

Engineering Department



Virtual Design and Construction Requirements

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1.0 INTRODUCTION

1.1 PURPOSE

This Virtual Design and Construction (VDC) Requirements introduces the information, management, and technical specifications to support the implementation of Building Information Modeling (BIM) and Computer Aided Design and Drafting (CADD) for The Port Authority of New York & New Jersey (“Authority”). The Authority’s requirements apply to the full life cycle of a project from conceptual design through construction, close out and operations.

This document should be read in conjunction with the following:

Table 1.1-ATable Associated Materials

Document	Type	Purpose
BIM Standard	Standard	Details the technical requirements to support projects produce, collect, and analyze BIM data that is consistent, relevant, and high quality.
CAD Standard	Standard	Establishes requirements and procedures for the preparation and milestone submissions of CAD based drawings throughout Design.
BIM Guidelines	Guidelines	Provides guidance on achieving the BIM standards.
CAD Guidelines	Guidelines	Provides guidance on achieving the CAD standards.
Information Delivery Plan	Specification	Details the technical BIM data requirements to be consistent, relevant, and high quality for BIM projects.
BIM Execution Plan Templates	Templates	Provides a base document with standardized content for the development of the BEP consequently with the PANYNJ standards.
BIM and CAD Support Files	Templates	Provides a base document with standardized content for the development of the model files accordingly with the PANYNJ standards.
BIM Progress Report Template	Template	Provides a base document with standardized content for the development of the BIM Progress Report accordingly with the PANYNJ standards.
Protected Information Practices and Procedure Manual	Standard	Provides policy and procedures to safeguard and secure the Authority’s data.
BIM Forum LOD	Standard	Enables practitioners to specify and articulate the content and reliability of BIMs at various stages of a project lifecycle.
Uniformat 2010	Standard	Classifies information into elements to arrange project descriptions, cost information, BIM elements and other associated documentation.

NOTE: Associated materials and content in this VDC Requirements are in grey and are under development.

1.2 OBJECTIVES

This section applies to **BIM** and **CAD** users.

The Authority's strategic objectives, relative to these Standard, are to:

1. Achieve interoperability between project teams to facilitate information exchange, enhance communication and enable collaboration between functions.
2. Promote the expansion of Virtual Design Construction (VDC) Technologies and ensure Data Integrity during the complete Project Lifecycle:

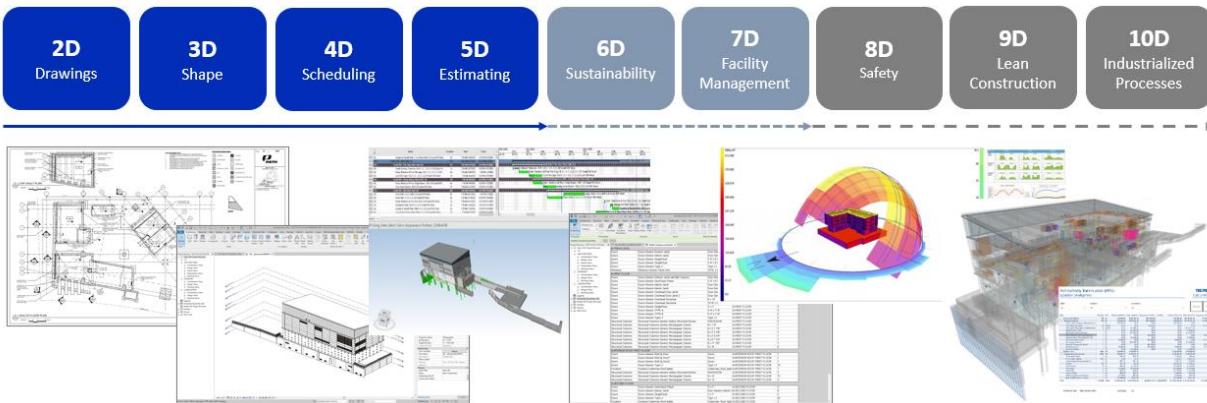


Figure 1 VDC Dimensions

- a. 2D - Drawings, sketches, details development.
 - b. 3D - Design development, visualization, review, and coordination.
 - c. 4D - Scheduling, field coordination and logistics management.
 - d. 5D - Quantity take off and estimating.
 - e. 6D - Resilience and Sustainability.
 - f. 7D - Facility management and enterprise asset management (EAM).
3. Ensure that all content, CAD, and BIM, is detailed appropriately, meeting the standards of the Authority, and fit its purpose. All models and files shall be in compliance with the Authority's VDC Standard.

In the event existing BIM models or CAD files are provided, the use of these files should be for reference only and shall not relieve the Contractor of their sole responsibility for verifying accuracy of conditions indicated within these files.

1.3 PERFORMANCE MEASURES

Per the data quality requirements in the **BIM** and **CAD** standards the following Key Performance Indicators (KPIs) will be reported according to the project schedule and in line with compliance requirements:

- Availability and timeliness of data produced in accordance with submittal requirements.
- Completeness and accuracy of data provided at project milestones/stages including project close out.
- Number of issues, i.e. non-conformance of data, identified as a ratio of number of issues assigned to appropriate Contractor/Consultant.
- Compliance against Authority functional and technical requirements.

2.0 INFORMATION REQUIREMENTS

This section applies to **BIM** and **CAD** users. The Information Delivery Plan is published and available for consultation in the PANYNJ website. Some specification may vary within projects and this reference file will be provided at the BIM kickoff meeting.

2.1 INFORMATION DELIVERY PLAN

The Information Delivery Plan (IDP) contains the required information and data to be included on each deliverable across the different project Stages including:

- LOD Definitions
- Model Element Table indicating the Level of Development (LOD) and Level of Information (LOI) for each element.
- The required data to be incorporated as part of the project information.
- The required data to be incorporated into each modeled element, across project Stages.
- Classification lists.

2.1.1 LOD DEFINITIONS

The Authority adopts the LOD definitions as stated in the BIM Forum's most current LOD specification¹. This section includes the Level of Development (LOD) definitions, which describes the degree to which the element's geometry have been thought through.

2.1.2 MODEL ELEMENT TABLE

The BIM models shall be created aligned with the Model Element Table meeting the Level of Development (LOD) targets, by the end of each work stage

2.1.3 PARAMETERS

Includes Project, Common and Detailed parameters that are required by each modeled element by Stage.

2.2 CONTRACT DRAWINGS

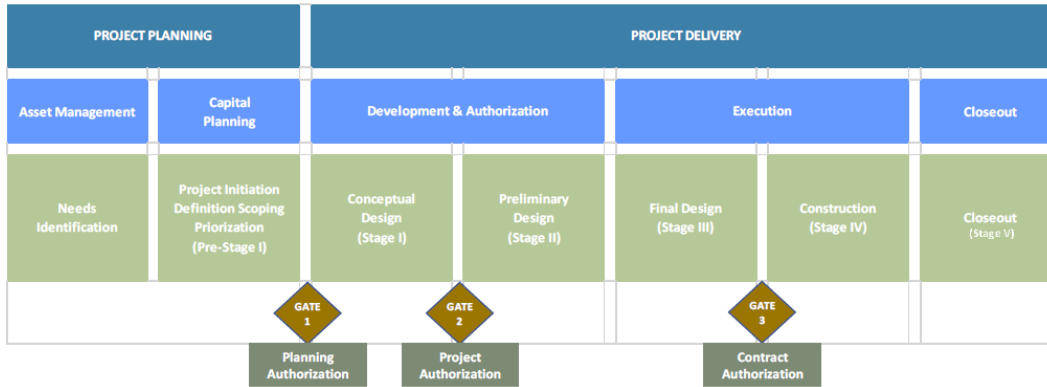
Refer to **BIM** Standard and **CAD** Standard for the drawing specifications including but not limited to the Contract Borders, Information required, Index, Symbols and all related to 2D documentation.

¹ <https://bimforum.org/lof/>

2.3 MILESTONES AND DELIVERABLES

2.3.1 DESIGN BID BUILD MILESTONES

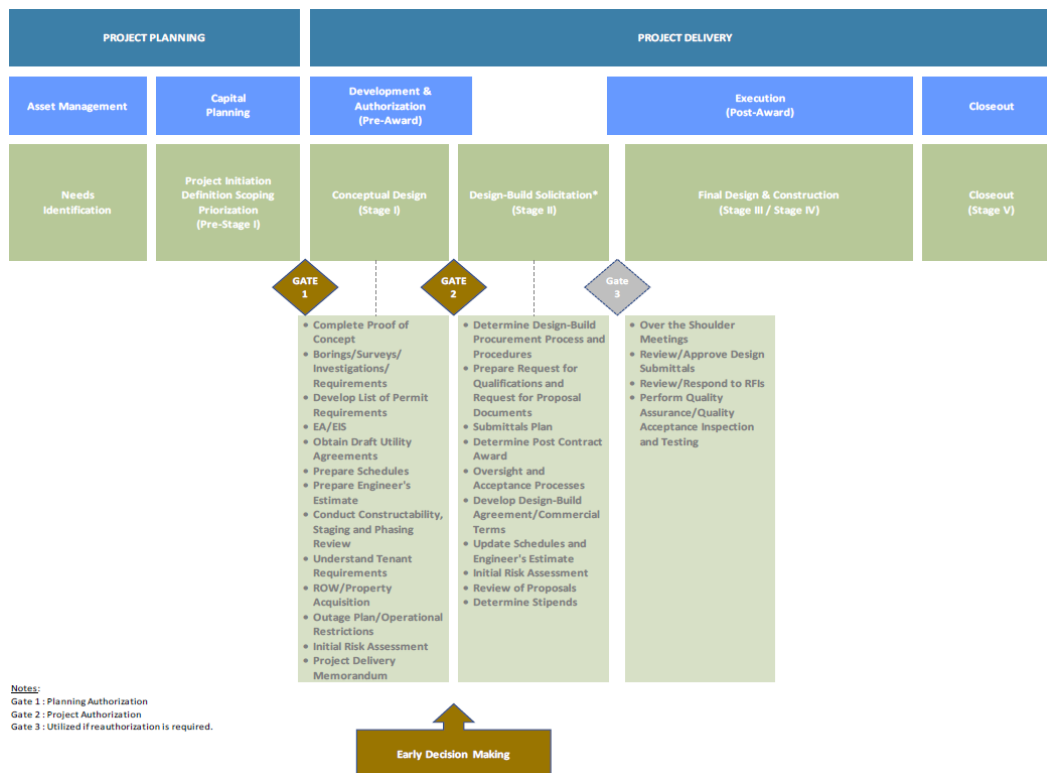
Information shall be exchanged in accordance with the design-bid-build stage gates shown in the following diagram.



In general, the consultant shall assume all responsibility for delivery during Stage III (design) and the Contractor shall assume all responsibility at the commencement of Stage IV (construction).

2.3.2 DESIGN BUILD MILESTONES

Information shall be exchanged in accordance with the design-build stage gates shown in the following diagram.



In general, the Contractor shall assume all responsibility for delivery at the commencement of stage III (final design) and throughout Construction.

2.3.3 DELIVERABLES

For both type of projects (DB and DBB) the following deliverables are required:

Stage	Responsibility	Deliverable	First Submittal	Submittal Frequency
I	VDC	Site Model	Within 15 days after the Project Kickoff meeting	Once
I	EAD	Design BIM Execution Plan	Within 15 days after the BIM Kickoff meeting	Once & updated as needed throughout Design
I	EAD	Context Model	Within 30 days after the BIM Kickoff meeting	Per milestones (25%, 50%, 75%, 100%)
I	EAD	Conceptual design model	Within 30 days after the BIM Kickoff meeting	Per milestones (25%, 50%, 75%, 100%)
II	EAD	Preliminary design model	Within 30 days after the BIM Kickoff meeting	Per milestones (25%, 50%, 75%, 100%)
III	EAD or Consultant	Final design model and Contract drawings	Within 30 days after the BIM Kickoff meeting	Per milestones (25%, 50%, 75%, 100%)
IV	VDC	Site Model	Within 15 days after the Project Kickoff meeting	Once
IV	Contractor	Construction BIM Execution Plan	Within 15 days after the BIM Kickoff meeting	Once, and update as specified
IV	Contractor	Context Model	Within 30 days after the BIM Kickoff meeting	Once, and update as specified
IV	Contractor	Construction model	Within 30 days after the BIM Kickoff meeting	Monthly as specified
IV	Contractor	4D Simulation model	Within 30 days after the BIM Kickoff meeting	Monthly as specified
IV	Contractor	Laser Scanning survey data	Based on the Current Progress Schedule, before any of the installed Work becomes hidden or concealed	Per approved BEP and as requested.
IV	Contractor	As-constructed model	Within 30 days prior to issuance of the Certificate of Final Completion	Once until approved.

NOTE: Every Stage of the project can be initiated as an independent cycle, or it can be integrated with another Stage depending on the project development.

Refer to [Appendix A](#) for detailed descriptions of deliverables.

3.0 INFORMATION MANAGEMENT

The following sub-sections apply to **BIM** and **CAD** users.

3.1 STANDARDS AND GUIDELINES

Refer to the core related **BIM** and **CAD** standards and guidelines listed in Table 1.1 Table Associated Materials.

3.2 ROLES AND RESPONSIBILITIES

The following VDC related roles shall be taken on directly by the Authority:

- VDC Engineer / Manager

Roles performed by the Contractor/Consultant must be described fully within the **BIM** Execution Plan (BEP). These roles may include:

- **BIM** Manager(s)
- **BIM** Coordinator

The Contractor/Consultant shall confirm the parties and named persons who will be responsible for the project, describing what activities will be performed and what authorities will be held. Candidates shall have the required experience for the size and scale of the project and shall seek clarification from the Authority prior to nomination.

Table below outlines the typical activities and the stakeholders involved:

Table 3.2-A RACI Matrix

Activity	PANYNJ VDC	PANYNJ EAD/CMD	Consultant / Contractor
Development and implementation of Port Authority VDC Requirements and BIM/CAD Standards.	R	C	I
Defining the project specific VDC Contract Requirements.	R	R	I
Defining and managing data exchange and data exchange procedures.	R	C	I
Ensure all sub-contracted organizations (design or construction) meet the requirements and are procured correctly.	A	A	R
Report on findings from quality assurance process.	I	A	R
Create and share a Site Model with coordinates.	R	A	I
Implementation of the BIM processes and procedures.	C	I	R
Development and maintenance of the BIM Execution Plan.	C	C	R
Enable integration and coordination of data.	I	I	R
Create content in line with Authority requirements and standards.	C	I	R

R – Responsible; A – Accountable; C – Contributor; I – Informed

3.3 MEETINGS

Table below defines the meetings that shall take place on a regular cycle.

Table 3.3-A Meetings

Meeting Name	Occurrence	Objective(s)
BIM Kick Off	Once, 15 days after design/preconstruction kickoff meeting	Stakeholder introduction. Confirm requirements and expectations.
BIM Progress Review	Monthly or by milestone	Review models progress and BIM coordination status; discuss outstanding BIM issues
BIM Submission Review	Monthly or by milestone	Discuss submission results / compliance.
BIM Close-out	Once, at completion of the Work after final deliverables have been reviewed	Discuss final BIM submission of Final design/As-Constructed Model and ensure completeness

3.4 DOCUMENT MANAGEMENT

3.4.1 FOLDER STRUCTURE

Consultants shall adhere to the folder structure requirement. Go to:

- Section 1.5.3 of the **CAD** Standard
- Section 6.2 of the **BIM** Standard

3.4.2 STANDARD NAMING CONVENTION

All electronic project information should be named following the Authority’s standard naming conventions. To find the standard naming convention go to:

- Section 1.5.5 of the **CAD** Standard
- Section 4.0 of the **BIM** Standard

3.4.3 ELECTRONIC SUBMITTALS

All project-related files must be submitted to E-Builder, Livelink or the nominated project/program Project Management Information System (PMIS).

Under the instruction of the PANYNJ Virtual Design and Construction (VDC) Group, the project must be hosted on Autodesk Construction Cloud for cross-collaboration use during the project lifecycle. Refer to BIM Standard Section 3.5 for specific instructions.

3.5 INFORMATION SECURITY

Refer to the [Protected Information Practices and Procedure Manual](#).

NOTE: For internal use only.

4.0 TECHNICAL REQUIREMENTS

This section applies to **BIM** and **CAD** users.

4.1 SOFTWARE

The Authority has adopted the following relevant software applications:

Table 4.1-A Software Applications

Data Authoring *Specialist tools to be used where appropriate
Autodesk Revit 2022
Autodesk Civil 3D 2022
Autodesk AutoCAD 2022
Autodesk MAP 3D 2022
Data Capture
Autodesk ReCap Pro
Data Exchange
eBuilder *project specific
LiveLink
Autodesk Construction Cloud
Data Assurance
<i>To be confirmed</i>
Data Analysis
Autodesk Navisworks Manage 2022
Synchro Pro
Primavera P6
Data Visualization
Microsoft Power BI
Asset Information Management
IBM Maximo

4.2 TEMPLATES

The following templates shall be used:

Table 4.2-A Templates

Name	Type	Purpose
Autodesk AutoCAD Templates	Template	Ensure consistent content creation
Autodesk Revit Templates	Template	Ensure consistent content creation
Autodesk Navisworks Templates	Template	Ensure consistent content creation
BIM Progress Report	Template	Ensure consistent content creation
BIM Execution Plan Templates	Templates	Ensure an agreed, executable plan.

4.3 COORDINATES AND GEOGRAPHIC INFORMATION SYSTEM

For all Authority projects the default horizontal coordinate systems are:

- NAD83 New York State Planes, Long Island, US Foot for all projects in NYC
- NAD83 New York State Planes, East Zone or New Jersey State Planes, US Foot where appropriate.

The default vertical system is the State Plane NAVD 88 system.

The project coordinate system will be established in the **BIM** site model file provided by the Authority.

4.4 QUALITY CONTROL

In every milestone/submission, files will be audited for BIM and CAD compliance. The Project team shall make the necessary changes, identified in the audit, to comply with Authority BIM and CAD Standards.

Refer to **BIM** Standard section 8.0 BIM review process and **CAD** Standard section 1.11 Compliance CAD Standards Report.

The Port Authority will have one week to review the interim or monthly submissions, Consultant/Contractor shall incorporate required comments before the following submission. During Final submissions two weeks will be taken to perform the review, and the Consultant/Contractor shall have three weeks to incorporate all comments to the satisfaction of the Authority.

APPENDIX A: GLOSSARY OF DELIVERABLES

Deliverable	Description
Site Model	This file holds the project coordinate system and controls the location, rotation, and elevation of all Revit-based Models linked to it. All Discipline models must link the SM by Shared Coordinates.
Design Model	Digital 3D representation of the design at preliminary and final design stage containing information to a level of development as defined in the Information Delivery Plan's model development specification. The Consultant shall ensure that the final Design Intent Model is used to produce the Detailed Contract Drawings.
Site Context Model	Digital 3D representation of the Work containing information regarding Construction activities other than the finished and final work (e.g. Fencing, Traffic Control where applicable, excavation works, Job trailer location, crane positions, etc.). The Site Context Model shall be a subcomponent of the Construction Model and shall be closely related to the Progress Schedule so that it also serves as a useful site planning and risk management tool.
Construction Model	The Contractor shall prepare a Construction Model developed from and based on the Contract Drawings and submit it to the Engineer for review. Model shall be the primary reference for production and coordination of Shop Drawings submitted by the Contractor . The Construction Model shall be tied into the 4D Model and developed into the As-Constructed Model.
4D Model	Not later than the date established at the initial BIM meeting (which shall be not later than 90 calendar days after the initial BIM meeting), the Contractor/Consultant shall prepare and submit a 4D Model and 5D Model to the Engineer for review. If an approved Baseline Schedule is not available at the time of submission, the Contractor/Consultant shall provide a 4D and 5D Model representing schedule and cost based on the draft schedule.
As-Constructed Model & Point Cloud Data	Prior to issuance of the Certificate of Final Completion, the Contractor/Consultant shall submit for review and approval, all as-constructed model and ancillary data in accordance with the agreed project submittal schedule.
As-Constructed Data	Prior to issuance of the Certificate of Final Completion, the Contractor/Consultant shall submit for review and approval, all as-constructed data in accordance with the agreed project submittal schedule.