

SOTL PRESENTATION; 477 words

The Utilization of Building Information Modeling (BIM) Software for Student Understanding of Building Systems

Michelle C. Rose

The University of Southern Mississippi

ABSTRACT

Problem: Building Information Modeling (BIM) software is becoming an industry

standard for communicating and producing design projects (Crumpton & Miller, 2010).

Because BIM software provides an integrated approach to designing built environments,

interior design programs, curriculum, and faculty must employ new pedagogical models

to prepare students for the future (Asojo, 2011). BIM requires the user to select a series

of building assembly components in order to create a typical interior design project. In

the process of creating an interior space, the software requires the user to select wall,

floor, and ceiling assembly types. In some instances, the selection process will include

stair construction, foundation type, roof assemblies, or other building methods. Rather

than faculty identifying the specific component types in a project statement or program

for the students, the students should be taught to make accurate choices independently.

Methodology: In order for students to make informed decisions when generating a BIM

model, a thorough understanding of each building assembly and construction procedure

would need to be addressed. A course was selected that encapsulated the components

needed to develop an understanding of the construction methods utilized in a typical

BIM model. The selected course objectives addressed the areas of the analysis and

application of architectural detailing, building systems, standards and codes, problem-

solving, and space planning. A project was modified to use BIM software (see Figures

1 and 2), instead of the formerly utilized two-dimensional drafting software, to create a

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two-story mixed occupancy use building that addressed code compliance, vertical circulation, and emergency egress issues (see Figures 3-5). Students were lectured on each building construction component, while being taught to use the BIM software, allowing students to make informed decisions for each component type as the building and project was being constructed. Additionally, pre-tests and post-tests were given to the students before and after lectures on each building component in order to discern student understanding of building components prior to and after the lectures. To ascertain student understanding of building systems utilizing BIM software, the students were given a comprehensive test upon completion of the project that examined retention of the students' building systems knowledge and long-term memory effects of the tested lecture information.

Results: Student ability to describe and demonstrate knowledge of building systems, architectural detailing, and the application of the proper systems for code compliance increased from the former course projects, in which BIM software was not utilized. Additionally, students understood and could demonstrate understanding of the vertical circulation design for the project, as well as justify decisions for material and finish choices. Although BIM software provides the means for low-effort and automated design of architectural systems and detail work, faculty should embrace the software programs as new teaching tools. By using BIM software as the means to produce the project construction drawings, course time was allowed to add the additional lectures and testing components. Additionally, the BIM software allowed students to focus on design, and not be weighted down with tedious drafting issues.

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REFERENCES (APA)

- Crumpton, A. & Miller, L. L. (2011). The E-Design Studio: Employing Multiple Technologies to Improve Interior Design Teaching and Learning. Proceedings of Interior Design Educators Council 2011 Annual Conference, 26-29.
- Asojo, A. O. (2011). An Instructional Design for Building Information Modeling (BIM) and Revit in Interior Design Curriculum. Proceedings of Interior Design Educators Council 2011 Annual Conference, 170-176.

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APPENDIX

Figure 1: Project Description (P1_Description.pdf)

Figure 2: Project Deliverables & Evaluation (P1_Evaluation.pdf)

Figure 3: Project Examples (P1_Ex1.pdf)

Figure 3: Project Examples (P1_Ex2.pdf)

Figure 3: Project Examples (P1_Ex3.pdf)

BATTAGLIA RESIDENCE AND SPECIALTY SHOPPE

PROJECT DESCRIPTION

Project Statement

Your firm has been hired by Mr. and Mrs. Battaglia to renovate an existing building located in Dallas, Texas to accommodate a specialty store on the first level, and a private loft home on the second level. The specialty store will carry a variety of wine, coffee, gourmet food, and gifts that reflect their Italian heritage. Your job is to design the facility and draw all construction documents necessary for the demolition and construction of this project.

General Criteria

The Battaglia Building is a two story building with solid brick masonry walls on the exterior. Although the building is structurally sound, neglect has made it impossible to salvage any of the interior wall or floor assemblies, and all materials must be demolished and removed. Currently, there is no second floor level, so a staircase and second level floor must be constructed. The lower level currently has 16'-0" high partitions, however, the renovated building will have a 12'-0" finished ceiling height on the first level with a 2'-0" plenum, and 10'-0" finished ceiling height for the second level. The first floor windows are positioned 2'-0" above finished floor (AFF) and are 8'-0" in height. The second level windows are positioned 16'-0" AFF and are 6'-0" in height. The Battaglia's have requested the staircase be a minimum clear width of 4'-0" for universal design purposes.

The facility shall meet or exceed the minimum requirements of all applicable building codes, the NFPA Life Safety Code, and the ADA (Americans with Disabilities Act) Standards for Accessible Design. Additionally, universal design features, for both the business and the residence, have been requested by the clients.

The Battaglia's have requested top of the line technology for the building, as well as the ability to adapt to new technology. Every room/area is to have individual voice and data capabilities. Security is a must! All additional power, plumbing, and HVAC must be delivered through the floor, ceiling, and interior wall systems. Only existing power locations may be accessed through an exterior wall. Mr. and Mrs. Battaglia prefer the HVAC ducts be located in ceilings, and that all walls and the residence ceilings be a gypsum board finished surface. However, they have requested an acoustical ceiling for the first floor specialty store. Every other facet of the decorative finishes is at the designer's discretion.

Keep in mind, Mr. and Mrs. Battaglia would like this project completed very quickly! Decide on a good layout that meets all of the requirements, and keep moving! Time management is crucial in order to meet deadlines.

Program Requirements: Wine & Gourmet Food Shoppe

Research and documentation of the client preferences should be clearly identified and implemented with the following criteria outlined below.

Executive Office

Private office for Mr. and Mrs. Battaglia. Should be a large office and private from the building's public entrance.

Freestanding furniture to include:

- Executive desk w/ return
- Executive high back task chair
- 2 guest chairs
- 10 linear feet of lateral file storage
- 45 linear feet of shelf space

Cashier Station

Include one cashier station in close proximity to the public entrance.

Considerations:

- Seating
- Storage
- Security
- Product point of purchase displays
- Packaging materials
- Specialized services

Product Displays

Include ample display space for product selections.

Display types:

- Wine
- Coffee
- Dry foods
- Refrigerated foods – self serve and/or full service
- Frozen foods – self serve and/or full service
- Gifts
- Wine and/or gourmet food accessories
- Tasting areas
- Other specialized products/services

Restroom

Include one restroom away from public view. See ADA requirements for layouts.

Include:

- Water closet
- Lavatory
- Mirror separate from lavatory
- Accessories – hand dryer, soap dispenser, waste disposal, paper dispenser, etc...

Facility Storage

Minimum 200 square feet of space. Do not show any furnishings.

Program Requirements: Loft Home

The private home for Mr. and Mrs. Battaglia should be functional, yet ready for upscale entertainment. The staircase leading to the loft apartment should be private and have a separate secure entrance from the back of the building that does not pass through the business, but is accessible from the business. Mr. and Mrs. Battaglia are a young urban couple that do not have any children or other persons residing in the home, and entertain frequently. They enjoy the atmosphere that typical loft style homes provide, except with a bit more privacy, and would like a comfortable, yet impressive, place to live.

Areas to include:

- Master Bedroom Suite with Master Bathroom
- Guest Bedroom
- Guest Bathroom
- Powder Room (Half Bath)
- Living Room
- Dining Room
- Kitchen
- Laundry Area

Kitchen

The kitchen must have a minimum of 158" of countertop frontage, and include a pantry and high-end appliances. However, space is conservative for all areas of the home for the city dwellers. Please design accordingly.

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PROJECT EVALUATION

COMPONENT	POINTS POSSIBLE
Title Page w/ List of Drawings	10
STRUCTURAL	
S-101: Foundation Plan	10
S-201: Exterior Elevation	10
S-301: Building Section	10
S-302: Building Transverse Section	10
S-303: Wall Sections A. Wall Type A B. Wall Type B	10
S-304: Stair Section	10
S-501: Stair Details	10
S-901: Framing Full Overview	10
ARCHITECTURAL	
A-101: Demolition Plan	10
A-102: First Level Floor Plan	10
A-103: Second Level Floor Plan	10
ELECTRICAL	
E-101: First Level Power & Communication	10
E-102: First Level Lighting Plan	10
E-103: First Level Reflected Ceiling Plan	10
E-104: Second Level Power & Communication	10
E-105: Second Level Lighting Plan	10
E-106: Second Level Reflected Ceiling Plan	10
MECHANICAL	
M-101: First Level Fire Sprinkler Plan	10
INTERIORS	
I-101: First Level Furnishings Plan	10
I-102: First Level Finish Plan	10
I-103: Second Level Furnishings Plan	10
I-104: Second Level Finish Plan	10
I-201 to I-202: Interior Elevations A. Check Out Station B. Check Out Station C. Display Cabinetry D. Public Restroom E. Kitchen Elevation F. Kitchen Elevation G. Master Bath Elevation H. Guest Bath Elevation	40
I-501: Detail Drawings A. Cornice Detail B. Base Trim Detail C. Door Surround/Trim Detail D. Countertop Profile Detail	20
I-901 to I-906: Presentation Views (6 Views)	60
GENERAL REQUIREMENTS Program Requirements / Spelling/Grammar	50
TOTAL	400

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PROJECT EXAMPLES

Figure 3.1. Title Page

Includes Table of Contents, List of Abbreviations, Project Title, and student's choice of imagery

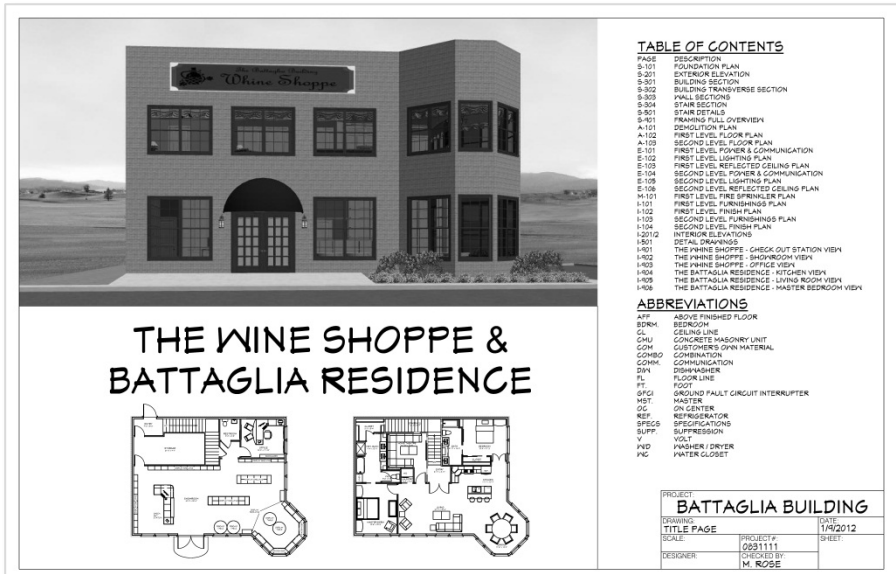


Figure 3.2. Building Section

Building Section showing all furnishings, fixtures, and equipment, along with structural elements. Levels and ceiling heights noted.

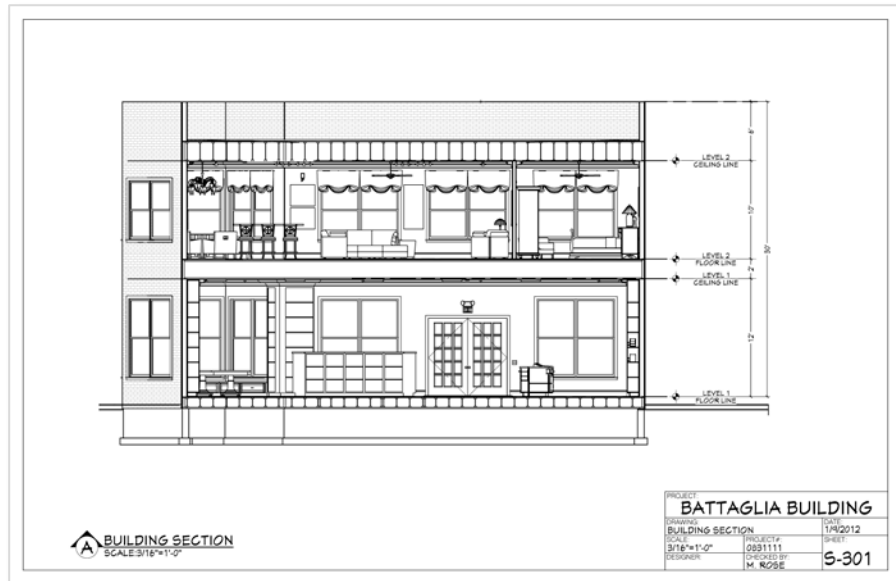
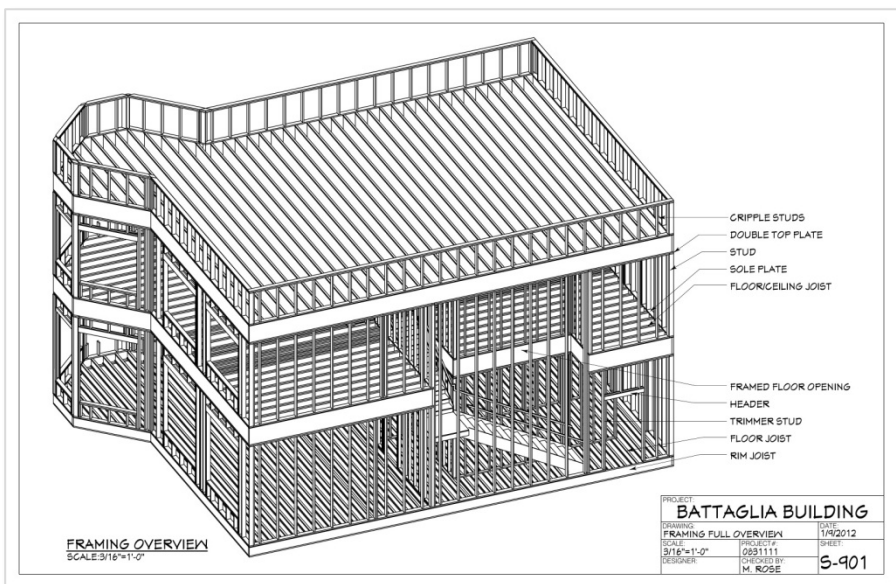


Figure 3.3. Framing Overview

Includes floor, ceiling, wall, and roof assemblies, including a parapet roof system, as well as window, door, and stair framing assemblies. Provides an opportunity to identify various framing components.



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PROJECT EXAMPLES

Figure 4.1. Demolition Plan

Includes general demolition notes, along with all partitions to be demolished and partitions to remain.

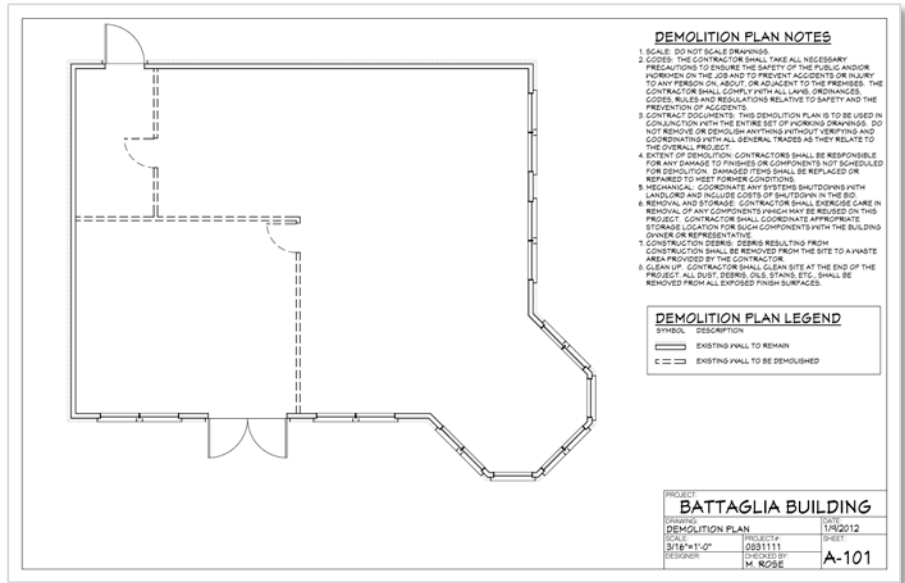


Figure 4.2. Floor Plan

Includes all built-in features, dimensions of existing and new partitions, general floor plan notes, notations of elevation views and perspective views, and stair section.

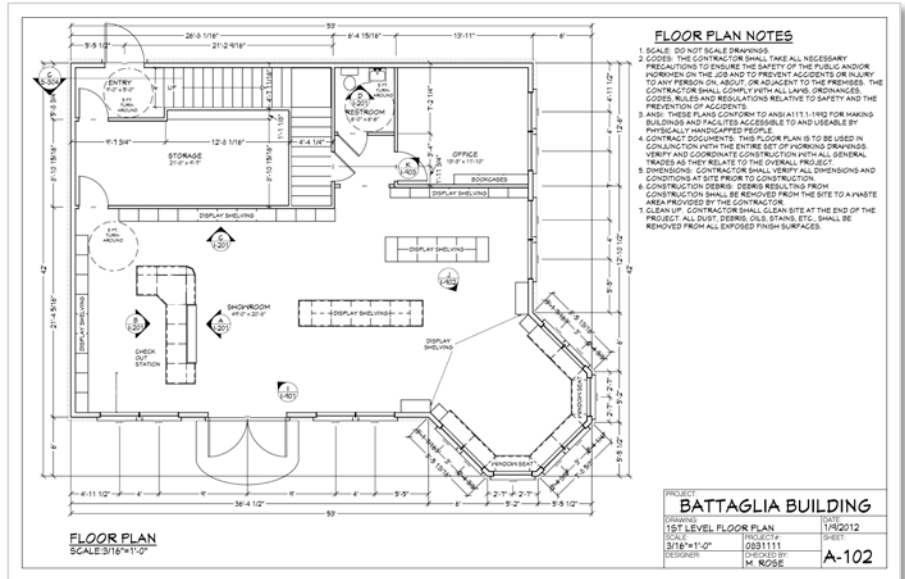
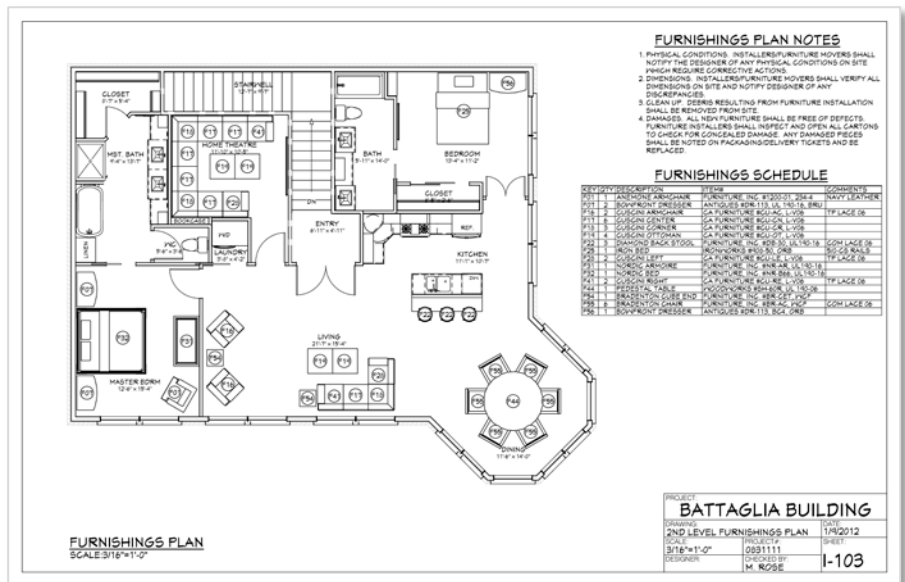


Figure 4.3. Furnishings Plan

Includes all furnishings, noted and keyed to a detailed furnishings schedule, along with general furnishings notes.



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PROJECT EXAMPLES

Figure 5.1. Fire Sprinkler Plan

Includes fire sprinklers with dimensioned locations, exit signage, and built-in fire extinguisher locations.

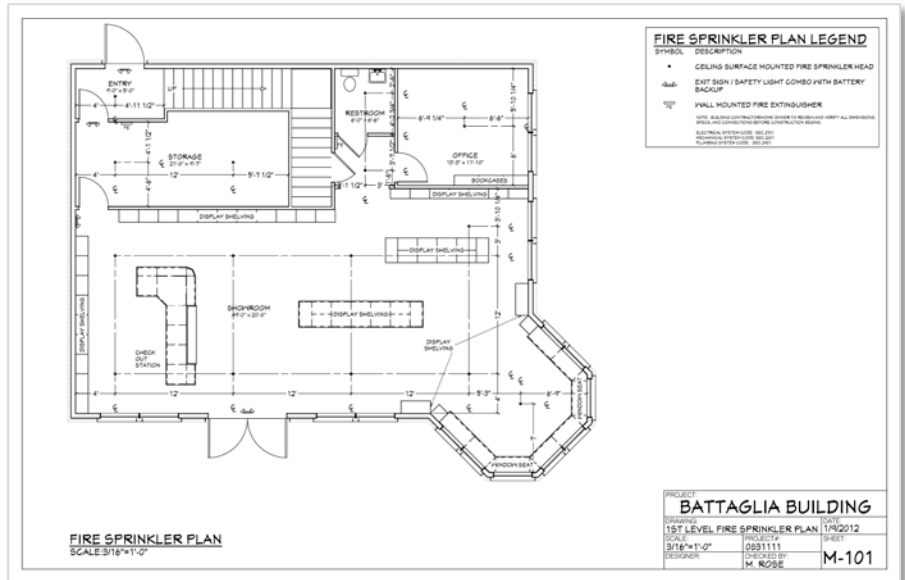


Figure 5.2. Lighting Plan

Includes all lighting, switching, exhaust fans, circuitry, electrical and/or control panels, and general lighting notes.

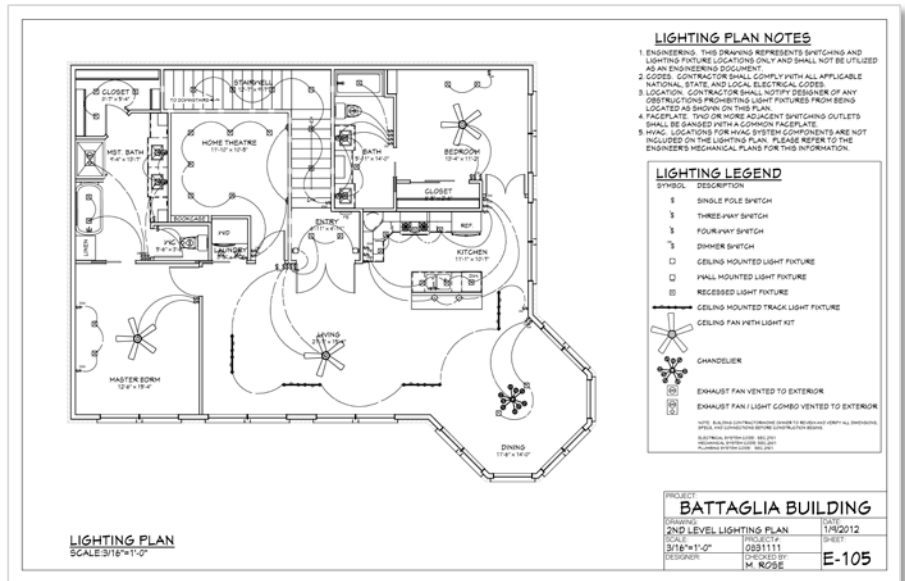


Figure 5.3. Finish Plan

Includes floor, wall, and ceiling finishes, general finish notes, and a detailed schedule of finish materials and types.

