



# BIM PROCESS MODEL REVIEW AND PROCEDURE

Sara Pace

Mike Lucas

Paul Kuehnel

Jon Brangan

Building **STIMULUS**  
THE GREEN BUILDING SPECIALISTS

# Members and BIM Roles

# Building Stimulus Contact Info

Construction  
Manager

□ Jon Brangan      [jmb5346@psu.edu](mailto:jmb5346@psu.edu)

Structural  
Engineer

□ Paul Kuehnel      [pkk5001@psu.edu](mailto:pkk5001@psu.edu)

Mechanical  
Engineer

□ Sara Pace      [sap5103@psu.edu](mailto:sap5103@psu.edu)

Lighting &  
Electrical  
Designer

□ Mike Lucas      [lwm124@psu.edu](mailto:lwm124@psu.edu)

# Organization Roles

Jon Brangan

BIM Manager

- **BIM Manager**
  - ▣ Build Navisworks Models
  - ▣ Run Clash Detections
  - ▣ Alert Responsible Parties of Interferences
  - ▣ Coordinate Effective Design Alternatives

# Organization Roles

Paul Kuehnel

Structural Project Manager

- **Structural Project Manager**
  - ▣ Model Engineered Systems
    - Structural Members
  - ▣ Provide Structural Revit Model
  - ▣ Collaborate Effective Design Solutions

# Organization Roles

Sara Pace

Mechanical Project Manager

- **Mechanical Project Manager**
  - ▣ Model Engineered Systems
    - Ductwork
    - Mechanical Equipment
  - ▣ Provide Mechanical Revit Model
  - ▣ Collaborate Effective Design Solutions

# Organization Roles

**Mike Lucas**

Lighting & Elec. Project Manager

- **Lighting & Electrical Project Manager**
  - ▣ Model Engineered Systems
    - Panelboards, Switchboards & Switchgear
    - Lighting Components
    - Conduits
  - ▣ Provide Lighting & Electrical Revit Model
  - ▣ Collaborate Effective Design Solutions

# BIM Use Staffing

BIM USE	ORGANIZATION	NUMBER OF TOTAL STAFF FOR BIM USE	ESTIMATED WORKER HOURS	LEAD CONTACT
3D Coordination	Building Stimulus	4	TBD	Mike Lucas
Design Authoring	Building Stimulus	4	TBD	Paul Kuehnel
Structural Analysis	Building Stimulus	1	TBD	Paul Kuehnel
Lighting Analysis	Building Stimulus	1	TBD	Mike Lucas
Energy Analysis	Building Stimulus	2	TBD	Sara Pace
Mechanical Analysis	Building Stimulus	1	TBD	Sara Pace
4D Modeling	Building Stimulus	1	TBD	Jon Brangan
Cost Estimation	Building Stimulus	1	TBD	Jon Brangan



# Project Information

# Project Information

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
PRELIMINARY PLANNING	September 1, 2010	September 10, 2010	All Disciplines
EXISTING CONDITIONS CONFIRMATION AND MODELING	September 11, 2010	October 4, 2010	All Disciplines
SCHEMATIC DESIGN & CONSTRUCTION PLANNING	October 5, 2010	October 27, 2010	All Disciplines
BIM PROCESS MODEL	October 28, 2010	November 15, 2010	All Disciplines
PROPOSAL	November 16, 2010	December 3, 2010	All Disciplines
IMPLEMENTATION OF PROPOSAL	December 4, 2010	TBD	All Disciplines
Remainder to be determined upon Spring Semester	TBD	TBD	TBD

# Project Information

ID	Task Mode	Task Name	Duration	Start	Qtr 4, 2010				Qtr 1, 2011			Qtr 2, 2011						
					Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr						
1		Preliminary Planning	8 days	Wed 9/1/10														
2		Existing Conditions Modelir	16 days	Mon 9/13/10														
3		Schematic Design and Cons	17 days	Tue 10/5/10														
4		BIM Process Model	13 days	Thu 10/28/10														
5		Proposal	14 days	Tue 11/16/10														
6		Implementation of Proposal	5 days	Mon 12/6/10														
7		Christmas Break	21 days	Mon 12/13/10														
8		Spring Semester	0 days	Mon 1/10/11														
9		Design Development	65 days	Mon 1/10/11														



# Project Goals & BIM Uses

# Project Goals & BIM Uses

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
H	<p><b>Assess Cost Associated with Design Changes –</b> Compare money spent/saved vs. quantitative benefit of design change</p>	<p>Cost Estimation, Existing Conditions Modeling</p>
H	<p><b>Increase Effectiveness of Design –</b> Increase efficiency of structural system, lighting/electrical system, and mechanical system</p>	<p>Design Authoring, Design Reviews, 3D Coordination, Engineering Analysis, Existing Conditions Modeling</p>
H	<p><b>Interdisciplinary Design Coordination –</b> Effectively implement BIM through open communication and periodical design reviews</p>	<p>Design Reviews, 3D Coordination</p>
M	<p><b>Increase Effectiveness of Sustainable Goals –</b> Increase thermal and lighting efficiency through implementation of double skin façade</p>	<p>Engineering Analysis, LEED Evaluation, Daylight Integration</p>
M	<p><b>Improve On-Site Coordination and Efficiency</b></p>	<p>Site Utilization Planning, 4D Modeling</p>

# 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
				Resources	Competency	Experience			
Design Authoring	Medium	Sara	Medium	1	3	3	3D Model Manipulation	Revit MEP	Yes
		Mike	Medium	1	3	3	3D Model Manipulation	Revit MEP	
		Paul	Medium	1	3	3	3D Model Manipulation	RevitStructure	
Record Modeling	Medium	Sara	Low	2	2	2	3D Model Manipulation	Facility Management Software	No
		Mike	Low	2	2	2	3D Model Manipulation	Facility Management Software	
		Paul	Low	2	2	2	3D Model Manipulation	Facility Management Software	
Site Utilization Planning	Medium	Jon	High	3	2	1	Design Authoring Software		Yes
Existing Conditions Modeling	High	Jon	Low	2	3	2	3D Model Manipulation		Yes
LEED Evaluation	High	Sara	High	2	2	1	LEED Credit Knowledge, 3D Model Manipulation		Yes
		Mike	High	2	2	1	LEED Credit Knowledge, 3D Model Manipulation		
		Paul	Low	2	2	1	LEED Credit Knowledge, 3D Model Manipulation		
		Jon	Medium	2	2	1	LEED Credit Knowledge, 3D Model Manipulation		
Energy Analysis	High	Sara	High	3	3	2	Engineering Analysis Tools	Trace, RevitMEP	Yes
Structural Analysis	High	Paul	High	3	3	2	Engineering Analysis Tools	Revit Structure, SAP 2000, MS Excel	Yes
Cost Estimation	High	Jon	High	3	2	2		Quantity Takeoff, RevitMEP	Yes
4D Modeling	Medium	Jon	High	3	2	2			Yes
3D Coordination (Design)	High	Sara	Medium	3	2	2	Model Review & 3d model Manipulation	Revit MEP & Navisworks	Yes
		Mike	Medium	3	3	3	Model Review & 3d model Manipulation	Revit MEP & Navisworks	
		Paul	Medium	3	2	2	Model Review & 3d model Manipulation	Revit MEP & Navisworks	
		Jon	High	3	2	2	Model Review & 3d model Manipulation	Revit MEP & Navisworks	
Daylight Integration & Lighting Analysis	Medium	Mike	High	3	2	2	AGI 32, Ecotect, DAYSIM	Façade Integration with all disciplines	Yes
Building Systems Analysis	Medium	Sara	High	2	2	2			No
		Mike	Medium	2	2	2			
		Paul	Low	2	2	2			
Design Reviews	Medium	Sara	High	3	3	3	3D Model Manipulation		Yes
		Mike	High	3	3	3	3D Model Manipulation		
		Paul	High	3	3	3	3D Model Manipulation		
		Jon	High	3	3	3	3D Model Manipulation		

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

# BIM Uses

- Design Authoring
- Site Utilization Planning
- Existing Conditions Modeling
- LEED Evaluation
- Energy Analysis
- Structural Analysis
- Cost Estimation
- 4D Modeling
- 3D Coordination
- Daylight integration/Lighting analysis
- Design Reviews

# Collaboration Procedures



# Meeting Procedures

MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM REQUIREMENTS KICK-OFF	Organizational	Once	Building Stimulus Members	BIM Thesis Lab
BIM EXECUTION PLAN DEMONSTRATION	BIM Process Model	Once	Building Stimulus & Practitioners	107 EUB
DESIGN COORDINATION	Design Development	Daily	Building Stimulus Members	BIM Thesis Lab

# Interactive Workspace

## □ 333 Sacket:



# Electronic Communication Procedures

\\aereseach.coeaccess.psu.edu\BIMThesis\Team 2 Working Files (Username & password protected network drive)

Revit\

Central\

- 001-PSU-MSC-ARCH.rvt -----Working Architectural Model
- 001-PSU-MSC-MEP.rvt-----Working MEP Model
- 001-PSU-MSC-STRU.rvt-----Working Structural Model
- 001-PSU-MSC-SITE.rvt-----Working Civil & Site Model

From RVA\

- MSC RVA Architecture.rvt-----Original Architecture Model

From W-T\

- MSC W-T Windows.rvt----- Window Construction Model
- MSC W-T Exterior Coordination.rvt-----Precast panel Construction Model
- MSC W-T Kinsley Structure.rvt-----Structural Construction Model

Project Specific Families\

- Architecture\-----Discipline specific Revit families
- Electrical\----- Discipline specific Revit families
- Mechanical\----- Discipline specific Revit families
- Site\----- Discipline specific Revit families
- 001-PSU-MSC-Title (30x42).dwg----- Building Stimulus Title Block

# Technological Infrastructure Needs

# Software

BIM USE	DISCIPLINE (if applicable)	SOFTWARE	VERSION
DESIGN AUTHORIZING	Architect	Revit	Revit Architecture 2011
Site Utilization Planning	Construction Manager	Revit	Revit Architecture 2011
Existing Conditions Modeling	Construction Manager	Revit	Revit Architecture 2011
LEED Evaluation	Mech. Engineer, Constr. Manager, L/E Engineer	MS Excel	MS Excel 2010
Energy Analysis	Mechanical Engineer	Trace, Revit	Trace 700 v6.2, RevitMEP 2011, MS Excel 2010
Structural Analysis	Structural Engineer	Revit, SAP 2000, MS Excel	Revit Structure 2011, SAP 2000 V14.0.0, MS Excel 2010
4D Modeling	Construction Manager	Navisworks, Synchro	Navisworks Manage 2011, Synchro 2011
Cost Estimation	Construction Manager	Quantity Takeoff, Revit	Quantity Takeoff 2010, Revit MEP 2011
3D Coordination (Design)	All Disciplines	Revit, Navisworks	Revit Suite 2011, Navisworks Manage 2011
Daylight Integration & Lighting Analysis	L/E Engineer	AGi32, Ecotect, DAYSIM	AGi32 v2.15 Rev. 4, Ecotect 2011
Design Reviews	All Disciplines	Revit	Revit Architecture 2011

# Computers/Hardware

Processor:	Intel Core i7 CPU 920 @2.67GHz
Operating System:	Windows 7 Enterprise
Memory:	24GB
Storage:	929GB (1TB)
Graphics:	NVIDIA GeForce GTX 260, 1GB
Monitors:	Dual Screen



# Quality Control

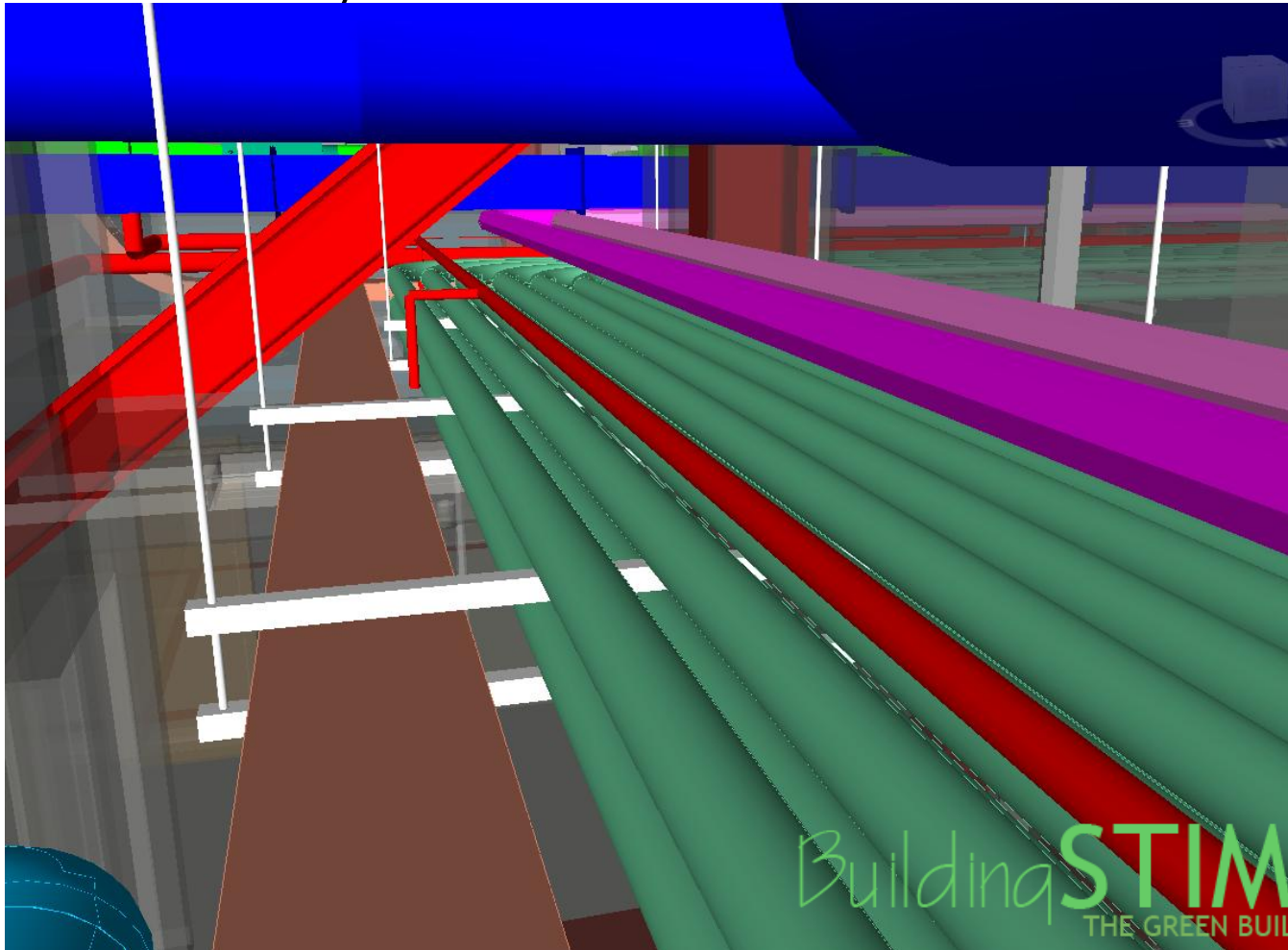
# Quality Control Checks

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)	FREQUENCY
<b>VISUAL CHECK</b>	Ensure there are no unintended model components and the design intent has been followed	All Project Managers	Revit	Continuously
<b>INTERFERENCE CHECK</b>	Detect problems in the model where two building components are clashing including soft and hard	BIM Manager	Navisworks	Weekly
<b>STANDARDS CHECK</b>	Ensure that the BIM and AEC CADD Standard have been followed (fonts, dimensions, line styles, levels/layers, etc.)	All Project Managers	Revit	Continuously
<b>MODEL INTEGRITY CHECKS</b>	Describe the QC validation process used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements and the reporting process on non-compliant elements and corrective action plans	All Project Managers	Revit	Continuously



# Model Accuracy & Tolerances

- Accurate to +/- 1" of actual size and location





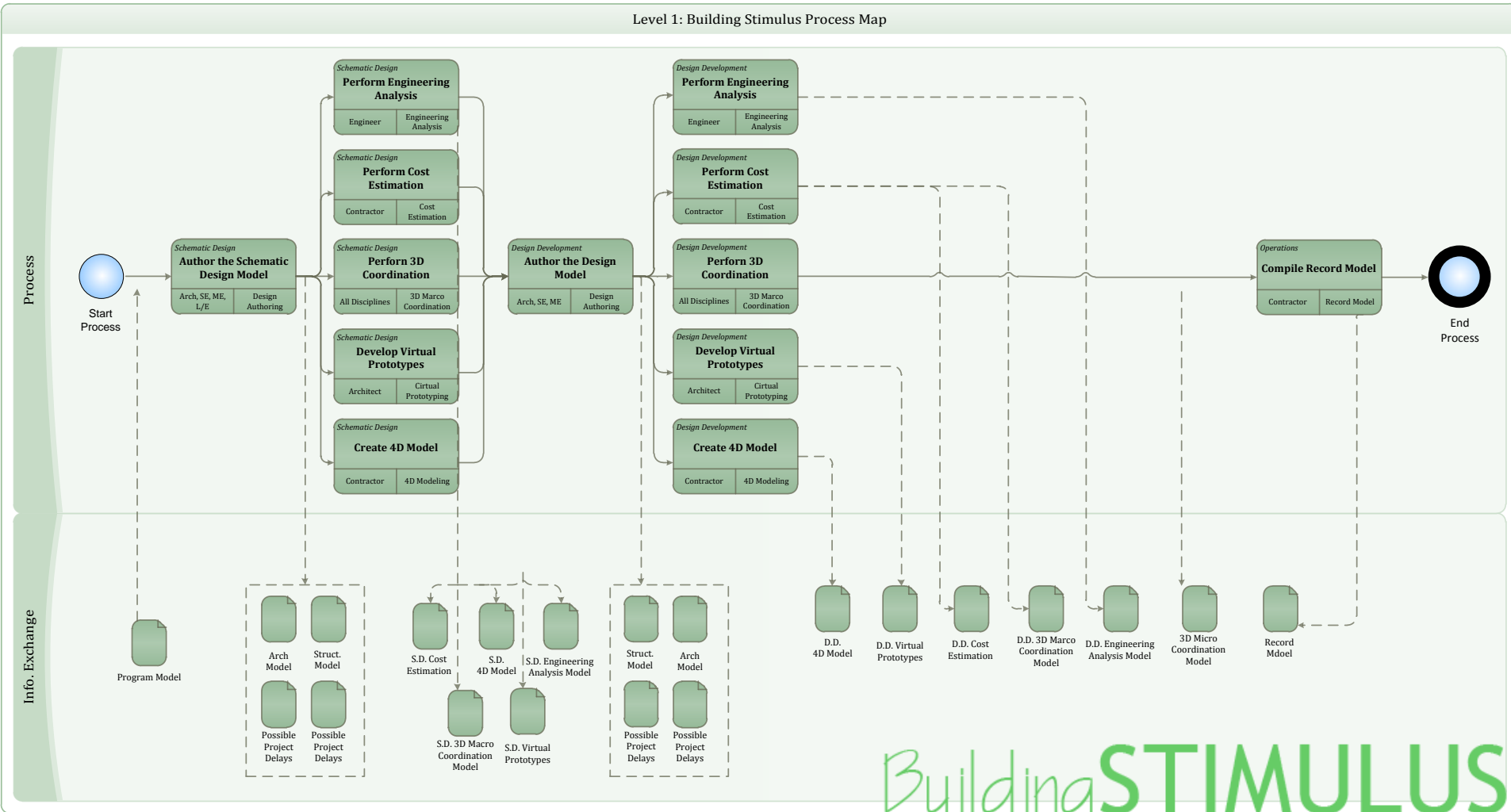
# Information Exchange





# Process Map

Level 1: Building Stimulus Process Map





# Questions

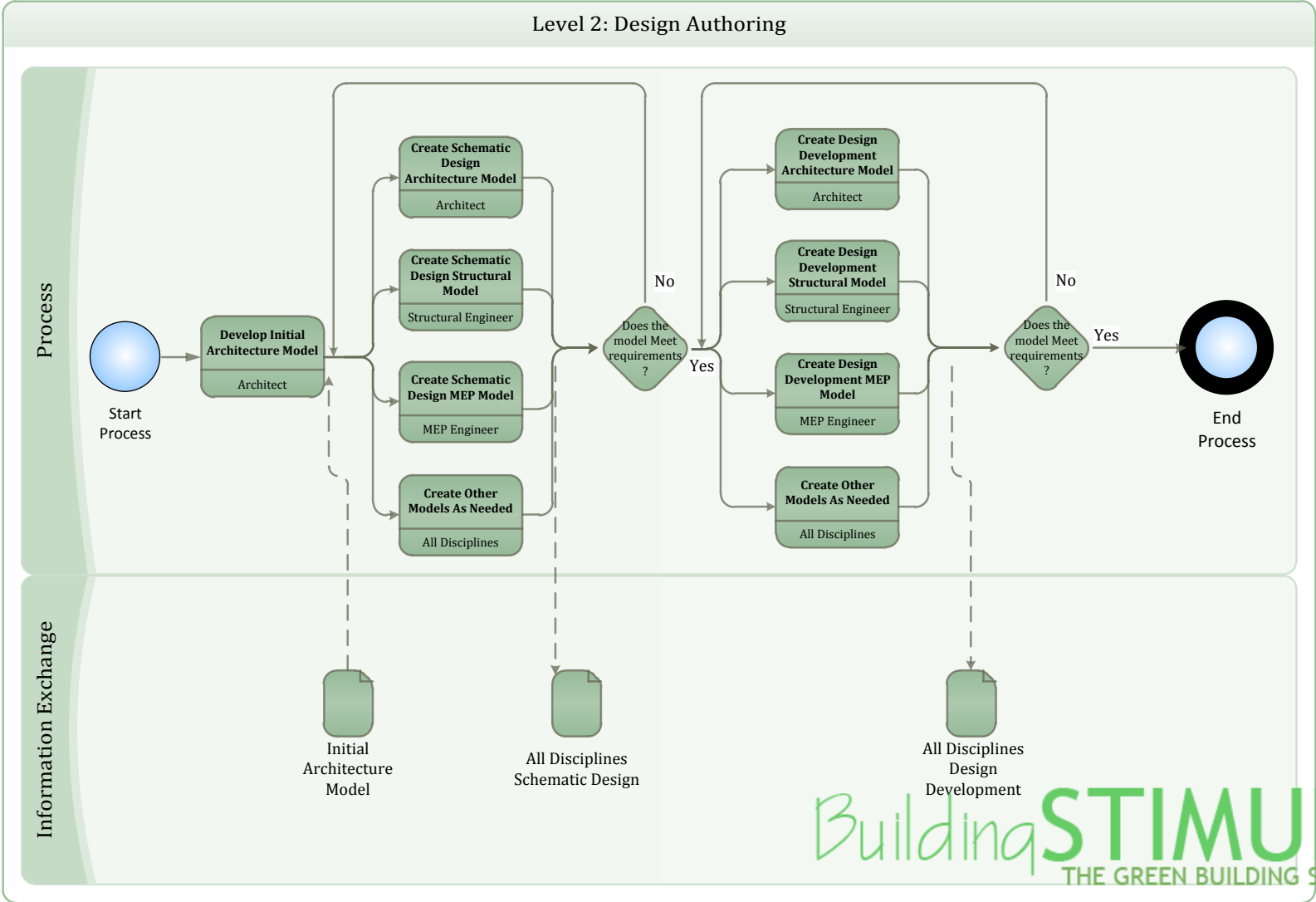
# &

# Comments

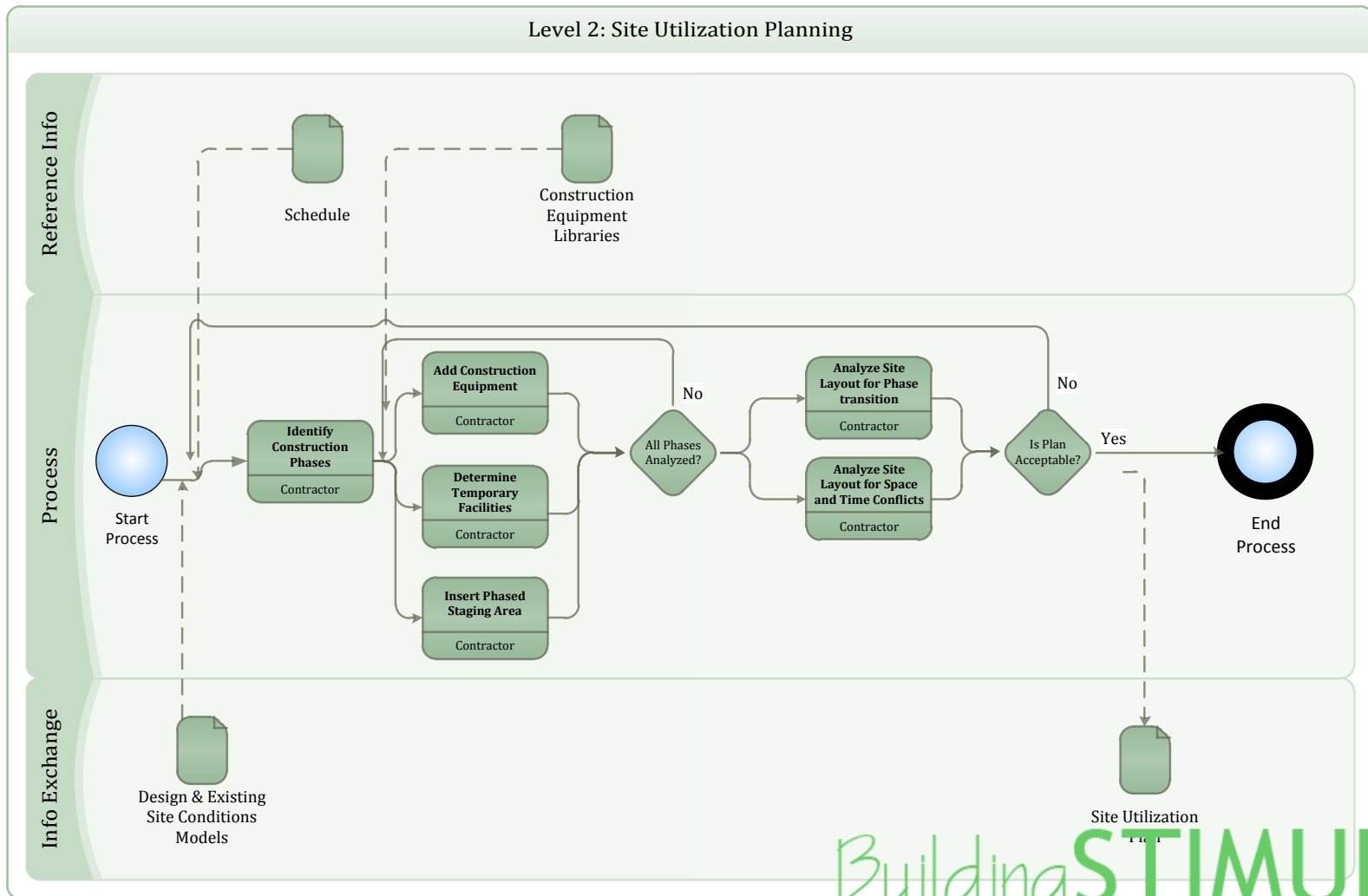


Building **STIMULUS**  
THE GREEN BUILDING SPECIALISTS

# Design Authoring

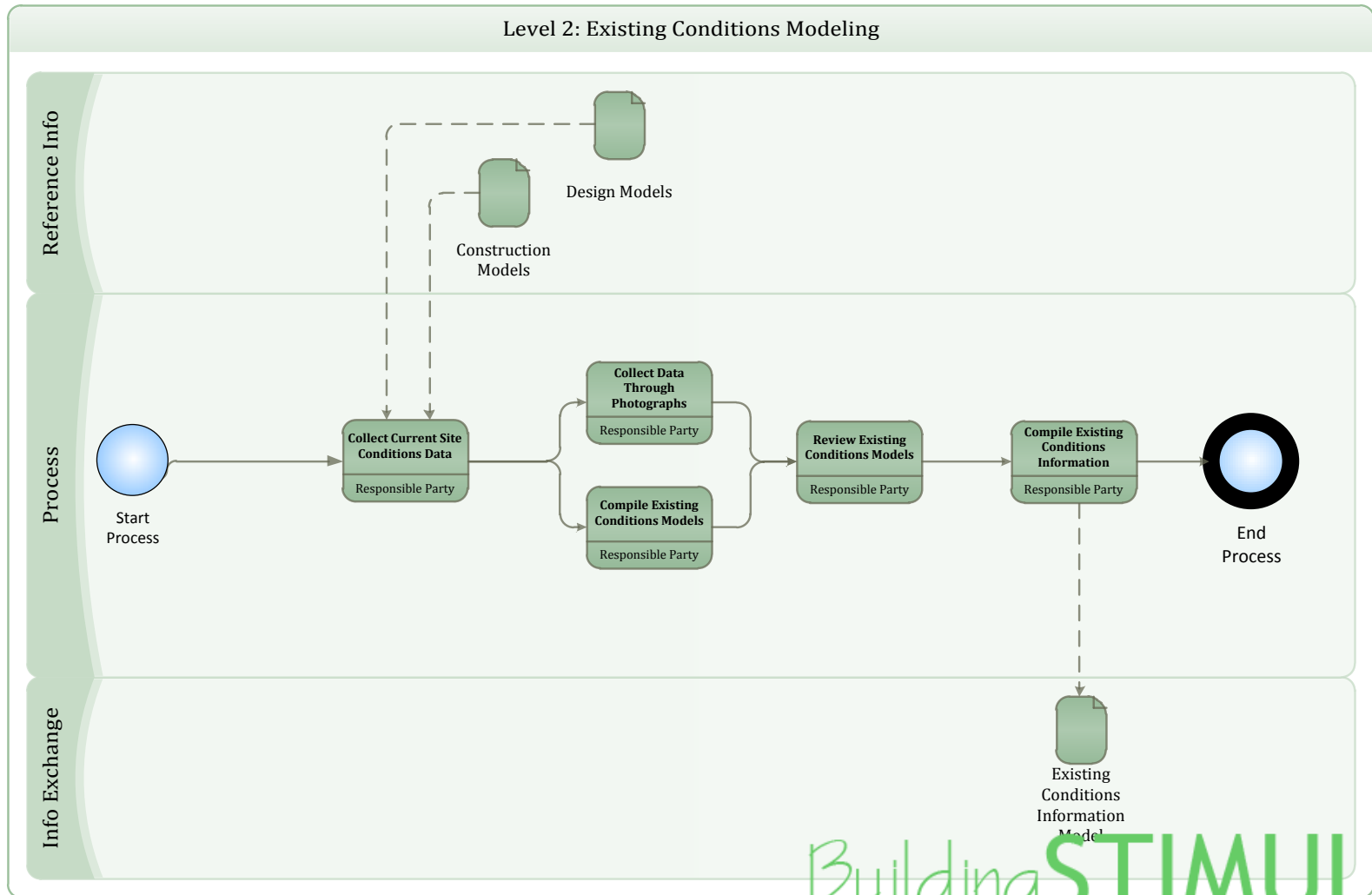


# Site Utilization Planning

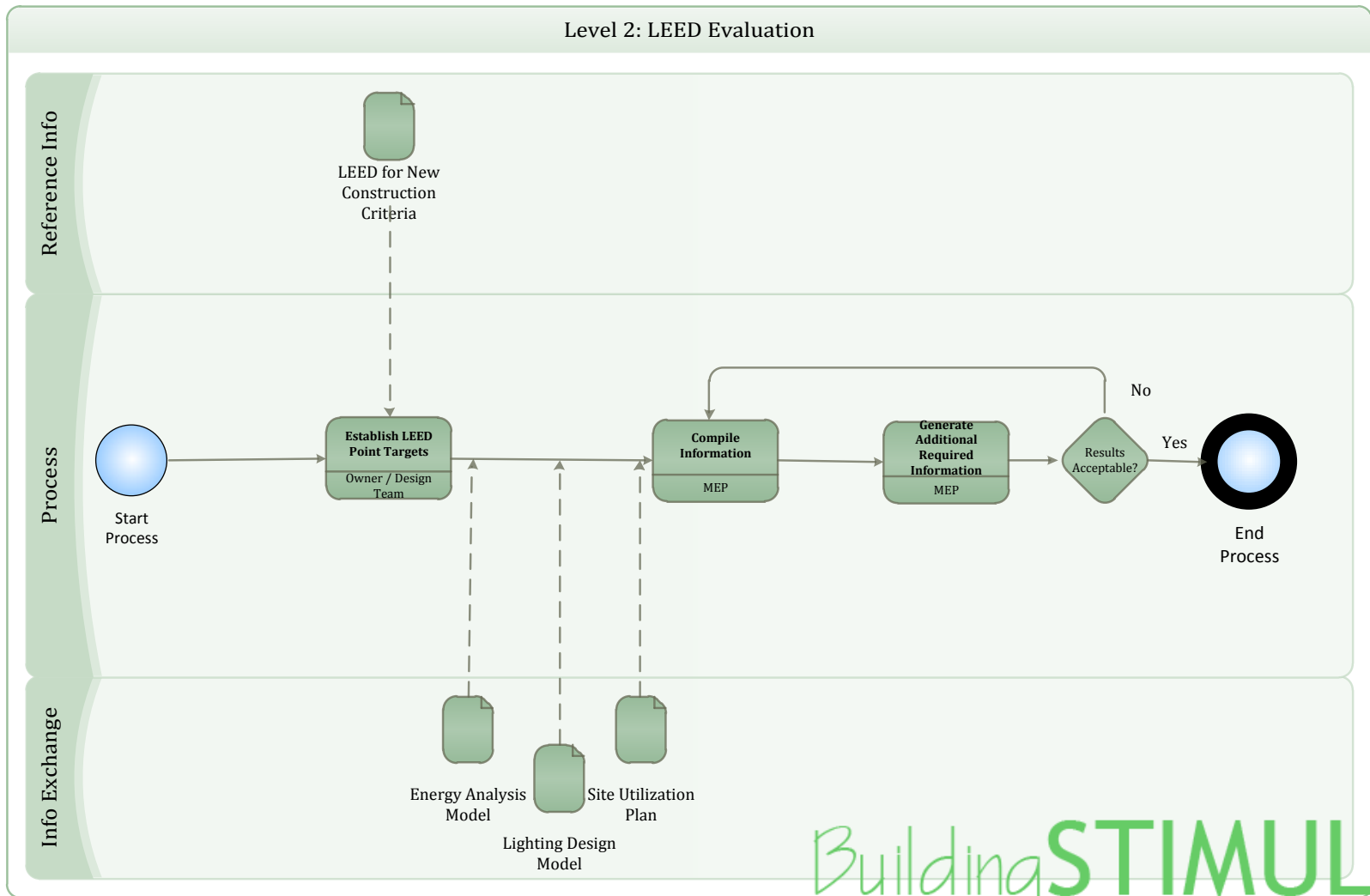




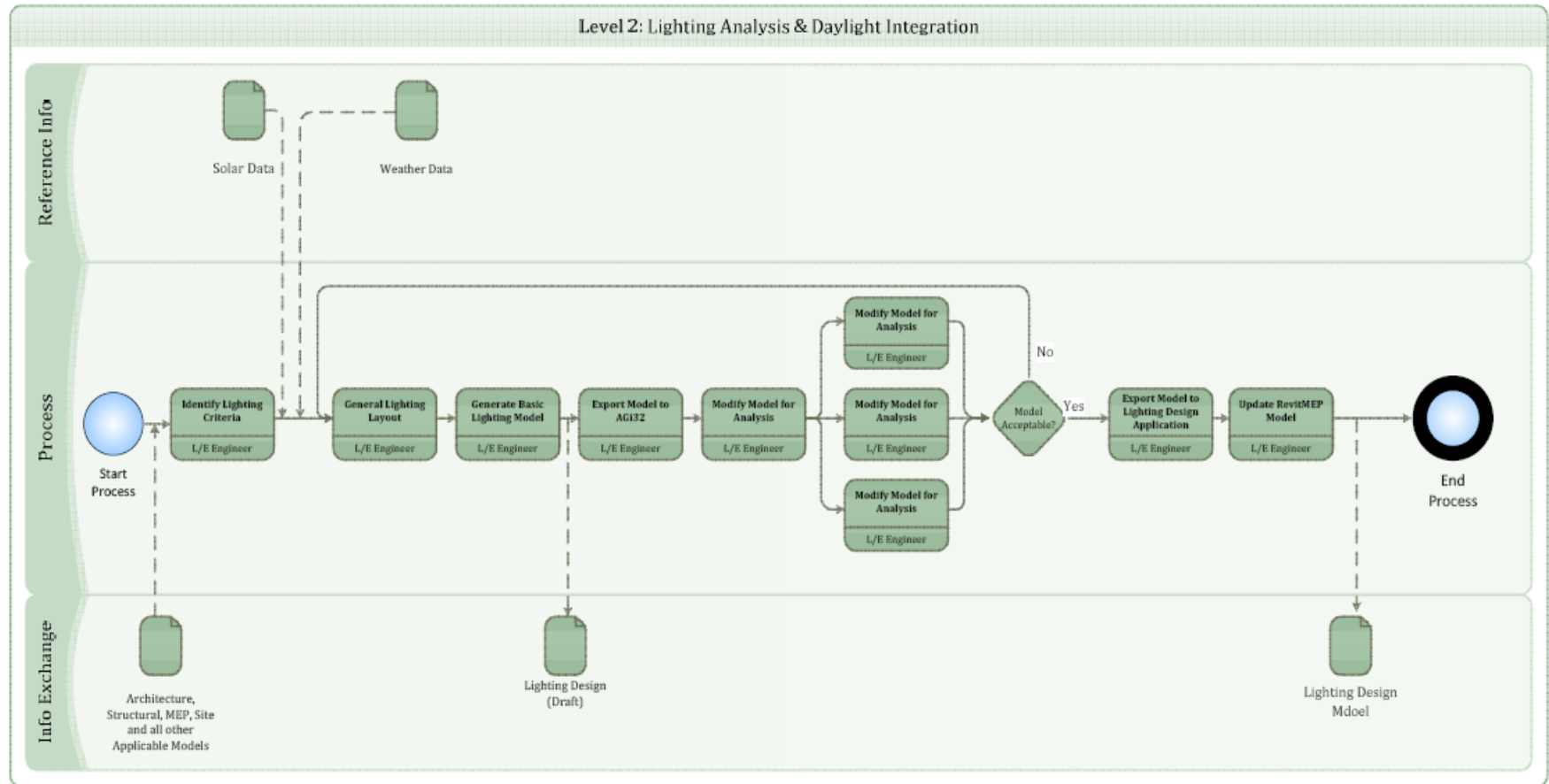
# Existing Conditions Modeling



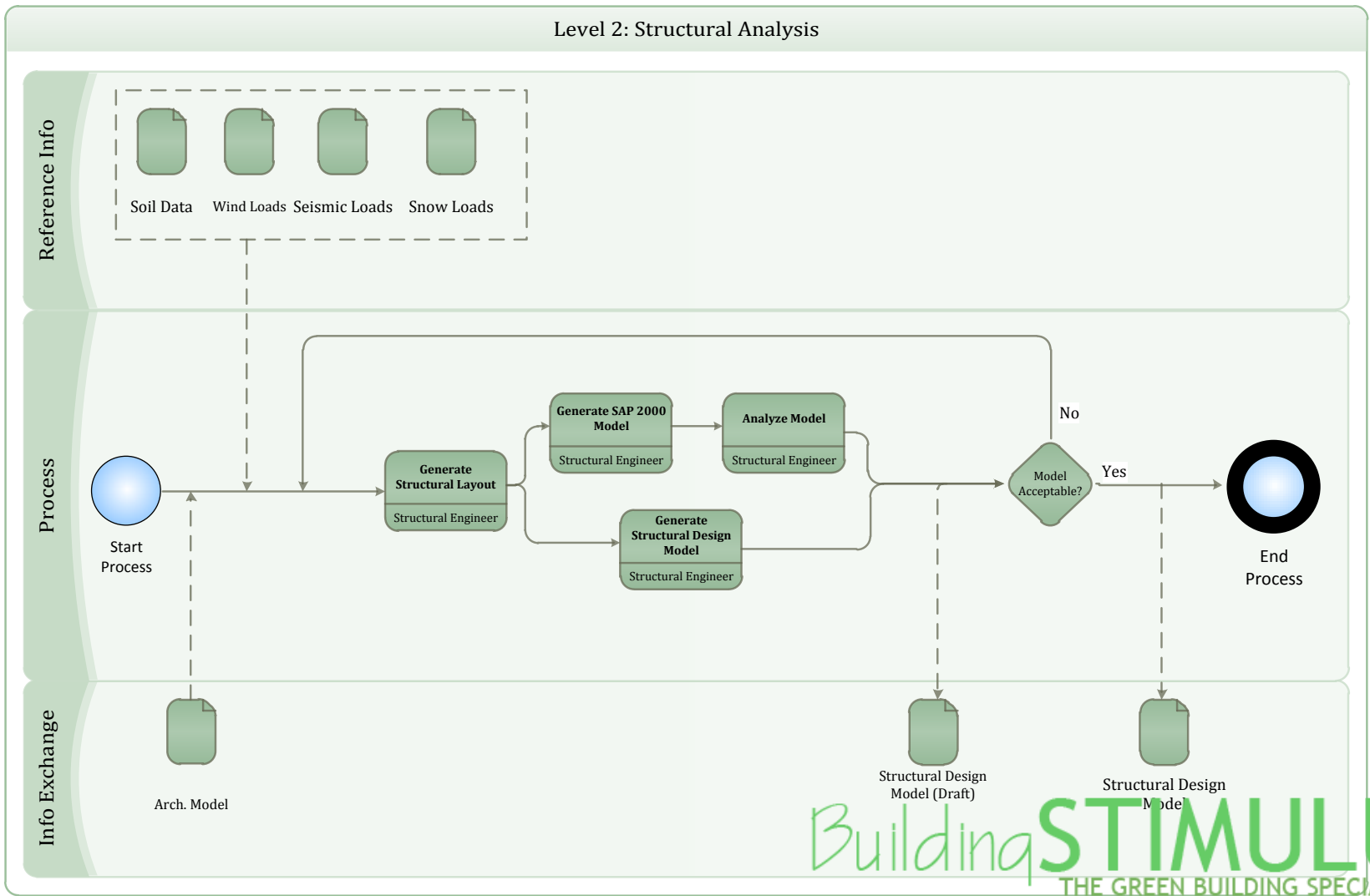
# LEED Evaluation



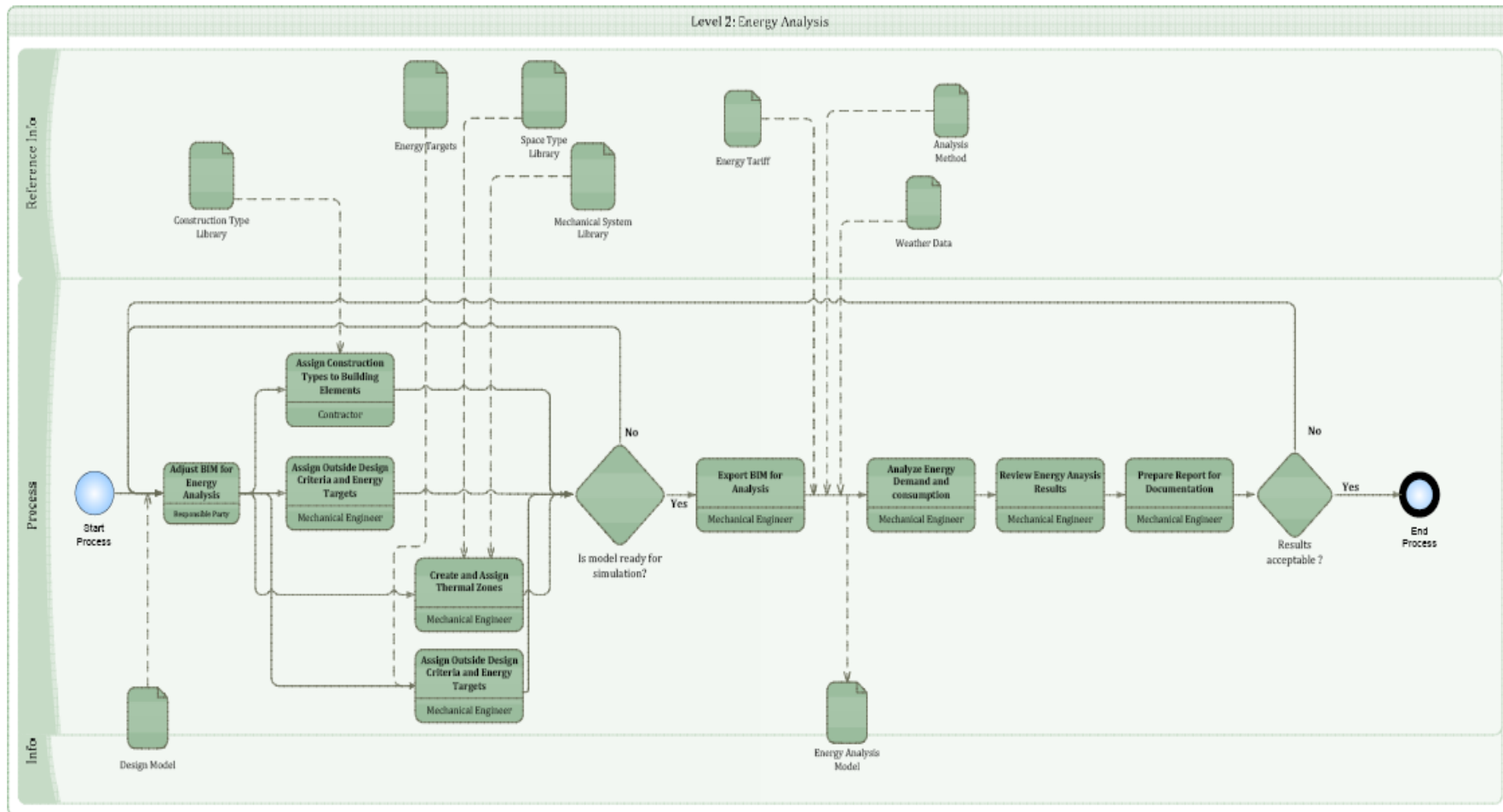
# Lighting Analysis & Daylight Integration



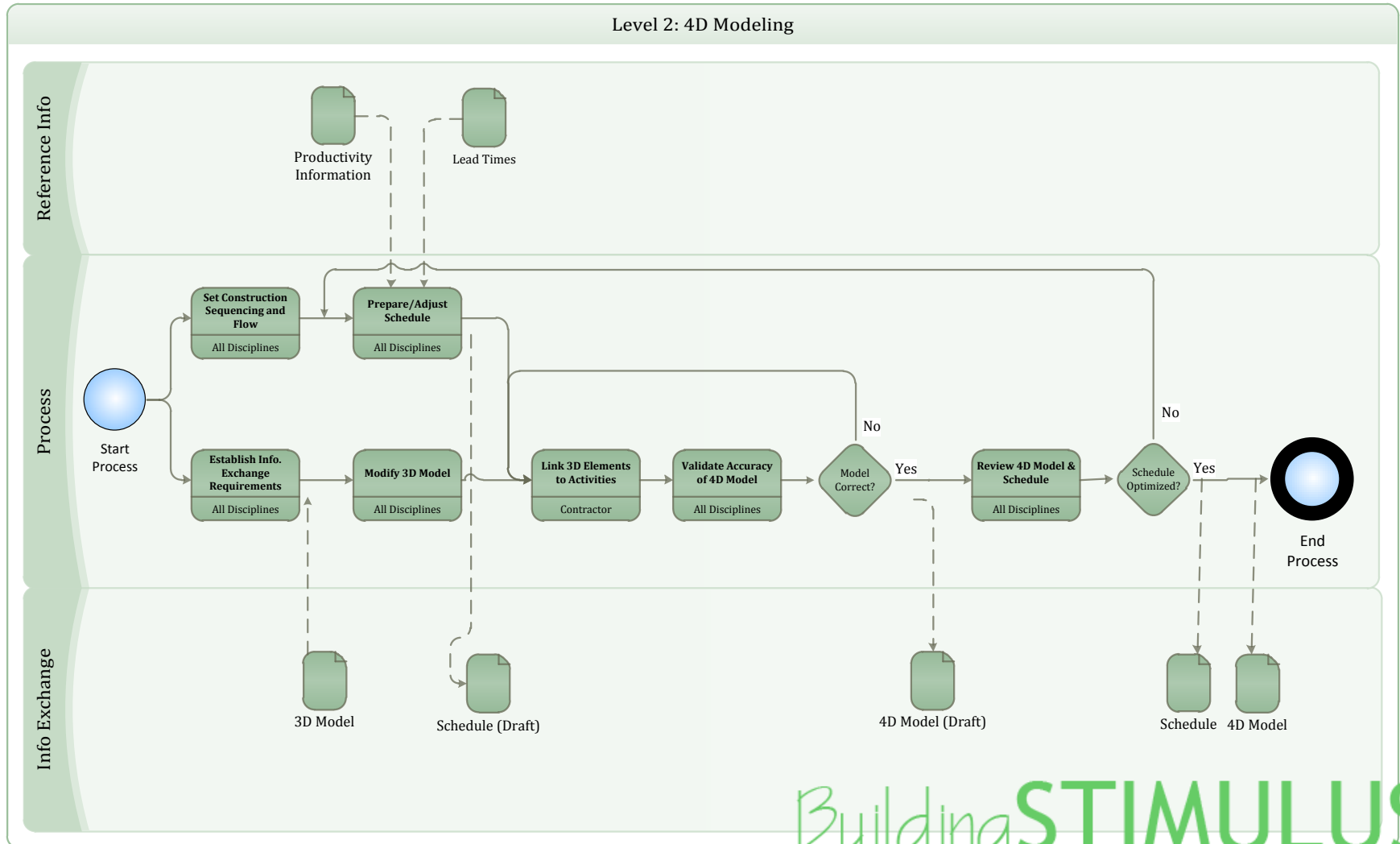
# Structural Analysis



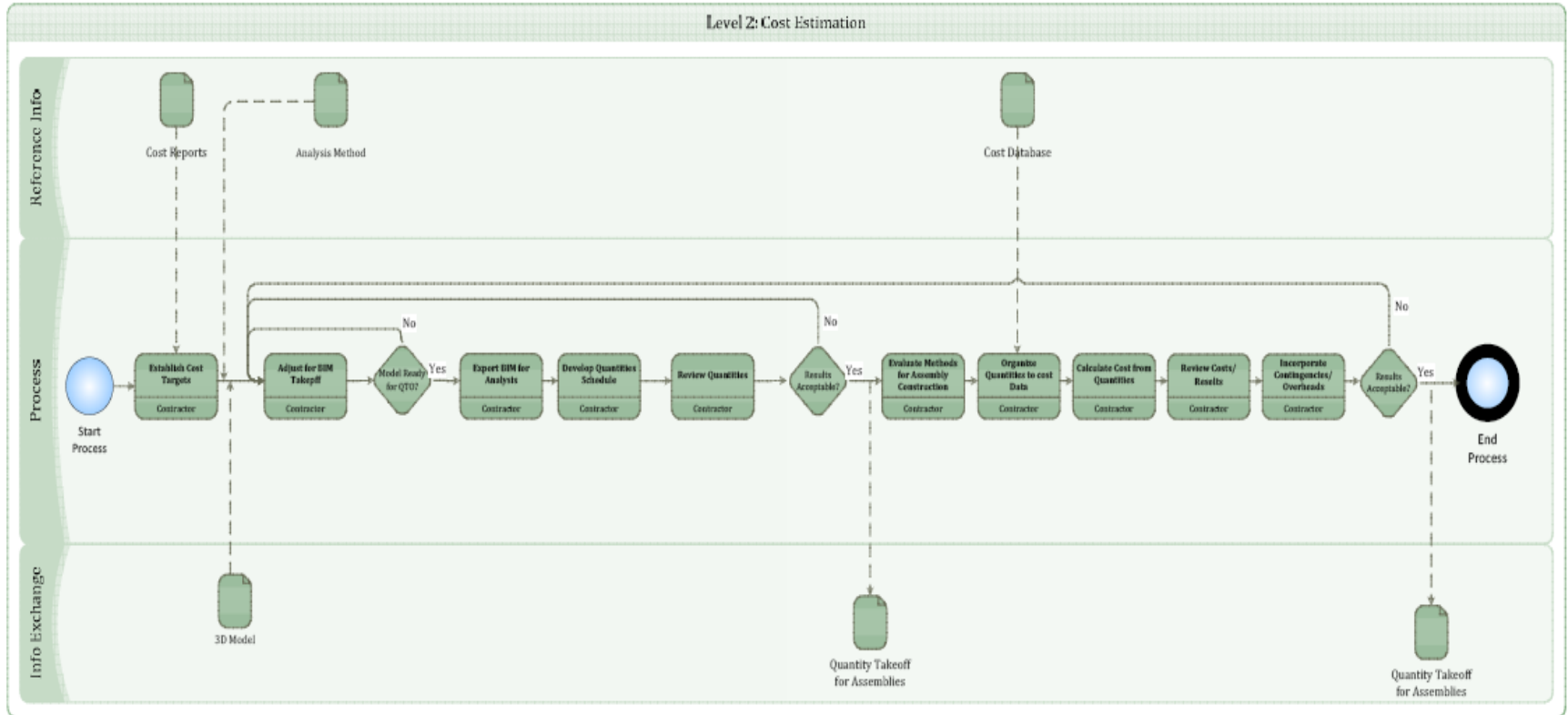
# Energy Analysis



# 4D Modeling



# Cost Estimation



# Design Coordination

