FAA Building Information Modeling (BIM) Guide

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AIR TRAFFIC ORGANIZATION

COMPUTER AIDED ENGINEERING GRAPHICS (CAEG) PROGRAM OFFICE

AIR TRAFFIC CONTROL FACILITIES

NATIONAL ENGINEERING SERVICES (NES) GROUP (AJW-29)

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INTRODUCTION/SCOPE

1. INTRODUCTION

The following FAA Building Information Modeling (BIM) Guide defines the implementation protocols, specific requirements, activities and processes for design and construction of projects using BIM within the FAA. An integral part of the NextGen transformation is to efficiently manage the FAA's Building and System information. BIM allows for such efficient Information management. Information, from Architectural Engineering firms (AE)'s and internal organizations, is stored in FAA's Electronic Document Management System (EDMS) ProjectWise and continually used throughout the Life Cycle Management Process.

This document represents the minimum modeling requirements for BIM. All projects using a BIM platform to produce drawings and reports shall adhere to these requirements in full.

The purpose of this document is:

- To outline the FAAs expectation of BIM used in service of FAA projects during design, construction and building operations and,
- To define basic requirements for BIM which will assure that the phase-specific needs of the FAA will be met by the developing BIM through each stage of design, construction and operations.

In support of post-construction use of the developed BIM, the FAA has implemented ProjectWise for managed access and file sharing during the operations stage by project participants. This is not just a simple utility for file receiving and storage. All project files, including but not limited to BIM, reside within the EDMS, synchronized between all participating sites, and are available for check in/out, viewing and editing, within the limits of defined secure access rights.

The mandate for secure and managed access outweighs the benefits and features of any single BIM platform. The FAA allows the use of BIM and CAD which are demonstrated as viable within the framework of the chosen EDMS. Bentley's AECOsim and Microstation, and Autodesk's AutoCAD are known to operate fully within the ProjectWise environment. Autodesk Revit is acceptable for use only within the workflows supported by ProjectWise which have been demonstrated as viable by Bentley. This requirements of this Guide have been prepared to work within this framework.

The current implementation of BIM includes use of BIM processes to assure coordination between building systems and derivation of drawings directly from this coordinated project model. Data shall be derived from the project model and delivered to the FAA for use in Operations after Construction.

Each project shall be governed by its BIM Implementation Plan (BIP), described in 3.1, which shall set the project-specific goals for BIM, how the models shall be structured to achieve those goals, appropriate software to be used, and the relationship between the project participants.

2. FAA BIM PROJECT TYPES

FAA ATO authorizes various building types that are delivered using different methodologies. Some of the common types of projects executed by the ATO are described below. The FAA intends to maintain the usage and adoption of BIM consistently across all these projects, despite differences in the parties responsible for creating and maintaining the BIM.

While the BIM is not considered the FAA's document of record, 2D documents of record shall be generated from the final BIM and a comprehensive "Master" BIM combining all disciplines shall be provided at each deliverable phase.

Independent of project delivery method, PDF plots shall be the 2D Documents of Record, created from the approved BIM project platform. All supporting files, BIM 3D and 2D, used in the creation of the PDF drawings shall be delivered in whole at each submission.

Projects "Issued for Construction" or "Ready to Advertise" shall have achieved LoD300, setting the "Basis of Design". This includes embedment of the initial system data within the BIM for the major equipment modeled, as described in the Project Specifications. The material and systems selection process, during construction, shall refine the model as alternates and substitutions are adopted.

2.1. Design Build Projects

The prime contractor shall deliver to the FAA, project BIM which is coordinated with all trades and disciplines, accurate to system dimensions and data, and a reflection of the progression through the project schedule. The final submitted model shall reflect fully coordinated, As-Built conditions for the project.

2.2. Design-Bid-Build Projects

The project Architect-Engineer (AE) shall deliver a fully coordinated and conflict-free BIM that reflects the project progress and design phase. Project BIM shall be prepared by the AE to LoD300 prior to Advertisement for Bidding or Issuance for Construction. Each stage of submission shall include review by the FAA and all issues shall be rectified by the AE prior to acceptance of the next stage.

At Award, the Prime Contractor (PC) shall be given access to the project BIM as designed, and shall verify its component systems. Any discrepancies shall immediately be brought to the attention of the FAA. As alternates and substitutions are adopted, the PC shall modify the model and underlying data accordingly, resolving all coordination issues with the model. Final system data shall reflect fully coordinated, As-Built conditions for the project.

2.3. Renovations

2D and 3D (BIM) of existing conditions shall be provided by the FAA, or creation of this existing BIM shall be part of the scope of service. 3D geometry and data shall be limited to only the extent required to inform the renovation work to be shown in the drawings.

The renovation contractor shall deliver an As-Built BIM that is fully coordinated to all building systems represented. This shall also apply to renovation projects executed in-house by FAA personnel. The CAEG program office shall be contacted if any assistance is required.

3. DESIGN AND COORDINATION OF BIM PROJECTS

The Architecture Engineer (AE) will adhere to these protocols, processes, and activities during the design and coordination of all FAA BIM Projects.

3.1. Project's BIM Implementation Plan (BIP)

The BIM Implementation Plan (BIP) provides a framework for all stakeholders, project team members and anyone else involved in the project to obtain a common operating vision regarding the use and implementation of BIM throughout the project. It presents a plan for the generation of project information during the project's design and construction lifespan. Further, it provides an illustration of how the BIP benefits can be used by the owner. The BIP will also provide a timeline and description of BIM related deliverables that ensure the project is completed on time and with minimum design and or coordination issues.

The BIP shall set the starting agreement and framework for BIM including:

- Project Initiation
    - Participant Roles & Responsibilities for BIM
- Best Practice
    - Modeling Level of Development (LoD)
- Modeling Plan
    - Modeling Reference & Common Alignment
    - Planned Models (list by AEC)
    - Minimum Modeling & Data Requirements
    - BIM File Naming
    - Deliverables
- Project Collaboration & Communication
    - Collaborative Data Environment (file sharing method)
    - Clash Management
- Project Technology Plan
    - Software Component Selection
    - Delivery Formats

The BIP shall address the viability of the BIM design and analysis technologies selected for the Project. From concept development through As-Built drawings and propagation of the FAA Maintenance Management System the BIP shall detail how the project will be implemented, monitored, and controlled with regard to BIM. The BIP will be coordinated with the project's master schedule and the scope of the AE Project Manual. It will identify the AE's and the contractor's BIM coordinator, as well

as, members responsible for creation, development, and maintenance of the BIM data, and how the BIM data shall be managed and interoperate (data storage, sharing, viewing and updating, as necessary) among all contractor team members. The AE and the contractor shall be responsible for all necessary model and data component clarifications to deliver BIM to the FAA compliant with this Guide.

The BIP will specifically address and describe BIM uses during design and construction phases and will include value management, interference management, and design-change tracking, or such other uses as the contractor proposes. The AE and the contractor shall be responsible for all model and data component clarifications necessary to deliver BIM models that are compliant with the Guide to the FAA.

The FAA requires a BIM Implementation Plan (BIP) within forty-five (45) days of the project being awarded, unless otherwise specified. Questions about BIP may be directed to the CAEG Program Office through the appropriate point of contact for the project. (See appendices section 10.2 Additional Resources for sample BIP).

3.2. Initial Design Conference

During the Initial Design Conference, the scope of the Project's BIM utilization shall be further clarified, including the use of BIM for design, generation of two (2)-dimensional extractions, coordination between various disciplines, clash detection, and to support migration of facility data for facility management applications.

The BIM Implementation Plan (BIP) will be reviewed for clarification, and to verify the functionality of the projects BIM technology, protocols, processes and activities. The FAA shall confirm acceptability of the BIP and advise of any required additional processes or activities to be incorporated. If modifications are required, the contractor shall execute the modifications and resubmit the final BIP for FAA acceptance.

Prior to the beginning of construction and based on the project type, it will be determined how the BIM will be used to serve as a coordination and conflict resolution model to resolve potential clashes between disciplines during design and during the construction phases.

3.3. BIM Coordination and FAA Approved Modeling Software/Tools

Deliverables shall be stored, post-construction, within the FAAs document management system, ProjectWise and actively used in maintenance of the built works. The mandate for secure and managed access outweighs the benefits and features of any single BIM platform. The FAA allows the use of BIM and CAD which are demonstrated as viable within the framework of ProjectWise. Bentley's AECOsim and Microstation, and Autodesk's AutoCAD are known to operate fully within the ProjectWise environment. AutoDesk Revit is acceptable for use only within the workflows supported by ProjectWise which have been demonstrated as viable by Bentley.

The Architectural Engineering (AE) firm is responsible for developing the BIM with facility data for the purposes of coordination between various disciplines. All submitted BIMs and associated facility data shall be fully generated by FAA approved BIM software/tools. The BIM approved software for FAA is limited to IFC certified versions of BIM authoring tools like Autodesk Revit 2015 and Bentley Architecture suite (V8i) or later]. The model deliverables associated with the project shall be delivered in one of the two approved principal modeling tools. Additional information required for the project like schedules, cost data, energy models, etc must be delivered in a format compatible with the chosen principal format. The coordinated BIM shall also be geographically aware and contain coordinate information that will allow the BIM to be connected to a Geographic Information System (GIS).

3.4. Coordination View Information Exchange (CVIE)

In addition to submittal of the BIM files, Industry Foundation Class (.IFC) format files shall be exported from the BIM for use by the FAA. The BIM authors shall utilize the latest version of IFC for an open and neutral data format.

This requirement is separate from and in addition to the required submittal of the BIM files, the Clash Management Reports and their supporting files.

The BIM CVIE shall use a common registration point for all design disciplines. The CVIE shall be based on the native object-based elements such as columns, beams, walls, doors, windows, etc. along with their associated parametric information provided in the BIM and the data shall be consistent with the structure of the latest IFC.

Each BIM object, physical room, and functional space shall be assigned a Globally Unique Identifier (GUID). GUID's for objects and spaces that are submitted in deliverables shall not change. An IFC Coordination View in IFC Express format including exported property set data for all IFC supported named building elements shall be included for all deliverables. All deviations from or additions to the Industry Foundation Class (IFC) property sets for new spaces, systems, and equipment shall be submitted for FAA approval.

If the BIM is in multiple files then each of these individual files shall be provided with each BIM CVIE deliverable as well as a BIM containing all the disciplines.

3.5. Model Reference & Common Alignment

Files that are in alignment horizontally and vertically are termed "in-registration." Registration of all BIM files is critical to cross-discipline coordination and multi-file work. The FAA requires that all BIM files develop their work through common selection of one of two methods, 1st, relative to the point (0,0,0) without re-assigning that origin point within a file. Or 2nd, by use of shared coordinates between all the project BIM. The method selected shall be so documented in the project's BIP.

The FAA shall test the relationship of files by independently attaching them as reference (or link) to an unmodified master in the project's BIM software, and the project's Clash Management software. Files found not "in-registration" shall be required to be corrected.

The 1st method is clarified below as executed in both Revit and AECOsim.

Revit Projects:

Revit files have both their initial Project Base Point and Survey Point set to (0,0,0).

- Do not move the Project Base Point in any file. If necessary move the Survey Point.
- Establish a structural grid relative to (0,0,0). Modelers may then author the building systems relative to the grid with assurance of a common respect to the Origin.
- Attachment (or links) of other building systems shall natively attach in proper alignment both in the BIM and clash management software.

AECOsim Projects:

AECOsim files all have their Global Origin set to (0,0,0).

- Establish a structural grid relative to (0,0,0). Modelers may then author the building systems relative to the grid with assurance of a common respect to the Origin.
- Attachment of other building systems shall natively attach in proper alignment in both the BIM and clash management software.

All Submittals shall include both the native building models as well as exported IFC format models, including data as defined in the Coordination View Information Exchange (CVIE) international standard. All deviations from or additions to the IFC property set shall be submitted for approval.

3.6. BIM Interference Check

Projects shall be delivered fully coordinated and clash free. Each submittal shall be reviewed for clash resolution, and issues found shall be provided to the model authors as comments to be resolved as the project advances.

Within a Revit project, Navisworks shall be used to check modeled system's "registration" and to verify the resolution of all found clashes.

Within an AECOsim project, Navigator or Navisworks shall be used to check the modeled system's "registration" and verify the resolution of all found clashes.

The BIM shall be set up to support clash/conflict/interference checks. AE's and their discipline consultants shall be responsible for setting up their respective coordination protocols to complete the BIM with the relevant data that is spatially aware. It is the responsibility of the AE/contractor to update their "All: BIM to reflect coordinated resolution, ensure the design intent has been followed, and that there are no unintended elements.

Log hard interferences where two elements are occupying the same physical space in the BIM (for example, mechanical vs. structural or mechanical vs. mechanical overlaps in the same location) and soft interferences (conflicts regarding service access, clearances, code elements, fireproofing, insulation, etc.) in a written report and resolve them. Coordination software will be used for

assembling the various design BIMs and for providing a report and viewing a list of design coordination issues. Detailed records of all conflict resolutions shall be maintained. The Design Team, including the Team's BIM Facilitator and the Discipline BIM Lead's, will review the model and the Clash Reports in coordination meetings with FAA personnel.

The AE contractor is responsible for conducting periodic single-discipline and cross-discipline interference checks and resolving the identified interferences. The AE contractor shall also be responsible for presenting a single-discipline and cross-discipline schedule in the BIP that includes interference checks at every major submission to the FAA. Additional coordination checks will be performed on an as-needed basis.

In case of unresolved clashes between modeled building systems during construction, the FAAs Contract Manager, shall assess the need to lead a Clash Resolution Workshop, where all affected parties shall mutually determine the best course of action to resolve the affecting clashes.

3.7. Facility Data

The FAA requires embedded data within the BIM in accordance with Appendice 10.2, BIM Data Requirements by Discipline/Workset/Components. This requirement acknowledges the evolution of the data in line with the evolving design geometry through the design submittal stages.

4. FAA BIM SUBMITTAL REQUIREMENTS

The AE shall provide the FAA a 3D interactive visualization from the "Master" BIM in Navisworks, ProjectWise Navigator, Adobe 3D PDF 7.0 (or later) or an equivalent format. The FAA may request other formats if needed to address Project-specific requirements. Facility data as available will be provided through a COBie spreadsheet.

The following deliverable requirements apply to BIM models only and do not impact the need to deliver the required CAD drawings. Refer to the FAA A/E project manual and FAA-STD-002 for CAD submittal requirements. Refer to section 4.5 for LoD Requirements.

AE Phase	Milestone	BIM LoD	Deliverable
Prior to Initial Design Conference	0%	n/a	BIP
PPD	10%	LoD200	Updated BIP Project Master Model Architectural Model(s) Structural Layouts MEP Equipment Layouts (2D) 2D Drawings (PDF & CAD)
Schematic	45%	LoD200-LoD300	Project Master Model Architectural Model(s) Structural Model(s) MEP Room Layouts MEP Calculations Clash Management Reports Preliminary Cost Estimate Data 2D Drawings (PDF & CAD) IFC Models
Design Development	70%	LoD200-LoD300	Project Master Model Architectural Model(s) Structural Model(s) MEP Model(s) MEP Revised Calculations Clash Management Reports Cost Estimates & Quantity Reports 2D Drawings (PDF & CAD) IFC Models

AE Phase	Milestone	BIM LoD	Deliverable
Construction Documentation	100%	LoD300	Project Master Model Architectural Model(s) Structural Model(s) MEP Model(s) MEP Revised Calculations Clash Management Reports Cost Estimates & Quantity Reports 2D Drawings (PDF & CAD) IFC Models
Corrected 100%	FINAL	LoD300	Project Master Model Architectural Model(s) Structural Model(s) MEP Model(s) MEP Revised Calculations Clash Management Reports Cost Estimates & Quantity Reports 2D Drawings (PDF & CAD) IFC Models
Modeling Passes from AE to Contractor			

Contractor Phase	Milestone	BIM LoD	Deliverable
Shop Drawings / Systems Selection	As Submitted	LoD350	Project Master Model Architectural Model(s) Structural Model(s) MEP Model(s) MEP Revised Calculations as affected Shop Drawing Model(s) Clash Management Reports Scheduling & Phasing Model(s) Shop Drawings (PDF) IFC Models
Facility Commissioning	E/O Construction	LoD350	As-Built Project Master Model As-Built Architectural Model(s) As-Built Structural Model(s) As-Built MEP Model(s) As-Built Drawings (PDF & CAD) As-Built IFC Model(s)
JAI / Closeout	FAA Handover	LoD350	Revised As-Built Model(s) Revised As-Built Drawings (PDF & CAD)
Models Pass from Contractor to FAA			

Table 4-1 FAA BIM Submittal Requirements

4.1. Digital Submittals

Digital submittal drawings (PDF) derived from BIM shall be of such resolution that supports printing at full-Size, (A1, ANSI D, etc.) size, and suitable for half-size (11”x17”) scaled reproduction.

4.2. Design Submittals

CAD drawings extracted from the BIM shall comply with the latest version of FAA-STD-002. Any deviations must be approved by the FAA. Two-dimensional (2D) documentation shall be generated from the BIM and prepared with FAA approved IFC Compliant BIM Authoring Software. All plans, elevations, sections, schedules, and details shall be fully coordinated with the BIM. All other documents are to be submitted per the contract requirements.

4.3. BIM and CAD Data Submittals

The submitted BIM shall include all files and reports as listed in table 4-1 above, on DVD/CD-ROM.

4.4. Submittal Reviews

The FAA will review BIM project design submittals for compliance with this BIM Guide as part of the phased reviews (such as 45%, 70%, 100% and Final) for resolution and discussion with FAA personnel during design coordination reviews. (See appendices section 10.3, Additional Resources, for sample model validation checklist)

The submittal review provides an evaluation of the BIM project for compliance including the following areas:

- Verification that all required files have been provided.
- BIM File Naming
- BIM Structure (file segregation) as noted in the project’s BIP
- Verification of Common Alignment of Discipline Models
- Verification of Clashes Reported & Resolution Achieved
- Verification of required Facility Data.
- LoD meets requirements per submittal.
- Validation of BIM deliverables percent complete by discipline

4.5. Model Level of Development (LoD)

All designs evolve through many stages from inception of design through to construction of the design, requiring an evolving level of detail appropriate to both the need to support design drawings, and later to support construction of the coordinated design.

LoD shall be as defined in the AIA E202, and coupled with the design process as follow:

Initially, modeled objects shall be LoD200, dimensionally correct.

As the presentation of the design requires schedules in the drawings, information shall also be embedded as object data, and all presented schedules shall express the embedded information within the BIM.

LoD300 is defined as objects dimensionally correct, with embedded data. The data required evolves through the design process as defined in Appendix 10.2, BIM Data Requirements. The submitted Final Design shall be LoD300 as defined in the requirements of section 5, General BIM Requirements, and Appendix 10.2, BIM Data Requirements. The BIM at Final Design shall reflect both the submitted information of the PPD and the specified "Basis of Design" building components.

The Contractor shall update the model to LoD350, both by updating the components and data as submitted and approved, and as system supports for installation are added to the model & coordinated.

Refer to both Section 5, General BIM Requirements, and Appendix 10.2, BIM Data Requirements.

4.6. Model Granularity

Models may vary in level of detail for individual elements within a model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g. at least 1/16th, 1/8th and 1/4th) and all the elements of fire protection, or appropriately scaled civil drawings.

5. GENERAL BIM REQUIREMENTS

This Section establishes the technical criteria required to develop a project using BIM technology for the FAA. The following requirements shall be included in the BIM as the design is developed and refined. The BIM shall be set up with the intention of being the source and container for all project information. Changes to the design and data shall be coordinated through the BIM. The BIM shall also serve as the authoritative source of project data at all times. The BIM shall be created to support 3D Model Visualization that represents the design including snapshots of 3D imagery and walk and fly-throughs for virtual navigation. (See Additional Resources for FAA BIM Object Element Matrix)

5.1. General Provisions.

The BIM shall be developed to include the systems described below as they would be built. The BIM shall also include as many of the systems described below as are necessary and appropriate for each design review cycle reflecting the progress of the design stage. Existing conditions shall be exempt from the modeling requirements except at areas where the new systems interface with existing. Performance attributes and specifications shall be included as attributes to the BIM object elements to the extent possible and per the LoD specifications. **Minimum Systems to be modeled are identified by Discipline below, including general framework for each listed system.**

The FAA shall inspect submitted works to verify that all modeled components are correctly assigned to the related workspaces when Revit is implemented as the project's BIM platform.

5.1.1. Architectural

WORKSET	SYSTEM COMPONENTS
A-Spaces	Space Defintions (incl. Net SF, Net Volume, Finish Schedule Data, Room Name & Number). Shall be used to validate against program SF & area quantities.
A-Flooring	Floor Systems, above structural components modeled separately and linked.
A-Wall	Wall System, coded by type (incl. Thermal, Acoustic & Fire Ratings.
A-Opening	Doors, Windows, Louvers, coded by type (incl. clearance zones) w/data required to create schedules.
A-Ceiling	Ceiling Systems, incl. soffits, materials & special conditions
A-Roof	Roof Systems, above structural components modeled separately and linked (incl. drainage system, penetrations, curbs & specialties).
A-Circulation	Circulation Systems (Elevators, Stairs, Walks, Ladders, Guards & Rails, limits of shafts for coordination, Supporting Equipment & clearance zones).
A-Plbg Fixtures	Plumbing Fixtures
A-Toilet Partitions	Toilet Partitoins
A-RR Accessories	Toilet Accessories
A-Casework	Fixed Cabinets & Counters. Built-Ins.
A-Specialties	Specialties (Masterformat Div. 10 Items)
A-FE Specialties	Fire Extinguishers, FE Cabinets, FP Hose Reel Cabinets, etc.
A-Signage	Signage, incl. data required to create schedules.

5.1.2. Architectural Interiors (Moveable items)

WORKSET	SYSTEM COMPONENTS
AI-System Furniture	Systems Furniture & Panels w/data required to identify
AI-Furniture	Relocatable Furniture w/data required to identify
AI-Equipment	Equipment (incl. clearance zones) w/data required to create schedules
AI-Partitions	Demountable Partitions, coded by type
AI-Plant	Interior Plantings (containerized) w/data required to identify or create schedules
AI-Artwork	Art Objects w/data required to identify
AI-Signage	Signage (not covered in base Architectural file) w/data required to create schedules
AI-OF Equipment	Owner Furnished Equipment (incl. respective data & clearance zones as provided)

5.1.3. Structural

WORKSET	SYSTEM COMPONENTS
S-Foundation	Foundations
S-Floor Framing	Floor Framing (frame components, deck, slab, exp/cntr joints, shafts, pits, openings, etc.) Modeling of bolted connections not required.
S-Roof Framing	Roof Framing (frame components, deck, slab, exp/cntr joints, shafts, pits, openings, etc.) Modeling of bolted connections not required.
S-Columns	Columns, Column grouted base-plates. Modeling of bolted connections not required.
S-CIP	Cast-In-Place Concrete Components (incl. joints & openings) excl. slabs
S-Precast	Precast Concrete Components (incl. openings)
S-Circulation	Circulation System Structural Components
S-Wall	Structural Wall Systems
S-Glazing	Structural Glazing Systems

5.1.4. Mechanical (Ductwork, fittings, equipment & related piping)

WORKSET	SYSTEM COMPONENTS
M-Duct-Supply Air	Supply Air ductwork & fittings
M-Duct-Return Air	Return Air ductwork & fittings
M-Duct-Exhaust Air	Exhaust Air ductwork & fittings
M-Duct-MUOA	Makeup / Outside Air ductwork & fittings
**add other duct systems in similar fashion as necessary	
M-Diff/Grilles	Diffusers & Grilles
M-Equipment	Mechanical Equipment & control systems (incl. clearance zones & respective data)
M-Piping	Mechanical Piping
M-System-FUEL	Fuel Oil System (Distribution, Equipment & Devices)
M-System-NGAS	Natural Gas System (Distribution, Equipment & Devices)
M-System-LPGS	LPG System (Distribution, Equipment & Devices)
M-Supports	Mechanical supporting systems (hangers, etc.)

5.1.5. Plumbing (Domestic Water Systems)

WORKSET	SYSTEM COMPONENTS
P-DOMW-Cold Water	CWS/CWR piping & fittings
P-DOMW-Hot Water	HWS/HWR/HWRR piping & fittings
P-DOMW-Equipment	DOMW Equipment (incl. clearance zones & respective data)
P-Supports	Plumbing supporting systems (hangers, etc.)

5.1.6. Plumbing (Drain, Waste, Vent, Storm Systems)

WORKSET	SYSTEM COMPONENTS
P-DWVS-Drainage	Drain piping & fittings
P-DWVS-Sanitary	Sanitary waste piping & fittings
P-DWVS-Vent	Vent piping & fittings
P-DWVS-Storm	Storm drain piping & fittings
P-DWVS-Equipment	DWVS Equipment (incl. clearance zones & respective data)

5.1.7. Fire Suppression.

WORKSET	SYSTEM COMPONENTS
FS-Distribution	Fire Suppression piping & fittings
FS-Equipment	Fire Suppression Equipment (incl. clearance zones & respective data)
FS-Devices	Fire Suppression devices (heads, etc.)
FS-Supports	FS Support Systems (hangers, etc.)

5.1.8. Fire Alarm

WORKSET	SYSTEM COMPONENTS
FA-Distribution	Fire Alarm distribution (conduit, trunking, cable tray, etc.)
FA-Equipment	Fire Alarm Equipment (Control Panels, etc. incl. clearance zones & respective data)
FA-Devices	Fire Alarm devices (sensors, detectors, pull stations, alarms, etc.)
FA-Supports	Fire Alarm Support systems (hangers, etc.)

5.1.9. Electrical Lighting.

WORKSET	SYSTEM COMPONENTS
E-Lighting-Distribution	Lighting System distribution (conduit, trunking, cable tray, etc.)
E-Lighting-Equipment	Lighting Equipment (Panels, Distribution Boards, etc. incl. clearance zones & respective data)
E-Lighting-Devices	Lighting System devices (lights, switches, etc.)

5.1.10. Electrical Power.

WORKSET	SYSTEM COMPONENTS
E-Power-Distribution	Power Distribution (conduit, trunking, cable tray, etc.)
E-Power-Equipment	Power Equipment (panels, disconnects, generators, transformers, etc. incl. clearance zones & respective data)
E-Power-Devices	Power Devices (receptacles, etc.)
E-Supports	Electrical support systems (hangers, etc.)

5.1.11. Electrical Lightning Protection, Grounding, Cathodic Protection

WORKSET	SYSTEM COMPONENTS
E-Ltng-Prot-Distribution	Lightning Protection Distribution
E-Ltng-Prot-Equipment	Lightning Protection Equipment (incl. clearance zones & respective data)
E-Ltng-Prot-Devices	Lightning Protection Devices
E-Grounding-Equipment	Grounding System Equipment (incl. clearance zones & respective data)
E-Grounding-Devices	Grounding System Devices

5.1.12. Telecom Data/Network

WORKSET	SYSTEM COMPONENTS
T-Data/Ntwk-Distribution	Data Distribution (cable tray, etc.)
T-Data/Ntwk-Equipment	Data Equipment (Servers, Control Panels, etc. incl. clearance zones & respective data)
T-Data/Ntwk-Devices	Data Devices (data ports, etc.)
T-Supports	Telecom Support Systems (hangers, etc.)

5.1.13. Telecom Mass Notification

WORKSET	SYSTEM COMPONENTS
T-MN-Distribution	Mass Notification Distribution (conduit, trunking, cable tray, etc.)
T-MN-Equipment	Mass Notification Equipment (control panels, etc. incl. clearance zones & respective data)
T-MN-Devices	Mass Notification Devices (speakers, etc.)

5.1.14. Telecom Security

WORKSET	SYSTEM COMPONENTS
T-Security-Distribution	Security Distribution (conduit, trunking, cable tray, etc.)
T-Security-Equipment	Security Equipment (servers, control panels, etc. incl. clearance zones & respective data)
T-Security-Devices	Security Devices (cameras, sensors, etc.)

5.2. Civil/Site

The civil BIM may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1”=100’) scaled drawing. Additional minimum BIM requirements include:

5.2.1. Terrain (DTM).

All relevant site conditions and proposed grading, shall be modeled with the necessary intelligence to produce accurate Project site topographical plans and cross sections.

5.2.2. Drainage.

Drainage will be modeled to include all existing and new drainage piping, including upgrades thereto, and shall contain the necessary intelligence to produce accurate plans and profiles for the Project site.

5.2.3. Storm Water and Sanitary Sewers.

All existing and new sewer structures and piping, including upgrades thereto, on the Project site shall be modeled with the necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles for the Project site.

5.2.4. Utilities.

Utilities will be modeled with all necessary new utility connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, containing the necessary intelligence to produce accurate plans and site-sections.

5.2.5. Roads and Parking.

The model will include all necessary roadways and parking lots and or parking structures, with the necessary intelligence to produce accurate plans, profiles and cross-sections.

5.2.6. Geographic Referencing.

The Civil/Site BIM shall include geo-referencing to accurately locate the building within the site.

The display of the linked Building BIM shall provide rotation and positioning of the linked files to assure accurate placement in the context of the site, without affecting registration of the various files composing the aggregate BIM.

The Civil/Site BIM shall include a geo-reference to accurately locate the buildings within the site and to give them a physical location context at larger scales. The Civil/Site BIM shall geo-reference site plans for site layout surveying and future GIS use in accordance with the State Plane Coordinate system where the project is located. Submit any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment for FAA approval. Once the projects geo coordinates are set in the model, they may not be changed without the consent of the CAEG P.O.

5.3 Indoor Air Quality (IAQ) Management Plan.

The project shall include an IAQ management plan that links the BIM design information to testing procedures during construction.

6. PROJECT DIRECTORY STRUCTURE (FAA'S POST-CONSTRUCTION DOCUMENT STORAGE)

The primary goal of the Project Directory Structure is to improve coordination among all Stakeholders and their consultants, as well as to develop consistent BIM projects in a way that will facilitate the further use of the electronic information for all FAA stakeholders through the facility life cycle.

6.1. Facility Folder Structure

When the project is handed over to the FAA, files shall be uploaded into the ProjectWise EDMS. The Facility Folder will be updated to store the most recent 3D BIM of that particular Facility. The Facility BIM supporting documentation shall be contained in sub-folders that comprise the Facility Folder Structure, an example of which is shown below:

Facility Folder

BIM	(empty "top level" folder, no documents)
Models	(Revit/AECOsim 3D models)
Data	(other data in maintenance of the BIM)
Output	(extracted output, ie. Reports, IModels, etc.)
Reference	(Graphic reference material used exclusively for BIM)
Facility	
CM	
Record	(Issued Record Drawings (PDF) that are signed)
Projects	
Record	
Reference	(Graphic reference materials used for the creation of the drawings)
Security	
Support	
Documentation	(Documentation pertaining to the facility, it. Manuals, Specs, etc.)
Photos	

Figure 6.1 Facility Folder Structure

6.2. Configuration Management (CM) Folder

Each Configuration Management (CM) folder will store the most recent Project CM requirements for that particular facility.

CM information provided to the Project Lead in submittal format and contained in the BIM will include requirements for;

- NAS System Interface
- Electronics Interface
- Electric Bus
- Configuration Managed Component Equipment

6.3. Projects Folder

Each Project Folder will store the most recent Project Requirements for that particular facility.

Project information provided to the Project Lead in submittal format and contained in the BIM will include requirements for;

- Project Siting
- HVAC Size & Type
- Power Capacity & Redundancy
- Modes of Egress
- Structural Capacities
- Fire Life Safety
- NAS Systems

6.4. Record, Reference, Support Folders

The Record, Reference, Support Folders will store the most recent Project Information contained in the Model of that particular facility. Project record, reference, support information provided to the Project Lead in submittal format and contained in the BIM will include;

- Manufacture Specifications
- Permits
- Earthquake & Flood Zone
- Building Codes
- FAA Specific Requirements

6.5. BIM Folder

The BIM folder will store the most recent Project Information contained in the BIM for that particular facility. All the BIM Projects will be included in a folder. The BIM folder will contain sub-folders for Models, Data, Output & Reference Material.

DATA SECURITY AND OWNERSHIP

7. BIM AND DATA SECURITY

The models shall be set up and maintained in compliance with FAA's established Information Technology and Modeling security protocols. The Design Teams and Contractors shall further take necessary steps to prevent any possible data corruption, virus "infections," and data misuse or deliberate damage by their own employees or outside sources.

The Design and Construction teams will establish adequate user access rights to prevent data loss or damage during file exchange, maintenance, and archiving of the BIM and drawings.

The model data and all associated project information shall be cleared from all the contractors and their sub-contractors hosted systems and drives upon successfully delivering to the FAA the project deliverables and conclusion of the contractual obligations.

8. DATA OWNERSHIP

The FAA shall have ownership and rights to all CAD files, BIM, and associated facility data developed for the Project in accordance with AMS Clause 3.5-13.The FAA may make use of this data following any deliverable. Contract clauses and special contract requirements shall be specified by Engineering Services in the project requirements. When conflicts exist between the contents of a BIM Model and the Contract Set of Drawings, the information contained within the BIM will prevail and be considered as definitive.

BEST PRACTICES AND ADDITIONAL RESOURCES

9. BEST PRACTICES AND PROCEDURES

The following best practices and procedures should be incorporated into all FAA BIM projects.

9.1. General Guidelines

When creating the project BIM consider how the following characteristics will affect the BIM's performance:

- Complex Geometry
- Size and scale of the design with respect to model organization
- Multiple Parametric Relations
- Multiple Constraints
- Linked Files
- BIM platform category or layer centric

9.2. Software Performance

There are many software applications that can be used to create, validate, and deliver the BIM.

The software being used by all subcontractors should be approved by the design team, in order to:

- Ensure applicability & compatibility for the proposed software use.
- Keep a complete listing including versions of all software design tools used for the project
- Track which subcontractors and design disciplines are using each software tool
- Obtain concurrence from the FAA prior to using new tools

BIM USE	Value to Project	Responsible Party	Value to Responsible Parties	Competencies Required
Design Authoring	High	Arch, Strc, MEP, Fire	High	Create BIM
Design Review	Medium	Arch, Strc, MEP, Fire	High	Review BIM
3D Coordination	High	Arch, Strc, MEP, Fire	High	Clash Detection
Cost Estimation	High	Estimator, Constructor, Arch, Strc, MEP	High	Cost Estimation
As-Built Modeling	Medium	Constructor	Low	Update BIM
Phase Planning (4D)	Medium	Constructor	High	Coordinate Parties
Construction System Design	Medium	Constructor	High	Construction

Table 9-1, Software Performance

9.3. Compacting Files

Compact central and local files to reduce file sizes when saving. Remove obsolete parts to save space. And eliminate all unresolved clashes prior to submission to FAA.

9.4. Creating the BIM

Many facility types within the FAA are based on prototype designs. Determine if a prototype BIM exists for specific projects prior to beginning the project.

- Until component types are determined, use the generic version of elements such as walls, doors, HVAC, electric panels, pumps, lights, etc. which incorporate less geometry.
- Create coordinated discipline BIM with multiple smaller models to assure that files sizes do not get too large to perform simulation or transfer data within a reasonable time frame.
- Regularly review and fix warnings and errors.
- Minimize the number of linked or imported DGN or DWG files.
- Only link essential DGN or DWG files into necessary views.
- Unload links of all types if not used.
- Turn off shadows in views where they are unnecessary.
- Close unnecessary window.

9.5. Updating Model

Maintain naming conventions that are consistent with the AE Project Manual and FAA-STD-002.

- Preserve Design Options only as long as they are useful to the project.
- Consider whether options should be preserved long-term in separate BIM that can be linked as needed.
- Maintain correct categorization of all components
- Avoid manually drafting elements when there is a tool available for creating the element.
- Assign object/component/element characteristics, material definitions, and other basic qualities directly to the objects.
- Views (floor plans, elevations, sections, details, etc.) shall be generated from the model.
- Associated/host model content to appropriate geometric plane or model component (Wall, Ceiling, Floor, Level, etc.) in order to avoid excessive offsets.
- Contract (Construction) Drawings shall be derived from the model(s).
- Sections and Details and other enlarged and more detailed views shall utilize model content to the greatest extent possible.

9.6. BIM Implementation Plan (BIP)

The BIP should contain details on the following areas;

- Coordinate BIP among subcontractors prior to submission to FAA
- Tailor BIM to be specific to project
- Develop a quality control plan identifying responsible party and frequency of reviews
- Identify responsible party for primary activities
-

10. APPENDICES

10.1. Acronyms & Glossary of Terms

Define the acronyms and terms used in this document

Acronym	Full Name
AE	Architecture / Engineer, Architectural Engineering
ATO	Air Traffic Organization
BIM	Building Information Modeling
BIP	BIM Implementation Plan
CAD	Computer Aided Design
CAEG	Computer Aided Engineering Graphics
CM	Configuration Management
COBIE	Construction Operations Building Information Exchange
CPC	Critical Power Centers
CVIE	Coordination View Information Exchange
DTM	Digital Terrain Model
DP	Distribution Panels
EDMS	Electronic Drawing Management System
FAA	Federal Aviation Administration
FFE	Furniture, Fixtures, Equipment
FIM	Facility Information Model / Management
GC	General Contractor
GIS	Geographic Information System
IFC	Industry Foundation Class
LCN	Logistic Control Number
LOBs	FAA Lines of Business
LoD	Level of Development
LRU	Lowest Replaceable Unit
ODBC	Open Database Connectivity
NextGen	Next Generation ATO Air Transportation Systems
NFPA	National Fire Protection Association
PSG	Power Services Group

10.2. BIM Data Requirements by Discipline / Worksets / Components

- Facility Data for a current submittal shall include data required at previous submittals, revised as necessary to the current design.
- Component size & Product Data shall match Manufacturer cut sheets as submitted in Basis of Design Specifications and updated PPD

Architectural

Workset	Component	Data Required					
		PPD/10%	45%	70%	100%	Final	As-Built
A-Flooring	System above Structural	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
A-Wall	Wall System	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
A-Opening	Doors	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Windows	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Louvers	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Ceiling	Ceilings & Soffits	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Roof	Insulation Layer	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Membrane Layer	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Roof Specialties	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Circulation	Elevator	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
	Stairs	Workset, Assembly Code	Rm#	---	---	---	Revised as built
	Stair Treads / Risers	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Escalators / Moving Walks	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
	Ladders	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
	Guards & Rails	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Plbg-Fixtures	Plumbing Fixtures	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Toilet Partiions	Toilet Partitions	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-RR Accessories	RR Accessories	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
A-Casework	Cabinets & Counters	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Specialties	Arch Specialties	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-FE Specialties	FE Specialties	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
A-Signage	Signage	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built

Architectural Interiors

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
AI-System Furniture	Systems Furniture	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
AI-Furniture	Relocateable Furniture	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
AI-Equipment	Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
AI-Partitions	Demountable Partitoins	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
AI-Plant	Interior Plantings	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
AI-Artwork	Art Objects	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
AI-Signage	Signage	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built

Structural

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
S-Foundation	Footings & Pads	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Piles	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Pile Caps	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Grade Beams	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Retaining Walls	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Floor Framing	Beams	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Joists / Trusses	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Decking / Slabs	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Roof Framing	Beams	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Joists / Trusses	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Decking / Slabs	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Columns	Columns	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Circulation	Elevators	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Stairs	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Escalators /Moving Walks	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
	Ladders	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Wall	Structural Wall	Workset, Assembly Code	Mark, Type, Rm#	---	---	---	Revised as built
S-Glazing	Structural Glazing	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built

Mechanical

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
M-Duct-Supply Air	Ductwork & Fittings	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Duct-Return Air	Ductwork & Fittings	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Duct-Exhaust Air	Ductwork & Fittings	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Duct-MUOA	Ductwork & Fittings	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Diff/Grilles	Diffusers & Grilles	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Equipment	Mechanical Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
M-Piping	Mechanical Piping	Workset, Assembly Code	---	---	---	---	Revised as built
M-System-FUEL	FUEL Piping	Workset, Assembly Code	---	---	---	---	Revised as built
	FUEL Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
	FUEL Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-System-NGAS	NGAS Piping	Workset, Assembly Code	---	---	---	---	Revised as built
	NGAS Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
	NGAS Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-System-LPGS	LPGS Piping	Workset, Assembly Code	---	---	---	---	Revised as built
	LPGS Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
	LPGS Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
M-Supports	Supports / Hangers	Workset, Assembly Code	---	---	---	---	Revised as built

Plumbing

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
P-DOMW-Cold Water	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DOMW-Hot Water	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DOMW-Equipment	DOMW Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
P-DWVS-Drainage	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DWVS-Sanitary	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DWVS-Vent	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DWVS-Storm	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
P-DWVS-Equipment	DWVS Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
P-Supports	Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built

Fire Suppression

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
FS-Distribution	FS Piping & Fittings	Worksets, Assembly Code	---	---	---	---	Revised as built
FS-Equipment	FS Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
FS-Devices	FS Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
FS-Supports	Supports / Hangers	Worksets, Assembly Code	---	---	---	---	Revised as built

Fire Alarm

Workset	Component	Data Required					
		PPD / 10%	**45%**	**70%**	**100%**	**Final**	**As-Built**
FA-Distribution	FA Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
FA-Equipment	FA Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
FA-Devices	FA Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
FA-Supports	Supports / Hangers	Worksets, Assembly Code	---	---	---	---	Revised as built

Electrical Lighting & Power

Workset	Component	Data Required					
		PPD / 10%	**45%**	**70%**	**100%**	**Final**	**As-Built**
E-Lighting-Distribution	Lighting Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
E-Lighting-Equipment	Lighting Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
E-Lighting-Devices	Lighting Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
E-Power-Distribution	Power Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
E-Power-Equipment	Power Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
E-Power-Devices	Power Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
E-Supports	Supports / Hangers	Worksets, Assembly Code	---	---	---	---	Revised as built

Lightning Protection, Grounding & Cathodic Protection

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
E-Ltng-Protection-Distribution	Ltng Prot Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
E-Ltng-Protection-Equipment	Ltng Prot Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
E-Ltng-Protection-Devices	Ltng Prot Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built

Telecom

Workset	Component	Data Required					
		PPD / 10%	45%	70%	100%	Final	As-Built
T-Data/Network-Distribution	Data /Network Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
T-Data/Network-Equipment	Data / Network Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
T-Data/Network-Devices	Data / Network Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
T-MN-Distribution	Mass Notification Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
T-MN-Equipment	Mass Notification Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
T-MN-Devices	Mass Notification Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
T-Security-Distribution	Security Distribution	Worksets, Assembly Code	---	---	---	---	Revised as built
T-Security-Equipment	Security Equipment	Workset, Assembly Code	Mark, Type, Rm#, MEP Connection Requirements	---	MFR, Model	---	Revised as built
T-Security-Devices	Security Devices	Workset, Assembly Code	Mark, Type, Rm#	---	MFR, Model	---	Revised as built
T-Supports	Supports / Hangers	Worksets, Assembly Code	---	---	---	---	Revised as built

10.3. Additional Resources

FAA BIM Implementation Plan – This reference document was adapted from the USACE BEP for use on FAA BIM projects with the consent of the USACE

BIP4F.doc

FAA Model Validation Checklist– This reference document was created by the FAA for use on FAA BIM projects

BIM Guide Model Validation CheckList.x

FAA Object Element Matrix – This reference document was adapted from the VA Object Element Matrix for use on FAA BIM projects with the consent of the VA

FAAObjEleMntMtrx.xlsm