BIM EXECUTION PLAN
FOR
MILLENNIUM SCIENCE COMPLEX

Developed By:

KGB Maser
Management. Engineering. Consulting.

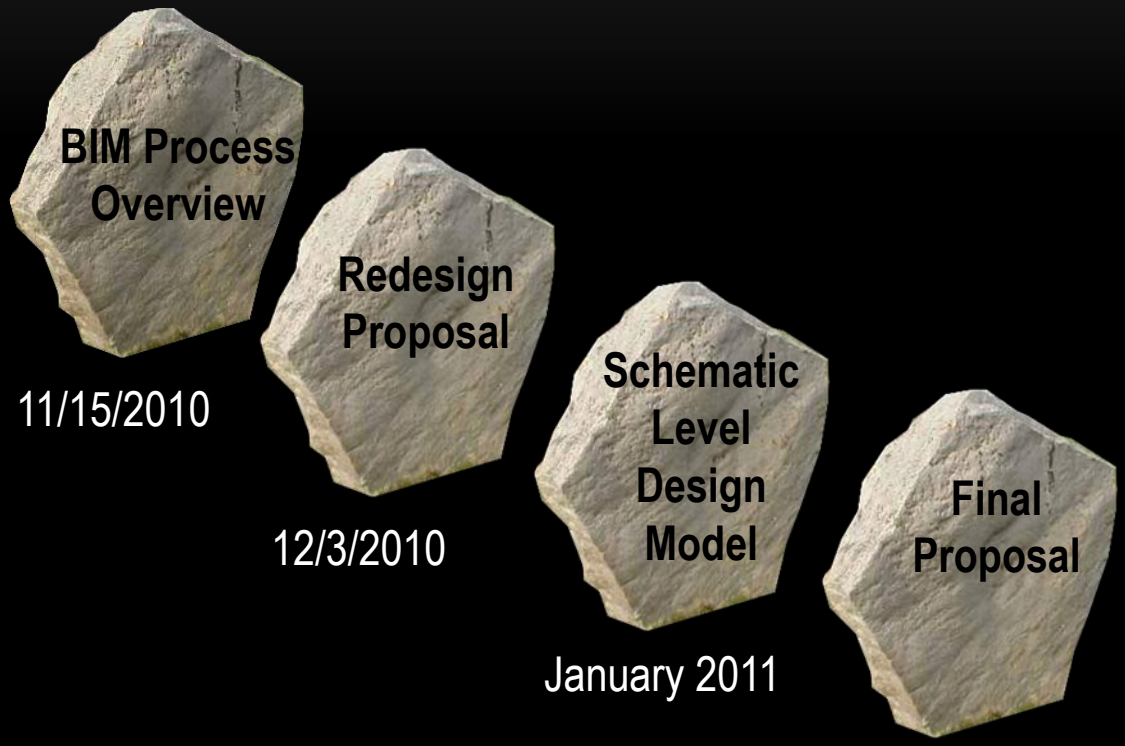
BIM MISSION STATEMENT

- “KGB Maser will utilize BIM to streamline the design process and effectively communicate building system designs to team members and advisors. BIM will be used as part of an integrated process to facilitate the investigation, coordination, and communication of the designs generated by our team. KGB Maser will use BIM to design, visualize, simulate, and analyze the designs that are developed for Millennium Science Complex.”

BIM MISSION STATEMENT

BIM + IPD → Success

PROJECT MILESTONES



PROJECT GOALS

- Develop multiple possibilities for a façade redesign of Millennium Science Complex.
- Develop multiple methods to reduce the energy consumption of Millennium Science Complex.
- Develop multiple coordinated, value engineered solutions for the building systems of Millennium Science Complex. (Structural, Lighting/Electrical, Mechanical)
- Develop a 4D model to identify concerns with phasing on campus, and to track the effects of design changes on the construction schedule.
- Utilize model based estimation programs to quickly assess the cost associated with various design changes.

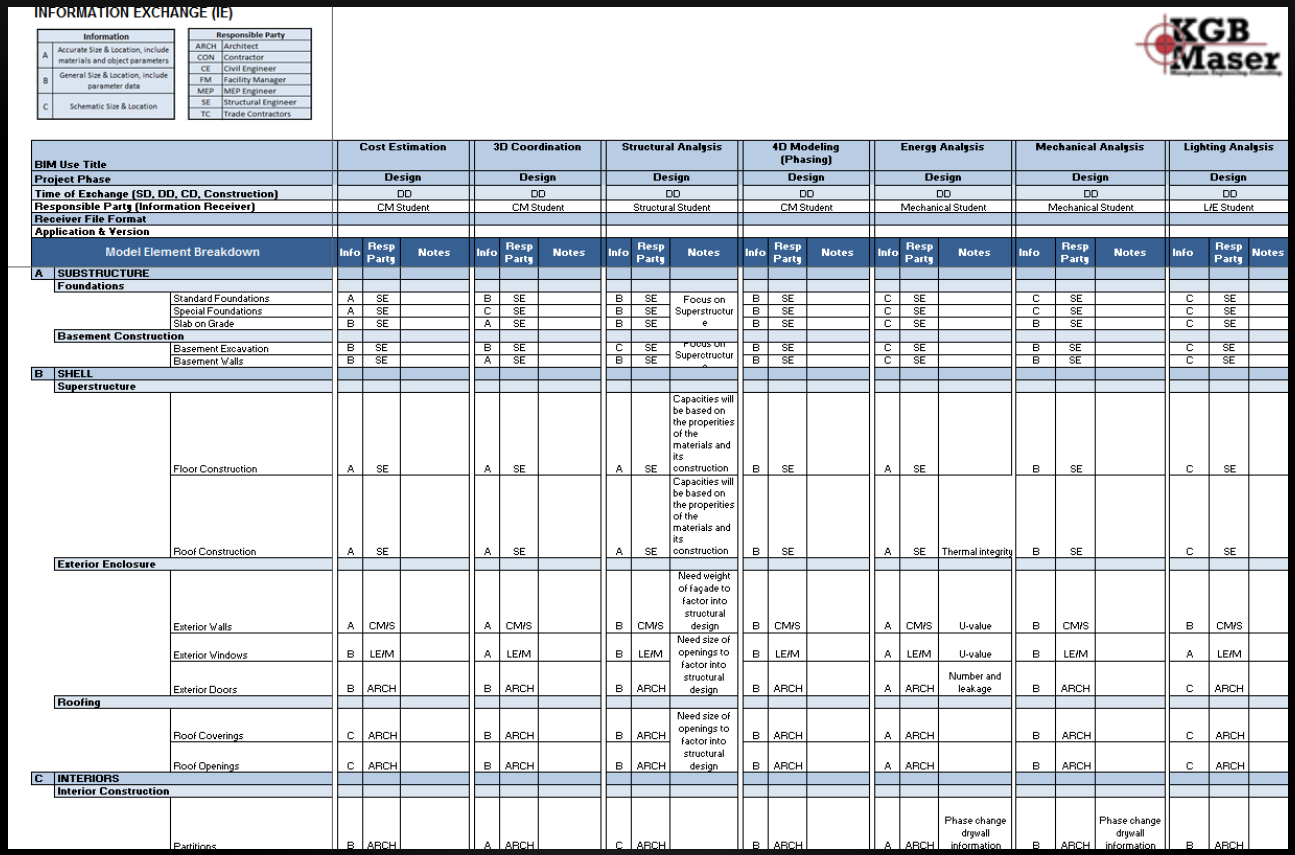
BIM USE ANALYSIS

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			
Maintenance Scheduling	Med	Facility Manager	High	3	2	1	Knowledge of future building use		**No**
		Contractor	Low	2	1	1			
		MEP Engineers	Med	2	1	1	Occupancy for engineering analysis		
Digital Fabrication	Low	Contractor	Low	1	1	1			**No**
		Subcontractors	Med	2	1	1			
Record Modeling	Med	Contractor	Med	2	2	2			**Maybe**
		Facility Manager	High	1	2	1			
		Designer	Med	3	3	3			
Cost Estimation	High	Contractor	High	2	1	1			**Yes**
4D Modeling	High	Contractor	High	3	2	2			**Yes**
Site Utilization Planning	High	Contractor	High	3	3	2			**Maybe**
Layout Control & Planning	Med	Contractor	Med	2	2	1			**No**
		Facility Manager	High	1	3	3			
3D Coordination	High	Contractor	High	3	3	3	For constructability		**Yes**
		Subcontractors	High	1	3	3			
		Architect	High	2	2	2			
		MEP Engineers	MED	2	2	1	For space requirements and sizing of equipment		
		Structural Engineer	High	2	2	1	For available desing options		
Engineering Analysis	Med	MEP Engineers	High	3	2	3	Occupancy, weather, systesms data		**Yes**
		Structural Engineer	High	3	2	2			
Site Analysis	Med	Contractor	Med	2	2	1			**Maybe**
		MEP Engineers	Med	2	2	1	Utility locations needed		
		Architect	Med	3	3	3	Site context		
Design Reviews	High	Architect	Low	1	2	1	Revit Models		**Yes**
		MEP Engineers	Med	2	2	2	Revit Models		
		Structural Engineer	Med	2	1	1	Revit Models		
Existing Conditions Modeling	High	Architect	High	3	3	3	Revit Models		**Yes**
		MEP Engineers	High	3	2	2	Revit Models, Energy Models		
		Structural Engineer	High	3	2	2	Revit Models		
Design Authoring	High	Architect	High	3	3	3			**Yes**

BIM USES

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING		DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		X	3D COORDINATION		3D COORDINATION		ASSET MANAGEMENT
		X	STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
		X	LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
		X	ENERGY ANALYSIS		RECORD MODELING		RECORD MODELING
		X	MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION	X	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

BIM INFORMATION EXCHANGES



INFORMATION EXCHANGE (IE)

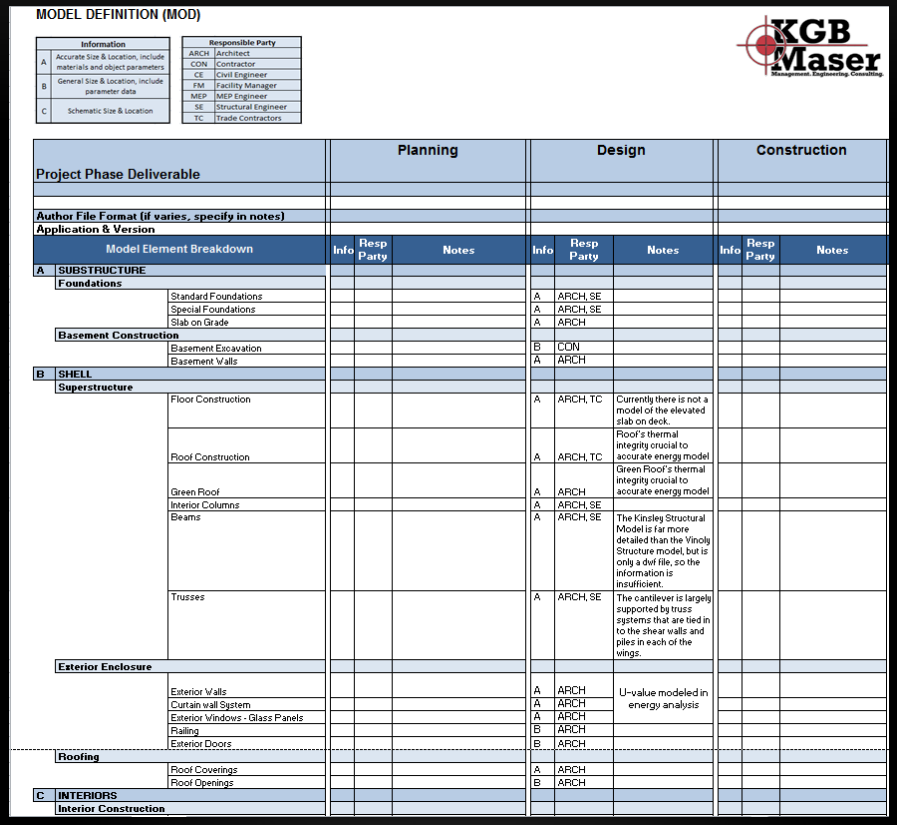
Information	
A	Accurate Size & Location, include materials and object parameters
B	General Size & Location, include parameter data
C	Schematic Size & Location

Responsible Party	
ARCH	Architect
CON	Contractor
CE	Civil Engineer
FM	Facility Manager
MEP	MEP Engineer
SE	Structural Engineer
TC	Trade Contractors

KGB Maser

BIM Use Title			Cost Estimation			3D Coordination			Structural Analysis			4D Modeling (Phasing)			Energy Analysis			Mechanical Analysis			Lighting Analysis		
Project Phase			Design			Design			Design			Design			Design			Design			Design		
Time of Exchange (SD, DD, CD, Construction)			DD			DD			DD			DD			DD			DD			DD		
Responsible Party (Information Receiver)			CM Student			CM Student			Structural Student			CM Student			Mechanical Student			Mechanical Student			L/E Student		
Receiver File Format																							
Application & Version																							
Model Element Breakdown			Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes
A	SUBSTRUCTURE																						
	Foundations																						
		Standard Foundations	A	SE		B	SE		B	SE	Focus on Superstructure	B	SE		C	SE		C	SE		C	SE	
		Special Foundations	A	SE		C	SE		B	SE		B	SE		C	SE		C	SE		C	SE	
		Slab on Grade	B	SE		A	SE		B	SE		B	SE		C	SE		B	SE		C	SE	
	Basement Construction																						
		Basement Excavation	B	SE		B	SE		C	SE	Focus on Superotructur	B	SE		C	SE		B	SE		C	SE	
		Basement Walls	B	SE		A	SE		B	SE		B	SE		C	SE		B	SE		C	SE	
B	SHELL																						
	Superstructure																						
		Floor Construction	A	SE		A	SE		A	SE	Capacities will be based on the properities of the materials and its construction	B	SE		A	SE		B	SE		C	SE	
		Roof Construction	A	SE		A	SE		A	SE	Capacities will be based on the properities of the materials and its construction	B	SE		A	SE	Thermal integrity	B	SE		C	SE	
	Exterior Enclosure																						
		Exterior Walls	A	CM/S		A	CM/S		B	CM/S	Need weight of façade to factor into structural design	B	CM/S		A	CM/S	U-value	B	CM/S		B	CM/S	
		Exterior Windows	B	LE/M		A	LE/M		B	LE/M	Need size of openings to factor into structural design	B	LE/M		A	LE/M	U-value	B	LE/M		A	LE/M	
		Exterior Doors	B	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH	Number and leakage	B	ARCH		C	ARCH	
	Roofing																						
		Roof Coverings	C	ARCH		B	ARCH		B	ARCH	Need size of openings to factor into structural design	B	ARCH		A	ARCH		B	ARCH		C	ARCH	
		Roof Openings	C	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH		B	ARCH		C	ARCH	
C	INTERIORS																						
	Interior Construction																						
		Partitions	B	ARCH		A	ARCH		C	ARCH		B	ARCH		A	ARCH	Phase change drywall information	B	ARCH	Phase change drywall information	B	ARCH	

MODEL DEFINITION



MODEL DEFINITION (MOD)

Information	
A	Accurate Size & Location, include materials and object parameters
B	General Size & Location, include parameter data
C	Schematic Size & Location

Responsible Party	
ARCH	Architect
CON	Contractor
CE	Civil Engineer
FM	Facility Manager
MEP	MEP Engineer
SE	Structural Engineer
TC	Trade Contractors

KGB Maser Management Engineering Consulting

Project Phase Deliverable		Planning			Design			Construction		
Author File Format (if varies, specify in notes)										
Application & Version										
Model Element Breakdown		**Info**	**Resp Party**	**Notes**	**Info**	**Resp Party**	**Notes**	**Info**	**Resp Party**	**Notes**
A	**SUBSTRUCTURE**									
	Foundations									
	Standard Foundations				A	ARCH, SE				
	Special Foundations				A	ARCH, SE				
	Slab on Grade				A	ARCH				
	Basement Construction									
	Basement Excavation				B	CON				
	Basement Walls				A	ARCH				
B	**SHELL**									
	Superstructure									
	Floor Construction				A	ARCH, TC	Currently there is not a model of the elevated slab on deck.			
	Roof Construction				A	ARCH, TC	Roof's thermal integrity crucial to accurate energy model			
	Green Roof				A	ARCH	Green Roof's thermal integrity crucial to accurate energy model			
	Interior Columns				A	ARCH, SE				
	Beams				A	ARCH, SE	The Kinsley Structural Model is far more detailed than the Vinoly Structure model, but is only a dwf file, so the information is insufficient.			
	Trusses				A	ARCH, SE	The cantilever is largely supported by truss systems that are tied in to the shear walls and piles in each of the wings.			
	Exterior Enclosure									
	Exterior Walls				A	ARCH	U-value modeled in energy analysis			
	Curtain wall System				A	ARCH				
	Exterior Windows - Glass Panels				A	ARCH				
	Railing				B	ARCH				
	Exterior Doors				B	ARCH				
	Roofing									
	Roof Coverings				A	ARCH				
	Roof Openings				B	ARCH				
C	**INTERIORS**									
	Interior Construction									

KGB MASER ROLES & RESPONSIBILITIES

- Each member is responsible to utilize BIM to accomplish the team goals, and to sufficiently develop and communicate the design proposal, for each discipline, to the other team members.
- The Structural, Lighting/Electrical, & Mechanical team members will be developing value engineered designs that focus in their option.
- The Construction Management student will be focusing on cost effective designs, and evaluating the cost and schedule implications of the other design proposals developed.
- KGB Maser's configuration as a team enables the team to easily work in an integrated atmosphere.

STRUCTURAL – BIM USE

- Construction of existing conditions analytical model in ETABS
  - Collaborative effort between structural students
- Analytical model of proposed design
  - Preliminary hand calculations lead to initial member sizes for proposal model
  - Existing conditions model provides a reference and base for editing the analytical model
  - Multiple evaluations of analytical model will be necessary for a final design
- Revit model of proposed design
  - The ETABS model will be exported to Revit Structure
- Navisworks Model
  - Used to confirm constructability of final design by checking conflicts

MECHANICAL – BIM USE

- Existing conditions analytical model in Revit MEP/ Revit Architecture
  - Collaborative effort between mechanical students for early analysis and energy modeling
- Revit MEP model of proposed design
  - Implementation of chilled beam, DOAS, and radiant floor heating into model
- Energy Analysis Model
  - Trane TRACE model will be used to analyze the differences in energy consumption between existing and proposed designs
- Navisworks Model
  - Used for 3D coordination of final design of all disciplines

LIGHTING/ELECTRICAL – BIM USE

- Develop energy efficient and coordinated lighting designs.
  - Integrated Design Development
  - 3D Clash Detection
- Room geometries for analysis.
  - Revit Architecture Model
- Coordination with Mechanical Option
  - Energy Modeling

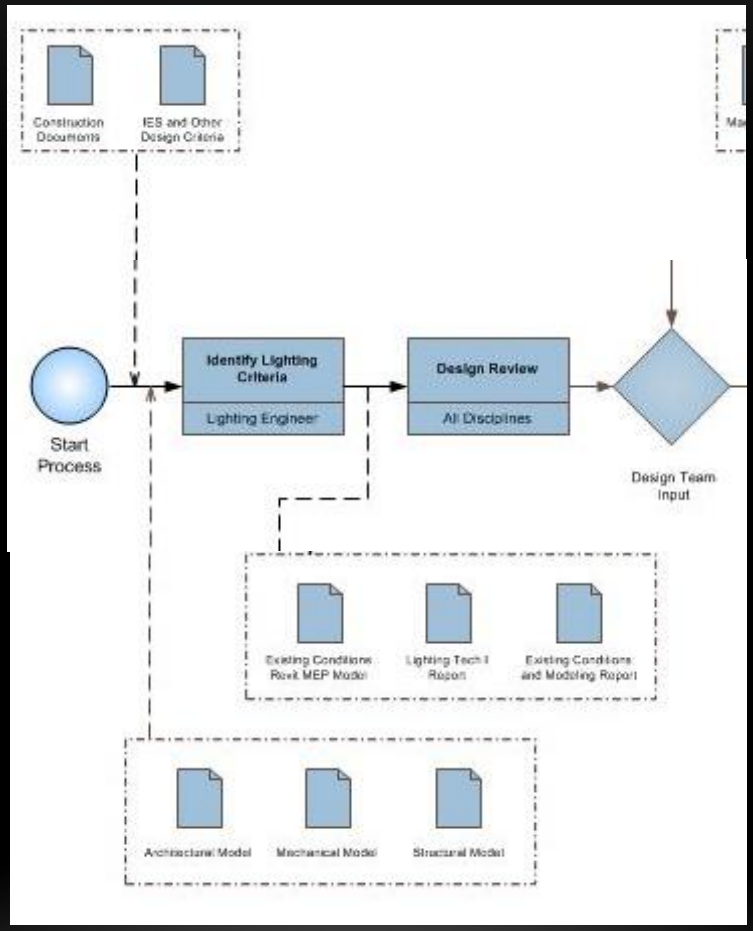
CONSTRUCTION MANAGEMENT – BIM USE

- Begin with a detailed model of the existing structure and site.
  - Existing Conditions Modeling – Revit Architecture, Structure, MEP
- Quickly measure the affect on cost and schedule of design changes by our team.
  - 4D Modeling
  - Autodesk Quantity Takeoff & Revit Architecture
- Develop efficient and coordinated designs through and integrated atmosphere.
  - Integrated Design Development
  - 3D Clash Detection
- Develop a detailed project phasing and site logistics model.
  - 4D Modeling
  - Site Logistics Planning

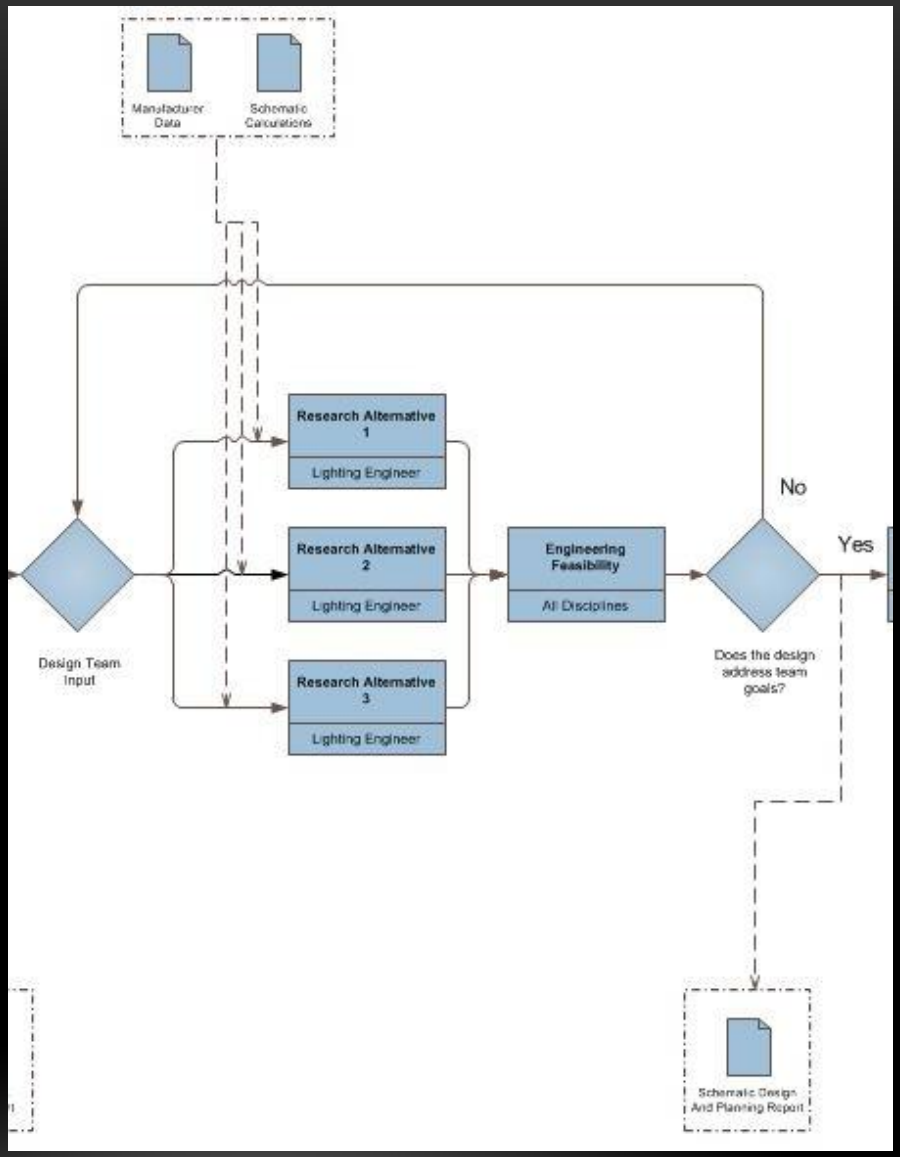
TEAM BIM PROCESS OVERVIEW

- The team will use BIM software to develop the proposal and finalize the design going from individual efforts into a collaborative process
- Using software such as ETABS, Trane Trace, AutoDesk Quantity Takeoff, and other programs, the team will combine their discipline specific designs into a final Revit Model
- Exporting the Revit model into Navisworks, the team will evaluate their individual designs in terms of the scope of the entire project
- A final design will be formed from the collaborative models

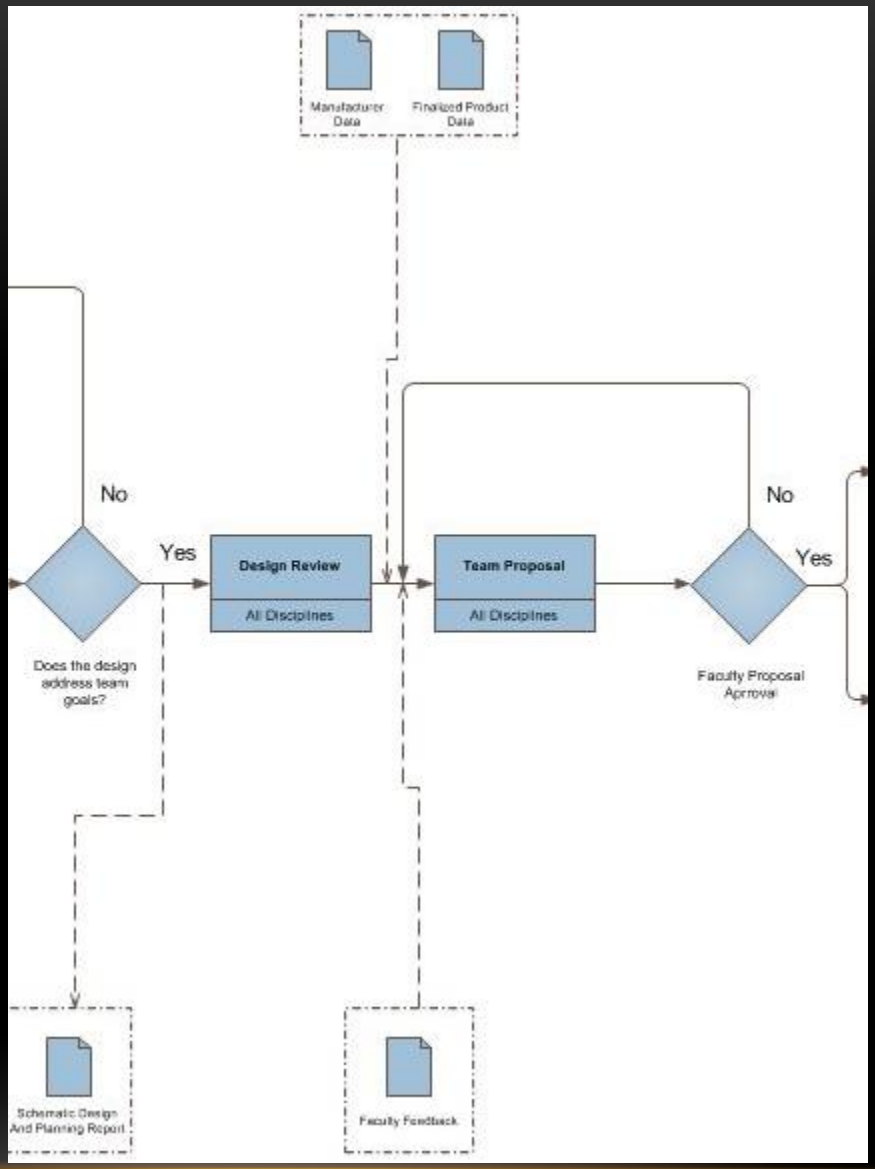
BIM PROCESS – LIGHTING/ELECTRICAL PROCESS



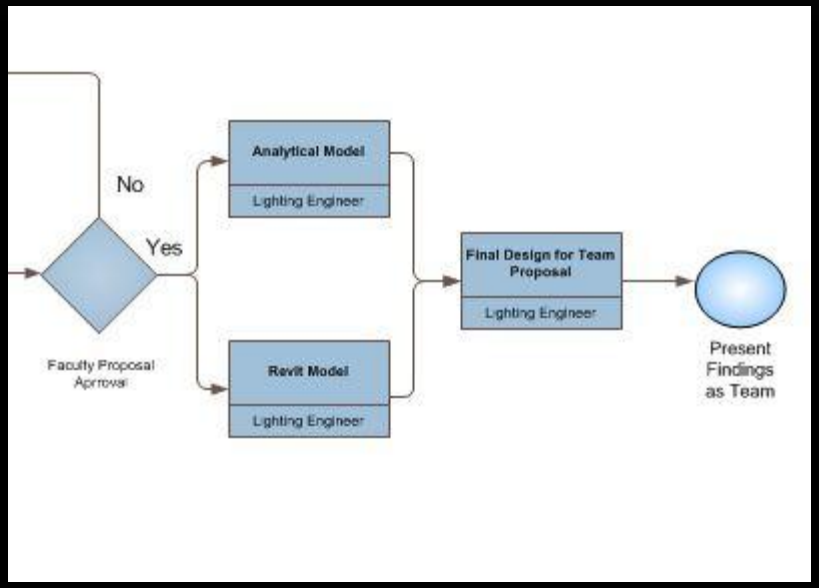
BIM PROCESS


Manufacturer Data
Schematic Calculations
Research Alternative 1
Lighting Engineer
Research Alternative 2
Lighting Engineer
Research Alternative 3
Lighting Engineer
Engineering Feasibility
All Disciplines
No
Yes
Design Team Input
Does the design address team goals?
Schematic Design And Planning Report

BIM PROCESS

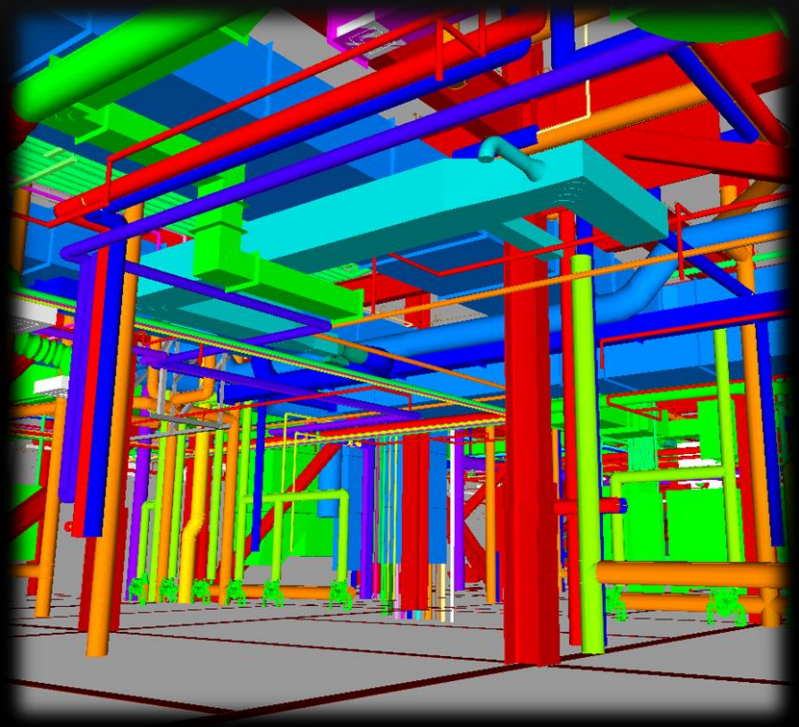

Manufacturer Data
Finalized Product Data
No
Yes
Design Review
All Disciplines
Team Proposal
All Disciplines
No
Yes
Does the design address team goals?
Faculty Proposal Aprroval
Schematic Design And Planning Report
Faculty Feedback

BIM PROCESS


No
Yes
Faculty Proposal
Aprroval
Analytical Model
Lighting Engineer
Revit Model
Lighting Engineer
Final Design for Team Proposal
Lighting Engineer
Present Findings as Team

PROJECT DELIVERABLES

- Energy Use Analysis
- Structural Analysis
- Lighting & Daylighting Analysis
- Mechanical Analysis
- 4D Model
- Cost Implication Summary



RECAP & THE NEXT STEP

- KGB Maser developed a BIM Execution Plan in order to:
  - Know the steps to create each deliverable that is desired for the final proposal.
  - Evaluate the uses and methods of BIM that will be used by KGB Maser
- Our next step is to:
  - Decide which of our design alternatives best suit the project and the owner.
  - Decide which design alternatives are most life cycle cost beneficial to the owner.
  - Begin to develop our chosen design alternatives.
- Questions?