

Ball Aerospace

Facilities Guidelines & Standards



B.01

BIM Standard

Revision 2023.1

****Please read this document in its entirety.****

If there are any questions about the Ball Aerospace BIM Standard, please contact Jake Spasaro at jake.spasaro@ballaerospace.com.

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BIM Standard Revision History		
Version	Date	Notes
BIM Guidelines 1.0	3/26/2020	· Initial release
BIM Guidelines 1.1	5/7/2020	· See 2022.1 Revision Table
BIM Guidelines 2021.1	2/1/2021	· See 2022.1 Revision Table
BIM Standard 2022.1	1/26/2022	· See 2022.1 Revision Table
BIM Standard 2023.1	TBD	· Modification of Section 3.4 - PSA Deliverables · Addition of 4.9.1.2 System Type Naming · Modifications and additions to the table in Section 6.0 - Model Detail Matrix

1. Section 1.0 - Definitions

1.1. BIM: Building Information Model

1.1.1. Building Information Modeling (BIM) is a digital representation of the physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its lifecycle; defined as existing from earliest conception to demolition.

1.2. Autodesk Revit

1.2.1. Autodesk Revit is a Building Information Modeling (BIM) software that allows the user to design with parametric modeling and drafting elements.

1.3. Design Model

1.3.1. The Design Model shall comply with the Design Model Standard laid out in this document and shall include all information that a design team would specify for a complete, biddable design package.

1.4. As-Built Model

1.4.1. The submitted As-Built Model defines the actual conditions of the facility per the requirements in this standard.

2. Section 2.0 - Purpose and Expectations

2.1. The purpose of the Ball Aerospace BIM Standard is to ensure that Ball will have the BIM data needed to design and construct our built assets, as well as the BIM data needed to maintain our built assets throughout their life cycle.

2.2. This document is not project-specific, rather it is the minimum BIM expectations for all Ball Aerospace facility modifications.

2.2.1. In some situations, it will make sense to go above and beyond what is laid out in this standard. It will be the responsibility of the project team to coordinate with one another and plan to execute the requirements laid out in this standard.

2.3. Upon design completion and before construction, Ball will require the project's design team to create a Revit model that complies with the entirety of the Design Model standards laid out in this document. The design team is also expected to hand over ALL available Revit models directly to Ball.

2.4. At project completion, Ball will require the As-Built Revit model fully complying with the entirety of the As-Built standards laid out in this document, to be turned over by the construction contractor(s) to Ball.

3. Section 3.0 - Deliverables

3.1. Summary

3.1.1. The following are the deliverables required for ALL facility modifications to be derived from this standard. Any Additional BIM deliverables will be separately identified in the RFP.

3.2. Design Team Deliverables

3.2.1. Design Model(s) in full compliance with this BIM Standard shall be turned over to Ball by the design contractor(s).

3.3. Construction Team Deliverables

3.3.1. As-built Model(s) in full compliance with this BIM Standard shall be turned over to Ball by the construction contractor(s).

3.4. Purchased Services Agreement Deliverables

3.4.1. As-built Model(s) in full compliance with this BIM Standard shall be turned over to Ball by the installing PSA contractors per individual project. These models shall comply with the As-built model deliverable standard laid out in this document.

3.5. Secured Spaces Additional Deliverables

3.5.1. Construction contractor(s) shall provide as-built Architectural drawings in AutoCAD format for use by the security team in their accreditation submission.

3.5.2. Additional BIM requirements for secured spaces found in “Standard C.54: Secured Spaces BOD” shall be followed.

3.5.2.1.

3.6. Extranet File Transfers

3.6.1. Models or files being sent to Ball that are too large to be shared as an email attachment, shall be transferred using the Facilities Departments Extranet site.

3.6.1.1. If you do not have access to the Facilities Departments Extranet site, let your project manager know so you can be granted access.

3.7. Micro-Projects

3.7.1. Approval is needed from Facilities Engineering to designate a project as a micro-project.

3.7.2. Examples of a micro-project:

3.7.2.1. Moving a door to a different location along a wall.

3.7.2.2. Adding a receptacle to a wall.

3.7.2.3. Swapping out a piece of equipment without changing connections.

3.7.3. In micro-project scenarios, a marked-up PDF file showing the graphical movement/addition of the building element/s, as well as a written report on changed/added required non-graphical information will be acceptable.

3.8. Do I Need to Model This?

3.8.1. If your project is adding any of the elements listed in Section 6.0, they need to be modeled according to this document regardless of dollar amount or scope.

3.8.1.1. Any elements not listed in Section 6.0 do not require modeling.

3.8.2. If you are replacing or upgrading any equipment listed in Section 6.0, they need to be modeled according to this document regardless of dollar amount or scope.

3.8.2.1. Non-graphical information will most likely be the largest part of this deliverable.

3.8.3. If your project consists of repairing a piece of equipment and you are not changing any of its non-graphical information, no modeling is required.

4. Section 4.0 - Model Requirements

4.1. Accepted File Type

4.1.1. Revit files (.RVT) will be the only accepted file type for all models.

4.2. Revit Version

4.2.1. All Revit models contracted to this version of the BIM Standard shall be delivered in Revit version 2022.

4.3. Model Naming Convention

4.3.1. Model Naming: (Project Name_Building Name_Discipline Code_ Revit Version)

4.3.1.1. Example: XYZ_FT_A_R21.rvt

4.3.1.2. Ask your Ball project manager for the project name.

4.4. Model Separation

4.4.1. Modeling teams may choose how to separate models in a way that best fits their workflow.

4.5. Worksets

4.5.1. No requirements.

4.6. Project Modeling Boundaries

4.6.1. The project team is only responsible for modeling new facility additions or modifications to the existing facility. There is no expectation that unmodified existing facility elements be modeled unless requested in the RFP.

4.6.2. It is expected that the project boundaries will be agreed upon and communicated before the design begins.

4.6.3. It is required that the entirety of the new project will be modeled.

4.6.3.1. Example: Conduit run to a panel on the floor below will be included in the model even though the floor below is not included in the project boundary).

4.7. Ball Provided As-built Documentation Expectations

4.7.1. If existing, the as-built Revit model of the agreed-upon project area will be provided by Ball.

4.7.2. If no Revit model exists, any available laser scans, DWG, and PDF files of the agreed-upon area will be provided by Ball.

4.7.2.1. In this scenario, the expectation will be that the design team will use this information to construct a generic architectural shell of the project boundaries within Revit. There is no expectation to model the entirety of the existing facility unless asked to do so in the RFP.

4.7.3. New facility elements within the project boundary will be created within Revit in full compliance with these BIM Standard.

4.8. Model Alignment and Coordinates

4.8.1. All submitted models shall align origin to origin.

4.8.2. If provided, align all models to the existing Ball facility model.

4.8.2.1. If the model(s) do not align to the existing Ball facility model origin to origin it will be rejected.

4.8.3. If no existing condition model is provided, the project team shall agree upon which model to align to and then do so origin to origin.

4.9. Model Structure and System Expectations

4.9.1. All MEP objects shall be placed and maintained on the correct system.

4.9.1.1. There shall not be any MEP elements not placed on their correct system. The only exception is for existing conditions modeling where it is not possible to identify the system in the field.

4.9.1.2. System Types shall match the exact spelling and spacing listed below. If incorporating a system type not listed, the project team is free to use an agreed-upon name that is identical across all models.

Abandoned	Fire Protection	Power Distribution
BAS (Low Voltage)	Fire Protection - CO2	Propane
Boil-off Nitrogen Gas	Fire Protection - Halon	Refrigerant Liquid
Chilled Water Return	Fire Protection - Inert Gas	Refrigerant Suction
Chilled Water Supply	Fuel Gas	Return Air
Compressed Air	Fuel Oil	Reverse Osmosis Water
Compressed Air	Fuel Vent	Sanitary
Condensate	Heating Hot Water Return	Sanitary Vent
Cooling Tower Water Return	Heating Hot Water Supply	Security
Cooling Tower Water Supply	Laboratory Gas	Steam - High Pressure
Deionized Water	Lighting	Steam - Low Pressure
Domestic Cold Water	LN2	Steam - Medium Pressure
Domestic Hot Water	LN2 Vent	Storm Drain
Dual Temperature Return	Medical Gas	Storm Drain Overflow
Dual Temperature Supply	Natural Gas	Supply Air
Emergency	Nitrogen	Telecommunication
Energy Recovery	Non-Potable Water	Unknown Pipe
Exhaust Air	Outside Air	Vacuum
Fire Alarm	Potable Water	

4.9.2. All objects shall be properly related (hosted) to the correct model elements.

4.9.2.1. Example: Outlets hosted to walls.

4.9.3. Where applicable, every object is to be related to its correct floor.

4.9.3.1. In no case shall unnecessary offsets be used to position an object within the model.

4.9.3.1.1. Example: A plumbing fixture located on the second floor is hosted to the first floor but with an offset of 10' off the first floor to show it visually on the second floor.

4.9.4. The network of connections is to be maintained to the furthest extent of the project's scope.

4.9.4.1. Example: Modeling ends at the project connection point to the existing system of pipe or duct.

4.9.5. BIM models that feature objects broken into individual elements when logical systems are available will NOT be accepted.

4.9.5.1. Example: A series of 10 pipe segments apart of a continuous pipe run not connected within the model will not be accepted

4.10. *Owner-Provided Equipment and Manufacturing Equipment*

4.10.1. The project teams shall model all new facility equipment regardless of provider.

4.10.2. If models are available from the manufacturer use those models.

4.10.3. The project teams only need to model manufacturing/engineering equipment at a basic shape still allowing for modeling within the specified tolerances.

4.11. *Design Model Graphical Requirements*

4.11.1. The design model will graphically model all elements included in the project per the notes and exclusions in the Model Detail Matrix.

4.11.2. The model elements shall be graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, location, and orientation.

4.12. *As-Built Model Graphical Requirements*

4.12.1. The as-built model will graphically model all elements included in the project per the notes and exclusions in the Model Detail Matrix.

4.12.2. The model elements shall be graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, location, and orientation.

4.13. *As-Built Model Dimensional Tolerance*

4.13.1. See Section 6.0 - Model Detail Matrix for a breakdown of expected dimensional tolerances.

4.14. *Ball Shared Parameters*

4.14.1. Ball Aerospace has created our own Revit Shared Parameters file which directly correlates with the Model Detail Matrix found in Section 6.0 of this document.

4.14.2. Ball shared parameters will be added to all Revit projects and relevant model elements. The shared parameters shall be filled out for every project to ensure consistency between all of Ball's BIMs. All Ball Shared Parameters are designated with a "B_" prefix. An example of a Ball shared parameter would be B_Equipment Name.

4.14.2.1. Contact Jake Spasaro at jake.spasaro@ballaerospace.com to obtain the latest Ball Shared Parameter file which can be loaded directly into Revit.

4.14.3. Regarding the Design Model non-graphical information, note that these are only required if specified without exception.

4.14.3.1. Example: If a specific make/model of AHU is specified by the design team, the expectation is that the design team graphically models the specified AHU and includes the required non-graphical information laid out in the matrix.

4.14.4. All model elements are required to have the shared parameters B_Project Identifier and B_Substantial Completion date filled out.

4.14.5. Educational link: [Click Here](#).

4.15. *Model Element Equipment Naming*

4.15.1. The shared parameter “B_Equipment Name” shall be filled out for all relevant model elements correlating to equipment in the Ball Equipment Naming standard.

4.16. *Clearances*

4.16.1. Graphically model all code required and maintenance clearances in both the design and as-built model as semitransparent red boxes.

5. Section 5.0 - Laser Scanning

5.1. Laser scanning is NOT a required deliverable. However, if requested in the RFP or deemed necessary, complete the laser scan to the following specifications.

5.1.1. Firms may decide the most efficient path to a compliant As-Built model is through the completion of a laser scan. This will be left up to the discretion of the project team.

5.1.2. Completed scans shall be checked for accuracy with the expectation that any given measurement over a distance of 230’ will be within 1/4” of a field measurement.

5.1.3. Ball will be able to provide recommendations on how to complete the laser scanning process if needed. Contact Jake Spasaro at jake.spasaro@ballaerospace.com for additional information.

6. Section 6.0 - Model Detail Matrix

6.1. *Model Detail Matrix Introduction*

6.1.1. The following pages contain the Ball Revit Model Detail Matrix. This matrix is not project-specific but instead a comprehensive list of possible building elements. Specific matrix requirements only apply to elements that will be a part of the project.

6.2. *Model Detail Matrix Column Definitions*

6.2.1. Model Element/s

6.2.1.1. This column represents the possible elements that could be a part of a project and need to be included in all model deliverables if applicable.

6.2.1.2. Some model elements are listed as categories, such as Mechanical Equipment with examples of mechanical equipment included below the category name. The expectation in these categorical situations is that all mechanical equipment will be modeled not just the items listed.

6.2.2. Graphical Notes and Exclusions

- 6.2.2.1. Sections 4.10 and 4.11 are expected to be followed for all graphical model elements. The only exceptions to those requirements are listed in this column as Notes and Exclusions.
- 6.2.2.2. Notes are clarifications and modifications to graphical requirements.
- 6.2.2.3. Exclusions are items that do not need to be graphically modeled.
- 6.2.3. As-Built Model Tolerance
 - 6.2.3.1. These columns define the expected location of model elements to their actual location determined by a field measurement.
 - 6.2.3.2. Approx. means that the model element is shown in approximately the correct location. For example, a receptacle is shown in its approximate location on the correct wall in a building.
- 6.2.4. Non-Graphical Shared Parameter Requirements
 - 6.2.4.1. This column lays out the required shared parameters to be associated with and filled out for the specified model element. The non-graphical shared parameter requirements shall be followed. These are critical data points that will allow Ball to efficiently operate, maintain, and renovate our facilities throughout their lifecycle.
 - 6.2.4.2. Note that these are required if applicable. For example, a solar-powered exterior light would not need to include B_Feeder Panel and B_Circuit because they do not apply to that model element. However, an exterior light that does connect to a panel and circuit would need to include those shared parameters.
 - 6.2.4.3. Regarding the Design Model non-graphical information, note that these are only required if specified without exception.
 - 6.2.4.3.1. Example: If a specific make/model of AHU is specified by the design team, the expectation is that the design team graphically models the specified AHU and includes the required non-graphical information laid out in the matrix.

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Architectural					
Walls	Notes: Check structural wall sections Exclude: Molding and base	X			B_Project Identifier, B_Material, B_Sound Rating, B_RF Foil, B_Fire Rating, B_Finish, B_Substantial Completion Date
Windows		X			B_Project Identifier, B_Film Type, B_Glazing Type, B_Substantial Completion Date
Doors		X			B_Project Identifier, B_Equipment Name, B_Make, B_Fire Rating, B_Sound Rating, B_Substantial Completion Date
Floors	Notes: Model different floor types separately	X			B_Project Identifier, B_Finish, B_Substantial Completion Date
Stairs		X			B_Project Identifier, B_Fabricator/Erector, B_Substantial Completion Date
Suspended Ceiling Construction		X			B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date
Hard Ceiling		X			B_Project Identifier, B_Material, B_Sound Rating, B_RF Foil, B_Fire Rating, B_Finish, B_Substantial Completion Date
Fire Escapes, Metal Walkways, And Ladders		X			B_Project Identifier, B_Substantial Completion Date
Furnishings: Furniture, Movable Multiple Seating, Other Movable Furnishings		X			B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date
Partitions		X			B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date
Railings		X			B_Project Identifier, B_Substantial Completion Date
Raised Floor Construction		X			B_Project Identifier, B_Live Load Capacity, B_ESD, B_Plenum Rating, B_Material, B_Substantial Completion Date, B_Superimposed Dead Load Capacity
Ramps		X			B_Project Identifier, B_Substantial Completion Date
Roof Accessories				X	B_Project Identifier, B_Substantial Completion Date

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Building Modules: Manufactured/Fabricated Rooms, Modular Mezzanines		X			B_Project Identifier, B_Substantial Completion Date
Structural					
Foundation Elements		X			B_Project Identifier, B_Substantial Completion Date, B_Concrete Compressive Strength
Steel Structural Framing	Notes: Dimensions of actual member elements must be modeled to the accurate dimensions of the member. Width and depth of overall element must be accurate. Include thickness of the web and flange. In lieu of B_Member Identifier, steel shape may be designated in the naming of Revit family (i.e. W12x19	X			B_Project Identifier, B_Substantial Completion Date, B_Material Grade, B_Member Identifier
Concrete Structural Framing	Notes: Dimensions of actual member elements must be modeled to the accurate dimensions of the member. Width and depth of overall element must be accurate. In lieu of B_Member Identifier, concrete shape may be designated in the naming of Revit family (i.e. 10DT24).	X			B_Project Identifier, B_Substantial Completion Date, B_Material Grade, B_Concrete Compressive Strength, B_Member Identifier, B_Strand Pattern

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Floors	Notes: Model different floor types separately	X			B_Project Identifier, B_Live Load Capacity, B_Substantial Completion Date, B_Material, B_Superimposed Dead Load Capacity
Shear Walls	Notes: Model shear walls as separate and designated elements	X			B_Project Identifier, B_Substantial Completion Date
Exterior and Load Bearing Walls	Notes: Model CMU structures as separate and designated elements with correct block size and bond pattern	X			B_Project Identifier, B_Substantial Completion Date, B_Material, B_Is Load Bearing Wall
Roofs		X			B_Project Identifier, B_Live Load Capacity, B_Substantial Completion Date, B_Superimposed Dead Load Capacity, B_Material
Electrical					
Electrical Control Devices	Notes: Graphically model all sensors and devices not integrated/mounted directly into equipment		X		B_Project Identifier, B_Make, B_Model Number, B_Signal Output, B_Calibrated range, B_Feeder Panel, B_Circuit, B_Substantial Completion Date
Point Of Use Distribution: Cable Bus, Power Bus Way			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_SCCR, B_Amperage, B_Copper/Aluminum- or Both , B_Feeder Panel, B_Circuit, B_Equipment Name, B_Substantial Completion Date
Grounding	Notes: Model actual dimensions of ground bars and rods, model schematic location of salt pits and electrodes		X		B_Project Identifier, B_Hole Sizes, B_Material, B_Substantial Completion Date, B_Copper or Aluminum
Panels	Notes: Make certain clearances are graphically modeled	X			B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_SCCR, B_Amperage, B_Copper/Aluminum, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Substantial Completion Date

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Conduit	<p>Exclude: Conduit less than 1.5" in size</p> <p>Notes: Block model hidden bunches (5+) of less than 1.5" conduit</p>		X		<p>Visible Conduit Non-Graphical Requirements: B_Project Identifier, B_Substantial Completion Date</p> <p>Hidden Conduit Non-Graphical Requirements: B_Project Identifier, B_Material, B_Insulation Type, B_Substantial Completion Date, B_Wire Size</p>
Electrical Equipment: Generators, Battery Equipment, Transfer Switches, Photovoltaic Collectors, Power Filtering, Switchgear, Transformers, Electric Vehicle Chargers, Motor Starters, Disconnects, Lighting Control Panels, Contactors			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Voltage, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Power Rating (KW), B_SCCR, B_Amperage
Lighting Fixtures: Interior Luminaries, Exterior Luminaries, Site Luminaries, Exit Signs			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Lumens at Central Plane, B_Voltage, B_Color Temp, B_Amperage, B_Feeder Panel, B_Circuit
Lightning Protection			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date
Receptacles And Switches	Notes: Model as correct type (Example: duplex vs quadplex)			X	B_Project Identifier, B_Feeder Panel, B_Circuit, B_Substantial Completion Date
Specialty Receptacles and Switches	Notes: Model as correct type			X	B_Project Identifier, B_Feeder Panel, B_Circuit, B_Substantial Completion Date, B_Make, B_Model
Site Communications Structures: Site Communications Distribution, Wireless Communications Distribution				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name
Telecom Pathways	<p>Exclude: Pathways less than 1.5" in size</p> <p>Notes: Block model hidden bunches (5+) of less than 1.5" pathways</p>		X		B_Project Identifier, B_Substantial Completion Date

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Elevators		X			B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Live Load Capacity, B_Feeder Panel, B_Circuit, B_Equipment Name
Valves					
Manual Valves	Notes: Model actual valve type		X		B_Project Identifier, B_Substantial Completion Date, B_Make, B_Model
Automated Valves	Notes: Model actual valve type		X		B_Project Identifier, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Make, B_Model
Fire and Life Safety					
Detection: Pull Stations, Detection Devices (Smoke, Heat, Fire Wire), Duct Detectors, Flow Switches, VESDA Systems				X	B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date, B_Explosion Rating
Suppression: Fire Protection Pipe, Fire Protection Pipe Accessories (Back Flow Preventor, Shut-Off Valve), Fire Protection Heads, Pumps, Tanks, Compressors (Pre-Action), Valves (Pre-Action)			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Design Pressure, B_Service, B_MAWP, B_Material, B_Max Temp, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Tank Capacity, B_Substantial Completion Date, B_Head Type
Notification: Horns and Strobes, Door Hold Opens				X	B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date, B_Explosion Rating
Fire Alarm Panels				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Explosion Rating
Fire Extinguishers: Cabinet Or Mount, Fire Extinguishers				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date
Hose Cabinets				X	B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date
Life Safety Alarms: Oxygen Detection Systems				X	B_Project Identifier, B_Substantial Completion Date

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Breathing Air Replenishment Systems				X	B_Project Identifier, B_Substantial Completion Date
Mechanical					
Ductwork	Notes: Model duct to actual size and model insulation and linings separate		X		B_Project Identifier, B_Substantial Completion Date
Grilles, Registers, And Diffusers			X		B_Project Identifier, B_Substantial Completion Date, B_CFM
Louvers And Vents			X		B_Project Identifier, B_Substantial Completion Date
Valves: Manual, Actuated, Balance	Notes: Model as actual valve type (Example: Butterfly, Gate, Ball)		X		B_Project Identifier, B_Feeder Panel, B_Circuit, B_Substantial Completion Date, B_Make, B_Model
Mechanical Fire Devices: Fire Dampers, Smoke Dampers	Notes: Model as actuated or manual		X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Equipment Name, B_Feeder Panel, B_Circuit
Mechanical Control Devices: VFD	Notes: Sensors and devices not directly mounted/integrated to equipment (localized)		X		B_Project Identifier, B_Make, B_Model Number , B_Service, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Substantial Completion Date, B_Associated Equipment Name
Mechanical Hydronic Equipment: Chillers, Cooling Towers, Condensers, Boilers			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Design Pressure, B_Gas Consumption, B_Cooling Capacity, B_Heating Capacity, B_Flow Rate, B_Pressure Drop, B_MAWP, B_Steam Boiler Load (LBS/HR)
Mechanical Dry Equipment: AHU, MAU, RAH, VAV (Fan Powered or Not), FCU, Exhaust Fans, General Supply Fans			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Design Pressure, B_Supply CFM, B_Exhaust CFM, B_Static Pressure, B_Gas Consumption, B_Percentage of Outside Air, B_Area Servicing, B_Cooling Load (BTU/HR), B_Cooling Load (Tons), B_Heating Load (BTU/HR)

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Humidifiers: Electric Humidifiers, Steam Humidifiers	Notes: Model separate from mechanical dry equipment (Family can be provided)		X		B_Project Identifier, B_Substantial Completion Date, B_Output Capacity, B_Steam Load (LBS/HR)
Coils: Chilled Water Coil, Hot Water Coil	Notes: Model separate from mechanical dry equipment (Family can be provided)		X		B_Project Identifier, B_Substantial Completion Date, B_Flow Rate, B_Delta Temp, B_MBH or BTU/HR, B_Associated Equipment Name
Mechanical Piping	Notes: Model pipe to actual diameter and model insulation separate		X		B_Project Identifier, B_Substantial Completion Date, B_System Type, B_Material, B_Material Grade or Schedule
Pumps: Floor Mounted, Inline Pumps, Condensate Pumps, Coil Pumps	Notes: Model and name as correct type of pump (Example: Sump)		X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name, B_GPM, B_Design Pressure, B_Feet of Head, B_Substantial Completion Date
Site Steam Distribution And Site Condensate Return Distribution: Steam Traps, Clean Steam Generators, Steam Condensate Return Units			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Design Pressure, B_Inlet Steam Load (LBS/HR), B_Outlet Steam Load (LBS/HR), B_Flow Rate, B_Feeder Panel, B_Circuit
Plumbing					
Waste Handling Equipment				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name
Domestic Water Equipment: Tanks, Pumps, Valves, Fixtures, Low Voltage Pipe Accessories, Water Heaters			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Design Pressure, B_Service, B_Material, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Tank Capacity

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
<p>Drainage System Equipment: Sump Pumps, Sewage Ejectors, Tanks, Separators, Process Systems Equipment, Lift Station</p> <p>Site Sanitary And Storm Equipment: Septic Tanks, Lift Stations/Pumps, Sanitary Sewage Lagoons, Culverts, Storm Ponds And Reservoirs, Storm Drains And Ditches</p>			X		B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Design Pressure, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Volume
Plumbing Fixtures		X			B_Project Identifier, B_Make, B_Model, B_Substantial Completion Date, B_Design Pressure, B_Material, B_Feeder Panel, B_Circuit, B_Equipment Name
Plumbing Pipe	Notes: Model all pipe regardless of size, model to actual pipe diameter not outside diameter of insulation Exclude: Traps, nipples, couplings, etc.		X		B_Project Identifier, B_Substantial Completion Date, B_Material Grade or Schedule
Compressed Air	Notes: Model all pipe regardless of size		X		B_Project Identifier, B_Substantial Completion Date
Natural Gas And Metering Devices	Notes: Model all pipe regardless of size		X		B_Project Identifier, B_Substantial Completion Date
Gaseous Nitrogen (GN2)	Notes: Model all pipe regardless of size		X		B_Project Identifier, B_Substantial Completion Date
Liquid Nitrogen (LN2)	Notes: Model all pipe regardless of size		X		B_Project Identifier, B_Substantial Completion Date

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Site					
Pedestrian Pavement, Curbs, Gutters, Appurtenances, Exterior Steps And Ramps, Plaza And Walkway Lighting, Exterior Pedestrian Control Equipment			X		B_Project Identifier, B_Substantial Completion Date
Planting Irrigation				X	B_Project Identifier, B_Substantial Completion Date
Retaining Walls, Site Bridges, Site Screening Devices, Site Specialties		X			B_Project Identifier, B_Live Load Capacity, B_Substantial Completion Date
Roadway Pavement, Roadway Curbs And Gutters, Roadway Appurtenances, Roadway Lighting, Vehicle Fare Collection, Parking Lot Pavement, Parking Lot Curbs And Gutters, Exterior Parking Control Equipment, Gates, Arms			X		B_Project Identifier, B_Substantial Completion Date
Vehicular Tunnels, Pedestrian Tunnels, Service Tunnels, Tunnel Construction Related Activities			X		B_Project Identifier, B_Substantial Completion Date
Misc.					
AV Equipment				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit
Commercial Laundry And Dry Cleaning Equipment				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit
Misc. Equipment				X	B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit

Model Element/s (Elements to be Graphically Modeled, See 6.2.1)	Graphical Notes and Exclusions (See 6.2.2)	As-Built Model Tolerance (See 6.2.3)			Non-Graphical Shared Parameter Requirements (If Applicable, See 6.2.4)
		1.5"	4"	Approx.	
Cranes, Hoists	<p>Entirety of crane clearance must be modeled as a semi-transparent red clearance box.</p> <p>Entirety of crane travel path must be modeled as a semi-transparent green clearance box.</p> <p>Crane busrails must be modeled in their entirety to their exact dimensions.</p>	X			<p>B_Project Identifier, B_Make, B_Model, B_Serial Number, B_Substantial Completion Date, B_Feeder Panel, B_Circuit, B_Equipment Name, B_Crane Hook Height, B_Crane Capacity</p>