

MIT

Design Standards

BIM Execution Plan

T04 Thematic Folder

Issued 2022

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1. BIM EXECUTION PLAN OVERVIEW

To successfully implement Building Information Modeling (BIM) on a project, the project team has developed this detailed BIM Project Execution Plan. The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle.

This is also a pilot use of BIM at MIT where the client is engaged in the BIM process alongside the design and construction teams.

There will be six interlinked BIM files by the design team: an Existing Conditions/Architectural Design Model by ARCH; Mechanical, Plumbing, Electrical, Communications, and Access Control models by ENG.; and then a Coordination Model by CONS. The design models will be in Revit Architecture 2019.

2. PROJECT INFORMATION

1. Project Owner: MIT
2. Project Name: MIT W1 Renovation Project
3. Project Location and Address: 305 Memorial Drive, Cambridge, MA 02138, USA
4. Contract Type/Delivery Method:
5. Project Description: Massachusetts Institute of Technology Building W-1 construction services for \$00 million, 185,000 sf design/build renovation and restoration of seven-story, historic (1900s) residence hall, including common areas, dining room, kitchen, and lobby; scope of work will include reconfiguration of dormitory rooms, ADA compliance upgrades, and all new life-safety and M/E/P systems; site is in a high-profile location on Massachusetts Avenue, requiring extensive logistical coordination; project is targeting LEED® Silver Certification
6. Project Numbers

PROJECT INFORMATION	NUMBER
MIT Project Number	07063
CONSTRUCTION Project Number	090193
ARCHITECTURAL Project Number	
ENGINEERING Project Number	2958.04

7. Project Schedule/Phase/Milestones

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
Existing conditions documentation	2/10/2022	12/1/2022	Owner, A/E, sub-consultants, CM
CD level model with major A/MEP coordination	8/01/2022	12/18/2022	A/E
Contractor coordination implemented into model.	6/17/2022	8/12/2022	CM, subcontractors
Incorporate as-built information into model	8/12/2022	11/11/2022	CM, subcontractors

3. KEY PROJECT CONTACTS

ROLE	ORGANIZATION	CONTACT NAME	LOCATION	E-MAIL	PHONE
Program Manager	MIT		NW23		
Project Manager	CONS				
Senior Associate	ARCH				
BIM Administrator	MIT		NW23		
Virtual CM	CONS				
	ENG				
	ENG				

4. PROJECT GOALS/BIM USES

4.1 MAJOR BIM GOALS/OBJECTIVES

PRIORITY	GOAL DESCRIPTION	POTENTIAL BIM USES
High	Streamline MEP/FP coordination	Clash free BIM
Medium (Open-Ended)	Explore how spaces and objects in the model can be enriched with data in a fashion that dovetails with CAFM and COBie-compliant data conversion	
Low		

4.2 BIM USES

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORING	X	SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS	X	DESIGN REVIEWS	X	CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		X	3D COORDINATION	X	3D COORDINATION	X	ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING/Shading ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY/MEP ANALYSIS	X	RECORD MODELING	X	RECORD MODELING
		X	COMMUNICATION w/ HISTORIC COMMISSION and MIT COMMUNITY	X	Virtual Mockup		
			CODE, LEED EVALUATION				
	4D MODELING	X	4D MODELING	X	4D MODELING		4D MODELING
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING

4.3 BIM USES ANALYSIS WORKSHEET

The BIM Uses Analysis Worksheet will specifically identify important information for the development of the chosen BIM Uses in an organized way to increase efficiency and collaboration. The worksheet can be found in Appendix **.

5. ORGANIZATIONAL ROLES/STAFFING

MODEL NAME	MODEL CONTENT	PROJECT PHASE	AUTHORING COMPANY	AUTHORING TOOL
Architectural Model	Architectural existing conditions	CD level drawings	ARCH	Autodesk® Revit® Architecture
HVAC Model	Completed design modeled with spatial requirements of and diagrammatic locations for equipment, piping, ductwork, valves etc.	CD level drawings	END	Autodesk® Revit® MEP
Plumbing Model	Completed design modeled with spatial requirements of and diagrammatic locations for piping, equipment, valves etc.	CD level drawings	ENG	Autodesk® Revit® MEP
Electrical Model	Completed design modeled with spatial requirements of and diagrammatic locations for electrical panels, equipment, starters, disconnects, outlets, switches etc. Conduits 4" and over shall be modeled.	CD level drawings	ENG	Autodesk® Revit® MEP
Communications Model			END	Autodesk® Revit® MEP
Access Control Model			END	Autodesk® Revit® MEP
Coordination Model	Architectural, structural, and MEP components		CONS	Autodesk® Revit® Architecture
As-Built Model	As- built conditions		CONS	Autodesk® Navisworks

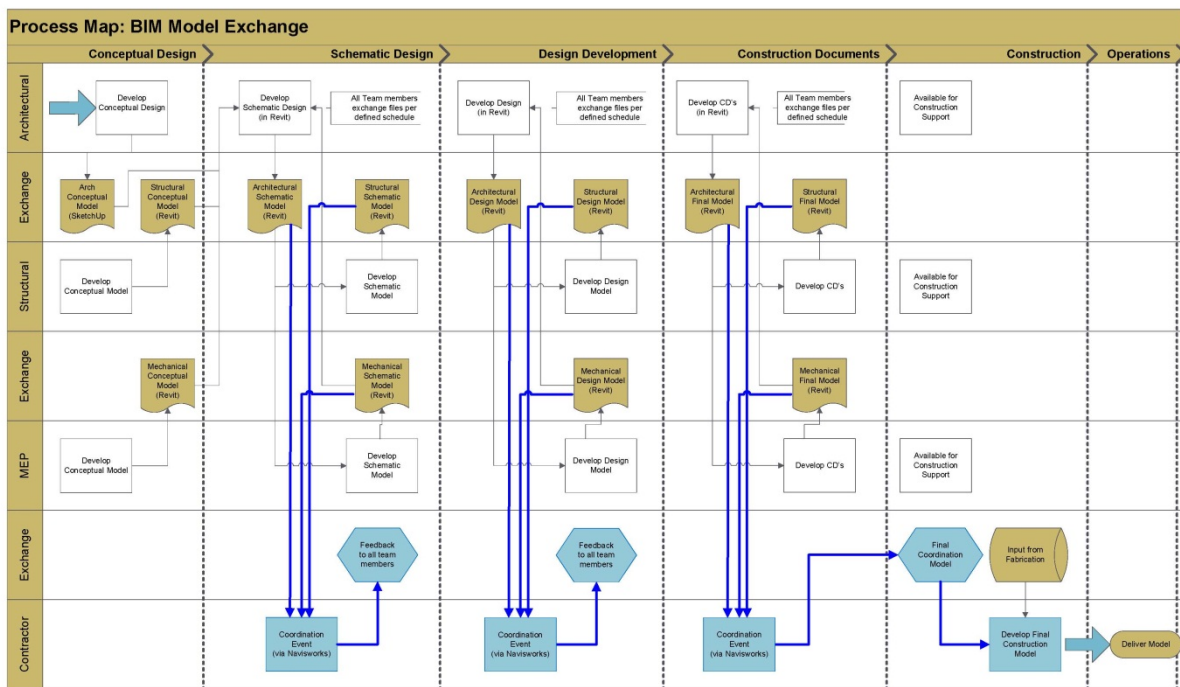
*Architectural and MEP models are separate but linked.

BIM USE	ORGANIZATION	NUMBER OF TOTAL STAFF FOR BIM USE	ESTIMATED STAFF HOURS	LOCATION(S)	LEAD CONTACT
Existing Model	Contractor A				

6. MODEL TRANSITION PROCESS DIAGRAM

Provide model transition process diagram for each BIM model. This process diagram will provide a detailed plan for execution of each BIM model, building the foundation for the entire execution plan.

6.1 OVERVIEW DIAGRAM



7. 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.

7.1 LIST OF INFORMATION EXCHANGE WORKSHEETS

The following are examples. Modify for specific project. Some Information Exchanges may need to be removed, while some Information Exchanges may need to be added.

- Existing Conditions Modeling
- Cost Estimation
- 4D Modeling
- Programming
- Site Analysis
- Design Reviews
- Design Authoring
- Energy Analysis
- Structural Analysis
- Lighting Analysis
- 3D Coordination
- Site Utilization Planning
- 3D Control and Planning
- Record Modeling
- Maintenance Scheduling
- Building System Analysis

7.2 MODEL DEFINITION WORKSHEET

(Attach Model Definition Worksheet)

8. BIM AND FACILITY DATA REQUIREMENTS

MIT seeks to use this model process to explore how MIT Space Accounting data can be integrated into the model. Spaces should follow MIT standards as described in the MIT Space Accounting Guidelines V3.0, and data should be created so that it can export via ODBC and other standard connectivity standards, such as a newly emerging 'lite' form of COBie. The MIT Space Accounting Guidelines can be found in Thematic Folder T18 in the MIT Design Standards.

The following is a list of items that should be included in the model for Facilities Management use:

* Include list of items to be included in the model from FM standpoint

9. COLLABORATION PROCEDURES

9.1 COLLABORATION STRATEGY

The project team will use an FTP site as a tool for communication, document management and transfer.

9.2 MEETING PROCEDURES

MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM REQUIREMENTS KICK-OFF				MIT
DESIGN COORDINATION				MIT
CONSTRUCTION PROGRESS REVIEWS		Weekly, as needed		MIT
BIM DEMONSTRATION AT CLOSEOUT	To team; To leadership of MIT Facilities; to other audiences	TBD		MIT

9.3 MODEL DELIVERY SCHEDULE OF INFORMATION EXCHANGE FOR SUBMISSION AND APPROVAL

INFORMATION EXCHANGE	FILE SENDER	FILE RECEIVER	ONE-TIME / FREQUENCY	DUE DATE/ START DATE	MODEL FILE	MODEL SOFTWARE	NATIVE FILE TYPE	FILE EXCHANGE TYPE
Existing Model	ARCH	MDS (FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	Arch	Revit Arch 2010	.rvt	.rvt
Engineering Models	ENG	RWS (FTP POST) (COORDINATION LEAD)	WEEKLY OR SOONER TBD	[DATE]	MEP	Revit Arch 2010	.rvt	.rvt
Coordination Model	CONS	SDC (FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	A/MEP	Navisworks	.nwd	.nwd

9.4 INTERACTIVE WORKSPACE

The project team should consider the physical environment it will need throughout the lifecycle of the project to accommodate the necessary collaboration, communication, and reviews that will improve the BIM Plan decision making process. Describe how the project team will be located. Consider questions like “will the team be collocated?” If so, where is the location and what will be in that space? Will there be a BIM Trailer? If yes, where will it be located and what will be in the space such as computers, projectors, tables, table configuration? Include any additional information necessary about workspaces on the project.

9.5 ELECTRONIC COMMUNICATION PROCEDURES:

FILE LOCATION	FILE STRUCTURE / NAME	FILE TYPE	PASSWORD PROTECT	FILE MAINTAINER	UPDATED
	MIT – W1/Renovations	FOLDERS	YES		ONCE/wk
	MIT – W1/Renovations	FOLDERS	YES		ONCE/wk

10. QUALITY CONTROL

10.1 OVERALL STRATEGY FOR QUALITY CONTROL / QUALITY CONTROL CHECKS

The following checks will be performed to assure quality and we will seek to capture the process as we proceed through the project.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)	FREQUENCY
VISUAL CHECK	Ensure there are no unintended model components and the design intent has been followed	CONS and ARCH and MIT	Revit, ADR	At submittals
INTERFERENCE CHECK	Detect problems in the model where two building components are clashing including soft and hard; this is limited in scope for this project but will mainly involve interference with built surfaces.	CONS and ARCH and MIT	Revit, ADR	At submittals
STANDARDS CHECK	Ensure that the BIM and AEC CADD Standard have been followed (fonts, dimensions, line styles, levels/layers, etc)	CONS and ARCH and MIT	Revit, ADR	At submittals
MODEL INTEGRITY CHECKS	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	CONS and ARCH and MIT	Revit, ADR	At submittals

10.2 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 in Appendix **.

PHASE	DISCIPLINE	TOLERANCE
Existing Model	Arch	<p>Existing structural columns and beams were modeled on an as needed basis from STP contract drawings and original structural drawings.</p> <p>Footprint of the masonry structure is approximate based on survey, field measurements and original drawings.</p> <p>Light fixtures, plumbing fixtures and toilet accessories are accurately located but the objects are not representative of the actual fixtures.</p>
Design Models	MEP	<p>All MEP system components shall be fully coordinated by the contractors prior to installation. What is specified and shown in the model is not necessarily what will be submitted, approved, and or installed. Due to the scale of the drawings bid/CD drawings are diagrammatic in nature. The creation of a 3D model in REVIT is done to assure that the major coordination issues can be resolved prior to installation; the 3D model will then be passed onto the contractors for their use in creating the as-built model with updated information and content, at a scale suitable to reflect the installation clearly on a printed sheet.</p>

11. TECHNOLOGICAL INFRASTRUCTURE NEEDS

11.1 SOFTWARE

BIM USE	DISCIPLINE (if applicable)	SOFTWARE	VERSION
Existing Model Authoring	ARCH	REVIT	2019
Mech. Design Models Authoring	ENG	REVIT	2019
Coordination Model Authoring	CONS	NAVIS	2019

11.2 COMPUTERS / HARDWARE

BIM USE	HARDWARE	OWNER OF HARDWARE	SPECIFICATIONS
DESIGN AUTHORING	XXX COMPUTER SYSTEM	ARCHITECT X	PROCESSOR, OPERATING SYSTEM, MEMORY STORAGE, GRAPHICS, NETWORK CARD, ETC.

11.3 MODELING CONTENT AND REFERENCE INFORMATION

BIM USE	DISCIPLINE (if applicable)	MODELING CONTENT / REFERENCE INFORMATION	VERSION
DESIGN AUTHORING	ARCH	To be determined further into the process	

12. MODEL STRUCTURE

12.1 FILE NAMING STRUCTURE

FILE NAMES FOR MODELS SHOULD BE FORMATTED AS:	
CAMPUS_BUILDING_MIT PROJECT #_MODELNAME_DATE.xyz	
EXISTING MODEL	MIT_W1_07063_EXIST- MMDDYY .rvt
HVAC MODEL	MIT_W1_07063_HVAC- MMDDYY .rvt
PLUMBING MODEL	MIT_W1_07063_PLUMB- MMDDYY .rvt
ELECTRICAL MODEL	MIT_W1_07063_ELEC- MMDDYY .rvt
COMMUNICATIONS MODEL	MIT_W1_07063_COMM- MMDDYY .rvt
ACCESS CONTROL MODEL	MIT_W1_07063_ACCESS- MMDDYY .rvt
ENERGY MODEL	Not Applicable unless decided otherwise by client
CONSTRUCTION LOGISTICS MODEL	MIT_W1_07063_CONST- MMDDYY .rvt
DISCIPLINE COORDINATION MODEL	MIT_W1_07063_COORD- MMDDYY .rvt

12.2 MODEL STRUCTURE

The model will be organized by level (floor 0,1,2,3,4,etc.).

MODELING STANDARDS	
Draft to be developed from list below and augmented throughout the modeling process	
Modeling should avoid:	Modeling Should:
Stacked walls	Use the overall coordinate system provided by MIT
Locking dimensions in the project	Model different construction elements separately even if they are adjacent (e.g., sills separate from windows)
Creating unnecessary parameters in the project	Use the shaft opening tool for shafts and elevators
Doors as curtain panels	Create views organized by sheet set or use (Working, Documentation, Presentation)
Attaching walls to floors and roofs	Create set of existing plans under the working folder, with dimensions.
Using mass families for anything except overall building massing	Use dependent views wherever they break up plans to fit on a sheet.
Openings in walls and openings as ways of windows to cut walls (use voids instead)	Use Uniformat for worksets
	Follow naming convention for any new families created
	Uniformat for 3d components
	CSI for 2d components

12.3 EXCLUSIONS

The following tables provide lists of objects that are to be excluded from the model(s).

ITEMS TO BE EXCLUDED FROM THE ARCHITECTURAL MODEL
Door hardware
Food Service Equipment and casework
Appliances
Skylights
Lobby reception desk
Handrails
Finishes, wood trim (not consistently), signage, window treatments, acoustic wall panels

ITEMS TO BE EXCLUDED FROM THE HVAC DESIGN MODEL
NOTE: the items omitted/not connected are for drawing clarity reasons or the systems were drafted in CAD.
All required offsets due to structural and other obstructions.
The full extent of piping and accessories associated with mechanical equipment.
Final connections to mechanical equipment (VAV, UH, FCU, etc.).
Connections between horizontal and vertical ductwork at shafts.
Pipe anchors.
Refrigerant Liquid and Suction lines between AC's and HPs
Various shut-off valves, gauges, drain valves, etc. required throughout the building. (See details and diagrams)
Hangers, seismic bracing, vibration isolation

ITEMS TO BE EXCLUDED FROM THE PLUMBING DESIGN MODEL

NOTE: the items omitted/not connected are for drawing clarity reasons or the systems were drafted in CAD.

Horizontal piping and connections in fixture chases, other than main risers and stacks

Hangers, seismic bracing, vibration isolation

Piping in the west wing on the ground floor including the kitchen area

Piping in the Servery area of the first floor (west wing)

Underground piping including floor cleanouts

The full extent of piping and accessories associated with the hot water heaters, thermostatic mixing valves and balancing valves

Exact locations of plumbing fixtures

Typical bathroom piping layout and pipe sizes (seen on bathroom part plans) shown on all floors

Final Connections to equipment (Hot Water Heaters, Sewage Ejector, Sump Pumps, Dryers, Stoves, etc.) may not be made for drawing clarity.

All required piping offsets due to structural and other obstructions

Various shut-off valves, gauges, drain valves, etc. required throughout the building

ITEMS TO BE EXCLUDED FROM THE ELECTRICAL DESIGN MODEL

Electrical conduits have not been modeled. Please refer to Electrical schedules for conduit sizing.

Conductor sizes have not been included within the model. Unless otherwise noted on plans, please refer to Electrical schedules for conductor sizing.

Equipment by other trades have not been included in the model. Electrical services for equipment has been provided.

Main service equipment (i.e. 15kV Switches, Substation, Generator, etc.) have not been included in the model.
Lighting Control System for Servery/Dining Area has not been modeled.
Details, Symbol Legend, General Notes, Riser Diagrams, Schedules have not been modeled.

ITEMS TO BE EXCLUDED FROM THE COMMUNICATIONS DESIGN MODEL
Communications conduits have not been modeled.
Communications wiring have not been modeled
Part Plans for Telecommunications rooms have not been modeled
Details, Symbol Legend, General Notes, Faceplate details, Riser Diagrams have not been modeled.
Communications work area outlets have not been modeled completely on correct elevation height

ITEMS TO BE EXCLUDED FROM THE ACCESS CONTROL DESIGN MODEL
Access controls conduits have not been modeled.
Access controls wiring have not been modeled
Part Plans for Telecommunications rooms have not been modeled
Details, Symbol Legend, General Notes, Riser Diagrams have not been modeled.
Access control points, control panel and device locations have not been modeled completely. Some devices shown as line work only.

12.4 REVIT OBJECT CATEGORIES

The following table gives the status of each object category required in the model(s).

OBJECT CATEGORY	STATUS
Areas	Not in Model
Casework	Not in Model
Ceilings	In Existing Model , suspended vs attached differentiated
Columns	In Existing Model
Curtain Systems	Not in Model, may be used in design model
Detail Items	In all Models as needed
Doors	In Existing Model , for location and overall size, not detail of panels
Electrical Equip.	In Existing Model , only as needed
Electrical Fixtures	In Existing Model , only as needed
Entourage	NA
Floors	In Existing Model
Furniture/Systems	Not in Model
Gen Models	Not in Model
Lighting	In Existing Model , to be discussed as per design scope
Lines	Are any needed for MIT georeferencing?
Mass	To be discussed
Mechanical Equip.	In Existing Model , only as needed
Parking	NA
Planting	In Existing Model , only as needed
Plumbing	In Existing Model , only as needed
Railings	In Existing Model , scope at stairs to be discussed
Ramps	NA
Raster	Survey images, to be discussed
Roads	In Existing Model , only as needed
Roofs	In Existing Model , pitch scope to be discussed
Rooms	In Existing Model , need data standards from MIT
Shafts	In Existing Model , only as needed
Site	Only immediate area, not full topographies
Spec. Equip.	NA
Str. Beam	In Existing Model
Str. Columns	In Existing Model
Str. Found.	To be drawn, not modeled (all subterranean work)
Str. Framing	To be discussed
Topography	See site
Walls	In Existing Model
Windows	In Existing Model , unhosted, w/o openings (only voids), to be refined extensively in design model

12.5 MEASUREMENT AND COORDINATE SYSTEMS

Imperial Units; Georeferenced Coordinates provided by MIT.

12.6 BIM AND CAD STANDARDS

STANDARD	VERSION	BIM USES APPLICABLE	ORGANIZATIONS APPLICABLE
MIT CAD & BIM Guidelines	V3.2	DESIGN AUTHORING	ARCH/ENG
UNIFORMAT		WORKSET AND FAMILY ORGANIZATION	ARCH/ENG

13. PROJECT DELIVERABLES

In this section, list the BIM deliverables for the project and the format in which the information will be delivered.

BIM SUBMITTAL ITEM	STAGE	APPROXIMATE DUE DATE	FORMAT	NOTES
			.DWG	
			.RVT	
			.RVT	
			.PDF / .DWG	
			.RVT	
			.RVT	
			.RVT	
			.RVT .NWD	

14. DELIVERY STRATEGY/CONTRACT

14.1 DELIVERY AND CONTRACTING STRATEGY FOR THE PROJECT

What additional measures need to be taken to successfully use BIM with the selected delivery method and contract type?

14.2 TEAM SELECTION PROCEDURE

How will you select future team members in regards to the above delivery strategy and contract type?

14.3 BIM CONTRACTING PROCEDURE

How should BIM be written into the future contracts?

