Level 1: BIM Execution Planning Process

Project Title

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

BIM USES

Planning
Validate Program
Owner | Programming

Schematic Design
Author Schematic Design
Architect | Design Authoring

Schematic Design
Perform Cost Estimation
Contractor | Cost Estimation

Schematic Design
Perform 3D Coordination
Architect | 3D Macro Coordination

Schematic Design
Develop Virtual Prototypes
Architect | Virtual Prototyping

Schematic Design
Create 4D Model
Contractor | 4D Modeling

Schematic Design
Perform Engineering Analysis
Engineer | Engineering Analysis

Design Development
Author Design Development
Architect | Design Authoring

Design Development
Perform Cost Estimation
Contractor | Cost Estimation

Design Development
Perform 3D Coordination
Architect | 3D Macro Coordination

Design Development
Develop Virtual Prototypes
Architect | Virtual Prototyping

Design Development
Create 4D Model
Contractor | 4D Modeling

Design Development
Perform Engineering Analysis
Engineer | Engineering Analysis

Construction Documents
Author Construction Documents
Engineer | Design Authoring

Construction Documents
Perform Cost Estimation
Contractor | Cost Estimation

Construction Documents
Perform 3D Coordination
Architect | 3D Macro Coordination

Construction Documents
Develop Virtual Prototypes
Architect | Virtual Prototyping

Construction Documents
Create 4D Model
Contractor | 4D Modeling

Construction Documents
Perform Engineering Analysis
Engineer | Engineering Analysis

Operations
Compile Record Model
Contractor | Record Model

End Process

INFO. EXCHANGE

Program Model

Schematic Design
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

Schematic Design Cost Estimation
Schematic Design 4D Model
Schematic Design Engineering Analysis Model
Schematic Design 3D Macro Coordination Model
Schematic Design Virtual Prototypes

Design Development
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

Design Development Cost Estimation
Design Development 4D Model
Design Development Engineering Analysis Model
Design Development 3D Macro Coordination Model
Design Development Virtual Prototypes

Construction Documents (WP)
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

Construction Documents (WP) Cost Estimation
Construction Documents (WP) 4D Model
Construction Documents (WP) Virtual Prototypes
Construction Documents (WP) 3D Micro Coordination Model
Construction Documents (WP) 3D Macro Coordination Model
Construction Documents (WP) Engineering Analysis Model

Record Model

Level 2: Existing Conditions Modeling

Project Title

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

REFERENCE INFO.

Geotechnical Report

Historical Site / Facilities Information

GIS Data

PROCESS

Start Process

Collect Current Site Conditions Data
Responsible Party

Survey Existing Facilities
Responsible Party

Survey Existing Site Conditions
Responsible Party

Collect Data through Photographs
Responsible Party

Laser Scan Existing Conditions
Responsible Party

Compile Existing Conditions Information
Responsible Party

End Process

INFO. EXCHANGE

Laser Scan Model

Survey Model

Existing Conditions Information Model

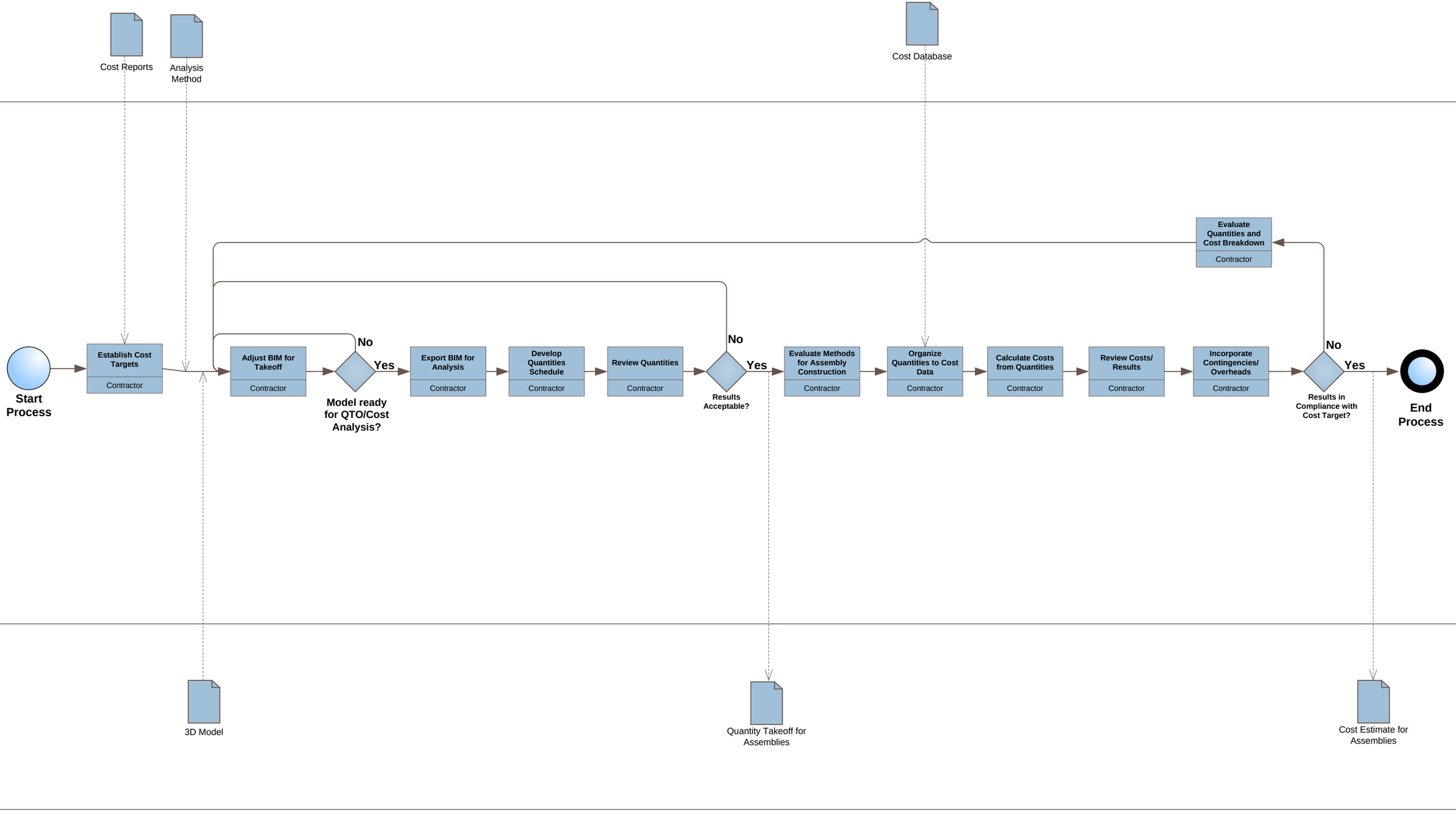
Level 2: Cost Estimation
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE



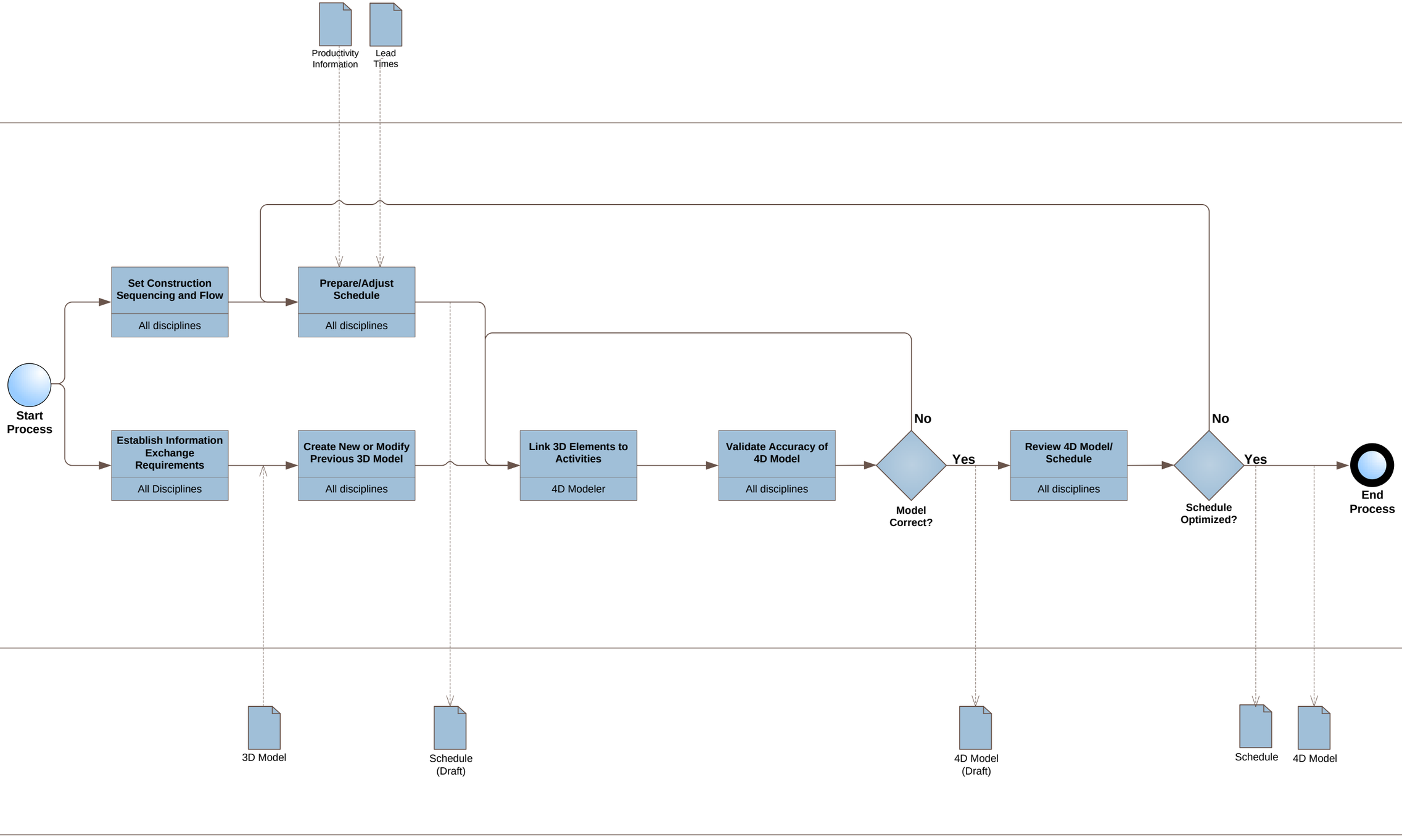
Level 2: 4D Modeling
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE



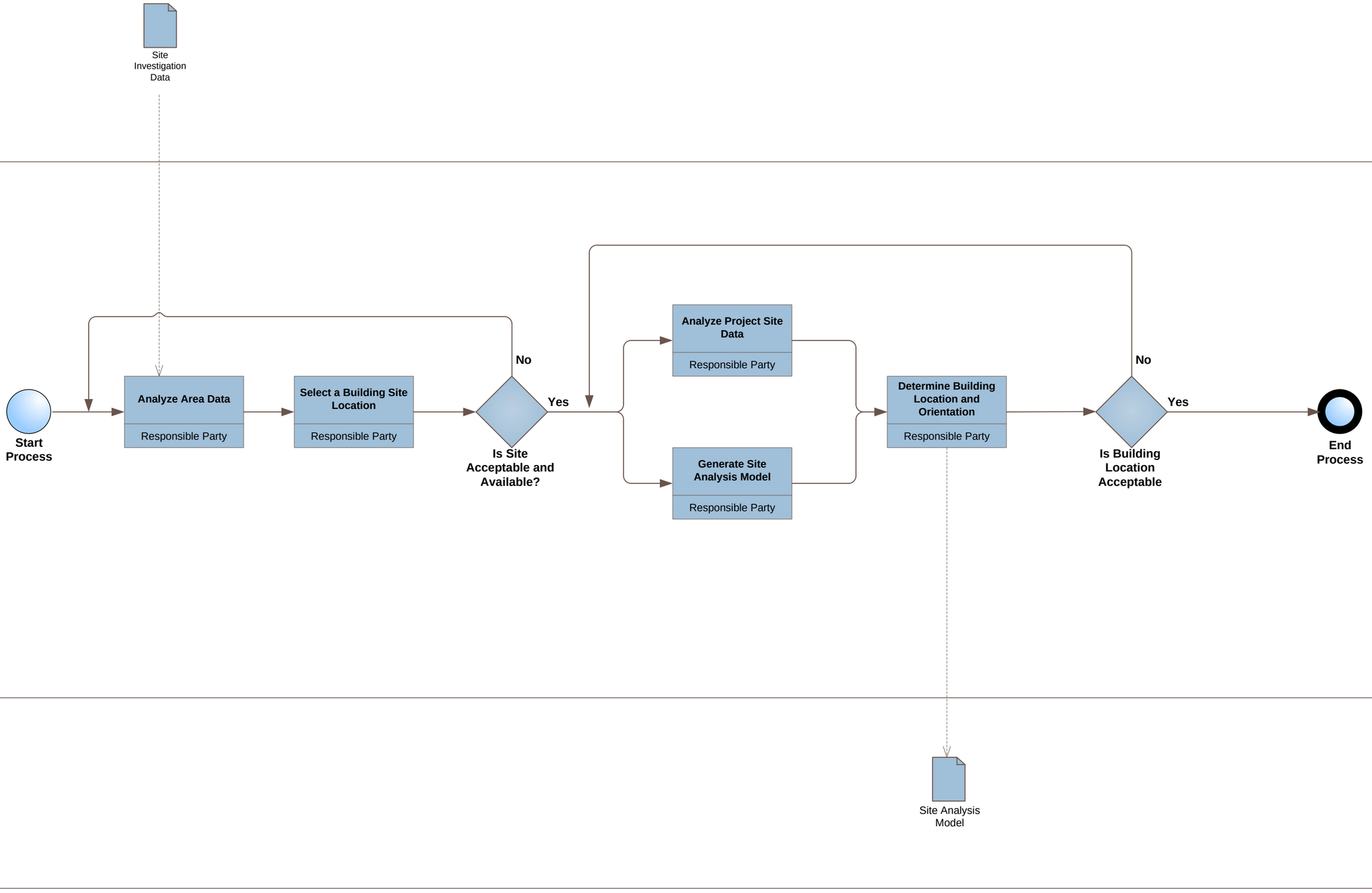
Level 2: Site Analysis
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE



Level 2: Programming
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE

Site Information

Start Process

Identify Building Use/ Type
Owner

Identify Area Requirements
Owner

Identify Cost Targets
Owner

Create Program
Owner

Start Design Programming

Generate Conceptual Building Layout
Architect

Identify Final List of Requirements
Owner

Program Validation

Not Acceptable

Acceptable

End Process

Site Analysis Model

Existing Conditions Model

Program Model

Level 2: Design Authoring
Project Title

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

REFERENCE INFO.

Parametric Modeling Content

PROCESS

Start Process

Identify Models Required
All Disciplines

Identify Content for Model Creation
All Disciplines

Develop Intitial Architecture Model
Architect

Create Schematic Design Architecture Model
Architect

Create Schematic Design Structural Model
Engineer

Create Schematic Design MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

Create Design Development Architecture Model
Architect

Create Design Development Structural Model
Engineer

Create Design Development MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

Create Schematic Design Architecture Model
Architect

Create Schematic Design Structural Model
Engineer

Create Schematic Design MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

End Process

INFO. EXCHANGE

Program Model

Preliminary Architecture Model

Schematic Design
Architectural Model
Structural Model
MEP Model
Other

Design Development
Architectural Model
Structural Model
MEP Model
Other

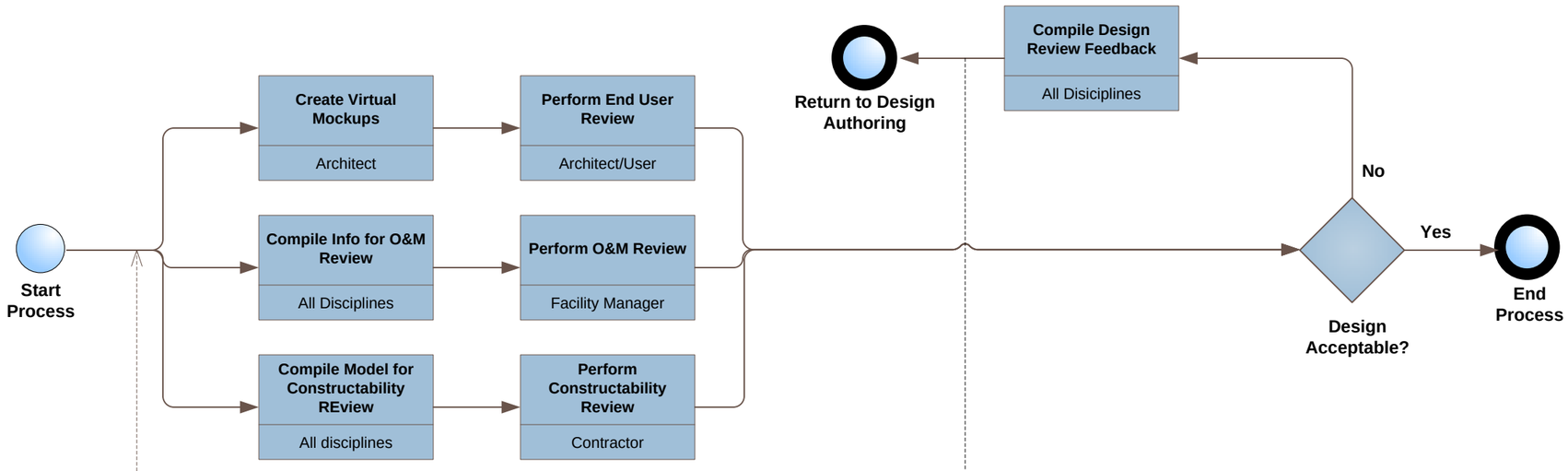
Construction Documentation
Architectural Model
Structural Model
MEP Model
Other

Level 2: Design Review
Project Title

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

REFERENCE INFO.

PROCESS



INFO. EXCHANGE

Level 2: Energy Analysis
Project Title

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

REFERENCE INFO.

Construction Type Library

Space Type Library

Mechanical System Library

Energy Tariff

Analysis Method

Weather Data

PROCESS

Start Process

Adjust BIM for Energy Analysis
Responsible Party

Assign Construction Types to Building Elements
Contractor

Assign Outside Design Criteria and Energy Targets
Mechanical Engineer

Create and Assign Thermal Zones
Mechanical Contractor

Is model ready for simulation?

No

Yes

Export BIM for Analysis
Mechanical Engineer

Analyze Energy Demand and consumption
Mechanical Engineer

Review Energy Anaysis Results
Mechanical Engineer

Prepare Report for Documentation
Mechanical Engineer

Results acceptable ?

No

Yes

End Process

INFO. EXCHANGE

Design Model

Energy Analysis Model

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

Level 2: Structural Analysis
Project Title

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

REFERENCE INFO.

- Soil Data
- Wind Loads
- Seismic Loads
- Snow Loads

PROCESS

Start Process

Generate Structural Layout — Structural Engineer

Generate Structural Design Model — Structural Engineer

Export Model to Structural Analysis Application — Structural Engineer

Analyze Model — Structural Engineer

Is Site Acceptable and Available?

- No
- Yes

Export Model to Structural Design Application — Structural Engineer

Update Structural Design Model — Structural Engineer

End Process

INFO. EXCHANGE

- Arch. Model
- Structural Design Model (Draft)
- Structural Analysis Model
- Structural Design Model

Level 2: Lighting Analysis
Project Title

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

REFERENCE INFO.

Solar Data

Weather Data

PROCESS

Start Process

Identify Lighting Criteria
Lighting Engineer

Generate Lighting Layout
Lighting Engineer

Generate Basic Lighting Model
Lighting Engineer

Export Model to Lighting Analysis Application
Lighting Engineer

Modify Model for Analysis
Lighting Engineer

Analyze Model for Lighting Levels
Lighting Engineer

Analyze Model for Daylighting
Lighting Engineer

Analyze Model for Density Levels
Lighting Engineer

Is Building Lighting Acceptable?

No

Yes

Export Model to Lighting Design Application
Lighting Engineer

Update Lighting Model
Lighting Engineer

End Process

INFO. EXCHANGE

Arch. Model

Other Applicable Models

Struct. Model

Lighting Design Model (Draft)

Lighting Analysis Model

Lighting Design Model

Level 2: Design Coordination
Project Title

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

REFERENCE INFO.

Company Implementation Standards

Contract Requirements

Information Exchange Requirements

PROCESS

Start Process

Create Model Sharing System
BIM Coordinator

Define Coordination Meeting Location
BIM Coordinator

Define Information for Discipline Models
All Disciplines

Define the Areas of Coordination
All Disciplines

Develop Schedule for Coordination
All Disciplines

Establish a Protocol to Address Collisions
All Disciplines

Start Design Coordination Process

Create Discipline Models
All Disiciplines

Compile Composite Model
BIM Coordinator

Perform Collision detection
BIM Coordinator

Any Collisions?

Yes

Identify Solutions to Collisions
All Disciplines

No

End Process

INFO. EXCHANGE

Design Model

Coordination Model by Discipline

Coordination Model

Level 2: Site Utilization Planning
Project Title

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

REFERENCE INFO.

Schedule

Construction Equipment Libraries

PROCESS

Start Process

Identify Construction Phases
Contractor

Add Construction Equipment
Contractor

Determine Temporary Facilities
Contractor

Insert Phased Staging Areas
Contractor

Are All Phases Analyzed? (Occurs for each Phase)

No

Yes

Analyze Site Layout for Phase Transition
Contractor

Analyze Site Layout for Space and Time Conflict
Contractor

Is Plan Acceptable?

No

Yes

Distribute Plan to Various Parties
Contractor

End Process

INFO. EXCHANGE

Design Model

Existing Site Conditions Model

Site Utilization Plan

Level 2:3D Control and Planning
Project Title

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

REFERENCE INFO.

Design Specifications and Intent

Schedule, Cost and Labor Info

Construction Families and Libraries

3D Controls Report

PROCESS

Start Process

Determine Scope of Work to be Analyzed
Contractor

Identify Alternative Construction Methods
Contractor

Model Alternative Methods
Contractor

Analyze Various Methods
Contractor

Is Model Acceptable?

Compare and Select Options
Contractor

Coordinate Construction Sequences
Contractor

Is Construction Sequence Acceptable?

Generate Construction Plans
Contractor

End Process

INFO. EXCHANGE

Design Model

Site Utilization Model

Construction Model

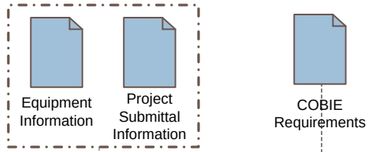
Level 2: Record Modeling
Project Title

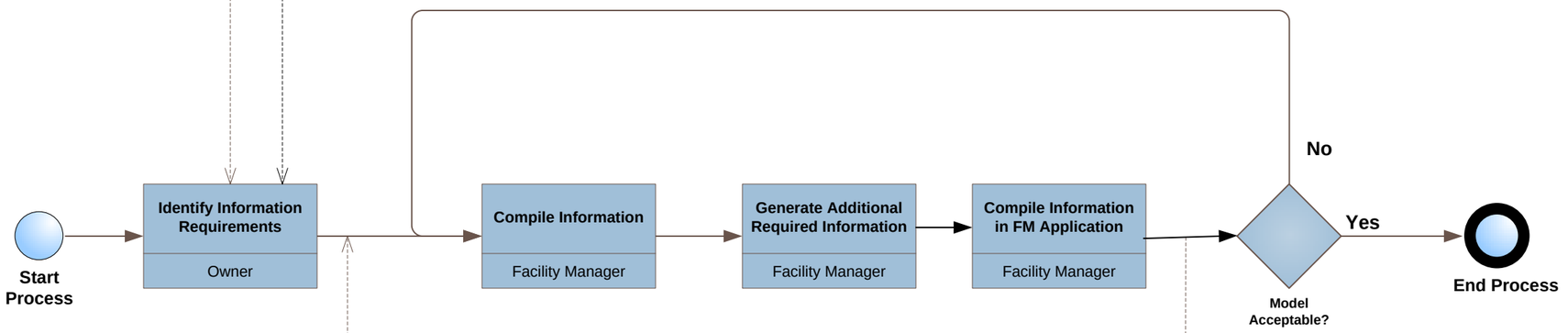
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex

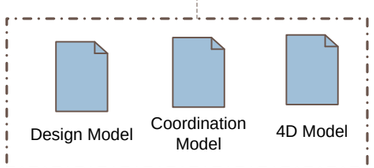
REFERENCE INFO.

PROCESS

INFO. EXCHANGE







Level 2: Maintenance Scheduling
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE

Level 2: Building System Analysis
Project Title

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE

Sensor Data

Other Performance Data

Performance Targets

Performance Cost

Weather Data

Start Process

Adjust BIM for Peformance Analysis
Responsible Party

Assign Performance Targets
Facility Manager

Collect Sensor and Building Performance Data
Facility Manager

Is Model Ready For Simulation?

No

Yes

Export BIM for Analysis
Responsible Party

Analyze Performance Demand and Consumption
Responsible Party

Review Building Performance Anaysis Results
Facility Manager

Prepare Preformance Analysis Reports
Facility Manager

Results Acceptable?

No

Yes

End Process

Energy Analysis Model

Record Model

Building Performance Analysis Model

Building Performance Analysis Output