

# Building Information Modeling Standard

*Last Updated: 01/31/2024  
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## STANDARD CHANGES

### DECEMBER 2023

SECTION	DESCRIPTION
1.4 Acronyms and Abbreviations	Section was relocated and acronyms were added.
2.0 VDC Engagement	Section name changed from BIM Workflows to VDC Engagement. Content within Section was re-organized.
2.2 BIM Objectives	Sub-Section was added.
2.3 BIM Dimensions Applications	Image updated.
2.4 BIM Models Expectations	Image updated.
2.5 BIM Models Lifecycle	Image updated.
2.6 VDC Roles and Responsibilities	Sub-Section was added
5.2 Files Ownership	Section title changed
5.4 Information Delivery Plan	Old "Level of Development", section renamed and new subsections and information added.
6.3 Design Site Model	Section updated.
7.8 Reality Capture	Section Updated.

### JANUARY 2024

SECTION	DESCRIPTION
8.6 BIM – BIM Execution Plan Report	New Section added
7.8 Reality Capture	Workflows images have been added

## DOCUMENT OWNERSHIP

Questions regarding the Authority's BIM Standards shall be directed to the Engineering Project Controls - VDC Support Group at:

Port Authority of NY & NJ  
 4 World Trade Center, 19th Floor  
 New York, NY 10007  
 212-435-6102  
[engvdc@panynj.gov](mailto:engvdc@panynj.gov)

## 1.0 INTRODUCTION

### 1.1 PURPOSE

The Building Information Modeling (BIM) Standard introduces the information, management, and technical specifications to support the implementation of Building Information Modeling (BIM) for The Port Authority of New York & New Jersey (“Authority”). The Authority’s BIM Standards 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 as shown in the Table below:

Table 1-1 - Associated Materials

DOCUMENT	TYPE	PURPOSE
<a href="#">VDC Requirements</a>	Requirements	Details the requirements to support, produce, collect, and analyze CAD and BIM data on projects that is consistent, relevant, and high quality.
<a href="#">CAD Standard</a>	Standard	Establishes requirements and procedures for the preparation and milestone submissions of CAD based drawings throughout Design.
<a href="#">Information Delivery Plan</a>	Specification	Details the technical BIM data requirements to be consistent, relevant, and high quality for BIM projects.
<a href="#">VDC Support files</a>	Document Templates, Software Templates, Content Library for CAD and BIM, Guidelines, others.	Provides base documents, templates, standardized content to support consistency during projects development.

### 1.2 DOCUMENT HIERARCHY

Error! Reference source not found. shows the document hierarchy adopted by VDC.

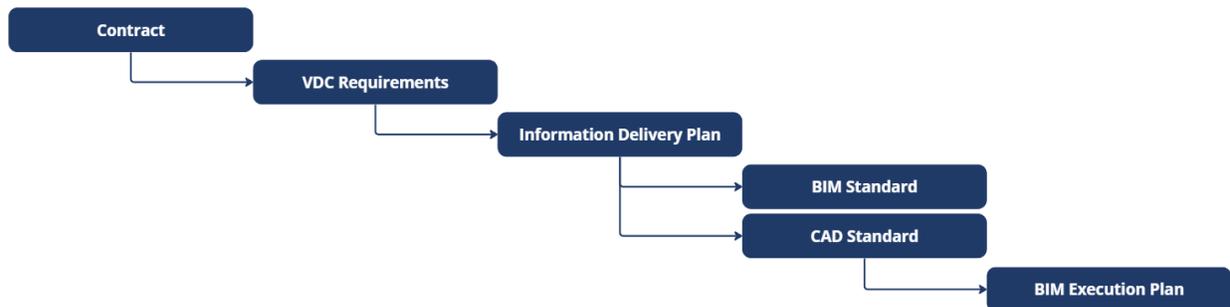


Figure 1 - Document Hierarchy

### 1.3 APPLICABILITY

The Port Authority operates an exception to the rule policy meaning that BIM applies to all projects unless specifically stated otherwise. This standard covers the entire project life cycle.

## 1.4 ACRONYMS AND ABBREVIATIONS

Table 13-2 - Acronyms

ACRONYMS	DESCRIPTION
<b>BEP</b>	BIM Execution
<b>BIM</b>	Building Information Model
<b>CAD</b>	Computer Aided Design
<b>C</b>	Confidential
<b>C3D</b>	Autodesk AutoCAD Civil 3D
<b>CM</b>	Construction Model
<b>CMD</b>	Construction Management Division
<b>CN</b>	Contract Number
<b>CP</b>	Confidential Privileged
<b>DB</b>	Design Build
<b>DBB</b>	Design Bid Build
<b>DWG</b>	AutoCAD drawing file
<b>EADD</b>	Engineering Architecture Design Division
<b>EAM</b>	Enterprise Asset Management
<b>FIM</b>	Facility Information Model
<b>IDP</b>	Information Delivery Plan
<b>IPD</b>	Integrated Project Delivery
<b>LEA</b>	Lead Engineer Architect
<b>LOD</b>	Level of Development
<b>NWC</b>	Autodesk Navisworks Cache files
<b>NWD</b>	Autodesk Navisworks Document fil
<b>NWF</b>	Autodesk Navisworks Federated file
<b>PC</b>	Point Cloud
<b>PID</b>	Project Identity Number
<b>PIM</b>	Project Information Model
<b>PWS</b>	Project Website
<b>RCP</b>	Autodesk ReCap
<b>RE</b>	Resident Engineer
<b>RFA</b>	Autodesk Revit Family
<b>RVT</b>	Autodesk Revit
<b>RTE</b>	Autodesk Revit Template
<b>SCM</b>	Site Context Model
<b>SM</b>	Site Model
<b>TL</b>	Task Leader
<b>VDC</b>	Virtual Design and Construction
<b>WCS</b>	World Coordinates System

## 2.0 VDC ENGAGEMENT

This section describes The Port Authority of NY & NJ BIM Project Workflow based on Agency BIM Master Plan.

### 2.1 PANYNJ PROJECT STAGES

The phases indicated in the table below relate directly to distinct Stages of a BIM project’s lifecycle development at The Port Authority of NY & NJ.

Table 2-1 - BIM Project Phases

BIM PHASE	PANYNJ STAGE	DESCRIPTION
Conceptualization & Analysis	Stage I	Conceptual Design
Design & Documentation	Stage II	Preliminary Design
	Stage III	Final Design
Management & Construction	Stage IV	Construction
Maintenance & Operations	Stage V	Project Closeout

### 2.2 BIM OBJECTIVES

The Authority’s strategic objectives, relative to these Standards, 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:

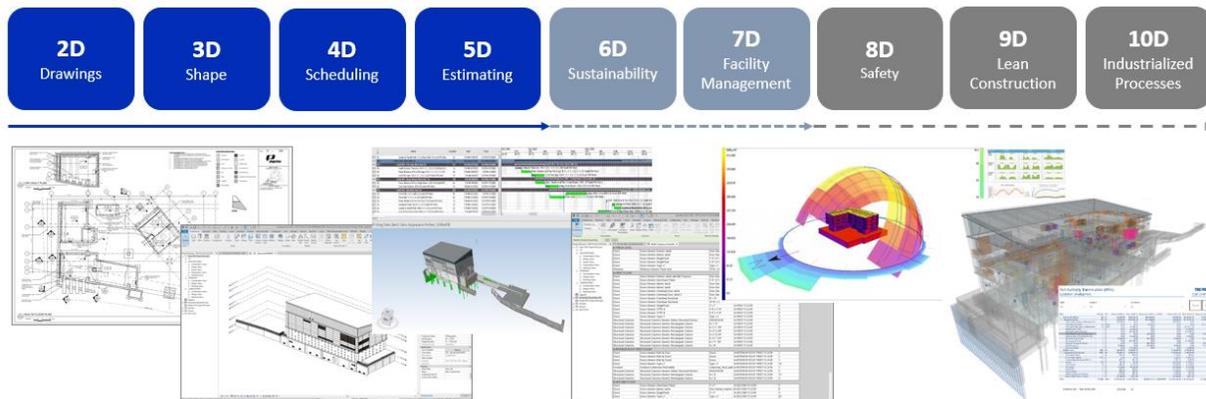


Figure 2 VDC Dimensions

- 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.

## 2.3 BIM DIMENSIONS APPLICATIONS

	PRE-STAGE I / STAGE I	STAGE II / STAGE III	STAGE IV	STAGE V
STAGE DEFINITION	Order of Magnitude / Conceptual Design	Preliminary Design / Final Design	Construction	Project Closeout
BIM APPLICATIONS	<b>2D</b> Preliminary Drawings.	<b>2D</b> Construction Drawings.	<b>2D</b> As-Built Drawings.	<b>2D</b> Record Drawings.
	<b>3D</b> Advanced visualization for design development, review and coordination.	<b>3D</b> Advanced visualization for design development, review and coordination.	<b>3D</b> Advanced visualization for design development, review and coordination.	<b>3D</b> As-Constructed model.
	<b>4D</b> Pre-Construction sequencing visualization.	<b>4D</b> Pre-Construction sequencing visualization.	<b>4D</b> Scheduling, field coordination and logistics management.	
	<b>5D</b> Quantity take off and Cost estimating.	<b>5D</b> Quantity take off and Cost estimating.	<b>5D</b> Quantity take off and Cost Simulation.	
		<b>6D</b> Sustainability Reporting.		
BIM USES	<ul style="list-style-type: none"> <li>• Capture Existing Conditions</li> <li>• Development of Stage I Report</li> <li>• Cost Estimation</li> <li>• Phase Planning</li> <li>• Site Analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Design Review &amp; Authoring</li> <li>• Code Validation</li> <li>• Design Coordination</li> <li>• Constructability Review</li> <li>• Cost and Schedule Forecast</li> <li>• Site and Logistics planning</li> </ul>	<ul style="list-style-type: none"> <li>• Construction Coordination</li> <li>• Digital Fabrication</li> <li>• Schedule Planning and Control</li> <li>• Cost Tracking and Control</li> <li>• Site and Logistics planning</li> <li>• Quality Assurance and Control</li> <li>• As-Built documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Model</li> <li>• Maintenance Schedule</li> <li>• Facility / Asset Management</li> </ul>

Figure 3 - BIM Dimensions Uses through Project Stages

2.4

2.4 BIM MODELS EXPECTATIONS

	PRE-STAGE I / STAGE I	STAGE II	STAGE III	STAGE IV	STAGE V
MODEL NAME	Conceptual Design Model	Preliminary Design Model	Final Design Model	Construction Model As-Constructed Model	Operations Model
MODEL DESCRIPTION	The <b>Conceptual Design Model</b> captures conceptual 2D drawings, 3D geometry and informational data that can be useful for the project conceptual design feasibility and early construction schedule (4D) and cost (5D) estimation.	The <b>Preliminary Design Model</b> captures preliminary 2D drawings, 3D geometry and informational Asset data (7D) that can be useful for the project design feasibility and early construction schedule (4D) and cost (5D) estimation. This model should also incorporate Asset data that would be useful in the future.	The <b>Final Design Model</b> captures final 2D drawings, 3D geometry and informational Asset data (7D) that can be useful for the development of project Contract drawings, detailed specifications, plan construction schedule (4D) and cost (5D) estimation. This model should also incorporate Asset data that would be useful in the future.	The <b>Construction Model</b> captures 3D geometry that is fully coordinated in order to detect any Design issues that would need to be addressed as PACCs. The model also contains schedule (4D) information to support construction progress validation.  The <b>As-Constructed Model</b> captures 3D geometry that is fully coordinated and representing the construction conditions plus Asset data that will be used to support asset maintenance and facility operations.	The <b>Operations Model</b> is the final version of the As-Constructed model, which represent the Constructed conditions and contains the Asset information to support the facility future Design changes and Operations.
GENERAL STAGE DELIVERABLES	<ul style="list-style-type: none"> <li>List of Assumptions.</li> <li>Presentations, Drawings, Renderings and/or Model</li> <li>List of ADS asset classes related to the project Order-of-Magnitude Construction Cost Estimate.</li> <li>Any item(s) necessary from Stage I deliverables.</li> <li>Stage I Report</li> <li>Stage I Estimate</li> <li>Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Final Design Criteria</li> <li>Preliminary Design Drawings</li> <li>ADS Asset List and Asset Data template</li> <li>Preliminary List of Specifications</li> <li>Preliminary Design Construction Cost Estimate and Duration</li> <li>Stage II Preliminary Design Schedule</li> <li>List of as-needed deliverables required for the project</li> </ul>	<ul style="list-style-type: none"> <li>Contract Drawings &gt; Signed and/or sealed drawings.</li> <li>Contract Book &gt; Terms and conditions + applicable technical specs required for bidders.</li> <li>ADS Asset List and Asset Data template.</li> <li>Final Construction Cost Estimate</li> <li>Updated LD approved engineering proposal, accounting for any scope or schedule changes schedule for Stage IV.</li> <li>QA/QC Documentation.</li> <li>A list of required contractor submittals and anticipated long lead items to be provided to the RE.</li> </ul>	<ul style="list-style-type: none"> <li>Approved submittals such as shop drawings, catalog cuts, calculations, etc.</li> <li>Reviewed Asset Data Submittals</li> <li>LD Signed Construction (PA 923) Completion Notice - Dated documents that identify portions of work that have been completed (partial completion) or that all construction has been completed (final completion) and accepted by the facility.</li> <li>Permit to Occupy or Use - Allows the facility to use the contract work.</li> <li>Drawing(s) of Record (DoRs)—Bid Set plus Addendum Drawings, issued PACC drawings, Approved Submittals, Final Shop Drawings, and Utility Record Drawings.)</li> <li>Additional documents.</li> </ul>	<ul style="list-style-type: none"> <li>Completion of Work Memorandum.</li> <li>Certificate of Final Completion.</li> <li>Drawing(s) of Record.</li> <li>Final Asset Data Submittals (Refer to the Contract Asset Data Submittal section for the detailed overview).</li> <li>Contract Closeout Package.</li> <li>Preparation of Property Breakdown &amp; Retirement (PBR) report.</li> </ul>

Figure 4 - BIM Models Expectations

## 2.5 BIM MODELS LIFECYCLE

This graphic represents the process of creating, utilizing, and maintaining the building information. There are 3 major phases throughout the life of a project: Design, Construction, and Operations and Maintenance. All of them supported by a series of documents throughout the life cycle of a Project.

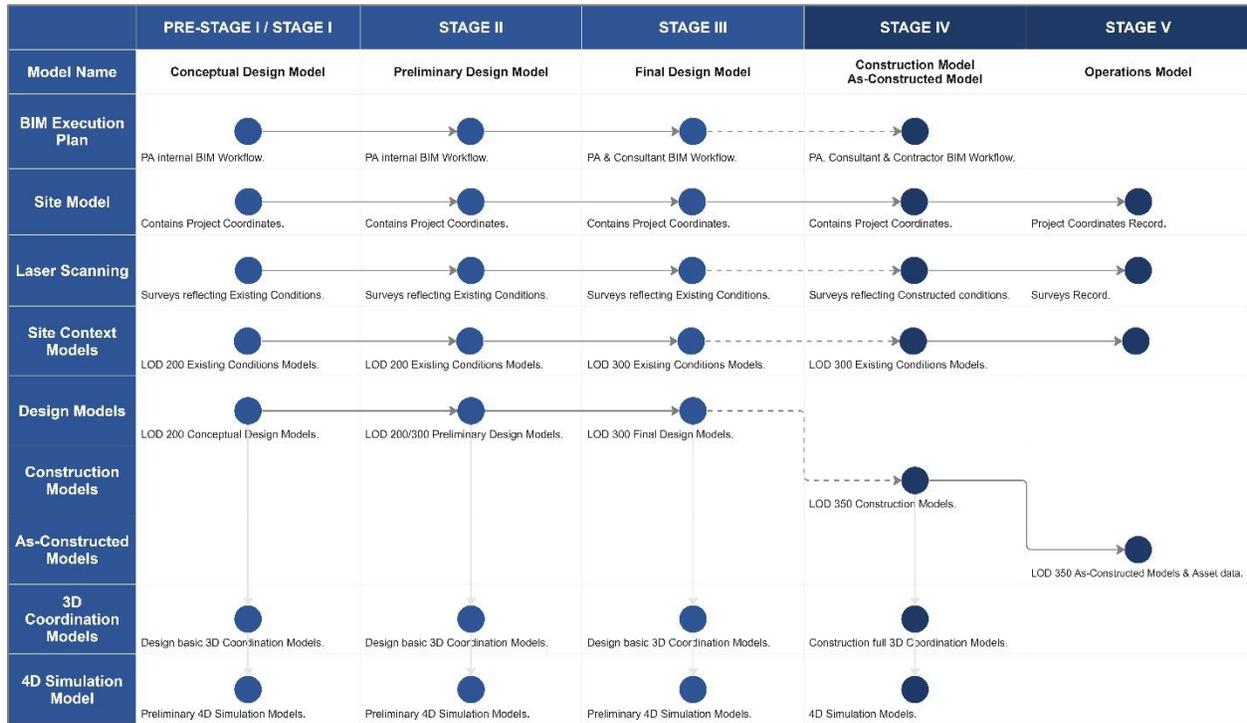


Figure 5 - BIM Models Lifecycle

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 Consultant/Contractor of their sole responsibility for verifying accuracy of conditions indicated within these files.

## 2.6 VDC ROLES AND RESPONSIBILITIES

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

- VDC Manager
- VDC Engineer

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.

### 3.0 VDC CONTENT MANAGEMENT

The Authority VDC Standard, Guidelines, Supporting Documents, Templates & Training content can be found in different locations depending on who is accessing the information:

**PANYNJ** Link for internal Staff:

[VDC SharePoint Site](#)

**Consultant/Contractor** Link for external Users:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\)](#)

### 3.1 VDC DOCUMENTS AND SUPPORT FILES

Table 3-1 –Documents and Content

VDC Documents > 01. Delivery	
Requirements	Contains the “VDC Requirements”.
Standards	Contains the “BIM Standard & CAD Standard”.
VDC Documents > 02. Development > 2022 > Content > Revit > Families	
All Disciplines	Contains all cross-discipline support files and content.
<Discipline>	Contains all discipline specific support files and content.
Lookup Tables	Includes the support files for Conduits and Pipes.
VDC Documents > 02. Development > 2022 > Content > Revit	
Borders	22x34 and 34x56 borders for PA Contract, Presentation, Report and Title sheet drawings.
Stamps	-Law Review, Preliminary, Quality Assurance and Percent submission stamp for use on borders. -Confidential Privileged Warning sign for use on stamp for use on borders for CP drawings. -Confidential stamp for use on borders for C drawings. -One and Multiple consultant company providing NJ & NY PE signatures on drawings. -One and Multiple consultant company providing NJ & NY RA signatures on drawings.
VDC Documents > 02. Development > 2022 > Folder Structure	
Folder Structure	Includes the Folder Structure templates to address both the Central File and the Local File.
VDC Documents > 02. Development > 2022 > Software Templates > Revit	
Revit Templates	Includes the discipline-specific template files for the Architectural, Electrical, Mechanical, and Structural disciplines.
Shared Parameters	Includes the Port Authority of NY & NJ custom Parameters file “PA-VDC-DB-RVT-X-GN-SharedParameters.txt”.
VDC Documents > 02. Development > 2022 > Document Templates	
Other templates	Includes BIM Execution Plans, BIM Progress Report and BIM Coordination Clash Report templates.

### 3.2 BIM EXECUTION PLAN (BEP)

At the start of every BIM project, a BEP must be submitted to the Port Authority VDC Support Group.

Refer to [Appendix C: BIM Execution Plan](#) for each Stage BEP Template.

Once approved by the Authority, BEP shall become the ultimate compendium on BIM requirements, methodologies, and workflow for a specific project.

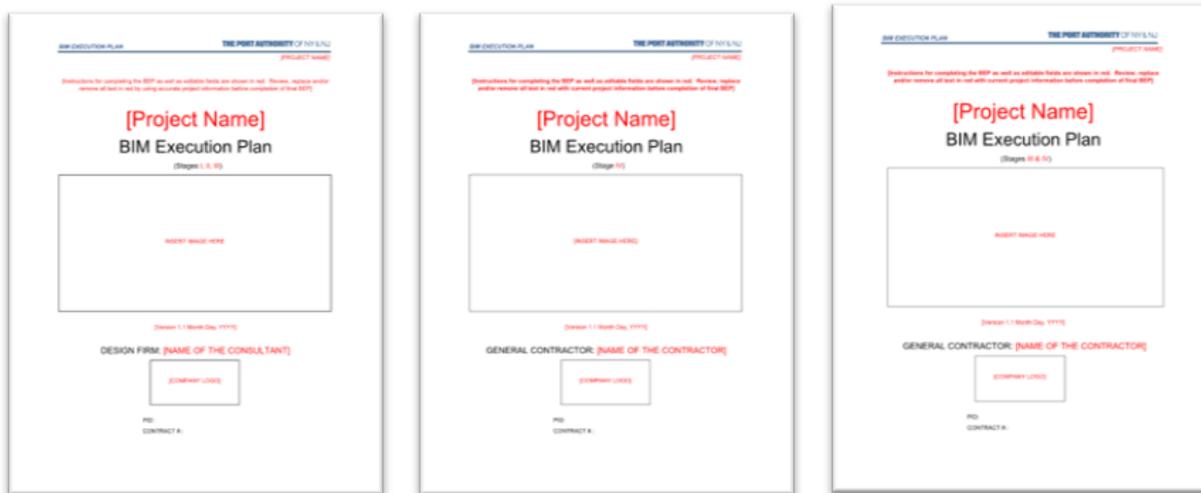
The BEP is considered a “living” document, in the sense that it will likely be updated throughout the project. Situations that may trigger a revision on the BEP by the Contractor include, but are not limited to:

- Changes in Staff, that directly affect the BIM processes and/or deliverables
- Changes in processes
- Changes in requirements
- Changes in BIM Schedule (Coordination sign-off dates, LOD milestones, etc.)
- Any other requirement specified by the Port Authority

Depending on who is accessing the information, the files can be accessed using the following links:

Internal Link:

[VDC Documents > 02. Development > 2022 > Document Templates > BIM Execution Plan](#)



- PA-VDC-TP-DOC-X-GN-BIMExecutionPlan\_Construction
- PA-VDC-TP-DOC-X-GN-BIMExecutionPlan\_Design
- PA-VDC-TP-DOC-X-GN-BIMExecutionPlan\_Design-Build

Figure 3-1 – BIM Execution Plan templates

External Link:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)

### 3.3 REVIT TEMPLATES

To promote consistency in the Revit models created, the PANYNJ has available Revit templates which contain several predefined Supporting Legends, Starting View, Project Browser, Shared Parameters, Loaded families, View templates, defined settings such as units, fill patterns, line styles, line weights, scales, text, dimensions, among others.

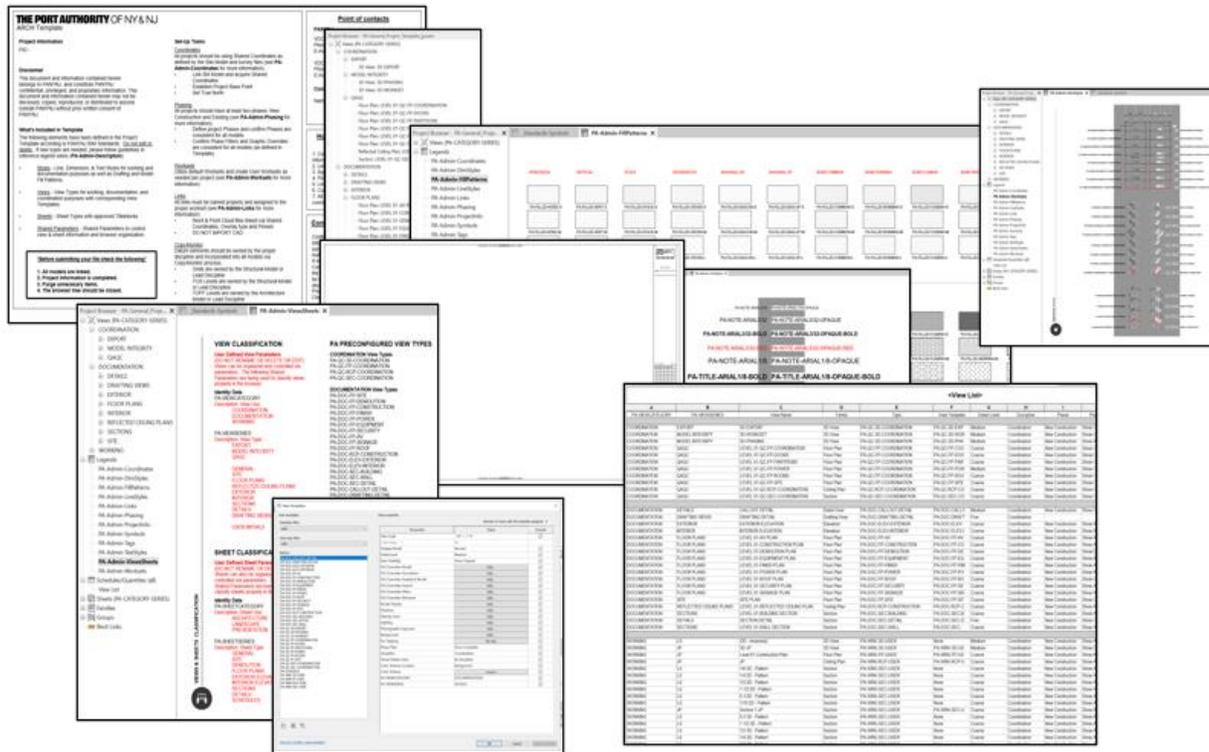


Figure 2 - Revit Templates Content

As to prevent the use of un-licensed fonts, all Port Authority of NY & NJ Text Styles, Dimension Styles, Leaders, Tags and Content have been defined using Arial Font.

All Revit projects must be created using the provided templates and version, which are:

- PA-TP-RVT-GN-2022-v1
- PA-TP-RVT-A-2022-v1
- PA-TP-RVT-MEP-2022-v1
- PA-TP-RVT-ST-2022-v1

Do not alter the settings within the Template Files. If needed, changes will be discussed and approved by the VCD Group. All specific requirements should be defined in the project BEP.

### 3.4 REVIT LIBRARY

#### 3.4.1 LOADABLE FAMILIES

The Port Authority of NY & NJ BIM Standard Templates includes System Families, such as Columns, Beams, Walls, Roofs, Ceilings, Floors, etc. Users can customize this content as per project needs.

The Content folder contains 2D detail components, tags, and symbols as well as 3D families. The library holds multi-discipline families to make the modeling process and drawings development easier and more efficient.

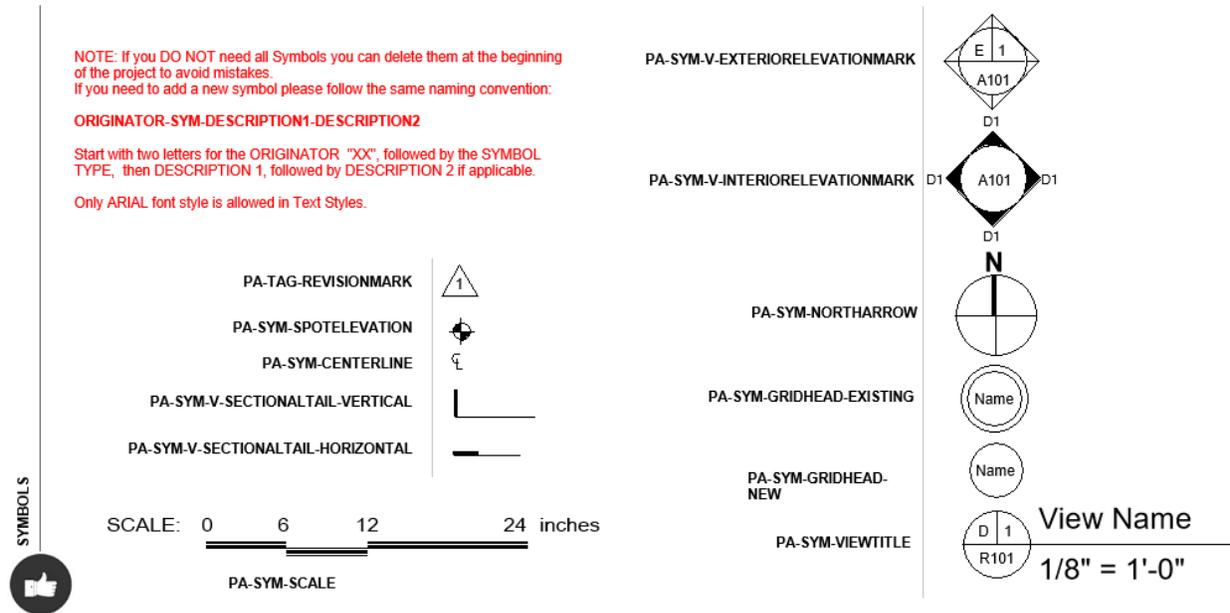


Figure 3 - Revit Annotation Families example

Depending on who is accessing the information, the files can be accessed using the following links:

Internal Link:

[VDC Documents > 02. Development > 2022 > Content > Revit > Families > Annotation](#)

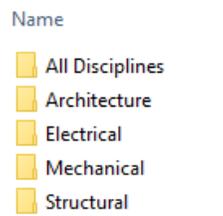


Figure 4 - BIM Content Library Folder Structure

External Link:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)

### 3.4.2 TITLESHEET & CONTRACT BORDER

All project sheets must be created using one of the Title-Sheet and Contract Border provided as part of the shared content. Images showing the official Port Authority of NY & NJ Title Sheets and Contract



Figure 5 - Title Sheet Engineering 22x34



Figure 6 - Title Sheet PATH 22x34

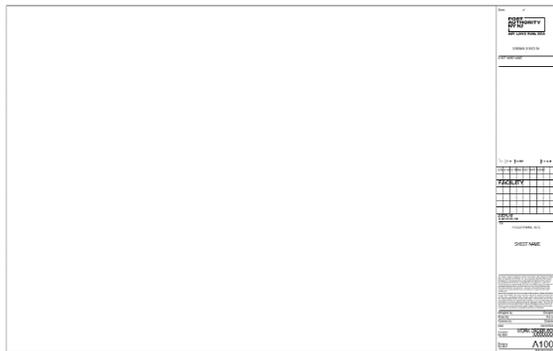


Figure 7 - Contract Border Engineering 22x34

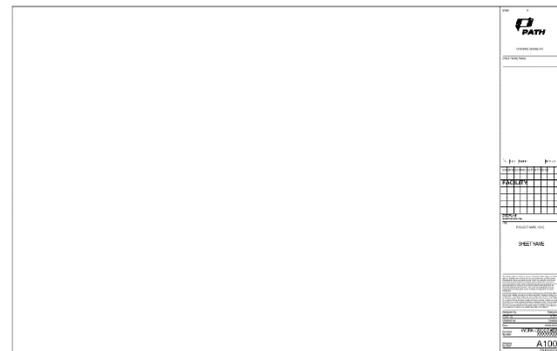


Figure 8 - Contract Border PATH 22x34

Depending on who is accessing the information, the files can be accessed using the following links:

Internal Link: [VDC Documents > 02. Development > 2022 > Content > Revit > Borders](#)

- Name
- PA\_Logo\_2020
  - PA-TB-CONTRACTBORDER-22X34
  - PA-TB-CONTRACTBORDER-34X56
  - PA-TB-PRESENTATIONBORDER-22X34
  - PA-TB-PRESENTATIONBORDER-34X56
  - PA-TB-REPORTBORDER-22X34
  - PA-TB-REPORTBORDER-34X56
  - PA-TB-SKETCHBORDER
  - PA-TB-TITLESHEET-22X34
  - PA-TB-TITLESHEET-34X56

Figure 9 - Contract Borders Folder

External Link: [Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)

### 3.4.3 STAMPS

Submission stamps have been provided to be included as part of the Contract Border. The following submission types have stamps provided with this standard:

- Law-Review
- Preliminary
- QA-Submission
- Percent Submission
- As-Constructed

**Signature stamps** have been provided for both the New York and New Jersey Professional Engineer and Registered Architect and are to be used by outside consultants in-lieu of Consultant Logos.

**Confidential Privileged Stamps** have been provided be included as part of the Contract border on each individual sheet unless the entire project is considered Confidential and Privileged, in which case the stamps can be placed within the Contract Border.

All stamps should be inserted as families within the Contract Border.

Depending on who is accessing the information, the files can be accessed using the following links:

Internal Link:

[VDC Documents > 02. Development > 2022 > Content > Revit > Stamps](#)

External Link:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)

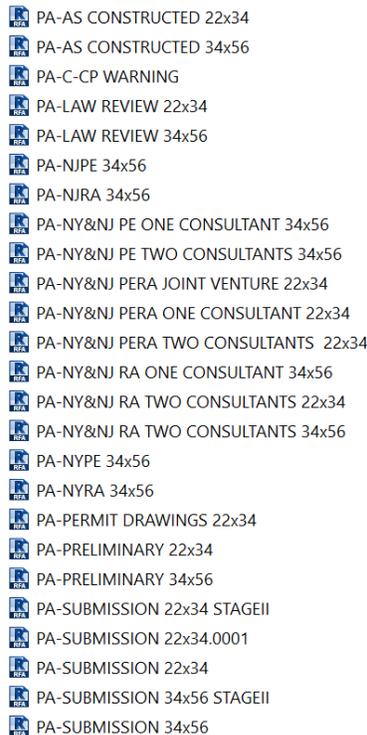


Figure 10 - Stamps

### 3.4.4 STANDARD DETAILS

For the purpose of facilitating the drawing development during Design, 2D Standard details have been created for Architecture, Electrical, Mechanical and Structural disciplines.

All details have been saved within each discipline Revit file, in case used those should be transferred to the Project file. It is important to clarify that these details have been developed to be used as a starting point and need to be modified to adjust the project needs.

Both AutoCAD and Revit files and are available for Port Authority E/A Design Division in the [EADD Standards Center](#) SharePoint Site as well as VDC SharePoint Site.

Internal Link:

[VDC Documents > 02. Development > 2022 > Content > Revit > Standard Details](#)

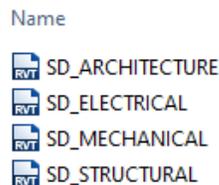


Figure 11 - Standard Details Revit files

### 3.3.5 CREATING CONTENT

When creating new Revit Content, the following practices must be considered:

- Revit Families must be created using family templates (by category)
- PA-Linestyles must be used.
- Arial Font must be used if creating an annotation family.
- Revit families cannot exceed a file size of 3 megabytes (MB). Limiting the file size helps manage project file sizes and ensures that families are optimized for performance.
- Revit families are not allowed to contain DWG files as nested components. This restriction is in place to maintain consistency, avoid potential issues with file compatibility or versioning, and encourage the use of native Revit elements.

## 3.5 AUTODESK CONSTRUCTION CLOUD

The Port Authority of NY & NJ VDC Standard provides a structure for the organization of projects hosted on Autodesk Construction Cloud.

A folder structure shall be created that is similar with the PA internal drives. The folder structure is created by the VDC Engineer using a Template with permissions and roles set up for consistency.

For more information, refer to [Autodesk Construction Cloud Guideline](#).

#### **NOTE:**

The Authority has also developed a SharePoint page dedicated to this topic, for PA users: [AUTODESK CONSTRUCTION CLOUD](#)

## 4.0 NAMING CONVENTION

All electronic project files should be named following The Port Authority of NY & NJ BIM Standard Naming Conventions.

### 4.1 FILES NAMING CONVENTION

As a general rule, the filenames should take the form of:

DPID–SN/DT/MT–DESCRIPTION

*Table 4-1 - File naming convention*

ITEM	DESCRIPTION
D	Discipline Code
PID	Eight-digit PID Number
DT/SN/MT (Optional*)	Drawing Type / Sequence Number / Model Type (Drawing Type or Two-digit consecutive numbers starting with 01)
DESCRIPTION (Optional*)	Brief User Description (up to 24 characters) The following characters should not be used as part of the description: @ \$ % ^ & < > / \ " ' ; : ? *   , ' ,

**NOTE:**

Optional\*: Meaning one of the two should be used, either DT/SN/MT or DESCRIPTION or both.

#### 4.1.1 DISCIPLINE CODES

There are nine disciplines within The Port Authority of NY & NJ Engineering Department. All electronic files should be named using the appropriate Discipline Code based on the following table:

*Table 4-2 - Discipline Codes*

DISCIPLINE CODE	DISCIPLINE NAME
A	Architectural
C	Civil
E	Electrical
N	Environmental
G	Geotechnical
M	Mechanical
S	Structural
T	Traffic
R	Resilience and Sustainable Design

## 4.1.2 MODEL TYPES CODES

Table -3 - Model Type Codes

MODEL TYPE CODE	DESCRIPTION
<b>GENERAL</b>	
GN	General Model
EC	Existing Conditions Model
SM	Site Model
PC	Point Cloud Model
RM	Removal
BR	Bridges
PBB	Pedestrian Boarding Bridges
TR	Terminal
UT	Utilities
3D	3D Coordination Model
4D	4D Simulation Model
<b>ARCHITECTURAL</b>	
SC	Site Context Model
CNP	Canopy
CW	Curtain Wall
FFE	Furniture Fixtures and Equipment
CR	Core
SH	Shell
<b>ELECTRICAL</b>	
CP	Corrosion Protection
ES	Electronics
FP	Facility Power
LG	Lighting
SA	SCADA
SG	Signage
TP	Traction Power
<b>MECHANICAL</b>	
FP	Fire Protection
PL	Plumbing
BH	Baggage Handling
HVAC	Heating, ventilation, and air conditioning
<b>STRUCTURAL</b>	
SS	Superstructure
SB	Substructure

### 4.1.3 REVIT CENTRAL FILES

By default, each discipline should have their own Discipline Central Model but, for certain projects, a Discipline’s work may be divided into several models. This could happen with large projects where the file size would otherwise generate an issue or when there is a need to create separated Revit models by sub-discipline or by areas. Once defined, the Central File name should not change through the project lifecycle.

If a Discipline only has one Model file, the “GN” (General) Type Code shall be used.

File names should take the form of:

DPID-MT\_CENTRAL.rvt

Table 4-4 - Revit Model Naming Convention

ITEM	DESCRIPTION
D	Discipline Code
PID	Eight-digit PID Number
MT	Model Type Code. Refer to MT chart.
CENTRAL	This shall stay as is

**NOTE:**

The only model that shall not follow this convention is the Site Model, created and owned by the VDC Group, which should be name as: PID-SM.rvt

Example:

- Discipline: Architecture
- PID: 12345678
- Model Type: General

File name: A12345678-GN\_CENTRAL.rvt

### 4.1.4 3D COORDINATION FILES

3D Coordination filename should take the form of:

DPID-MT\_CENTRAL.nwc

PID-3D.nwd

ITEM	DESCRIPTION
D	Discipline Code
PID	Eight-digit PID Number
MT	Model Type Code. Refer to chart below.
3D	This shall stay as is

#### 4.1.5 4D SIMULATION FILES

4D Simulation filename should take the form of:

PID-4D.nwd, or PID-4D.sp, or PID-4D.avi

ITEM	DESCRIPTION
PID	Eight-digit PID Number
4D	This shall stay as is

#### 4.1.6 PLOTSHEET FILES

Plotsheet files should be generated out of the Revit Models in PDF format.

Name the Plotsheet files using this format:

DPID-DT-001\_###.pdf

*Table 4-5 - Plotsheet Naming Convention*

ITEM	DESCRIPTION
D	Discipline Code
PID	Eight-digit PID Number
DT	Drawing Type
001_###	First Sheet Number to Last Sheet Number

If Bluebeam Revu is being used, page labels should correspond to sheet numbers.

When using Series Numbers, either Option 1, Option 2 or Option 3 as described in [Section 4.3.2 Drawing Number](#), the PDF files should be named not only by grouping them together by Drawing Type but also by their Series Number.

For example:

The Architectural Group is creating a set of drawings using Option 1 (without using the Series Number), which include the General drawings (1 through 7), Architectural drawings (1 through 37), and Landscape drawings (1 through 11) for a project with a PID Number of 07963000, three multi-sheet files should be created and named as follows:

- A07963000-G001\_G007.pdf
- A07963000-A001\_A037.pdf
- A07963000-LS001\_LS011.pdf

### 4.1.7 AUTOCAD FILES

The filename should take the form of:

DPID–MTSN–Description.dwg

ITEM	DESCRIPTION
D	Discipline Code
PID	Eight-digit PID Number
MT	Model Type (refer to CAD Standard)
SN	Sequence Number (Drawing Type or Two-digit consecutive numbers starting with 01)
DESCRIPTION	Brief User Description (up to 24 characters)

### 4.1.8 POINT CLOUD FILES

The filename should take the form of:

PID\_SRN\*\_F\_DATE-CS\_Description.rcs

ITEM	DESCRIPTION
PID	Eight-digit PID Number
SNR*	Central Survey Request Number *Optional, applicable only if Survey is performed by CSG.
F	Facility
DATE	Scan Start Date (YYYYMMDD)
CS	Coordinate System ie: NJ83F
DESCRIPTION	Brief Description (up to 24 characters)

## 4.2 REVIT COMPONENTS NAMING CONVENTION

### 4.2.1 3D MODEL FAMILIES

The filename should take the form of:

CATEGORY-MANUFACTURER-DESCRIPTION.rfaZ

ITEM	DESCRIPTION
CATEGORY	Names the element that the family creates
MANUFACTURER	Manufacturer Name or the word “Generic”.
DESCRIPTION	A brief Description and/or a Model Number.

When naming Family files keep in mind the following:

- Use UPPERCASE throughout the entire family name.
- Keep file names as short as possible because they need to display in the Type Selector.
- Create a Type Catalog for Family files that contain five or more types.
- No spaces or dashes should be used in the manufacturer and/or description.
- When needed, abbreviate “IN” (inches), “FT” (feet) or use the type name for the description.

For example:

- WINDOWS-ANDERSEN-DOUNBLEHUNG400SERIES.rfa

#### **4.2.2 ANNOTATION FAMILIES**

Several standardized Annotation Families are provided with each of the PANYNJ project templates, and their names shall not be changed.

The annotation family name should take the form of:

CI-CATEGORY-DESCRIPTION1-DESCRIPTION2.rfa

CI: Company Initials (Originator)

SUBCATEGORY CODE	FAMILY SUBCATEGORIES
DI	Detail Items
PR	Profiles
SYM	Symbols Generic Annotations Callout Heads Section Heads Elevation Marks View Title
TAG	All Tags
TB	Title-Blocks

For example:

- PA-TAG-ROOF.rfa
- PA-SYM-VIEWTITLE.rfa
- PA-SYM-NORTHARROW.rfa

**NOTE:**

If additional (not existing within the template) styles are needed, those should be named following the existing styles naming convention, but instead of using “PA” use your company initials.

\*All text styles should use the Font Arial.

### 4.2.3 FAMILY TYPES

Types within a Family file should indicate the key differences or variations between the different Family options. Depending on the Family Component the Type names might take one of the following forms:

- Model or Series Number
- Value or Capacity
- WidthxDepthxHeight

When naming Family Type, keep in mind the following:

- Capitalize the leading letters in each portion of the Type Name (when applicable).
- When Types are named by size, use dimensions only.
- Keep file names as short as possible because they need to display in the Type Selector.
- Create a Type Catalog for Family files that contain five or more types.
- Special characters, like period or quotation marks, are allowed.

For example:

- WINDOWS-ANDERSEN-DOUBLEHUNG400SERIESARCHTOP.rfa
  - WA1832
- Plumbing Fixtures-Generic-OvalUndercounterSink.rfa
  - Standard Height
  - ADA Height

### 4.2.4 WORKSETS

All models are required to be workshared. Each model should have at least Workset 1 and Shared Levels and Grids.

When naming Worksets, the Port Authority of NY & NJ BIM Standard adopts different approaches based on the size and complexity of the project.

Worksets name should be defined based on their use.

#### 4.2.4.1 DEFAULT

These Worksets should not be renamed or deleted.

- **Workset 1:** Default Worksets to be used for all elements not specifically categorized in other Worksets. Workset 1 cannot be deleted or merged. Because it is the only workset with this stipulation, do not rename Workset 1.
- **Shared Levels and Grids:** Default Worksets to be used for all Levels, Grids, Scope Boxes, Reference Planes, and Work Planes.

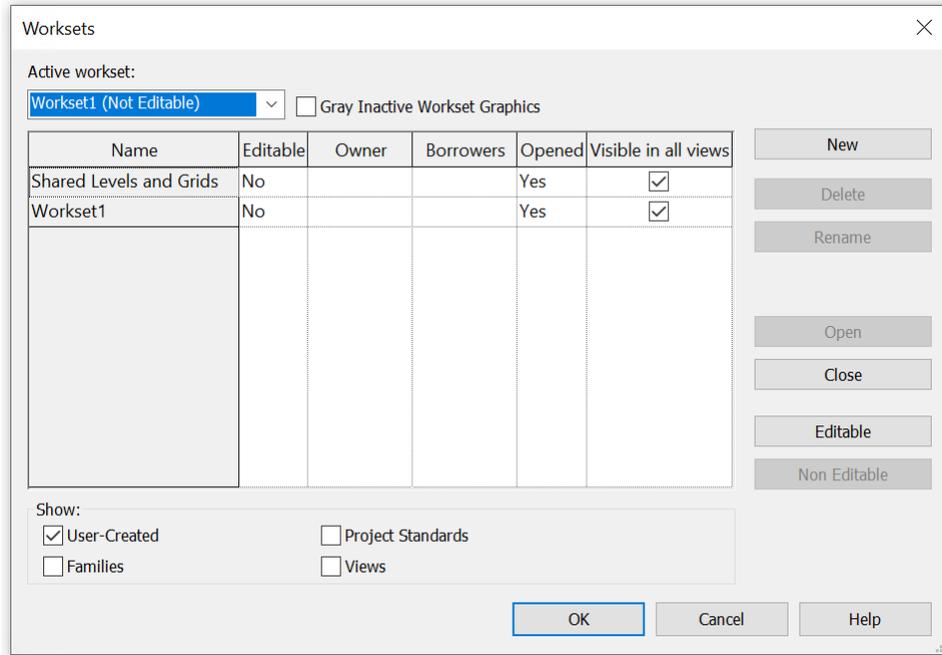


Figure 4-1 - Default Worksets

#### 4.2.4.2 LINKED FILES

Additional Worksets shall be created for linked files:

- CAD links
- Revit links (1 Workset per Discipline)
- Point Cloud links

Naming Convention for linked files should take format of:

LINK-DESCRIPTION

For example:

- LINK-CAD
- LINK-STRUCTURAL
- LINK-POINTCLOUD

#### 4.2.4.3 DISCIPLINE ELEMENTS

Additional Worksets to be created as needed by each discipline. The following factors should be considered when creating Worksets:

- Project and Team size
- Project typology
- Disciplines involved
- Shared elements between models (lighting, rooms, etc.)

Naming Convention for this type of Worksets should take format of:

D-DESCRIPTION

ITEM	DESCRIPTION
D	Discipline Code

For example:

- A-LIGHTING
- S-FOUNDATION
- M-PLUMBING

For large and/or complex projects, consider using the WHO-WHAT-WHERE logic for Worksets:

- A-EXTERIOR-LEVEL01
- M-EQUIPMENT-ZONEA
- S-FOUNDATION-EAST

4.2.4.4 WORKSET PROPERTIES

- **Active Workset:** The Worksets to which new elements are added when selected.
- **Editing & Ownership:** All Worksets have the ability to be edited, either by borrowing elements or checking out the entire Worksets. If a Workset is Editable, the Workset is checked out which removes editing capability for all elements on that Worksets from other users. If a Workset is non-Editable, the elements can be borrowed by other users as needed.
- **Open/Closed:** All Worksets have the ability to be closed which can improve model performance. If a Worksets is closed, you will not be able to see elements on that Workset in any view regardless of Visibility settings.
- **Visibility:** All Worksets have the ability to be shown in all or select views which can improve model performance.

4.2.5 VIEWS

The Views should take the form of:

TC-LEVEL/LOCATION/SEQUENCE-DESCRIPTION

Table 4-6 - Views Naming Convention

ITEM	DESCRIPTION
TC	View Type Code. Refer to chart below.
LEVEL/LOCATION/SEQUENCE (Optional*)	Level Number or Location or Sequence Number. (Two-digit integer)
DESCRIPTION (Optional*)	Brief User Description (up to 24 characters).

**NOTE:**

All View names must include a Level/Sequence number and / or Description.

For Example:

**Example including View Type, Level/Location/Sequence and Description:**

- FP-LEVEL 01-CONSTRUCTION PLAN
- FP-02-SECOND FLOOR
- SC-INTERIOR 01-ELECTRICAL ROOM

**Example including View Type and Level/Location/Sequence:**

- CP-03
- FP-LEVEL 01
- SC-INTERIOR 01

**4.2.5.1 VIEW TYPE CODES**

**General Type Codes:**

*Table 4-7 - View Discipline General Type Codes*

VIEW TYPE CODE	VIEW TYPE NAME
3D	3D Views
AP	Area Plans
BS	Building Sections
CP	Ceiling Plans
CS	Construction Staging or Construction Sequence
DL	Drawing List
DR	Drafting Views
DS	Detail Sections
DV	Detail Views
EE	Exterior Elevations
EP	Enlarged Plan
ES	Engineering Estimates
FE	Framing Elevation
FP	Floor Plans
IE	Interior Elevations
KL	Keynote Legend
LG	Legends
LP	Location Plan
MT	Material Takeoff
NB	Note Block
NO	General Notes
ON	One Line Diagram Plan
QP	Equipment Plan

RD	Riser Diagram
RO	Roof Plan
RP	Reports
SC	Sections
SL	Sheet List
SP	Site Plan
SQ	Schedule/Quantities
VL	View List
WT	Walkthroughs

Architectural Type Codes:

Table 4-8 - Architectural Type Codes

ARCHITECTURAL	
VIEW TYPE CODE	VIEW TYPE NAME
FU	Furniture Plan
SP	Signage Plan

Electrical Type Codes:

Table 4-9 - Electrical Type Codes

ELECTRICAL	
VIEW TYPE CODE	VIEW TYPE NAME
AC	Access Control Plan
AX	Auxiliary Power Plan
CM	Communication Plan
CO	Corrosion Protection Plan
FA	Fire Alarm Plan
GP	Grounding Plan
LI	Lighting Plan
LT	Lightning Protection Plan
NS	Network System Plan
PA	Public Address System Plan
PP	Power Plan
RS	Radio System Plan
SS	Security System Plan
TC	Telecommunication Plan
WD	Wiring Diagram Plan

Mechanical Type Codes:

Table 4-10 - Mechanical Type Codes

MECHANICAL	
VIEW TYPE CODE	VIEW TYPE NAME
CC	Control Schematic Plan
CD	Communication System Plan
CN	Control Plan
FP	Fire Protection Plan
FS	Fire Suppression Plan
HP	HVAC Ductwork Plan
MD	Machine Design Plan
MH	Material Handling Plan
PI	Piping Plan
PL	Plumbing Plan
SI	Specialty Piping Plan
SK	Sprinkler Plan

Structural Type Codes:

Table 4-11 - Structural Type Codes

STRUCTURAL	
VIEW TYPE CODE	VIEW TYPE NAME
CF	Concrete Framing Plan
DP	Decking Plan
FD	Foundation Plan
FR	Framing Plan
GC	Graphical Column Schedule
J L	Joist Girder Load Diagram
PP	Precast Panel Plan
RE	Reinforcement Plan
SF	Stair Framing Plan
ST	Steel Framing Plan
TB	Truss Bracing Plan
WG	Wind Girt Plan
XB	X Bracing Plan

#### 4.2.6 LEVELS

At the beginning of each project, the lead discipline will determine the Master Level Names that will be used for all Disciplines of the project.

The Levels should take the form of:

DESCRIPTION-LEVEL

Table 4-12 - Levels Naming Convention

ITEM	DESCRIPTION
DESCRIPTION	Level Description / Level Number
LEVEL	This shall stay as is

**NOTE:**

Once defined by the lead discipline, all other disciplines should follow the same naming convention. As a general rule, Architecture should define the TOFF Levels (Top of Finish Floors) and Structure the TOS Levels (Top of Slab). The rest of the Disciplines should copy/monitor these main levels from them, if necessary.

#### 4.2.7 PHASES

Phases in Revit are used to simplify the creation of Renovation or Multi-Phases projects. By default, Existing Conditions and New Construction phases should exist within the model.

If applicable, additional Phases shall be created and must be named consistently across all Revit models.

**NOTE:**

At the beginning of each project, the lead discipline will determine how many Phases the project might have so each Discipline’s leader can duplicate and create them on their own Revit Models.

### 4.3 SHEET NAMING CONVENTION

The Sheet Name should take the form of:

SHEET NUMBER-SHEET TITLE

**NOTE:**

Sheet Number starts with a Sheet Type followed by the Sheet Number.

**4.3.1 DRAWING TYPES**

Drawing Types are categories used to organize the Contract Set of Drawings and refer to either one or two letters that appear before the Sheet Number in the lower right-hand corner of each sheet.

The image shows an example of a Structural drawing:

It is a violation of law for any person to alter a document in any way, or to act under the direction of a licensed professional engineer or registered architect, if the document bearing the seal of an engineer or architect is altered, the altering engineer or architect fails to the document be so sealed the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

Designed by	T. Bal
Drawn by	N. Dellarosa
Checked by	J. Quiroz
Date	08/01/2015
Contract Number	<b>WORK ORDER No.</b>
Drawing Number	<b>S001</b>
	PID#

Figure 18 - Example of Drawing Type Name

The following table shows the Drawing Types Convention to be used on BIM Projects.

Table 4-13 - Drawing Type Naming Convention

ALL DISCIPLINES	
TS	Title Sheet
IX	Index of Drawing Sheet
G	General
SK	Stage IV Sketch Sheets (For Stage IV use only)
CS	Construction Staging or Sequence
ARCHITECTURAL	
A	Architectural
LS	Landscape
CIVIL	
C	Civil
ML	Marking Lighting & Signage
ELECTRICAL	
CP	Corrosion Protection
E	Electrical
ES	Electronics
ENVIRONMENTAL	
N	Environmental
GEOTECHNICAL	
GT	Geotechnical Plan
MECHANICAL	

B	Baggage Handling
FP	Fire Protection
M	Mechanical
P	Plumbing
SP	Sprinkler
VT	Vertical Transportation
<b>STRUCTURAL</b>	
S	Structural
<b>TRAFFIC</b>	
ITS	Intelligent Transportation Systems
MT	Maintenance of Traffic
SG	Signal Plan
T	Traffic

### 4.3.2 DRAWING NUMBER

The Drawing Number Convention refers to the numbers that appear right after the Drawing Type and are used to organize the Contract Drawings in order.

The Port Authority supports three options of sheet numbering, numbering by “One-Digit-Series”, numbering by “Two-Digit-Series”, or numbering by “Counter” alone.

At the start of each project the LE/A will determine which numbering option will be used. This (and only this) option will be used by all disciplines for every contract drawing produced for the project.

When a “Series” numbering system is chosen by the LE/A, each disciplines Task Leader will be responsible for the determination of what drawing types are assigned to each of the available counters in the series. This information will be distributed within the discipline by the Task Leader.

These three formats cannot co-exist on the same project. The Sheet Number will take the form of:

Option One			Option Two			Option Three	
Plotsheet Plan Type	Series Number (1 through 9)	Counter Number (01 through 99)	Plotsheet Plan Type	Series Number (01 through 99)	Counter Number (01 through 99)	Plotsheet Plan Type	Counter Number (001 through 999)
S	1	01	S	01	01	S	001

**Option I:** One-digit series.

**Option II:** Two-digit series.

**Option III:** Without series.

**4.3.2.1 OPTION I**

For projects with nine or less series the sheet number format will include a one or two letter Plotsheet Plan Type followed by a one-digit series number followed by a zero-padded, two-digit sheet “counter” number.

- Use digits “1” through “9” as the series numbers
- Series numbers can be skipped.
- Counter numbers must be consecutive numbers beginning at “01” for each series.

For example: D\_Series Number\_Drawing Counter

- S101

**4.3.2.2 OPTION II**

For projects with ten or more series the sheet number format will include a one or two letter Plotsheet Plan Type followed by a two-digit series number followed by a two-digit sheet “counter” number.

- Use digits “01” through “99” as the series numbers
- Series numbers can be skipped
- Counter numbers must be consecutive numbers beginning at “01” for each series.

For example: D\_Series Number\_Drawing Counter

- S0101

**4.3.2.3 OPTION III**

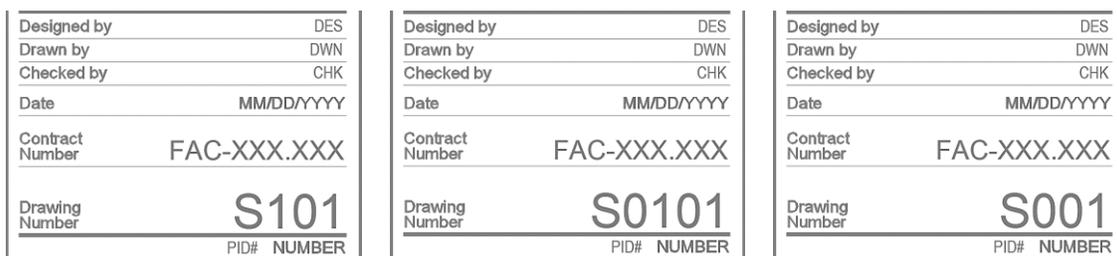
For projects that are not using a series the sheet number format will include a one or two letter Plotsheet Plan Type followed by a zero-padded three-digit sheet “counter” number.

- Counter numbers must be consecutive numbers beginning at “001”

For example: D\_Counter Number

- S001

The following images display how the three options would appear on a Plotsheet:



**Option I**

**Option II**

**Option III**

*Figure 3 - Drawing Number options*

**4.3.3 SHEET CLASSIFICATION**

Sheets should also be organized and controlled via parameters. The following Shared Parameters are being used to classify sheets properly in the browser:

- PA-SHEET CATEGORY: Defines the Sheet Use
- PA-SHEET SERIES: Defines the Sheet Type

## 5.0 TECHNICAL REQUIREMENTS

This Section establishes all specific requirements for the creation and collaboration when working with BIM files in a project.

**NOTE:**

The content of this section is applicable for both Design and Construction Phases.

### 5.1 SOFTWARE

The Port Authority of NY & NJ CAD and BIM practice is comprised of several Autodesk products. The VDC Standard will generally use terminology and references that are unique to the Autodesk-based software applications.

All active project files shall be developed in accordance with the current software version in use by The Port Authority of NY & NJ. This includes all third-party applications, regardless of when the project began.

Based on the backwards compatibility issues of some applications, please make sure to check which version of the application is recently being used by the Port Authority of NY & NJ. **Current Autodesk products version used is v.2022.**

The Port Authority of NY & NJ has adopted the following Autodesk products:

*Table 5-1 – Software Applications*

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

## 5.2 FILES OWNERSHIP

The Port Authority of NY & NJ holds ownership of the BIM Model including all inventions, ideas, designs, and methods contained within. This includes, but is not limited to, Revit families (system-based and/or component-based) and any other content submitted as part of the BIM Model itself.

Outside resources, such as consultants and/or contractors, using the BIM Model are granted temporary use of it for the duration of the project. After project completion, they are required to return all copies of the BIM Model to The Authority.

## 5.3 COORDINATES 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. Depending on the project location, NY or NJ State Plane in use could vary, CSG Group should always be contacted to reconfirm the coordinates applicable for the project.

The LEA must determine at the beginning of a project if another coordinate system is to be used. The project coordinate system will be established in the BIM Site Model file provided by The Port Authority of NY & NJ VDC Support Group. All other models' coordinates will be set by acquiring coordinates from the Site Model.

## 5.4 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:

- Level Of Development 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.

### 5.4.1 LEVEL OF DEVELOPMENT (LOD)

The LOD defines the amount and degree of building information for both graphic and non-graphical content. The latter one is often referred to as Level of Information (LOI). A popular "equation" has been used nowadays to describe the formation of LOD as:

$$\text{Level of Development} = \text{Level of Detail} + \text{Level of Information}$$

The LOD is cumulative and should progress along with the design from stage to stage. The LOD Specification is a reference that enables practitioners in the AEC Industry to specify and articulate with a high level of clarity the content and reliability of Building Information Models (BIMs) at various stages in the design and construction process.

The Port Authority of NY & NJ requires, at a minimum, that models adhere latest version of the BIM Forum LOD Specification (Part I), publicly available at <https://bimforum.org/lod>.

PANYNJ BIM Standard

This document shall be used along with the project specific [Information Delivery Plan](#) (IPD) spreadsheet prepared by the Authority, where each element's LOD assignment is indicated, as well as the information parameters to be included per element at each project stage.

The Port Authority of NY & NJ uses the term Design Model to distinguish a model in Design from a model to be used for Construction purposes. Likewise, the term Construction Model is used to indicate a model that has been developed to a higher level of LOD and shows how a project will be constructed in the field.

Virtual Design and Construction | Fundamental LOD Definitions  
 Updated: December 2023



STAGE I	STAGE II	STAGE III	STAGE IV	
Conceptual Design	Preliminary Design	Basis of Design	Coordination sign-off	As-Constructed
LOD 200		LOD 300		LOD 350
Approximate geometry		Precise Geometry		Precise Geometry with Connections
<p>The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.</p> <p><b>BIMForum interpretation:</b> At this LOD elements are generic placeholders. They may be recognizable as the components they represent, or they may be volumes for space reservation. Any information derived from LOD 200 elements must be considered approximate</p>		<p>The Model Element is 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.</p> <p><b>BIMForum interpretation:</b> The quantity, size, shape, location, and orientation of the element as designed can be measured directly from the model without referring to non-modeled information such as notes or dimension call-outs. The project origin is defined and the element is located accurately with respect to the project origin.</p>		<p>The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, location, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element.</p> <p><b>BIMForum interpretation:</b> Parts necessary for coordination of the element with nearby or attached elements are modeled. These parts will include such items as supports and connections. The quantity, size, shape, location, and orientation of the element as designed can be measured directly from the model without referring to non-modeled information such as notes or dimension call-outs.</p>

Figure 4 - Level of Development

5.4.2 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.

Elements	Design (only) Attribute Table	Stage I		Stage II		Stage III		Construction Attribute Table	Stage IV			
		Conceptual Design LOD	MEA	Preliminary Design LOD	MEA	Basis of design LOD	MEA		Table	Coordination LOD	Sign-off MEA	As-Constructed LOD
<b>SUBSTRUCTURE</b>												
<b>Foundations</b>												
<b>Standard Foundations</b>												
Wall Foundations	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Column Foundations	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Standard Foundation Supplementary Components	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
<b>Special Foundations</b>												
Driven Piles	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Bored Piles	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Caissons	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Special Foundation Walls	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Foundation Anchors	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Underpinning	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Raft Foundations	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Pile Caps	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Grade Beams	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
<b>Subgrade Enclosures</b>												
<b>Walls for Subgrade Enclosures</b>												
Subgrade Enclosure Wall Construction	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Subgrade Enclosure Wall Interior Skin	Common Parameters	200	PANYNJ	200	PANYNJ	300	EXTERNAL	Common Parameters	300	EXTERNAL	300	EXTERNAL
Subgrade Enclosure Wall Supplementary Components	Common Parameters	N/A	PANYNJ	N/A	PANYNJ	N/A	EXTERNAL	Common Parameters	N/A	EXTERNAL	N/A	EXTERNAL

Figure 5 - Model Element Table example

### 5.4.3 PARAMETERS

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

Type	Dataset	Stage	Field Definition	Parameter Name	Parameter Group	Data Type	Allowed Values	Long Description	Example	Source
Project	Project Information	1,2,3,4	Contract Number	PA-CONTRACTNUMBER	General	String	Any	Contract Number assigned	PAT-784.217	Assign By User
Project	Project Information	1,2,3,4	Facility	PA-FACILITY	General	String	Per pick list	Facility	PATH	Assign By User
Project	Project Information	1,2,3,4	Line Department	PA-LINEDEPARTMENT	General	String	Per pick list	Line Department	AVIATION	Assign By User
Project	Project Information	1,2,3,4	PID	PA-PID	General	String	Any	PID Number assigned	16010000	Assign By User
Project	Project Information	1,2,3,4	Project Address	Project Address	General	String	Any	Project Address	Harrison, NJ 07029	Assign By User
Project	Project Information	1,2,3,4	Project Name	Project Name	General	String	Any	Project Name	HARRISON STATION - SOUTHWEST STATION HOUSE, PLATFORM, AND PLAZA REPLACEMENT	Assign By User
Project	Project Information	1,2,3,4	CP Number	PA-CFNUMBER	Views and Sheets	String	Any	Confidential Privilege Number	Number assigned to identify projects that contain sensitive information	Assign By User
Project	Project Information	1,2,3,4	Work Order	PA-WORKORDER	Views and Sheets	String	Any	Work Order Number	#03	Assign By User
Project	Project Information	1,2,3	BIM Standard Release Date	PA-BIMSTANDARDRELEASEDATE	General	String	MM/DD/YYYY	BIM Standard Release Date	MM/DD/YYYY	Assign By User
Project	Project Information	1,2,3	Current Sheet	PA-CURRENTSHEET	Views and Sheets	String	Any	Current Sheet Number	253	Assign By User
Project	Project Information	1,2,3	Discipline	PA-DISCIPLINE	Views and Sheets	String	Per pick list	Discipline of the Model	Mechanical	Assign By User
Project	Project Information	1,2,3	Discipline Chief	PA-DISCIPLINECHIEF	Views and Sheets	String	Any	Name of the Discipline Chief in charge	Name	Assign By User
Project	Project Information	1,2,3	Program Director	PA-PROGRAMDIRECTOR	Views and Sheets	String	Any	Program Director assigned	Name	Assign By User
Project	Project Information	1,2,3	Signe Name	PA-SIGNEENAME	Views and Sheets	String	Any	Original Signed By	Name	Assign By User
Project	Project Information	1,2,3	SubDiscipline	PA-SUBDISCIPLINE	Views and Sheets	String	Per pick list	Subdiscipline of the Model	Plumbing	Assign By User
Project	Project Information	1,2,3	Total Sheet	PA-TOTALSHEET	Views and Sheets	String	Any	Total Sheet Number	305	Assign By User

Figure 6 - Project Parameters

Type	Dataset	Stage	Field Definition	Parameter Name	Parameter Group	Data Type	Allowed Values	Long Description	Example	Source
Space	Locational	1,2,3,4	Room Name	Room Name	Space	String	Must be unique per nomenclature	The name of the room within the facility	Pump Room	Assign By User
Space	Locational	1,2,3,4	Room Number	Room Number	Space	String	Must be unique per nomenclature	The number of the room within the facility	5	Assign By User
Object	3D	1,2,3,4	Width	Width	Construction	Floating Point	>0	The width of the asset in inches or feet	8 (ft)	Revt Built in Parameter
Object	3D	1,2,3,4	Depth	Depth	Construction	Floating Point	>0	The depth of the asset in inches or feet	8 (ft)	Revt Built in Parameter
Object	3D	1,2,3,4	Height	Height	Construction	Floating Point	>0	The height of the asset in inches or feet	4 (ft)	Revt Built in Parameter
Object	3D	1,2,3,4	Volume	Volume	Construction	Floating Point	>0	The volume of the asset in cubic inches or feet	20 (cuft)	Revt Built in Parameter
Object	3D	1,2,3,4	Material	PA-MATERIAL	Materials and Finishes	String	Any	Brief description of the principal material of the asset	Concrete	Assign By User
Space	3D	3,4	Is heated	PA-ISHEATED	Space	Boolean	Y or N	Is the space mechanically heated	N	Assign By User
Space	3D	3,4	Is ventilated	PA-ISVENTILATED	Space	Boolean	Y or N	Is the space mechanically ventilated	Y	Assign By User
Object	4D	4	Activity ID	PA-ACTIVITYID	Construction	String	Must be unique per nomenclature	Schedule activity ID in accordance with schedule nomenclature	PROJ4-12345	Assign By User
Object	4D	4	Construction Status	PA-CONSTRUCTIONSTATUS	Construction	String	Basis of Design, As Per Shop Drawing, As Constructed	Defines the current status of the element per PANYNJ Workstage	As-Constructed	Assign By User
Object	4D	4	Stage	PA-CONSTRUCTIONSTAGE	Construction	String	Per Schedule and Contract Drawings	Stage in which the project activity occurs in	53	Assign By User
Object	5D	3,4	Trade	PA-TRADE	Construction	String	Per pick list	Masterformat specifications-writing standard	22 (Division 22 - Plumbing)	Predefined list
Object	5D	3,4	Uniform Level 4 Code	Assembly Code	Design & Construction	String	Per pick list (see Uniform Level 4 Code)	Division of work classification per Uniform 2010 standard	D3505.10	Predefined list
Object	5D	3,4	Uniform Level 4 Description	Assembly Description	Design & Construction	String	Per pick list (see Uniform Level 4 Description)	Division of work classification per Uniform 2010 standard	Facility Hydronic Distribution	Predefined list

Figure 7 - Common Parameters

Type	Dataset	Stage	Field Definition	Parameter Name	Parameter Group	Data Type	Allowed Values	Long Description	Example	Source
Space	Locational	1,2,3,4	Room Name	Room Name	Space	String	Must be unique per nomenclature	The name of the room within the facility	Pump Room	Assign By User
Space	Locational	1,2,3,4	Room Number	Room Number	Space	String	Must be unique per nomenclature	The number of the room within the facility	5	Assign By User
Object	3D	1,2,3,4	Width	Width	Construction	Floating Point	>0	The width of the asset in inches or feet	8 (ft)	Built in Parameter
Object	3D	1,2,3,4	Depth	Depth	Construction	Floating Point	>0	The depth of the asset in inches or feet	8 (ft)	Built in Parameter
Object	3D	1,2,3,4	Height	Height	Construction	Floating Point	>0	The height of the asset in inches or feet	4 (ft)	Built in Parameter
Object	3D	1,2,3,4	Volume	Volume	Construction	Floating Point	>0	The volume of the asset in cubic inches or feet	20 (cuft)	Built in Parameter
Object	3D	1,2,3,4	Material	PA-MATERIAL	Materials and Finishes	String	Any	Brief description of the principal material of the asset	Concrete	Assign By User
Space	3D	3,4	Is heated	PA-ISHEATED	Space	Boolean	Y or N	Is the space mechanically heated	N	Assign By User
Space	3D	3,4	Is ventilated	PA-ISVENTILATED	Space	Boolean	Y or N	Is the space mechanically ventilated	Y	Assign By User
Object	4D	4	Activity ID	PA-ACTIVITYID	Construction	String	Must be unique per nomenclature	Schedule activity ID in accordance with schedule nomenclature	PROJ4-12345	Assign By User
Object	4D	4	Construction Status	PA-CONSTRUCTIONSTATUS	Construction	String	Basis of Design, As Per Shop Drawing, As Constructed	Defines the current status of the element per PANYNJ Workstage	As-Constructed	Assign By User
Object	4D	4	Stage	PA-CONSTRUCTIONSTAGE	Construction	String	Per Schedule and Contract Drawings	Stage in which the project activity occurs in	53	Assign By User
Object	5D	3,4	Trade	PA-TRADE	Construction	String	Per pick list	Masterformat specifications-writing standard	22	Assign By User
Object	5D	3,4	Uniform Level 4 Code	Assembly Code	Design & Construction	String	Per pick list (see Uniform Level 4 Code)	Division of work classification per Uniform 2010 standard	D3505.10	Assign By User
Object	5D	3,4	Uniform Level 4 Description	Assembly Description	Design & Construction	String	Per pick list (see Uniform Level 4 Description)	Division of work classification per Uniform 2010 standard	Facility Hydronic Distribution	Assign By User
Object	7D	4	Asset Tag	PA-ASSETTAG	Asset Management	String	16-digit string	The contractor will define a 16-digit string for each asset (such number will be connected to the rest of the information related to this same asset). Once the asset is actually placed on site, the physical	2459820192836580	Asset specific Revt Category
Object	7D	4	Asset Acronym	PA-ASSETACRONYM	Asset Management	Code	Per pick list (see Structure Sheet)	Combination of Hierarchy Code/Id System Code/Asset Code/Child Asset Code	FANCR01A-P588-TUNN	Asset specific Revt Category
Object	7D	4	Horizontal location	PA-HORIZONTALLOCATION	Construction	String	Per BEP	Standardized location of activity in x,y plane	GN	TBD by Project
Object	7D	4	Vertical location	PA-VERTICALLOCATION	Construction	String	Per BEP	Standardized location of activity in z plane	CP	TBD by Project

Figure 8 - Detailed Parameters

**5.4.4 3D MODEL EXCLUSIONS**

As a rule of thumb, objects smaller than 1” in size do not need to be modeled during Design.

There is no requirement to model the following objects:

*Table 5-2 - Model Exclusions*

DISCIPLINE	OBJECTS	DESIGN	CONSTRUCTION
Structural	Rebar	X	X
	Bolts	X	X
	Anchors	X	
Fire Protection	Couplings	X	
	Hangers	X	
HVAC	Duct Insulation	X	
	Pipe Insulation	X	
	Couplings	X	
	Filters	X	
	Hangers	X	
Electronics	Hangers for items under 25lbs	X	
Electrical	Wires	X	X
	Conduits	X	
Plumbing	Couplings	X	
	Hangers	X	

## 6.0 DESIGN REQUIREMENTS

This section describes requirements, processes and procedures currently demanded and in use by The Port Authority of New York and New Jersey in relation to use of BIM during Design Phase, which includes projects under Stage I to III for a traditional Design-Bid-Build project delivery method. For Design-Build Phases should be considered, and specific process will be outlined in the BEP.

### 6.1 GOALS AND USES

The Design Model goal is to facilitate design coordination and generate Construction Documents.

As an owner, the PANYNJ considers the Design Model as a tool to facilitate:

- 2D Documentation linked to the 3D model.
- 3D BIM Coordination between all disciplines.
- 4D Simulation of future Construction phasing.
- 5D Cost Estimating and QTO.
- 6D Sustainability Analysis and Reporting.
- Risk mitigation, by providing reliable information earlier in time (compared to a non-BIM methodology).
- Data recollection on relevant situations.

**NOTE:** Specific Project Uses to be confirmed with the Project LEA.

### 6.2 FOLDER STRUCTURE

The Port Authority of NY & NJ BIM Standard provides a structure for the organization of BIM projects within the Engineering Department.

The primary goal is to improve coordination among all functional groups within the PANYNJ Divisions and their Consultants, as well as to develop BIM projects in a way that will facilitate the further use of the electronic information beyond the initial contract.

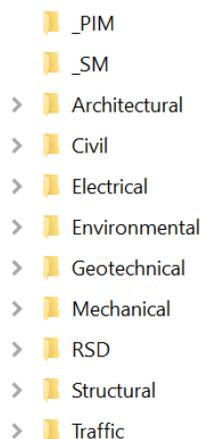


Figure 9 - Project Folder

Note: For cloud-based projects, refer to [Section 6.2.8 Autodesk Construction Cloud Folders](#)

### 6.2.1 FACILITY FOLDER

All Port Authority of NY & NJ projects are stored on a central server, which has internally been mapped using the drive letter "M." The Server (M:\ drive) is organized by Facility Folders using the following Facility Codes.

Table 6-1 - Facility Folder Codes

FACILITY CODE	FACILITY NAME
AMT	Automobile Marine Terminal
BB	Bayonne Bridge
BRKMT	Brooklyn Port Authority Marine Terminal
EP	Elizabeth Port Authority Marine Terminal
EWR	Newark Liberty International Airport
FERRY	Ferry Transportation
GB	Goethals Bridge
GWB	George Washington Bridge and Bus Station
HCMF	Harrison Car Maintenance Facility
HELI	Downtown Manhattan Heliport
HH	Howland Hook Marine Terminal
HT	Holland Tunnel
IPY	Industrial Park at Yonkers
JFK	John F. Kennedy International Airport
JSTC	Journal Square Transportation Center
LGA	LaGuardia Airport
LT	Lincoln Tunnel
MULTI	Multi Facility Projects
NFC	Newport Financial Center
NJMT	New Jersey Marine Terminals
NLCC	Newark Legal and Communication Center
OBX	Outer Bridge Crossing
PABT	Port Authority Bus Terminal
PACD	Port Authority Police Academy
PATC	Port Authority Technical center
PATH	Port Authority Trans-Hudson Corporation
PHQ	Police Headquarters
PJ	Port Jersey
PN	Port Newark
PRTC	Police Rescue Training Center
RLLC	Cross Harbor Rail Road NY/NJ
SWF	Stewart International Airport
TEB	Teterboro Airport
TLPT	Staten Island Teleport
WTC	World Trade Center

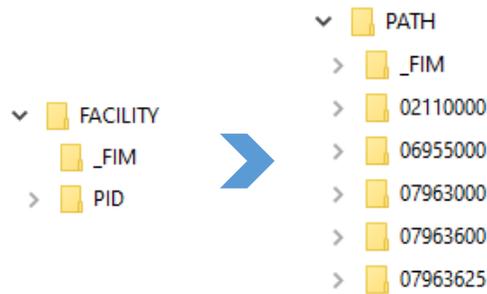


Figure 10 - Facility Folder

### 6.2.2 \_FIM FOLDER (FACILITY INFORMATION MODEL)

The Facility Information Model (\_FIM) stores the latest version of the Facility 3D Model; completed projects are uploaded here. The following image shows the workflow for PANYNJ BIM projects.

The FIM is stored as a Navisworks File Set (\*.nwf) and composed of Navisworks Federated Files (\*.nwf).

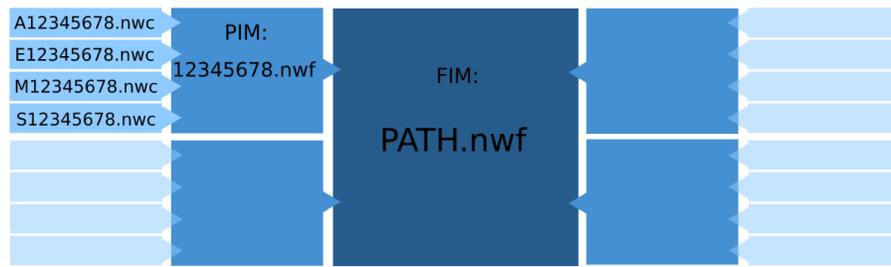


Figure 11 - Facility Information Model Flow Chart

The image below illustrates this concept using the \_FIM Folder for PATH:

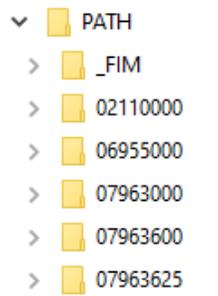


Figure 12 - FIM (Facility Information Model) Folder

### 6.2.3 PID FOLDER (PROJECT IDENTIFICATION)

The PID Number is a unique identifier assigned for all PANYNJ BIM projects. Every Facility Folder within the Engineering Server has been divided into project folders using an eight-digit PID Number. The image below illustrates this concept using a PATH project with the PID Number 07963625, which includes the PIM Folder, the SM folder and eight pre-defined Discipline Folders.

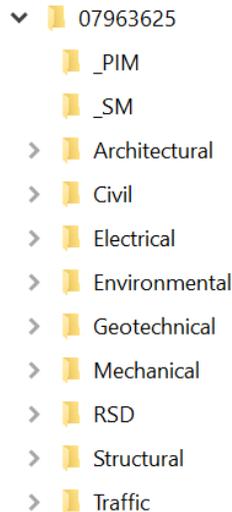


Figure 13 - Example of a PID folder

The Lead Engineer/Architect (LE/A) shall request the creation of the Project Folder Structure on the Engineering BIM Server by filling out the [TECNow form](#). Consultants are required to get this number from either the LE/A or the discipline’s Task Leader (TL) at the project kickoff.

#### 6.2.3.1 PID INTERNAL FOLDERS RULES

Table 6-2 - Rules for Project Folders

FOLDER	RULES			
	Sub-folders Permitted	Read-write Permissions (per discipline)	Access for Other Disciplines (Read-only Permission)	Archived
PIM			✓	✓
SM			✓	✓
DISCIPLINE		✓	✓	✓

### 6.2.4 \_PIM FOLDER (PROJECT INFORMATION MODEL)

A Project Information Model (PIM) file is created for each BIM project. This file has a combination of all the Revit-based and Civil 3D-based most recent Models. Each discipline should be exported as Navisworks file (\*.nwc).

The image below illustrates this concept using a project with the PID Number of 07963625, which includes the PIM Folder at the top of the folder:

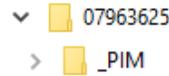


Figure 14 - Project Information Model

### 6.2.5 \_SM FOLDER (SITE MODEL)

Each PID Folder contains an SM sub-folder that stores the Site Model file, which holds the project coordinate system and controls the location, Project North, and elevation of all Discipline Models.

The image below illustrates this concept using a project with the PID Number of 07963625, which includes the SM Folder.

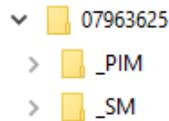


Figure 15 - Site Model Folder

The Site Model Folder stores two files, an AutoCAD file in DWG format and a Revit file in RVT format, both named PID-SM.

#### **NOTE:**

The VDC Group is responsible for creating the files contained within the SM Folder.

### 6.2.6 DISCIPLINE FOLDERS

This folder is used to share files among the eight Disciplines of the Port Authority of NY & NJ Engineering Department:

- Architectural
- Civil
- Electrical
- Environmental
- Geotechnical
- Mechanical
- RSD
- Structural
- Traffic

Every Discipline is provided with a folder in the Project Directory. Each Discipline folder has a series of standardized sub-folders in which all design related data is to be stored.

The image below illustrates these standardized sub-folders using the Architectural folder as an example.

Figure 33 - Discipline Folders

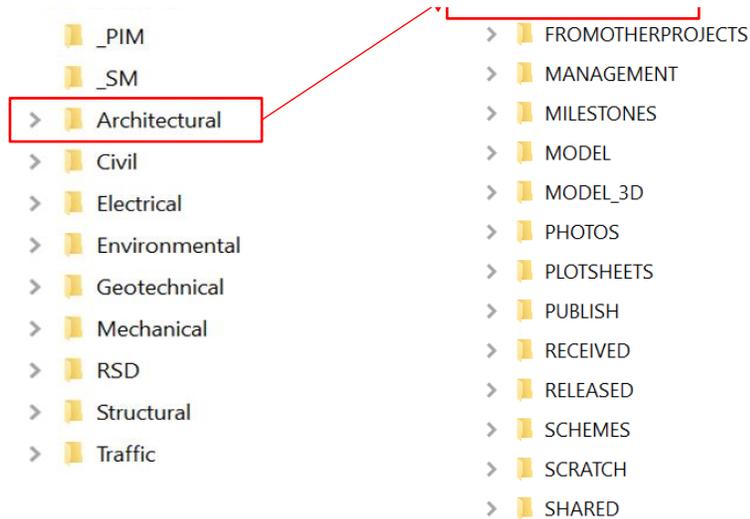


Figure 32 - Discipline Folders

**6.2.6.1 DISCIPLINE INTERNAL FOLDERS RULES**

All folders have a pre-set of rules that inhouse and consultant shall follow. The table below displays, for specific discipline, the use of each folders for consistency throughout the projects for the Port Authority.

Table 6-3 - Rules for Discipline internal Folders

FOLDER	RULES			
	Sub-folders Permitted	Read-write Permissions (per discipline)	Access for Other Disciplines (Read-only Permission)	Archived
FROMOTHERPROJECTS	✓	✓		
MANAGEMENT	✓	✓		✓
MILESTONES		✓	✓	✓
MODEL		✓	✓	✓
MODEL_3D		✓	✓	✓
PHOTOS	✓	✓	✓	✓
PLOTSHEETS		✓	✓	✓
PUBLISH		✓	✓	✓
RECEIVED	✓	✓		
RELEASED	✓	✓		
SCHEMES	✓	✓		
SCRATCH	✓	✓		
SHARED	✓	✓	✓	

**6.2.6.2 FROMOTHERPROJECTS FOLDER**

The FROMOTHERPROJECTS folder will contain drawings and data that have been taken from other projects that relate to the current project. If a file from another project is required for reference purposes only and is not going to be included as part of the contract set it will be stored in this directory. If a file is required to be part of the contract set, then it will be copied to the MODEL/MODEL\_3D folder and must

comply with the current CAD and BIM Standards. Related contracts and reference documents are shared in Livelink/E-Builder with the consultants in Stage I through Stage III.

### **6.2.6.3 MANAGEMENT FOLDER**

The MANAGEMENT folder will contain all non-drawing related project data. Spreadsheets, documents, specifications, memos, estimates, etc. will be stored in this folder

#### **1.1.1.1 MILESTONES FOLDER**

The MILESTONES folder is a location for storing independent (duplicate) copies of project information as it appears at each milestone of the project. While the root Model, Plotsheets and Publish folders contain the current versions of drawings which will evolve throughout the life cycle of the project, the MILESTONES folder will preserve the state of those drawings at the instance of each milestone.

Sub-folders have been created for each submission milestone from Stage I through Stage IV.

Each discipline Task Leader is responsible for archiving their own discipline-specific Central Files into one of the sub-folders within MILESTONES. After verifying that all discipline Task Leaders has archived their folders, the LEA should notify the VDC Group.

#### **1.1.1.2 MODEL FOLDER**

All design work and annotation must be stored inside AutoCAD drawings saved within the MODEL folder. The CAD Standard refers to these design drawings as Model files.

Images and Office documents referenced or linked by drawing files will also be stored in the Model folder and must comply with the rules for Model files. References to OLE objects are not permitted.

### **6.2.6.4 MODEL\_3D FOLDER**

This folder stores the Central Revit Model files.

Within this folder lives the SUPPORT sub-folder, which stores Revit-related information that is not contained under any other existing available folder and do not need to be shared outside each discipline. If NWCs need to be stored for BIM Coordination purposes, the COORDINATION folder should be used.

### **6.2.6.5 PHOTOS FOLDER**

The PHOTOS folder will contain all digital photographs relevant to the project, with the exception of those used on contract drawings. If a photo needs to be part of the Contract Set, it should be moved or copied into the MODEL or MODEL\_3D folder and renamed accordingly.

Within this folder lives the RENDERING sub-folder, which stores Rendering files such as JPGs, PNGs, TIFs, etc.

### **6.2.6.6 PLOTSHEETS FOLDER**

All layouts for plotted sheets will be saved inside AutoCAD drawings stored within the PLOTSHEETS folder. The CAD Standard refers to these layout drawings as Plotsheet Files. These files are assembled sheets used for plotting. These drawings consist of a series of external references. Only Plotsheets files will be stored within this folder.

All paper drawings in the Contract Set will have a corresponding Plotsheet file in the PLOTSHEETS folder, the only exception is the Title Sheet.

Within this folder lives the PDF sub-folder, which stores PDF files assembled as sheets for printing. PDF files will be created at full-size, directly from the Revit files and stored in the PDF folder.

The PDF folder will always contain the most recent milestone version of the PDF file(s). Earlier milestone files once copied to the MILESTONES folder for the milestone will be either deleted from the PDF folder or overwritten in place.

#### 6.2.6.7 PUBLISH FOLDER

The PUBLISH folder will be used as a sharing mechanism between disciplines. A discipline may copy Model files into its own PUBLISH folder, making them available for other disciplines to reference. Other disciplines are not permitted to copy these files but will instead externally reference them directly from the owner's PUBLISH folder.

There will be only one Contract Border per project. The only exception to this rule is when new drawings are added to the Contract Set as part of a Stage IV – PACC. If necessary, BIM Models will be exported as DWG files and saved within this folder.

It is important that this methodology for referencing design files from other disciplines be followed. If a user copies design files from another discipline's Model, Plotsheets or Publish folder then they must take ownership of the file. By taking ownership the discipline copying the file will then be responsible for all CAD Standards compliance of that file as if it were created by that discipline. Only copies of Model files for other disciplines to references shall be stored in the Publish folder. The owning discipline is not able to reference file from its own PUBLISH folder.

#### 6.2.6.8 HISTORY FOLDER

The HISTORY folder is the only sub-folder permitted within the PUBLISH folder. If a single file is to be published more than once, the file that exists in the PUBLISH folder will be moved to a dated sub-folder within the HISTORY folder. The updated version of the file will then be copied into the root of the PUBLISH folder. This will allow other disciplines to continue to reference older or time-phased versions of reference drawings if required by their design schedule by changing the external reference path to the dated sub-folder within the History folder. Only copies of previously published files will be copied to the HISTORY folder.

#### 6.2.6.9 \_DATASHORTCUTS FOLDER

The \_DATASHORTCUTS folder is only populated in the folder structure for disciplines that use AutoCAD Civil3D as an authoring application. This folder exists only under CIVIL and GEOTECHNICAL Publish folder.

- This is the folder selected when setting up the Data Shortcut using Civil 3D the Toolspace Prospector.
- Sub-folders are permitted within the \_DATASHORTCUTS folder (Refer to **Error! Reference source not found. Error! Reference source not found.** for proper usage).
- The \_DATASHORTCUTS folder has read-write permissions assigned to the owning discipline.
- Other disciplines have read permissions assigned to the \_DATASHORTCUTS folder.
- The \_DATASHORTCUTS folder will be archived with the project.

#### 6.2.6.10 RECEIVED FOLDER

The RECEIVED folder will contain a dated archive of design information received from other disciplines and outside sources. This folder is intended as a record to identify exactly what information was provided and on what date.

#### 6.2.6.11 RELEASED FOLDER

The RELEASED folder will contain a dated archive of design information provided to other disciplines and outside sources. This folder is intended as a record to identify exactly what information was provided and on what date.

#### 6.2.6.12 SCHEMES FOLDER

The SCHEMES folder will contain various schemes of a design as well as any temporary design data. This folder provides the designer with an area in which to make trial changes to a design and a place to

store temporary files. If a scheme is created and is later chosen as the final design version, the files stored under that scheme are to be copied to the MODEL folder.

When using the Revit-based applications, Design Options is the preferred method to accomplish schemes. This folder is a record intended to identify exactly when, and what information was provided to a consultant.

**6.2.6.13 SCRATCH FOLDER**

This folder is meant to be used by team members to work on details, or store Project related information relevant to the Discipline members.

**6.2.6.14 SHARED FOLDER**

The SHARED folder will be used as a sharing mechanism for non-CAD\BIM-related information between disciplines. A discipline may copy MANAGEMENT files into its own SHARED folder, making them available for other disciplines. Files stored within the SHARED folder are not to be referenced into any contract drawings and are provided for information only. Only copies of MANAGEMENT files shall be stored in this folder, Model files are not permitted within the SHARED folder.

**6.2.7 ADDING FOLDERS**

If sub-folders are needed, and the creation of sub-folders is allowed by the Folder's Rules, those can be created under the predefined Project Folder Structure and should follow the Folder Naming Convention.

The folders should be named using the following format:

- “YYYY-MM-DD-Description”

*Table 6-4 – Subfolders Naming Convention*

ITEM	DESCRIPTION
YYYY	Four-digit Year
MM	Two-digit Month
DD	Two-digit Day
Description (optional)	Brief User Description (up to 24 characters) The following characters should not be used as part of the description: @ \$ % ^ & < > / \ " ' ; : ? *   , ' ,

**6.2.8 AUTODESK CONSTRUCTION CLOUD FOLDERS**

The Port Authority of NY & NJ BIM Standard provides a structure for the organization of BIM projects on Autodesk Construction Cloud.

A folder structure shall be created that is familiar with the PA internal drives. The folder structure is created by the VDC Engineer using a Template with permissions and roles set up for consistency.

For more information refer to Autodesk Construction Cloud Guideline.

Files



Figure 34 - ACC Project Folder Structure

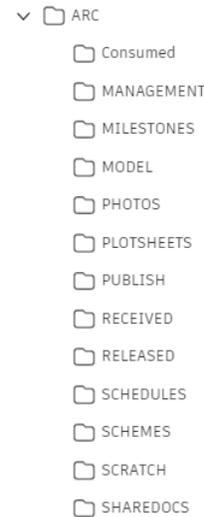


Figure 35 - ACC Discipline Folder Structure

### 6.3 DESIGN SITE MODEL

The Site Model (SM) file is created and distributed by the VDC Group at the Project’s BIM Kick-off meeting. This Site Model file has a combination of Aerial Photograph, CAD Files obtained from The Port Authority of NY & NJ [BMMS \(Base Map Management System\)](#) and specific CAD file background with coordinates provided by Central Survey Group. This file holds the project coordinate system and controls the location, rotation, and elevation. All Discipline models must link the SM and acquire the project coordinates from it. This model shall NOT be modified, will be provided for reference only.

**NOTE:**

Refer to [Section 7.2 Construction Site Model](#) for Site Model requirements during Construction.

Upon receipt of the base Site Model, the Consultant must perform an assessment to determine if there is any information of particular importance that may require additional validation.

### 6.4 DESIGN CONTEXT MODEL

This section refers to the particularities of the Context Model, as a special case among all Models to be developed by the BIM authors. The Context Model developed during Design will be used as a base to be further developed during Construction.

The Design Context Model is a subcomponent of the Design Models, being the context the one that must include all elements in the project surroundings (e.g., topography, property lines, fences, traffic elements, buildings, bridges and more).

It is worth mentioning that due to the different project types within the PANYNJ portfolio, and their potential locations, the Context Model requirements can greatly vary between projects.

### 6.4.1 DESIGN CONTEXT MODEL LIFECYCLE

The Consultant/BIM Leader is the owner and solely responsible for the development of the Context Model. The Context model shall be submitted for Compliance Review in each official submission as part of the Design Deliverables package.

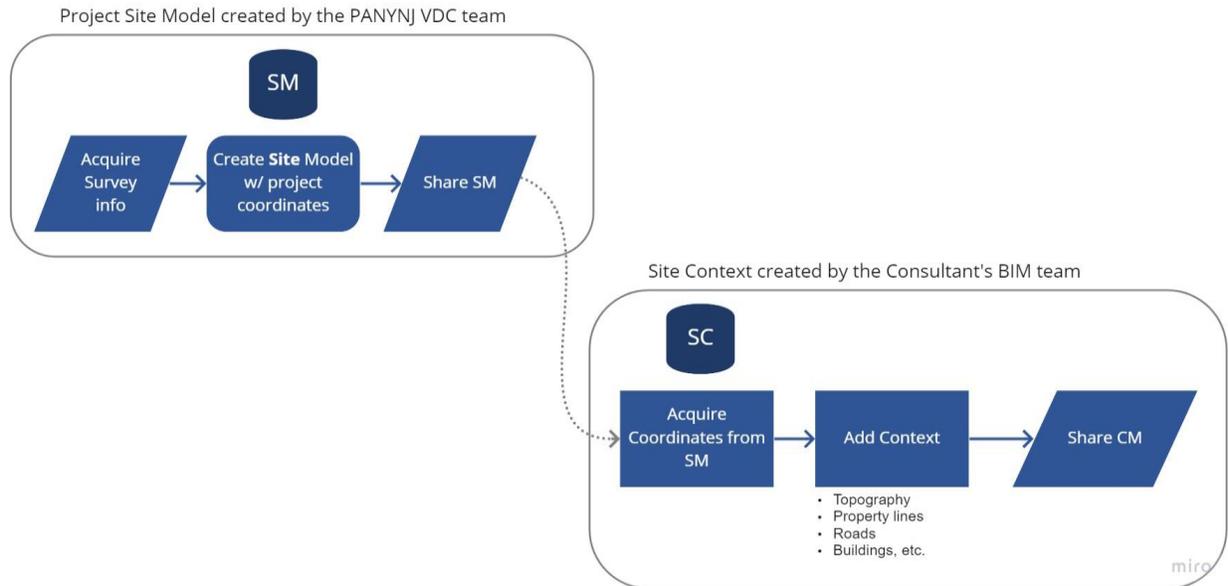


Figure 20 – Design Context Model creation workflow

### 6.4.2 GOALS AND USES

Specific goals pursued by the Context Model include:

- To support site planning and logistics.
- To improve connectivity and accessibility.
- To improve sense of place adding to the development identity.
- To improve security.

## 6.5 DESIGN MODELS

Each discipline that is part of the project will develop their individual Design Model including all the elements and settings to work in a collaborative environment. Task leaders, guided by the Agency Standards, are responsible for the progress of each instance. The Design Models shall incorporate the links of the other disciplines, to improve coordination and reflect the design intent.

### 6.5.1 DESIGN MODELS CREATION WORKFLOW

The workflow in the creation of the Design Models start acquiring the coordinates from the Site Model provided by the VDC group. Architecture and Structure discipline will have the lead defining the Levels and Grids that will be shared across all disciplines. The final step requires that every individual model will have to link, into their own model, the rest of the disciplines involved in the project.

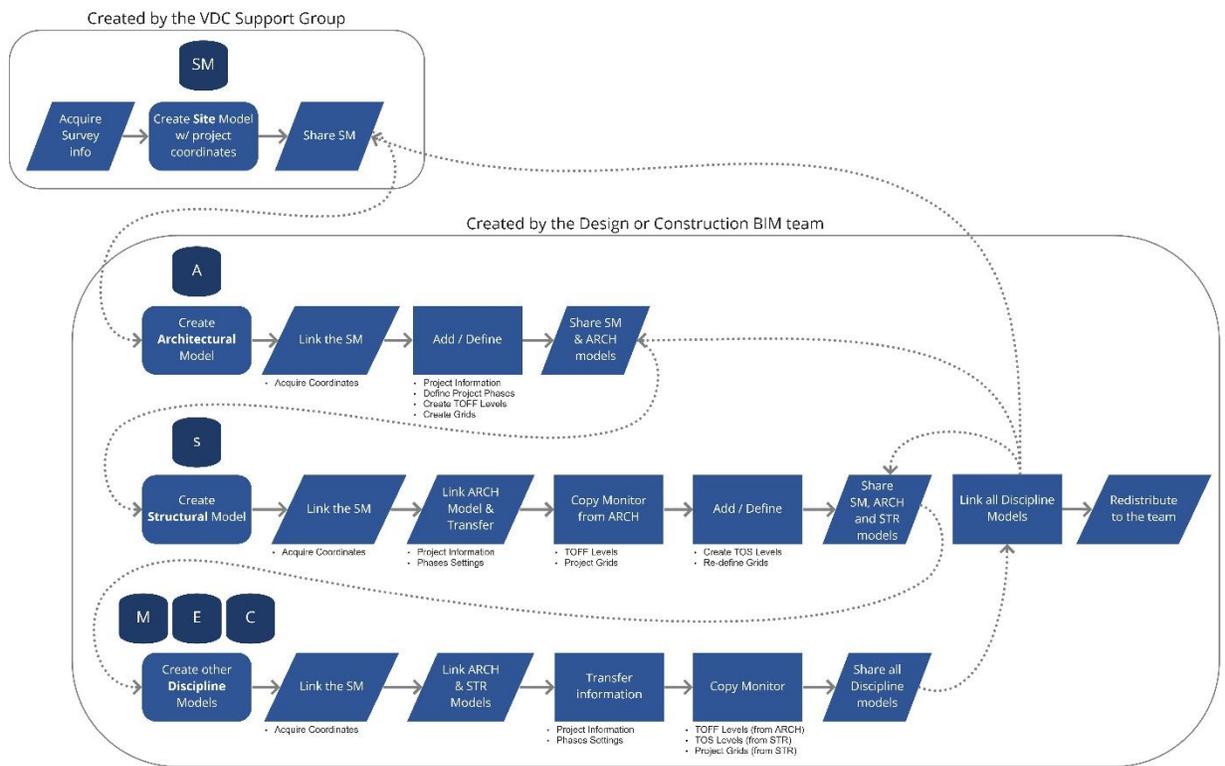


Figure 21 - Design Models creation workflow

## 6.5.2 LINKING FILES

All files should be Linked, not imported. Specific rules apply when linking files:

### 6.5.2.1 LINKING REVIT FILES

When working with other Discipline Revit Model files, you are required to link them into each other. All project Revit files should be linked into each other, including the Site Model.

Linked models must be pinned in place to ensure that they retain their coordinates relative to the active model and other linked models in the project.

### 6.5.2.2 LINKING AUTOCAD FILES

There are some types of AutoCAD Drawings that might need to be linked into Revit; these are called Reference Drawings. These refers to drawings such as Floor Plans, that will be used as an underlay to build Revit Elements from their entities and will not be part of the Contract Set.

The following minimal settings are required before linking them into Revit:

- Linked files should not contain External References.
- To preserve the AutoCAD Line Weight inside Revit, the Line Weight column within the Layer Properties Manager Dialog Box should be set to Default.
- Avoid importing unnecessary data like hatching or line-work such as construction lines.
- Delete all unnecessary parts and layers of the DWG file within AutoCAD and import only the cleaned smaller version.
- Minimize the number of linked or imported DWG files.
- Only link essential DWG files into necessary views.
- All linked AutoCAD files should be pinned.
- Do not explode the geometry imported from DWG files. The exploding operation within a Revit-based application can change a DWG from a single-managed element to hundreds or thousands of additional elements depending on the number of entities in the imported DWG.

#### **NOTE:**

The Import CAD Tool should never be used instead of the Link CAD Tool since the Revit-based applications handles AutoCAD entities individually, decreasing overall Model performance.

Reference Drawings are typically linked into Floor Plan Views and/or Ceiling Plan Views and are usually used as an underlay to build Revit Elements from their entities.

In addition to the requirements described above, the Reference Drawings should have the following:

- DWG files shall be on NAD83 Coordinate System or as defined by the SM.
- DWG files shall be saved using the World Coordinates System (WCS) before they are linked into in Revit in order to be correctly aligned.
- Elements within the DWG cannot be more than 2 miles apart from each other.

### 6.5.3 SHARED PARAMETERS

The Revit-based applications enable the creation of custom fields that may be shared between project and family files and be scheduled and called out correctly through a function named “Shared Parameters”. The Authority has made available a list of Shared Parameters that includes parameters that are needed for schedules and may be added to as needed.

Refer to Information Delivery Plan spreadsheet for common and detailed parameters.

### 6.5.4 STARTING VIEW

A Legend View is included in all Project Templates that allows important Project Information to be readily available upon opening the project, as it is set as the default starting View. This View is used when synchronizing with the Central model.

<p><b>THE PORT AUTHORITY OF NY &amp; NJ</b> ARCH Template</p> <p><b>Project Information</b> PID -</p> <p><b>Disclaimer</b> This document and information contained herein belongs to PANYNJ, and constitute PANYNJ confidential, privileged, and proprietary information. This document and information contained herein may not be disclosed, copied, reproduced, or distributed to anyone outside PANYNJ without prior written consent of PANYNJ.</p> <p><b>What's Included in Template</b> The following elements have been defined in the Project Template according to PANYNJ BIM Standards. <u>Do not edit or delete.</u> If new types are needed, please follow guidelines in reference legend views (<b>PA-Admin-Description</b>):</p> <ul style="list-style-type: none"> <li><b>Styles</b> - Line, Dimension, &amp; Text Styles for working and documentation purposes as well as Drafting and Model Fill Patterns.</li> <li><b>Views</b> - View Types for working, documentation, and coordination purposes with corresponding View Templates.</li> <li><b>Sheets</b> - Sheet Types with approved Titleblocks.</li> <li><b>Shared Parameters</b> - Shared Parameters to control view &amp; sheet information and browser organization.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>"Before submitting your file check the following"</b></p> <ol style="list-style-type: none"> <li><b>All models are linked.</b></li> <li><b>Project Information is completed.</b></li> <li><b>Purge unnecessary items.</b></li> <li><b>The browser tree should be closed.</b></li> </ol> </div> <p><b>Set-Up Tasks</b> <u>Coordinates</u> All projects should be using Shared Coordinates as defined by the Site Model and survey files (see <b>PA-Admin-Coordinates</b> for more information).  <ul style="list-style-type: none"> <li>Link SM Model and acquire Shared Coordinates</li> <li>Establish Project Base Point</li> <li>Set True North</li> </ul> <u>Phasing</u> All projects should have at least two phases, New Construction and Existing (see <b>PA-Admin-Phasing</b> for more information).  <ul style="list-style-type: none"> <li>Define project Phases and confirm Phases are consistent for all models</li> <li>Confirm Phase Filters and Graphic Overrides are consistent for all models (as defined in Template)</li> </ul> <u>Worksets</u> Utilize default Worksets and create User Worksets as needed per project (see <b>PA-Admin-Worksets</b> for more information)  <u>Links</u> All links must be named properly and assigned to the proper workset (see <b>PA-Admin-Links</b> for more information)  <ul style="list-style-type: none"> <li>Revit &amp; Point Cloud files linked via Shared Coordinates, Overlay type and Pinned DO NOT IMPORT CAD</li> </ul> <u>Copy/Monitor</u> Datum elements should be owned by the proper discipline and incorporated into all models via Copy/Monitor process.  <ul style="list-style-type: none"> <li>Grids are owned by the Structural Model or Lead Discipline</li> <li>TOS Levels are owned by the Structural Model or Lead Discipline</li> <li>TOFF Levels are owned by the Architecture Model or Lead Discipline</li> </ul> </p>	<p><b>Point of contacts</b></p> <p><b>PANYNJ</b> VDC manager: Turner Ashley Phone: 212-435-6103 E-mail: aturner@panynj.gov</p> <p>VDC engineer: Phone: 212-435-xxx E-mail: xx@panynj.gov</p> <p><b>Consultant / Contractor</b> Name - Role - Discipline - Phone - e-mail</p>
	<p><b>How to setup your model using this template</b></p> <ol style="list-style-type: none"> <li>Complete all the information in the Project Information.</li> <li>Link Site Model Origin to Origin.</li> <li>Acquire Coordinates - Check in the Site View.</li> <li>Pin the Site Model.</li> <li>Links other models/disciplines and pin.</li> <li>Copy/Monitor (levels and grids).</li> <li>All settings like phasing should be coordinated.</li> </ol>
	<p><b>Confidential and Privileged Project</b></p> <p>Confidential Projects contain highly sensitive information that if lost or made public could seriously damage or compromise the Port Authority and/or public safety and security. If information on a drawing is considered to be Confidential Privileged the system that contains the Confidential Privileged design elements is to be removed from the main file for that particular discipline and stored in a separate Confidential Privileged model file in the Model_CP folder. Check 12.0 APPENDIX B: SPECIAL PROJECTS</p>

Figure 22 - Example of Starting View

Within the view you will find basic information and different references to other Legends that will provide guidance on important aspects related to the use of Revit.

### 6.5.5 PROJECT INFORMATION

Project Information should be completed at the beginning of the project.

The screenshot shows a 'Project Information' dialog box with the following structure:

- Family:** System Family: Project Information (dropdown menu)
- Type:** (empty dropdown menu)
- Instance Parameters - Control selected or to-be-created instance**

Parameter	Value
<b>Identity Data</b>	
Organization Name	CONSULTANT NAME
Organization Description	CONSULTANT DESCRIPTION
Building Name	NOT APPLICABLE
Author	NOT APPLICABLE
Workset	Project Info
Edited by	
<b>Energy Analysis</b>	
Energy Settings	Edit...
<b>General</b>	
PA-CPNUMBER	XXXXXXXX
PA-SIGNEESNAME	-
PA-DISCIPLINESCHIEF	NAME NAME
PA-DISCIPLINE	DISCIPLINE
PA-SUBDISCIPLINE	SUBDISCIPLINE
PA-WORKORDER	XX
PA-PROGRAMDIRECTOR	NAME NAME
<b>Route Analysis</b>	
Route Analysis Settings	Edit...
<b>Other</b>	
Project Issue Date	00/00/0000
Project Status	100
Client Name	NOT APPLICABLE
Project Address	Address here
Project Name	PROJECT NAME HERE
Project Number	NOT APPLICABLE
PA-CONTRACTNUMBER	XXXXXXXX
PA-FACILITY	FACILITY
PA-PID	XXXXXXXX
PA-BIMSTANDARDRELEASEDATE	FEB 2020
PA-LINEDEPARTMENT	DEPARTMENT

Buttons: OK, Cancel

Figure 39 - Project Information

### 6.5.6 PROJECT BROWSER

Customized Revit Project Browser has been included within the different Discipline Templates, in which Views and Sheets within the Project Browser will be grouped based on the PA-View Classification as follows:

Table 6-5 - Types of project Browsers within a Discipline Template

PROJECT BROWSER	
PA - VIEW CLASSIFICATION	DESCRIPTION
COORDINATION	Views are intended to be the Views that maintain the coordination across the different Discipline Revit Models as well as for coordination purposes only. These types of Views include Floor Plans, Ceiling Plans, 3D Views and Elevations. Subcategories have been defined and indicate the purpose of each view: EXPORT, MODEL INTEGRITY and QAQC. These views should not be deleted.
DOCUMENTATION	Views intended to be included in the Contract Set.
WORKING	These types of Views are for working purposes only and not intended to be included in the Contract Set. These are temporarily views that should be deleted before the final submission.

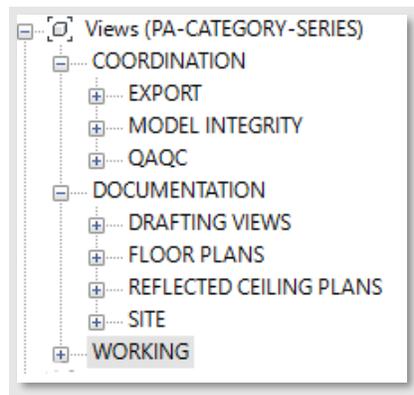


Figure 24 - General Project Browser

The Project Browser scheme should be set to “PA-CATEGORYSERIES”. Do not edit the Filter or Sort settings of this scheme. It is fine to add other browser schemes temporarily, however, be sure to reset the scheme to “PA-CATEGORYSERIES” as part of the submission preparation process.

All Views need to be associated to their corresponding Category by assigning the appropriate View Template. Once assigned, the associated Category will be shown in the correspondent parameters under Identity Data.

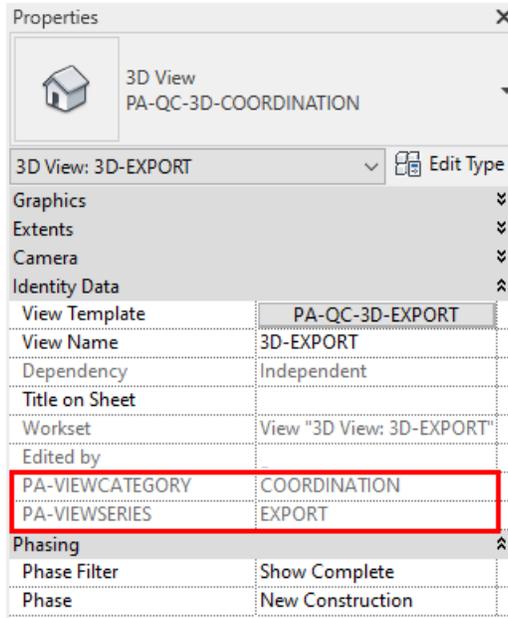


Figure 41 - Highlighted PA-VIEW CATEGORY and PA-VIEWSERIES parameters.

### 6.5.7 TEXT STYLES

Several Text Styles have been defined within the Templates as follows:

- PA-NOTE-ARIAL1/8-OPAQUE
- PA-NOTE-ARIAL1/8-TRANSPARENT
- PA-NOTE-ARIAL1/16-OPAQUE
- PA-NOTE-ARIAL1/16-TRANSPARENT
- PA-NOTE-ARIAL3/32-OPAQUE
- PA-NOTE-ARIAL3/32-OPAQUE-BOLD
- PA-NOTE-ARIAL3/32-OPAQUE-RED
- PA-NOTE-ARIAL3/32-TRANSPARENT
- PA-NOTE-ARIAL3/32-TRANSPARENT-BOLD
- PA-NOTE-ARIAL3/32-TRANSPARENT-RED
- PA-TITLE-ARIAL1/8-OPAQUE-BOLD
- PA-TITLE-ARIAL1/8-TRANSPARENT-BOLD
- PA-SCHEDULE TEXT-1
- PA-SCHEDULE TEXT-2

**NOTE:**

If a new text style is needed, they must follow the naming convention:

- "ORIGINATOR-CATEGORY-DESCRIPTOR-SUBDESCRIPTOR"

Start with two letters for the ORIGINATOR "XX", followed by the new text style, the font and size, followed by other attributes if applicable.

\*Only ARIAL font style is allowed in Text Styles.

### 6.5.8 DIMENSIONS STYLES

Several Dimension Styles have been defined within the Templates as follows:

- PA-LINEAR-ROUNDED1/2-OPAQUE
- PA-LINEAR-ROUNDED1/2-TRANSPARENT
- PA-LINEAR-ROUNDED1/4-OPAQUE
- PA-LINEAR-ROUNDED1/4-TRANSPARENT
- PA-LINEAR-ROUNDED1/4-OPAQUE-INCHES
- PA-LINEAR-ROUNDED1/4-TRANSPARENT-INCHES
- PA-LINEAR-ROUNDED1/4-OPAQUE-ALTUNITS
- PA-LINEAR-ROUNDED1/4-TRANSPARENT-ALTUNITS
- PA-LINEAR-ROUNDED1/8-OPAQUE
- PA-LINEAR-ROUNDED1/8-TRANSPARENT
- PA-LINEAR-ROUNDED1/16-OPAQUE
- PA-LINEAR-ROUNDED1/16-TRANSPARENT
- PA-LINEAR-ROUNDED1/32-OPAQUE
- PA-LINEAR-ROUNDED1/32-TRANSPARENT
- PA-LINEAR-WORKINGEXACT-OPAQUE-RED
- PA-LINEAR-WORKINGEXACT-TRANSPARENT-RED

Identical Dimension Styles have been created for Radial and similar options for Angular, but it is important to define, at the beginning of the project, which are the dimensions styles that will be needed in order to keep the file clean and avoid unnecessary mistakes.

**NOTE:**

If a new dimension style is needed, they must follow the naming convention:

“ORIGINATOR-CATEGORY-DESCRIPTOR-SUBDESCRIPTOR”

Start with two letters for the ORIGINATOR “XX”, followed by the new dimension style, the rounding and other attributes if applicable.

\*Only ARIAL font style is allowed in Dimensions Styles.

### 6.5.9 LINE STYLES

Different Line Styles that match the Line Weights have been provided as follows:

Table 6-6 - Line Styles

LINE STYLES		
NAME	PEN # (WIDTH)	LINE PATTERN
PA-BLACK-SOLID-PEN01	1 (0.0040")	Solid Black
PA-BLACK-SOLID-PEN02	2 (0.0080")	Solid Black
PA-BLACK-SOLID-PEN03	3 (0.0100")	Solid Black
PA-BLACK-SOLID-PEN04	4 (0.0150")	Solid Black
PA-BLACK-SOLID-PEN05	5 (0.0200")	Solid Black
PA-BLACK-SOLID-PEN06	6 (0.0280")	Solid Black
PA-BLACK-SOLID-PEN07	7 (0.0360")	Solid Black
PA-BLACK-SOLID-PEN08	8 (0.0480")	Solid Black
PA-RED-SOLID-PEN04	4 (0.0150")	Solid Red
PA-GREY20-SOLID-PEN08	8 (0.0480")	Solid Grey
PA-GREY40-SOLID-PEN06	6 (0.0280")	Solid Grey
PA-GREY60-SOLID-PEN04	4 (0.0150")	Solid Grey
PA-GREY80-SOLID-PEN02	2 (0.0080")	Solid Grey

**NOTE:**

If a new Line style is needed, they must follow the naming convention:

- "ORIGINATOR-CATEGORY-DESCRIPTOR-SUBDESCRIPTOR"
- Start with two letters for the ORIGINATOR "XX", followed by the new dimension style, the rounding and other attributes if applicable.
- \*Only ARIAL font style is allowed in Dimensions Styles.

### 6.5.10 LINE WEIGHTS

Line Weights have been provided for Model, Annotation and Perspective Objects as follows.

Sixteen Line Weights have been provided for Model, Perspective and Annotation Objects, which have been defined at the 1/8" = 1' Scale.

Table 6-7 - Line Weights

MODEL AND ANNOTATION LINEWEIGHTS	
PEN #	WIDTH
1	0.0040"
2	0.0080"
3	0.0100"
4	0.0150"
5	0.0200"
6	0.0280"
7	0.0360"
8	0.0480"

### 6.5.11 SYMBOLS

Different Annotations such as, Tags, Callouts, North Arrow, Graphic Scales, View titles, among others have been pre-loaded within the Templates based on the Discipline.

**NOTE:**

The Annotation Symbols are loaded under the Project Browser under FAMILIES tab within the Annotation Symbols.

If a new symbol is needed, they must follow the naming convention:

- "ORIGINATOR-SYM-DESCRIPTION1-DESCRIPTION2"
- Start with two letters for the originator "XX", followed by the new Symbol Type, then DESCRIPTION 1, followed by DESCRIPTION 2 if applicable.
- \*Only ARIAL font style is allowed in Symbols, if a text style is needed.

### 6.5.12 VIEW TITLE

All PA View Title families have a toggle control checkbox parameter (“View Scale”) that allows for the scale to be hidden when the box is unchecked or displayed when the box is checked.

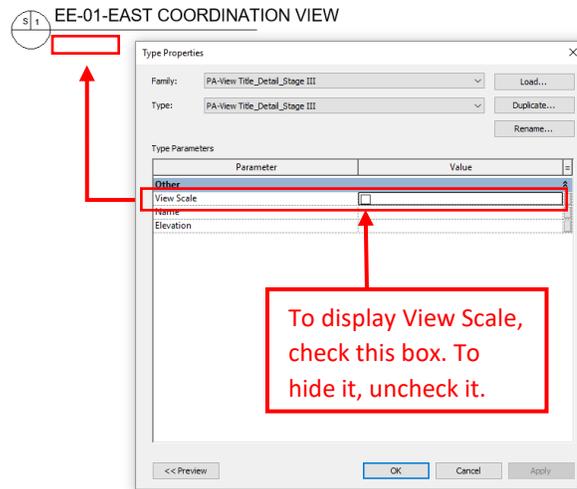


Figure 6-26 – View Scale checkbox

Given the preference for the use of graphic scales in most projects, the View Title families have been set to have their scales hidden by default. View Titles should see as the image below:

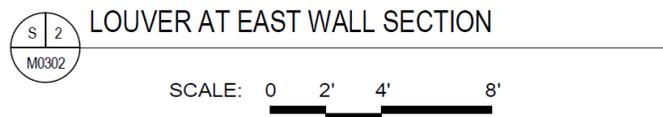


Figure 6-27 – Example of View Title family and Type Properties

### 6.5.13 GRIDS

Two Standard Grids have been provided as follows:

- PA-GRID-EXISTING (for existing construction)
- PA-GRID- NEW (for new construction)

### 6.5.14 ELEVATIONS

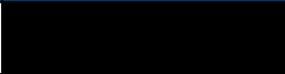
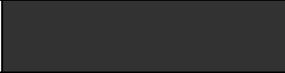
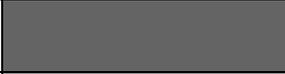
Four Standard Elevations have been provided under the Coordination View in the Project Browser as follows:

- EE-EAST ELEVATION
- EE-NORTH ELEVATION
- EE-SOUTH ELEVATION
- EE-WEST ELEVATION

**6.5.15 FILLED REGIONS**

Fill Regions (opaque and transparent) have been provided as follows:

Table 6-8 - Filled Regions

SCREENING		
FILLED REGION NAME	RGB VALUE	RGB COLOR
PA-BLACK100%-OPAQUE PA-BLACK100%-TRANSPARENT	000-000-000	
PA-BLACK80%-OPAQUE PA-BLACK80%-TRANSPARENT	050-050-050	
PA-BLACK60%-OPAQUE PA-BLACK60%-TRANSPARENT	100-100-100	
PA-BLACK40%-OPAQUE PA-BLACK40%-TRANSPARENT	150-150-150	
PA-BLACK20%-OPAQUE PA-BLACK20%-TRANSPARENT	200-200-200	

**NOTE:**

Other “Out-of-the-Box” Fill Regions exist within the template to use.

### 6.5.16 FILL PATTERS

Several Fill Patterns have been created in order to avoid inserting patterns not approved by the Agency, for most cases patterns will be found in a small, medium and large versions:

Table 6-9 - Fill Patterns

FILL PATTERNS		
PA-FILL2D-ANSI31	PA-FILL2D-CONC	PA-FILL2D-GRATE
PA-FILL2D-ANSI32	PA-FILL2D-CONC-PRECAST	PA-FILL2D-GRAVEL
PA-FILL2D-ANSI33	PA-FILL2D-CORK	PA-FILL2D-GYPSUM
PA-FILL2D-ANSI34	PA-FILL2D-CROSS	PA-FILL2D-HERRING
PA-FILL2D-ANSI35	PA-FILL2D-DASH	PA-FILL2D-HEXAGONS
PA-FILL2D-ANSI36	PA-FILL2D-DIAG-DN	PA-FILL2D-HONEY
PA-FILL2D-ANSI37	PA-FILL2D-DIAG-UP	PA-FILL2D-HORIZ
PA-FILL2D-ANSI38	PA-FILL2D-DOLMIT	PA-FILL2D-HOUND
PA-FILL2D-ALUM	PA-FILL2D-EARTH	PA-FILL2D-INSUL
PA-FILL2D-BOND	PA-FILL2D-FLEMISH	PA-FILL2D-MASONRY-BLOCK
PA-FILL2D-BRASS	PA-FILL2D-RUBBER	PA-FILL2D-STEEL
PA-FILL2D-MDF	PA-FILL2D-RUNNING	PA-FILL2D-STONE
PA-FILL2D-PARQUET	PA-FILL2D-SAND	PA-FILL2D-TACTILE
PA-FILL2D-PERF	PA-FILL2D-GLASS	PA-FILL2D-TRIANGLE
PA-FILL2D-PLASTER	PA-FILL2D-SEALANT	PA-FILL2D-VERT
PA-FILL2D-PLY-VENEER	PA-FILL2D-SIDING	PA-FILL2D-MASONRY-BRICK
PA-FILL2D-PLYWOOD	PA-FILL2D-STACK	PA-FILL2D-WOOD

**NOTE:**

Other “Out-of-the-Box” Fill patterns exist within the template to use. New Fill Patterns can be created, they must follow the standard naming convention.

### 6.5.17 SCHEDULES

A series of Engineering Estimates Schedules have been provided with the different Discipline Templates to support the Estimating process.

**NOTE:**

Schedules can be duplicated within the Revit Model so the Filter and Sorting/Grouping Categories can be used.

There are two “Admin” schedules created for QC purposes that should be deleted or modified, those are “PA-Admin-Multi-Category” and “PA-Admin-ViewList”.

### 6.5.18 PHASES

Phases can be created to match the Project Construction Phases as necessary. The LE/A is responsible for coordinating how many Phases the Project might have. For naming convention, refer to [Section 4.2.7 Phases](#). Phase Settings for Existing, Demolished, New and Temporary have been set as shown in the image below. These settings for Phase Filters and Graphic Overrides should not be modified.

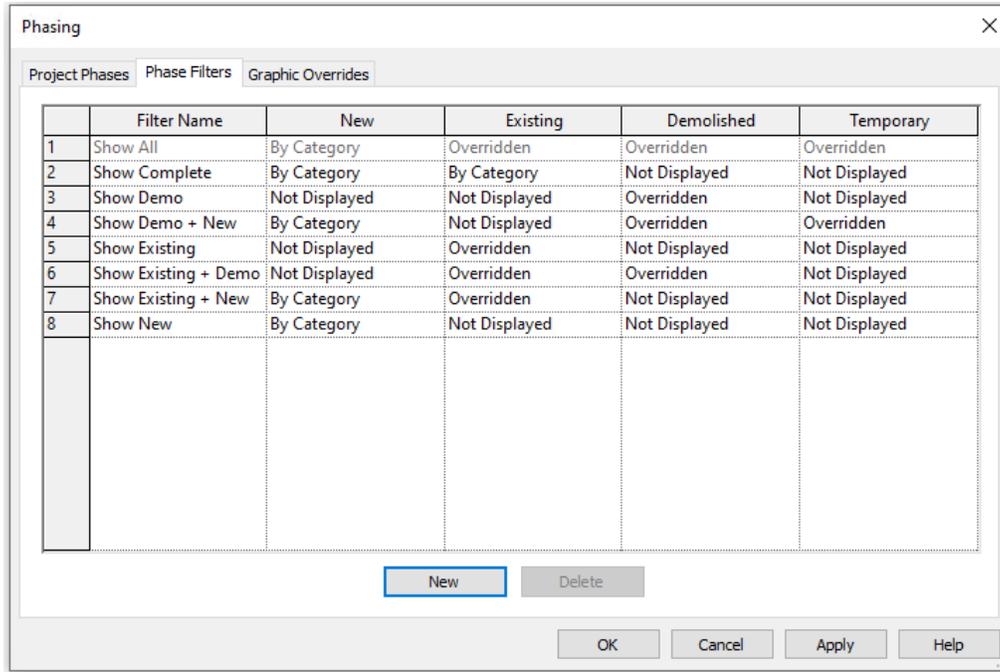


Figure 45 - Phase Filters

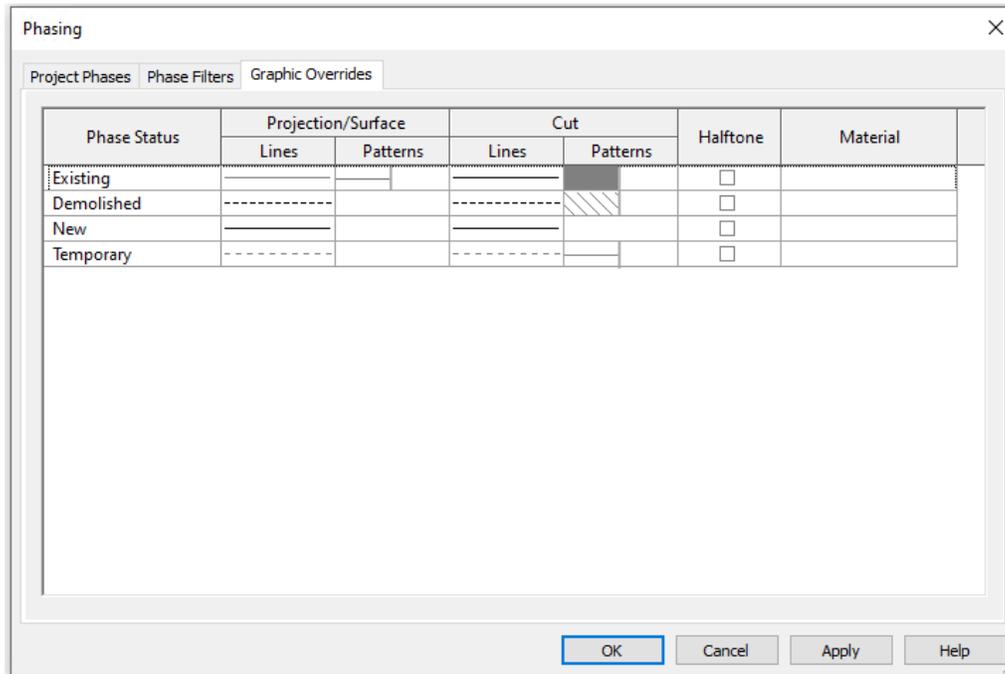


Figure 44 - Graphic Overrides

## 6.5.19 ROOMS

Rooms are Revit elements that should be created in the Architecture model, these elements are defined by other elements in the model like walls and ceilings. All rooms should be enclosed spaces. In the project, the room properties must be filled (like the room number and the room name). Having that information completed, will help in the further steps like a model analysis, quantity takeoff, etc.

### 6.5.19.1 ROOMS COMPUTATION

Room Computation has been enabled for Area and Volumes and has been set at wall finish as shown in the image below.

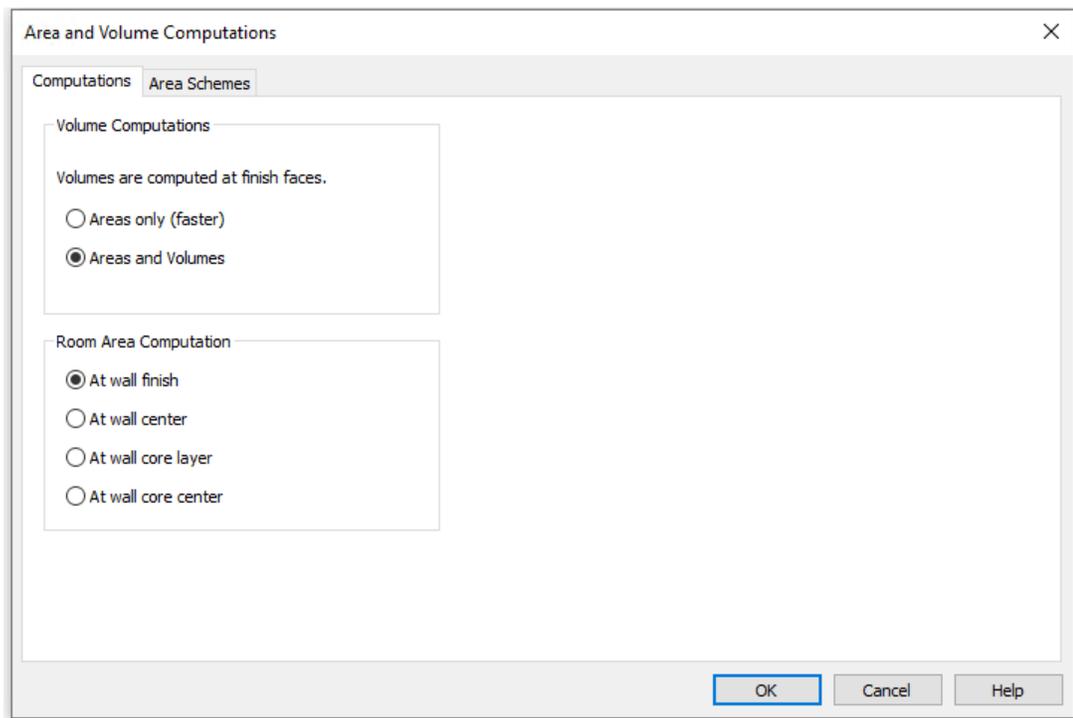


Figure 30 - Area and Volume Computation Dialog Box

## 6.6 BIM COORDINATION MODEL - DESIGN

The VDC Engineer assigned to a project is responsible for setting up inter-disciplinary clash detection testing and creating a BIM Coordination Clash Report one (1) month before each, the 50% and 100% submissions during Stage III.

The inter-disciplinary clash detection will be performed by the project VDC Engineer using Autodesk Navisworks. Each discipline's Task Leader, including the Lead Discipline, is responsible for creating a Navisworks file (.nwc) out of their Revit Models.

After testing the Coordination Model for clashes, the VDC Engineer has one (1) week to create the BIM Coordination Clash Report and share it with the LE/A.

### 6.6.1 COLOR SCHEME

The following color scheme is used to promote consistency and easy identification across all users when coordinating the project and generating Clash Reports.

*Table 6-10 - Color Scheme*

DISCIPLINE	COLOR
Architectural	Cyan
Electrical	Yellow
Electronics	White
Corrosion Protection	Orange
HVAC	Green
Plumbing	Magenta
Fire Protection	Red
Vertical Circulation	Pink
Structural	Blue

**NOTE:** Depending on the project needs further breakdown can be set either by level or by system. Contact the VDC Support Group if you need to create new Color Schemes.

### 6.6.2 INTERFERENCE CHECK / CLASH DETECTION

The use of Clash Detection tools will have 3 possible outcomes within our BIM practice:

- **No Clash:** Absence of clash, this represents the perfect case scenario.
- **Soft Clash:** Alerts on an excessive proximity between two objects that could generate issues during execution/installation or maintenance. During design this type of clash will not require any additional action.  
e.g., Ducts going through Partition Walls.
- **Hard Clash:** Detects a physical collision between two model objects. This type of clash will require action/work from the team.  
e.g., Columns going through Equipment.

NOTE: Clash Detection tool should be used during the design process to coordinate major building elements and systems allowing the identification of interferences earlier in the process.

#### **6.6.2.1 SINGLE-DISCIPLINE CLASH DETECTION**

The Single-Discipline Clash Detection will be performed by each Discipline's Leader using the Interference Check tool within Revit or Clash Detective in Navisworks.

#### **6.6.2.2 CROSS-DISCIPLINE CLASH DETECTION**

The VDC Engineer is responsible for setting up Cross-Disciplinary Clash Detection sessions as often as the project requires, usually defined in the BEP (BIM Execution Plan).

During the Stage III, said frequency of the Cross-Disciplinary Clash Detection sessions shall be set to a minimum of two (2). The first one, a month prior to the submission of the 50% progress of the project and the second, a month before the 100% final submission of the stage.

The Cross-Discipline Clash Detection will be performed by the VDC Engineer using Autodesk Navisworks.

Each Discipline Leader, including the Lead Discipline, is responsible for creating a Navisworks file out of their Revit Models (.nwc).

#### **6.6.3 NAVISWORKS CLASH REPORT**

The VDC Engineer is responsible for compiling all the discipline specific Navisworks Cache files (.nwc) into a single Master Navisworks file (.nwf).

The VDC Group has developed a Navisworks Template to be used as a base for coordination purposes.

Following every Clash Detection sessions, a Federated Model (.nwd) file shall be distributed to all Discipline Leaders. The NWD file shall contain Saved Viewpoints of all clashes that are *New* or *Existing*.

Along with the NWD Federated Model and as a complement, The VDC Engineer shall create a Report listing the clashes and issues that are analyzed during the sessions, indicating which course of action has been agreed.

After the VDC Kick-off Meeting, the VDC Engineer will provide to the Contractor a 3D Coordination Meeting Report template that will gather the following sections:

- a. Introduction
- b. List of Models Reviewed
- c. Overview of Clash Report
- d. Clash Detection Results

#### **6.6.4 DESIGN DELIVERABLES**

Hardcopy and electronic deliverables are required at the completion of every project. All submitted sheets must use The Port Authority of NY & NJ Title Sheets and Contract Borders identified in this Manual.

All submitted electronic files must be compatible with the version of the Autodesk Revit software recently being used by the Port Authority of NY & NJ and must conform and comply with the latest version of the Port Authority of NY & NJ BIM Standard as outlined in this Manual.

### 6.6.5 HARDCOPY DELIVERABLES

Final hardcopies of each sheet must use the PANYNJ Contract Border identified in this standard and must be submitted at full size, either 22x34 or 34x56.

Submitted hardcopies must use archival paper with Permalife® plotter paper specifications. Engineering Department staff will verify that submissions contain the “Permalife 25% cotton content” watermark.

### 6.6.6 ELECTRONIC DELIVERABLES

Electronic files are required for each milestone during Stages I, II and III. If the project does not have a milestone scheduled prior to the 100% Submittal, files must be submitted no later than 2 weeks before the submission for a BIM Wide Review.

The Port Authority of NY & NJ BIM Standard adopts the PDF format as the standard to be used when creating sheets for plotting purposes. Plotting from the Revit-based application is accomplished by exporting the sheets as a PDF file.

PDF files shall always be created as multi-sheet files, in full size (22x34 or 34x56), in black and white, and grouped together by Drawing Type and by Series (if used).

### 6.6.7 SUBMISSION PROCESS

All project-related files from must be submitted in the SUBMITTAL folder.

Files from Consultants must be submitted on Livelink or media CDs/DVDs, delivered virus free.

The following formats are required on every submission:

- RVT: Autodesk Revit files
- NWD: Autodesk Navisworks Document files
- NWC: Autodesk Navisworks Cache files
- PDF: Adobe 2D Portable Document Format files

### 6.6.8 RECORD DRAWINGS

In addition to any revisions required by the Engineer, updated Design Models shall include all approved (a) Shop Drawing changes as field verified by the Contractor, (b) revisions resulting from responses to requests for information (RFIs) during performance of the Work, and (d) accurate geometry and location for all constructed Work.

All Model submissions shall include a description of updates made to these models and all necessary linked files to ensure a comprehensive, coordinated submission (including but not limited to \*.rvt and \*.nwd files). When requested by the Engineer, editable model geometry and data shall be submitted in native approved formats (e.g., \*.rvt, \*.dwg) in addition to published formats (i.e., \*.pdf, \*.nwc, \*.nwd, \*.nwf).

All files submissions should be delivered following the Standard drawings requirements; the Contract Border should include the “As-Constructed” Stamp to indicate the drawings reflect the final conditions of each element in the field.

Files will be submitted for compliance review and will need to be approved in order to closeout the Project final Submission.

## 7.0 CONSTRUCTION REQUIREMENTS

The current section describes requirements, processes and procedures currently demanded and in use by The Port Authority of New York and New Jersey in relation to use of BIM in Stage IV Construction, particularly for a traditional Design-Bid-Build project delivery method.

**NOTE:**

For Design Build projects, [Design Requirements](#) section should be considered as well.

### 7.1 GOALS AND USES

The main objective of this section is to provide the proper framework, so that all Stakeholders can deliver and receive consistent information throughout the construction.

As an owner, the PANYNJ considers the Model as a tool to facilitate:

- Reutilization of information available from Stages I-III.
- Risk mitigation, by providing reliable information earlier in time (compared to a non-BIM methodology)
- Reduction of errors during construction, improving project delivery on time, and within budget (for example, by minimizing Change Orders and Coordination-driven delays and rework in the field).
- More efficient site planning and logistics.
- Improving project safety.
- Data recollection on relevant assets, for future Operation needs.

### 7.2 CONSTRUCTION SITE MODEL

The Site Model (SM) file is created and distributed by the VDC Group at the Project's BIM Kick-off meeting. This Site Model file has a combination of Aerial Photograph and CAD Files obtained from The Port Authority of NY & NJ [BMMS \(Base Map Management System\)](#) and specific CAD file background with coordinates provided by Central Survey Group. This file holds the project coordinate system and controls the location, rotation, and elevation. All Discipline models must link the SM and acquire the project coordinates from it. This model shall NOT be modified, will be provided for reference only.

Upon receipt of the base Site Model, the Contractor must perform an assessment to determine if there is any information of particular importance that may require additional validation.

### 7.3 CONSTRUCTION CONTEXT MODEL

This section refers to the particularities of the Context Model, as a special case among all Models to be developed by the BIM authors. The Context Model developed during Design shall be used as a base to be further developed during Construction.

The Context Model is a subcomponent of the Construction Model, so its required for the Context Model to work in close relation to the schedule, in order to develop its full potential and provide real value. The Context Model shall include the topography, Site utilities, access and egress routes for materials, material lay down, temporary work, etc.

It is worth mentioning that due to the different project types within the PANYNJ portfolio, and their potential locations, the Context Model requirements can greatly vary between projects.

### 7.3.1 CONSTRUCTION CONTEXT MODEL LIFECYCLE

The Contractor/BIM Leader is the owner and solely responsible for the development of the Context Model. The Context model shall be submitted for Compliance Review in each official submission as part of the Construction Deliverables package.

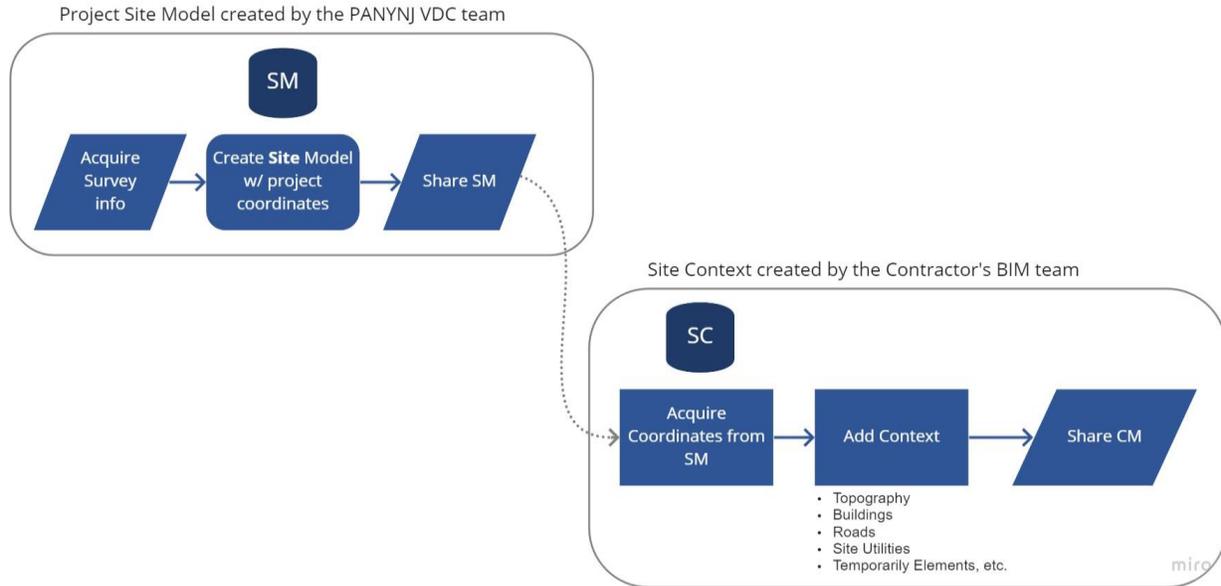


Figure 31 - Construction Context Model creation workflow

### 7.3.2 GOALS AND USES

Specific goals pursued by the Context Model include:

- To support site planning and logistics.
- To improve project safety.
- To assist activities involving new Underground Utilities.
- To support Program management, when applicable.

### 7.3.2.1 USES BY THE PANYNJ

- **Contextual analysis:** By showing site surroundings, the Model will better mirror the real-world conditions, as no Construction project is impervious to the environment in which it transpires. Access roads and logistic, impact on vehicle or pedestrian traffic, are some of the studies that can be performed.
- **Assisting on Program planning:** By containing a unified coordinate system, a particular project can be incorporated in a Program-level Construction Model, rather seamlessly. This allows to analyze how different project interact with each other.
- **Improving site safety:** By incorporating geometry and schedule, some major hazards can be simulated in time, and preventive or mitigation actions can also be defined for specific dates.
- **Reference of existing underground utilities, when available:** By incorporating existing site utilities into the starting Context Model, as provided by the Authority.
- **Systematic Revision of 4D Site Plans:** By incorporating project schedule, a more comprehensive analysis on construction activities and their repercussions can be performed.
- **Logistics Planning:** The 4D Context Model is invaluable in planning logistics issues such as access and egress routes for materials, traffic shutdowns, use of lay-down space, etc. This tool is especially useful on tightly constrained project sites.

### 7.3.2.2 USES BY THE CONTRACTOR

For the Model to fulfil the uses envisioned by the Authority, it is the Contractor's responsibility to develop and maintain the Site Context Model. The Model shall comply with the general requirements made herein and documented on the BEP.

Furthermore, the PANYNJ believes there are other potential uses that may provide value to the Contractors and Subcontractors. In this spirit, the Authority encourages all parties to:

- **Support and improve the efficiency of the site layout:** From the visualization standpoint alone, the Model may provide a different perspective to consider alternate possible layouts (location of trailer, access to site and material lay down, etc.).
- **Preliminary hazard detection and safety planning.**
- **Analysis of construction activities sequence:** Either by a human operator or a computer-based application, which may reveal new threats or opportunities, previously overlooked.

Unlike other Models (Discipline models) the Context Model will not typically undergo a LOD transformation throughout the process, since it will mostly be elemental geometry acting as place holder for temporary works.

### 7.3.3 REPRESENTED ELEMENTS AND ENTITIES

The following table includes elements to be represented by the Contractor on the Context Model. Contractor is encouraged to include more representative geometry when available and also include any other element that may be an additional part of the construction logistics and may affect the Project development and its surroundings, such as pedestrian paths, traffic, city areas, etc.

Table 7-1 - Elements to be included in the Context Model

ELEMENT	MODELING GUIDELINE	WORKSET – COLOR
Property line perimeter	Modeled as a single element, of negligible thickness and with an elevation equal to or higher than the top-most point of any temporary or final work	Site – Layout; White, Semi transparent
Job Trailers	Represented as simple prisms (overall dimensions)	Site – Layout; White, Semitransparent
Material lay down areas (non-hazardous)	Represented as simple prisms (overall dimensions)	Site – Logistics; Gray, Semitransparent
Site access points	Modeled as a single element, of negligible thickness. May overlap with fencing and property line geometry.	Site – Logistics; Gray, Semitransparent
Parking (temporary)	Modeled as single or multiple elements of arbitrary thickness. “Slab” tool is acceptable.	Site – Layout; White, Semitransparent
Fences	Modeled as single or multiple elements of arbitrary thickness. “Wall” tool is acceptable.	Site – Layout; White, Semitransparent
Cranes, hoists, and Fixed Equipment	Geometry must suggest the type of equipment when possible. Crane envelopes, equipment clearance and other “no-fly” zones must be represented	Site – Equipment; Orange, Solid (equipment) Site – Equipment; Red, Semitransparent (envelopes and “no-fly” zones)
Excavation	Basic prismatic shapes showing overall dimensions.	Site – Construction Activity; Red, semitransparent
Temporary Structures	Basic prismatic shapes showing overall dimensions.	Site – Construction Activity; White, Semitransparent

### 7.3.4 MODELING REQUIREMENTS

Unlike discipline models, the Context Model shall not contain any final work and shall not be migrated to the Agency's Asset Management System. As a direct consequence, content requirements are fewer and less strict.

However, the following practices are to be observed, at minimum:

- Contractor is always expected to follow PANYNJ BIM Standards during the development of the Context Model.
- Revit Templates provided by the Authority will contain basic Worksets and custom materials as a starting point. Contractor may create more at his own discretion, providing all color and Worksets conventions as stated in the BEP.
- The LOD requirements for elements within the model will not be higher than a level of development "LOD-200" as understood and interpreted by the BIM Forum's LOD Specification (Part I), version as stated in [Section 5.4 Information Delivery Plan](#).
- No permanent work is to be included in the Context Model.
- The Model must remain a Revit native file, and its geometry must also be native to this software (there may be some approved exceptions, like imported Civil 3D Pipe networks, that will be treated on a case-by-case scenario).
- Use of the "Model in place" tool to create geometry, is accepted in the SCM (unlike trade models).
- To avoid rework, consider the Project schedule requirements when creating content in the Context Model, as some elements extent may be limited by some activity's duration (e.g.: activity duration limited to "x" days may determine how excavation geometry is modeled)

### 7.3.5 CONTEXT MODEL UPDATES

Contractor shall maintain the Context Model throughout the construction process by incorporating any major change in geometry, logistics or site layout. Additionally, Contractor is also responsible for keeping Model current in terms of Construction sequence.

Reporting: Contractor shall include a basic narrative on the BIM report, whenever there is a significant change is made. There is no need to include a mention in the report when SC presents no modifications.

## 7.4 CONSTRUCTION MODEL

The construction model contains all digital data relevant to the construction process. The construction model is the source-of-truth for coordination purposes.

The Revit and Navisworks files will be monitored and updated as construction progresses. The construction model will be composed of:

- 2D – PDF Construction Plan Sheet Set.
- 3D – RVTs, NWCs, NWD Federated Model, including the Site Model, Context Model, Construction Models and Coordination Model.
- 4D – NWD including simulation of Construction Schedule.
- 7D - EAM attributes incorporated in the RVT models as defined in the Information Delivery Plan (IDP)

Depending on context, the 3D “Construction Model” may refer to:

- A single composite Model, e.g., the Navisworks NWF/NWD files.
- Several Models, e.g., the aggregate of the Revit and Civil 3D native files; or
- A single trade model (e.g., the electrical Construction Model).

### **DISCLAIMER:**

Design Models provided by the Authority (when available) to Contractors are for visual information only. The Contractor/s shall use those as reference. Design Models may be used as a starting point for trade Construction Models at the Contractor’s own risk. The PANYNJ may not be held accountable for measurements, quantifications, coordination or any other activities and assumptions made based on the Design Models. It is strongly suggested that, if the Contractor decides to use them for the processes and deliverables described in this Standard, they are thoroughly validated with all Contract information first (drawings, specifications, etc.).

### 7.4.1 CONSTRUCTION MODEL BREAKDOWN AND MILESTONES

Since the Construction Model is to correlate to the construction itself, different development status will coexist in the same model. It is not possible to state that the Construction Model is at a singular stage of construction and development.

To facilitate a common understanding of actual progress, the PANYNJ breaks down the CM under two concepts: Construction Model Milestones and Areas of Interest (AOIs).

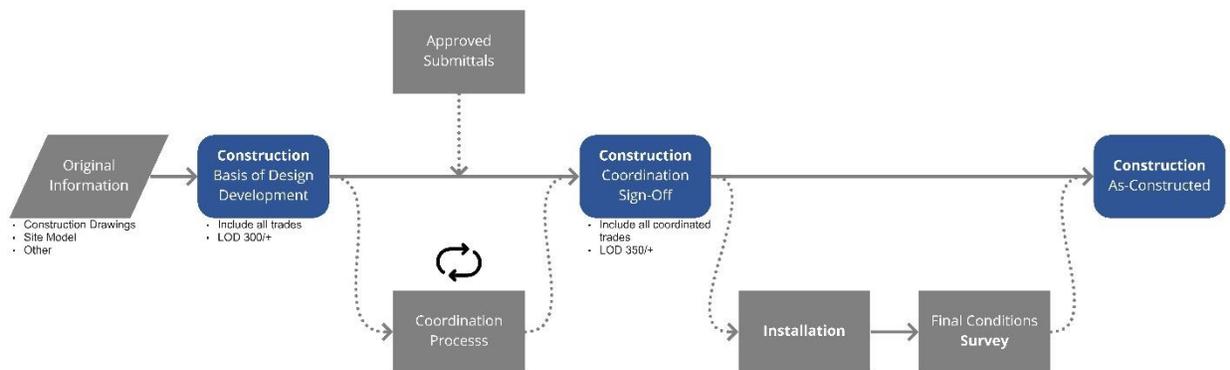
These can be considered as a Construction Model division in time. Model milestones will typically be the same for every project and follow logical construction sequence. These are defined by the Authority and cannot be changed.

In general terms, milestones are defined as follows:

- **Basis of Design (BOD):** Models have been prepared as per Contract Documentation, including any variation requested from or approved by the Authority (PACCs, returned RFIs, approved Change requests). Regarding coordination, the location of elements is approximate, not final.
- **Coordination Sign-off:** Discipline models have reached the required LOD, and all elements are in their final position. The CM is considered a “single source of truth” and used for coordination purposes. As part of the sign-off process, all parties agree to install layouts as shown on the model.
- **As-Constructed:** Elements identified in the models have been updated as per field-verified locations. Additionally, information relevant to the Enterprise Asset Management (EAM) System has been incorporated to each Discipline Revit models, as per required in the [Information Delivery Plan](#) document ( “Project, Common, and Detailed” parameters).

Refer to the image below for a simplified flow chart showing the main Construction Model milestones, their related processes and relevant information exclusively for spatial coordination.

For simplicity only one flow is shown. In practice, this will be repeated for each Area of Interest.



*Figure 32 - Simplified Construction Models workflow*

## 7.4.2 AREAS OF INTEREST (AOIs)

AOIs are the geographic/spatial division of the project into areas. These are defined by the Contractor and stated in the BIM Execution Plan. Definition is typically influenced by the construction sequence, but other factors may become relevant as well. As a general rule, defined AOIs must include all disciplines occupying that space.

Examples of AOIs are entire Construction Zones, complete or partial Floors, Mechanical rooms, Generator/Electrical Rooms, Risers, Restrooms, single rooms of particular importance, etc.

### 7.4.2.1 DEFINING AOIs

As mentioned before, the Contractor shall propose in the BEP the areas that the Construction Model will be broken into. AOIs are subject to approval by the Authority.

A few aspects to consider for this purpose:

- Each AOI will be considered by the Authority as a BIM partial deliverable. Reporting from the Contractor will be AOI based. (Refer to [Appendix C: BIM Progress Report Template](#)).
- Naturally, the sum of the AOIs needs to contain the full scope of the Work.
- AOIs will go through each Model Milestones independently.
- There is no limitation of how big or small a AOI needs to be in terms of square footage.
- There is no minimum or maximum amount of AOIs that a project needs to have.
- It is often helpful to think “backwards in time”. For example, to identify zones that will need shop drawings first, so in-depth BIM coordination can begin sooner on said areas.

#### **NOTE:**

The Authority may request at its sole discretion that all AOIs are submitted for the BOD milestone at the same time. This may be the case for relatively small and simple projects like Parking garages, simple concrete bridges, small Ad-Hoc buildings, etc.

### 7.4.2.2 RELATION BETWEEN MILESTONES, AOIs AND IDP

The [Information Delivery Plan](#) (IDP) is closely related to the Construction Milestones, since it defines the LOD that is expected for each one of them (See Model Element Table > Stage IV column). As mentioned before, each of the AOIs will typically go through the Milestone sequence independently and will be considered as a partial delivery of the whole.

#### **NOTE:**

The LOD stated for each category on each column, is the minimum accepted for that milestone. The Contractor may at his sole discretion, chose to model beyond the requested LOD.

Strictly speaking, LOD definition includes coordination status, as it often refers to location of elements. For example, it is not correct to describe a pipe segment as LOD350 if it has outstanding interferences related to it, because it is likely that the element is not on its final position.

## 7.5 BIM COORDINATION MODEL - CONSTRUCTION

### 7.5.1 BIM COORDINATION PROCESS

The Authority will only take a monitoring approach on BIM spatial coordination aspects. It is up to the Contractor to define the best approach for each specific project. The specifics of the Contractor's coordination process will be defined in the BIM execution plan. However, there are some guidelines that Contractor and Subcontractors must adhere to. Specifically:

- Proposed spatial coordination process cannot contradict this standard unless approved on writing by the Authority. That includes the roles and responsibilities as defined in the requirements.
- It is the Contractor's responsibility to ensure all parties remain collaborative and diligent throughout the coordination process.
- Situations identified as conflict or potential issues must always have: Responsible Party, Specific Action Item, and a Due Date.
- Areas of Interest must always be signed-off prior to any installation to occur. Refer to [Section 7.4.2 BIM Coordination Sign-Off](#) for sign-off procedures and documentation.

#### 7.5.1.1 POTENTIAL SCENARIOS AND BASIC WORKFLOWS

Depending on the project specific requirements and the different Subcontractors BIM capabilities and maturity, many different processes may be possible. For practical purposes, this standard defines two main scenarios based on traditional coordination practices, since most of the remaining possibilities can be considered as a combination of the two.

##### 7.5.1.1.1 SCENARIO A: CONTRACTOR CONCENTRATES ALL MODELING EFFORTS ON A SINGLE PARTY

In this case, all Construction Model updates are responsibility of the Contractor either directly, or via a third-party consultant (BIM Subcontractor). Subcontractors are still to participate on coordination meetings and are responsible for validating the model and provide feedback based on their expertise to help ensure that Coordination Sign-off Model is in fact, constructible and efficient. Contractor is to agree on a model validation workflow with each sub (model sharing, joint review, etc.).

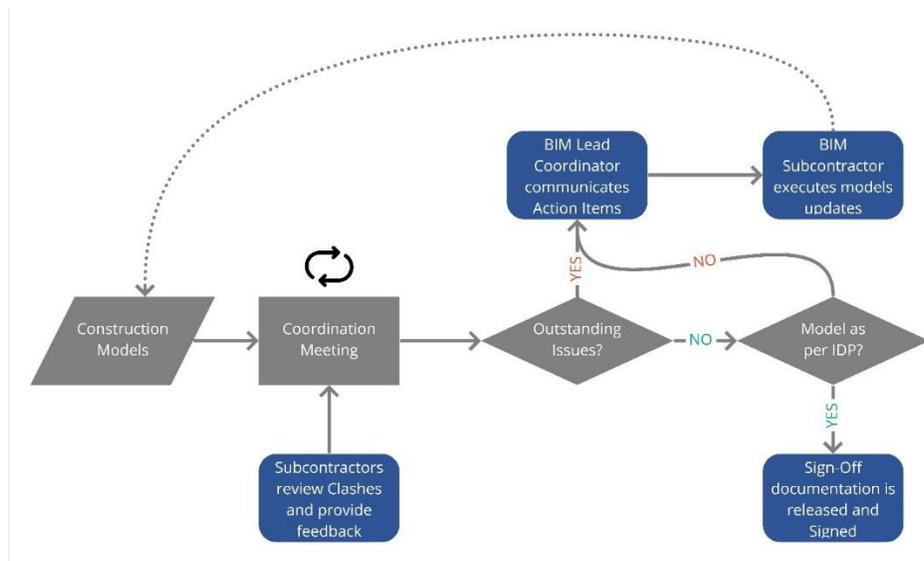


Figure 33 - BIM Coordination Scenario A

**7.5.1.1.2 SCENARIO B: EACH SUBCONTRACTOR IS IN CHARGE OF EACH DISCIPLINE MODEL AUTHORING**

The Contractor’s BIM Manager Coordinators act as liaison between Subcontractors BIM Coordinators and communicate action items to each Sub’s model authoring team. Individual discipline models are shared by means defined and provided by the Contractor, at intervals defined by the BEP. Subcontractors typically define their internal process for Model validation and trade best practices.

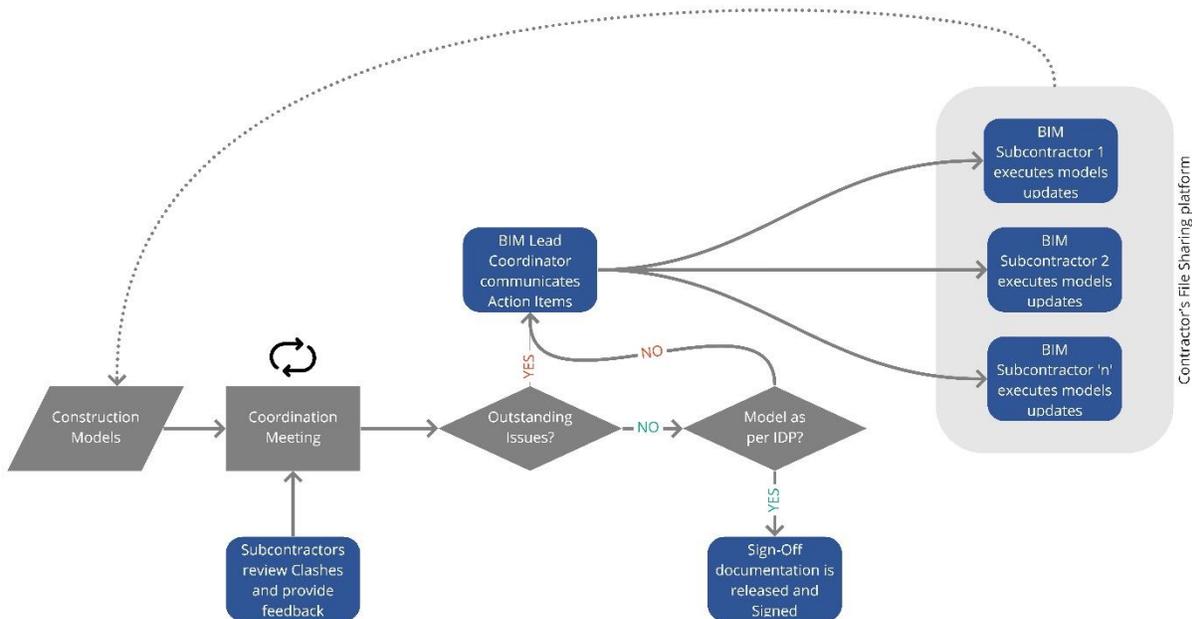


Figure 34 - BIM Coordination Scenario B

**7.5.2 BIM COORDINATION MEETINGS**

This Standard uses the concept of Coordination Meeting in the broader sense, not referring only to the spatial coordination aspects, but also to any meeting where Contractor and Subcontractors gather to discuss on model status and agree on specific action items. For example, if one of the Subcontractors’ Model is not meeting the IDP requirements, a meeting between the BIM Manager and the Sub’s BIM Coordinator to review, discuss and agree on corrective actions, is considered a Coordination Meeting.

As mentioned before, it is the Contractor’s responsibility to define the appropriate methodology for this type of meetings. Frequency, attendees, typical meeting agenda and action items tracking mechanism, among other topics, must all be recorded in the BEP and submitted to the Authority for review and comment.

However, there are certain requirements that provide a framework for the process to guarantee the outcome is the one desired by the PANYNJ. Specifically:

- Meetings need to occur frequently enough to ensure Coordination sign-off dates for each AOI, as stated in the BEP, are met.
- At meeting conclusion, every issue addressed must have a specific action item, a responsible party, and a due date. Contractor must track these items, and be able to provide evidence to the Authority, if it so requires it.
- If a Subcontractor is not the direct author of the Discipline Model, the Contractor must define a Model validation mechanism. For example, by hosting one-to-one (Contractor + Single Sub) or

one-to-many (Contractor + All Subs) model joint review sessions. Means and methods for Model validation shall be stated in the BEP.

- The VDC Engineer representative/s may be required to attend these meetings, as an observer only.
- Other requirements may be defined in the BIM Kick-off Meeting, for specific projects.

### **7.5.3 BIM COORDINATION SIGN-OFF**

Once a Model achieves this condition (for a particular Area of interest), it becomes the single source of truth for spatial coordination. This is relevant because if any conflict arises during construction or installation, the sign-off Model will be the first stop to open a discussion and determine the reasons, and the responsible party, behind the problem.

#### **7.5.3.1 CONDITIONS FOR SIGN-OFF ELIGIBILITY**

Essentially, two requirements must be met:

- Geometry must meet the LOD requirements stated in the IDP; the intended location of the modeled elements may be affected by changes in geometry, connection points of equipment, etc.
- Acceptable interference resolution: a “clash-free” model, though desired, may not always be possible or practical to pursue. Model may have open items at the time of sign off, under the condition that they all have a responsible party assigned that acknowledges them in the sign-off documentation provided to the Authority. The PANYNJ may still reject the claim for sign-off status if the open items reported are considered of relevance and action items are not satisfactory.

Examples of clashes approvable by the Contractor or Subcontractors:

- Slight insulation clashes (requires trade specialist/Subcontractor to approve).
- MEP interferences with basic walls, where penetrations are not necessarily modeled.
- Intentional MEP interferences with floating ceiling, such as sprinklers, lighting fixtures, electrical devices, etc.

Example of clashes that may require additional approval by the PANYNJ:

- Any interference that is left to be resolved in the field.
- Interference with access zones or clearances, where this may difficult operation and maintenance of equipment.
- Other as ruled by the Resident Engineer.

#### **7.5.3.2 PROCESS AND RECORD**

Regardless of the final methodology and process followed for spatial coordination, it is mandatory that all participants (Contractor and Subcontractors) formally sign-off on a coordinated Model prior to any installation.

The actual wording of the document may be rewritten to fit the necessities of each project, on the condition that the language includes the following:

- Statement of conformity regarding coordination status.

- Acknowledgement of any outstanding open items (if any), their recommended actions and their potential implications. These items must be listed, each with their responsible party and expected action.
- Expressed commitment to perform any construction and installation works as close to the signed off Model as possible, and to immediately report any field deviations that may impact future works, specially to other trades.

#### 7.5.4 SPECIFIC REQUIREMENTS

It is the Contractor's responsibility to append all trade models to an NWF file and develop it to the project specific needs so they remain compliant with this standard.

Project specific NWF settings, folder structure, search sets, etc., shall be stated in the BEP. The process of obtaining an efficient Federated Model setting may imply some trial-and-error, and more so on the earliest stages of a project. The BEP template may contain a specific Appendix for this purpose.

The following requirements are mandatory solely for the Federated Models as submitted to the Authority. Contractor and Subcontractors are free to manage internal files as per each Company's standard or common practice, unless ruled otherwise by the Contractor in the BEP.

Having multiple active NWF files with repeated information may result in miscommunication between stakeholders.

Regardless of the process that the Contractors decides to follow, the only official Models are those submitted to the Authority by the formal channels.

**No claims or justification of work based on other Models than the ones officially submitted to the PANYNJ will be accepted. This is particularly important for work based on shop drawings developed from other models that the ones submitted to the Authority.**

##### 7.5.4.1 GROUPING CLASHES

The BIM Manager shall determine how to group clashes to better reflect the status at any given time. For internal reports (e.g., to Contractor or Subcontractors), this may be done with whatever criteria the BIM Manager sees fit. However, when reporting to the PANYNJ the following shall be considered:

- As the first general criteria, coordination should move in a direction that allows for groups to be assigned specific action items from specific parties.
- This practice may not be entirely possible at the very early stages but should always be pursued.
- "Contractor XXX to submit RFI", "Subs YYY and ZZZ to work on a solution", "Sub AAA to move 6" south"; are all examples of specific actions from specific people. Aversely, "All trades to improve coordination in this area" is an example of a poor directive and group assignment.
- Grouping criteria may change during the coordination process, but always from larger to smaller areas, and from higher to lower quantity of elements involved.
- For example: whilst it is acceptable to group all Fire range pipe clashes for an AOI into a single clash while the Model is being populated, it will not be acceptable once the Fire Main has been coordinated with the other trades and is likely on its final position. Following the example, group

may contain hundreds of individual clashes at first, but will have to eventually be broken down into smaller groups.

- If the same action will solve multiple individual clashes, these may be grouped as a single situation, regardless of the area span of clashes.
- For example: moving a pipe main and reconnecting branches, accordingly, will solve multiple clashes across the entire AOI. These may all be under a single group until said change is made. Then smaller groups will have to be created for the remaining situations.
- “False” clashes may be grouped as a single situation, within reason.

#### 7.5.4.2 TECHNICAL REQUIREMENTS

All Federated Models submitted to the Authority must comply with the following minimum requirements to be approved. All these requirements are necessary and vital for a correct and complete analysis of the current BIM process performed by the contractor.

Technical Requirement List includes:

- File Name (All files must be named as per Standard, Revit files, Navisworks files, Cache files)
- Project Coordinates (Federated Model must follow Site Coordinates)
- Site context (Context Model must be included on Federated Model showing all project Context)
- Appended files (All Disciplines Models must be included on the Federated Model as NWC Files)
- Search Sets (Search Sets must be Created for all BIM Activities and All Construction Milestones)
- Color Scheme (Disciplines must be Colored as defined on [Section 7.5.4.5 Color Scheme](#))
- Rooms (No Rooms Geometries must be included on Federated Model)
- 2D Elements (No 2D elements must be included on Federated Model)
- Clash Tests and Results (Clash Tests Must Be Correctly Setup, and Results managed properly as per Standard requirements)
- Construction Status Parameter (All items must contain a Parameter that Reflects the Current Construction Milestone achieved for that item BOD, AS, AC)
- Viewpoints (Viewpoints must be included to directly show, all AOI, all Open issues, All RFIs, all closed issues, all Conflictive Areas, A comprehensive folder Structure must be created and used for Viewpoints management)

#### 7.5.4.3 REFERENCE VIEWPOINTS

The NWF provided by the Authority will have starter viewpoints, that will need to be reoriented and updated once the NWCs are added. This process shall have a consistent outcome throughout all Federated Models created by the Contractor.

Additional requirements as follows:

- Element Color, Hide/Isolate attributes and Sectioning configuration must be saved as a property of the Viewpoint. Regardless of the visibility or scope that it is being used, they should always reset when selecting the Viewpoint.
- For ease of navigation and quick reference, each Federated Models shall have at minimum:

- Viewpoint of the entire project (or AOs contained in that Federated Model), from a convenient top-side view
- Isometric side and front views
- Viewpoints other than the ones referred to above, shall be saved in an appropriate folder, containing issues of similar nature.
- Federated models must be purged of redundant or useless viewpoints prior to submission to the PANYNJ.

**7.5.4.4 SEARCH SETS**

Because of the monitoring activities that the Authority will perform over the modes, as an owner, it is of paramount importance that Sets are created and maintained throughout the lifespan of the Construction Model. This will allow any questioning to the Model to be made in a relatively seamless and consistent fashion.

Search Sets are, for most uses, preferred over Selection Sets. This is due to the ability of the former to remain always current without human action. BIM Coordinator shall whenever possible, follow this general rule for locating elements in the model.

NWF Template as provided by the Authority, will contain basic predefined Search Sets in a proposed folder Structure. BIM Coordinator will define the Sets as appropriate for the project, and state them in the corresponding BEP Annex.

**7.5.4.5 COLOR SCHEME**

The following color scheme is used to promote consistency and easy identification across all users when generating Clash Reports.

DISCIPLINE	COLOR
Architectural	Cyan
Electrical	Yellow
Electronics	White
Corrosion Protection	Orange
HVAC	Green
Plumbing	Magenta
Fire Protection	Red
Vertical Circulation	Pink
Structural	Blue

**NOTE:**

Depending on the project needs further breakdown can be set either by level or by system. Contact the VDC Group if you need to create new Color Scheme.

**7.5.4.6 APPEARANCE PROFILER**

Different uses of the Federated Model may require different visibility settings. For instance, visualization of construction status (Basis of Design, As per Shop Drawings, As Constructed) implies different grouping and coloring than the one used to identify trades.

For consistency across the project, and to be able to quickly switch from one visualization configuration to the next, Appearance Profilers should work in close tandem with Search Sets (Selection Sets are not recommended).

The BIM Coordinator may choose to categorize or represent elements differently than the Authority’s standard coloring, for many numbers of reasons (e.g., for identifying different Piping systems, or a subdivision in trades like Mechanical dry and wet systems, etc.).

Contractor is welcomed to create and maintain different profilers as deemed appropriate, as long as they are:

- Detailed in the BEP, with sets and coloring scheme in use, and intended purpose.
- Consistent throughout the different Federated Models submitted to the Authority, if more than one.

**7.5.4.7 RFI TRACKING**

The Contractor shall keep viewpoints to visually support any Request for Information to the Authority, whenever possible.



Figure 51 - RFI Folder structure

For new RFIs, the BIM Manager shall proceed as follows:

1. Create a new folder with the following naming convention, in the “Open” directory:  
\*RFI Number\*-\*Location and Room number if available\*-\*Brief Description of the issue\*  
For Example: 061-1st Floor NW Corridor 103-Insufficient overhead space
2. Create one or many Viewpoints, as needed to fully describe the situation.
3. Log Comments using the same viewpoint, to record any novelties regarding this situation. Particularly, when specific action items are assigned and when the issue is closed.

Comments				
Comment	Date	Author	Comment ID	Status
RFI submitted to Design team requesting to relocate 4” Water Main as shown			1	Resolved
As per response on *MM/DD/YYYY*, this is approved. PL Sub to relocate Water Main			2	Resolved
Confirmed in coordination meeting on *MM/DD/YYYY* this solves the issue. Moved to CLOSED items			3	New

Figure 36 - Sample RFI Comment log

4. Once RFI is closed, move to the Closed folder.

## 7.6 4D SIMULATION MODEL

A four-dimensional Model is commonly accepted and referred to in the industry as the integration between three-dimensional geometry (length-width-depth) and the dimension of time, represented in most cases by the project schedule.

Construction schedule is one of the most important aspects to be considered when coordinating interdisciplinary work as well as phasing where portions of a facility undergoing remodeling must be kept operational, since it defines what work needs to be done, where, when and by whom. If schedule is cost loaded, the potential for analysis is even greater (e.g., facilitates Earned Value analysis or Cash-Flow)

For the PANYNJ as an owner, it allows to monitor one of the most important aspects for construction: that the project will meet its intended completion date. For this specific reason, 4D Model becomes one of the most important BIM deliverables from the Contractor to the Authority.

**4D is considered by the PANYNJ as a visualization tool. It is meant to complement, not replace, any of the Schedule obligations the Contractor has with the Authority. In the same sense, BIM requirements made herein are secondary to those made in terms of Scheduling. If there is any contradiction, the latter shall prevail.**

### 7.6.1 GOALS AND USES

There are many scheduling software and methodologies that have the potential to obtain a 4D simulation. The main objective of this standard on this regard, is to provide the minimum requirements the Contractor must meet, as well as to suggest a set of guidelines for the approved software in use by PA to produce other BIM deliverables.

In this spirit, Contractor may propose an alternative workflow and software on the project's BEP, as long as it allows for the Authority to benefit from the uses of the 4D Model. These alternates shall be subject to approval of the Authority, as part of the BEP original submission. Contractor shall also validate with the PANYNJ the 4D simulation software to use at the BIM Kick-off meeting.

The PANYNJ will use the Schedule simulation or 4D Model for the following:

- Visualization of Baseline Schedule
- Visualization of all Progress Schedule updates
- Simulation of each Progress Schedule update versus original Baseline Schedule
- Visualization of other site activities, involving elements other than finished or installed work
- Site logistics Model Requirements
- Basic cost analysis

### 7.6.2 4D MODEL REQUIREMENTS

The following properties are required in the Construction Model as stated in the Information Delivery Plan:

- **Construction Status:** represented by three YES/NO parameters which will indicate in general terms the level of definition for a particular element.

- **As per Design Intent:** Object or element has been dimensioned based on Contract documentation (Drawings, specifications, etc.), best modeling practices, and meets the LOD and data as specified in the project specific IDP corresponding to the Basis of Design milestone.
- **As per Approved Submittal:** Element geometry has been upgraded based on Manufacturer content, drawings, cut-sheets, etc., and meets the LOD and data as specified in the project specific IDP corresponding to the Coordination Sign-Off column. See also Submittal No. parameter, defined below.
- **As Constructed:** Element location and orientation has been field verified and adjusted in the model to a level of accuracy in accordance with the LOA2 column on the IDP. Refer to [Section 7.7.2.3 Level of Accuracy](#) for clarification on LOA values.
- **Activity ID:** Every element in the models is to relate to a Construction activity. The value of this parameter, for each element, shall match the unique identifier for the associated activity, as defined by the project's Work Breakdown Structure (WBS) and stated in the approved baseline schedule.

Modeling practices: in addition to complying with the appropriate LOD for every milestone or stage, it is critical that modeling efforts are carried out considering the 4D simulation application, in particular regarding model granularity. This is important so components can be properly associated to tasks/activities without creating logic violations or misrepresentations in the construction sequence.

#### 7.6.2.1 SCHEDULE SETUP

Whilst it is not the purpose of this section to rule on any aspects of the Construction Schedule development, it is worth mentioning that due to the close relation with the 4D Model and simulation, some level of collaboration and coordination will most certainly be necessary between these seemingly separate efforts.

As an example, there is a known limitation that occurs in Navisworks when multiple activities in the Schedule relate to the same geometry. To better reflect the construction sequence, some "grouping" of activities may be necessary in the scheduling Software. This, however, should not affect the duration, logic, sequence, and overall structure of said schedule. Before modifying the schedule in any way, Contractor shall confirm with PANYNJ this will not cause violations or non-compliances in future Schedule submissions.

### 7.6.2.2 4D ANIMATION

With every 4D Model submission, Contractor shall provide a video file showing an animated simulation of the Construction sequence. Video shall be exported from the software used to prepare the simulation, and its minimum requirements are as follow:

- When the purpose of the submission is to show Baseline vs Progress schedule comparison, both sequences shall be shown running in parallel in the same video file, either side to side or top to bottom, in such way that they both appear to run in the same timeline.
- When the main purpose of the video is to allow for visually appreciation of every element start and end dates, both planned and actual. Contractor shall take every precaution to facilitate this, which may include rotating, sectioning, changing camera position, etc. Temporarily hiding finished elements or making them more transparent for visibility purposes (e.g., finished walls or slabs concealing work in the interior) are acceptable.
- Text wise, animation/s shall display, at minimum:
  - Dynamic timeline (dates in MM/DD/YYYY format preferable).
  - Active tasks (progress between 1% and 99%).
  - Percentages of completion for active tasks.
  - Percentage of completion for project.
- Length of the video shall be such that allows for analysis of dates and overall sequence. 60 seconds per year of project is typically an acceptable first approximation.
- Video format/file extension shall be agreed on the BIM kick-off meeting.

### 7.6.3 4D MODEL ASSEMBLY

Since Autodesk Navisworks is the PANYNJ default software for spatial coordination and other BIM related requirements, and considering this platform contains a built-in construction sequence simulator (referred to as TimeLiner), a workflow is presented as a proof of concept.

The process detailed is only of suggestive nature, and the Contractor may propose a different approach. The final methodology for geometry and Schedule integration shall be recorded on the BEP and submitted for approval of the PANYNJ.

#### 7.6.3.1 NATIVE MODELS PREPARATION

Every discipline Model as well as the Context Model needs first to incorporate the Activity ID parameter as described. Parameter values should be an exact match with the Activity code value representing the task ID.

Every model will also be exported as a single separate \*.nwc (Navisworks Cache) file.

Each exported file should comply with the following:

- Only 3D elements should be exported.
- All the parameters are carried over from the native to the cache file.
- No linked files should be exported.
- NWC file name should follow Revit file naming convention.

**7.6.3.2 FEDERATED MODEL ASSEMBLY**

The Navisworks File set needs to be generated using the Navisworks template provided by the Authority. This file will contain the base appearance profiler and basic set ups.

All NWC files need to be appended directly from its correct location on the folder structure to maintain a correct path with the NWC file.

**7.6.3.3 PRIMAVERA P6 INCORPORATION**

Primavera P6 schedule information can be incorporated in many ways to the federated model. Methodology for using Comma Separated Value file (\*.csv) is explained herein:

- From Primavera P6, export columns containing the following information to an Excel spreadsheet:
  - Activity ID
  - Task name
  - Task Type
  - Start Date (Baseline)
  - End Date (Baseline)
  - Start Date (Progress Schedule)
  - End Date (Progress Schedule)
- Actual column names may differ depending on personal or corporate scheduling practices from the Contractor.
- In Navisworks, set up task types in the TimeLiner Configure tab. Some types are included in the PANYNJ template, but alterations may be in order to match Primavera Task types or project specific needs.
- From the Data Source tab, import the \*.cvs file obtained from P6 and manually map the Column fields (Navisworks) to External Field Name (\*.csv file) as needed.

**7.6.3.4 TASKS AND GEOMETRY LINK**

To enable a 4D Simulation, a link must exist between tasks or Activities on the schedule and the geometric elements on each trade and Context Model. The following steps explain one possible methodology to achieve this:

- Create a series of Search-Sets that enables the selection of the elements using the incorporated Activity ID parameter value for each element (some commercial and free add-ons allow for automated Search Set creation).
- From the Task tab, use the Auto-attach Using Rules feature, creating a custom rule to map the Time-Liner Tasks Name to Search sets with the same name. The Activity ID parameter should act as the nexus between platforms.
- The Find Items feature in the TimeLiner Tasks tab should be used for checking, amongst other things, that no model element has failed to associate to a task (Unattached/Uncontained items).

## 7.7 AS-CONSTRUCTED MODEL

The As-Constructed Model is considered as the final version of the Construction Model, as submitted to the Authority for final approval as part of the project handover. The As-Constructed model is meant to represent the final as-built conditions and with that it should have the required LOD, be also validated with Laser Scanning and contain the correspondent Asset Data incorporated on each modeled element.

### 7.7.1 GOALS AND USES

As-Constructed model is considered of the utmost importance for the PANYNJ as an owner and operator of its facilities. It is meant to provide reliable and accurate information of the finished Work.

As-Constructed Model will be used for:

- As design reference for future expansions and/or renovations made to the facility.
- Provide Asset information for the Authority to export to the Facility Management software in use.

### 7.7.2 BASIC DEFINITIONS AND CLASSIFICATIONS

#### 7.7.2.1 REAL WORLD CONDITIONS

This manual considers two types of actual or “real-world” conditions:

- **Existing conditions:** they are considered as the aggregate of all material objects or element that Contractor must work with and around of, to execute the Work. Existing conditions may or may not remain at the end of the project (e.g., due to Demolition or decommissioning activities). Requirements for modeling of existing conditions are defined in the Project Model Development Spec.
- **As-Constructed conditions:** final condition of all completed Work. Unless specified differently in the Contract, this refers to final Work only (no temporary). Requirements for the As-Constructed Model(s) are defined in the IDP.

#### 7.7.2.2 DATA TYPES

The Authority recognizes two basic types of information:

- **Geometrical information:** related to size, shape, quantity, location, and orientation of elements.
- **Asset information:** specific data on elements of interest, typically but not limited to equipment information such as Manufacturer, model, make, etc. Refer to IDP for full detailed list of parameters and references. It shall be incorporated to the Construction Model as it becomes available and will be reviewed by the Authority throughout the duration of the project. Contractor must use the available IDP to identify all elements that have incorporated the respective Asset information. This will help both the Contractor and the Authority to quickly filter and locate elements for checking the associated data.

## 7.8 REALITY CAPTURE

Reality Capture is the used term to describe the process of scanning a build, natural environment, asset or object at a point in time using image or laser scanning devices. The output from the scanning process is the creation of a digital 3D representations of the target, commonly referred to in the industry as Point Clouds.

As part of the contractual requirements, Contractors must typically provide record of final installed/constructed conditions to the PANYNJ. Additionally, depending on the project there may be a requirement to capture and record Existing Conditions as well, as part of the Work. Contractor may also choose to capture and record any temporary work.

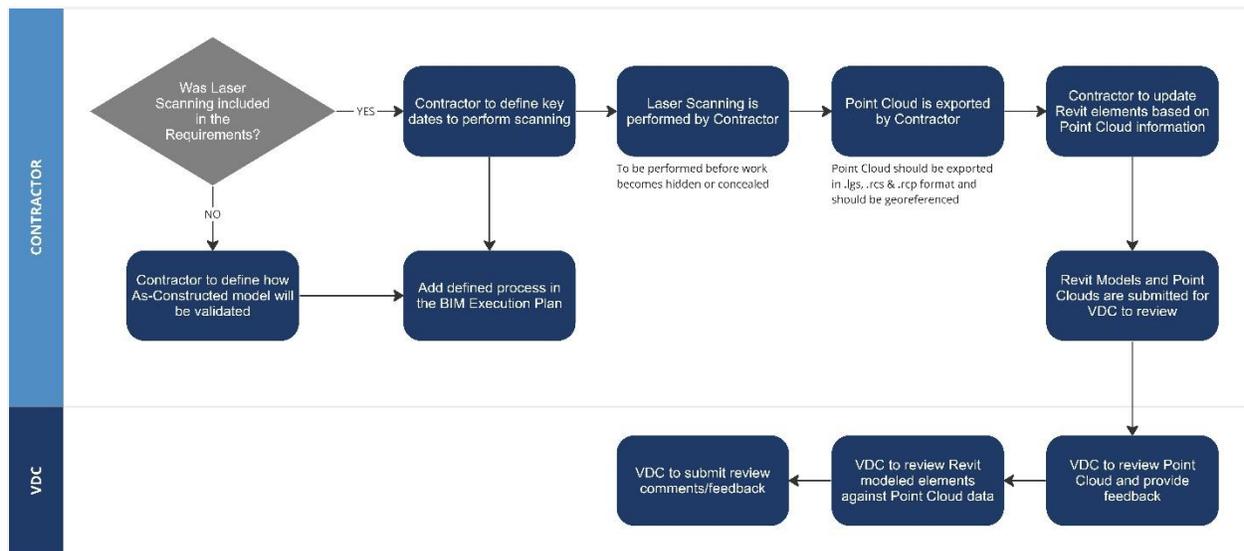


Figure 37 - Laser Scanning Workflow

### 7.8.1 LASER SCANNING

Laser Scanning, sometimes referred to as LiDAR (Light Detection and Raging), is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3D representations of the target, commonly referred to in the industry as Point Clouds.

The purpose of this section is describe BIM requirements and workflows using this technology. To access to specific Laser Scanning guidelines and information, please, refer to [Laser Scanning Standard](#).

### 7.8.2 GOALS AND USES

The Authority encourages the use of Laser Scanning technologies even if not required by Contract. Contractor may use this for the following:

- Adjust the Construction Model geometry to the surveyed information.
- Keep record of Construction progress and Site conditions.
- As record for otherwise hidden items in walls, floors, and ceilings.

- Record the final As-Constructed conditions.

### 7.8.3 LEVEL OF ACCURACY (LOA)

The PANYNJ adopts the LOA specifications as stated in the latest U.S. Institute of Building Documentation (USIBD) LOA Specification, as publicly available on <https://usibd.org>.

Extending on this specification, this manual further defines the following two different types of LOAs:

- **LOA1:** referring to how accurately an element's geometric information has been captured.
- **LOA2:** referring to how accurately an element's geometric features has been represented in the model.

LOA values, where applicable, are recorded in the IDP for each Unifomat line item. LOA values shall only refer to intended dimensions, unless specified otherwise.

### 7.8.4 LASER SCANNING REQUIREMENTS

As part of the contractual requirements, Contractors must typically provide record of final installed/constructed conditions to the PANYNJ. Additionally, depending on the project there may be a requirement to capture and record Existing Conditions as well, as part of the Work. Contractor may also choose to capture and record any temporary work.

Regardless of the case, Contractor will typically work in the following sequence:

- Planning Requirements
- Data Capture
- Data Registration
- Data Control and Assurance
- Data Delivery and Handover

As-Constructed Model requirements have been broken down into this steps or sequence.

#### 7.8.4.1 PLANNING REQUIREMENTS

**Related to geometrical information:** Contractor shall deliver to the Authority an Existing and As-Constructed Conditions Survey Plan. This document will cover the following items, at minimum:

- Detailed plan of subdivision of survey Areas and identification of all elements to be surveyed at any given stage.
- Detailed list of position and coordinates of Control Point and control lines to be used as reference on the survey Process.
- Detailed Schedule on survey activities and correlation with Construction schedule. Schedule must include dates on which Point Clouds (or approved equivalent) will be submitted to the Authority.
- Proposed equipment to execute this work, considering it needs to comply with LOA project requirements.
- Description of the process that will be utilized to incorporate surveyed information to the model, as well as the control methods that will be implemented to guarantee final model complies with the project LOA requirements.

This plan shall be submitted to the Authority for review and comment, and once approved, it shall be incorporated as an Annex to the BEP.

#### 7.8.4.2 DATA CAPTURE

**Geometric information:** In order to achieve the required LOA, the Contractor must use specific equipment to guarantee quality and accuracy is met. It is necessary to follow the detailed plan in order to ensure that all necessary information is captured during the Laser Scanning process.

- Considering the Authority's requirements for LOA values, it is likely that the only methodologies that can meet them are the ones using some form of Laser Scanner (LiDAR) survey, often in combination with Total Station (TST) survey. For this reason, this Standard refers to these types of equipment and known associated processes (Point cloud generation, incorporation to models, etc.).
- Only when LiDAR is not specifically required by contract, the Contractor may propose alternate ways of obtaining the required accuracy. Contractor shall in this case, submit the proposed equipment and methodology as part of the Existing and As-Constructed Conditions Survey Plan, and include proof that LOA requirements can be met. Evidence may consist of Manufacturer information, calibration certificates, white papers from or endorsed by a recognized entity, etc.

#### 7.8.4.3 DATA CONTROL AND ASSURANCE

As part of the review process, the VDC Engineer assigned to the project will audit and provide comments for every Point Cloud delivered as part of the submission process.

#### 7.8.4.4 DATA DELIVERY AND HANDOVER

Final deliverables must be provided by the constructor following the Laser Scanning milestones established within the project BIM contract.

Refer to Section 2.8 of the [PA-ST-DOC-X-GN-LaserScanningStandards](#) to see the required deliverables.

Depending on the survey method used, Contractor may provide one of the following:

- If Total Station (TST) is used:

A table showing the following information, for every surveyed point:

- Point identification number.
- X, Y, Z coordinates.
- Identification Comment.

Plan Drawing showing schematic position of the surveyed points, for ease of identification.

- If a LiDAR equipment is used:

Unified RCS Point Cloud file with shared coordinates system.

A table like the one described for TST survey, but for control Points used to reference the Point Cloud to the project coordinate system.

## 7.9 CONSTRUCTION DELIVERABLES

This section contains a description of the main deliverables expected from the Contractor.

### 7.9.1 CONTEXT MODEL SUBMISSION

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.). Definitions and requirements are separated for practical and applicability purposes, but this model may or may not be integrated with the Construction Model.

#### 7.9.1.1 FIRST SUBMISSION

Contractor will submit the Model for comment at a date defined at the BIM Kick-Off meeting. Given the low complexity of the Model and the benefits it can provide on the early stages of construction; an early submission will be required by the PANYNJ (i.e., before the Discipline Models).

#### 7.9.1.2 MONTHLY UPDATES

Contractor will submit the Context Model with every regular Construction Model submission as stated on the BEP. Regardless of the CM being submitted “For Record Only”, the VDC group reserves the right to request a submission for approval, if the Contractor fails to observe basic model quality and BIM management good practices (e.g., in regard to naming convention, size of families imported to the model, appropriate model categories, etc.).

### 7.9.2 CONSTRUCTION MODEL SUBMISSION

Digital 3D representation of the Work mostly containing information about final and finished work, although some temporary elements may be represented as well if found convenient (e.g., for coordination purposes) by the Contractor. The Contractor will be responsible for continually updating this model throughout construction, so it always reflects the latest information available, including but not limited to: Shop Drawings, Approved Submittals and cut-sheets, field verification, Post Awards Contract Changes (PACCs).

#### 7.9.2.1 BASIS OF DESIGN SUBMISSION

Within 30 calendar days (or as defined) after the initial BIM kick-off meeting, the BIM Manager shall prepare the Construction model developed from and based on the contract drawings. Geometry shall be modeled in a way that mimics how the objects represented will be constructed.

#### 7.9.2.2 MONTHLY PROGRESS UPDATES

Contractor or BIM Manager shall update the construction model and submit it on a monthly basis. Updated Construction models shall include all approved shop drawings, RFIs, PACCs and any other information available on the construction process.

### 7.9.3 4D SIMULATION SUBMISSION

Digital representation of the Work, integrating the Construction Model with the cost-loaded construction Schedule. With each schedule update submitted to the Authority, the Contractor shall also submit an updated 4D Simulation Model based on the latest version of the Construction Model and the revised schedule.

### 7.9.4 AS-CONSTRUCTED MODEL SUBMISSION

The As-Constructed Model shall be considered the final version of the Construction Model, which incorporates both fields verified locations and geometry for all Model components, as well as Asset information as requested by the Authority.

The As-Constructed Model as such will be submitted only once at the end of the project for review and approval. This Model is of paramount importance to the Authority, and its approval is a mandatory requirement for achieving Project close-out and handover.

#### 7.9.4.1 SUBMISSION TIME

This Model is only submitted as such once all the following conditions have been met:

- Project Engineer has confirmed that construction has achieved substantial completion.
- All required Asset information has been incorporated to the trade models by the Contractor (or Subcontractors).
- As-Constructed conditions have been replicated in a way that LOA2 requirements are satisfied.
- Target LODs as stated in the IDP have been achieved.
- All outstanding issues regarding BIM as recorded on the BIM Submission log have been closed.

Previous submissions of the Construction Model containing partial information or complying only partially with the above list, do not count as submission of the As-Constructed Model.

Contractor shall submit for approval all native files (e.g., Revit Discipline models, Civil 3D models, etc.) as well as a the Navisworks NWD\* federated file.

#### **NOTE:**

NWD file shall be a data-rich model. Prevision must be taken by the BIM Manager to ensure that individual files composing the NWD are exported from the native platforms in a way that all possible parameters and their values are carried over to Navisworks.

#### 7.9.4.2 APPROVAL PROCESS

The Authority's VDC Support Group and Asset Management team will thoroughly review the Models for compliance with this Standard. The Authority may reject the deliverables if not satisfactory, in which case the Contractor shall meet with the PANYNJ to review non-compliances, then revise and resubmit the Models for approval, on an agreed time period (typically between two and four weeks depending on the amount and severity of the issues).

Cycle will continue and Project closure may not occur until BIMs are approved. Periodical Model and data validation throughout Construction, as required in this Standard, should minimize the possibility of such scenario.

#### 7.9.5 LASER SCANNING SUBMISSION

Registered Point Clouds, when required by Contract, shall also be delivered to the Authority on intervals that are project specific. Whilst Point Cloud data may be submitted several times during the duration of Work, a final deliverable is expected.

## 8.0 BIM COMPLIANCE REVIEW

To ensure accuracy, completeness, and compliance with this Standards, all discipline models must be subject and shall pass the BIM reviews.

- During the **Design** phase (Stages I to III) is the LE/A responsibility to submit and request for the compliance review.
- During the **Construction** phase (Stage IV) is the Resident Engineer's (RE) responsibility to submit and request for the compliance review.

The VDC Group has developed several reports which allows for the rating of BIM Standards Compliance at every stage of the Project.

The reviews are applicable to all kind of Projects: In-house, Consultants and/or Contractors that are issued either design, construction contracts, or work orders.

### 8.1 REQUEST FOR VDC (BIM/CAD) REVIEW

To submit a Review Request form, the LEA or RE shall use the following link:

[Request for VDC \(BIM/CAD\) Review Form](#)

The VDC Review request form should be properly completed to ensure that all necessary files will be reviewed by the VDC engineer in charge.

The following steps and information should be completed:

- 1 **Insert PID:** By selecting the project PID, the following information will be completed automatically: Facility Name, Contract Number, Project Title, Stage, Confidentiality Level, Lead Discipline, LEA, RE.
- 2 **Review the auto filled information:** Make sure that all the information has been properly filled out, if any of the fields is incorrect, just proceed to fix it.
- 3 Complete the remaining fields:
  - **Delivery Method:** Indicate if the project is a "Design Build" or "Design Bid Build".
  - **Review Type:** Select the type of review/milestone that applies for the project (Interim, PA Wide Review, As-Advertised, Addendum, PACC, Conformed, Work Order, Stage IV Submittal, As-Constructed Submittal, Drawing of Record)
  - **Submittal Percentage/Number:** Indicates % for Design projects and Submittal number for Construction projects.
  - **Confidentiality Level:** Select if the project is Not Confidential, Confidential or Confidential Privileged.
  - **Folder Path:** Indicate where the files have been saved or located.



## 8.2 INSTANCES OF REVIEW AND SPECIFICATIONS

- BIM Review is mandatory for:
  - Revit models used to produce report drawings (Stage I).
  - Revit Models used to produce contract drawings by one discipline or more (Stage I to III).
  - Revit Models used during Construction and Final As-Constructed (Stage IV).
  - Navisworks files used for 3D Coordination and 4D Simulation. (All Stages)
  - Synchro files used for 4D Simulation. (All Stages)
  - BIM Execution Plans. (All Stages)
- Requirements:
  - **During Design** is required at 25%, 50% and 100% milestones, additionally as determined by the LEA if no official interim milestone prior to each official submission.
  - **During Construction** is required on every monthly submission or as determined by the RE.
  - Initiated by the LEA, RE via EOL request form.
- Generalities:
  - Report is issued to the Assistant Chiefs, Principals, LEA, Task Leaders, and RE. It is their responsibility to deliver the report results to contractor.
  - 2 weeks are provided for the correction of non-compliant model files.

## 8.3 BIM – DISCIPLINE COMPLIANCE REPORT

The BIM Discipline Compliance report is divided into 3 main sections:

- **Project Information:** Project files submission Information. Prefilled from the Request form.
- Review fields: **Pre-Audit, Performance Summary** and **Model Performance Summary** sections, indicating compliance with BIM Standards results.
- **Notes:** These will support the understanding of the items failed in the review.

The following images show the different sections of the BIM Discipline Compliance Report using a project example.

### **NOTE:**

See BIM – Discipline Compliance Report, example in the following page:

Engineering Operations Project Controls - VDC Group

### BIM - DISCIPLINE COMPLIANCE REPORT

Reviewed By:

PROJECT INFORMATION			
Facility Name:	<input type="text"/>	Review Type:	<input type="text"/>
Contract Number:	<input type="text"/>	Submittal Percentage / Number:	<input type="text"/>
PID Number:	<input type="text"/>	Date Submitted:	<input type="text"/>
Project Title:	<input type="text"/>	Date Reviewed:	<input type="text"/>
Stage:	<input type="text" value="1"/>	Due Date:	<input type="text"/>
Lead Discipline:	<input type="text"/>	Task Leader:	<input type="text"/>
LEA:	<input type="text"/>	Discipline:	<input type="text"/>
Resident Engineer:	<input type="text"/>	File Reviewed:	<input type="text"/>
Consultant/Contractor:	<input type="text"/>	Confidentiality Level:	<input type="text" value="Not Confidential"/>

Figure 39 - Example of BIM Discipline Compliance Report – Project Information

PRE-AUDIT			
PRE-AUDIT	<input type="text"/>		
File Location	<input type="text"/>		
File Submitted	<input type="text"/>		
File Naming Convention	<input type="text"/>		
File Size	<input type="text"/>		
Software Version	<input type="text"/>		

PERFORMANCE SUMMARY			
<b>PROJECT SETUP</b>	<b>NAMING CONVENTION</b>	<b>MODEL INTEGRITY</b>	
Project Coordinates	Families	Phases	
Project Information	Worksets	Worksets	
Project Browser	Views	Rooms Setup	
Project Level	Sheet Names	Views Category	
Project Grids	Sheet Numbers	Sheets Category	
Project Units		Schedules	
AutoCAD Links		Overlaps/Duplicates	
Revit Links		Object Hosting	
Point Clouds Links		Floating Content	
Phase Settings		Object Category	
		Parameter Assignment	
		Model Cleanup	

DRAWINGS PERFORMANCE SUMMARY			
<b>PLAN SET PREPARATION</b>	<b>STYLES</b>		
Title Sheet (Lead)	Text		
Contract Border	Dimensions		
Drawing Information	Lines		
Consultant Stamp	Symbols		
No Linework in Sheets	Tags		
PDFs Setup	Fill Regions		

Figure 38 - Example of BIM Discipline Compliance Report – Review sections

NOTES
<p><b>PROJECT SETTINGS</b></p> <p>1. Coordinate System is not consistent with the one set up in the Site Model file provided by the PANYNJ. Site Coordinates are: N/S 694190° 5 97/128° E/W 609262° 0 159/256° Elev 2' 2" Angle to True North 17.66°.</p> <p><b>MODEL INTEGRITY</b></p> <p>1. Exterior Railings need to be adjusted. 2. Some doors are overlapping with walls. Door ID258129 vs Wall ID320358.</p> <p><b>MITIGATION</b></p> <p>No action was needed</p>

Figure 41 - Example of BIM Discipline Compliance Report – Notes

### 8.3.1 BIM - DISCIPLINE COMPLIANCE REVIEW FIELDS

The Compliance Report for Disciplines checks the compliance of the standards within the submitted Revit files. The following fields are evaluated:

- PRE-AUDIT:**

ITEM	DESCRIPTION
<b>Files Location</b>	Submitted files are stored in the correct location within the PA server.
<b>Files Submitted</b>	All necessary project files have been submitted.
<b>Files Naming Convention</b>	File names are following the Standards.
<b>Files Size</b>	Files size should be less than 650MB. First warning will be indicated when file exceeds 300MB.
<b>Software Version</b>	Revit version of the file is correlative to the version established in the BEP of the project.

- PROJECT SETUP:**

ITEM	DESCRIPTION
<b>Project Coordinates</b>	Project Coordinates need to be acquired coordinate from the SM provided, and consistent across all Disciplines.
<b>Project Information</b>	Project Information parameters should be completed.
<b>Project Browser</b>	All Views within the Project Browser must be assigned to the proper Sub-Discipline and View Classification.
<b>Project Levels</b>	Levels are copy/monitored to ensure consistency across all Disciplines
<b>Project Grids</b>	Grids are copy/monitored to ensure consistency across all Disciplines.
<b>Project Units</b>	Project Units set up in the project are consistent with the ones provided within the PA templates.
<b>AutoCAD Links</b>	All AutoCAD Files used should be linked and pinned.
<b>Revit Links</b>	All Project Revit files should be linked and pinned into each other, including the Site Model.
<b>Point Clouds Links</b>	All point clouds should be pinned.
<b>Phase Settings</b>	Project Phases and settings to be established by Architecture or Lead Discipline. Other disciplines should recreate the Phases settings to ensure consistency.

• **NAMING CONVENTION:**

ITEM	DESCRIPTION
<b>Families</b>	Families in use are following the PA Naming Convention. <ul style="list-style-type: none"> <li>• <b>Model Families:</b> CATEGORY-MANUFACTURER-DESCRIPTION/MODEL NUMBER</li> <li>• <b>Annotation Families:</b> CI-CATEGORY-DESCRIPTION1-DESCRIPTION2</li> </ul>
<b>Worksets</b>	Worksets are following the Standard Naming Convention. Default Worksets should be maintained. Worksets naming convention: <ul style="list-style-type: none"> <li>• DISCIPLINECODE-DESCRIPTION</li> </ul>
<b>Views</b>	Views are following the PA Naming Convention. Views naming convention: VIEW-LEVEL/LOCATION/SEQUENCE-DESCRIPTION
<b>Sheet Name</b>	Sheets are following the PA Naming Convention.
<b>Sheet Number</b>	Sheets Numbers are following the PA Naming Convention.

• **MODEL INTEGRITY:**

ITEM	DESCRIPTION
<b>Phases</b>	Elements are assigned to phases properly.
<b>Worksets</b>	Elements are assigned to Worksets properly.
<b>Rooms Setup</b>	There should be no duplicated or floating rooms in the model.
<b>Views Category</b>	Views are assigned to the correct Category based on their use.
<b>Sheets Category</b>	Sheets are assigned to the correct Category based on their use.
<b>Schedules</b>	All Schedules in the Project are smart, meaning created by bringing information from the model.
<b>Overlaps/Duplicates</b>	There are no Clashes or Duplicated elements within the model.
<b>Object Hosting</b>	All elements are hosted.
<b>Floating Content</b>	No element is loose or floating
<b>Object Category</b>	By preference, Generic Models should not be used, but if needed those should be renamed and re-categorized accordingly.
<b>Parameter Assignment</b>	All required parameters are completed.
<b>Model Cleanup</b>	Revit Models must be cleaned before every official submission by purging, deleting temporary views, etc.

- **PLAN SET PREPARATION:**

ITEM	DESCRIPTION
<b>Title Sheet (Lead)</b>	PA Official Title Sheet should be used and placed inside the Lead Discipline Revit Model.
<b>Contract Border</b>	PA Official Contract Border family should be used.
<b>Drawing Information</b>	Drawing Information has been completed at all sheets.
<b>Consultant Information</b>	Consultant information must be included in the Contract Border.
<b>No Linework in Sheets</b>	Objects other than the Viewports, North Arrow and Graphic Scales are not allowed directly on Sheets; Other objects must be included in either separate Drafting Views, or in the Design Views that they belong to.
<b>PDFs Setup</b>	PDFs have been exported in full size and in Black and White.

- **STYLES:**

ITEM	DESCRIPTION
<b>Text</b>	Texts in use are per the ones defined in the template. Or additional styles follow PA Naming Standards.
<b>Dimensions</b>	Dimensions in use are per the ones defined in the template.
<b>Lines</b>	Lines in use are per the ones defined in the template. Or additional styles follow PA Naming Standards.
<b>Symbols</b>	Symbols in use are per the ones defined in the template. Or additional annotations follow PA Naming Standards.
<b>Tags</b>	Tags in use are per the ones defined in the template.
<b>Fill Regions</b>	Fill regions in use are per the ones defined in the template. Or additional Regions follow PA Naming Standards.

**NOTE:**

Plan set preparation and Styles are meant to be reviewed during Design Stages, for Construction projects, these will be shown as N/A.

## 8.4 BIM – 3D COORDINATION REPORT

Same as the Discipline Report, the 3D Coordination report is divided into 3 main sections:

- **Project Information:** Project files submission Information. Prefilled from the Request form.
- Review fields: **Pre-Audit** and **Performance Summary** sections, indicating compliance with BIM Standards results.
- **Notes:** Contain general comments referred to the review, BIM Standard Sections to refer to, etc. These notes will support the understanding of the items failed in the review.

The following images show the different sections of the 3D Coordination Report using a project example.

**NOTE:**

See BIM – 3D Coordination Report example in the following page:

Engineering Operations Project Controls - VDC Group

### BIM - 3D COORDINATION REPORT

▼

Reviewed By:

PROJECT INFORMATION			
Facility Name:	<input style="width: 95%;" type="text"/>	Review Type:	<input style="width: 95%;" type="text"/>
Contract Number:	<input style="width: 95%;" type="text"/>	Submittal Percentage / Number:	<input style="width: 95%;" type="text"/>
PID Number:	<input style="width: 95%;" type="text"/>	Date Submitted:	<input style="width: 95%;" type="text"/>
Project Title:	<input style="width: 95%;" type="text"/>	Date Reviewed:	<input style="width: 95%;" type="text"/>
Stage:	<input style="width: 95%;" type="text" value="1"/>	Due Date:	<input style="width: 95%;" type="text"/>
Lead Discipline:	<input style="width: 95%;" type="text"/>	LEA:	<input style="width: 95%;" type="text"/>
Resident Engineer:	<input style="width: 95%;" type="text"/>	Consultant/Contractor:	<input style="width: 95%;" type="text"/>
File Reviewed:	<input style="width: 95%;" type="text"/>	Confidentiality Level:	<input style="width: 95%;" type="text" value="Not Confidential"/>

Figure 42 - Example of BIM 3D Coordination Report – Project Information

PRE-AUDIT			
<b>PRE-AUDIT</b>	<input style="width: 95%;" type="text"/>		
Files Submitted	<input style="width: 95%;" type="text"/>	BIM Progress Report	<input style="width: 95%;" type="text"/>
File Location	<input style="width: 95%;" type="text"/>	Software Version	<input style="width: 95%;" type="text"/>
File Naming Convention	<input style="width: 95%;" type="text"/>		

PERFORMANCE SUMMARY			
<b>PROJECT SETUP</b>	<input style="width: 95%;" type="text"/>	<b>MODEL INTEGRITY</b>	<input style="width: 95%;" type="text"/>
All Links	<input style="width: 95%;" type="text"/>	Models Alignment	<input style="width: 95%;" type="text"/>
Appended Files Format	<input style="width: 95%;" type="text"/>	Color Scheme	<input style="width: 95%;" type="text"/>
Search Sets	<input style="width: 95%;" type="text"/>	Rooms	<input style="width: 95%;" type="text"/>
Areas of Interest	<input style="width: 95%;" type="text"/>	2D Elements	<input style="width: 95%;" type="text"/>
<b>NAMING CONVENTION</b>	<input style="width: 95%;" type="text"/>	<b>COORDINATION</b>	<input style="width: 95%;" type="text"/>
Appended File Name	<input style="width: 95%;" type="text"/>	Clash Tests	<input style="width: 95%;" type="text"/>
		Clash Grouping	<input style="width: 95%;" type="text"/>
		Clash Status	<input style="width: 95%;" type="text"/>
		Viewpoints Folder Structure	<input style="width: 95%;" type="text"/>

Figure 43 - Example of BIM 3D Coordination Report – Review sections

NOTES
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;"> <span>Normal</span> <span style="margin-left: 10px;">◂</span> <span style="margin-left: 10px;">≡</span> <span style="margin-left: 10px;">B</span> <span style="margin-left: 10px;">I</span> <span style="margin-left: 10px;">U</span> <span style="margin-left: 10px;">S</span> <span style="margin-left: 10px;">A</span> <span style="margin-left: 10px;">🌲</span> <span style="margin-left: 10px;">☰</span> <span style="margin-left: 10px;">☷</span> <span style="margin-left: 10px;">☰</span> <span style="margin-left: 10px;">☷</span> <span style="margin-left: 10px;">🔗</span> <span style="margin-left: 10px;">📷</span> <span style="margin-left: 10px;">🔗</span> </div> <p>NAMING CONVENTION</p> <ol style="list-style-type: none"> <li>1. Site Model name differs from name in Revit model.</li> </ol> <p>MODEL INTEGRITY</p> <ol style="list-style-type: none"> <li>1. The Site Context is basic and should be improved.</li> </ol> <p>COORDINATION</p> <ol style="list-style-type: none"> <li>1. The BIM Report information does</li> </ol>

Figure 44 - Example of BIM 3D Coordination Report – Notes

### 8.4.1 BIM – 3D COORDINATION REVIEW FIELDS

BIM 3D Coordination Review Report checks for compliance in the submitted NWD/NWF files in the following fields among others:

- PRE-AUDIT:**

ITEM	DESCRIPTION
<b>Files Submitted</b>	All necessary project files have been submitted.
<b>Files Location</b>	Submitted files are stored in the correct location within the PA server.
<b>Files Naming Convention</b>	File names are following the Standards. NWD & NWF should follow: PID-3D
<b>BIM Progress Report</b>	All necessary information related to the progress deliverables have been outlined in the BIM Progress Report.
<b>Software Version</b>	Navisworks version of the file is correlative to the version established in the BEP of the project.

- PROJECT SETUP:**

ITEM	DESCRIPTION
<b>All Links</b>	All trade models and Site Model are appended to the Federated model.
<b>Appended Files Format</b>	All native models should be imported in NWC format.
<b>Search Sets</b>	All elements should be grouped using Search Sets by Milestones and Activities ID.
<b>Areas of Interest</b>	All defined Areas of Interest must have at least one Viewpoint that shows the area in detail.

- NAMING CONVENTION:**

ITEM	DESCRIPTION
<b>Appended Files Name</b>	NWCs should follow the native Revit Model naming convention.

- MODEL INTEGRITY:**

ITEM	DESCRIPTION
<b>Models Alignment</b>	All appended files are showing aligned to each other based on their coordinates.
<b>Color Scheme</b>	All PA Federated Models must follow the BIM Standard Color Scheme.
<b>Rooms</b>	Room geometries should not be exported in the NWC files in order to avoid interferences while running clash detection tools.
<b>2D Elements</b>	2D Elements should not be exported in the NWC files to avoid interferences while running clash detection tools.

- **COORDINATION**

ITEM	DESCRIPTION
<b>Clash Tests</b>	Clash Tests must be created on the Federated model, the file must contain at least one test for each combination of two separate NWCs files appended.
<b>Clash Settings</b>	Clash settings should be set as per template.
<b>Clash Grouping</b>	Clash Grouping must be present on each clash test to allow users to manage all individual issues that contain 2 or more single interferences.
<b>Clash Status</b>	All clashes must be classified with their correspondent status at the moment of the submission (New, Active, Resolved, etc.)
<b>Viewpoints Folder Structure</b>	All Viewpoints must be grouped and managed in an organized manner for ease of use.

### 8.5 BIM - 4D SIMULATION REPORT

Same as the previous reports, the 4D Simulation report is divided into 3 main sections:

- **Project Information:** Project files submission Information. Prefilled from the Request form.
- Review fields: **Pre-Audit** and **Performance Summary** sections, indicating compliance with BIM Standards results.
- **Notes:** Contain general comments referred to the review, BIM Standard Sections to refer to, etc. These notes will support the understanding of the items failed in the review.

The following images show the different sections of the 4D Simulation Report using a project example.

**NOTE:**

See BIM – 4D Simulation Report example in the following page:

Engineering Operations Project Controls - VDC Group

### BIM - 4D SIMULATION REPORT

Reviewed By:

---

PROJECT INFORMATION

Facility Name:	<input type="text"/>	Review Type:	<input type="text"/>
Contract Number:	<input type="text"/>	Submittal Percentage / Number:	<input type="text"/>
PID Number:	<input type="text"/>	Date Submitted:	<input type="text"/>
Project Title:	<input type="text"/>	Date Reviewed:	<input type="text"/>
Stage:	1 <input type="text"/>	Due Date:	<input type="text"/>
Lead Discipline:	<input type="text"/>	LEA:	<input type="text"/>
Resident Engineer:	<input type="text"/>	Consultant / Contractor:	<input type="text"/>
File Reviewed:	<input type="text"/>	Confidentiality Level:	Not Confidential <input type="text"/>

Figure 395 - Example of BIM 4D Simulation Report – Project Information

PRE-AUDIT

PRE-AUDIT	<input type="text"/>		
Files Submitted	<input type="text"/>	BIM Progress Report	<input type="text"/>
File Location	<input type="text"/>	Software Version	<input type="text"/>
File Naming Convention	<input type="text"/>		

---

PERFORMANCE SUMMARY

<b>PROJECT SETUP</b>	<b>MODEL INTEGRITY</b>	
Appearance Profiler	Site Context	<input type="text"/>
Schedule Data Source	Task Names	<input type="text"/>
3D Models Data Source	Task Activity IDs	<input type="text"/>
	Planned Dates	<input type="text"/>
	Actual Dates	<input type="text"/>
	Attached By Sets	<input type="text"/>
	Attached By Explicit Selection	<input type="text"/>
	Unattached Items	<input type="text"/>
	Items in Multiple Tasks	<input type="text"/>
	Items in Overlapping Tasks	<input type="text"/>

Figure 406 - Example of BIM 4D Simulation Report – Review sections

NOTES

**PERFORMANCE SUMMARY**

**MODEL INTEGRITY**

**Unattached Items:** Unattached Elements are not allowed. They should be attached to a specific Task.

**MITIGATION**

Apply changes with next submission.

Figure 47 - Example of BIM 4D Simulation Report – Notes

### 8.5.1 BIM – 4D SIMULATION REVIEW FIELDS

BIM 4D Simulation Review Report checks for compliance in the submitted NWD/NWF or Synchro files in the following fields among others:

- PRE-AUDIT:**

ITEM	DESCRIPTION
<b>Files Submitted</b>	All necessary project files have been submitted.
<b>Files Location</b>	Submitted files are stored in the correct location within the PA server.
<b>Files Naming Convention</b>	File names are following the Standards. NWD & NWF or Synchro should follow: PID-4D
<b>BIM Progress Report</b>	All relevant information to the progress deliverables has been outlined in the BIM Progress Report.
<b>Software Version</b>	Navisworks/Synchro Pro version of the file is correlative to the version established in the BEP of the project.

- PROJECT SETUP:**

ITEM	DESCRIPTION
<b>Appearance Profiler</b>	Timeliner (or Synchro) Appearance should be setup based on the BIM Standards.
<b>Schedule Data Source</b>	Data Source file must correspond to latest Schedule Submission and must be defined on the monthly submission Report.
<b>3D Models Data Source</b>	Data Source files must correspond to latest BIM files Submission and must be defined on the monthly submission Report.

- **MODEL INTEGRITY:**

ITEM	DESCRIPTION
<b>Site Context</b>	Site Context Model should be created in order to include site context information such as: site topography, project limits, adjacent building, roads, sidewalks, among others.
<b>Task Names</b>	All Activities on Schedule must have a Name assigned.
<b>Task Activity IDs</b>	All Activities on the Schedule must have an Activity Identification Number.
<b>Planned Dates</b>	All Schedule Activities must contain Planned Dates, Start and Finish, as per Baseline Schedule.
<b>Actual Dates</b>	All Schedule Activities must contain Actual Dates, Start and Finish, as per most current Schedule Update.
<b>Attached by Sets</b>	All Geometrical elements must be attached to their specific Activities using the correspondent search set.
<b>Attached by Explicit Selection</b>	Elements attached by explicit selection are not allowed.
<b>Unattached items</b>	All Geometrical elements must be attached to one BIM Activity.
<b>Items in Multiple Tasks</b>	All Geometrical elements must be attached to only one BIM Activity.
<b>Items in Overlapping Tasks</b>	All Geometrical elements must be attached to only one BIM Activity.

## 8.6 BIM – BIM EXECUTION PLAN REPORT

Same as the previous reports, the BIM Execution Plan report is divided into 3 main sections:

- **Project Information:** Project files submission Information. Prefilled from the Request form.
- Review fields: **Pre-Audit** and **Performance Summary** sections, indicating compliance with BIM Standards results.
- **Notes:** Contain general comments referred to the review, BIM Standard Sections to refer to, etc. These notes will support the understanding of the items failed in the review.

The following images show the different sections of the BIM Execution Plan Report using a project example.

**NOTE:**

See BIM – BIM Execution Plan Report example in the following page:



### 8.6.1 BIM – BIM EXECUTION PLAN REVIEW FIELDS

BIM Execution Plan Review Report checks for compliance in the submitted PDF file in the following fields among others:

- PRE-AUDIT:**

ITEM	DESCRIPTION
<b>BEP Template</b>	Ensure available PA Templates have been used.
<b>Document Integrity</b>	Overall document structure and organization is done based on project size and needs.

- INFORMATION:**

ITEM	DESCRIPTION
<b>Project Information</b>	Complete table showing all Project Information.
<b>Scope</b>	Describe project scope, detailing phases, add images, others.
<b>Contacts</b>	Complete all project contacts including Port Authority staff and all external stakeholders.
<b>Project Schedule</b>	Detail project duration and add specific dates for main milestones.

- GENERAL:**

ITEM	DESCRIPTION
<b>Model Breakdown</b>	Include list of all models to be developed and submitted.
<b>Other Deliverables Breakdown</b>	Include list of all files to be developed and submitted.
<b>Site Context Model</b>	Detail all content and workflow for the development of the Site Context model.
<b>Project Coordinates</b>	Add the specific project coordinates to be used throughout all project model files.
<b>Project Phases</b>	Add, describe all Revit Phases that will be included as part of the model files.
<b>Level of Development</b>	Include table describing the LOD to be used based on the project needs and the IDP.
<b>Model Data</b>	Include list of parameters that will be included in the models and data to be captured as per the IDP.
<b>Software and Templates</b>	Include list of Software, templates, and versions to be used.
<b>Specific Requirements</b>	Add any other project specific requirement not mentioned anywhere else.

- **COMMUNICATION:**

ITEM	DESCRIPTION
<b>Meetings</b>	Add description for all BIM meetings including the goal, frequency, and owner.
<b>Information Exchange</b>	Add the Exchange platform to be used, include list of deliverables, frequency of delivery, etc.
<b>Autodesk Construction Cloud</b>	If implemented, include list of members that need to be invited to the ACC project hub.

- **MODELS DEVELOPMENT:**

ITEM	DESCRIPTION
<b>Design Workflow</b>	Add the description of the Revit models development including the workflow, stakeholders, coordination process, data insertion, LOD validation, and any other relevant information.
<b>Construction Workflow</b>	
<b>As-Constructed Workflow</b>	

- **3D COORDINATION:**

ITEM	DESCRIPTION
<b>Coordination Workflow</b>	Add the description of the Coordination models development including the workflow, stakeholders, coordination process, and any other relevant information.
<b>Areas of Interest</b>	Complete table with the AOI depending on the project needs and scope.
<b>Clash Report</b>	Clash report should include all relevant information to ensure clash is able to be identified, analyzed, assigned and status is updated.

- **4D SIMULATION:**

ITEM	DESCRIPTION
<b>Simulation Workflow</b>	Add the description of the Schedule Simulation model development including the workflow, stakeholders, simulation process, and any other relevant information.

- **LASER SCANNING:**

ITEM	DESCRIPTION
<b>Scanning Workflow</b>	Add the description of the Laser Scanning development including the workflow, stakeholders, scanning process, and any other relevant information.
<b>Scanning Schedule</b>	Add the scanning plan based on the project schedule.

## APPENDIX A: CONFIDENTIAL & CONFIDENTIAL PRIVILEGE PROJECTS

Confidential and Confidential Privilege Projects are those in which unique circumstances may require different guidelines be followed in order to comply with the BIM Standards. The contents of this document will be followed in addition to the ones already specified in the BIM Standards, unless specifically instructed otherwise within this section.

### PURPOSE

The Port Authority C & CP Standard Compliance outlined is established to provide guidance for the preparation of the EAD Division of the Port Authority of New York and New Jersey's contract documents that contain Confidential and Confidential Privilege.

This document is intended for use by both in-house personnel as well as outside consultants involved in creating construction documents for the Port Authority. It establishes requirements and procedures for the preparation and submission of BIM based drawings throughout the project life cycle. Adherence to this standard ensures that the E/A Design Division and the Construction Division of the PANYNJ will receive and produce data in a consistent format.

For more information on practices and procedures on protected information projects it can be found on [Engineering Department Protected Information Practices and Procedures](#).

### CONFIDENTIAL PROJECTS

Confidential Projects contain highly sensitive information that if lost or made public could seriously damage or compromise the Port Authority and/or public safety and security. Confidential information includes, but is not limited to, methods utilized to mitigate vulnerabilities and threats, such as identity, location, design construction and fabrication of security systems.

For that reason, if aspects being worked on as part of a project drawing are considered Confidential, they will need to be handled differently than standard contract drawings.

If information on a drawing is Confidential, then that model drawing is to be stored in the Model\_C folder. Any plotsheet drawing that contains Confidential information must be stored in the Plotsheets\_C folder. It is permitted to reference non-Confidential information from outside the Confidential folder into a Confidential project. If a model file that has been deemed Confidential needs to be shared across disciplines, then the file is to be copied to the Publish\_C folder.

The Warning Sign is displayed below:

"WARNING": THE ATTACHED IS THE PROPERTY OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY (PANYNJ). IT CONTAINS INFORMATION REQUIRING PROTECTION AGAINST UNAUTHORIZED DISCLOSURE. THE INFORMATION CONTAINED IN THE ATTACHED DOCUMENT CANNOT BE RELEASED TO THE PUBLIC OR OTHER PERSONNEL WHO DO NOT HAVE A VALID NEED TO KNOW WITHOUT PRIOR WRITTEN APPROVAL OF AN AUTHORIZED PANYNJ OFFICIAL. THE ATTACHED DOCUMENT MUST BE CONTROLLED, STORED, HANDLED, TRANSMITTED, DISTRIBUTED AND DISPOSED OF ACCORDING TO PANYNJ INFORMATION SECURITY POLICY. FURTHER REPRODUCTION AND/OR DISTRIBUTION OUTSIDE OF THE PANYNJ ARE PROHIBITED WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PANYNJ.

AT A MINIMUM, THE ATTACHED WILL BE DISSEMINATED ONLY ON A NEED TO KNOW BASIS AND, WHEN UNATTENDED, WILL BE STORED IN A LOCKED CABINET OR AREA OFFERING SUFFICIENT PROTECTION AGAINST THEFT, COMPROMISE, INADVERTENT ACCESS AND UNAUTHORIZED DISCLOSURE.

*Figure 51 - Confidential Information Warning Sign*

Cover sheets shall be used to divide the complete set into Unmarked, Confidential and Confidential Privileged drawings, the cover sheet files are found inside the Contract Border folder of the standardize files. If a project contains any Confidential sheets, then they must be separated out into their own set with its own Cover Sheet. The Confidential Stamp markings at the top, bottom and right side of the pages must be displayed, identifying the project as Confidential. This is accomplished by turning on and thawing the “GN-ANNO-TTLB-CONF” layer. Confidential Cover Sheet doesn’t require the use of the Warning stamp.

All interior Confidential pages within the set must also be marked Confidential at the top, bottom, and right side of the page. Sets of documents that are folded or rolled must be marked so that the marking is visible on the outside of the set once folded or rolled. This is accomplished by inserting the “Drawing\_Info – Stamp\_Cbar.dwg” block into paper space of the Plotsheet drawing containing the Confidential information. The “Drawing\_Info – Stamp\_Cbar.dwg” block is to be inserted with an insertion point of 0,0,0 on layer 0 and is not to be exploded or modified in any way. All of the Confidential Markings are displayed in following images.



Figure 52 - Example of Confidential Projects Title sheet

On the Drawing Index sheet, names of Confidential drawings should be listed and should take the form: "<Drawing Title> (Protected Information)", where <Drawing Title> is the title of a Confidential drawing.



Confidential and Unmarked drawings will be separated into two sets. On the Drawing Index sheet, names of Confidential drawings shall be listed to inform the viewer that additional drawings have protected information. This drawing shall take the form "<Drawing Title> (Confidential)", where <Drawing Title> is the title of a Confidential drawing, as shown in the image below.

INDEX OF DRAWINGS	
DRAWING NO.	SHEET TITLE
GENERAL	
TS001	TITLE SHEET
IX001	INDEX OF DRAWINGS
CIVIL	
C001	NOTES, LEGEND AND ABBREVIATION
C002	SITE PLAN (PROTECTED INFORMATION VOL. 2)
ELECTRICAL	
E001	NOTES, LEGEND AND ABBREVIATION
E002	ELECTRICAL DETAILS (PROTECTED INFORMATION VOL. 3)

Figure 53 - Index of Drawings

For more information on the handling and submitting of Confidential projects refer to “The Port Authority of New York & New Jersey Information Security Handbook”.

### CONFIDENTIAL PRIVILEGED PROJECTS

Confidential Privileged Projects contain extremely sensitive security or public safety information that if lost or made public could seriously damage or compromise the Port Authority and/or public safety and security. Confidential Privileged information includes, but is not limited to, any information identifying vulnerabilities, capabilities, threats, operational methodologies and/or security related design criteria.

For that reason, if aspects being worked on as part of a project drawing are considered Confidential PRIVILEGED, they will need to be handled differently than standard contract drawings.

If information on a drawing is Confidential Privileged, then that model drawing is to be stored in the Model\_CP folder. Any plotsheet drawing that contains Confidential Privileged information must be stored in the Plotsheets\_CP folder. It is permitted to reference non-Confidential information from outside the CP folder into a Confidential Privileged plotsheet drawing. If a model file that has been deemed Confidential Privileged needs to be shared across disciplines, then the file is to be copied to the Publish\_CP folder.

**Cover sheets shall be used to divide the contract set** into Unmarked, Confidential and Confidential Privileged drawings; the cover sheet files are found inside the Contract Border folder of the standardize files. If a project contains any Confidential Privileged **sheets, then they must be separated out into their own set with its own Cover Sheet.** The Confidential Information Warning Sign (CP - WARNING.dwg) must be displayed on the Cover Sheet of the Confidential Privileged set, along with markings at the top, bottom and right side of the page identifying the project as Confidential Privileged. **This is accomplished by turning on and thawing the “GN-ANNO-TTLB-CP\_” layer.**

The Title Sheet setup for Confidential Privileged projects is shown in the following image:



Figure 54 - Title Sheet setup of Confidential Privileged projects

All interior pages within the set must also be marked at the top, bottom, and right side of the page. Sets of documents that are folded or rolled must be marked so that the marking is visible on the outside of the set once folded or rolled. The Confidential Privileged markings can be set to display by setting a check mark in the box next to the "Confidential Privileged Sheet" parameter (for instructions regarding the setup of the CP Number parameter, see above). All the Confidential Privileged Markings for interior pages are displayed in the following image.

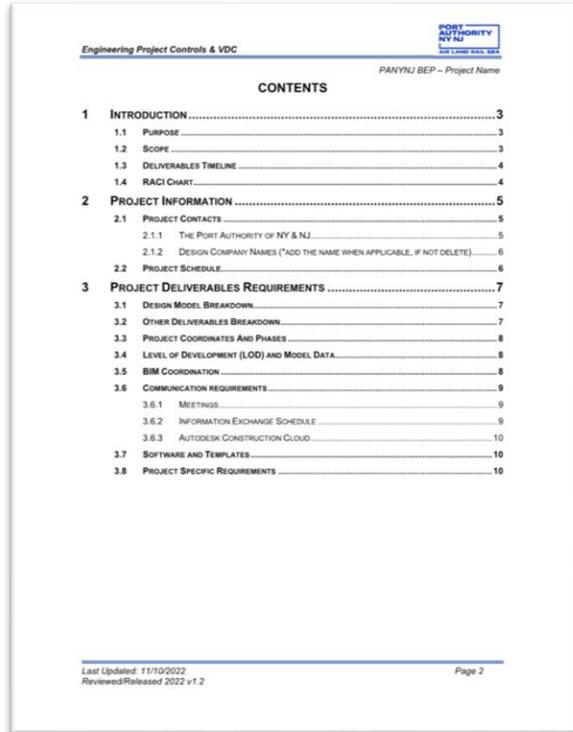
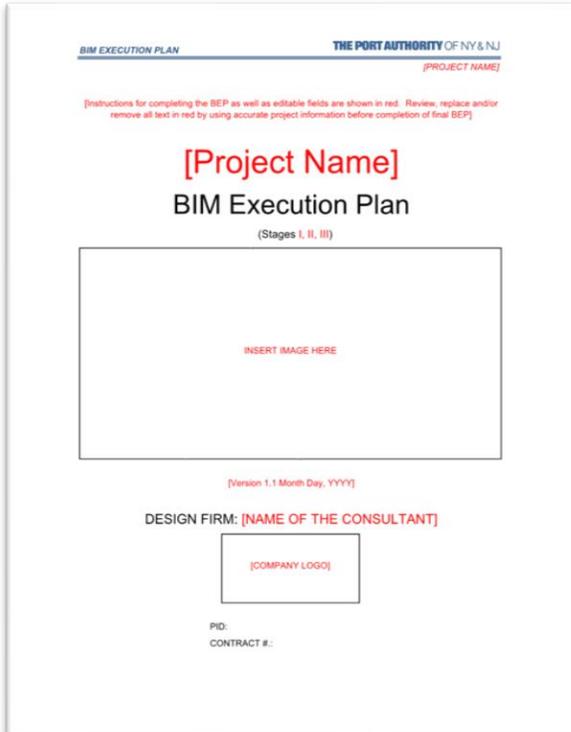


## APPENDIX B: BIM EXECUTION PLAN TEMPLATES

### DESIGN BID BUILD - TEMPLATE FOR DESIGN

To download the BEP Template for Design, follow the link below:

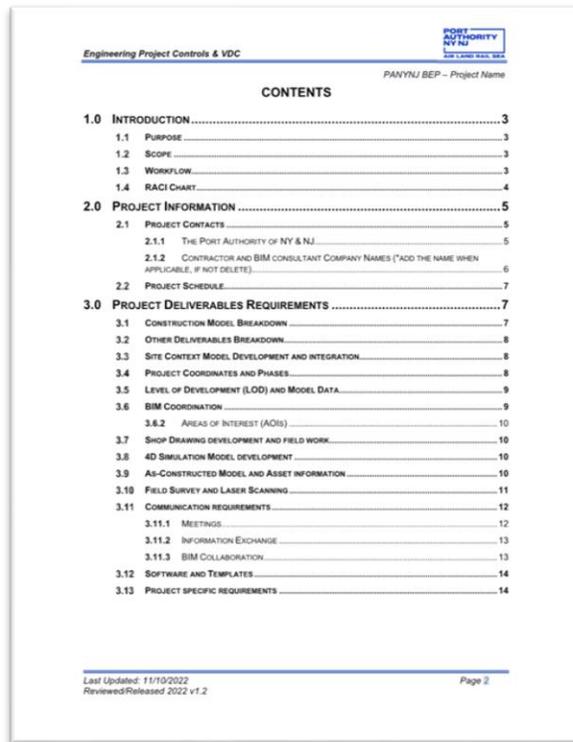
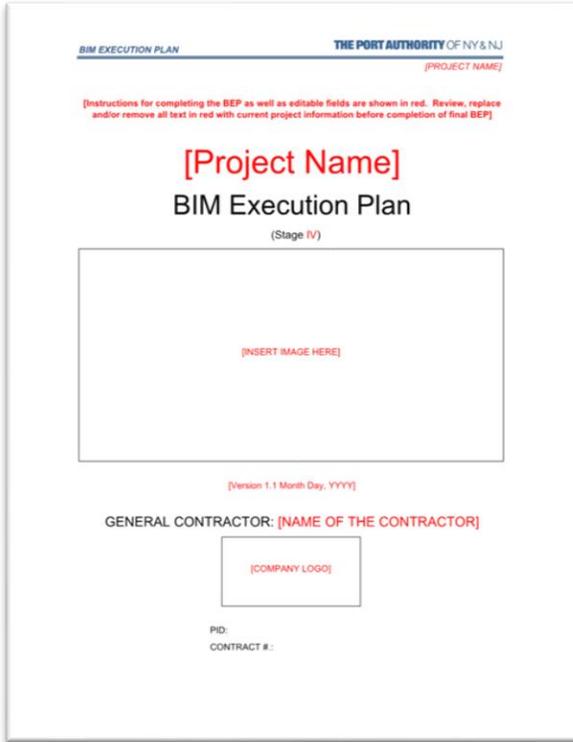
[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)



## DESIGN BID BUILD- TEMPLATE FOR CONSTRUCTION

To download the BEP Template for Construction, follow the link below:

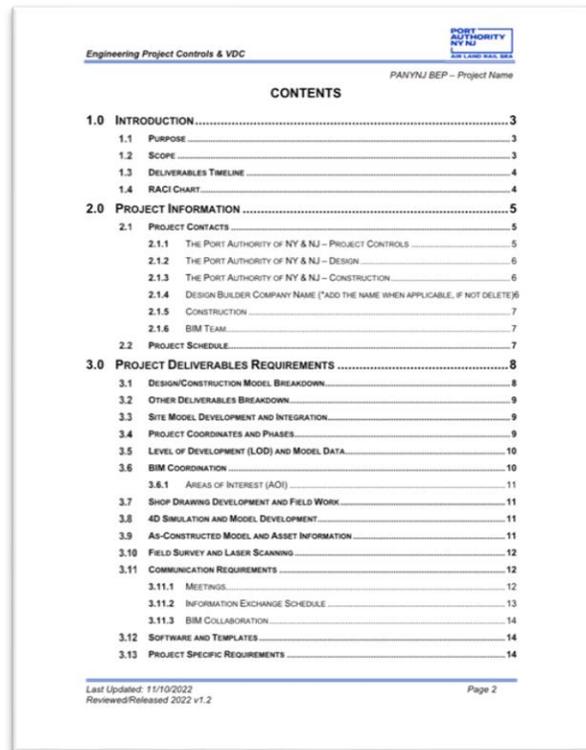
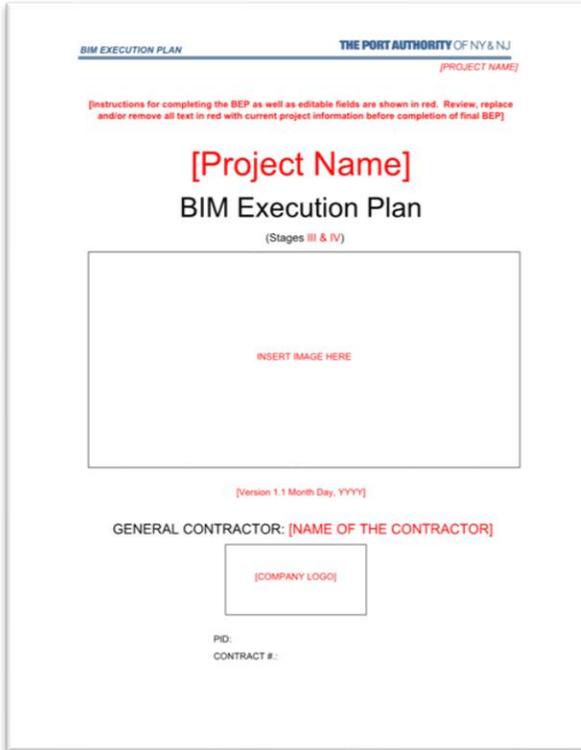
[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)



## DESIGN BUILD - TEMPLATE FOR DESIGN & CONSTRUCTION

To download the BEP Template for Design Build, follow the link below:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)



## APPENDIX C: BIM PROGRESS REPORT TEMPLATE

To download the BIM Progress Report Template, follow the link below:

[Engineering Available Documents > VDC Requirements and Standards \(BIM/CAD\) > BIM Standard > BIM Support Files](#)

PORT AUTHORITY NY NJ AIR LAND RAIL SEA

**BIM SUBMISSION REPORT** [PROJECT NAME]

**1.1 NARRATIVE OF CHANGES ON CONSTRUCTION MODELS SINCE PREVIOUS SUBMISSION**

Describe Updates and work Done on Models since last Submission.

**1.2 SUBMISSION SUMMARY**

PROJECT NAME	(Complete here)
PROJECT NUMBER	(Enter the PID Number)
CONTRACT NUMBER	(Enter the CN Number)
PROJECT STAGE	(Describe the location of the project at the address below)
GENERAL CONTRACTOR	(Indicate Contractor name)
SUBMISSION #	(Provide submission number)
SUBMISSION DATE	(Month, YYYY)
BIM / LEAD COORDINATOR	(Enter the Contractor BIM Lead Coordinator name)
PANYNJ VDC ENGINEER	(Enter the PANYNJ VDC Engineer name)

FILE NAME	FILE SIZE	FILE PROGRESS	DELIVERABLE STATUS
File Name 1	00MB	Completeness %	Updated / No updates
File Name 2	00MB	Completeness %	Updated / No updates
File Name 3	00MB	Completeness %	Updated / No updates
File Name 4	00MB	Completeness %	Updated / No updates
File Name 5	00MB	Completeness %	Updated / No updates
File Name 6	00MB	Completeness %	Updated / No updates
File Name 7	00MB	Completeness %	Updated / No updates
File Name 8	00MB	Completeness %	Updated / No updates
File Name 9	00MB	Completeness %	Updated / No updates
File Name 10	00MB	Completeness %	Updated / No updates

PORT AUTHORITY NY NJ AIR LAND RAIL SEA

**BIM SUBMISSION REPORT** [PROJECT NAME]

**1.3 HISTORICAL MODEL COMPLIANCE REVIEW STATUS**

Complete last 6 months Compliance Review Status.

MODEL NAME	MONTH A	MONTH B	MONTH C	MONTH D	MONTH E	MONTH F
File Name 1	APP	APP	APP	APP	APP	APP
File Name 2	NA	NA	NA	NA	NA	NA
File Name 3	FRO	FRO	FRO	FRO	FRO	FRO
File Name 4	APP	APP	APP	APP	APP	APP
File Name 5	NA	NA	NA	NA	NA	NA
File Name 6	APP	APP	APP	APP	APP	APP
File Name 7	FRO	FRO	FRO	FRO	FRO	FRO
File Name 8	NA	NA	NA	NA	NA	NA
File Name 9	APP	APP	APP	APP	APP	APP
File Name 10	FRO	FRO	FRO	FRO	FRO	FRO

Status may be APP (approved/passed), NA (not approved/failed), this is based on past submissions responses by the PA's VDC support group.

**1.4 3D BIM COORDINATION STATUS**

	Search Set 1	Search Set 2	Search Set 3	Search Set 4	Search Set 5	Search Set 6	Search Set 7
Search Set 1	█						
Search Set 2		█					
Search Set 3			█				
Search Set 4				█			
Search Set 5					█		
Search Set 6						█	
Search Set 7							█

\*Search Sets for System Identification Defined on BEP. Matrix above is to reflect ACTIVE class count.

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