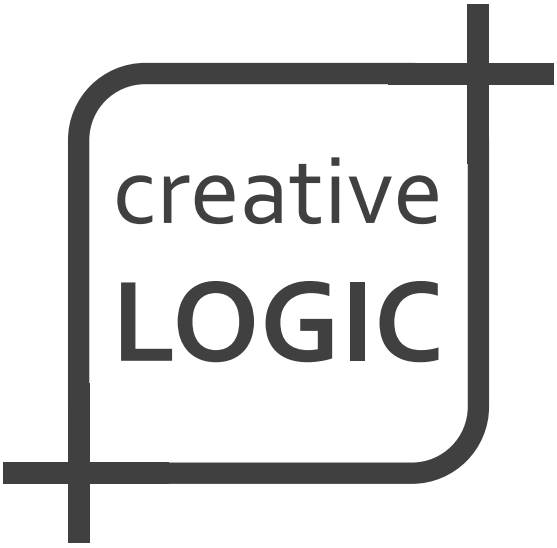
PRESENTATION #1: BIM EXECUTION PLAN



TASHAKORI | DONNACHIE | PROGAR | WENTZ | HARDER | LANINGER

JANUARY 27, 2011

BIM PROJECT EXECUTION PLAN Version 2.0

FOR

Mt. Nittany Elementary School

DEVELOPED BY

creative•LOGIC

Table of Contents

Section A: BIM Project Execution Plan Overview

Creative Logic is dedicated to delivering efficient, sustainable designs that maximize project value and minimize extraneous project expenditures. We strive to work cooperatively with owners and subcontractors alike in an effort to eliminate the traditionally adversarial atmosphere associated with the building construction process.

Section B: Project Information

1. **Project Owner:** State College Area School District
2. **Project Name:** Mt. Nittany Elementary School
3. **Project Location and Address:** 656 Brandywine Drive; State College, PA 16801
4. **Contract Type / Delivery Method:** GMP /Integrated Project Delivery (IPD) with BIM
5. **Brief Project Description:** The project shall be developed as a 400 student elementary school. A program similar to the architectural space used for Gray's Woods Elementary School will be used for this project. The proposed total Net Square Footage (the internal area of each space that is usable to the occupant) is 36,920SF and the proposed total gross area (includes circulation, mechanical, chase space, and wall thickness) is 58,333SF.
6. **Additional Project Information:** Building Information Modeling required through interdisciplinary coordination. Note that an add alternative for a separate cafeteria shall be incorporated into the project.
7. **Project Numbers:**

PROJECT INFORMATION	NUMBER
CONTRACT NUMBER:	02112-11
TASK ORDER:	778
PROJECT NUMBER:	02112-11
NET SQUARE FOOTAGE	36,920 SF
GROSS SQUARE FOOTAGE	58,333 SF

8. **Project Schedule / Phases / Milestones:**

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
PRELIMINARY PLANNING Presentation #1: BIM	Sun, Jan. 17, 2011	Thurs, Jan. 27, 2011	Architect, Landscape Architect, Construction Manager, Lighting/Electrical Lead, Mechanical Lead, Structural Lead
DESIGN DOCUMENTS Presentation #2: Schematic	Tues, Feb. 1, 2011	Tue, Feb. 8, 2011	Architect, Landscape Architect, Construction Manager, Lighting/Electrical Lead, Mechanical Lead, Structural Lead
DESIGN DOCUMENTS Presentation #3: Development	Thurs, Feb. 10, 2011	Thurs, Mar. 3, 2011	Architect, Landscape Architect, Construction Manager, Lighting/Electrical Lead, Mechanical Lead, Structural Lead
CONSTRUCTION DOCUMENTS Presentation #4: Final	Tues, Mar. 8, 2011	Thurs, Mar. 24, 2011	Architect, Landscape Architect, Construction Manager, Lighting/Electrical Lead, Mechanical Lead, Structural Lead
CONSTRUCTION	Summer 2011	Summer 2012	Architect, Landscape Architect, Construction Manager, Lighting/Electrical Lead, Mechanical Lead, Structural Lead

Section C: Key Project Contacts

Role	Organization	Contact Name	Location	E-Mail	Phone
BIMEx Manager(s)	Creative Logic	Patrick Laninger	State College	planinger@gmail.com	814-360-6802
BIM Manager(s)	Creative Logic	Josh Progar	State College	josh.progar@gmail.com	717-802-5665
Architect	Creative Logic	Mahzad Tashakori	State College	mahzad.t@gmail.com	814-954-2214
Landscape Architect	Creative Logic	Laurie Beth Donnachie	State College	lvd5015@gmail.com	484-947-7123
Construction Manager	Creative Logic	Patrick Laninger	State College	planinger@gmail.com	814-360-6802
L/E Lead	Creative Logic	Asher Harder	State College	asherharder@gmail.com	717-381-7534
Mechanical Lead	Creative Logic	Josh Wentz	State College	joshwentz@gmail.com	724-401-1201
Structural Lead	Creative Logic	Josh Progar	State College	josh.progar@gmail.com	717-802-5665
BIM Consultant	Penn State	Bob Holland	State College	rjh32@psu.edu	814 867-0458
BIM Consultant	Penn State	Alex Stough	State College	azs5055@psu.edu	

Section D: Project Goals / BIM Uses

1. **Major BIM Goals / Objectives:**

PRIORITY (HIGH/MED/LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
High	Maximize efficiency of design & coordination process	3D Coordination, Design Authoring
High	Minimize clashes both in frequency and severity on-site	3D Coordination, Design Reviews
High	Turnover the project on-time and at least on-budget	Cost Estimation
High	Perform design reviews in a virtual environment	Design Review
High	Utilize analytical programs to design a sustainable, energy efficient project.	Sustainability, Struct., Mech., Lighting Analysis
Medium	Utilize integrated multi-disciplinary software to learn capabilities	Design Authoring
Medium	To evaluate constructability and verify the feasibility of an aggressive schedule	4D Modeling, Design Reviews
Medium	Improve communication between all disciplines	3D Coordination

2. **BIM Uses:**

X	DESIGN	X	CONSTRUCT
X	DESIGN AUTHORING	M	SITE UTILIZATION PLANNING
X	DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN
X	3D COORDINATION	X	3D COORDINATION
M	STRUCTURAL ANALYSIS		DIGITAL FABRICATION
M	LIGHTING ANALYSIS		3D CONTROL AND PLANNING
M	ENERGY ANALYSIS		RECORD MODELING
M	MECHANICAL ANALYSIS		
	OTHER ENG. ANALYSIS		
M	SUSTAINABLITY (LEED) EVALUATION		
	CODE VALIDATION		
X	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)
X	COST ESTIMATION	X	COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

BIM Use Worksheet: See Attachment 1

Section E: Organizational Roles / Staffing

1. **BIM Roles and Responsibilities:**

Architect: Mahzad Tashakori

Key Responsibilities:
- Overall design concept
- Sustainable design
- Consider aesthetics and functionality of the building at the same time
- Coordination with other disciplines, keep them updated with changes and utilize their expertise throughout the design process from pre-design research to design development
- Provide required spaces of the project program within the given space requirements

Landscape Architect: Laurie Beth Donnachie

Key Responsibilities:
- Coordination with all disciplines to ensure building utilizes natural ecological processes
- Design systems of energy and resource cycles that decrease waste
- Site design that offers creative solutions to long term adaptability and low maintenance costs
- Visual communication of the design
- prevent negative environmental impacts off the site

Construction Manager: Patrick Laninger

- Key Responsibilities:
  - Communicate constructability thoughts and opinions effectively with different disciplines
  - Maintain up-to-date BIM Ex Plan
  - Work with landscape architect on site utilization
  - Explore potential project delivery strategies and contract types
  - Perform ROM, square Foot, and detailed estimates
  - Explore value engineering options related to all disciplines
  - Perform CPM and 4D scheduling.
  - Analyze potential sources of risk
  - Perform MEP coordination and clash detection analyses
  - Perform LEED certification analyses

Structural Engineer: Josh Progar

Key Responsibilities:
- Sustainable, efficient structural design for the building
- Structural analysis of the building
- 3D Coordination with Architect and MEP Engineers
- Value engineering throughout life cycle of building

Mechanical Engineer: Josh Wentz

Key Responsibilities:
- Utility Availability and capacity as it relates to site layout
- Mechanical systems requirements, selection, and layout
- 3D Systems & Clash Coordination with Architect, Structural, and Electrical engineer
- Strategies to design sustainably
- Energy Model of the designed building in comparison with PSU Design
- LEED Certification Analysis

Lighting/Electrical Engineer: Asher Harder

Key Responsibilities:

- Electrical Power availability as it relates to the Mechanical engineering equipment
- 3D Systems & Clash Coordination with Architect, Structural, and Mechanical Engineer
- Energy analysis of day lighting systems
- Coordination with Architect to ensure aesthetically pleasing and function day lighting solutions
- Value engineering throughout equipment selection and analysis of equipment performance

Overall Team Responsibilities

- Successfully design the Panorama Village Elementary School
- Maintain overall sustainable design
- Keep value engineering in mind at all stages
- Actively investigate potential clashes between disciplines
- Actively update and utilize the BIMex Plan
- Maintain a code compliant, ethically responsible design

Maintain Overall Sustainability

- Utilize site potentials to have as much natural ventilation and day lighting as possible
- Use on-site renewable energy sources
- Use local materials when possible
- Use recycled material
- Controllability of systems

Section F: BIM Process Design

1. **Level One Process Overview Map: Attachment 2**

2. **List of Level Two – Detailed BIM Use Process Map(s): Attachment 3**
    a. Cost Estimation
    b. Phase Planning (4D Modeling)
    c. Programming
    d. Site Analysis
    e. Design Reviews
    f. Design Authoring
    g. Energy Analysis
    h. Structural Analysis
    i. Lighting Analysis
    j. Mechanical Analysis
    k. 3D Coordination
    l. Site Utilization Planning
    m. Building System Analysis
    n. Sustainability Goals
    o. Information Exchange

Section G: BIM Information Exchanges

1. **Information Exchange Worksheet:**

BIM USE	RESPONSIBLE DISCIPLINE	INFORMATION NEEDED AND SUPPLYING DISCIPLINE
Design Authoring	ARCH, LARCH, SE, ME, LE	discipline specific models
Code Analysis	ARCH, LARCH, SE, ME, LE, CM	discipline specific requirements
Design Reviews	ARCH, LARCH, SE, ME, LE, CM	ARCH - schematic floor plans
		LARCH - preliminary site design, conceptual grading plan
		SE - structural system selection
		ME - mechanical system selection, space requirements
		LE - lighting/elec. system selection, space requirements
		CM - constructability & site logistics
Structural Analysis	SE	Final architectural, structural & MEP design, building loads used
Building System Analysis	SE, ME, LE	SE - building layout, space utilization
		ME - mechanical system design, space utilization
		LE - lighting/elec. system design, space utilization
Energy Analysis	ME, LE	ARCH - materials selection and ratings
		LE - lighting power density, weather data, occupancy
		ME - weather data, building type, occupancy, function, thermal zones
3D Coordination	ARCH, LARCH, SE, ME, LE, CM	discipline specific final designs
Cost Estimate	CM	details from all disciplines
Sustainability (LEED) Evaluation	SE, ME, LE	ARCH - finalized architectural design
		ME, L/E - energy analysis
		CM - environmental codes
Phase Planning (4D Modeling)	CM	discipline specific finalized models
Site Utilization Planning	CM	CM - site layout, construction phasing, scheduling

Section H: Collaboration Procedures

1. **Communication Methods:**

The key to successful collaboration is constant communication and an open mind. Our group's commitment to BIM means valuing other team members input and knowledge as well as taking advantage of face to face interaction to ensure high quality results. Meetings will be the preferred method of communication with phone calls, emails or the revision log on google documents being secondary methods. Our hours of communication will be between 8am and 11pm unless prior plans have been made; otherwise team members will not make major design revisions outside of this time period without prior consent from the rest of the team.

2. **Meeting Procedures:**

Agenda

Be prepared for meetings by keeping a short list of concerns and design updates that need to be discussed with the entire group. During meetings where 2 or more people brief meeting minutes will be kept as a google document to ensure all design revisions are shared and understood.

Locations

The location of meetings will follow a rotating schedule in the following spaces:

Engineering Unit C: ICON lab
Sackett Building: Room 307
Stuckeman Building: SCDC lab

Scheduling conflicts

At the end of each meeting the group will confirm when and where the next meeting will take place. If conflicts arise later and group members would like to change a meeting time or will not be attending the next meeting they will notify the group by email.

MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM EXECUTION PLAN	program	4 times before 01.27 3x every 4 weeks	all	ICON & SALA
DESIGN COORDINATION	design	1x a week	all	varies
STUDIO CRITIQUES (group)	design	2x a week	all	ICON & SALA
STUDIO CRITIQUES	design	1x a week	arch/larch	SALA
ENERGY ANALYSIS	design	as needed	varies	varies
COST ANALYSIS	design & construction	as needed	all	digitally
3D MEP COORDINATION	construction	1x a week	all	ICON & SALA
CONFLICT RESOLUTION	varies	by appt.	varies	varies
PRESENTATION ASSEMBLY	production	week prior to presentations	varies	varies
PRESENTATIONS	varies	4 times	all	ICON & IEL

MEETING DAY	TIME	CONFLICT	COMMENTS
Monday	11:00a-2:00p 5:30-7:30p	3	meeting & bi-weekly lab
Tuesday	5:15-7:15p	0	class time
Wednesday	5:30-7:30p	0	preferred
Thursday	5:15-7:15p	0	class time
Friday	2:00p	1	work
Saturday			not preferred
Sunday	2:00p	0	only if nessecery

3. **Information exchanges:**

Our group will be accessing many of our documents from the architectural engineering network y drive. In addition our google site, sites.google.com/site/bimstudio1, will help keep us organized and assist in conflict resolution. The following documents can be found on the website:

meeting minutes: to increase communication at meetings that not everyone is in attendance
revision log: conflict resolution when face to face meetings cannot be arranged
BIM execution plan: our living document
google documents: examples, presentation, paperwork

Much of our work will remain in digital format throughout the semester but any papers that accumulate as well as the BIM book will be stored on the 4th floor of the Stuckeman Building; on the desk labeled BIM studio to the right of the stairwell.

4. **Conflict Resolution:**

The procedure for resolving design conflicts will be group discussion of pros and cons. Each person will present the pros and cons that they see with more value being placed on points of sustainability & structural stability over aesthetics. If the conflict cannot be resolved through discussion it will be put to vote. In the event of a tie an unbiased outside source will be consulted.

Clash detections will be highlighted in yellow until the conflict has been resolved. When resolving the conflict all appropriate team members will be consulted; preferably in person.

5. **Model Delivery Schedule of Information Exchange for Submission and Approval:**

INFORMATION EXCHANGE	FILE SENDER	FILE RECEIVER	FREQUENCY	DUE DATE	MODEL SOFTWARE	NATIVE FILE TYPE	FILE EXCHANGE TYPE
BIM EXECUTION PLAN	ALL	ALL	weekly	01.27 02.22 04.26	google document	.doc	
MEP COORDINATION MODEL	L/E, M	A, CM	weekly	04.26	revit	.rvt	
ENERGY ANALYSIS REPORTS	L/E, M	L/E, M, A	bi-monthly	04.12 04.26	ecotect	.eco	
STRUCTURAL ANALYSIS REPORTS	S	CM		04.26	RAM, SAP, STAAD, RISA	.sdp .std	
COST ESTIMATES	ALL	CM		02.08 04.26	google document		
SITE LAYOUT	LA	CM	as needed	03.03 04.26	autocad	.rvt	.dwg
SITE ANALYSIS GEOTECH REPORT	LA, A	S		02.08			
EQUIP SPACE REQUIREMENTS	M, L/E	ARCH		02.08			

6. **Electronic Communication Procedures: Y-drive mapping and permissions established**
(Note: File Naming and Folder Structure will be discussed in Section L: Model Structure).

Correspondence shall be by email, google documents, and file sharing. Email shall be utilized for meeting logistics, updates on documents and progress, and other interpersonal communication as necessary. The listserv bimstudio1@googlegroups.com has been set up to facilitate communication with the design team. Google docs will be utilized via google forms for the documentation of significant building design changes, as well as smaller design changes that may largely affect the design of other disciplines. Google docs will also be used to record meeting minutes to allow all members of the group to remain updated should one or more members be unable to attend a meeting. File sharing shall be accomplished through the Architectural Engineering Department' Y-drive. Students will be able to access the Y-drive throught any computer with VPN or by mapping the Y-drive on a university computer. The Y-drive folder "Creative Logic" will have permissions restricted to include only the BIM Studio faculty and the team members of "Creative Logic." With the exception of the google docs, all project files will be kept on the Y-drive.

Section I: Quality Control

1. OVERALL STRATEGY FOR QUALITY CONTROL:

Team members from each discipline are responsible for ensuring that their individual designs not only conform to the overall design intent, but also coordinate with the design input from other members. The team will maintain an active awareness of model accuracy, clash avoidances, and overall model soundness.

2. QUALITY CONTROL CHECKS:

The following checks should be performed to assure quality.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)	FREQUENCY
VISUAL CHECK	Ensure there are no unintended and unsupported model components and that the design intent has been followed by all disciplines	ALL	REVIT, NAVISWORKS	ONGOING
INTERFERENCE CHECK	Actively look for clashes between components related to all disciplines	ALL	REVIT, NAVISWORKS	ONGOING
MODEL INTEGRITY CHECKS	Confirm that overlaying files reference the same base point and that the latest versions of each layer are being used prior to authoring new content	ALL	REVIT, NAVISWORKS	ONGOING

Section J: Technological Infrastructure Needs

1. Software:

BIM USE	DISCIPLINE (if applicable)	SOFTWARE	VERSION
3D SCHEDULING	CM	Navisworks	2011
CLASH DETECTION	ALL	Navisworks	2011
CONCEPTUAL DESIGN	LARCH	Sketchup	7
DESIGN AUTHORING	ARCH	Revit Architecture	2011
DESIGN RENDERING	ARCH, LARCH, L/E	3D Studio Max	VER. 13.0 (2011)
DESIGN RENDERING	LARCH	Rhino	4.0
DESIGN RENDERING	LARCH	Adobe CS5	VER. 15.0 (2010)
FILE COORDINATION	ALL	Bentley ProjectWise	V8i
L/E AUTHORING	L/E	Revit MEP	2011
L/E CALCULATIONS	L/E	AGI	Version 2.14
L/E DAYLIGHTING	L/E	Ecotect Analysis	2011
MECHANICAL AUTHORING	ME	Revit MEP	2011
MECHANICAL CALCULATIONS	ME	Trane Trace	v700
PROJECT ESTIMATION	CM	Quantity Takeoff	2010
PROJECT SCHEDULING	CM	Primavera	P6
SITE ANALYSIS	LARCH	ARCMAP	VER. 10.0 (2010)
SITE DRAFTING	LARCH	AutoCAD	2011
STRUCTURAL ANALYSIS	SE	RAM	v14.03
STRUCTURAL AUTHORING	SE	Revit Structure	2011

2. Computers / Hardware

BIM USE	HARDWARE	OWNER OF HARDWARE	SPECIFICATIONS
DESIGN AUTHORING	MACINTOSH G5	Arch/Larch Department LAB NAME	Intel Xeon CPU 2.66 GHz 8.00 GB RAM ATI Radeon X1900 Graphics Card Intel PRO/1000 EB Network Card 1 17” Monitor, 1 Widescreen Monitor
DESIGN ENGINEERING/CM	DELL OPTIPLEX 980	AE Department 308 Sackett	Intel Core i7 2.79GHz Windows 7 64 BIT 8.00GB RAM ATI Radeon HD 4550 Graphics Card 82578DM Gigabit Network Card Dual 17” Monitors
DESIGN ENGINEERING/CM	DELL OPTIPLEX 960	AE Department 307 Sackett	Intel Core 2 Duo 3.17GHz Windows 7 64 BIT 8.00GB RAM ATI Radeon HD 3450 Graphics Card 82567LM Gigabit Network Card Dual 17” Monitors

Section K: Model Structure

1. File Naming Structure:

Files should be backed up (save as) regularly. File versions should be notated as “option-name-1-1.extension. The first number corresponds to the section of the course. The documentation shall reflect the four sections of the course that precede each presentation. The second number corresponds to iteration of the file. For example, MEP-building-2-2.extension corresponds to the second version of a file created during work done for second presentation, and was made by the Mechanical or Electrical Engineer. See table below for clarification.

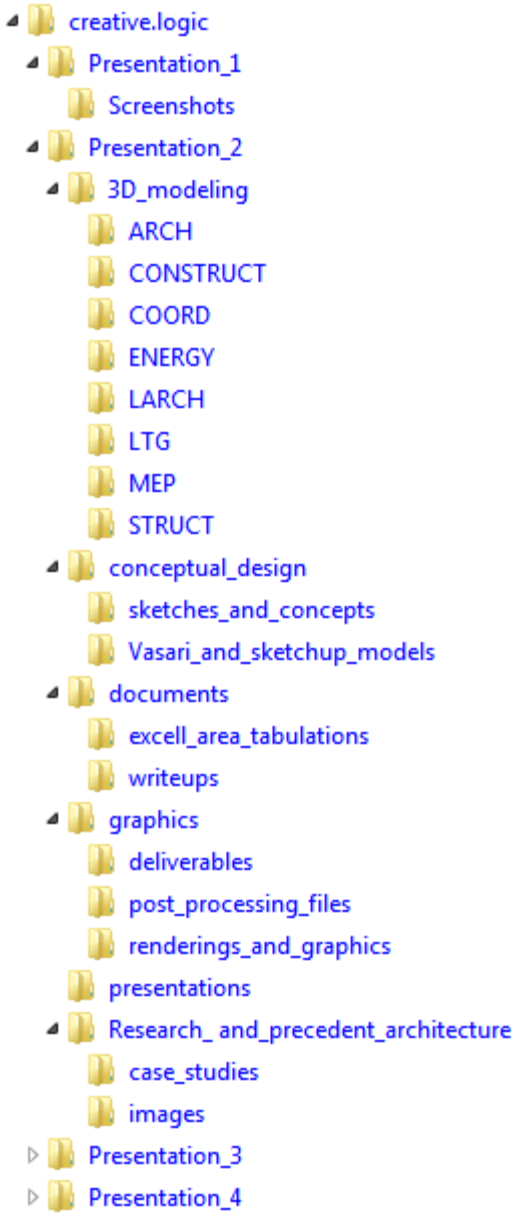
Within the “Revit” folder, the disciplines pertaining to the various Revit applications are listed, so as to separate the .rvt files for an organized linking later in the design process.

The graphics folder is for all graphics generated and produced throughout the life of the project. “Renderings_and_graphics” are for graphics generated by hand or via computer programs. “Post_processing contains Photoshop (and other) files used to manipulate the original images. “Deliverables” contain graphics suitable for presentation.

FILE NAMES FOR MODELS SHOULD BE FORMATTED AS:	
DISCIPLINE - NAME - SECTION - ITERATION.XYZ (example: ARCH-BUILDING-1-2.xyz)	
ARCHITECTURAL MODEL	ARCH-
LANDSCAPE ARCHITECTURE MODEL	LARCH-
MECHANICAL, ELECTRICAL, PLUMBING MODEL	MECH-
ELECTRICAL MODEL	ELEC-
LIGHTING MODEL	LTG-
STRUCTURAL MODEL	STRUCT-
ENERGY MODEL	ENERGY-
CONSTRUCTION MODEL	CONST-
COORDINATION MODEL	COORD-

2. Model Structure:

The model shall be separated by discipline, based on the categories listed above in section L-1. Below is a sample file structure which reflects our model structure.



Section L: Project Deliverables

BIM SUBMITTAL ITEM	STAGE	APPROX. DUE DATE	FORMAT	NOTES
Presentation #1: BIM	Preliminary Planning	01.27.11	.ppt	BIM Execution Plan Presentation, Team Charter, Deliverable Definition, Design Criteria, Team Org, Integrated Work Flow, BIM/IPD for Sustainability
BIMex Execution Plan	Preliminary Planning	01.27.11	.doc	Printed copy deliverable
Presentation #2: Schematic Design	Design Documents	02.08.11	.ppt	Specific to each discipline
Revised BIMex Plan	Design Documents	02.22.11	.doc	After revising Ralph Kreider's notes
Presentation #3: Design Development	Design Documents	03.03.11	.ppt	Building & site design, Sustainability strategies, Code Analysis, Preliminary BIM Model
Presentation Outline	Construction Documents	04.14.11	.doc	Must be approved by professors
Presentation#4: Final Project Presentation	Construction Documents	04.24.11	.ppt	Sustainability concepts, energy model, systems integration, Final BIM Model, Cost Estimate / schedule, Construction Logistics

Section M: Attachments

1. **BIM USE WORKSHEET** [FROM SECTION D]
2. **LEVEL 1 PROCESS OVERVIEW MAP** [FROM SECTION F]
3. **LEVEL 2 DETAILED BIM USE PROCESS MAP(S)** [FROM SECTION F]