prime focus was on the development of a partial set of working drawings for a small commercial building (see Figure 1). Typically, the class consists of lectures and lab time devoted to developing a fictitious project. In this instance, an adopted building served as the classroom, the case study and a source of building technical information.

Methodology

Case studies have been touted as a valuable method for conducting research in architecture as they add to the "thick" description of a project that Dana Cuff discusses[3]. She notes that it is imperative to work with case studies to develop in-depth qualitative data.

Yet a case study is not a data-gathering technique per se, but rather a method that incorporates a number of different data-gathering instruments[4]. The case is essentially the field of study where data can be collected, yet the manner in which the data is collected is the actual methodology. The case merely frames the data within a specific context. Architectural students often are required to visit sites, yet typically, in a design problem setting, the site is either vacant, waiting for a building to be constructed, or a building waiting to be demolished. In this particular instance the different sets of data were collected from an existing building on a particular site using the several methods noted below.

Site Data and the Development of Technical Drawings

The students first went to the adopted building site to record observed information either through notes and drawings, digital pictures (see Figure 3) or direct measurements. The case or "adopted" building for this project was an old 4 story warehouse that was being renovated into an office building (see Figures 1 and 2). In this instance the case building was a way of making an academic design exercise real or concrete. It provided, as Darke notes: a "way into the problem" or served as a "primary generator"[5].

Figure 1: Adopted Building

Figure 2: Students in Adopted Building

Students were divided into groups with the purpose of exploring the various facets of the building and the site. Prior to going to the site they created check lists that guided the research for each group:

Group 1: Site and Context
Group 2: Structural Elements
Group 3: Exterior Façade

Group 4: Roof
Group 5: Interior Plan

Upon returning to the classroom, the groups shared their data. The instructor then lectured on how to create a set of as-built working drawings from the data collected on site. As-built details and a wall section of the existing structure were developed by the students to graphically record the site data and to serve as a bench mark for future renovations. This exercise was also intended to introduce the students to commercial construction methods and materials and methods of documenting this information graphically. Each student created their own set of as built working drawings (see Figures 4 and 5) under the guidance of the teacher, field notes, class mates and existing (limited) hard copy drawings of the adopted building

Figure 3: Site Photo of Wall/Floor Intersection

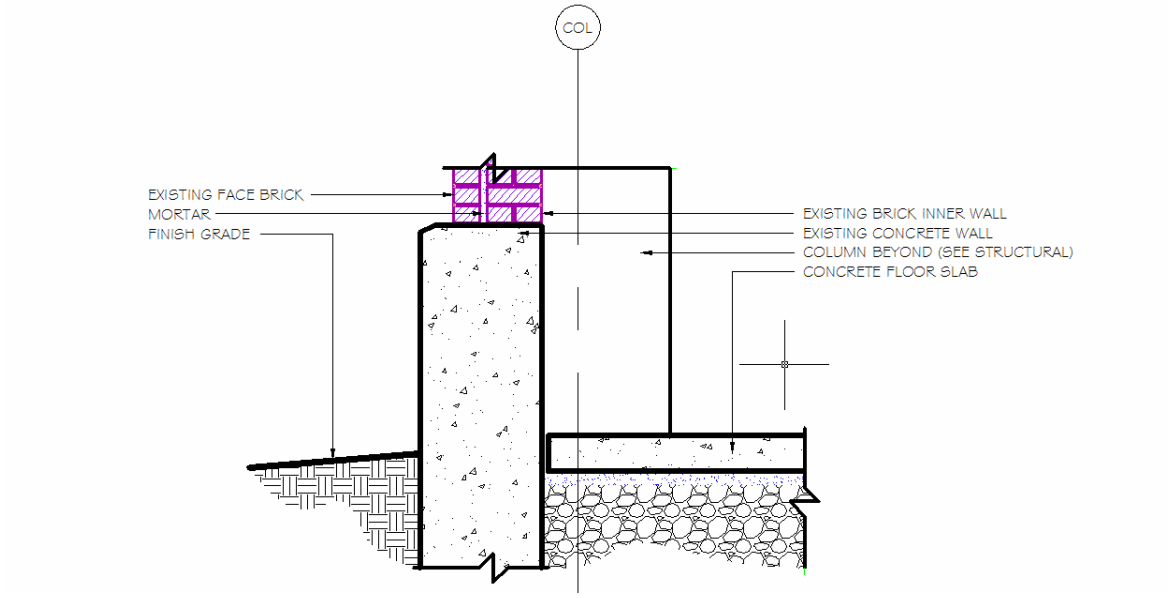

Figure 4: As-Built Floor/Wall Detail @ Grade (N.T.S.)

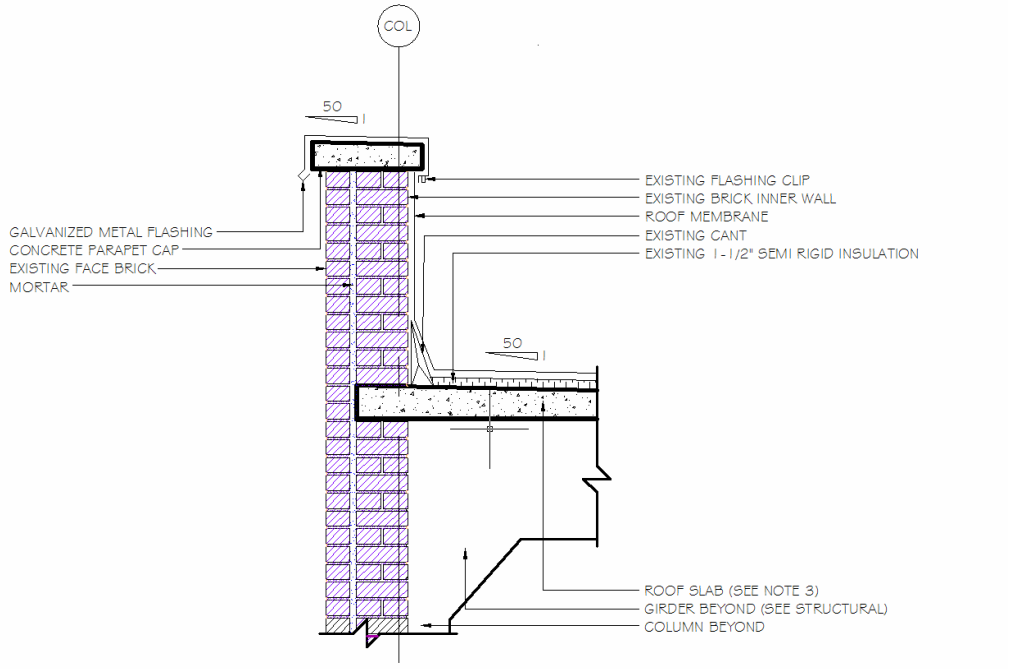

Figure 5: As-Built Parapet Detail (N.T.S.)

Development of a Renovation Project from the Adopted Building

After studying the adopted building using the as-built drawings, students were told to develop a set of design and working drawings for a medium sized architectural office that was to occupy a maximum of two floors of this building. Following the International Building Code and a skeletal program for the architectural office, the students were instructed to design a solution to the problem. As the students were from several different programs (e.g., Interior Design and Civil Engineering Technology) they were allowed to determine which drawings they would produce in order to fulfill the requirements of the course curriculum. Some students chose to develop the interior of the building, whereas others looked at the technical problems and solutions involved in introducing new assemblies to the adopted structure. All of this work forced the students to refer to the original as-builts to determine what they could or could not do. An example of the work done in this component of the course can be found within Figure 6.

This type of course development was more akin to the studio environment noted earlier in this paper. As the students gained more confidence in their knowledge of commercial construction and this building, fewer lectures were required and more one on one teaching evolved.

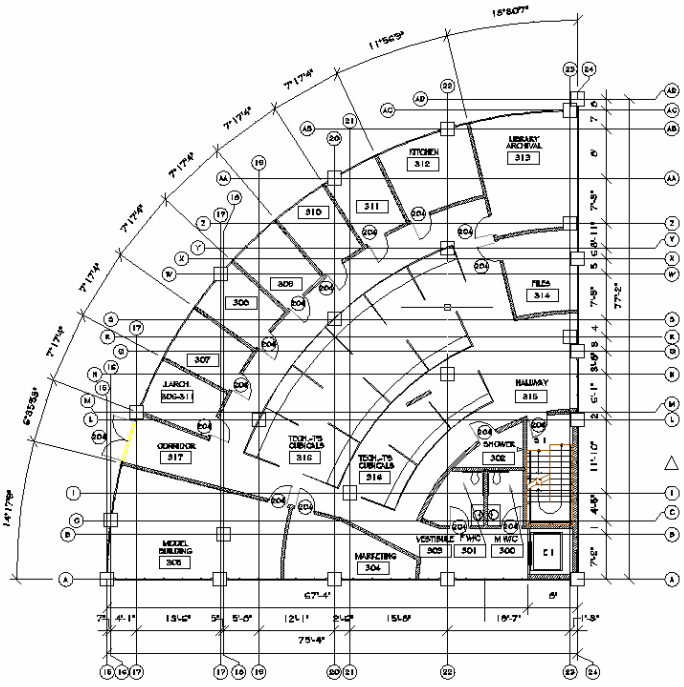

Figure 6: Floor Plan of Architectural Office (N.T.S.)

Questionnaire: Adopted Building as an Effective Pedagogical Method

The second method for acquiring data about the adopted building was related to the usefulness of the case study as a source of learning and instruction. The data gathering instrument in this instance was a questionnaire that was administered to the students involved in this project. The questionnaire was a set of questions that were given to the students at the end of the semester (see Appendix A). Each student was given fifteen minutes outside of regular class time to devote to answer the questionnaire. Anonymity was maintained by not having the participants identify themselves on the answer sheet. As well, the author was absent from the classroom and had his teaching assistant administer the questionnaire.

Descriptive Statistics from Questionnaire

Of the total of 10 participants the greatest numbers were in interior design. Fifty percent of them were either in the Interior Associates Degree (AS) program or the Bachelors Degree program (BS). Forty percent of them were in the Architectural Technology program and one was in the Civil Engineering program (see Table 1).

Table 1: Program of Study

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	20.0	20.0	20.0
	2	2	20.0	20.0	40.0
	3	1	10.0	10.0	50.0
	5	2	20.0	20.0	70.0
	6	3	30.0	30.0	100.0
	Total	10	100.0	100.0	

Note:
1=Architectural Technology (AS)
2=Architectural Technology (BS)
3=Civil Engineering Tech. (AS)
4=Civil Engineering Technology (BS)
5=Interior Design (AS)
6=Interior Design (BS)

The participants were asked about their knowledge of commercial construction prior to entering the class. It was found that 40% of them rated themselves at a low level of knowledge coming into this course. This was to be expected as most were young (see Table 3) (70% were 25 years of age or younger) and hadn't taken another course in commercial construction.

Table 2: Prior Knowledge of Commercial Construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	20.0	20.0	20.0
	2	4	40.0	40.0	60.0
	3	2	20.0	20.0	80.0
	4	1	10.0	10.0	90.0
	5	1	10.0	10.0	100.0
	Total	10	100.0	100.0	

Note:
1=Very High
2= High
3= Moderate
4= Low
5= Very Low

Table 3: Participant Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	40.0	40.0	40.0
	2	3	30.0	30.0	70.0
	3	2	20.0	20.0	90.0
	7	1	10.0	10.0	100.0
	Total	10	100.0	100.0	

Note:
1=19-21
2= 21-25
3= 25-30
7= 45 and above

The participants were also asked what they thought about their knowledge of commercial construction after taking the class. Table 4 below indicates that there were 60% of them that stated that they had a high or very high knowledge of commercial construction after taking this particular class.

Table 4: End Knowledge of Commercial Construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	10.0	10.0	10.0
	3	3	30.0	30.0	40.0
	4	5	50.0	50.0	90.0
	5	1	10.0	10.0	100.0
	Total	10	100.0	100.0	

Note:
1=Very High
2= High
3= Moderate
4= Low
5= Very Low

The questionnaire was also directed towards determining the effectiveness of the use of the adopted building as a case study within the course. The data in Table 5 indicate that 70% of the participants rated the value of using an adopted building as either high or very high.

Table 5: Adopted Building Value

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	30.0	30.0	30.0
	4	5	50.0	50.0	80.0
	5	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

Note:
1=Very High
2= High
3= Moderate
4= Low
5= Very Low

These answers were also double checked for accuracy. When asked later in the questionnaire how they would rate the value of using an adopted building for this course there were 80% of them that rated the value as either high or above. No one rated it below a moderate value.

Table 6: Use Of Adopted Building Value

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	20.0	20.0	20.0
	4	6	60.0	60.0	80.0
	5	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

Note:
1=Very High
2= High
3= Moderate
4= Low
5= Very Low

The participants felt that the adopted building knowledge helped them the most in developing their floor plans. Sixty percent of them stated this (see Table 7). The next drawing that the building helped in was the Wall section and 20% of the participants rated this as number one.

Table 7: Adopted Building Knowledge Most Helped What Drawing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	10.0	10.0	10.0
	2	1	10.0	10.0	20.0
	3	2	20.0	20.0	40.0
	5	6	60.0	60.0	100.0
	Total	10	100.0	100.0	

Note:
1=Building Sections
2= Details
3= Wall Sections
4= Elevations
5= Floor Plans

Summary and Recommendations for Future Research

This paper reviewed a project that incorporated an adopted building into an architectural working drawings course. The research questions in this instance were, as noted in the beginning:

1. Is using an *adopted building* an effective method for teaching commercial construction?
2. Does using an *adopted building* help in the production of a set of working drawings?

3. What specific drawings in a set of working drawings are most influenced by using an *adopted building* in a project?

By means of a questionnaire, answers were provided to the research questions. Based upon the large majority of students favoring the use of an adopted building in this course, it can be concluded (with respect to this small sample group only) that this was an effective method for teaching commercial construction and, as well, helped in the production of a set of working drawings. This was reinforced by the numbers of participants who felt that their knowledge of commercial construction had increased substantially after taking this course.

The questionnaire also helped to answer which drawings were most influenced by using a case study. The participants (60% of them) stated that the floor plans benefited the most from using an existing building as an adopted case study.

This study involved several participants however the sample group was exceedingly small, given the size of the class. A longitudinal study that would involve more participants would enable the data and conclusions to be further reaching in conclusions and recommendations. As it now stands the conclusions can only be attributed to this small sample group. However, given the encouraging results from this study it appears that using an adopted building as a case study within this context could prove to be a valuable method for teaching students about commercial construction.

References:

1. Grabow, S. & Alexander, C. (1983). The Search For A New Paradigm In Architecture. Boston: Oriel Press, p. 88.
2. Scott Brown, D. Breaking Down the Barriers between Theory and Practice, p.43.
3. Cuff, D. (1991). Architecture: The Story of Practice. Cambridge: MIT Press, p. 7.
4. Berg, B. (2001). Qualitative Research Methods for the Social Sciences. Toronto: Allyn and Bacon.
5. Darke, J. (1984). *The Primary Generator and the Design Process*. In Cross, N. Developments in Design Methodology. Toronto: John Wiley and Sons, Ltd., p. 181.

Appendix A: Questionnaire

The main purpose of this questionnaire is to assess your opinions of the value of using an existing building as a case study in ART 222 Commercial Construction. Herein it may be identified as an "adopted building".

You should be aware that:

1. You will not be graded on this.
2. You will have 15 minutes to complete this.
3. All information will be kept confidential. Please do not sign your name to any of these pages.
4. The reference building is the Stutz building on Capital Street in Indianapolis.

1. I would rate my knowledge of commercial construction prior to entering ART 222 as: (Please place an "X" in the box that you feel is the most correct answer)

☐ VERY HIGH ☐ HIGH ☐ MODERATE ☐ LOW ☐ VERY LOW

Further Comments:

2. I would rate the value of the field trip to the Stutz building in this course as: (Please place an "X" in the box that you feel is the most correct answer)

☐ VERY HIGH ☐ HIGH ☐ MODERATE ☐ LOW ☐ VERY LOW

Further Comments:

3. I would rate the value of doing as built drawings of the Stutz building as: (Please place an "X" in the box that you feel is the most correct answer)

☐ VERY HIGH ☐ HIGH ☐ MODERATE ☐ LOW ☐ VERY LOW

Further Comments:

4. I would rate the value of having an "adopted building" to constantly reference to in completing my project as:
(Please place an "X" in the box that you feel is the most correct answer)

VERY HIGH	HIGH	MODERATE	LOW	VERY LOW
☐	☐	☐	☐	☐

Further Comments:

5. I would rate my use of the existing drawings of the building as:
(Please place an "X" in the box that you feel is the most correct answer)

VERY HIGH	HIGH	MODERATE	LOW	VERY LOW
☐	☐	☐	☐	☐

Further Comments:

6. I would rate the value of the ART 222 blog site as:
(Please place an "X" in the box that you feel is the most correct answer)

VERY HIGH	HIGH	MODERATE	LOW	VERY LOW
☐	☐	☐	☐	☐

Further Comments:

7. I would rate the value of Sketchup 4.0 software in ART 222 as:
(Please place an "X" in the box that you feel is the most correct answer)

VERY HIGH	HIGH	MODERATE	LOW	VERY LOW
☐	☐	☐	☐	☐

Further Comments:

8. I found that the adopted building helped me the most in understanding how to approach doing: (Please place an "X" in the box that you feel is the most correct answer)

☐ Floor Plans ☐ Elevations ☐ Wall Sections ☐ Details ☐ Building Sections

Further Comments:

9. I would rate my knowledge of commercial construction upon completing ART 222 as: (Please place an "X" in the box that you feel is the most correct answer)

☐ VERY HIGH ☐ HIGH ☐ MODERATE ☐ LOW ☐ VERY LOW

Further Comments:

10. I would rate the use of an adopted building in this course as:
(Please place an "X" in the box that you feel is the most correct answer)

☐ VERY EFFECTIVE ☐ EFFECTIVE ☐ MODERATELY EFFECTIVE ☐ POORLY EFFECTIVE ☐ NOT EFFECTIVE

Further Comments:

11. I would rate the value of the Wall of Wisdom in this course as:
(Please place an "X" in the box that you feel is the most correct answer)

☐ VERY EFFECTIVE ☐ EFFECTIVE ☐ MODERATELY EFFECTIVE ☐ POORLY EFFECTIVE ☐ NOT EFFECTIVE

Further Comments:

12. Demographic Questions:

The following questions relate to demographic characteristics that will be used in analyzing the results. This information is kept confidential and used only in aggregate form to understand the make-up of those participating in this research project (select one answer only by placing an "X" in the appropriate box):

1. What Program are you currently enrolled in?

a. Architectural Technology (AS)_____ ☐

b. Architectural Technology (BS)_____ ☐

c. Civil Engineering Technology (AS)_____ ☐

d. Civil Engineering Technology (BS)_____ ☐

e. Interior Design (AS)_____ ☐

f. Interior Design (BS)_____ ☐

g. Other (please indicate which one)

_____

2. What year of your program are you currently in?

Freshman ☐

Sophomore ☐

Junior ☐

Senior ☐

3. How much commercial design and construction experience do you have?

a. Less than 1 year ☐

b. 1 year ☐

c. 1-5 years ☐

d. Greater than 5 years ☐

4. What is your age group?

a. 19-21 ☐

b. 21-25 ☐

c. 25-30 ☐

d. 30-35 ☐

e. 35-40 ☐

f. 40-45 ☐

g. 45 and above ☐

THANKS!

Those involved in this research project would like to thank you for your time and effort in completing the above questionnaire.