BIM STANDARDS

**BUILDING INFORMATION MODELING (BIM) STANDARDS
FOR ARCHITECTS, ENGINEERS, AND CONTRACTORS**

Encouraged on all projects.

The following information will aid in establishing a building information modeling standards for the allocation and management of space. This will be reviewed and modified on a continual basis and should not be considered all-inclusive. As new information presents itself, and as time permits, the guide will be revised.

For more information and updates on Miami Dade College BIM standards – please visit our website www.mdc.edu/facilities , or email facilitiesplanning@mdc.edu

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1 GENERAL INFORMATION

1.1   MIAMI DADE COLLEGE OBJECTIVES FOR BIM USE

Miami Dade College is committed to utilizing Building Information Modeling (BIM) tools, 3D Models, 2D Drawings, Data and other uses to support the delivery and management of all of their facilities. The Facilities Management Department at Miami Dade College strive to be able to use BIM for new facilities and deliver higher value in quality, timeliness, cost and to maximize building performance during operations.

BIM and other digital tools can enhance communication and lean efficiencies during project development, providing all stakeholders an improved way of understanding the issues so they can fully participate together in solving problems.

The release of the Miami Dade College BIM Standards, a collection of documents which includes this paper will allow Miami Dade College and our industry partners to apply the efficiencies BIM provides to capital asset projects for MDC.

Miami Dade College aims to achieve improvements in construction by recognizing that the AE's work deliverable must be tailored specifically for the needs of contractors. MDC intends to use the BIM models not just for drawings, but also for construction purposes such as the use of regular 3D coordination meetings during design and construction in order to reduce field coordination issues such as RFIs and change orders, general quantity takeoffs for materials, using survey coordinates for the site and building layouts, ant other process improvements such as offsite fabrication, etc.

1.2   OWNERSHIP AND USE OF BIM

The ability to own, reuse, and properly manage building data throughout the facility lifecycle accrues significant advantages for an owner. Consequently, the Facilities Management Department at Miami Dade College places significant importance on the accurate creation, management, and stewardship of all digital information (including but not limited to Models, 2D Drawings, specifications, visualizations, and data) created during project development and execution. Miami Dade College intends that this information will be used for planning, design, construction, equipment selection, facility management, as well as other purposes (including but not limited to commissioning, management of project activities, and real property reporting), and by other software as needed.

1.3   REVIEWS, APPROVALS, ISSUE RESOLUTION, AND WAIVERS

Situations may arise where adherence to this standard is not in the best interest for Miami Dade College. If such a situation arises, the party creating the information must request and obtain a waiver from Miami Dade College before deviating from the MDC BIM Standard. If a Construction Agent is used the Construction Agent must submit the waiver request to Miami Dade College for a decision. The Construction Agent is not authorized to waive the MDC BIM Standard. Miami Dade College is not opposed to waiver requests, but the request must identify the specific standard for which the waiver is requested, the reason for the waiver, the resulting impacts on the purposes Miami Dade College intends, and any alternative approaches that should be considered.

1.4   REQUIRED EXPERTISE

All work requiring services to create BIM Models and data about or for Miami Dade College facilities must take place under the formal direction of a BIM professional who has a **minimum of five years of proven experience** in using BIM for similar projects of size and complexity, and who can provide examples of competency to execute the requirements in the Miami Dade College BIM Standards. Design services must be conducted under the supervision of a licensed professional architect and/or engineer. Site surveying, identifying the survey

monument for the project, laser or photogrammetry scanning, must be under the formal direction of a licensed professional surveyor.

1.5   REQUIRED DATA MANAGEMENT

Miami Dade College considers building data to be a strategic asset that must be managed appropriately to maintain its value. All entities working on Miami Dade College capital asset projects will take due care that data nomenclature, integrity, accuracy, and completeness are maintained during project delivery and transfer between software applications.
All deliverables will be appropriately named and stored as described within the attached 'FM:Interact Revit Modeling Standards' document, under their 'File Names' section on page 1.

Example: "**SiteNumber_BuildingNumber_type.rvt**"

The Architecture model for Building 444th at Wolfson Campus would be named: **"03_444_ARCH.rvt"**

1.6   BIM EXECUTION PLAN

Contingent on the delivery method applied for the project, the Project Execution Plan to be submitted within **thirty (30) working days** of contract award of the primary parties involved in the model development. The Project Execution Plan will be reviewed and approved by MDC within **fifteen (15) working days**. The Project Execution Plan should identify the complete project team and their roles and responsibilities associated to the model. Considerations regarding the type of project, the goals associated with the project by MDC, the trade contractor's involvement, and the complexity of the project should be considered when developing the Project Execution Plan. All proposed initiatives by the design and construction teams through the RFP process should be included in the comprehensive document. Additionally, Project Execution Planning meetings should be held and MDC staff should be a part of the planning process for assuring the highest value from model development.
It is the responsibility of the AE and GC to ensure that digital systems, software, and servers, etc. being used to create or manage Miami Dade College building information during project delivery are accessible to only those individuals who are responsible for design, construction, coordination, management, and/or approval of the specific project.

1.7   MODEL MANAGER RESPONSIBILITIES

One individual must be designated as the Model Manager to be the responsible person who is accountable to Miami Dade College for BIM, including data creation and model management coordination between team members for the project. If the project is being procured by Design-Bid-Build, then there will be a separate Model Manager for the AE and the GC who must coordinate their respective work.
If Design-Build (or other similar joint Design/Construction entity) procurement is used, there may be just one Model Manager for the entire project work.

Each Model Manager is accountable to Miami Dade College for the following activities:

a. Ensuring compliance with Miami Dade College BIM Standard and required deliverables.
b. Developing, maintaining, updating, distributing, and providing clarifications to/for the BIM Execution Plan.
c. Structuring, defining, coordinating, and managing model creation, model and data quality control across all firms, disciplines, or trades under its contractual umbrella

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d. Leading and facilitating the BIM Management Project Kick-off meeting with project team member modelers to explain the BIM project objectives and management protocols
e. Verifying that the geo-references in the associated technical discipline models are properly referenced to the identified project permanent survey monument and with each other
f. Ensuring regularly scheduled periodic Design Coordination and/or Construction Coordination review meetings
g. Coordinating updates of the Design-Intent model(s) to create the Record Model and delivery of BIM-derived 2D Drawings and other information as required to support the project delivery process
h. Instituting Quality Control (QC) for proper modeling, standards adherence, and classification of all spaces and equipment as required

1.8   PROJECT DELIVERY

The procedures outlined in the Project Delivery Guide apply to all planning, design and construction work at Miami Dade College.

Project Managers are responsible for enforcing Miami Dade College's documentation standards during the design and construction processes. Contractors are required to maintain proper as-built documentation, including records of all product/equipment submittals from submission to acceptance.

When the contractor turns the project over to MDC at completion, as-built documentation becomes an important tool for the owner, essential to the successful long-term operation and maintenance of the project.

Typical project delivery is structured into four major phases:

a. **Schematic Design (SD)**

b. **Design Development (DD)**

c. **Construction Documents (CDs)**

d. **Construction Administration, Preconstruction**

e. **Construction Administration (CA)**

These phases are used in order to establish benchmarks for progress, and to organize the design review process. Design fees are often allocated according to phase.

1.8. a   SCHEMATIC DESIGN (SD)

During Schematic Design, the design team develops initial concepts in response to the major requirements of the program document, the site, the budget, and other constraints. The documents developed during SD may illustrate several feasible "schemes" that satisfy the requirements of the

program. The objective of the SD phase is the selection of a single design scheme that achieves project objectives, in order to proceed with Design Development. The Design Team is encouraged to use electronic programming and planning tools that integrate into their BIM Authoring software to capture early cost, schedule and program information during this phase.

Miami Dade College expects the Design Team to use analysis tools, static images and interactive 3D to describe the design concepts.

Square Foot Cost Analysis

The Design Team shall extract square foot information using BIM Authoring Software and other BIM integrated tools to support comparative cost analysis of options studied. Outputs shall be converted to spreadsheets and submitted as part of the design solution justification at end of this phase.

Program and Space Validation

The Design Team shall use the BIM Authoring software or other analysis tools to compare and validate stated program requirements (Educational Specifications provided by Miami Dade College) with the actual design solution. The space validation shall be based on the Postsecondary Education Facilities Inventory and Classification Manual (FICM).

The following shall be developed automatically from the building information model:

- Assignable Areas (ASF) and Non-Assignable Areas (NaSF) measured to inside face of wall objects and designated boundaries of areas.
- Gross Area (GSF) measured to the outside face of wall objects.

DELIVERABLES AT 100% SD:

1. Consultant: Schematic diagrams, plans, sections, and elevations for the primary design scheme, illustrating the basic configuration and concept of the design
2. Consultant: Schematic summaries of room-by-room floor area (for occupied spaces), system capacity and equipment sizing (for MEP systems), or other relevant quantitative information as requested by Facilities Management Department
3. Consultant: Budget pricing and an updated total project cost budget
4. Consultant: Updated project schedule
5. Consultant: Supporting documentation to illustrate the rationale for selecting the primary design scheme
6. Consultant: LEED deliverables as outlined in the Construction Contract
7. Consultant: BIM deliverables as outlined in the BIM Execution Plan

1.8. b DESIGN DEVELOPMENT (DD)

After the conclusion of the Schematic Design phase, the design team begins to resolve more detailed aspects of the design and addresses outstanding conflicts as part of the Design Development phase.

The Design Team shall continue development of their Building Information Model. Parametric links shall be maintained within the models to enable automatic generation of all plans, sections, elevations, custom details and schedules as well as 3D views. All information needed to describe the "detailed design" shall be graphically or alphanumerically included in and derived from these models only, except for the Specifications. Documentation of the models shall not happen outside of the BIM Authoring

software.

By the end of Design Development, most major decisions about the building systems have been finalized.

Architectural Systems
The model should include the following architectural elements to a level that defines the design intent and accurately represents the design solution:

- Architectural Site plan (also see Civil Engineering section below)
  - Paving, grades, sidewalks, curbs, gutters, site amenities and other elements typically included on enlarged scale site drawings in building vicinity
- Existing conditions
- Demolished items
- New interior and exterior walls including but not limited to:
  - Doors, windows, openings
  - Interior and exterior soffits, overhangs, sun control elements
  - Parapets, screening elements
  - Architectural precast
  - All finishes need to be included within the wall type regardless of the thickness of the finish
- Floor, ceiling and roof systems including but not limited to:
  - Appropriate structural items listed below if not provided by the structural engineer and integrated into the architectural model for coordination and document generation
  - Insulation, ceiling systems, and floor are to be included.
  - Roof, floor and ceiling slopes, if needed, shall be modeled
  - Soffits, openings, and accessories will also be modeled.
- Elevators, stairs, and ramps (including railing systems)
- Casework, shelving, and other interior architectural elements
- Furnishings, fixtures, and equipment (if not provided by others and integrated into the architectural model for coordination and document generation).
  - Furniture (fixed and loose)
  - Furniture Systems
  - Specialty equipment (food service, medical, etc.)
  - Model mechanical, electrical and plumbing items that require architectural space (toilets/sinks/etc.), require color/finish selection (louvers, diffusers, etc.) or affect 3D visualization (lighting fixtures) unless provided by engineers

- Clearance zones for access, door swings, service space requirements, gauge reading, and other operational clearance must be modeled as part of all equipment and checked for conflicts with other elements. These clearance zones should be modeled as invisible solids within the object.

Structural Engineering

The model should include the following structural elements:

- Foundations such as:
    - Spread Foundations
    - Caisson Foundations
    - Pile Foundations
    - Mat Foundations
    - Load-bearing Wall Foundations
- Framing such as:
    - Steel Columns (with correct shape and size)
    - Steel Floor C-Joists
    - Open Web Joists
    - Joist Girders
    - Steel Beams (with correct shape and size)
    - Precast Concrete Elements (Hollow Core Plank may be modeled as a slab unless the hollow core is being used for mechanical systems and coordination with those systems needs to occur)
    - Cast-In-Place Concrete Elements
    - Floors including overall extents and openings
    - Model overall thickness of wood floor systems o Wood Posts/Column
    - All other Joists
    - Wood Trusses
    - Solid Wood or Laminated Beams
- Wall Types including openings
    - Load Bearing Walls – for calculations only (Masonry, Concrete, Cold-Formed Steel, and Wood)
    - Model overall thickness of Cold-Formed Steel and Wood Stud walls (individual members may be modeled at the Design Team's option)
    - Structural Foundation Walls including brick ledges
- These items may be modeled at the Design Team's option:
    - Steel reinforcing in concrete
    - Embeds in concrete
- Miscellaneous Steel
    - Angles for openings, deck bearing, etc.
    - Channels for mechanical units needed for coordination reviews between structural and mechanical
    - Lintels (unless considered a major member)
    - The detail and responsibility to fulfill the above modeling requirements should be addressed fully within the BIM Execution Plan.

HVAC Systems

The model should include the following HVAC elements at a minimum:

- Equipment
    - Fans, VAV's, compressors, chillers, cooling towers, air handlers etc.
- Distribution

- o Supply, return, exhaust, relief and outside air ductwork modeled to outside face dimension or duct insulation (whichever is greater)
- o Duct Joints
- o Diffusers, grilles, louvers, hoods, radiant panels, perimeter units, wall units
- Pipes larger than 3/4" diameter, include any insulation in model.
  - o Unless otherwise noted and approved by the BIM Execution Plan.
- Clearance zones for access, door swings, service space requirements, gauge reading, and other operational clearance must be modeled as part of the HVAC equipment and checked for conflicts with other elements. These clearance zones should be modeled as invisible solids within the object.

The detail and responsibility to fulfill the above modeling requirements should be addressed fully within the BIM Execution Plan.

Electrical Systems
The model should include the following electrical elements at a minimum:

- Power and Telecommunications
  - o Interior and exterior transformers, emergency generators, and other equipment
  - o Main and distribution panels and switchgear including access clearances
  - o Main IDF's
  - o Feeders and conduit larger than 3/4" diameter. Unless otherwise noted and approved by the BIM Execution Plan.
  - o Outlets, switches, junction boxes
- Lighting
  - o Permanently mounted lighting fixtures (moveable, plug-in fixtures need not be modeled as part of the electrical package unless needed for plug load calculations or for estimating purposes within a loose furnishings package. Should be discussed and agreed upon within the BIM Execution Plan)
  - o Lighting Controls
  - o Switches
  - o Junction Boxes
- Fire Alarm and Security Systems
  - o Input devices
  - o Notification devices
  - o Associated equipment and access clearances
  - o Permanently mounted fixtures
- Building Controls
- Clearance zones for access, door swings, service space requirements, gauge reading, valve clearances and other operational clearance must be modeled as part of the electrical equipment for collision checking. These clearance zones should be modeled as invisible solids within the object.

Plumbing and Fire Protection
The model should include the following plumbing and fire protection elements at a minimum:

- Waste and Vent Piping sized at and over 3/4" diameter, includes any insulation in model. Unless

otherwise noted by the BIM Execution Plan.
- o Roof and floor drains, leaders, sumps, grease interceptors, tanks, water treatments and other major items.
- ▪ Supply Piping larger than 3/4" diameter, includes any insulation in model. Unless otherwise noted and approved by the BIM Execution Plan.
  - o Domestic Booster Pumps
- ▪ Fixtures: sinks, toilet fixtures, water tanks, floor sinks
- ▪ Fire protection o Sprinkler lines larger than 3/4" diameter
  - o Sprinkler heads, Fire Protection Pumps
  - o Stand pipes, wall hydrants, fire department connections, risers, including valve clearances
- ▪ Clearance zones for access, service space requirements, gauge reading, valve clearances and other operational clearance must be modeled as part of the plumbing and fire protections system and checked for conflicts with other elements. These clearance zones should be modeled as invisible solids within the object.

Specialty Consultants
The model should include the following specialty consultant elements to correct size and location:

- ▪ Equipment provided or specified by said consultant
- ▪ Rough-in connection points for power, data, communications, water service and waste, gas, steam, or other needed utilities.
- ▪ Extent of specialty consultant modeling shall be coordinated with the Design Team and described in the BIM Execution Plan.
- ▪ Clearance zones for access, doors swings, service space requirements, controls, gauge reading, and other operational clearance must be modeled as part of the equipment and checked for conflicts with other elements.

Civil Engineering
If a Revit model is used it should include the following civil engineering elements at a minimum:

- ▪ Topography – 3D terrain of all site work as designed, including retaining walls. This model should include the site and surrounding areas that contribute to the site's drainage system or otherwise impact on the site. In most cases this will require that adjacent roadways be modeled.
- ▪ Landscaping elements: planting areas, such as raised planting beds and berms, parking islands, pools/ponds/other water features, terraces and other items not included elsewhere in the model.
- ▪ Storm water management structures, pump stations, fueling systems, manholes and other major items that impact on the overall project understanding or which may become project design constraints. All items must be geo-referenced such that all elements can be viewed as an overlay in the building information model.

DELIVERABLES AT 100% DD:

1. Consultant: Detailed diagrams, plans, sections and elevations of the project

2. Consultant: Detailed summaries of room-by-room floor area, occupant loads, support

space capacities, system sizing/equipment selection for MEP systems, and other quantitative information as requested by Facilities Management Department

3.　　Consultant: Schematic Operation and Maintenance plans, as requested by Facilities Management Department

4.　　Consultant: Schematic measurement and verification plan

5.　　Consultant: Refined budget pricing and an updated total project cost budget

6.　　Consultant: Updated project schedule

7.　　Consultant: LEED deliverables as outlined in the Construction Contract

8.　　Consultant: BIM deliverables as outlined in the BIM Execution Plan

1.8. c　CONSTRUCTION DOCUMENTS (CDs)

During the Construction Documents phase, the design team compiles the architectural and engineering drawings and specifications (the "drawing set") required to document all design development decisions and to build the project. The design team revises and supplements the plans, sections, and elevations created during the Design Development phase to include all information required for cost estimation and construction.

During the CD phase, the Project Manager may request that the design team issue one or more "pricing sets" in order to obtain more accurate, revised budget pricing from the General Contractor or Construction Manager while there is still an opportunity to revise detailed design decisions.

Pre-Bid Collision Reports
Submit at 95% Construction Document Submittals.

Initial Collision Report
  i.　General
   The Design Team is to use automated conflict checking software for this phase of the work and shall be outlined in the BIM Execution Plan. The collision report should show any outstanding coordination issues between the Design Team members.
  ii.　Level One Collisions
   Level One Collisions are reported collisions that are considered critical to the design and construction process. These collisions have been assigned the highest priority and should be rectified within the model as soon as possible:

    • Mechanical Ductwork and Piping vs. Ceilings
    • Mechanical Ductwork and Piping vs. Rated Walls (For coordination of Dampers and other mechanical equipment needs)
    • Mechanical Ductwork and Piping vs. Structure (Columns, Beams, Framing, etc.)
    • All Equipment and their applicable Clearances vs. Walls

- All Equipment and their applicable Clearances vs. Structure
- Mechanical Equipment and Fixtures vs. Electrical Equipment and Fixtures
- Mechanical Ductwork and Piping vs. Plumbing Piping

iii. Level Two Collisions

Level Two Collisions are reported collisions that are considered important to the design and construction process. These collisions have been assigned a greater priority and should be rectified during project meetings during design:
- Casework vs. Electrical Fixtures and Devices
- Furnishings vs. Electrical Fixtures and Devices
- Structure (Columns, Beams, Framing, etc.) vs. Specialty Equipment
- Structure (Columns, Beams, Framing, etc.) vs. Electrical Equipment, Fixtures and Devices
- Ductwork and Piping vs. Electrical Equipment, Fixtures, and Devices
- Ductwork vs. Floors

iv. Level Three Collisions

Level Three Collision are reported collisions that while considered important to the correctness of the model will generally be changing on a regular basis throughout the design and construction process. These collisions have been assigned a lower level of priority and should be rectified before the phase submission of the models:
- Casework vs. Walls
- Plumbing Piping vs. Electrical Equipment, Fixtures, and Devices
- Plumbing Piping vs. Mechanical Equipment, Fixtures, and Devices
- ADA Clear Space Requirements vs. Doors, Fixtures, Walls, Structure

Program and Space Validation

The Design Team shall use the BIM Authoring software or other analysis tools to compare and validate stated program requirements (Educational Specifications provided by Miami Dade College) with the actual design solution.

Other analysis and checking tools

The Design Team is encouraged to analyze the design using software that interacts with the model in order to refine load calculations, daylighting, natural ventilation, acoustics, code issues, and design issues.

Quantity Cost Estimating

The Design Team shall extract square quantity takeoff information using BIM Authoring Software and other BIM integrated tools to support comparative costs analysis of options studied. Outputs shall be converted to spreadsheets and submitted as part of the design solution justification at end of this phase.

DELIVERABLES AT 100% CDs:

1. Consultant: A complete drawing set, consisting of stamped/sealed drawings by the architect or engineer and all sub-consultants, documenting every aspect of the project including (but not limited to) plans, sections, and elevations illustrating spatial layout and architectural intent, finishes, construction details, MEP system layouts, and all

necessary schedules

2. Consultant: A complete set of technical specifications in the form of a project manual, documenting the detailed criteria for every aspect of the project, including (but not limited to): materials, installation methods, equipment selection, and performance requirements

3. Consultant: Detailed pricing and an updated total project cost budget

4. Consultant: Updated project schedule

5. Consultant: LEED deliverables as outlined in the Construction Contract

6. Consultant: BIM deliverables as outlined in the BIM Execution Plan

1.8. d   CONSTRUCTION ADMINISTRATION, PRECONSTRUCTION

The Preconstruction portion of the Construction Administration phase begins once the drawing set is finalized and the CD set is issued to a GC or CM to generate a Guaranteed Maximum Price (GMP). Alternatively, the set may be issued as part of a bid package in order to solicit bids from multiple GCs or CMs. The design team is responsible for supporting these processes by:

1. Organizing a pre-bid meeting, if the project will be bid

2. Conducting a site walk to familiarize the construction team with site constraints

3. Responding to RFIs, issuing bulletins and addenda as necessary to clarify project requirements

Once the construction contract has been awarded and construction has begun, the design team continues to monitor the progress of construction and to communicate with the Project Manager and the GC or CM in order to ensure that the project is constructed in accordance with design documents and all applicable specifications. The design team must attend all regular project meetings and site inspections. Timely coordination and communication of design decisions is essential to successful project delivery.

The Project Manager is ultimately responsible for ensuring that the project meets all applicable design and quality standards, and all proposed exceptions to MDC standards must be communicated explicitly to the Project Manager.

DELIVERABLES DURING CA, PRECONSTRUCTION:

1. Consultant: A set of conformed design documents (final drawing set and specifications/project manual) sufficient for permitting and completion of the contracted scope of work

2.	Consultant: Bulletin drawings and partial re-issues of the drawing set as required to clarify intent

3.	Consultant: Project support materials, such as addenda and meeting minutes, as requested by Facilities Management Department

4.	Consultant: Responses to Requests for Information (RFIs)

5.	Consultant: BIM deliverables as outlined in the BIM Execution Plan

6.	Contractor: MDC-approved construction-phase BIM Execution Plan, based on MDC's BIM Execution Plan template, detailing BIM deliverables during construction.

7.	Contractor: Accurate project pricing (bid or proposal)

8.	Consultant and Contractor: LEED Plus deliverables as outlined in the Construction Contract

1.8. e   CONSTRUCTION ADMINISTRATION (CA)

The Design Team is expected to continuously maintain and update the design intent model(s) with changes made from official Construction Change Directives and as-built mark-ups maintained on site by the Contractor(s) during construction. At an interval that is decided within the BIM Execution plan.

BIM Execution Plan Review
The Contractor shall review the BIM Execution Plan with the Design Team and Miami Dade College and submit any Addendums within thirty (30) days of contract award. The Design Team and Miami Dade College will review and approve of any Addendum within fourteen (14) days of submittal.

Coordination Meetings
The contractor shall submit a plan to the Miami Dade College for review, prior to the start of construction that outlines the process for concurrent as-built documentation. Concurrency is mandated. Methods for recording as-built information are left to the discretion of the contractor. Potential options include traditional methods, and/or periodic laser scanning of completed or partially completed primary systems coordinated with the sequence of construction. Primary systems fall into two categories:

Primary Architectural Systems include, but may not be limited to: Partition systems with structure, flooring systems, major HVAC, piping, sewerage and /or conduit systems, partition systems with bulkheads, partition systems with expansion control, vertical transportation systems with primary engineering systems, millwork and casework systems with power and data outlets, horizontal ceiling systems with window openings, bulkheads, partitions, lighting, fire protection and HVAC outlet locations, exterior skin systems with window openings, structure, roof edge conditions, parapets, roof penetrations, and equipment locations.

Primary Engineering Systems include, but may not be limited to: structural framing, primary HVAC duct runs, primary fire protection main runs, primary electrical conduits (larger than ¾" diameter), ceiling grid layouts, primary data, audio/visual, security and communication distribution systems (cable trays, etc).

Projects *without* active Revit Models
If REVIT models are not provided by the AE at the start of construction, the contractor shall develop REVIT models during construction according to the program requirement as established in the bid documents. The contractor shall coordinate REVIT model source with Miami Dade College prior to selection. The purpose of this model shall be to support future facility management objectives. Additionally, these models shall be the repository of final 'as-built' data incorporated wither by concurrent laser scanning and/ or traditional recording methods for as-built conditions.

Projects *with* active REVIT Model at the start of construction
If REVIT models are provided by the A/E at the start of construction, the contractor shall use those models.

Coordination with Design Team and Miami Dade College
On no less than once every month, the contractor shall include the project model manager, (architect's or other) in a coordination established for the purpose of assessing and / or executing data transfers from the construction process into the REVIT model. The data transfer shall be coordinated with Miami Dade College's BIM Manager and the architect's model manager (when feasible) and be based on Facilities Management objectives as defined in the BIM Execution Plan and project program.

1.9   DESIGN TEAM DELIVERABLE SCHEDULE AND MILESTONES

The submittal schedule along with the milestones for any given project is listed below:

(PROJECT NAME) DELIVERABLE SCHEDULE AND MILESTONES		
MILESTONE	DELIVERABLE	DATE
PRE-DESIGN (CONCEPT)	ARCHITECTURAL MASSING MODEL	
	PRELIMINARY ENERGY MODEL	
	FLOOR PLATE MODEL FOR PROGRAMMING VALIDATION	
	PROJECT EXECUTION PLAN	
SCHEMATIC DESIGN	ARCHITECTURAL MODEL	
	SCHEMATIC ENERGY MODEL	
	CIVIL MODEL	
	MEP LAYOUT / NARRATIVE	
	SD COLLISION REPORT / ANALYSIS	
	EQUIPMENT TRACKING MATRICES	

DESIGN DEVELOPMENT	ARCHITECTURAL MODEL	
	MEP MODEL(S)	
	SCTRUCTURAL MODEL	
	CIVIL MODEL	
	DISCIPLINE COLLISION REPORT / ANALYSIS	
	PROGRAM VALIDATION REPORT	
	EQUIPMENT LISTS AND DEFINITION OF SYSTEMS	
CONSTRUCTION DOCUMENTS	ARCHITECTURAL MODEL	
	MEP MODEL(S)	
	STRUCTURAL MODEL	
	CIVIL MODEL	
	DISCIPLINE COLLISION REPORT/ANALYSIS	
CONSTRUCTION (CONTRACTOR)	DISCIPLINE SPECIFIC COORDINATION MODELS	
	SHOP DRAWINGS	
	FABRICATION MODELS	
	AS-BUILT MARKUPS	
	SCHEDULING AND PHASINS MODELS	
CONSTRUCTION (A/E)	CURRENT AS-BUILT MODELS FOR EACH DISCIPLINE	

1.10   PROJECT CLOSE-OUT

Design Team As-Builts
The Design team shall update their respective models with contractor recorded changes (Record Documents), and republish record documents in paper, .dwg and .pdf formats. They must also submit full Revit model(s) with all needed objects and reference drawings, in original authored software. The Design Team is required to submit all per Miami Dade College professional services contract.

Miami Dade College Project Close-Out-Checklist Review
The Design team shall complete and review the MDC Project Close-Out Checklist.

2 MODELING REQUIREMENTS

2.1   GENERAL

The Models, 2D Drawings, and specifications serve three essential purposes: First, the information must effectively and clearly convey the AE's design to allow Miami Dade College to evaluate the suitability of the design for MDC's operational needs. Secondly, the information must unambiguously present the design to the GC and its subcontractors and vendors during the bidding and construction process, thus minimizing RFIs and eliminating Change Orders due to incomplete, inaccurate or conflicting information (MDC expects that AE documentation will correspond to the contractor's need for information and to

support efficient project execution). Third, the information must support Miami Dade College's Facility Management requirements.

The information listed in this section is a minimum requirement. It remains the responsibility of the AE and the GC to create the appropriate level of information needed to fulfill their required contractual project obligations. It is expected by Miami Dade College that the models, analyses, and data will be used to support the decision making process for high performance building design and construction activities. Building information models shall be created to include all geometry, physical characteristics and product data needed to describe the design and construction work of a project. All drawings, schedules, simulations, and services required for assessment, review, bidding and construction shall be extractions from this model. The Design Team shall follow the guidelines and requirements detailed in this document for BIM related services. Deliverable requirements are as specified in the Miami Dade College's professional services contract (deliverables sections).

At a minimum, all elements within the scope of work and within the limits of the construction site or that may be affected by construction must be modeled, including but not limited to:

- All building structures, equipment, and systems
- Utilities above or below ground inside and outside of project boundaries to service connection points
- Construction Details
- All major vegetation (e.g., heritage trees) to be preserved
- Any areas to be protected during construction
- Project site conditions
- Equipment needed for Room Test-fits and Building Service Equipment

2.2   MODELING TOLERANCES AND DIMENSIONING

Building Objects/elements must to be modeled in their exact location within the industry standard tolerance for the trade or discipline being represented, but in no case greater than 1/8". All BIM Objects for construction must be modeled to actual real-world dimensions (not nominal). The AE and GC are responsible for designating stricter tolerances if needed to facilitate the intended uses of the model as outlined in this manual or as needed to execute the project. GC modeling for construction uses must have tolerances that enable accurate manufacture or layout of elements to which it applies. If laser-guided layouts, pre-fabrication or modular assembly techniques are being used, then the modeling teams, preferably with the GC, will review the tolerances required in those areas and for that building system component. Results and any adjustments affecting current and future modeling must be documented in the BIM Execution Plan. Exceptions must be approved by Miami Dade College and also noted in the BIM Execution Plan.

Dimensions must be automated, object referenced and associated, and must not be overridden. Dimensional values (i.e., the text appearing in dimension strings) will be in Imperial units (e.g., 10'-0").

2.3   MODEL QUALITY

Building Information Modeling best practices should be utilized throughout the project to ensure that the project is not only coordinated, but constructible and maintainable. Elements should generally be

designed to a level 300 for the design team and progressed to a level 400 for construction fabrication by the contractor and trades based on the AIA/AGC specification put out through BIMforum.org (https://bimforum.org/lod/). This same quality should be included in the data management side of the any characteristics defined on a project by project basis, but at a minimum the room and departmental associations of space should be in accordance with Miami Dade College's room numbering protocols. Additionally, it is expected that the model handoff between design and construction be seamless and the quality outlined in the Project Execution Plan is consistent with the deliverable.

NOTE: MDC and the LOD Specifications do not address LOD500 since that LOD relates to filed verification and is not an indication of progression to a higher level of geometry or information.

The Design Team shall establish and use in-house modeling quality control guidelines and exchange protocols. Good BIM practices may include, but are not limited to:

- Use of element and component objects that embed the best practices of the firm.
- Maintenance of parametric linkages within the model at all times.
- The building envelope needs to be "air-tight" and correct to help support energy modeling activities and simulations.
- Use appropriate and interoperable viewing, checking and output file formats.
- Use appropriate phasing throughout the project to maintain proper model nomenclature.

2.4   PROPERTIES AND ANNOTATIONS

The BIM Model(s) and BIM Objects must contain the appropriate non-graphical properties to accurately support automatic population of annotation tags and schedules from within the BIM software. In general, all information that would appear in a schedule for a particular object must have object properties with populated values.

All general annotations must comply with the Drawing Deliverable Requirements. Where the Miami Dade College BIM Standard does not explicitly define a standard for a particular type of annotation, the latest version of the National BIM Standard applies. The models must be documented with the appropriate tool within the BIM software designed for that purpose.

All references including but not limited to elevations (interior or exterior, partial or whole), sections (building, wall, or object), plan, and detail callouts or marks must be created using the appropriate tools/commands from within the BIM software and remain dynamically connected throughout the project. Manual overrides are not permitted.

Title block identification values (e.g., sheet number and sheet name) must be associated and automatically populated and remain current throughout the project.

Annotation symbols such as tags are to read and display information contained within the model properties.

Fire rating fill patterns must be constructed within 3D wall types so that the partition's respective rating is shown through all scales and types of views, including 2D Drawings.

2.5   BIM OBJECTS / BUILDING ASSETS

The term BIM Objects involves elements, building assets, and systems. While the terminology is often interchanged and the understanding can vary based on software platform used or Various disciplines/trade

involved, the basic concept is that BIM Objects refers to an individual item, or a collection of items, that comprise the model(s) for the design of the facility and the site.

All BIM Objects and categories must be named in accordance with Facilities Management data. If no Miami Dade College naming standard is available, follow a logical naming convention that is to be documented in the BIM Execution Plan.

The authoring of BIM Objects must adhere to the following guidelines:

- Global Properties must be used where appropriate to increase modeling value and performance. The attribute of any given BIM Object will reference global properties for its respective category. For example, a Width property for one piece of equipment must use the same global properties designated as Width for all equipment within the same category. Additional properties denoting the same attribute with slight variations must not be created (i.e., width1, Object Width, etc.)

- All objects must be modeled or created using the tool within the software that is designed to be used for that specific object or purpose. For example, a BIM software's wall tool must be used to create a wall. A wall is not permitted to be merely drafted lines. If a new object is created then it must be designated as the real world element it represents, having the proper classification and/or data attributes for the project and object type, and must report properly from the BIM software as the objects they represent rather than unassigned graphic primitives. This will allow the information associated with them to be properly updated, reported and available for export and reuse. Generic, miscellaneous, or unspecified categories are not allowed.

- Use BIM authoring software object libraries when creating BIM Objects whether they are actual 3D BIM Objects or 2D representations. Models must be comprised of the software's BIM Objects for representing building products. Geometric lines, arcs, and vertices are not allowed. This is necessary to enable classification and reference keynoting (such as to the Unified Facilities Guide Specification (UFGS) or MASTERSPEC number).

2.6   LEGENDS AND SYMBOLS

Legends and symbols in the 2D drawings may be 2D representations but are to be connected to the actual BIM Objects to which they are referring (i.e., any change to the actual BIM Object will result in an immediate updated 2D representation). Actual BIM Objects must be 3D objects with attached or associated data and metadata as defined throughout the Miami Dade College BIM Standard.

2.7   SCHEDULES AND DETAILS

All construction details must be "Model Details" and created with BIM tools and linked to the 3D view. All details that appear on 2D Drawings must be derived from BIM and match the assembly in BIM. No "Drafting Details" created in 2D software and added to the 2D Drawings will be accepted.

All 2D drawing schedules must be derived from the properties of the model object, with the exception of calculations (e.g., calculations for low voltage, structural, electrical, etc.). Schedules are not to be augmented with unconnected data. Exceptions where calculations are done outside of BIM must be noted in QA/QC reports and state the technical reason for the exception.

2.8   GEO-REFERENCE REQUIREMENTS

Miami Dade College requires that all models contain geospatial information that is properly referenced between a permanent, physical, Unites States Geological Survey Marker's geographic survey point (Site Origin Point) available in the State Plane Coordinate system where the project is located, and the coordinate system in the model space, thereby providing a precise, measurable reference point for accurately locating and constructing buildings, site work, utilities, and infrastructure.

The design team shall coordinate with Miami Dade College to determine the GIS application and information required for the project. Geo referencing of the project with the College's GIS system will be reviewed on a case by case basis with the project teams.

2.9   MODEL PROPERTIES

Physical construction and products that are represented in objects must include the basis of design for the properties of the object. The AE may use external BIM tools to manage the data during design if the external tools are IFC compliant. *The final deliverable must provide the required information in order to maximize the interoperability between the final Revit Model and Miami Dade College's Integrated Workplace Management System 'FM:Systems'. Please see attached FM:Interact Revit Modeling Standards.* The AE will model all BIM Objects with sufficient detail necessary to communicate design intent (if Design-Bid-Build procurement) for construction, conduct design coordination, and facilitate Miami Dade College BIM requirements. If a Design/Build procurement will be used, the AE must model for construction fabrication and adapt that model for Facilities Management purposes.

The GC will model detailed elements of building equipment and systems, with their accompanying space reservations.

2.10   MODELING SPACES

Rooms, departments, areas, and mechanical spaces that are typically a part of the Architectural, MEPFT, and Interior Design models must be generated with the appropriate BIM tool and associated with bounding elements (walls, doors, windows, floors, columns, ceilings, underside of deck).

When using Autodesk Revit, Architectural Spaces (in the architectural and interior design models) must be modeled as "Rooms" and when rooms are aggregated into Departments they must also be modeled as "Areas." Mechanical Spaces for MEPFT must be modeled as "Spaces" (volumes that go to the underside of the deck above for load calculations) and when spaces are aggregated together they must also be modeled as a "zone."

All discipline models (see next section, 2.11), must reference each other, and the references describes in the BIM Execution Plan to assure proper coordination (utility hookups, shielding, structural support, etc.) between disciplines.

Rooms: The Net Square Footage (NSF) must be modeled for each functional room and space. Rooms must be represented and broken down into functional areas (e.g., Classroom, Office, Conference Room, etc.), and as defined in the SREF (State Requirements for Educational Facilities). Even though they may be parts of a larger designed physical area. A physical area may contain several functional areas that are treated as individual rooms in the spatial program. If two rooms have different functional space classifications, even though they are within the same physical area, they must be modeled as two separate spaces.

Departments: Miami Dade College will define the organizational arrangement for providing services. Rooms must be grouped into the Miami Dade College defined Departments for space management and square footage analysis, and color coded to help distinguish space belonging to the different organizations.

Circulation Factors: Must be calculated based on the spatial values derived from the floorplates in BIM.

2.11   DISCIPLINE MODELS

AE design models must be subdivided by discipline and by non-building equipment as required in the Miami Dade College BIM Standard. All discipline model divisions are to be documented in the BIM Execution Plan. In general, each discipline model, must contain the objects that relate to their discipline's design.
Each project will require different discipline models depending on the scope of work. It is the responsibility of the AE and GC to appropriately structure their modeling to provide adequate information as needed for the project. However, Miami Dade College has the following requirements for these discipline models, which must be included in the Record Model.

      a. Site Civil / Landscape
      b. Architecture
      c. Structure
      d. Interiors and FFE
      e. Mechanical, Electrical, Plumbing, Fire Protection & Other Specialty System
      f. Historic Significance

2.11. a SITE CIVIL / LANDSCAPE

All features and information typically provided in site plans must be provided using Civil Information Modeling (CIM) software, and comply with the Miami Dade College BIM Standard. This includes roadways, walks, physical features, topography (contours), location and rim and invert elevations of underground utilities, soil/geotechnical conditions, etc. AE modeling of subsurface utilities and conditions must be labeled as FOR INFORMATION ONLY. Buildings must be minimally modeled for site civil work but must reflect the accurate location of outside proposed building walls and any utility penetrations through floor slabs and walls below ground. *Site elements requiring maintenance must include unique identification data.*

Underground Site Utilities: Objects must be modeled in 3D for civil underground utilities and site work, both existing and proposed. Include all utility properties, modeling will extend five feet beyond the project construction boundaries and will connect with the site and building utility services.

Please review the *'FM:Interact Revit Modeling'* Standards section on "Area Plans" and "Rooms and Areas" for more information on how to documents the building model spaces.

2.11. b ARCHITECTURE

Architectural models must include all the exterior envelope and central core circulation objects and openings. The BIM Objects should all be relative to a floor or level, exterior and interior walls and partitions, roofs, vertical transportation, windows, doors, stairs, ramps, railings, ceilings, grilles & gates, interior specialties, etc. Required structural blocking (such as for TV, monitors) must be modeled for quantities, size, shape, and location, etc. Reference major structural components from the Structural model (including but not limited to structural walls, floors, roof structure, columns, and foundations). Reference the Interiors Model, and appropriate building equipment and systems models (including mechanical for louvers), and others as needed to coordinate the work.

2.11. c STRUCTURE

Structural models must be the basis of evaluating and analyzing the building structure, and include all the objects, elements, and components to do so. All material and material properties must be included for each Object, the building structure and geometry must be accurately defined and labeled for foundations, subgrade enclosures, slab-on-grade, superstructure, and exterior vertical enclosures and roofs.

2.11. d INTERIORS AND FFE

Interior Partitions: Must be modeled to include fire resistance ratings in the wall object properties and must graphically be depicted in 2D plan sets. The use of wall fill patterns in models and drawings that depict the appropriate construction is important to understanding which spaces are protected.

Interior Door Objects: Properties of door objects must include finish information, door swing, vision panels, seals, acoustical properties, hardware, locks and keying, electrical requirements, and applicable fire resistance ratings.

Ceilings: Properties of ceilings must include fire ratings and sound transmission coefficients.

Raised Floors: Access/Raised Floors are modeled EXCLUDING supports.

Casework: All architectural casework, millwork and features provided by the GC must be modeled to include finish information and be collected in the room properties to be included in the overall room finish tag. Casework materials will generally consist of a horizontal and/or vertical element. Casework and countertops must be modeled to correct dimensions (length/width, depth, and height).

Interior Finishes: Interior finish plans, reflected ceiling plans, elevations, and intelligent scheduling of objects/elements must be used to convey materials and finishes in a separate Interiors model, associated with the architectural model (and others as required). Interior Finishes must be included as a part of the room properties. All materials that are representative of a system greater than ¼ inch in thickness must be included in the model as 3D geometry (example: wall protection, interior cladding such as stone, masonry, glass, metal, or wood paneling).

Modular Furniture: Manufactured modular furniture selected for the design-intent documents which will be purchased by Miami Dade College and installed by the GC must be modeled to correct dimensions (length/width, depth, and height) and linked to the basis-of-design cut sheet for the item.

2.11. e MECHANICAL, ELECTRICAL, PLUMBING, FIRE PROTECTION & OTHER SPECIALTY SYSTEM

Mechanical, Electrical, Plumbing, Fire Protection, and any other specialty systems must be in their own discipline models, referenced to the Architectural model and other discipline models as needed. All system models must include all equipment necessary for operations, including (but not limited to) boilers, chillers, geothermal and solar energy systems; pumps and piping distribution systems (including modeling for pipe slope and insulation), water-side terminal units; fans, air handlers, air distribution and evacuation systems (including modeling for duct and equipment insulation), air-side terminal units, VAV boxes; electrical feed and distribution systems transformers, electrical panels and switchgear, lighting, emergency circuitry, emergency generators; all public utility systems from tap, all control systems, data and phone wiring and terminal devices, data switches, data rooms, etc. Fire protection models must include fire ratings, sprinkler medium, pressure and flow volume. All system elements 1.0 inches in diameter and larger (e.g., general plumbing, fire protection, etc.), and other elements (ducts, cable trays, etc.) with a dimension 4 inches and

22

over must be modeled. Conduit that will be consolidated into cable trays need not be modeled individually; only the tray needs to be modeled. All riser diagrams must be model based.

Mechanical: All components of the mechanical systems must be modeled accurately, and include the necessary space reservations for appropriate access during maintenance and replacement. Louvers should be modeled as a part of Mechanical.

Electrical: Ceilings diffusers, light fixtures, etc. are cosmetically arranged by the architect but the systems are designed by the electrical engineer. The architectural, mechanical, and electrical models must reference each other and be a part of the Design Coordination to eliminate any mismatches between the models.

Plumbing: All plumbing components must be identified by system. The architectural, mechanical, and electrical models must reference each other and be a part of the Design Coordination to eliminate any mismatches between the models.

Fire Protection: A "Design Build" procurement executed by the GC is generally used for Fire Protection systems. The GC must assure that the Fire Protection system is a part of the BIM construction coordination management. It is the GC's responsibility to assure that the Fire Protection system is installed so that it does not interfere with the location or maintenance access to other building systems or equipment. The GC must provide as-built documentation regarding the final location of the Fire Protection system in a 3D format.

2.11. f HISTORIC SIGNIFICANCE

Areas and items of Historical or Cultural Significance must be identified in a separate BIM if they are to be included in the construction work, including but not limited to identifying items and areas to be conserved, demolished, and repaired.

3 FREQUENTLY USED TERMS

A

AE
The Architect/Engineering firm, along with all the consultants hired by the AE to produce the Design-Intent Model, contract documents, and all other documentation necessary to support bidding and construction.

As-Built Documents
As-built documents are the collection of paper drawings or electronic drawings that typically reside in the contractor's onsite trailer that contain mark-ups, annotations, and comments about changes that have been made to the contract documents during the construction phase.

As-Built Model
Design Intent Models that have been updated throughout the construction process. These changes and

updates have been communicated from the Contractor to the Design Team through the comments, annotations, and mark-ups from the As-Built Documents. These typically, but not always, are discipline specific models.

B

BIM
Building Information Model(ing): various definitions are used within industry. BIM is the process, the Model, and the management of creating digital information for design and construction. The context defines the acronym's meaning.

BIM Execution Plan (BEP)
A plan that is created from Miami Dade College BIM Execution Plan Template that is to be submitted thirty (30) days after contract award. The BEP helps to define roles and responsibilities within a project team.

C

CAD
Computer Aided Design

Critical Path Modeling
Critical Path Modeling is a method of demonstrating Integrated Project Delivery. It sets a plan within the design team that accounts for the activities of each discipline and how they interact with each other. It builds upon a critical path method for those activities, and allows the project team to schedule a complete project.

Construction Model(s)
The GC models used for construction purposes on the project.

D

Design-Intent Model
A complete and coordinated expression of the AE's design. Final equipment and materials choices are based on performance specifications provided by the AE, allowing some variation, but equivalent, equipment and materials to be selected by the GC during construction. Therefore, the Design-Intent Model will be augmented with submittals, shop drawings and substitution requests provided by the GC. Moreover, the GC is responsible for the means and methods of construction, which are similarly not contained in the Design-Intent Model. The GC is, however, responsible for providing, installing, and constructing a complete and functional project, which includes requirements explicitly contained in the Design-Intent Model and requirements that, using normal industry practices, are reasonably inferable from the Design-Intent Model and necessary to achieve a complete, functional, and maintainable project. Design-Intent model also refers to individual models such as a particular discipline model or in whole such as a composite or federated model.

Design Team
The Design Team is considered to be the Architect and all of the consultants that provide design services

for a project. These design services can be rendered at any time during the project.

Drawing Deliverable Requirements (DDR)

Defines 2D drawing creation derived from either CAD or BIM.

.DWG

.DWG is a native AutoCAD file format. It is a widely used file format for exchanging drawing information and 3D information to different programs. While not a database file type, it still has lots of uses for exchanging information

F

FICM – Post Secondary Facilities Inventory and Classification Manual

FICM is standard that describes practices for initiating, conducting, reporting, and maintaining an institutional facilities inventory.

Furnishings, Fixtures, & Equipment (FFE)

Movable and fixed furnishings, fixtures, non-med equipment.

I

Industry Foundation Classes (IFC)

An international standard schema for data exchange.

IPD – Integrated Project Delivery

IPD describes a contractual relationship between Owner, Architect, and Contractor. It is a project delivery method that integrates people, systems, business structure and practices into a process that collaboratively harness the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

IPD Methodology

IPD Methodology is a concept that uses methods from the IPD contracts, but does not have the contracts actually in place. It idealizes the concepts of integration of all team members to try and benefit the entire project.

IPD Methodology Plan

The IPD Methodology Plan is a declaration of how the project team will achieve the goals of an IPD Methodology. The plan can have several components. Two examples of an IPD Methodology Plan are: The completion of a Reverse Phase Schedule and Critical Path Modeling.

L

LEED

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a suite of standards for environmentally sustainable construction. Based on a point system, a building or project,

can achieve different ratings based on the performance of the design, the construction, and/or the operation.

M

Model
Refers to an individual model containing various components, a combination of models,
AND/OR the process of modeling in general. The most appropriate meaning within the context of use would apply.

N

Navisworks
Navisworks is software that allows for the viewing of multiple model formats. This ability to "view" these files also allows for Navisworks to simulate the interaction between model files. That includes collision reporting, time lining, and coordination.

NWC
An .NWC file is a Navisworks Cache File that is used by Navisworks to quickly read many other file types. All linked files in Navisworks have an .NWC file created automatically. In addition, Revit will export directly to the very small file type of .NWC for quick access by Navisworks.

.NWD
A much larger file than the .NWC, the .NWD file shows a snapshot in time of a Navisworks file. No linked files exist but all geometry is included.

.NWF
The .NWF file is a native Navisworks file which has all linked files, clashes, markups, animations, schedules, etc.

O

Open Architecture
Open Architecture is a concept of creating a framework that helps to describe a common set of rules for how a project is created. This includes what types of software, the interoperability of the information, and how the participants interact with each other. This is different than open standards because it promotes progress without anchoring forward thinkers to a rigid standard.

Owner's Architectural Floor Plans – Interim Record Documents
A complete current electronic CAD set of Owner's Architectural floor plan drawings with room names, room numbers, and room square footages indicated. The Owner's Representative shall not be relieved of responsibility when files are delivered if the files do not meet established requirements or are defective.

P

Phases

The phases of a project can be described in two different ways as the adoption of IPD terminology starts to penetrate the BIM Execution Plan and the IPD Methodology Plan. Below is a list of the traditional names followed by the IPD name:

> Pre-Design/Conceptualization Phase
> Schematic Design/Criteria Design Phase
> Design Development/Detailed Design Phase
> Construction Documents/Implementation Phase

Project Data Security Plan

The documented protocol that defines how the data will be protected from loss or unauthorized access during creation, exchange, and retention.

R

Record Drawing

The production of Record Drawings is the capturing of the As-Built Document's annotation, comments, and mark-ups in a drawing format only. This does not typically include the updating of any models.

Record Model

The Design-Intent Model updated with actual constructed locations for equipment, systems, walls, etc. which will be used for Facility Management. This is intended to be a lightweight model with enough detail to enable facilities management operations without overly detailed elements.

Reverse Phase Scheduling

Reverse Phase Scheduling Is a method of demonstrating Integrated Project Delivery. It sets a plan within the design team that accounts for the activities of each discipline and how they interact with each other. It uses the completion date as a point to work backward from to schedule all of the project's activities.

RVT

A .RVT file is a native REVIT file type. It is also the deliverable file format for all projects. This includes all of the Design Team's models.

S

SBIM – Simple Building Information Modeling

SBIM is a concept of producing a "light" model that can be used for simulating the building's performance very early within the design process. SBIM is the process of modeling only the exterior envelope, and the interior volumes to produce a lean model that energy modeling software can use easily.

FM:Interact
Revit Modeling Standards

Revision	Author	Description	Date
1.0	Gilbert Doll	Initial Version	01/30/2013
1.2	Robert Norin	Revision	05/19/2014
1.3	Chuck Galantis	Revision	07/15/2016

Document Summary

This document outlines recommend standards within Revit for building model files in order to maximize the interoperability between those models and FM:Interact.

Contents

File System

Folder Organization

We recommend building model files be organized into a manageable and consistent directory structure. For example:

- <Model Root Folder>
    - <Site Folder>
        - <Building Folder>
            - <Architectural model>
            - <MEP Model>
            - Etc…

In this scenario building model files are located under a single root drawing folder, with a separate folder for each site, and a separate folder for each building. All building model files for a specific building are located in the same folder.

This structure may need to be modified to provide for individual client access and security needs.

Filenames

Individual model file names should follow the naming convention: BldgCode_model_type.rvt

For example the building 444th model architectural plans would be named 444_ARCH.rvt.

Multiple Floors Per Model

FM:Interact supports many levels/ floors per a model file. Depending on the size of the model file and amount of resources on the Revit machine the model may be split based upon floors or disciplines.

Area Plans

8.5.x and above

1. FM:Systems
This area plan is used to segment information you want to use with FM:Interact.
NOTE: This area plan *must* be named FM:Systems – as presented here.
2. Gross Area Plan
This area plan determines the overall square footage of the level.
3. Interior Gross Area Plan
This area plan is utilized in chargeback calculations.
NOTE: This area plan *must* be named FMI Interior Gross – as presented here.

Rooms and Areas

Revit considers a room any space element defined by walls. You can only use the Room element with spaces that are defined by walls. Therefore, you do not use the Room element to define cubicles.

FM:Interact utilizes the Revit Area element rather than the Revit Room element to track spaces. This allows both closed wall rooms and systems furniture cubicles to be tracked as spaces in the database.

Use Unique Revit Room Numbers

Revit will warn you that you have created a duplicate Room ID but will not prevent you from saving the duplicate ID. When the FMI BIM Integration Component generates areas from the room elements, it will use the Revit Room ID as the FM:Interact room number. Duplicate room numbers will cause FM:Interact errors.

Visibility Sets

Once you define the areas on a model, and the model is ready for use with FM:Interact, you create something called a Visibility Set. The visibility set defines what elements are presented on a DWF that is used by FM:Interact.

Common Drawing Information

Model plans drawings typically contain at least the following basic elements, each on their own layer:

- Doors
- Windows
- Walls
- Stairs / Elevators
- Fixtures (plumbing fixtures in bathrooms, etc.)
- Columns
- Furniture (Cube panels, etc.) – Furniture that "defines space"

Add additional items as needed (Assets). There are four (4) out of box asset systems which include Furniture, Equipment, Building Equipment and Data Jacks. Users can define an additional twenty-two (22) asset systems

Boundary Lines

Boundary lines are used by FM:Interact to define an area/space.

Ideally you should register a model with FM:Interact and use the Revit's Room and Area ribbon tab when creating boundary lines to ensure they are bound to the Room/Area.

Exterior/Interior Boundaries

FM:Interact requires an "Exterior Gross" boundary line that should trace the outside edge of the exterior wall. This boundary line must be closed.

FM:Interact also requires an "Interior Gross" boundary that should trace the inside edge of the exterior wall. This boundary line must be closed.

The Interior Gross boundary must be completely contained within the Exterior Gross boundary.

The difference between the Exterior and Interior gross areas represents space lost to building walls.

Area Boundary Lines

Area Boundary Lines should follow these guidelines:

- All areas that you wish to track within FM:Interact on a level must be defined by a boundary line. This includes any area you want to have a person, asset or group occupy. You can assign multiple persons or assets to a single area/space in FM:Interact.
- No defined area/space boundary line should go outside of the Interior Gross boundary.
- Any area/space on a level not defined by a boundary will be automatically counted as "secondary circulation."
- Each area/space defined by a boundary line must have one and only one room id/tag/number.
- Area/space boundaries should not overlap because area/space will be double counted.
- We assume primary circulation will be boundary lined and tracked (elevator lobbies, etc).
- Non-assigned areas like circulation are prorated automatically based upon the area/space type/proration code assigned to each space.

Room Numbers

Room numbers must be unique to each area/space, not just for a level but for an entire building.

Room numbers must be alphanumeric with no spaces and can include the special characters: dash (-), underscore (_), period (.)

Room numbers are required in order to use Rooms to Areas function.

If you are defining area/spaces individually you can enter each room number at that time.

There must be one and only one room number per defined area/space (boundary line).

Additional Area/Space Information

Linked AutoCAD Drawings

Remove any unnecessary linked drawings - may cause publishing issues and will increase RVT file size.

Area Types

Changing an area type will change how the boundary line is drawn. The line may be drawn to the inside of the wall, the center of the wall or to the exterior of the wall depending on the area type.

Hatching Legends

Users will need to stretch the plan region visibility to allow for the showing of the legends

Mixed Model

A building can have a mix of CAD drawing(s) (one per floor) and one or more Revit models.

Additional Models

FM:Interact supports multiple models for a building. The Revit models can be separated out by discipline(s) and/or by floor(s).

Assets Integration

Overview

Introduction

The FM:Interact BIM Integration Component allows asset managers and BIM technicians to share product information and maintain an accurate, detailed asset inventory for the building.
BIM technicians can populate FM:Interact product catalogs with data from Revit type properties (e.g., manufacturer, model number, cost). Also, key information about specific assets (e.g., installation date, serial number, etc.) can be synchronized between Revit instance properties and the FM:Interact asset inventory.

Revit and FM:Interact: Bidirectional

Revit and FM:Interact share a bidirectional link in which data flows both ways. A user can choose either Revit or FM:Interact to be authoritative, and the data from the authoritative source will overwrite the data in the other source.

FM:Interact can accomdate any fields associated with assets in Revit. Below are basic suggested mappings between Revit and FM:Interact.

Catalog Mapping Example		
Revit Family	**FM:Interact Catalog**	**Existing/New**
Furniture	Furniture Catalog	Existing
Furniture Systems	Furniture Catalog	Existing
Mechanical Equipment	Building Equipment Catalog	Existing
Ducts	Building Equipment Catalog	Existing
Duct Fittings	Building Equipment Catalog	Existing
Plumbing Fixtures	Building Equipment Catalog	Existing
Lighting Fixtures	Lighting Catalog	New

Field Mapping Example	*Suggested fields to be populated in Revit	
Revit Field	**FM:Interact Field**	**Catalog/Inventory**
Description	Description	Furniture Catalog
Manufacturer	Manufacturer	Furniture Catalog
Model	Model	Furniture Catalog
Price	Cost	Furniture Catalog
Item Number	Tag #	Furniture Inventory
Description	Description	Building Equipment Catalog
Manufacturer	Manufacturer	Building Equipment Catalog
Model	Model	Building Equipment Catalog
Price	Cost	Building Equipment Catalog
Serial #	Serial #	Building Equipment Inventory

By signature below, this BIM Execution Plan integrates into the project Agreement, dated _____, for Professional Design Services between _____ and MIAMI DADE COLLEGE.

_____   _____
Miami Dade College   Date

_____   _____
Architect   Date

_____   _____
Construction Manager   Date

_____   _____
Civil Engineer   Date

_____   _____
Structural Engineer   Date

_____   _____
Mechanical Engineer   Date

_____   _____
Electrical Engineer   Date

_____   _____
Plumbing Engineer   Date

_____   _____
Additional Party as Needed   Date

_____   _____
Additional Party as Needed   Date

Overview

The intent of this BIM Execution Plan is to provide an outline that will let the owner, architect, engineers, and construction manager organize building information modeling (BIM) technology and best practices on this project faster and more cost-effectively. This plan defines roles and responsibilities of each party, the detail and scope of information to be shared.

A. Project Summary

This section defines the Core Collaboration Team, the project objectives, project phases, and overall communication plan throughout the project's phases.

1. Project Information

Project Name:	
Project Number:	
Project Address:	
Project Description:	

2. Core Collaboration Team

Contact Name	Role/Title	Company	Email	Phone

3. Project Goals and Objectives

Project Goal	Objective	Achieved if	Project Timeframe

4. Collaborative Process Mapping (Coordination Plan)

	Owner	Architect	Consulting Engineers	Construction Manager	Commissioning Agent
Conceptualization/ Program of Requirements					
Criteria Design/Schematic Design					
Detailed Design/Design Development					
Implementation Documents/Construction Documents					
Agency Coordination/Final Buyout					
Construction					
Facility Management					

B. Modeling Plan

Advance planning around which models will need to be created during the different phases of the project, who will be responsible for updating models and distributing them, and predetermining the content and format of models as much as possible will help your project run more efficiently and cost-effectively during every phase.

1. **Revit Model Manager**

Each party—such as the **owner, architect, contractor, or sub-consultants**—that is responsible for contributing modeling content should assign a model manager to the project. The model manager from each party has a number of responsibilities. They include, but are not limited to:

- Transferring modeling content from one party to another
- Validating the level of detail and controls as defined for each project phase
- Validating modeling content during each phase
- Combining or linking multiple models
- Participating in design review and model coordination sessions
- Communicating issues back to the internal and Project team
- Keeping file naming accurate
- Managing version control

Company Name	BIM Model Manager Name	Email	Phone

2. **Planned Models**

In the table below, outline the models that will be created for the project. List the model name, model content, project phase when the model will be delivered, the model's authoring company, and the model authoring tool that will be used. For models that will not be used or created in your project, just leave the row blank, and add rows for model types you anticipate needing that are not already listed. The first line offers an example.

Model Name	Model Content	Project Phase	Authoring Company	Authoring Tool

C. Model Components

As an aid to usability during later phases of your project, specify what the content, level of detail, and file naming structure of your models should look like.

1. File Naming Structure

Determine and list the structure for model file names.

File Names for Models Should Be Formatted as:	
See FM:Interact Revit Modeling Standards Document attached	
Architectural Model	ARCH-
Civil Model	CIVIL-
Mechanical Model	MECH-
Electrical Model	ELECT-
Plumbing Model	PLUMB-
Food Service Model	KITCHEN-
Structural Model	STRUCT-
Energy Model	ENERGY-

2. Precision and Dimensioning

Models should include all appropriate dimensioning as needed for design intent, analysis, and construction. With the exception of the exclusions listed below, the model will be considered accurate

and complete. In the table below, enter which items' placement will not be considered entirely accurate and should not be relied on for placement or assembly.

Items that Will Not Be Considered Accurate for Dimensioning or Placement
Architectural –
MEP –
Civil –
Construction –
Food Service –
Structural –

3. Modeling Object Properties

The level of property information in the modeling objects and assemblies depends on the types of analysis that will be performed on the model.

4. Modeling Level of Detail + Worksets (Object Layers)

Follow the table below to create and organize your Revit Project Worksets. Each modeling object should be placed within its corresponding workset. This will require a very high level of attention to detail when modeling, and should be the Revit Model Manager's responsibility to schedule interval Workset housekeeping time.

Workset	Modeling Objects
Grids and Levels	Structural Grids and Elevation Levels
Core + Shell	Exterior Envelope, Circulation Elements, Structural Elements
Interiors - Architecture	Interior Walls and demountable Partitions, Doors
Interiors - Flooring	All Flooring Families
Interiors - Ceilings	All Ceiling Families
Interiors - Furniture	Moveable or Fixed manufacture bought furniture elements
Interiors - Millwork	Fixed and Contractor Built elements
Interiors - Equipment	Specialty Equipment
Entourage	Any exterior accessories, Model People for scale, Plantings
Life Safety	All Life Safety modeling elements
Link - CAD	Any Linked CAD Drawing Backgrounds used for reference
Link - BIM	Any Linked BIM Models used for reference or Project Coordination

D. Detailed Modeling Plan

For each phase of the project, the project team should create a detailed modeling plan, which should include the modeling objectives, models included, and the roles and responsibilities of model contributors. Model objectives and model manager roles and responsibilities by phase are outlined below.

1. Conceptualization / Program of Requirements Phase
    1. Objectives:

2. Model Roles:

3. Responsibilities:

2. Criteria Design / Schematic Design Phase
1. Objectives:

2. Model Roles:

3. Responsibilities:

3. Detailed Design / Design Development Phase
1. Objectives:

2. Model Roles:

3. Responsibilities:

4. Implementation Documents / Construction Documents Phase
1. Objectives:

2. Model Roles:

3. Responsibilities:

5. Agency Coordination / Bidding Phase
1. Objectives:

2. Model Roles:

3. Responsibilities:

6. Construction
1. Objectives:

2. Model Roles:

3. Responsibilities:

7. Facility Management
1. Objectives:

2. Model Roles:

3. Responsibilities: