BIM PROJECT EXECUTION PLAN

FOR

Millennium Science Complex

DEVELOPED BY

KGB Maser

KGB Maser
Management. Engineering. Consulting.

BIM PROJECT EXECUTION PLAN
VERSION 2.0
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SECTION A: BIM PROJECT EXECUTION PLAN OVERVIEW

TO SUCCESSFULLY IMPLEMENT BUILDING INFORMATION MODELING (BIM) ON A PROJECT, KGB MASER HAS DEVELOPED THIS DETAILED BIM PROJECT EXECUTION PLAN. THIS BIM PROJECT EXECUTION PLAN DEFINES THE BIM USES THAT WILL BE UTILIZED ON THIS PROJECT, AND A DETAILED DESIGN OF THE PROCESS FOR EXECUTING BIM THROUGHOUT THE PROJECT LIFECYCLE.

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 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.

SECTION B: PROJECT INFORMATION

1. **PROJECT OWNER:** THE PENNSYLVANIA STATE UNIVERSITY
2. **PROJECT NAME:** MILLENNIUM SCIENCE COMPLEX
3. **PROJECT LOCATION AND ADDRESS:** UNIVERSITY PARK, PA 16802
4. **CONTRACT TYPE / DELIVERY METHOD:** CM AGENCY/DESIGN BID BUILD
5. **BRIEF PROJECT DESCRIPTION:** THE MILLENNIUM SCIENCE COMPLEX IS A NEW 275,000 SF BUILDING THAT WILL BRING TOGETHER THE HUCK INSTITUTES OF LIFE SCIENCES AND MATERIALS RESEARCH. THE FOUR-LEVEL STEEL STRUCTURE, WITH VARYING CANTILEVERED TIERS, IS CLAD IN PRE-CAST, CURTAIN WALL AND METAL PANELS. ONE OF THE BUILDING'S SIGNATURE FEATURES IS A 150-FOOT CANTILEVER AT THE MAIN ENTRANCE. THE CANTILEVER INCLUDES AN OPENING IN THE ROOF TO ALLOW SUN TO REACH THE GARDEN PLAZA BENEATH. GREEN ROOFS WILL REDUCE STORM WATER RUNOFF, ENHANCE ENERGY EFFICIENCY AND AID IN ACHIEVING LEED CERTIFICATION.

   INCLUDED IN THE MILLENNIUM SCIENCE COMPLEX IS A 20,000 SF VIVARIUM, 40,000 SF QUIET LAB, AND 9,500 SF NANO-CLEAN ROOM. THE SCIENTISTS WILL ALSO UTILIZE 66 FUME HOODS, 32 VENTED GAS CABINETS, AND 30 BIO-SAFETY CABINETS.

6. **PROJECT SCHEDULE / PHASES / MILESTONES:**

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
BIM PROCESS OVERVIEW REPORT	11/8/2010	11/15/2010	CM, L/E, S, M
REDESIGN PROPOSAL	11/16/2010	12/3/2010	CM, L/E, S, M
SCHEMATIC LEVEL DESIGN MODEL	12/4/2010	JANUARY 2011	CM, L/E, S, M
FINAL PROPOSAL	JANUARY 2011	APRIL 2011	CM, L/E, S, M

SECTION C: KEY PROJECT CONTACTS

List of lead BIM contacts for each organization on the project. Additional contacts can be included later in the document.

ROLE	ORGANIZATION	CONTACT NAME	LOCATION	E-MAIL
CM-Student	PSU-AE	David Maser	University Park, PA	Drm5087@psu.edu
L/E-Student	PSU-AE	Jason Brognano	University Park, PA	Jcb5133@psu.edu
Mech.-Student	PSU-AE	Michael Gilroy	University Park, PA	Mpg5034@psu.edu
Struct.-Student	PSU-AE	Stephen Kijak	University Park, PA	Sak5093@psu.edu
CM-Advisor	PSU-AE	John Messner	University Park, PA	Jmessner@psu.edu
L/E-Advisor	PSU-AE	Richard Mistrick	University Park, PA	Rmistrick@psu.edu
Mech.-Advisor	PSU-AE	Jelena Srebric	University Park, PA	Jsrebric@psu.edu
Struct.-Advisor	PSU-AE	Andres Lepage	University Park, PA	Alepage@psu.edu
CM-Contact	Whiting-Turner	Chris Dolan	University Park, PA	Chris.dolan@whiting-turner.com
Owner-Contact	OPP	John Bechtel	University Park, PA	Jrb115@psu.edu
MEP-Contact	Flack & Kurtz	Eric Mitchell		
BIM-TA	PSU-AE	Ryan Solnosky	University Park, PA	Rls5008@psu.edu
BIM-Professor	PSU-AE	Kevin Parfitt	University Park, PA	mkp@psu.edu
BIM-Professor	PSU-AE	Robert Holland	University Park, PA	RJHolland@psu.edu

SECTION D: PROJECT GOALS / BIM USES

DESCRIBE HOW THE BIM MODEL AND FACILITY DATA ARE LEVERAGED TO MAXIMIZE PROJECT VALUE (E.G. DESIGN ALTERNATIVES, LIFE-CYCLE ANALYSIS, SCHEDULING, ESTIMATING, MATERIAL SELECTION, PRE-FABRICATION OPPORTUNITIES, SITE PLACEMENT, ETC.) REFERENCE WWW.ENGR.PSU.EDU/BIM/DOWNLOAD FOR BIM GOAL & USE ANALYSIS WORKSHEET.

1. MAJOR BIM GOALS / OBJECTIVES:

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
MED	WE WILL UTILIZE BIM TO INVESTIGATE AND DEVELOP POSSIBLE FAÇADE REDESIGNS FOR MILLENNIUM SCIENCE COMPLEX.	3D COORDINATION, STRUCTURAL ANALYSIS, LIGHTING ANALYSIS, ENERGY ANALYSIS, COST ESTIMATION
HIGH	WE WILL UTILIZE BIM TO EVALUATE AND DEVELOP METHODS TO REDUCE THE ENERGY CONSUMPTION OF MILLENNIUM SCIENCE COMPLEX.	MECHANICAL ANALYSIS, ENERGY ANALYSIS, LIGHTING ANALYSIS
HIGH	WE WILL UTILIZE BIM TO INVESTIGATE AND DEVELOP VALUE ENGINEERING EFFORTS FOR OTHER SYSTEMS OF MILLENNIUM SCIENCE COMPLEX.	3D COORDINATION, STRUCTURAL ANALYSIS, MECHANICAL ANALYSIS, LIGHTING ANALYSIS, ENERGY ANALYSIS, 4D MODELING, COST ESTIMATION.
HIGH	WE WILL UTILIZE BIM TO IDENTIFY CONCERNS ASSOCIATED WITH PHASING ON CAMPUS.	4D MODELING, SITE UTILIZATION PLANNING
HIGH	WE WILL UTILIZE BIM AND MODEL BASED ESTIMATION PROGRAMS TO QUICKLY ASSES COST ASSOCIATED WITH DESIGN CHANGES.	COST ESTIMATION, DESIGN REVIEWS
MED	WE WILL UTILIZE BIM TO EFFECTIVELY TRACK THE SCHEDULE IMPLICATIONS OF DESIGN CHANGES.	4D MODELING, DESIGN REVIEWS

2. BIM USE ANALYSIS WORKSHEET: ATTACHMENT 1

REFERENCE WWW.ENGR.PSU.EDU/BIM/DOWNLOAD FOR BIM GOAL & USE ANALYSIS WORKSHEET. ATTACH BIM USE ANALYSIS WORKSHEET AS ATTACHMENT 1.

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	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		

3. 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

SECTION E: ORGANIZATIONAL ROLES / STAFFING

1. BIM ROLES AND RESPONSIBILITIES:

THE ROLES AND RESPONSIBILITIES OF EACH MEMBER OF KGB MASER WILL BE TO UTILIZE BIM TO ACCOMPLISH OUR GOALS, AND TO SUFFICIENTLY DEVELOP AND COMMUNICATE THEIR DESIGN PROPOSALS TO THE ENTIRE TEAM, AND REVIEW COMMITTEE. THE CM-STUDENT, DAVID MASER, WILL PLAY A ROLE OF A CONSTRUCTION AGENT, WHICH WILL PROVIDE CONSTRUCTABILITY INPUT, COST IMPLICATIONS OF DESIGN CHANGES, AND SCHEDULING ADVICE.

THE L/E STUDENT, JASON BROGNANO, WILL CONTINUE TO DEVELOP VALUE ENGINEERED DESIGNS FOR MILLENNIUM SCIENCE COMPLEX THAT WILL FOCUS ON DAYLIGHTING OPPORTUNITIES, ENERGY USAGE, AND EFFICIENT LIGHTING DESIGNS.

THE MECHANICAL STUDENT, MICHAEL GILROY, WILL INVESTIGATE AND DEVELOP VALUE ENGINEERED DESIGNS FOR MILLENNIUM SCIENCE COMPLEX THAT WILL FOCUS ON REDUCING THE ENERGY CONSUMPTION BY THE BUILDING AND IMPROVING THE SUSTAINABLE ASPECTS. USING BIM, THE ADDITION OF A 100% DEDICATED OUTDOOR AIR SYSTEM WITH ACTIVE CHILLED BEAM COOLING AND RADIANT FLOOR HEATING WILL BE EVALUATED WHERE POSSIBLE WITHIN THE BUILDING. ALSO, AN ANALYSIS OF REDUCING THE FACE VELOCITIES OF THE FUME HOODS WILL BE PERFORMED TO ASSESS ENERGY PERFORMANCE VERSUS USER SAFETY.

THE STRUCTURAL STUDENT, STEPHEN KIJAK, WILL INVESTIGATE AND DEVELOP VALUE ENGINEERED DESIGNS FOR MILLENNIUM SCIENCE COMPLEX THAT WILL FOCUS ON DEVELOPING EFFICIENT STRUCTURAL SYSTEM ALTERNATIVES, AS WELL AS RESEARCH AND DEVELOP VARIOUS DESIGNS TO SUPPORT THE CANTILEVER.

THE CONFIGURATION OF KGB MASER ENABLES THE TEAM TO EASILY WORK IN AN INTEGRATED ATMOSPHERE. EACH MEMBER OF THE DESIGN AND CONSTRUCTION TEAMS ARE ALL IN ONE LOCATION, WHICH ENABLES THE TEAM TO WORK IN A TASK FOCUSED METHOD. KGB MASER WILL WORK ON SPECIFIC AREAS OF CONCERN AS AN INTERDISCIPLINARY TEAM, AND STRIVE TO MEET THE GOALS SET FORTH BY OUR TEAM. THE INTERDISCIPLINARY APPROACH WILL ULTIMATELY PROVIDE DIFFERENT PERSPECTIVES TO SOLVING PROBLEMS, WITH EACH MEMBER HAVING VARIED SPECIALTIES, BACKGROUNDS, AND EXPERIENCES.

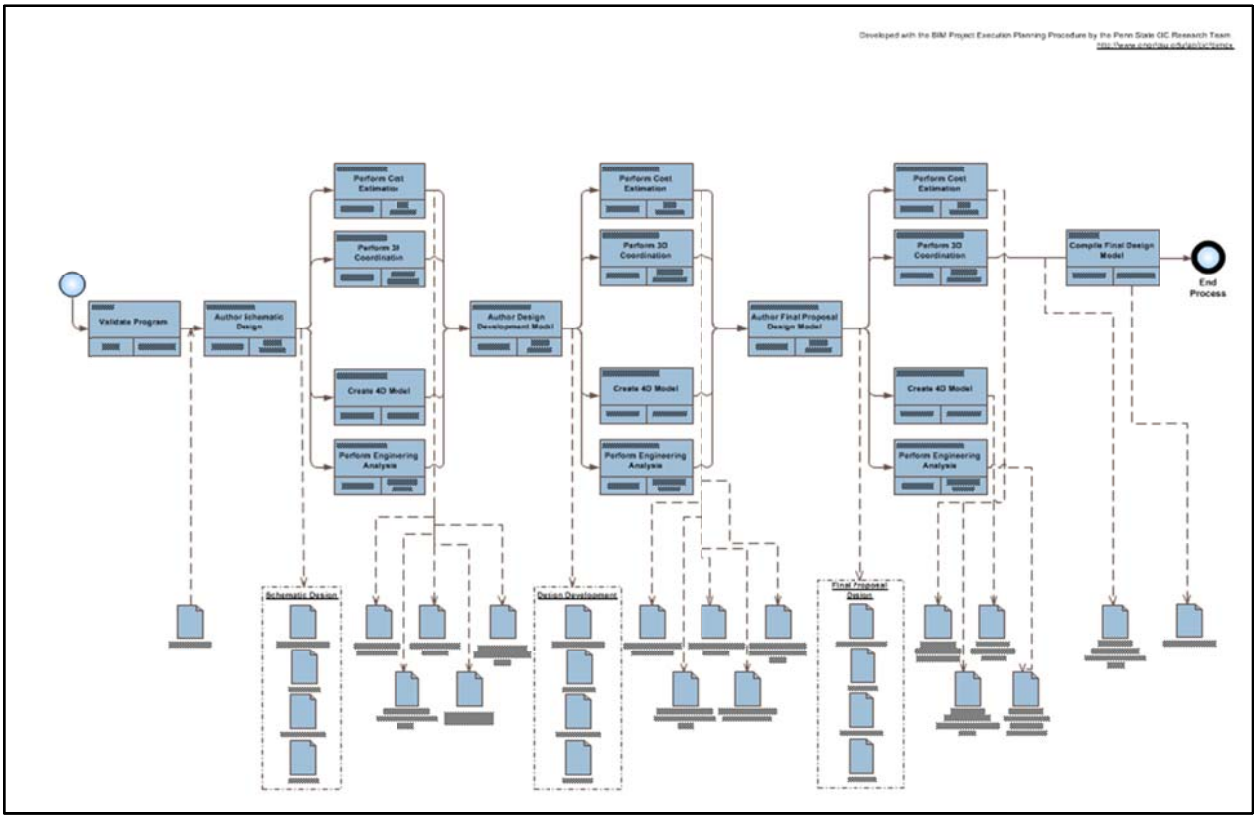
2. BIM USE STAFFING

BIM USE	ORGANIZATION	NUMBER OF TOTAL STAFF FOR BIM USE	ESTIMATED WORKER HOURS	LEAD CONTACT
EXISTING CONDITIONS MODELING	WHITING-TURNER	1	PREVIOUSLY COMPLETED	CHRIS DOLAN
COST ESTIMATION	KGB MASER	1	10	DAVID MASER
PHASE PLANNING (4D) MODELING	KGB MASER	1	10	DAVID MASER
ENERGY ANALYSIS	KGB MASER	2	4	MICHAEL GILROY
MECHANICAL ANALYSIS	KGB MASER	1	4	MICHAEL GILROY
STRUCTURAL ANALYSIS	KGB MASER	1	4	STEPHEN KIJAK
LIGHTING ANALYSIS	KGB MASER	1	5	JASON BROGNANO
3D COORDINATION	KGB MASER	4	10	DAVID MASER

SECTION F: BIM PROCESS DESIGN

PROCESS MAPS HAVE BEEN PROVIDED FOR EACH BIM USE SELECTED IN SECTION D: PROJECT GOALS/BIM OBJECTIVES. THESE PROCESS MAPS PROVIDE A DETAILED PLAN FOR EXECUTION OF EACH BIM USE. THEY ALSO DEFINE THE SPECIFIC INFORMATION EXCHANGES FOR EACH ACTIVITY, BUILDING THE FOUNDATION FOR THE ENTIRE EXECUTION PLAN. THE PLAN INCLUDES THE OVERVIEW MAP (LEVEL 1) OF THE BIM USES, A DETAILED MAP OF EACH BIM USE (LEVEL 2), AND A DESCRIPTION OF ELEMENTS ON EACH MAP, AS APPROPRIATE.

1. LEVEL ONE PROCESS OVERVIEW MAP: ATTACHMENT 2



2. LIST OF LEVEL TWO – DETAILED BIM USE PROCESS MAP(S): ATTACHMENT 3

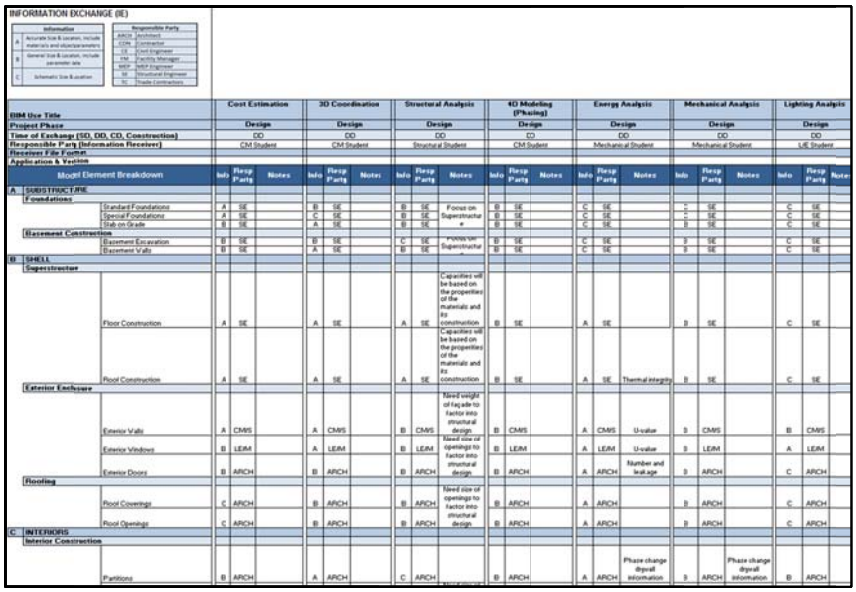
a. EXISTING CONDITIONS MODELING
b. COST ESTIMATION
c. PHASE PLANNING (4D MODELING)
d. ENERGY ANALYSIS
e. MECHANICAL ANALYSIS
f. STRUCTURAL ANALYSIS
g. LIGHTING ANALYSIS
h. 3D COORDINATION

SECTION G: BIM INFORMATION EXCHANGES

MODEL ELEMENTS BY DISCIPLINE, LEVEL OF DETAIL, AND ANY SPECIFIC ATTRIBUTES IMPORTANT TO THE PROJECT ARE DOCUMENTED USING INFORMATION EXCHANGE WORKSHEET. SEE CHAPTER FOUR: DEFINING THE REQUIREMENTS FOR INFORMATION EXCHANGES IN THE BIM PROJECT EXECUTION PLANNING GUIDE FOR DETAILS ON COMPLETING THIS TEMPLATE.

1. LIST OF INFORMATION EXCHANGE WORKSHEET(S): ATTACHMENT 4

a. EXISTING CONDITIONS MODELING
b. COST ESTIMATION
c. PHASE PLANNING (4D MODELING)
d. ENERGY ANALYSIS
e. MECHANICAL ANALYSIS
f. STRUCTURAL ANALYSIS
g. LIGHTING ANALYSIS
h. 3D COORDINATION

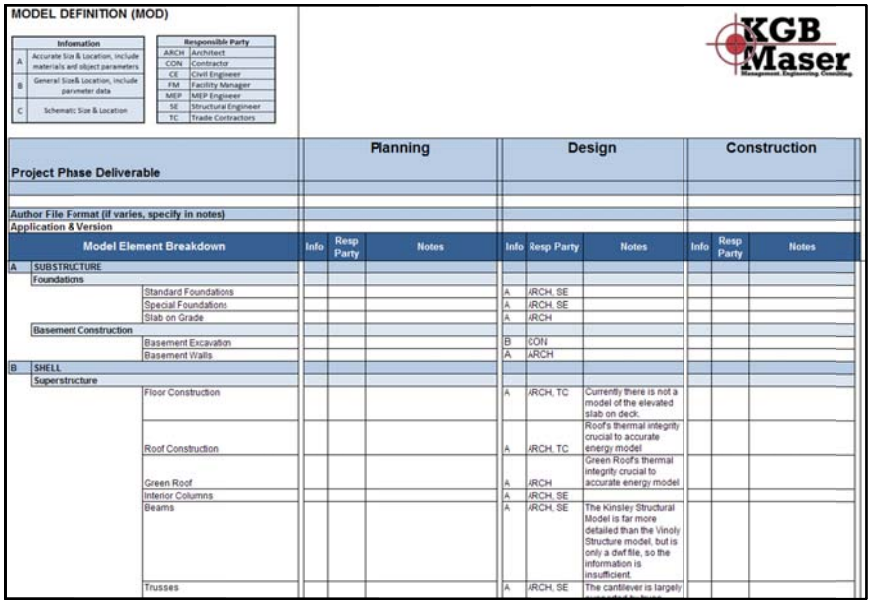

INFORMATION EXCHANGE (IE)

Information	Responsible Party
A Accurate Size & Location, include materials and object parameters	ARCH Architect
B General Size & Location, include parameter data	CON Contractor
C Schematic Size & Location	CE Civil Engineer
	FM Facility Manager
	MEP MEP Engineer
	SE Structural Engineer
	TC Trade Contractors

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	CD	DD	DD	DD
Responsible Party (Information Receiver)	CM Student	CM Student	Structural Student	CM Student	Mechanical Student	Mechanical Student	LiE Student
Receivers 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		3	SE		C	SE	
Special Foundations	A	SE		C	SE		B	SE		B	SE		C	SE		3	SE		C	SE	
Slab on Grade	B	SE		A	SE		B	SE		B	SE		C	SE		3	SE		C	SE	
Basement Construction																					
Basement Excavation	B	SE		B	SE		C	SE	Focus on Superstructure	B	SE		C	SE		3	SE		C	SE	
Basement Walls	B	SE		A	SE		B	SE		B	SE		C	SE		3	SE		C	SE	
B SHELL																					
Superstructure																					
Floor Construction	A	SE		A	SE		A	SE	Capacities will be based on the properties of the materials and its construction	B	SE		A	SE		3	SE		C	SE	
Roof Construction	A	SE		A	SE		A	SE	Capacities will be based on the properties of the materials and its construction	B	SE		A	SE	Thermal integrity	3	SE		C	SE	
Exterior Enclosure																					
Exterior Walls	A	CMS		A	CMS		B	CMS	Need weight of façade to factor into structural design	B	CMS		A	CMS	U-value	3	CMS		B	CMS	
Exterior Windows	B	LEM		A	LEM		B	LEM	Need size of openings to factor into structural design	B	LEM		A	LEM	U-value	3	LEM		A	LEM	
Exterior Doors	B	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH	Number and leakage	3	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		3	ARCH		C	ARCH	
Roof Openings	C	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH		3	ARCH		C	ARCH	
C INTERIORS																					
Interior Construction																					
Partitions	B	ARCH		A	ARCH		C	ARCH		B	ARCH		A	ARCH	Phase change drywall information	3	ARCH	Phase change drywall information	B	ARCH	

2. MODEL DEFINITION WORKSHEET: ATTACHMENT 5


MODEL DEFINITION (MOD)

Information	Responsible Party
A Accurate Size & Location, include materials and object parameters	ARCH Architect
B General Size& Location, include parameter data	CON Contractor
C Schematic Size & Location	CE Civil Engineer
	FM Facility Manager
	MEP MEP Engineer
	SE Structural Engineer
	TC Trade Contractors

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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			

SECTION H: COLLABORATION PROCEDURES

1. **COLLABORATION STRATEGY:** KGB MASER WILL WORK AS AN INTEGRATED TEAM, IN WHICH THERE IS A REPRESENTATIVE FROM EACH DISCIPLINE. (STRUCTURAL ENGINEER, MECHANICAL ENGINEER, LIGHTING/ELECTRICAL ENGINEER, & A CONSTRUCTION MANAGER) THE INTEGRATED PROJECT DELIVERY STRATEGY THAT KGB MASER IS ENABLED TO WORK IN, WILL INTEGRATE PEOPLE, SYSTEMS, DESIGNS, AND KNOWLEDGE. KGB MASER IS ENABLED TO WORK TOGETHER IN A COMMON FACILITY, 333 SACKETT, AND DIRECTLY SEE THE IMPACT OF EACH DISCIPLINES DESIGN CHANGES. KGB MASER WILL BE ABLE TO COORDINATE EFFECTIVE, AND QUALITY DESIGNS EASIER BY WORKING IN AN INTEGRATED ATMOSPHERE.

2. **MEETING PROCEDURES:**

MEETING TYPE	PROJECT STAGE	DATE & FREQUENCY	PARTICIPANTS	LOCATION
BIM REQUIREMENTS KICK-OFF	BIM PROCESS OVERVIEW REPORT	TWO/WEEK	CM STUDENT, L/E STUDENT, MECH STUDENT, STRUCT STUDENT	333 SACKETT
BIM EXECUTION PLAN PRESENTATION	BIM PROCESS OVERVIEW REPORT	ONCE (11/18/10)	CM STUDENT, L/E STUDENT, MECH STUDENT, STRUCT STUDENT	162 WILLARD
DESIGN COORDINATION	REDESIGN PROPOSAL – FINAL PROPOSAL	ONE/WEEK	CM STUDENT, L/E STUDENT, MECH STUDENT, STRUCT STUDENT	333 SACKETT
DESIGN REVIEWS	REDESIGN PROPOSAL – FINAL PROPOSAL	ONE/WEEK	CM STUDENT, L/E STUDENT, MECH STUDENT, STRUCT STUDENT	333 SACKETT

3. MODEL DELIVERY SCHEDULE OF INFORMATION EXCHANGE FOR SUBMISSION AND APPROVAL:

INFORMATION EXCHANGE	FILE SENDER	FILE RECEIVER	ONE-TIME or FREQUENCY	DUE DATE or START DATE	MODEL FILE	MODEL SOFTWARE	NATIVE FILE TYPE	FILE EXCHANGE TYPE
3D COORDINATION	STRUCTURAL STUDENT	CM-STUDENT	WEEKLY	12/3/2010	STRUCT	REVIT STRUCTURE	.RVT	.RVT TO .NWD
	MECHANICAL STUDENT	CM-STUDENT	WEEKLY	12/3/2010	MEP	REVIT MEP	.RVT	.RVT TO .NWD
	LIGHTING/ELECTRICAL STUDENT	CM-STUDENT	WEEKLY	12/3/2010	MEP	REVIT MEP	.RVT	.RVT TO .NWD

4. INTERACTIVE WORKSPACE

THE WORKSPACE THAT HAS BEEN PROVIDED FOR KGB MASER TO WORK IN IS LOCATED AT 333 SACKETT. THIS FACILITY HAS THREE ALIENWARE COMPUTERS EACH WITH 24 GB OF RAM AND AN I7 920 PROCESSOR. THE WORK SPACE ALSO HAS CONFERENCE TABLES FOR KGB MASER TO COLLABORATE AND DEVELOP IDEAS AT. ALSO AVAILABLE IS A PRESENTATION AREA TO PRACTICE FOR FUTURE PRESENTATIONS. ALSO AVAILABLE FOR KGB MASER'S USE IS THE ICON LAB IN THE ENGINEERING UNITS. INFORMATION ON THE ICON LAB FACILITY AT PENN STATE CAN BE FOUND AT HTTP://WWW.ENGR.PSU.EDU/AE/CIC/FACILITIES/ICON/.

5. ELECTRONIC COMMUNICATION PROCEDURES:

(NOTE: FILE NAMING AND FOLDER STRUCTURE WILL BE DISCUSSED IN SECTION L: MODEL STRUCTURE).
THE FOLLOWING DOCUMENT MANAGEMENT ISSUES SHOULD BE RESOLVED AND A PROCEDURE SHOULD BE DEFINED FOR EACH: PERMISSIONS / ACCESS, FILE LOCATIONS, FTP SITE LOCATION(S), FILE TRANSFER PROTOCOL, FILE / FOLDER MAINTENANCE, ETC.

SECTION I: QUALITY CONTROL

1. OVERALL STRATEGY FOR QUALITY CONTROL:

DESCRIBE THE STRATEGY TO CONTROL THE QUALITY OF THE MODEL.

2. QUALITY CONTROL CHECKS:

THE FOLLOWING CHECKS SHOULD BE PERFORMED TO ASSURE QUALITY.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)
VISUAL CHECK	ENSURE THERE ARE NO UNINTENDED MODEL COMPONENTS AND THE DESIGN INTENT HAS BEEN FOLLOWED	ALL	REVIT
INTERFERENCE CHECK	DETECT PROBLEMS IN THE MODEL WHERE TWO BUILDING COMPONENTS ARE CLASHING	CM	NAVISWORKS
STANDARDS CHECK	ENSURE THAT THE BIM AND AEC CADD STANDARD HAVE BEEN FOLLOWED (FONTS, DIMENSIONS, LINE STYLES, LEVELS, ETC)	N/A	N/A
ELEMENT VALIDATION	ENSURE THAT THE DATASET HAS NO UNDEFINED OR INCORRECTLY DEFINED ELEMENTS	ALL	REVIT

3. MODEL ACCURACY AND TOLERANCES:

MODELS SHOULD INCLUDE ALL APPROPRIATE DIMENSIONING AS NEEDED FOR DESIGN INTENT, ANALYSIS, AND CONSTRUCTION. LEVEL OF DETAIL AND INCLUDED MODEL ELEMENTS ARE PROVIDED IN THE INFORMATION EXCHANGE WORKSHEET.

PHASE	DISCIPLINE	TOLERANCE
DESIGN DOCUMENTS	MECHANICAL	ACCURATE TO +/- 1% OF ACTUAL LOCATION & MATERIAL
DESIGN DOCUMENTS	ENERGY ANALYSIS	ACCURATE TO +/- 5% OF ACTUAL ENERGY USAGE
DESIGN DOCUMENTS	LIGHTING/ELECTRICAL ANALYSIS	ACCURATE TO +/- 5% OF ACTUAL ENERGY USAGE
DESIGN DOCUMENTS	STRUCTURAL ANALYSIS	ACCURATE TO +/- 5% OF ACTUAL LOCATION & SIZES

SECTION J: TECHNOLOGICAL INFRASTRUCTURE NEEDS

1. SOFTWARE:

BIM USE	DISCIPLINE (if applicable)	SOFTWARE	VERSION
EXISTING CONDITIONS MODELING	CM-CONTACT	AUTODESK REVIT ARCHITECTURE, AUTODESK REVIT MEP	2011
COST ESTIMATION	CM-STUDENT	AUTODESK QUANTITY TAKEOFF, RS MEANS COSTWORKS	2011
PHASE PLANNING(4D MODELING)	CM-STUDENT	AUTODESK NAVISWORKS MANAGE, SYNCHRO	2011
ENERGY ANALYSIS	MECH-STUDENT	TRACE TRACE 700	2010
MECHANICAL ANALYSIS	MECH-STUDENT	TRANE TRACE 700	2010
STRUCTURAL ANALYSIS	STRUCT-STUDENT	ETABS	VERSION 9
LIGHTING ANALYSIS	L/E-STUDENT	AGI 32, DAYSIM	VERSION 2.1
3D COORDINATION	CM-STUDENT, L/E-STUDENT, MECH-STUDENT, STRUCT-STUDENT	AUTODESK NAVISWORKS MANAGE	2011

2. COMPUTERS / HARDWARE:

UNDERSTAND HARDWARE SPECIFICATION BECOMES VALUABLE ONCE INFORMATION BEGINS TO BE SHARED BETWEEN SEVERAL DISCIPLINES OR ORGANIZATIONS. IT ALSO BECOMES VALUABLE TO ENSURE THAT THE DOWNSTREAM HARDWARE IS NOT LESS POWERFUL THAN THE HARDWARE USED TO CREATE THE INFORMATION. IN ORDER TO ENSURE THAT THIS DOES NOT HAPPEN, CHOOSE THE HARDWARE THAT IS IN THE HIGHEST DEMAND AND MOST APPROPRIATE FOR THE MAJORITY OF BIM USES.

BIM USE	HARDWARE	OWNER OF HARDWARE	SPECIFICATIONS
EXISTING CONDITIONS MODELING	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
COST ESTIMATION	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
PHASE PLANNING (4D MODELING)	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
ENERGY ANALYSIS	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
MECHANICAL ANALYSIS	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
STRUCTURAL ANALYSIS	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
LIGHTING ANALYSIS	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.
3D COORDINATION	ALIENWARE COMPUTERS	THE PENNSYLVANIA STATE UNIVERSITY – ARCHITECTURAL ENGINEERING DEPARTMENT	INTEL CORE I7 920 @ 2.67 GHZ, 64-BIT WINDOWS 7, 24 GB RAM, NVIDIA GFORCE GTX 260.

3. MODELING CONTENT AND REFERENCE INFORMATION

BIM USE	DISCIPLINE (if applicable)	MODELING CONTENT / REFERENCE INFORMATION	VERSION
EXISTING CONDITIONS MODELING	CM-CONTACT	EXISTING CONDITIONS DESIGNS	REVIT ARCHITECTURE, MEP, STRUCTURE (2011)
COST ESTIMATION	CM-STUDENT	QUANTITY SCHEDULES	REVIT ARCHITECTURE(2011) AUTODESK QUANTITY TAKEOFF 2011
PHASE PLANNING (4D MODELING)	CM-STUDENT	3D MODEL & TIME LAPSE SCHEDULE	NAVISWORKS MANAGE (2011)
ENERGY ANALYSIS	MECH-STUDENT	ASHRAE STANDARD 90.1	TRANE TRACE 700 (2010)
MECHANICAL ANALYSIS	MECH-STUDENT	ASHRAE STANDARD 55/62.1	2004/2010
STRUCTURAL ANALYSIS	STRUCT-STUDENT	MEMBER SIZES, MEMBER PROPERTIES, MEMBER LOCATION, GRAVITY & LATERAL LOADS.	ETABS & REVIT STRUCTURE 2011
LIGHTING ANALYSIS	L/E-STUDENT	MATERIAL PROPERTIES, LIGHTING SYSTEM DISTRIBUTION & DAYLIGHT PATTERNS	AGI 32 VERSION 2.1 (2010) & DAYSIM
3D COORDINATION	CM-STUDENT	LAYOUT AND SIZING OF ALL BUILDING SYSTEMS	NAVISWORKS MANAGE (2011)

SECTION K: MODEL STRUCTURE

1. FILE NAMING STRUCTURE:

FILE NAMES FOR MODELS SHOULD BE FORMATTED AS:	
DISCIPLINE - PROJECT NUMBER – BUILDING NUMBER.XYZ (EXAMPLE: ARCH-11111-BL001.XYZ)	
ARCHITECTURAL MODEL	PSU_MSC_BUILDING,RVT
SITE MODEL	MSC SITE.RVT
MECHANICAL MODEL	PSU_MSC_MEP.RVT
PLUMBING MODEL	PSU_MSC_MEP.RVT
ELECTRICAL MODEL	PSU_MSC_MEP.RVT
STRUCTURAL MODEL	PSU_MSC_STRUCTURAL.RVT
ENERGY MODEL	PSU_MSC_ENERGY.TRC
CONSTRUCTION MODEL	PSU_MSC_4D.NWF
COORDINATION MODEL	PSU_MSC_COORDINATION.NWF

2. **MODEL STRUCTURE:** THE MODELS THAT HAVE BEEN PROVIDE TO KGB MASER FROM RAFAEL VINOLY ARCHITECTS, ARE SEPARATED INTO AN ARCHITECTURAL REVIT MODEL, A MEP REVIT MODEL, AND A STRUCTURAL REVIT MODEL. ALSO PROVIDED TO KGB MASER ARE MODELS FROM THE CONSTRUCTION MANAGER, WHITING-TURNER. THESE MODELS CONSIST OF DIFFERENT COMPONENTS INCLUDING SEPARATE MODELS FOR THE STRUCTURE, THE PRECAST PANELS, THE WINDOWS, THE STUDS, AND OTHER COMPONENTS. ALSO KGB MASER HAS BEEN PROVIDED WITH NAVISWORKS COORDINATION MODELS. THE NAVISWORKS MODELS HAVE BEEN SEPARATED INTO EACH WING, LIFE SCIENCES AND MATERIAL SCIENCES.

SECTION L: PROJECT DELIVERABLES

BIM SUBMITTAL ITEM	STAGE	APPROXIMATE DUE DATE	FORMAT	NOTES
ENERGY USE ANALYSIS	REDESIGN PROPOSAL	12/3/2010	PDF REPORT	A TRANE TRACE MODEL WILL ALSO BE DELIVERED FOR FURTHER USE.
	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	PDF REPORT	
	FINAL PROPOSAL	APRIL 2011	PDF REPORT	
4D MODEL	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	(.AVI)	THE 4D MODEL WILL BE A COMPARISON OF ANY SCHEDULE/PHASING IMPLICATIONS WE HAVE INITIATED.
	FINAL PROPOSAL	APRIL 2011	(.AVI)	THE FINAL 4D MODEL WILL SHOW HOW KGB MASER'S DESIGN CHANGES HAVE AFFECTED THE SCHEDULE.
LIGHTING & DAYLIGHTING ANALYSIS	REDESIGN PROPOSAL	12/3/2010	PDF REPORT	WILL INCLUDE LIGHTING REDESIGN TO BE PRESENTED AT LUTRON.
	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	PDF REPORT	
	FINAL PROPOSAL	APRIL 2011	PDF REPORT	
STRUCTURAL ANALYSIS	REDESIGN PROPOSAL	12/3/2010	PDF REPORT	STRUCTURAL REDESIGN WITH SUPPORTING CALCULATIONS AND SCHEMATIC MODEL.
	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	PDF REPORT	ANALYTICAL MODEL OF THE STRUCTURE WILL BE CREATED.
	FINAL PROPOSAL	APRIL 2011	PDF REPORT	FINAL STRUCTURAL DESIGN WILL BE DELIVERED WITH SUPPORTING CALCULATIONS AND A COORDINATED DESIGN WITH OTHER DISCIPLINES.

COST IMPLICATION SUMMARY	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	PDF REPORT	
	FINAL PROPOSAL	APRIL 2011	PDF REPORT	
MECHANICAL ANALYSIS	SCHEMATIC LEVEL DESIGN MODEL	JANUARY 2011	PDF REPORT	LAYOUT DRAWINGS AND DETAILS EXPORTED FROM REVIT MEP AND OTHER SOURCES
	FINAL PROPOSAL	APRIL 2011	PDF REPORT	

SECTION M: ATTACHMENTS

1. **BIM USE SELECTION 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]
4. **INFORMATION EXCHANGE REQUIREMENT WORKSHEET(S)** [FROM SECTION G]
5. **MODEL DEFINITION WORKSHEET** [FROM SECTION G]

BIM USE SELECTION WORKSHEET: ATTACHMENT 1

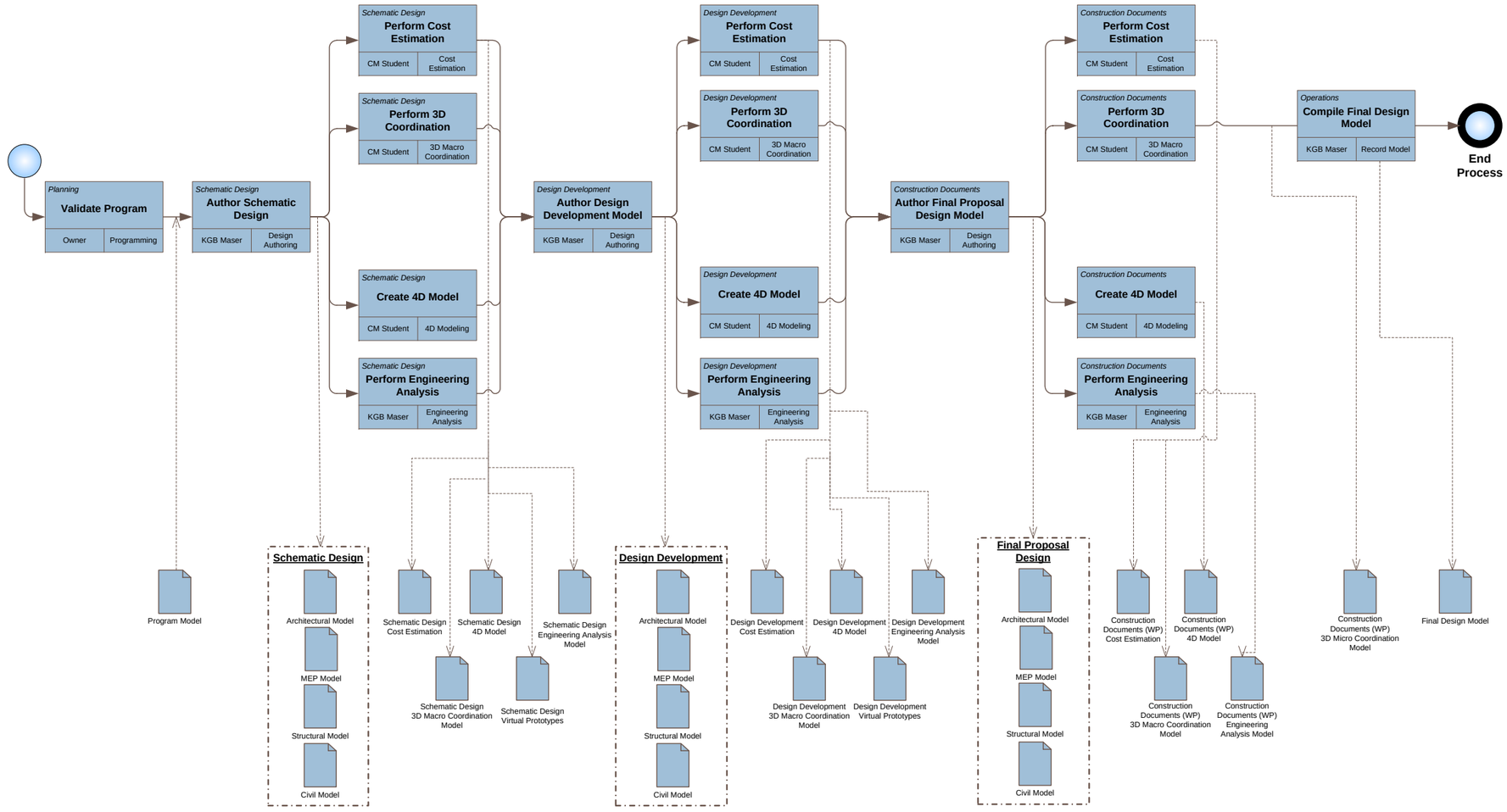
BIM USE ANALYSIS
Version 2.0

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**
		MEP Engineers	Med	3	3	3			
		Structural Engineer	High	3	3	3			
Programming	Low	Architect	Med	3	3	3			**No**
Sustainability LEED Evaluation	Low	Architect							**Maybe**
		MEP Engineers							
		Contractor							

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

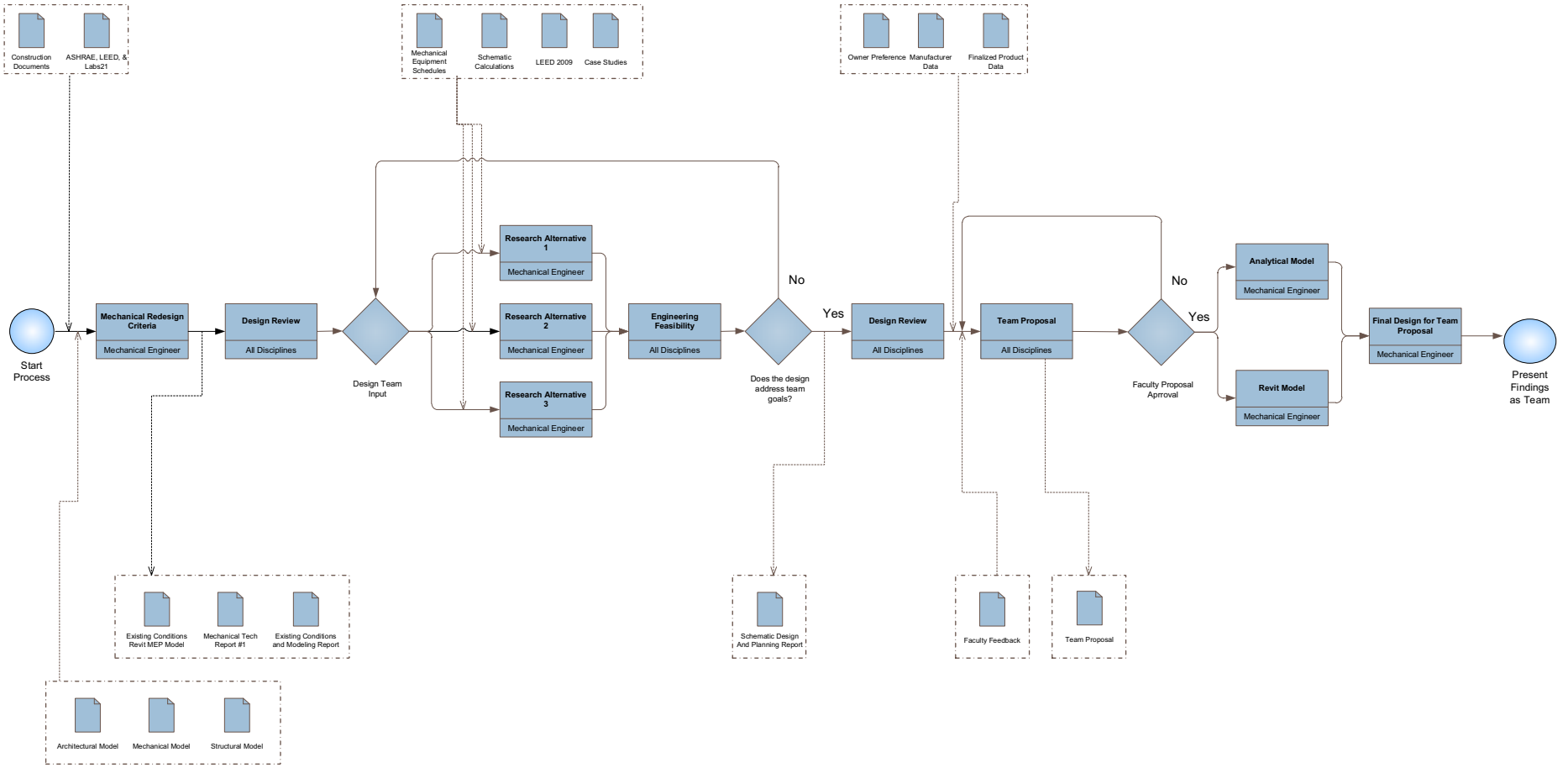
LEVEL 1 PROCESS OVERVIEW MAP: ATTACHMENT 2

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



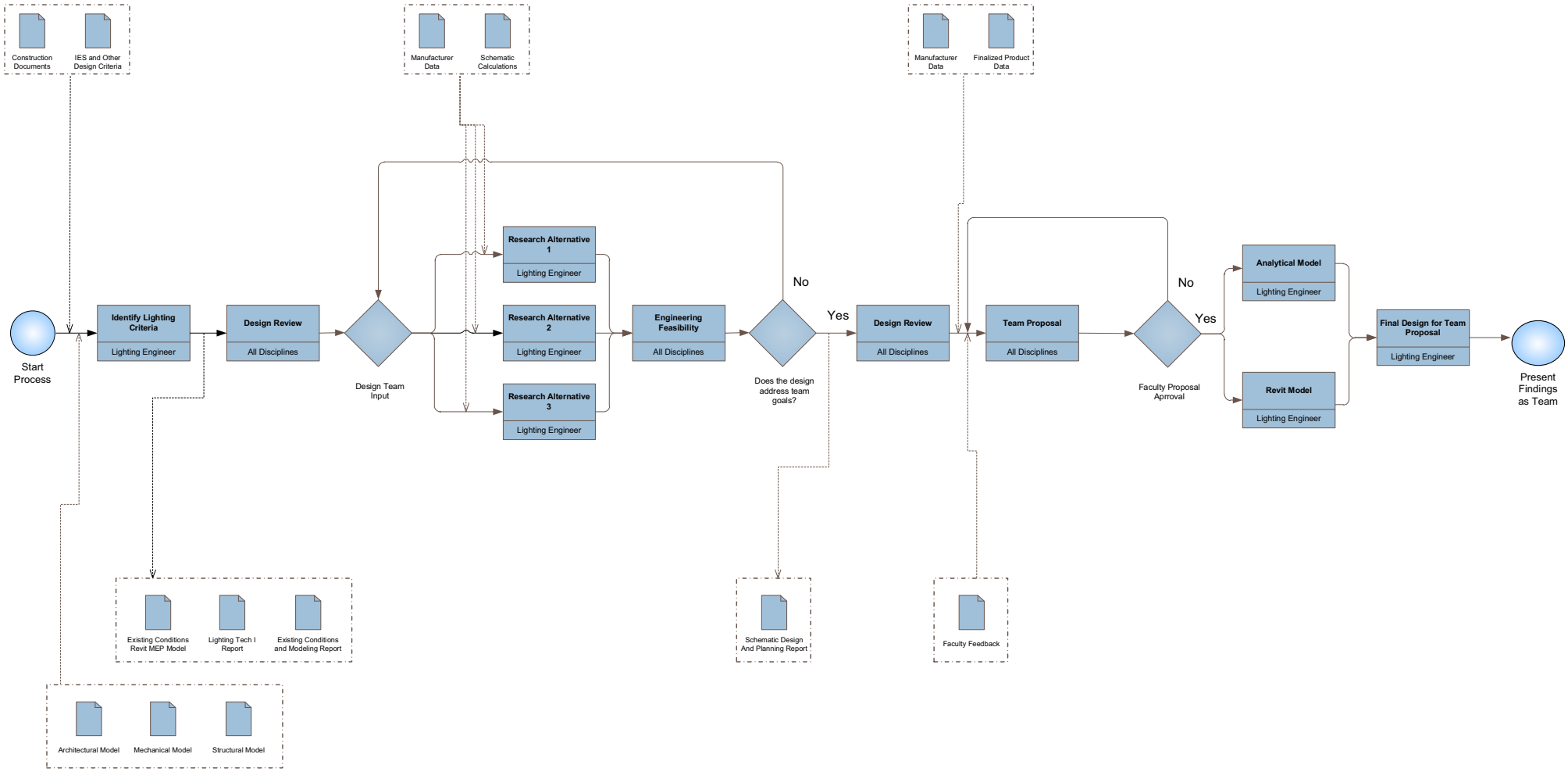
Mechanical Analysis

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr.psu.edu/ae/cic/bimex



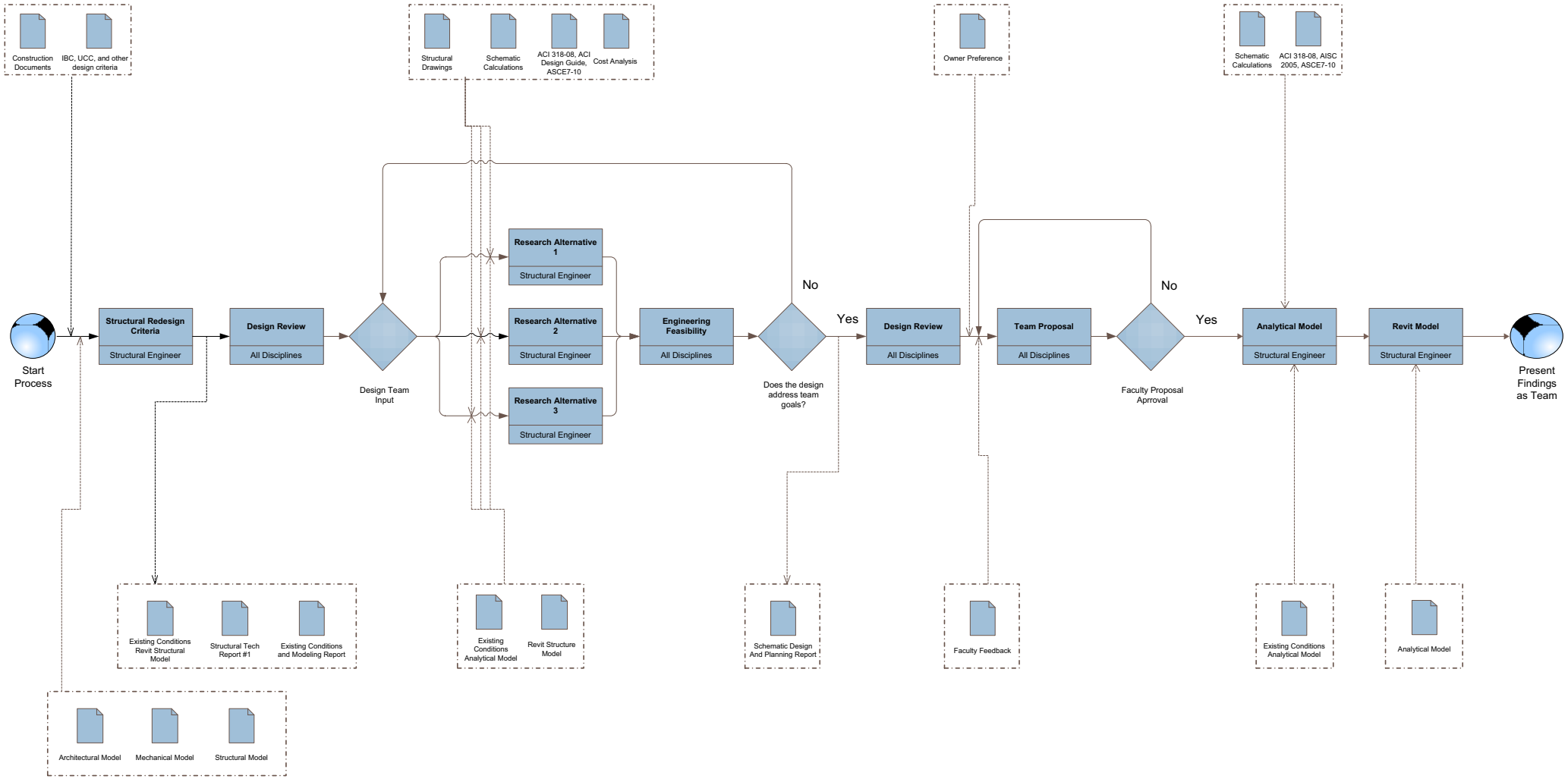
Lighting Analysis

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Structural Analysis

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex

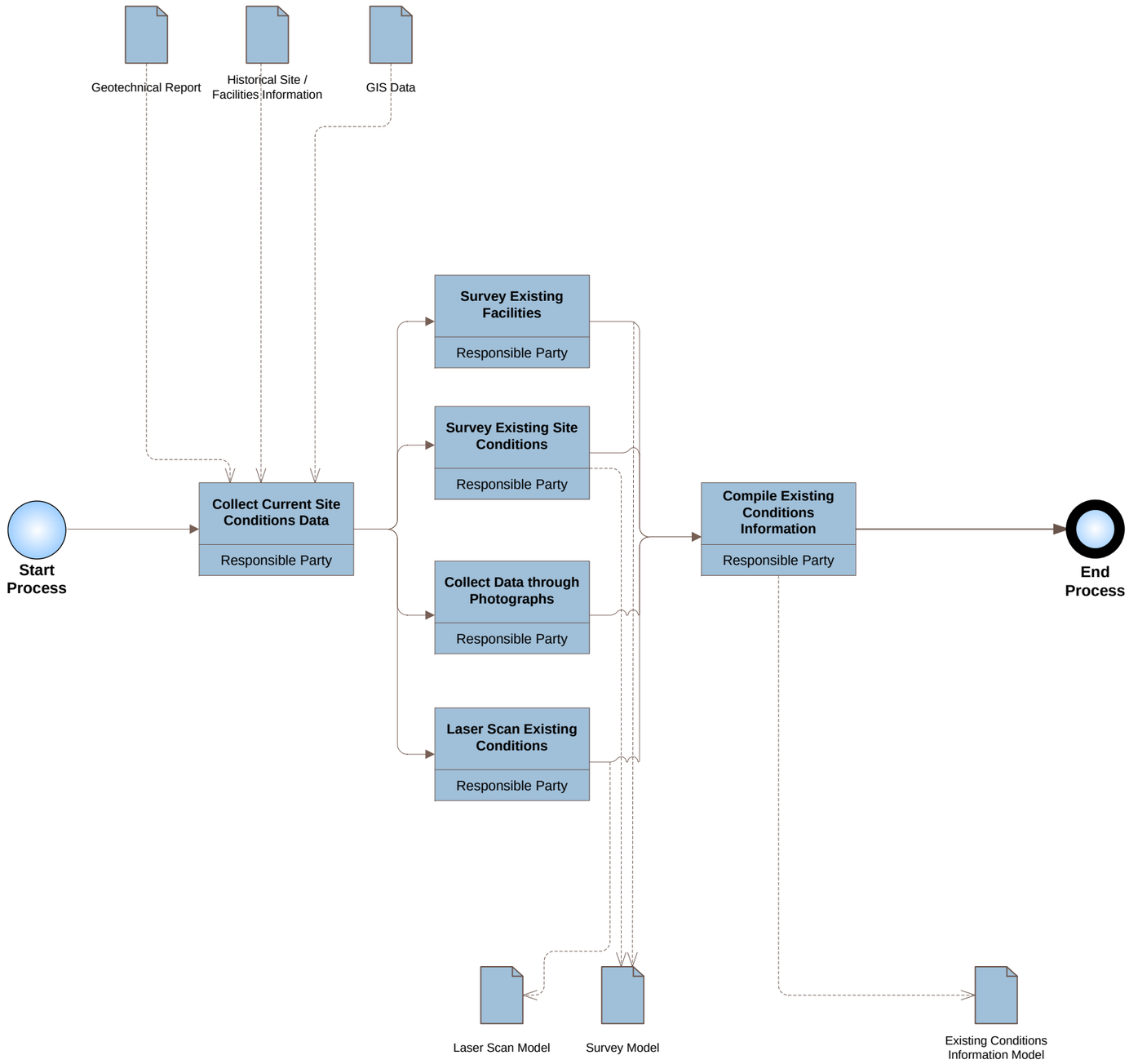


LEVEL 2 DETAILED BIM USE PROCESS MAPS:

ATTACHMENT 3

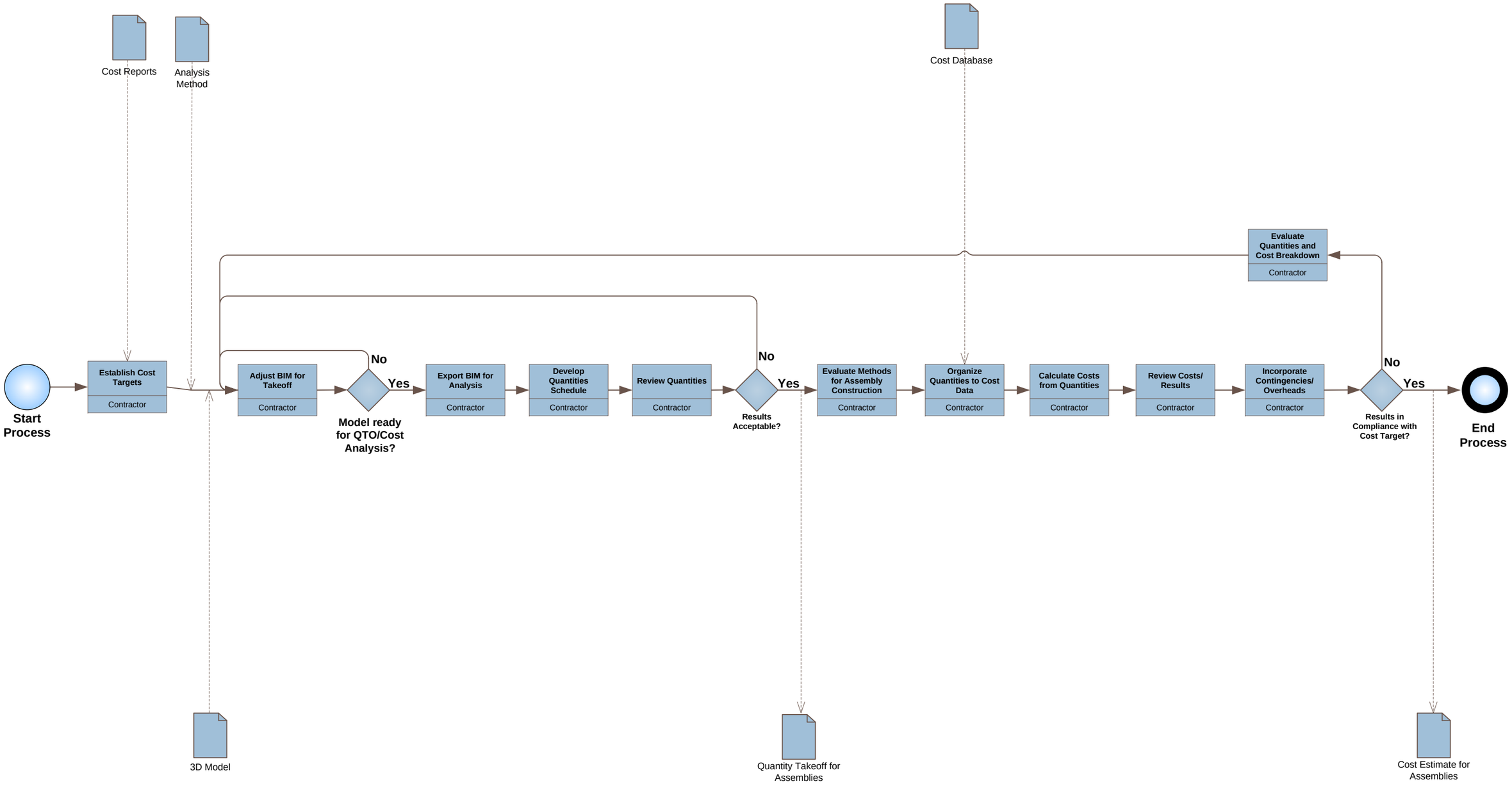
Existing Conditions Modeling

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



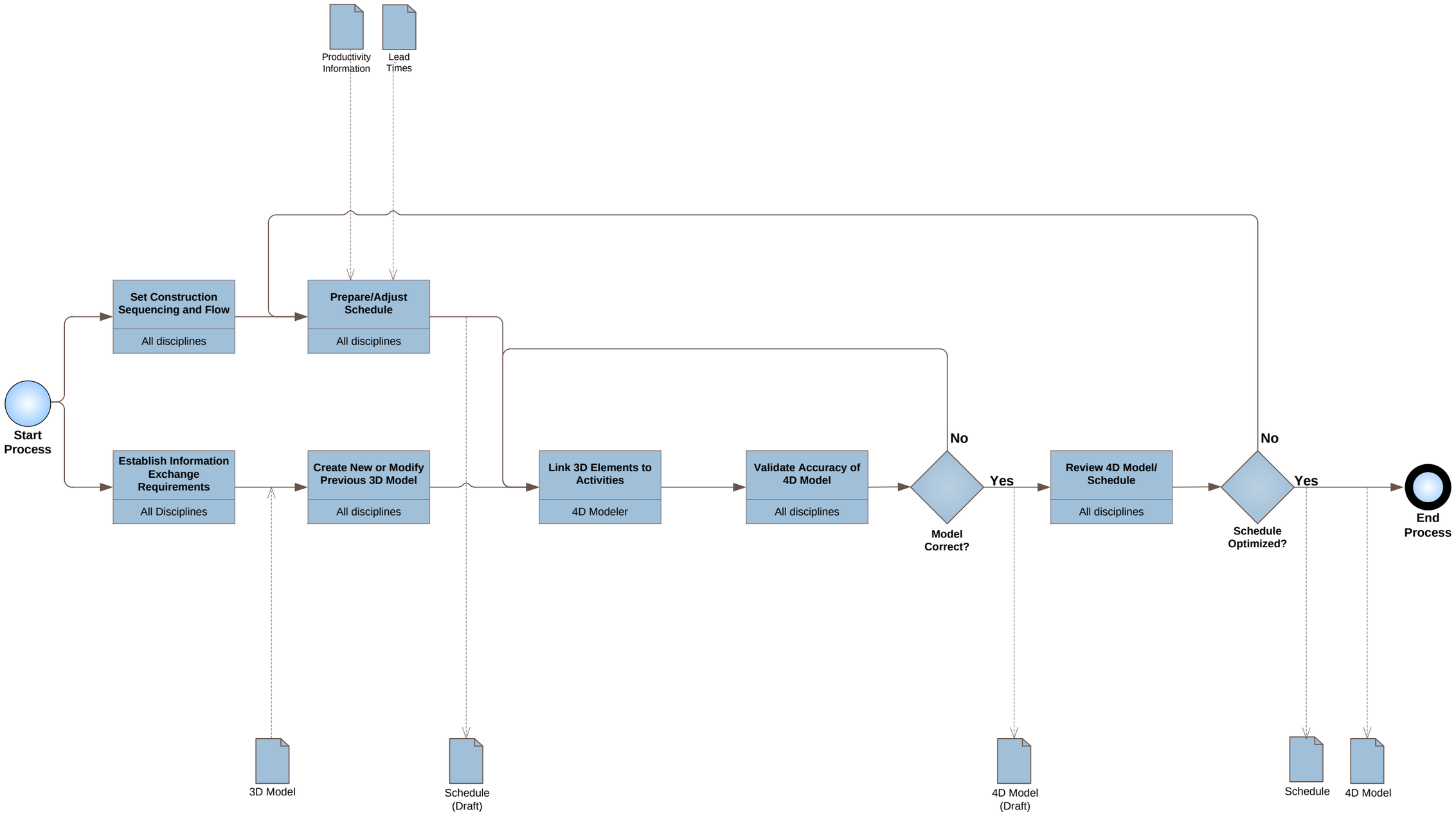
Cost Estimation

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



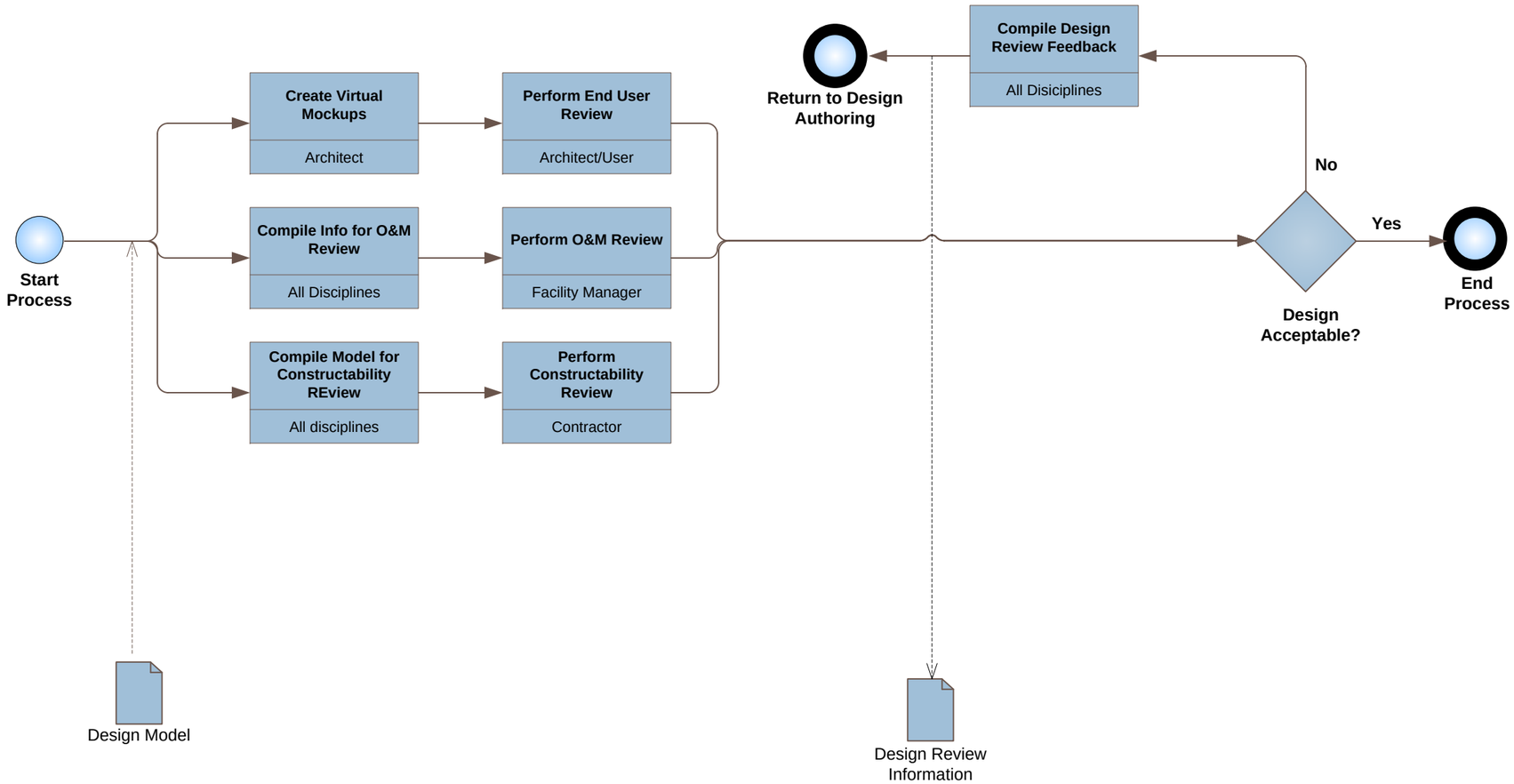
4D Modeling

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



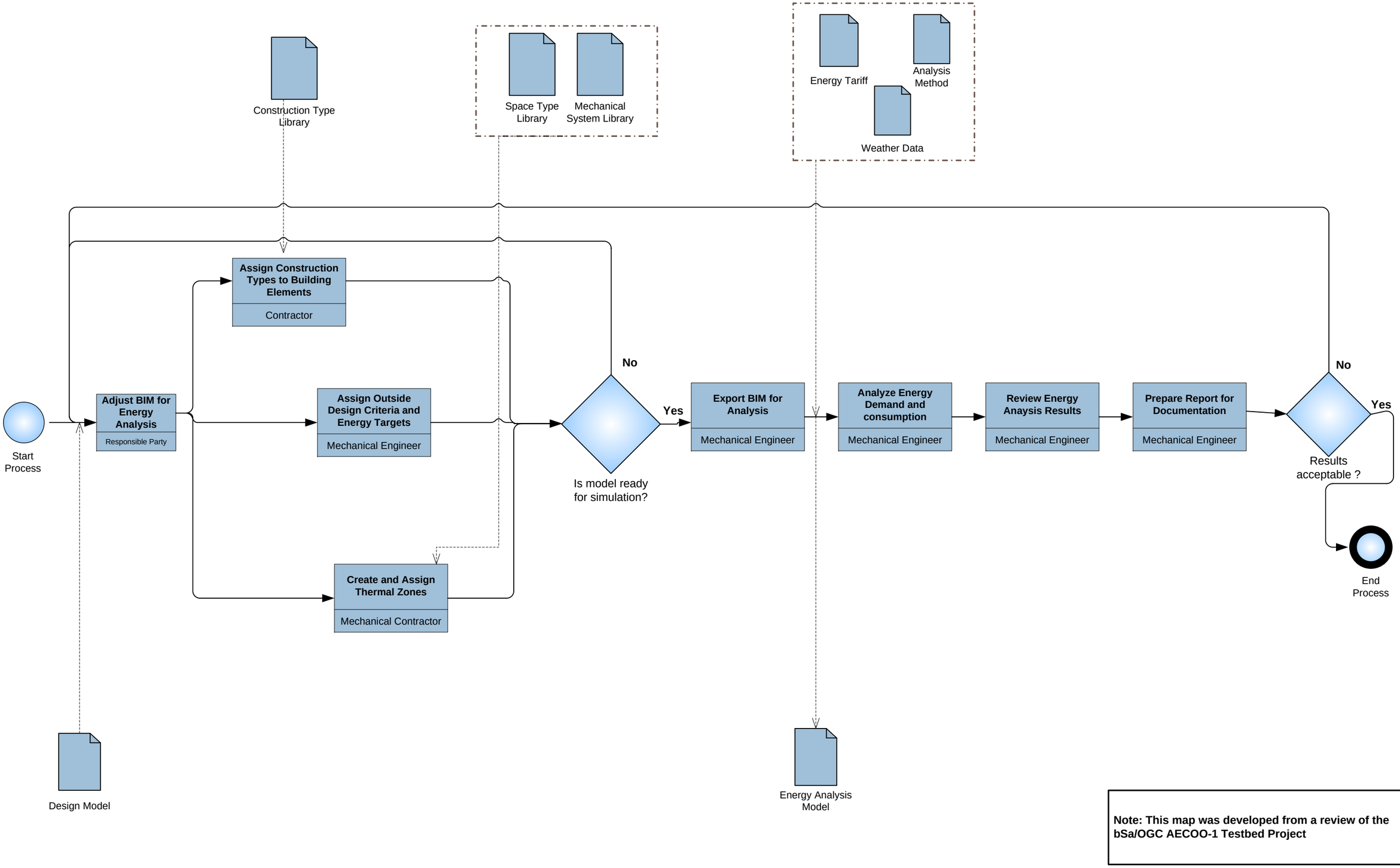
Design Review

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Energy Analysis

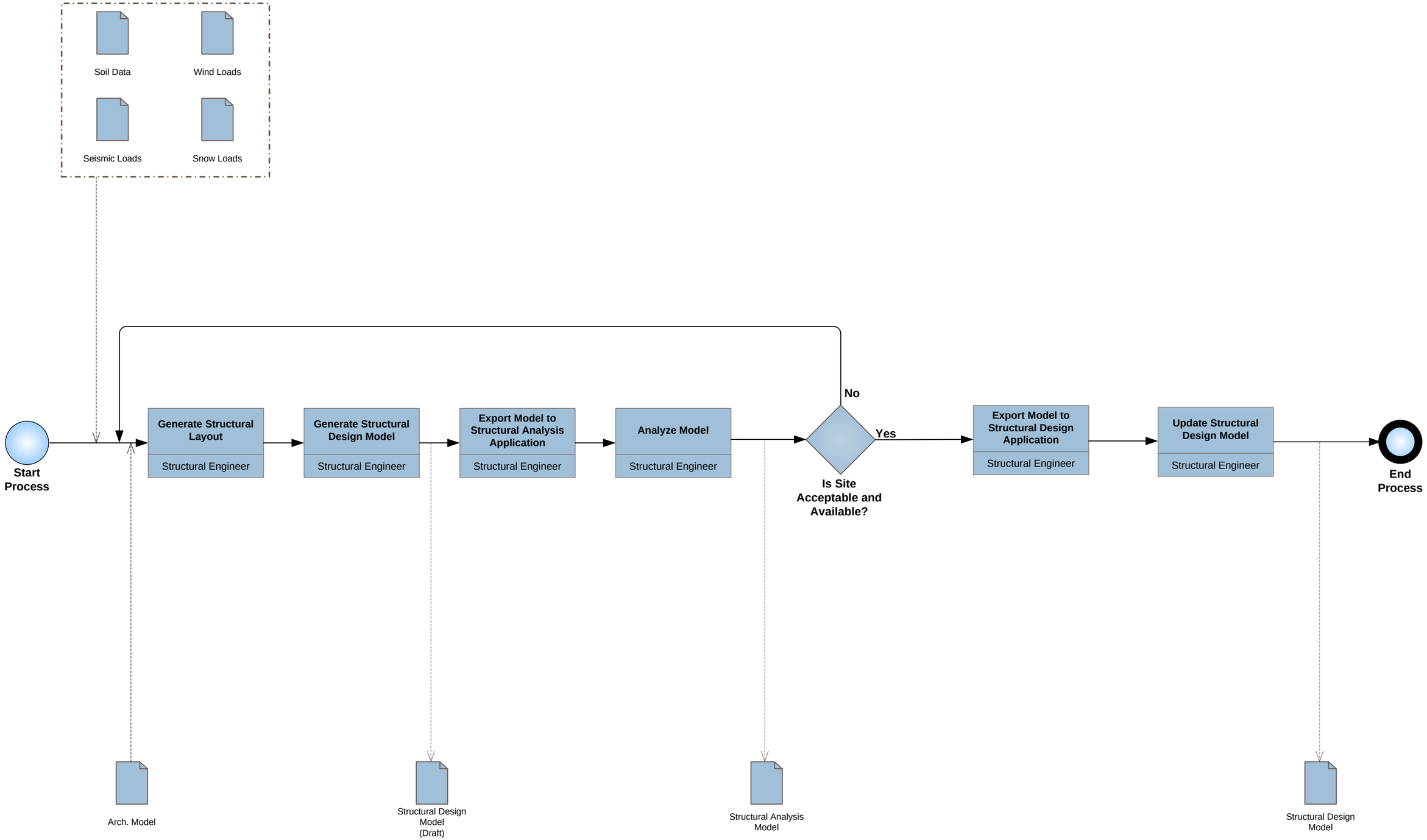
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Note: This map was developed from a review of the bSa/OGC AECOO-1 Testbed Project

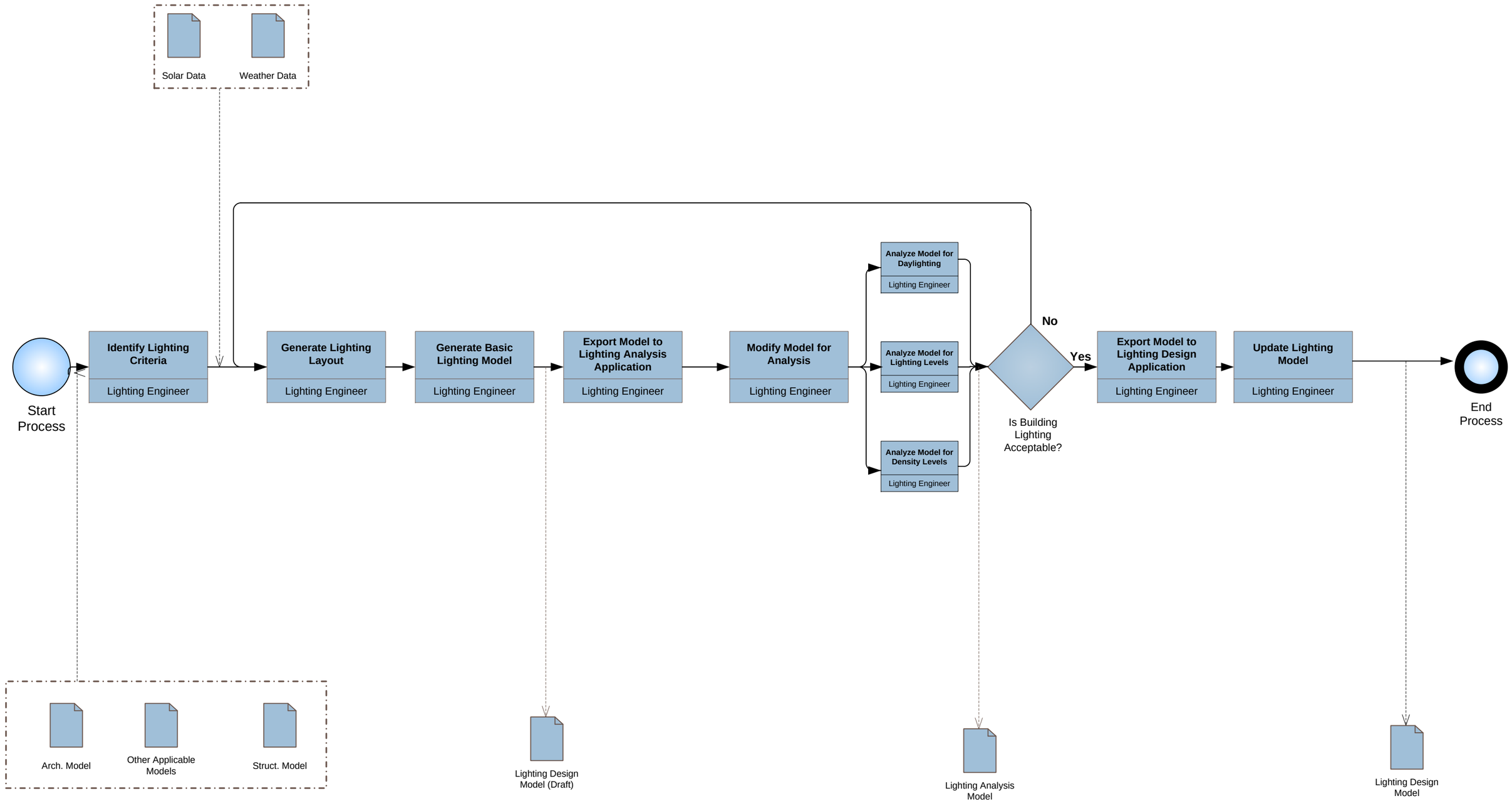
Structural Analysis

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



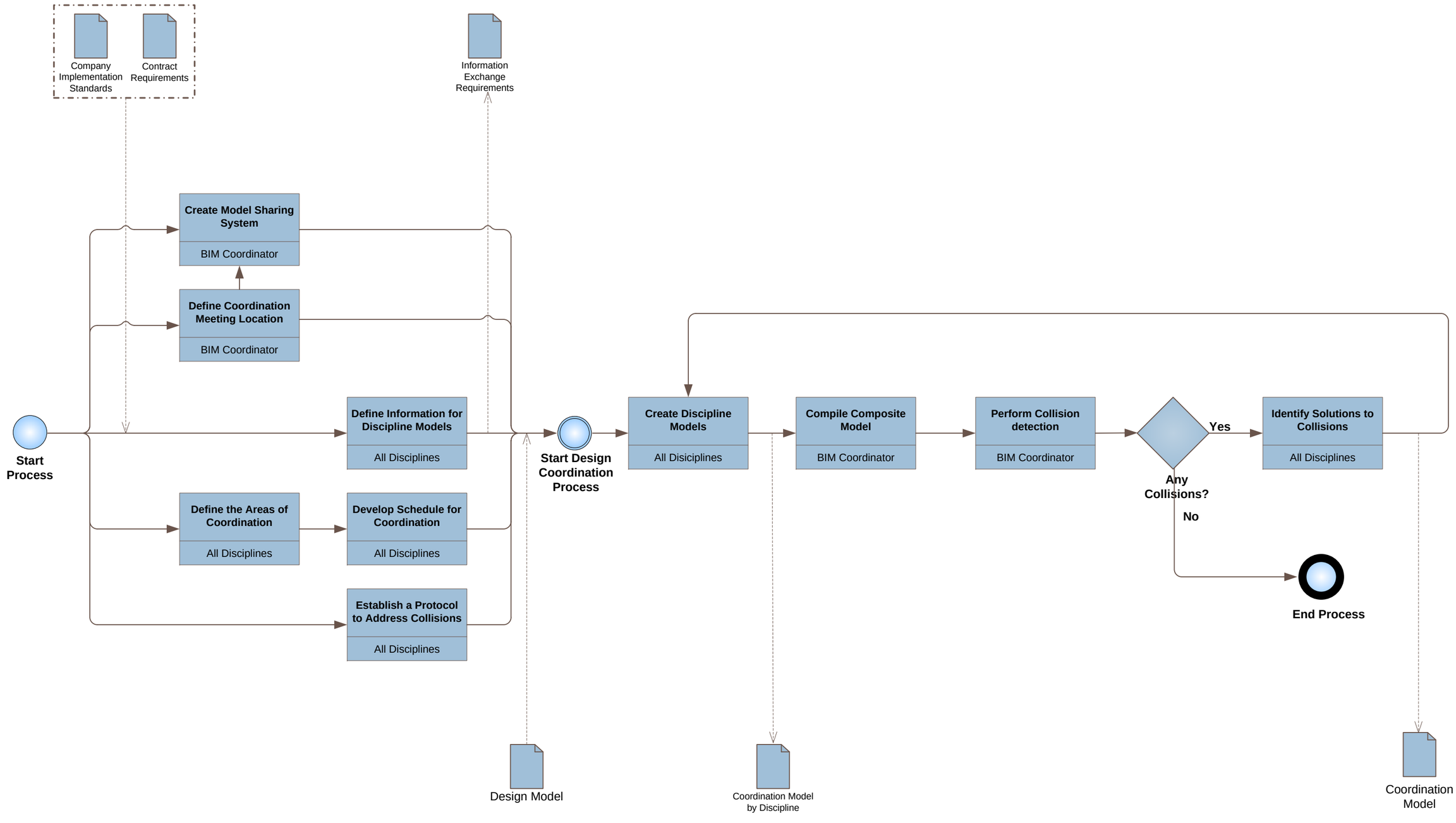
Lighting Analysis

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Design Coordination

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



INFORMATION EXCHANGE REQUIREMENT WORKSHEET: ATTACHMENT 4

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

BIM Use Title			Existing Conditions Modeling			Cost Estimation			3D Coordination			Structural Analysis			4D Modeling (Phasing)			Energy Analysis			Mechanical Analysis			Lighting Analysis		
Project Phase			Design			Design			Design			Design			Design			Design			Design			Design		
Time of Exchange (SD, DD, CD, Construction)			DD			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**	**Info**	**Resp Party**	**Notes**
A	**SUBSTRUCTURE**																									
	Foundations																									
		Standard Foundations	B			A	SE		B	SE		B	SE	Focus on Superstructure	B	SE		C	SE		C	SE		C	SE	
		Special Foundations	B			A	SE		C	SE		B	SE		B	SE		C	SE		C	SE		C	SE	
		Slab on Grade	B			B	SE		A	SE		B	SE		B	SE		C	SE		B	SE		C	SE	
	Basement Construction																									
		Basement Excavation	C			B	SE		B	SE		C	SE	Focus on Superctructure	B	SE		C	SE		B	SE		C	SE	
		Basement Walls	B			B	SE		A	SE		B	SE		B	SE		C	SE		B	SE		C	SE	
B	**SHELL**																									
	Superstructure																									
		Floor Construction	A			A	SE		A	SE		A	SE	Load Capacities will be based on the properities of the materials and its construction	B	SE		A	SE		B	SE		C	SE	
		Roof Construction	A			A	SE		A	SE		A	SE	Load 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	B			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	C			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	C			B	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH	Number and leakage	B	ARCH		C	ARCH	
	Roofing																									
		Roof Coverings	B			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	A			C	ARCH		B	ARCH		B	ARCH		B	ARCH		A	ARCH		B	ARCH		C	ARCH	
C	**INTERIORS**																									
	Interior Construction																									
		Partitions	B			B	ARCH		A	ARCH		C	ARCH		B	ARCH		A	ARCH	Phase change drywall information	B	ARCH	Phase change drywall information	B	ARCH	
		Interior Doors	C			C	ARCH		A	ARCH		B	ARCH	Need size of openings to factor into structural design	B	ARCH		C	ARCH		B	ARCH		B	ARCH	
		Fittings	C			C	ARCH		B	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		C	ARCH	
	Stairs																									
		Stair Construction	B			C	ARCH		B	ARCH		B	ARCH		B	ARCH		C	ARCH		C	ARCH		C	ARCH	
		Stair Finishes	C			C	ARCH		B	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH	
	Interior Finishes																									
		Wall Finishes	B			B	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		A	ARCH	
		Floor Finishes	B			B	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		A	ARCH	
		Ceiling Finishes	B			B	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		A	ARCH	
D	**SERVICES**																									

Conveying Systems																										
	Elevators & Lifts	C			C	ARCH		B	ARCH		B	ARCH		B	ARCH		C	ARCH		C	ARCH		B	ARCH	
	Escalators & Moving Walks	C			C	ARCH		B	ARCH		B	ARCH		B	ARCH		C	ARCH		C	ARCH		B	ARCH	
	Other Conveying Systems	C			C	ARCH		B	ARCH		B	ARCH		B	ARCH		C	ARCH		C	ARCH		C	ARCH	
Plumbing																										
	Plumbing Fixtures	C			C	MEP		B	MEP		C	MEP		C	MEP		A	MEP	Flow rate of fixtures	B	MEP		C	MEP	
	Domestic Water Distribution	C			C	MEP		B	MEP		C	MEP		B	MEP		A	MEP		B	MEP		C	MEP	
	Sanitary Waste	C			C	MEP		B	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Rain Water Drainage	B			C	MEP		B	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Other Plumbing Systems	C			C	MEP		B	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
HVAC																										
	Energy Supply	A			B	MEP		B	MEP		B	MEP	Size and weight of equipment need to be factored into structural design	C	MEP		A	MEP		A	MEP		B	MEP	
	Heat Generating Systems	B			A	MEP		A	MEP		B	MEP		B	MEP		A	MEP		A	MEP		C	MEP	
	Cooling Generating Systems	B			A	MEP		A	MEP		B	MEP		B	MEP		A	MEP		A	MEP		B	MEP	
	Distribution Systems	A			A	MEP		A	MEP		C	MEP		B	MEP		A	MEP	Impact of 100% OA, chilled beams, and radiant floor system on operating costs and life cycle cost comparision to exisitng	A	MEP	Decreased size of AHU equipment and ductwork if 100% OA	C	MEP	
	Terminal & Package Units	A			A	MEP		A	MEP		C	MEP		B	MEP		A	MEP		A	MEP	Size and location of chilled beams; radiant floor structural relationship	C	MEP	
	Systems Testing & Balancing	C			B	MEP		C	MEP		C	MEP		B	MEP		A	MEP		A	MEP		C	MEP	
	Other HVAC Systems & Equipment	B			B	MEP		B	MEP		C	MEP	Size and weight of equipment need to be factored into structural design	C	MEP		A	MEP		A	MEP	Structural impact of heavy equipment	C	MEP	
Fire Protection																										
	Sprinklers	B			C	MEP		A	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Standpipes	B			C	MEP		A	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Fire Protection Specialties	B			C	MEP		B	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Other Fire Protection Systems	B			C	MEP		B	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
Electrical																										
	Electrical Service & Distribution	A			B	LE		A	LE		C	LE		B	LE		C	LE		B	LE		A	LE	
	Lighting and Branch Wiring	A			B	LE		A	LE		C	LE		B	LE		A	LE		B	LE		A	LE	
	Communications & Security	C			B	LE		B	LE		C	LE		B	LE		C	LE		B	LE		A	LE	
	Other Electrical Systems	B			B	LE		B	LE		C	LE		B	LE		C	LE		B	LE		A	LE	
E	**EQUPMENT & FURNISHINGS**																									
	Equipment																									
	Commercial Equipment	B			B	ARCH		B	ARCH		C	ARCH		B	ARCH		B	ARCH		A	ARCH		B	ARCH	
	Institutional Equipment	C			B	ARCH		B	ARCH		C	ARCH		B	ARCH		A	ARCH	Fumehoods energy requirements	A	ARCH		B	ARCH	
	Vehicular Equipment	C			C	ARCH		C	ARCH		C	ARCH		B	ARCH		B	ARCH		A	ARCH		B	ARCH	
	Other Equipment	C			C	ARCH		C	ARCH		C	ARCH		B	ARCH		B	ARCH		A	ARCH		B	ARCH	
	Furnishings																									
	Fixed Furnishings	C			C	ARCH		B	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		B	ARCH	
F	**SPECIAL CONSTRUCATION & DEMOLITION**																									
	Special Construction																									
	Special Structures	A			A	SE		A	SE		B	SE		A	SE		C	SE		C	SE		C	SE	
	Integrated Construction	B			A	CM/SE		C	CM/SE		B	CM/SE		B	CM/SE		C	CM/SE		B	CM/SE		C	CM/SE	
	Special Construction Systems	B			A	CM		B	CM		C	CM		A	CM		C	CM		B	CM		C	CM	
	Special Facilities	A			B	CM		B	CM		C	CM		A	CM		A	CM		B	CM		C	CM	
	Special Controls & Instrumentation	A			B	CM		B	CM		C	CM		B	CM		A	CM		B	CM		C	CM	
	Selective Bldg Demo																									
	Building Elements Demolition	C			C	CM		C	CM		C	CM		B	CM		C	CM		C	CM		C	CM	
	Hazardous Components Abatement	C			C	CM		C	CM		C	CM		C	CM		C	CM		C	CM		C	CM	
G	**BUILDING SITEWORK**																									
	Site Preparation																									
	Site Clearing	C			B	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	
	Site Demolition & Relocations	C			B	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	
	Site Earthwork	B			B	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	
	Hazardous Waste Remediation	C			C	CE		C	CE		C	CE		C	CE		C	CE		C	CE		C	CE	
	Site Improvements																									
	Roadways	B			C	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	

	Parking Lots	C			C	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	
	Pedestrian Paving	C			C	CE		C	CE		C	CE		C	CE		C	CE		C	CE		C	CE	
	Site Development	B			B	CE		C	CE		C	CE		B	CE		C	CE		C	CE		C	CE	
	Landscaping	B			B	ARCH		C	ARCH		C	ARCH		C	ARCH		B	ARCH		C	ARCH		C	ARCH	
	Site Civil/Mech Utilities																									
	Water Supply & Distribution Systems	B			B	MEP		A	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Sanitary Sewer Systems	B			B	CE		A	CE		C	CE		B	CE		B	CE		B	CE		C	CE	
	Storm Sewer Systems	B			B	CE		A	CE		C	CE		B	CE		B	CE		B	CE		C	CE	
	Heating Distribution	B			B	MEP		A	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Cooling Distribution	B			B	MEP		A	MEP		C	MEP		B	MEP		B	MEP		B	MEP		C	MEP	
	Fuel Distribution	B			B	CE		A	CE		C	CE		B	CE		A	CE		A	CE		C	CE	
	Other Civil/Mechanical Utilities	B			B	CE		A	CE		C	CE		B	CE		A	CE		A	CE		C	CE	
	Site Electrical Utilities																									
	Electrical Distribution	C			B	LE		A	LE		C	LE		B	LE		B	LE		B	LE		C	LE	
	Site Lighting	B			B	LE		A	LE		C	LE		B	LE		B	LE		B	LE		A	LE	
	Site Communications & Security	C			B	LE		A	LE		C	LE		B	LE		B	LE		B	LE		C	LE	
	Other Electrical Utilities	C			B	LE		A	LE		C	LE		B	LE		B	LE		B	LE		C	LE	
	Other Site Construction																									
	Service Tunnels	A			A	CM		A	CM		B	CM		B	CM		B	CM		B	CM		C	CM	
	Other Site Systems & Equipment	B			C	CM		B	CM		C	CM		B	CM		B	CM		C	CM		C	CM	
1	**Construction Systems**																									
	Construction Equipment	A			A	CM		C	CM		C	CM		A	CM		C	CM		C	CM		C	CM	
	Temporary Safety	A			B	CM		C	CM		C	CM		A	CM		C	CM		C	CM		C	CM	
	Temporary Security	C			C	CM		C	CM		C	CM		B	CM		C	CM		C	CM		C	CM	
	Temporary Facilities	B			B	CM		C	CM		C	CM		A	CM		C	CM		C	CM		C	CM	
	Weather Protection	C			C	CM		C	CM		C	CM		C	CM		C	CM		C	CM		C	CM	
2	**Space**																									
	Construction Activity Space	A			A	CM		C	CM		C	CM		A	CM		C	CM		C	CM		C	CM	
	Analysis Space	C			C	CM		C	CM		C	CM		B	CM		C	CM		C	CM		C	CM	
3	**Information**																									
	Construction Information	A			A	CM		B	CM		C	CM		A	CM		C	CM		B	CM		C	CM	
	Engineering Information	A			B	MEP		B	MEP		C	MEP		C	MEP		C	MEP		A	MEP		C	MEP	
	Record Information	C			C	ARCH		C	ARCH		C	ARCH		C	ARCH		C	ARCH		A	ARCH		C	ARCH	

MODEL DEFINITION WORKSHEET: ATTACHMENT 5

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											
		Partitions				A	ARCH					
		Interior Doors				B	ARCH					
		Fittings				C	ARCH					
	Stairs											
		Stair Construction				C	TC					
		Stair Finishes				C	ARCH					
	Interior Finishes											
		Wall Finishes				A	ARCH, MEP	Phase change drywall in energy model and Revit				
		Floor Finishes				B	ARCH, MEP	Incorporating the radiant floor with a desire finish				
		Ceiling Grid				B	ARCH,MEP	Placing chilled beams in functional and aestheically pleasing locations				
		Drop Ceiling				B	ARCH					
		Ceiling Finishes				C	ARCH					
D	**SERVICES**											
	Conveying Systems											
		Elevators & Lifts				C	ARCH					
		Escalators & Moving Walks				C	ARCH					
		Other Conveying Systems				C	ARCH					
	Plumbing											
		Plumbing Fixtures				C	MEP					
		Domestic Water Distribution				C	MEP					
		Sanitary Waste				C	MEP					
		Rain Water Drainage				C	MEP					
		Other Plumbing Systems				C	MEP					
	HVAC											
		Energy Supply				B	MEP	Campus steam and chilled water modeled in TRACE, power to pumps and auxiliary devices				
		Heat Generating Systems				A	MEP	Campus steam and local heat exchangers				
		Cooling Generating Systems				A	MEP	Campus chilled water and associated pumps				
		Distribution Systems				A	MEP	CHW Piping, Ductwork location and sizing crucial to MEP model, Radiant Floor not likely in RevitMEP				
		Terminal & Package Units				A	MEP	Chilled beams size and				
		Systems Testing & Balancing				A	MEP, CON					
		Other HVAC Systems & Equipment				A	MEP					
	Fire Protection											
		Sprinklers				B	TC					
		Standpipes				B	TC					
		Fire Protection Specialties				B	TC					
		Other Fire Protection Systems				B	TC					
	Electrical											
		Electrical Service & Distribution				A	MEP					
		Lighting and Branch Wiring				A	MEP					
		Communications & Security				C	TC					
		Other Electrical Systems				B	MEP					
E	**EQUPMENT & FURNISHINGS**											

	Equipment												
		Commercial Equipment				C	CON						
		Institutional Equipment				A	CON, MEP	Location and size of the laboratory fume hoods will be represented in the energy model					
		Vehicular Equipment				C	CON						
		Other Equipment				B	CON						
	Furnishings												
		Fixed Furnishings				C	ARCH						
F	**SPECIAL CONSTRUCATION & DEMOLITION**												
	Special Construction												
		Special Structures				A	CON						
		Integrated Construction				B	CON						
		Special Construction Systems				B	CON						
		Special Facilities				B	CON						
		Special Controls & Instrumentation				B	CON						
	Selective Bldg Demo												
		Building Elements Demolition				C	CON						
		Hazardous Components Abatement				C	CON						
G	**BUILDING SITEWORK**												
	Site Preparation												
		Site Clearing				C	CON						
		Site Demolition & Relocations				C	CON						
		Site Earthwork				B	CON						
		Hazardous Waste Remediation				C	CON						
	Site Improvements												
		Roadways				C	CON						
		Parking Lots				C	CON						
		Pedestrian Paving				C	CON						
		Site Development - topography				C	CON						
		Landscaping				B	CON						
	Site Civil/Mech Utilities												
		Water Supply & Distribution Systems				C	MEP						
		Sanitary Sewer Systems				C	MEP						
		Storm Sewer Systems				C	MEP						
		Heating Distribution				A	MEP	Location and size of incoming utilities					
		Cooling Distribution				A	MEP						
		Fuel Distribution				B	MEP						
		Other Civil/Mechanical Utilities				C	MEP						
	Site Electrical Utilities												
		Electrical Distribution				B	MEP						
		Site Lighting				A	TC						
		Site Communications & Security				B	TC						
		Other Electrical Utilities				B	TC						
	Other Site Construction												
		Service Tunnels				B	CON						
		Other Site Systems & Equipment				B	CON						
1	**Construction Systems**												
		Construction Equipment				A	CON						
		Temporary Safety				A	CON						
		Temporary Security				C	CON						
		Temporary Facilities				B	CON						
		Weather Protection				C	CON						
		Construction Lay down				C	CON						
2	**Space**												
		Department Assignments				B	ARCH						
		Room Assignments				B	ARCH						
		Diagrammatic Phasing				B	ARCH						
		Occupancy				B	ARCH						

	Construction Activity Space				B	ARCH						
	Analysis Space				B	ARCH						
3	**Information**											
	Construction Information				A	CON						
	Engineering Information				A	ARCH, CON						
	Record Information				B	ARCH						
4	**Datum**											
	Grid				A	ARCH						
	Levels				A	ARCH						
	Origin				A	ARCH						