University of Tennessee Building Information Model Project Execution Plan and Standards Guide

Version 1
June 2019

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1. INTRODUCTION

1.1. MISSION OF THE UNIVERSITY BIM STANDARDS

The mission of the University of Tennessee Knoxville (University) Building Information Modeling (BIM) standards is to utilize BIM technology for the purposes of Capital Project Planning, Facilities Management and Campus Administration and Services-related throughout the University of Tennessee.

1.2. PURPOSE AND APPLICATION OF UNIVERSITY BIM STANARDS

The University of Tennessee's Building Information Modeling (BIM) Project Execution Plan and Standards Guides is a reference manual for Design and Construction project team members to understand what relevant 3D geometry and attribute information should be delivered on BIM-enabled University projects. This document defines uses for BIM on the project (for example, design authoring, cost estimating, and design and construction coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle.

The University has adopted BIM as a tool for project documentation and development, as-built record documentation, and facility management. These guidelines are intended to act as standards for BIM development from schematic design to project closeout. These guidelines will assist with the establishment of protocols for the development, use, transmission, and exchange of digital data, defining expectations of Level of Development for Model Elements at various milestones of the project. These standards encompass the development of the following key BIM Project Deliverables:

BIM DELIVERABLE	PROJECT PHASE
BIM Execution Plans	Updated at the end of each phase
Design BIMs	End of Construction Documents Phase
Record BIMs (Design BIMs and Construction BIMs)	Project Closeout
Construction Drawings	Per Designer Manual's Requirements

The University has made every attempt to provide these standards as complete as possible. However, if there are items not covered in this guide, please contact the University's Facilities Services Project Manager for guidance.

BIM models will be required on all new construction projects and major additions contracted by the University that exceed $3 million dollars. These models will include all geometry, physical characteristics, and product data needed to describe the design and construction work of a project as outlined in this document. After project-closeout, the University intends to make final BIM deliverables available for integration into a facility lifecycle management solution linking the models to ARCHIBUS, our current Computerized

Maintenance Management System. In order to meet that objective, it is important that the guidelines presented in this document are followed.

These standards are an amendment to the requirements outlined by the State of Tennessee Office of the Architect (OSA) BIM Standards (https://www.tn.gov/osa.html) and identify specific BIM needs to fit the University's goals. Project Teams should follow OSA's latest standards for complete information on requirements, or clarification of definitions and responsibilities.

1.3. PROJECT BIM GOALS AND OBJECTIVES

The University's major BIM goals and objectives for each project are listed below.

GOAL DESCRIPTION	PROJECT PHASE	RESPOSIBLE PARTY
Provide the University a LOD 500 model including ARCH, MEP and Structure for Construction	Construction	CM/GC
Provide the University a LOD 300 Conformed Design Model including for future planning purposes	Design	AE
Coordinate all disciplines through the design/construction process to reduce RFIs	Construction	CM/GC
Improve commissioning process by adding equipment information into BIM process	Lifecycle	University
Automated access to building asset information by linking the record information model to the University's computerized maintenance management system (CMMS).	Lifecycle	University

2. OBLIGATIONS TO USE BIM AND GENERAL PRINCIPALS

The following definitions of ownership and Level of Developments are specific to University projects.

2.1.OWNERSHIP AND RIGHTS OF DATA

It is important to the University to own, reuse, and properly manage building data throughout the facility lifecycle. The goal of the BIM process is to develop deliverables in support of the owner, and for utilization in facility management. University will retain ownership of all documentation created throughout the BIM process including Revit, DWG files, BIM Models and facility data developed for the project. The University may make use of this data following any deliverable. The University will release the Design and Construction Teams of any liabilities related to the model.

2.2. LEVEL OF DEVELOPMENT

The BIMForum's Level of Development (LOD) Specifications will serve as the framework for defining the progression of the model components. The LOD defines the relevant model element geometry to be included along with minimum parameters to facilitate the ongoing use of the BIM. The information below is referenced from the BIMForum's LOD Specification Version 2019. Please reference the BIMForum's documentation for additional information. The Design and Construct Teams are expected to progress their models to the appropriate LOD as defined below. This defines both the geometry and non-graphic information to be included in the Record Construction BIM and Conformed Design Intent BIM.

- **LOD 100 – Conceptual Model:**

The Model Element may be graphically represented in the Model with a symbol or other generic representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.

The Model would consist of overall building massing representative of area, height, volume, location and orientation that may be modeled in three dimensions.

- **LOD 200 – Approximate Model:**

Model Elements are modeled as generalized systems or assemblies with approximate quantities, size, shape, location, and orientation. Additional information may also be attached to Model Elements.

Model includes basic elements such as windows and doors. This level of modeling is for visualization and basic energy analysis and is similar to the schematic design or design development.

- **LOD 300 – Precise:**

Model Elements are graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.

Model Elements are suitable for construction and are the equivalent of traditional construction documents and shop drawings. This model level would be suitable for analysis and simulation of detailed elements and systems.

- **LOD 350 – Assemblies for Coordination:**

Model Elements are modeled as detailed assemblies that accurately represent specific systems, objects, or assemblies in terms of quantity, size, shape, orientation, and interfaces with other building systems with the detail necessary for cross-trade coordination and construction layout. Non-graphic information may also be attached to the Model Element. Parts necessary for coordination of the element with nearby or attached elements are modeled. These parts will include such items as supports and connections.

- **LOD 400 – Fabrication:**

The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element. This Model level of development is considered suitable for fabrication and assembly.

- **LOD 500 – As-Built; University's Model Delivery:**

Model Elements are modeled as constructed assemblies actual and precisely representing size, shape, location, quantity, and orientation, including As-Built conditions. The Model represent the project as it has been constructed and focus on facility management by identifying key building equipment and space information and including it in the Model. This includes ARCHIBUS equipment ID numbers and key equipment information outlined in Section 6.5.

- All models must contain the required space and equipment information outlines in Sections 6.4 and 6.5
- Data entry should be completed as soon as the equipment is installed and should not be held until the end of the project.
- All record drawings and documentation at the time of turnover must be provided in native file format. Elements included in the model must be detailed in both the 2D and 3D documentation for internal University use. Elements must be marked or tagged and visual in both the 2D and 3D documentation.
- All record drawings must be submitted in AutoCAD DWG, PDF and BIM in its native file format.

While the BIM Forum LOD Specification defines the minimum geometric requirements, Appendices B and C outline required components that will enable the University to link the Record BIMs with ARCHIBUS system for the facility lifecycle maintenance and operation requirements.

3. BIM REQUIREMENTS FOR THE UNIVERSITY

The University will provide the following information (where available) to the Project Teams in support of the development and delivery of BIM according to these guides and standards.

- All project team members will have access to the University's BIM Project Execution Plan and Standard Guides document.
- Provide verification that the Design Team's BIM is developed in accordance to the University's BIM Standards throughout the Design phase to ensure the Construction Team will receive an acceptable product to being their BIM work.
- Provide relevant project data as required by the BIM project execution plan.
- Models of existing facilities will be made accessible by the University along with other models, drawings and specifications of past projects for renovation, additions, and use in connecting to adjacent facilities.
- The University's Space Coordinator will coordinate information regarding floor level and elevation naming conventions outlined in Floor/Level and Room Numbering Conventions with Design and Construction Teams.
- Room numbering conventions will follow the Floor/Level and Room Numbering Conventions.

3.1. UNIVERSITY OF TENNESSEE BIM MANAGER

The University will identify a BIM Manager for each project who will serve as the main point of contact between the Design Team, Construction Team, and the University for all BIM related issues. The University's BIM Manager responsibilities include:

- Collaborate with the Design and Construction teams to develop the BIM Execution Plan.
- Serve as liaison between all design and construction team members to the University for all BIM-related activities.
- Provide specific BIM Use Cases that identify unique project needs.
- Provide oversight and direction to all project team members so they are able to perform their work in accordance with the required deliverables outlined in this document.
- Provide final approval of to the project's BIM Execution Plan.
- Distribute BIM project documentation to project teams as outlined in Section 8.1
- Coordinate and participate with model reviews.

4. BIM FILES TYPES

4.1. ARCHITECTURE MODELS

Architecture models constructed using Revit, files should not be delivered as central files. Models should be detached from the central file, worksets discarded, and delivered as fully contained files not attached to other models. Custom families should be delivered to the University attached to the models or as a separate file to be reloaded.

The architectural model file shall contain all architectural features for a building including but not limited to:

- Grid lines that are labeled and visible.
- Floor plans named according to the University's Floor/Level and Room Numbering Conventions
- Building Elevation Plans
- Exterior Wall Systems
- Interior Wall Systems including landscape furniture
- Fire Rated Walls colored coded per the following guidelines:

WALL RATING	COLOR	RGB Formula
1-Hour	Yellow	255/255/0
1.5-Hour	Orange	255/128/0
2-Hour	Red	255/255/0

- Architectural Floor Slabs
- Roofing Systems
- Ceiling Plans
- Circulation including elevators, stairs, escalators and railings.
    - The room boundary of open stairs between two levels should be split between levels.
    - Room boundaries for multiple elevators in one open shaft should be equally split between the elevator cars.
- Room boundaries and tags per the University's Floor/Level and Room Numbering Conventions.
- Doors
- Windows, interior glazing, curtain walls and storefront.
- Classroom furniture
- Millwork and casework
- All plumbing fixtures
- Toilet partitions

4.2. STRUCTURAL MODELS

Structural models constructed using Revit, files should not be delivered as central files. Models should be detached from the central file, worksets discarded, and delivered as fully

contained files not attached to other models. Custom families should be delivered to the University attached to the models or as a separate file to be reloaded.

The structural model file shall contain all architectural features for a building including but not limited to:

- Foundations
- Columns, beams and joists
- Column grids
- Brace frames and shear walls
- Structural slab
- Specialties
- Miscellaneous structural components.

4.3. MECHANICAL, ELECTRICAL AND PLUMBING MODELS

Mechanical, electrical and plumbing models were constructed using Revit, files should not be delivered as central files. Models should be detached from the central file, worksets discarded, and delivered as fully contained files not attached to other models. Custom families should be delivered to the University attached to the models or as a separate file to be reloaded.

The mechanical model file shall contain all architectural features for a building including but not limited to:

- Mechanical equipment following the requirements outlined in Appendix C.
- Rain Leader
- Overflow Drain
- Vent
- Waste Water
- Domestic Cold Water
- Domestic Hot Water
- Fire Protection
- Gases
- Fire Alarm System
- Mechanical Ductwork
- Electrical Conduit
- Electrical Lighting
- Fire/Smoke Dampers
- Valves
- Plumbing Equipment and Fixtures
- Electrical Equipment
- Electrical Panels and Schedules
- Specialties

5. BIM REQUIREMENTS FOR DESIGNERS

5.1. BIM STANDARDS FOR DESIGNERS

OSA's standards should be reviewed for information regarding disciplines that are required to produce BIM, model accuracy specifications and BIM deliverables at each design phase deliverable.

5.2. BIM USES

The Design Team and University shall identify project specific BIM uses based on the project scope and objective. These uses shall be outlined in the BIM Execution Plan as explained in Appendix A.

5.3. BIM SOFTWARE

All BIM project participants are required to have their own software licenses and computers capable of running the needed software to perform their portion of work. The Design Team should use commercially available software that provides interoperability between the different software applications used within a project. The software and version used shall be identified in the BIM Execution Plan. In addition, all project participants shall have network connectivity and Wi-Fi accessibility enabling remote project collaboration vie webinars and model review meetings. Projects shall remain on the same software release throughout the life of the project if possible. Updates to a new software release should be discussed a project milestone. BIM-related files used by the Design Team will be shared through a common project site managed by the Design Team. Design firms are required to perform internal coordination between disciplines to ensure quality project delivery.

5.4. GENERATE SPACE INVENTORY

Space information shall be collected for use in the University's Space Management System following these guidelines:

- Reference the U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Postsecondary Education Facilities Inventory and Classification Manual (FICM) (NCES 2006).
- Outside covered circulation areas of ten net square feet or greater shall be tracked and identified by name and room number, even if those spaces are not listed in the program.
- Spatial data shall be generated, and associated with bounding elements (walls, doors, windows, floors, columns, ceilings).
- The Net Square Footage (NSF) shall be modeled for each functional space. BIM Spaces shall be represented and broken down into area types (Example: Public Corridor, Mechanical, Office Staff, Classroom, etc.) as defined in Appendix A of the UT Physical Facilities Inventory 2017 document. A physical space may contain several areas that are treated individually (lobby, partitions, cubicles, entrance areas). If two areas have different functional space classifications, even though they are within the same physical space, they shall be modeled as two separate spaces. For example, a work area such as a

built-in reception desk within an entrance or lobby shall be modeled as separate non-overlapping spaces. These spaces might also be grouped into a Zone, for visualization and analysis purposes (e.g., for thermal simulation calculations). Space/area schedules and diagrams must be dynamically updated from the model geometry.

- Review University's Floor/Level and Room Numbering Conventions for all floor levels and room number assignments. All room numbers shall be approved by University's Space Coordinator.

Refer to Appendix B for a list of parameters shall be associated with space elements. Attributes marked with an 'X' in the 'BIM' column should be populated by the Design or Construction Teams as appropriate.

5.5. GENERATE EQUIPMENT INVENTORIES

Each BIM equipment object shall contain geometric data and a set of attributes. Equipment attribute data shall have the ability to be extracted from the project BIM's deliverable and linked to our ARCHIBUS database. Refer to Appendix C for a list of attribute data that shall be provided for each piece of equipment as it is relevant to the project by the Design Team and populated by the Construction Teams as appropriate.

5.6. BIM DELIVERABLES BY PHASE

The Design Team shall follow OSA's standards for executing the appropriate deliverables at each phase of the design process. The following are University clarifications on BIM deliverables:

- Author the BIM Execution Plan for the design phase of a project. Review Appendix A of this document for requirements of the BIM Execution Plan. The following
- **Design BIM**: The Design Team will be required to submit their Design BIM at LOD 300 for each project discipline to the University as part of their construction documents package. This model will be made available to the construction teams.
- All BIM updates by the Design Team will be delivered to the Construction Team as a Design BIM at LOD 300 as defined by the BIMForum's LOD Specification Version 2019. These definitions are based on the AIA G202-2013 Building Information Modeling Protocol Form. The Construction Team shall then be responsible for the construction related updates to the BIMs.
- Design BIM should include all required model parameters listed in Appendices B and C when delivered to the Construction Team.
- **Record BIM**: By the end of Closeout, the Designer shall provide the Designer's Record BIM at LOD 300 that reflects changes cause by Addenda, modifications, and observed changes recorded by the contractors.
- **Construction Drawings/Record Drawings**: By the end of Construction Phase, the designer shall provide Construction Documents as outlined by the Designer's Manual.

At the project's completion, final digital project documentation will be submitted to University by both the Design and Construction teams. This includes the following items that will ultimately become the University's As-Maintained and Archived BIMs. Deliverable requirements for both teams include:

DELIVERABLE	RESPONSIBLE PARTY
BIM Execution Plan	AE/CM/GC Firm
Design BIM (LOD 300)	AE Firm
Record BIMs (Native File Format) (LOD 500)	CM/GC Firm
Final 2D As-Built Drawings (PDF and DWG)	CM/GC Firm
Operations and Maintenance Manuals	CM/GC Firm
Equipment ID Tagging	CM/GC Firm

5.7. QUALITY CONTROL

The Construction and Design Teams will be responsible for verifying that the model meets the requirements described in University's Project Execution Plan and Standard Guides. The following checks should be performed to assure quality.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAMS	FREQUENCY
Visual Check	Review of all 3D design intent	AE Firm		
Visual Check	Review of all 2D design intent (Review of drawings)	AE Firm	PDF	
Coordination	Coordinate all disciplines including Arch, MEP and Structure to reduce construction RFI's and change orders	AE/CM/GC/UT/ Subs		
Record Model	Submit Record Model including required information defined by Model parameters included in Sections 6.4. and 6.4.	CM/GC		
Standard Checks	Ensure University's Standard Guides document have been followed	AE/ CM/GC /UT		
Model Integrity Checks	Ensure that the project room and equipment information has no undefined, incorrectly defined or duplicated elements	AE/ CM/GC /UT		
Model Integrity Checks	External model coordination should be performed between disciplines including clash detection and visualization	CM/GC		

5.8. CLASH DETECTION

Clash detection allows the project team to verify clearance, analyze conflicts, deliver quality documentation, and coordinate between disciplines to reduce RFI and Change Order submittals.

- It is the Design/Construction Teams responsibility to conduct and manage a Clash Detection process so that all major interferences between building components will have

been detected and resolved before construction. The Design Team will be responsible for Clash Detection during the Design Phase. The Construction Team will be responsible for Clash Detection during the Construction Phase.

- The Design/Construction Teams BIM Managers shall assemble a composite BIM from all of the BIMs of each design discipline for the purpose of performing a visual check of the building design for spatial and system coordination. An updated clash report will be issued by the Design/Construction Teams BIM Manager to the project team at project milestones.

- Coordination software (such as Navisworks or other approved software) shall be used for assembling the various design BIMs to electronically identify, collectively coordinate resolutions, and track and publish interference reports between all disciplines.

- The Project Team shall review the model and the Clash Reports in coordination meetings on a regular as-needed basis until relevant spatial and system coordination issues have been resolved.

- During the construction phase, the accuracy of fabrication models shall be verified and approved, prior to submittal and fabrication. Fabrication contractors shall submit their BIMs to the Construction Team BIM Manager for integration and Clash Detection /coordination and resolution.

5.9. GEOREFERENCING

The Designer and the Designer's Consultants are required to geo-reference BIMs, site plans and associated construction drawings. The project geographical locations shall be set using Tennessee State Plane coordinates. The following datum should be used: North American Data 1983 (NAD83) HARN for horizontal control and North American Datum (NAVD) 1988 for vertical control.

5.10. EXISTING CONDITIONS

For renovations and/or additions projects, the University will provide BIM (where available) of existing campus buildings that have been converted from 2D to 3D. Each of these models will state that "no guarantee is implied as to the accuracy of dimensions or building features shown and users of the models assume full responsibility for verifying its accuracy."

5.11. STAFFING

The Designer shall identify a Design BIM Manager for each project. Individual assigned by the Design Team to serve as the main point of contact between the Design Team, Construction Team, and the University for all BIM related issues. This individual shall have sufficient BIM experience required for the size and complexity of the project and shall have relevant proficiency in the BIM authoring and coordination software. The responsibilities below do not supersede the overall chain of command that exists on a project. The identification of BIM project-specific leadership roles will be outlined in the BIM Project Execution Plan as described in Appendix A. Responsibilities include the following:

- Author the BIM Execution Plan for the design phase of a project.

- Advise and support the University's Facilities Services Project Manager, serving as the technical resource for all BIM-related issues.
- Provide oversight to the design BIM use cases as defined in Appendix A.
- Ensures development and compliance with University's BIM Guides and Standards.
- Responsible for the development, coordination, publication, and verification that necessary configurations and standards required for seamless integration of design and construction modeling information has been implemented.
- Assembles the design model for coordination meetings.
- Facilitates use of the design models in design coordination/clash detection meetings and provides detection reports by the identification and resolution of collisions.
- Ensures that BIMs are used appropriately to test design requirements/criteria for functionality.
- Assumes responsibility for the proper classification of all spaces in the model according to the requirements listed in Appendices B and C to ensure direction downstream use for facility management.
- Schedules, coordinates, and facilitates BIM technical meetings between the Design Team and the University during the Design phase.
- The Design BIM Manager and discipline-specific BIM Managers are required to coordinate their LOD 300 building components, assemblies and systems.
- Determines the project BIM geo-reference point(s), and assures all technical discipline models are properly referenced.
- Primary interface between the Design and Construction Teams and the University for BIM data and file transfers as required at each design phase.
- Coordinates with the Construction Team BIM Manager to assure the creation of proper BIM final deliverables
- Monitors compliance with the University's Standards and Guides documents and related BIM Level of Development (LOD) requirements.

5.12. BIM EXECUTION PLAN

At the initiation of the project, the University's Facilities Services Project Manager will collaborate with the project's primary architect and engineer to identify the Design BIM Manager and other key individuals. These key individuals will be responsible to document the collaborative design and construction workflows that will meet the University's project delivery requirements. The Design BIM Manager shall submit their BIM Execution Plan to the university within 60 days after contract has been signed. If the Construction Team was not under contract at this stage, they shall review and update the BIM Execution Plan as appropriate with information about the Construction Phase within 60 days after contract has been signed. The requirements of the BIM Execution Plan are outlined by the Appendix A of these document and are also outlined by OSA's standards.

6. BIM REQUIREMENTS FOR CONSTRUCTION

6.1.BIM STANDARDS FOR CONSTRUCTION

OSA's standards should be reviewed for information regarding disciplines that are required to produce BIM, model accuracy specifications and BIM deliverables at each design phase deliverable

6.2. OPEN STANDARDS AND COLLABORATION

The University encourages the use of open standards and collaboration tools to facilitate interoperability between the University, members of the Design Team, the Design Team and the Construction Team, and any other consultant involved in the BIM process.

During the construction phase, the Construction Team will maintain a record construction BIM which will be used by the Design and Construction Teams to review and compare any changes, deviations, additions or corrections to the BIM's as implemented during the construction process. The Construction Team will lead model review meetings focused on providing a 3D review of the model and where project team members will have the opportunity to ask questions and address concerns. The amount of model review meetings will be at the discretion of the University's Facilities Services Project Manager. Also, the Record Construction BIM model should be made available for on-going review by the University project team members.

Design and Construction teams shall outline what software will be used and how they intend to collaborate and share models to support the project's BIM Uses and develop the required deliverables. All parties including Design, Engineering, Construction and the University are required to participate in the BIM coordination process.

6.3. BIM USES

The Construction Team and University shall identify project specific BIM uses based on the project scope and objective. These uses will be outlined in the BIM Execution Plan as explained in Appendix A.

6.4. BIM SOFTWARE

All BIM project participants are required to have their own software licenses and computers capable of running the needed software to perform their portion of work. The Construction Team should use commercially available software that provides interoperability between the difference software applications used within a project. The software and version used shall be identified in the BIM Execution Plan. In addition, all project participants shall have network connectivity and Wi-Fi accessibility enabling remote project collaboration vie webinars and model review meetings. Projects shall remain on the same software release throughout the life of the project if possible. Updates to a new software release should be discussed a project milestone.

6.5. BIM DELIVERABLES

The University's Facilities Services Project Manager will collaborate with the Construction BIM Managers to document when key deliverables will be submitted to the University. The Construction Team will assure all updates and/or revisions to the BIMs as necessary reflect the As-Built information. Overall responsibilities of the Construction Team include:

- **Record Construction BIM:** The Construction Team will be responsible for submitting a record construction model which will become the University's LOD 500 deliverable for use during the maintenance and operations of the facility. The model's progression to the LOD 500 components will be achieved in accordance with the BIMForum 2019 LOD Specifications definitions outlined in Section 2.3.1.
- **Equipment ID Tagging:** The Contractor shall assign ARCHIBUS UT ID numbers to all equipment included in Appendix C.
- **Final 2D Record Drawings:** The Construction Team shall deliver final 2D As-Built drawings in both PDF and DWG format to the University.
- **Operations and Maintenance Manuals:** The Construction Team shall deliver PDF copies of the O&M manuals. This will include manufacturer's documents including cut sheets, installation instructions, and recommended maintenance tasks, test data and reports. An electronic format of the O&M manuals shall be submitted along with the paper copies in PDF format. O&M manual documents should also be linked to components and systems within the BIM deliverable.
- Incorporate final updates to material/equipment data and properties where installations differ from the basis of design included in the Design Teams BIMs.
- At substantial completion, the Construction Team will transmit the BIMs to the Design Team who will then incorporate updates and/or revisions causes by Addenda, modifications, and observed changes recorded by the contractors into the Record BIM.

At the project's completion, final digital project documentation will be submitted to the University by both the Design and Construction teams. This includes the following items that will ultimately become the University's As-Maintained and Archived BIMs. Deliverable requirements are outlined in Section 4 and include:

DELIVERABLE	RESPONSIBLE PARTY
BIM Execution Plan	AE/CM/GC Firm
Design BIM (LOD 300)	AE Firm
Record BIMs (Native File Format) (LOD 500)	CM/GC Firm
Final 2D As-Built Drawings (PDF and DWG)	CM/GC Firm
Operations and Maintenance Manuals	CM/GC Firm
Equipment ID Tagging	CM/GC Firm

6.5.1. SPACE NAMING

The Contractor shall maintain the space object names, classifications, and designations that were developed during the design of the building.

6.5.2. EQUIPMENT NAMING

The Construction Team shall maintain the equipment object types and attributes that were developed during the design of the building.

Equipment objects shall be created, named, classified, and assigned attributes per the requirements in Appendix D or as required by the University. The Construction Team shall add any equipment objects that were not modeled by the Designer, but are required for the University's Facility Management. The Construction Team shall add equipment attribute data not available during design.

6.6. QUALITY CONTROL

The Construction Team and Design Teams will be responsible for verifying that the model meets the requirements described in University's Project Execution Plan and Standard Guides. The Construction Team shall review quality control requirements listed in Section 4.7.

6.7. CLASH DETECTION

Clash detection allows the project team to verify clearance, analyze conflicts, deliver quality documentation, and coordinate between disciplines to reduce RFI and Change Order submittals. The Construction Team shall review clash detection requirements listed in Section 4.8.

6.8. GEOREFERENCING

The Designer and the Designer's Consultants are required to geo-reference BIMs, site plans and associated construction drawings. The project geographical locations shall be set using Tennessee State Plane coordinates. The following datum should be used: North American Data 1983 (NAD83) HARN for horizontal control and North American Datum (NAVD) 1988 for vertical control.

6.9. STAFFING

The Construction Team shall identify a Construction BIM Manager for each project. Individual assigned by the Construction Team to serve as the main point of contact between the Design Team, Construction Team, and the University for all BIM related issues. This individual shall have sufficient BIM experience required for the size and complexity of the project and shall have relevant proficiency in the BIM authoring and coordination software. The responsibilities below do not supersede the overall chain of command that exists on a project. The identification of BIM project-specific leadership roles will be outlined in the BIM Project Execution Plan as described in Appendix A. Responsibilities include the following:

- Author BIM Execution Plan in collaboration with the Design BIM Manager. If Construction BIM Manager is not part of the team during the design phase, provide updates for the construction phase once the Construction team has been assigned.
- Provide oversight to the construction BIM use cases as defined in Section 5.5.
- Ensures development and compliance with the University's BIM Guides and Standards.
- Overall responsibility for the Construction Teams BIMs coordinating creation and information developed during construction.
- Acts as the main point of contact for BIM and related issues between the Construction Team, subcontractors, the University, the Design Team and others as required.
- Facilitates use of composite BIM models in construction coordination/clash detection meetings and provides detection reports by the identification and resolution of significant collisions.
- Communicates with the Design Team, coordinates the data extraction sets required by the construction trades and ensures that these requests are met.
- Assumes responsibility for the proper classification of all equipment in the model to ensure direction downstream use for facility management.
- Coordinates with the Design Team to facilitate design changes in the field have been documented and are updated in the BIMs in a timely manner.
- Prior to approval and installation, works to integrate 3D fabrication models with the updated design model to ensure compliance with design intent.
- Responsible for evolving the model elements from the Design Intent Model delivered at LOD 300 to the LOD 500 components in accordance with the BIMForum 2019 Specifications and the requirements outlined in this document.
- Coordinates update of as-constructed conditions in the Record (As-Built) BIM deliverable.
- Schedules, coordinates, and facilitates BIM technical meetings between the Construction Team and the University during the Construction phase.

6.10. BIM EXECUTION PLAN

At the initiation of the construction phase, the University Facility Services' Project Manager will collaborate with the GM/CM to update the BIM Execution Plan finalized during the Design Phase with information that identifies the protocols for the development and management of BIMs during the construction phase. The Construction BIM Manager shall submit their BIM Execution Plan to the university within 60 days after contract has been signed. The requirements of the BIM Execution Plan are outlined in Appendix A of these document and are also outlined by OSA's standards.

APPENDIX A. BIM EXECUTION PLAN

This section defines basic project reference information and determined project milestones.

1. PROJECT INFORMATION

a) Project Owner: University of Tennessee
b) Project Name:
c) Project Number:
d) Project Location and Address:
e) Contract Type/Delivery Method:
f) Brief Project Description:
g) Additional Project Information:

PROJECT INFORMATION	NUMBER
UT Project Number	
AE Project Number	
GC Project Number	
Software and Version	

2. PROJECT CONTACTS

List of lead BIM contacts for each organization on the project. Additional contacts can be included later in the document.

ROLE	ORGANIZATION	CONTACT NAME	E-MAIL	PHONE
UT Project Manager	University of Tennessee Knoxville			
UT Project Manager	University of Tennessee			
Project Manager				
Design Team BIM Coordinator				
Construction BIM Coordinator				
Architect				
Construction Manager				

Civil Engineer				
Landscape Architect				
Structural Engineer				
Mechanical Engineer				
Fire Protection Engineer				
Plumbing Engineer				
Electrical Engineer				
Low Voltage Engineer				
Other Project Role				

3. PROJECT GOALS AND OBJECTIVES

Below is an example of suggested BIM uses. Highlight and place an X next to the additional BIM Uses to be developed in the BIM model as selected by the project team. Additional items can be added and may be needed on the project. Project Scope and Objectives should determine the proper application modeling.

X	PROGRAMMING	X	DESIGN	X	CONSTRUCTION	X	OPERATE
	Existing Conditions Modeling		Existing Conditions Modeling		Existing Conditions Modeling		Existing Conditions Modeling
	Cost Estimation		Cost Estimation		Cost Estimation		Cost Estimation
			Design Authoring				
	Programming						
	Site Analysis						
			Design Reviews				
			Energy Analysis				
			Structural Analysis				
			Lighting Analysis				
			Mechanical Analysis				
			Other Eng. Analysis				

			3D Coordination		3D Coordination		
					Site Utilization Planning		
					Construction System Design		
					Digital Fabrication		
					3D Control And Planning		
					Record Modeling		Record Modeling
							Building Maintenance Scheduling
							Building System Analysis (Commissioning)
							Asset Management
							Space Management / Tracking

4. ROLES AND RESPONSIBILITIES

Briefly describe each organization's responsibility for:

- Model creation
- Model quality
- Model analysis
- Mode management

Describe the roles of the BIM Manager and BIM Coordinators.

5. BIM COLLABORATION PLAN

During the construction phase, BIM-related files may be share using either the Construction Teams or Design Team site. CM/GC firms are required to coordinate models between disciplines using the appropriate software to perform clash detection in order to assure constructability and reduce RFI and change order submissions.

Design and Construction teams are responsible for defining the required meetings, frequency and needed participants to support the project BIM deliverables outlined in this document. The following are examples of meetings that should be considered.

MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM Requirements Kick-Off		Once	University, Design and Construction Teams	
BIM Execution Plan Review		Once	University, Design and Construction Teams	
Design Coordination		As Needed		

Construction Coordination		As Needed		
Design Intent	AE Firm			
MEP Coordination				
Structure Coordination				
Clash Detection Meetings		At Milestones		
Design BIM Turnover	AE Firm	Once	University, Design and Construction BIM Managers	
Record BIM Turnover	Project Completion and Turnover	Once	University, Design and Construction BIM Managers	

6. SOFTWARE REQUIREMENTS

Identify all software products to be used for model creation and the software version.

BIM DELIVERABLES	MODEL MANAGER	SOFTWARE/ VERSION	FORMAT
Design BIMs	Design		
Construction BIM	Construct		
Record BIMs	Design		

Any technology-centric object, enabler, installs, viewers or other downloads that are required to view or use the models should be outlined as listed below.

SOFTWARE	OBJECT ENABLER NAME	LINK TO DOWNLOAD OBJECT ENABLER

In addition, describe the coordination software (such as Navisworks or other approved software) that shall be used for clash detection.

7. PLANNED MODELS

- Identify model name and phase of delivery
- Detail contents of each model by phase
- Identify authoring company
- Identify authoring tools
- Identify file formats required

8. MODELING STANDARDS

8.1. MODEL COORDINATE SYSTEMS

The BIM Execution Plan should identify the units, project coordinates, work points and orientation to true north of the BIM.

8.2. MODEL NAMING

Design and Construction Teams are responsible for document the model naming for their final BIM deliverables following the naming convention below.

MODEL NAMING CONVENTION			
BUILDING NUMBER	MODEL AUTHOR	DATE	FILE EXTENSION

- Building Number: Official eight-digit building number. This building number will be provided to the Design and Construction Teams by the University's Project Manager.
- Model Author: Standard model author abbreviations as listed below. Model author abbreviations shall not be edited but can removed or added with the approval of the University as needed per project:

ABBREVIATION	MODEL AUTHOR
ARCH	Architect
STRCE	Structural Engineer
PLMBE	Plumbing Engineer
HVACE	HVAC Engineer
FRPTE	Fire Protection Engineer
ELCTE	Electrical Engineer
LOWVE	Low Voltage Engineer
CNTRM	Construction Manager
GNRLC	General Contractor
STRCTC	Structural Contractor
DSNGB	Design Builder
PLMBC	Plumbing Contractor
HVACC	HVAC Contractor
FRPTC	Fire Protection Contractor
	Other

- Date: Date format should be a four-digit year, two-digit month and two-digit day.

Example:

50110100	ARCH	20170928	.RVT

9. PROJECT DELIVERABLES

The University's project manager will collaborate with all stakeholders to document when key BIM deliverables will be submitted to the University. The table below outlines typical project deliverables and should be edited by the Design and Construction Model Managers with specific project deliverable requirements.

BIM DELIVERABLES	MODEL MANAGER	DUE DATE	FORMAT
BIM Execution Plan	Design & CM/GC	End of Programming and Design Phases	.PDF
Design BIMs	Design	End of Construction Document Phase	.IFC
BIM Execution Plan – Construction Updates	CM/GC	Project Close Out	.PDF
Record BIM (Final Design BIMs and Final Construction BIMs)	Design	Project Close Out	.IFC
Final 2D Record Drawings	Closeout	Project Close Out	DWG/PDF

APPENDIX B. SPACE MANAGEMENT INFORMATION

The table below lists the required attributes that shall be associated with space elements. All attributes should be included in the model, but only those marked with an 'X' should be populated by the Design or Construction Teams as appropriate.

DESCRIPTION	ARCHIBUS DATABASE FIELD	RESOURCES	BIM
Building Name	utk_name	Provided by the University	x
Building Code	utk_bl_id	Provided by the University	x
Floor Code	utk_fl_id	Floor/Level and Room Numbering Conventions	x
Floor Name	utk_fl.name	Basement Floor (Floor B) Mezzanine Floor (Floor M) First Floor (Floor 1) Second Floor (Floor 2), etc.	x
Room Number	utk_rm_id	Floor/Level and Room Numbering Conventions	x
Building Area	utk_Area_gross_int	Gross Interior Footage (GSF)	x
Room Area	utk_area	Net Square Footage (NSF)	x
Room Standard	utk_rm_std		
Room Category	utk_rm_cat	See Appendix D	x
Room Use	utk_rm_use	See Appendix D	
Area Type	utk_rm_type	See Appendix D	x
Number of Workspaces	utk_cap_em		
College ID	utk_dv_id		
Department Code	utk_dp_id		
Room Name	utk_name		
Department	utk_name		
Occupant	utk_em_id		
Occupancy Count	utk_Count_em	Seat count occupancy	x
Door Number	utk_rm_id_door	Room number based on signage	x
Room Height	utk_rm_height	Use main room height measurement	x
Room Width	utk_rm_width	Use longest width measurement	x
Room Length	utk_rm_length	Use longest length measurement	x
Funding	utk_fc_ic		
Card Access	utk_has_card	Y or N option field	x
Key Shop ID	utk_keyshopid		
Room Notes – Departments	utk_note_dept		
Room Notes – Facilities	utk_note_ft		
Responsible Cost Center	utk_dp_id		
Requestable	utk_requestable	Y or N option field	

APPENDIX. C. BIM EQUIPMENT OBJECTS

Each BIM equipment object shall contain geometric data and a set of attributes. Equipment attribute data shall have the ability to be extracted from the project BIM's deliverable and linked to our ARCHIBUS database.

Equipment components shall have a unique equipment code named as followings:

Equipment Standard (eq_std)	-	Building ID (bl_id).Floor(fl_id).Room Number (rm_id).	-	Sequential Number

Example: WFTN-1610UA.01.104 -BFS-0001 (Water Fountain Bottle Filling Station #1 at Room 104, in the First Floor of 1610 University Avenue Building).

The following attribute data shall be provided for each piece of equipment as it is relevant to the project.

DESCRIPTION	ARCHIBUS DATABASE FIELD	OPTIONS	RESOURCES
Equipment Code	utk_eq_id		Concatenation of bl_id_reg & "-" & eq_std & "-" & <sequential number>
Building Code	utk_bl_id		Provided by the University
Floor Code	utk_fl_id		Floor/Level and Room Numbering Conventions
Room Number	utk_rm_id		Floor/Level and Room Numbering Conventions
Equipment Standard	utk_eq_std		See Appendix D
Equipment Category	utk_eq_cat		See Appendix D
Manufacturer	utk_mfr		
UT Tag #	utk_iris_tag_numer		
Model #	utk_modelno		
Serial #	utk_num_serial		
Equipment Status	utk_status	in = In Service out = Out of Service rep=In Repair stor = In Storage salv = Salvaged sold = Sold miss = Missing	Defaults to "in"
CSI Classification	utk_csi_id		See CSI Classification Codes

DESCRIPTION	ARCHIBUS DATABASE FIELD	OPTIONS	RESOURCES
Criticality	utk_criticality	1 = None 2 = Very Low 3 = Low 4 = Low to Moderate 5 = Moderate 6 = Moderate to High 7 = High 8 = Very High 9 = Hazard with warning 10 = Hazard without warning	Defaults to "1"
Equipment Condition	utk_condition	New Good Fair Poor	Defaults to “New”
Years Life of Expectancy	utk_qty_life_expct		
Isolation Transformer	utk_isolation_transformer		
VFD Size	utk_vfd_size		
VFD Brand	utk_vfd_brand		
RPM	utk_rpm		
Voltage	utk_voltage		
Enclosure	utk_enclosure		
Mounting	utk_mounting		
HP (Horsepower)	utk_hp		
PH (Phase)	utk_ph		
AMPS	utk_amps		
Duty	utk_duty		
Motor ID	utk_motor_id		
Frame	utk_frame		

DESCRIPTION	ARCHIBUS DATABASE FIELD	OPTIONS	RESOURCES
Vendor	utk_war_vendor		
Contact Info	utk_contact_info		
Warranty Description	utk_description		
Expiration Date	utk_date_expiration		
Warranty Code	utk_warranty_id		

APPENDIX. D. ROOM CATEGORIES, USE AND AREA TYPE

A description of these area type codes can be found in the document below:
Appendix A of the UT Physical Facilities Inventory 2017 document.

ROOM CATEGORY	DESCRIPTION	AREA TYPE	DESCRIPTION
01.000	Unclassified Areas	50	Unclassified --Inactive, Avail.
01.000	Unclassified Areas	60	Unclassified--Alteration, Conversion
01.000	Unclassified Areas	70	Unclassified--Unfinished, New
01.000	Unclassified Areas	80	Unclassified--Inactive, Renovation Required
01.100	Classroom Facilities	10	Classroom
01.100	Classroom Facilities	10.2	Classroom, Special Purpose
01.100	Classroom Facilities	10.3	Class Auditorium, General
01.100	Classroom Facilities	10.4	Class Auditorium, Special
01.100	Classroom Facilities	10.6	Classroom, Seminar
01.100	Classroom Facilities	15	Classroom Service
01.200	Laboratory Facilities	10	Laboratory, Class
01.200	Laboratory Facilities	10.1	Laboratory-DRY, Class
01.200	Laboratory Facilities	10.2	Laboratory-WET, Class
01.200	Laboratory Facilities	10.4	Laboratory, Class-Photo Darkroom
01.200	Laboratory Facilities	15	Laboratory Service, Class
01.200	Laboratory Facilities	15.4	Laboratory Svc, Class-Photo Darkroom
01.200	Laboratory Facilities	20	Laboratory, Open
01.200	Laboratory Facilities	20.4	Laboratory, Open-Photo Darkroom
01.200	Laboratory Facilities	25	Laboratory Service, Open
01.200	Laboratory Facilities	25.4	Laboratory Svc, Open-Photo Darkroom
01.200	Laboratory Facilities	50	Laboratory, Research/Non-Class
01.200	Laboratory Facilities	50.1	Laboratory-DRY, Research/Non-Class
01.200	Laboratory Facilities	50.2	Laboratory-WET, Research/Non-Class
01.200	Laboratory Facilities	55	Laboratory Svc,Research/Non-Class
01.200	Laboratory Facilities	55.1	Laboratory Svc,Research /NC-Glasswash
01.200	Laboratory Facilities	55.2	Laboratory Svc,Research /NC-Warmroom
01.200	Laboratory Facilities	55.3	Laboratory Svc,Research /NC-Coldroom
01.200	Laboratory Facilities	55.4	Laboratory Svc,Research /NC-Photo Darkroom
01.200	Laboratory Facilities	55.5	Laboratory Svc,Research /NC-Instrument
01.200	Laboratory Facilities	55.6	Laboratory Svc,Research /NC-Prep
01.200	Laboratory Facilities	55.7	Laboratory Svc,Research /NC-Storage
01.200	Laboratory Facilities	55.8	Laboratory Svc,Research /NC-Culture
01.200	Laboratory Facilities	55.9	Laboratory Svc,Research /NC-Autoclave
01.300	Office Facilities	10.1	Office, Faculty
01.300	Office Facilities	10.9	Office, Library Faculty

ROOM CATEGORY	DESCRIPTION
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
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01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.300	Office Facilities
01.400	Study Facilities
01.400	Study Facilities
01.400	Study Facilities
01.400	Study Facilities
01.400	Study Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
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01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities

AREA TYPE	DESCRIPTION
11	Office, Staff
11.2	Office, Program Staff
11.4	Office, Clerical
11.6	Office, Other Non-Exempt
12	Office, Student Employee
12.2	Office, Graduate Assistant
12.4	Office, Graduate Teaching Asst
12.6	Office, Graduate Research Asst
12.8	Office, Post-Doctoral
13	Office, Emeritus
13.2	Office, Visitor
15	Office Service
15.2	Suite/Department Corridor
50	Conference Room
55	Conference Room Service
10	Study, Reading
20	Library Stack
30	Library Open-Stack/Reading
40	Library Processing
55	Library/Study Service
10	Armory
15	Armory Service
20	Athletics/Physical Education
23	Athletics Spectator Seating
25	Athletics/Physical Ed Service
25.7	Athletics/Physical Ed Svc, Locker Room
30	Media Production
35	Media Production Service
35.4	Media Production Svc, Darkroom
40	Clinic, Non-Medical
45	Clinic Service, Non-Med
50	Demonstration
50.5	Staff Training
55	Demonstration Service
60	Agricultural Field Building
70	Animal Facilities
75	Animal Facilities Service
75.1	Animal Facilities Svc--Cage Wash
75.2	Animal Facilities Svc--Quarantine
75.3	Animal Facilities Svc--Surgery
75.4	Animal Facilities Svc--Surgery Prep

ROOM CATEGORY	DESCRIPTION
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.500	Special Use Facilities
01.600	General Use Facilities
01.600	General Use Facilities
01.600	General Use Facilities
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01.600	General Use Facilities
01.600	General Use Facilities
01.600	General Use Facilities
01.600	General Use Facilities
01.600	General Use Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
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01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.700	Support Facilities
01.800	Health Care Facilities

AREA TYPE	DESCRIPTION
75.5	Animal Facilities Svc--Surgery Recovery
75.6	Animal Facilities Svc--Receiving
80	Greenhouse
85	Greenhouse Service
90	Other Special Use
90.5	Other Special--Dept Recharge
10	Assembly
15	Assembly Service
20	Exhibition
25	Exhibition Service
30	Food Facility
35	Food Facility Service
40	Day Care
45	Day Care Service
50	Lounge
55	Lounge Service
60	Merchandising
65	Merchandising Service
65.7	Merchandising Service, Locker Room
70	Recreation
75	Recreation Service
75.7	Recreation Service, Locker Room
80	Meeting Room
85	Meeting Room Service
10	Central Computer/Telecommunication
15	Central Computer/Telecom Service
20	Shop
25	Shop Service
25.7	Shop Service, Locker Room
30	Central Storage
35	Central Storage Service
40	Vehicle Storage
45	Vehicle Storage Service
50	Central Service
50.6	Laundry, Central
55	Central Service Support
60	Hazardous Materials Storage
70	Hazardous Waste Storage
75	Hazardous Waste Storage Service
80	Unit Storage
10	Patient Room

ROOM CATEGORY	DESCRIPTION	AREA TYPE	DESCRIPTION
01.800	Health Care Facilities	15	Patient Room Service
01.800	Health Care Facilities	20	Patient Bath
01.800	Health Care Facilities	30	Nurse Station
01.800	Health Care Facilities	35	Nurse Station Service
01.800	Health Care Facilities	35.7	Nurse Station Service, Locker
01.800	Health Care Facilities	40	Surgery
01.800	Health Care Facilities	45	Surgery Service
01.800	Health Care Facilities	50	Treatment/Examination
01.800	Health Care Facilities	50.7	Treatment/Examination, Radiology
01.800	Health Care Facilities	55	Treatment/Examination Service
01.800	Health Care Facilities	55.4	Treatment/Examination Service, Darkroom
01.800	Health Care Facilities	60	Laboratory, Diagnostic
01.800	Health Care Facilities	60.1	Laboratory, Diagnostic-Pharmacy
01.800	Health Care Facilities	60.2	Laboratory, Diagnostic-Autopsy
01.800	Health Care Facilities	60.6	Laboratory, Diagnostic-Bacteriology
01.800	Health Care Facilities	65	Laboratory Service, Diagnostic
01.800	Health Care Facilities	65.4	Laboratory Service, Diagnostic, Darkroom
01.800	Health Care Facilities	70	Central Supplies (Health)
01.800	Health Care Facilities	80	Public Waiting Room
01.800	Health Care Facilities	90	Staff On-Call Facility
01.800	Health Care Facilities	95	Staff On-Call Facility Service
01.900	Residential Facilities	10	Sleep/Study, No Bath/Toilet
01.900	Residential Facilities	19	Residential Bath/Toilet
01.900	Residential Facilities	20	Sleep/Study with Bath/Toilet
01.900	Residential Facilities	35	Sleep/Study Service
01.900	Residential Facilities	50	Residential Apartment
01.900	Residential Facilities	55	Residential Apartment Service
01.900	Residential Facilities	70	Residential House
02.100	Circulation Areas	01	Bridge/Tunnel
02.100	Circulation Areas	02	Elevator
02.100	Circulation Areas	03	Escalator
02.100	Circulation Areas	04	Loading Dock
02.100	Circulation Areas	05	Public Lobby
02.100	Circulation Areas	06	Public Corridor
02.100	Circulation Areas	07	Stairway
02.200	Building Service Areas	01	Custodial Supply Closet
02.200	Building Service Areas	02	Janitor Room
02.200	Building Service Areas	03	Public Restroom
02.200	Building Service Areas	03.1	Public Restroom, Unisex
02.200	Building Service Areas	03.3	Public Restroom, Female
02.200	Building Service Areas	03.5	Public Restroom, Male

ROOM CATEGORY	DESCRIPTION
02.200	Building Service Areas
02.200	Building Service Areas
02.200	Building Service Areas
02.200	Building Service Areas
02.300	Mechanical Areas
02.300	Mechanical Areas
02.300	Mechanical Areas
02.300	Mechanical Areas
02.300	Mechanical Areas
02.300	Mechanical Areas
02.300	Mechanical Areas

AREA TYPE	DESCRIPTION
03.7	Public Restroom Lounge
03.9	Public Restroom, Family
04	Trash Room
05	Wellness Room
01	Central Utility Plant
02	Fuel Room
03	Shaft
04	Utility/Mechanical, Unspecified
04.3	Computer/Communications
04.5	Electrical
04.7	Telephone wiring

ROOM USE	DESCRIPTION
0110	Inst Use - E & G (Use as a default)
0112	Inst Use - Auxiliary
0114	Inst Use - Athl / Recr
0116	Inst Use - Foundation
0120	Leased Out to Non-UT
0130	Shared Out to Non-UT
0210	Vacant - E & G
0212	Vacant - Auxiliary
0214	Vacant - Athl / Recr
0216	Vacant - Foundation

APPENDIX E. EQUIPMENT CATEGORIES AND STANDARDS

CATEGORY	DESCRIPTION	STANDARD
Air Handling Equipment		
	Air Conditioning Split Unit or Split System	ACU-S/S-IDU
	Air Conditioning Unit	ACU-PAK
	Air Curtain	AIRCN
	Air Dryer	AIRDRY
	Air Handling Unit (Fresh Air)	AHU-FA
	Climate Changer Central Station Air Handler	CLCH
	Dish Washer Exhaust Fan	FAN-DEX
	Ductless Mini Split Air Conditioning	ACU-SUDM
	Exhaust Fan	FAN-EX
	Fan Motor	FAN-MOTOR
	Fire Smoke Exhaust Fan	FAN-FSEX
	Fume Exhaust Hood , Fume Cabinet, Fume cupboard, Laboratory Chemical Fume Hood.	EXHAUST-FHD
	General use exhaust fan unit	EXHAUST-VHD
	Heavy Air Conditioning Unit	ACU-HP
	Kitchen Exhaust Hood	EXHAUST-KITHD
	Make-Up Air Unit	AHU-MU
	Multizone Air Handling Unit	MZAH
	Perchloric Acid Hoods	EXHAUST-AHD
	Portable Air Conditioner Unit	ACU-P/W
	Pressurized Supply Fan	FAN-PS
	PTAC unit or through the wall unit	ACU-PTAC
	Purge Fan	FAN-SP
	Relief Fan	FAN-REL
	Return Fan	FAN-RET
	Supply Fan	FAN-SUP
	Transfer Air Fan	FAN-TA
Air Pollution Control		
	Air Monitor	AIR-MON
	Portable Fume Collector	PFCR

CATEGORY	DESCRIPTION	STANDARD
Building Systems		
	Building Automation System	BUILD-AS
	Building Management System	BUILD-MS
	Hand Rail	HNDRL
	Stairway	STW
Door		
	Automatic Door	DOOR-AUTO
	Door	DOOR
	Emergency Exit Door - in a structure is a special exit for emergencies such as a fire.	DOOR-EME
	Exterior Door	DOOR-EXT
	Interior Door	DOOR-INT
	Overhead Garage Door	OHGD
Electrical Equipment		
	15KV Switchgear	SG-15KV
	600V Switchboards	SWB-600V
	Bus Duct	DUCT-BUS
	Electrical Closet	CLOS-EL
	Electrical Substation	SUBSTATION
	Electrical Vault	VAULT-ELEC
	Insulated Cased Circuit Breaker (600V)	CIRCUITBRK-IC
	Molded Cased Circuit Breaker (600V)	CIRCUITBRK
	Output Distribution Panel	ODP
	Remote Power Panel	PANEL-RP
Elevators		
	Elevator	ELEVATOR
Energy Recovery		
	Energy Recovery Ventilation	ERV/HEAT WHEELS
Filter Systems		
	HVAC Air Filter	FILT-HVAC
	Water Filter System	FILT-WTR

CATEGORY	DESCRIPTION	STANDARD
Fire Safety		
	Battery powered smoke detector	SMOKE-DET-BATT
	Fire Alarm System	FIRE-AS
	Fire Extinguisher	FIRE-EXT
	Fire Extinguisher #10 Dry Chemical	FIRE-EXT-10-DRY
	Fire Extinguisher #20 CO2	FIRE-EXT-20-CO2
	Fire Extinguisher, #20 Dry Chemical	FIRE-EXT-20-DRY
	Fire Hydrant	FIRE-HYD
	Fire Mist System	FIRE-MS
	Fire Sprinkler System	FIRE-SPR
	Fire Suppression System	FIRE-SUP
	Fire Suppression Valves	FIRE-SUP-V
	Pre Action Panel	PANEL-PA
	Smoke Detector	SMOKE-DET
	Sprinkler System	FIRE-SS
	Stand Pipe System	FIRE-SP
Fuel Oil		
	Fuel Oil Controls	FO-C
	Fuel Oil Pump	FO-P
Gas Fired Equipment		
	Boiler	BOILER
	Boiler-Gas fired	BOILER-GH
Generators		
	Electric Generator	GEN
	Emergency Power Generator	GEN-EMP
	Generator Control Panel	GEN-CP
	Generator Switch Gear	GEN-SW
	Nitrogen Generator	NITGEN
Grounding Systems		
	Grounding System	GND

CATEGORY	DESCRIPTION	STANDARD
HVAC Equipment		
	Air Circuit Breaker	ACB
	Air Compressor	AIRCOMP
	Cabinet Unit Heater	HEATR-CU
	Chiller	CHIL-AIR COOL
	chiller disconnect, starter, and control equipment	CHIL-CP/STR
	Coil Ducting	COIL-DUCT
	Cooling Control Valves	COOL-CV
	Cooling Meter	COOL-MTR
	Cooling Tower	COOLTWR
	Cross Flow Cooling Tower	COOLTWR-CF
	Damper - Fire Damper, Smoke Damper, Ceiling Radiation Damper, Relief Damper, etc.	DAMP
	Domestic Hot Water Heater	HEATR-DHW
	Drinking Fountain Water Chiller	CHIL-DF
	Duct Heater	HEATR-D
	Dust Collector	DSTCTR
	Electric Unit Heater	HEATR-EU
HVAC Equipment		
	Fan Coil Unit/Unit Ventilator	FCU
	Gas Unit Heater	HEATR-GU
	Heat Exchanger	HEATEX
	Heating Water Unit Heater	HEATR-HWU
	Hot Air Furnace	FURNACE
	HVAC Outlet Vent	HVAC-OV
	Hydronic Unit Heater	HEATR-HYD
	Plate and Frame Heat Exchanger	HEATEX-PF
	Process Water Chiller	CHIL-PROCESS
	Steam Unit Heater	HEATR-STU
	Variable Air Volume	VAV
	Water cooled chiller	CHIL-CEN
	Water Cooled Condensing Unit	COND UNIT-WC
Lifts		
	Conveyance system	LIFT-ADA
Lighting		
	Controls	LGHT-CTL
	Lightning Power Panel	LGHT-PP
	Occupancy Sensors	LGHT-OSEN
Meters		
	Condensate Meter	METER-COND
	Electric Meter	METER-ELEC

CATEGORY	DESCRIPTION	STANDARD
Meters		
	Power System Metering Device	PQM
	Steam Flow Meter	METER-STM
	Vibration Analysis	VIBA
	Water Flow Meter	FLMTR
	Water Meter	METER-WTR
Motors		
	Electric Motor Starter	MOTOR-ES
	Motor Control Center	MCC
Plumbing Equipment		
	Backflow Preventer	BFPR
	Emergency Eyewash or Emergency Shower.	SHWR-EM
	Expansion Tank	EXPTANK
	Grease Trap	GRSETRP
	Heaters and Heat Exchangers	HEAT-HEATEX
	Lavatory	BATH
	Meter	PLMB-MTR
	Pump room lift	LIFT-PMP
	Sewer Flushing Machine	SEWER FLUSH
	Shower	SHWR
	Sink	SINK
	Urinal	URINAL
	Water Closet	WTRCL
	Water Cooler	WTRCOOL
	Water Pump	PUMP-W
Power		
	Emergency Power Management System	PS-EM
	Transient and Surge Suppression	TVS
	Transient Voltage Surge Suppression	TVSS
	Variable Frequency Drive	VFD
	Voltage Transformer	VT

CATEGORY	DESCRIPTION	STANDARD
Pumps		
	Pump	PUMP-A
	Boiler Feed Water Pump	PUMP-BF
	Chemical Water Treatment Pump	PUMP-CHE
	Chilled Water Pump	PUMP-CW
	Circulating Pump	PUMP-CIR
	Condensate Return Pump Unit	PUMP-CRU
	Condenser Water Pump	PUMP-TWR
	Domestic Cold Water Pump - or Circulating cold/hot Water Pump Circulating Water Pump	PUMP-D
	Fire Booster Pump	PUMP-FB
	Fire House Pump	PUMP-FH
	Fire Jockey Pump	PUMP-FIREJ
	Fire Pump/Jockey Pump	PUMP-FIRE
	Fuel Oil Pump	PUMP-FUO
	Gasoline Dispensing Pump	PUMP-GD
	Heat Pump	PUMP-HEAT
	Hot Water Pump	PUMP-HW
	Make up Water Pump	PUMP-MU
	Sump Pump - and or elevator sump pump	PUMP-SUMP
	Vaccum Pump	PUMP-VAC
	Water Source Heat Pump	PUMP-WSH
Relays		
	Protective Relay	PR
Safety Equipment		
	Battery powered carbon monoxide detector	CO-DET-BATT
Steam Delivery and Condensate		
	Coils	STM-COIL
	Control Valves	STM-CV
	Pumping Traps	STM-PMPT
Storage Tanks		
	Acid Dilution Tank	TANK-DIL
	Fuel Storage Tank	TANK-FUST
	Hot Water Storage Tank	TANK-HWS
	Tank	TANK
Storm System		
	Cisterns/Tanks	CISTRN-TANK
	Stormwater Treatment sinks	TRTMT-SINK
	Water quality units	WTR-QUALU

CATEGORY	DESCRIPTION	STANDARD
Substation		
	Unit Substation	USS
Switches		
	Automatic Transfer Switch	SWITCH-AT
	Bolted Pressure Switch (600V switch in switchboards)	BPS
	Disconnect Switch	DSW
	Manual Transfer Switch	MTS
	Static Transfer Switch	STS
Transformers		
	60 HZ - 50 HZ Transformer	TRANSFMR-60
	Current Transformer	TRANSFMR-CT
	Dry Type Transformer	TRNSFMR-DT
	Electrical Transformer	TRNSFMR-EL
	Transformer	TRANSFMR
	Transformer - Insulating Liquid	TRANSFMR-IL
	Wet Type Transformer	TRANSFMR-WT
Treatment Systems		
	Water treatment system such as demin tanks	WATERTMT
Valves		
	Automatic valves	VALVE-AUTOMATIC
	Post Indicating Valve	PIV
	Pressure Reducing Valve	VALVE-PRV
Voltage, High		
	Gas Insulated High Voltage Switch	HV-SW-G
Water Fountains		
	Water fountain - or Drinking Fountain.	WFTN
	Water Fountain Bottle Filling Stations	WFTN-BFS