THE NEW YORK TIMES BUILDING

IPD / BIM THESIS - TECHNICAL REPORT III

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EXECUTIVE SUMMARY

This report focuses on the construction management student's efforts in contributing to the overall efforts of the IPD / BIM Thesis Team 3. Included in this technical report are the observations about the features of the New York Times Building that require further investigation for improvement. Also included in this report is a detailed explanation of how the BIM Project Execution Planning Guide will be used to help organize the integrated team's efforts. An outline of the topics that are addressed in this technical report are listed below:

Problem Identification

- Envelope efficiency of the current New York Times façade
- Floor to floor height reduction to add additional floors
- Co-generation plant optimization

Technical Analysis Methods

- How can I use the BIM Project Execution Planning Procedure to organize the integrated project group?
- Which BIM uses are best suited for the New York Times Building project and how can they be best implemented on the project?
- What BIM use will best support the work that will be done around a common theme for the project team and the collaboration necessary for working together?
- What are common success factors for Integrated Project Delivery teams?

PROBLEM IDENTIFICATION

When brainstorming goals for the development of this IPD / BIM Thesis project, the group found that there were a few areas that needed improvement in the New York Times Building. Some of the areas of focus included improving the performance of the façade, decreasing floor to floor height in order to possibly add additional floors, and optimize the co-generation plant to meet the building's needs. Further discussion of these topics revealed that all of the options would have some hand in developing these possible areas of focus.

FAÇADE

The façade was immediately looked at as a primary focus for all of the group members. There is much room for improvement in the current New York Times façade's envelope efficiency, shading abilities, and structural serviceability. The façade is comprised of an ultra-clear glazing system shaded by an array of ceramic tubes that provide shading to the interior of the building. The façade is supposed to give a transparent feel to the building.

The ceramic rods on the façade account for 30% shading of the interiors but only provide 1% energy savings in the mechanical systems. This fact provides a great opportunity to investigate how to best improve the façade system in order to create a more efficient envelope. If the changes made can lower the amount of heating and cooling that is needed it can save on the HVAC system in the building. A better performing façade can be produced by changing to a higher reflective glazing and a more efficient shading system. Some of the systems that are being looked into will drastically affect how the structural system would perform. This could also give the opportunity to move the exterior structural system into the interior of the building which will eliminate the temperature differential that causes the structure to expand and contract and the exterior temperature changes.

With all of these factors being considered by the group, it is evident that the façade is a great area for all of the team members to focus on. It will be very important to keep an integrated approach when dealing with any design changes. In addition to the cost and constructability analyses that must be done by the construction management students, a large portion of their role will be to keep open the lines of communication for the different team members and help to organize the groups focus. It will be very important to structure a system of sharing ideas within the group.

FLOOR TO FLOOR HEIGHTS

Another goal that was put forward by the group was to investigate whether it would be possible to lower the floor to floor height in order to add additional floors. These additional floors could offer a payback to the owner by providing additional rentable office space in the building. There are a few ways that the group came up with to possibly eliminate height from each floor.

Andres explored the possibility of using a castellated beam system that would allow for penetrations through the structural members. This would allow the possible coordination of HVAC, electrical, and fire protection distribution through these castellations. In order to possibly lower the floor to floor height, the group would perhaps eliminate the raised floor system and explore the use of chilled beams to take care of heating and cooling the space. The chilled beams would decrease the size of ductwork that would be needed to condition the space and allow for it to be run through the castellations in the structural members.

This exploration of an alternative system would allow for a large need for detailed coordination. The construction management student would be able to explore the use of 3D coordination through Building Information Modeling.

CO-GENERATION OPTIMIZATION

Another goal that the lighting/electrical and mechanical students would like to look into is the opportunity to optimize the on-site Co-Generation facility of the New York Times building. There has been some interest in investigating the possibility of sizing the Co-Gen plant to meet both the electrical needs and the heating and cooling needs of the building. Studies would have to be done into which systems on the market are the most efficient and which systems would fit the need of this specific building.

A utility cost analysis of the Co-Gen plant verses energy off of the grid would help to analyze the practicality of a system like to one currently in the building. This may help to reveal some opportunities to optimize the size of the system as well as explore other more sustainable systems that may be able to take its place.

TECHNICAL ANALYSIS METHODS

A large responsibility of the construction management students in the IPD / BIM thesis program will be to organize the integrated project groups. I will primarily focus on techniques used to best organize an integrated project group. The construction management topics that I plan to explore are as follows:

How can I use the BIM Project Execution Planning Procedure to organize the integrated project group?

Which BIM uses are best suited for the New York Times Building project and how can they be best implemented on the project?

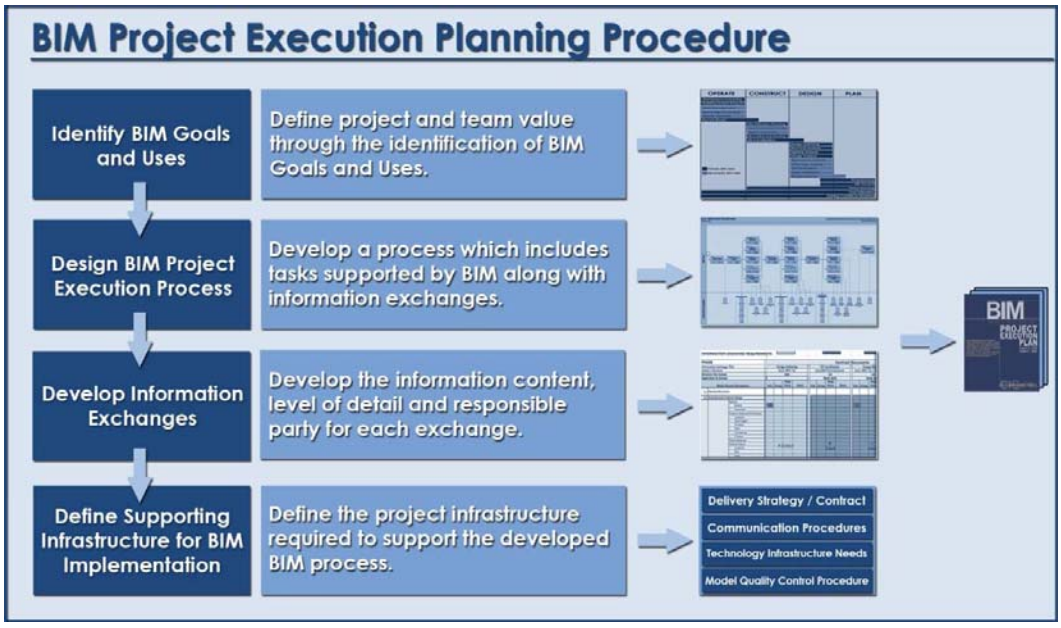
What BIM use will best support the work that will be done around a common theme for the project team and the collaboration necessary for working together?

What are common success factors for Integrated Project Delivery teams?

BIM EXECUTION PLANNING PROCEDURE

When moving forward with the IDP / BIM Thesis program in the spring, it is going to be very important to keep the group organized. There will be a few methods that will be implemented in order to effectively organize the IPD teams. One resource that will be used is the BIM Project Execution Planning Guide developed by the Computer Integrated Construction Research Program at The Pennsylvania State University.

Outlined in this guide is a four step procedure that helps to develop a detailed BIM plan for the project. The goal of this procedure is to help guide the early design participants to form consistent plans for the project. The four steps help to form goals and BIM uses for the specific project and develop a plan of execution of the BIM process. The graphic below from the BIM Project Execution Planning Guide outlines the planning procedure:



The group's main goal is to use the BIM Project Execution Planning Procedure is to help organize the goals of the group and explore possible BIM uses that can be developed when moving forward with the project. Once the group settles on a specific topic or focus, a plan can be shaped to best implement BIM on the project.

IDENTIFY PROJECT GOALS

The group had a two hour long session on November 10th, 2009 in order to learn about the BIM Execution Planning Guide and its possible benefit to the project. In attendance at this meeting was each of the four team members and three CIC research assistants. The CIC research team introduced the BIM Execution Planning Guide and explained the first step in the Planning Procedure. Focusing in the inefficiencies in the building, the group brainstormed some goals that they thought were important when investigating the issues in the New York Times Building. Once the group discussed the goals that they have for the project they explored the possible BIM uses for each goal that was listed. The goals that the group came up with are listed below:

Priority (1-3)	Goal Description	Potential BIM Uses
1- Most Important	**Value added objectives**	
1	Alternate Shading Techniques and Glazing	Energy Analysis, Lighting, Cost, design reviews, VM, DA
2	Increase the constructability of the façade	Structural, cost, phasing
2	Increase the comfortability of the building occupants	Lighting analysis, mechanical, cost analysis
2	Capture solar energy for heating degree days	Energy analysis, lighting analysis, Mechanical
1	Cost analysis of the façade for each design change	Cost, DA, DR
1	Keep the aesthetic appeal of the façade	DR, Programming Existing conditions
3	Decrease floor to floor height in order to add additional floors	DR, Programming, Cost, phasing, structural, 3D coordination, DA, Mechanical
2	Look at how to obtain a zero grid energy building	Mechanical, lighting, electrical, energy analysis, cost, site analysis
3	Utility cost analysis (cogen, natural gas, electricity)	Mechanical, lighting, electrical, energy analysis, cost, site analysis
3	Optimize the CoGen plant	Mechanical, lighting, electrical, energy analysis, cost, site analysis
2	Lateral system alternative	structural, cost, 3D coordination, DR, DA, Code validation, construction system design
3	Investigate serviceability of the structural system	Code validation, 3D coordination, cost, structural
3	Investigate the updated codes of NYC for concrete/steel **union** issue	No BIM

IDENTIFY POSSIBLE BIM USES

The BIM use analysis worksheet was used to give the group an idea of what BIM uses can be implemented on the project. The worksheet allows the group to identify the potential BIM uses by figuring out how each would add value to the overall project. The group went through each of the potential BIM uses and first rated each use on how much value it will add to the project. Once that was done the group came up with a list of all of the responsible parties for each BIM use. This helped in finding out who would need to contribute if the BIM use was selected for the project. Two other criteria were used to rate the value and risk that each party would get out of each use. These two were the value of the BIM use to each responsible party and the capability of each party to perform this BIM use. The capability rating was rated in three areas on a scale from 1-3, 1 being the least capable. The capability was rated on the whether the party had the resources to perform the BIM use, whether the party has the competency to implement the BIM use, and whether the party has experience in previously performing the particular BIM use.

All of these factors are considered when deciding if it is worth the effort to proceed with each of the BIM uses. The BIM use worksheet that was developed for this project by Team 3 is shown on the next page. Descriptions of the different BIM uses can be found in the BIM Execution Planning Guide.

MOVING FORWARD WITH BIM

As the project moves along into next semester it will be important to keep our project goals, as well as our BIM goals in mind. Further developing the BIM Execution Plan will help to organize the efforts of all of the group members.

By designing a BIM project execution process as the next step in the BIM Execution Planning Procedure, a roadmap of the BIM and project goals can be shown visually to help communicate the overall plan of the project group. Developing an accurate process model for the project will help keep the group on track and aware of the overall milestones of the project.

First, a list of the project phases must be laid out from the start of the spring semester through the final thesis presentations. Next, the group will discuss the different processes that must take place during each project phases in order to move on to the next phase of the project. It is important to make sure that the group comes up with a list of the resources that are necessary to complete each process and the deliverables that are required from each process alone the way. Having a realistic idea of the inputs and outputs of each process will make it easy to check the status of the project alone the way. Milestone meetings will be vital for the integrated project group to have between each phase of the project. A “Go – No Go” decision will be made in order to make sure we have all of the resources needed to move on to the next phase. At the conclusion of these meetings every team member will be on board and ready to attack the next phase.

Defining the information exchange requirements for each team member will help to keep communication lines open and help the keep the team together. The milestone meetings will help keep the group on the same page. Each member will be able to share their findings and analysis from the previous phase and update the group on what will be coming next.

Keeping the BIM Execution Planning Procedure in mind will help to shape the organization and increase the efficiency of the integrated project group.

BIM USE ANALYSIS WORKSHEET

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Building Systems Analysis	Med	Mech	High	2	1	1			**NO**
		L/E	High	2	1	1			
		CM	Med	1	1	1			
Cost Estimation	High	CM	High	2	1	1			**NO**
4D Modeling	Med	CM	Med	3	2	2			**Maybe**
Engineering Analysis	Med	Structural	High	1	1	1			**NO**
		Lighting	Med	2	1	1			
		Mech.	Med	2	1	1			
Design Reviews	Med	CM/Arch	High	3	2	1			**Maybe**
		L/E	High	3	2	2			
		Mech.	Low	1	1	1			
		Structural	Low	1	1	1			
3D Coordination (Design)	High	CM	High	3	2	2			**YES**
		Mech	Med	3	1	1			
		Structural	Med	3	1	1			
		L/E	Med	2	1	1			
Design Authoring	High	CM	High	3	3	3			**YES**
		Mech	High	3	2	2			
		L/E	High	3	2	2			
		Structural	High	3	2	2			

* Additional BIM Uses as well as information on each Use can be found at http://www.engr.psu.edu/ae/cic/bimex/

SUCCESS FACTORS FOR IPD TEAMS

One of the topics that were discussed at this year's PACE Roundtable event was the increased need for business networking in the building construction and design field. The emphasis was on the need for new types of relationships in the industry to accommodate a changing marketplace. A slowing economy paired with a rising demand for sustainable buildings has forced many companies to get creative in forming strategic partnerships with each other. Sustainable projects are requiring a more integrated approach to contracting in comparison to the majority of past projects.

The integrated approach to design and construction that leads to the most successful project is being found with projects that utilize a Design-Build or Integrated Project Delivery method of contracting. These delivery methods provide a way for designers and contractors to interact with each other and share ideas in an integrated manner by creating an infrastructure of sharing the risk of the project equally between all parties.

It is important to realize that not every partnership that is made will be a successful one. In order to form an integrated project team that can perform to its greatest potential there must be some consideration taken in forming the team. It will be important to investigate the various success factors that contribute to a thriving IPD team. Studying the Integrated Project Delivery contract from AIA will be important in order to come up with an idea of what terms are included in an IPD contract. Surveys can then be developed to give to contractors and designers that have participated in an IPD project. Data can be collected about what IPD teams thought contributed to a successful team and in turn a successful project.