

# Building Information Modeling Standard

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**CHANGES ON THE STANDARDS****2021**

| FILE / SECTION                                              | DESCRIPTION                                                   |
|-------------------------------------------------------------|---------------------------------------------------------------|
| 1.1 PURPOSE                                                 | Associated Materials Table was updated.                       |
| 2.1.1 DESIGN                                                | Design workflow for BIM files creation has been redefined.    |
| 2.2.3 MAINTENANCE AND OPERATIONS                            | Reference to Information Delivery Plan spreadsheet was added. |
| 3.2 REVIT TEMPLATES                                         | Revit Templates have been updated.                            |
| 5.1.2 REVIT CENTRAL FILE                                    | Revit Files naming convention was updated.                    |
| 5.1.6 OTHER FILES                                           | Other Files naming convention was updated.                    |
| 5.2.3 ANNOTATION FAMILY FILES                               | Annotation families naming convention was updated.            |
| 5.2.4 WORKSETS                                              | Worksets naming convention was updated.                       |
| 5.2.5 VIEWS                                                 | Views naming convention was updated.                          |
| 5.3.1 DRAWING TYPES                                         | New "All Discipline" codes have been added.                   |
| 5.3.3 SHEET CLASSIFICATION                                  | New Section added.                                            |
| 6.4 LEVEL OF DEVELOPMENT (LOD)                              | Reference to Information Delivery Plan spreadsheet was added. |
| 6.5 MODEL GRANULARITY                                       | Reference to Information Delivery Plan spreadsheet was added. |
| 7.4.2 SHARED PARAMETERS                                     | Reference to Information Delivery Plan spreadsheet was added. |
| 7.4.3 STARTING VIEW                                         | New Section added.                                            |
| 7.4.4 PROJECT INFORMATION                                   | Project Information has been updated.                         |
| 7.4.5 PROJECT BROWSER                                       | Project Browser organization has been updated.                |
| 7.4.6 TEXT SYLES                                            | Text styles have been updated.                                |
| 7.4.7 DIMENSIONS SYLES                                      | Dimension styles have been updated.                           |
| 7.4.8 LINE SYLES                                            | Line styles have been updated.                                |
| 7.4.9 LINE WEIGHTS                                          | Line Weights styles have been updated.                        |
| 7.4.10 ANNOTATION SYMBOLS                                   | Annotation Symbols have been updated.                         |
| 7.4.14 FILLED REGIONS                                       | Filled Regions have been updated.                             |
| 7.4.15 FILLED PATTERNS                                      | Filled Patterns have been updated.                            |
| 7.4.16 SCHEDULES                                            | Schedules have been updated.                                  |
| 7.4.17 PHASES                                               | Phases have been updated.                                     |
| 9.1 REQUEST FOR VDC (BIM/CAD) REVIEW                        | Request form was updated.                                     |
| 9.3 BIM - DISCIPLINE COMPLIANCE REPORT                      | Report was updated.                                           |
| 9.4 BIM - 3D COORDINATION REPORT                            | Report was updated.                                           |
| 9.4 BIM - 4D SIMULATION REPORT                              | Report was updated.                                           |
| APPENDIX B: CONFIDENTIAL & CONFIDENTIAL PRIVILEGED PROJECTS | C & CP requirements have been updated.                        |
| APPENDIX C: TITLE SHEETS & CONTRACT BORDERS                 | Images were updated.                                          |

## 1.0 INTRODUCTION

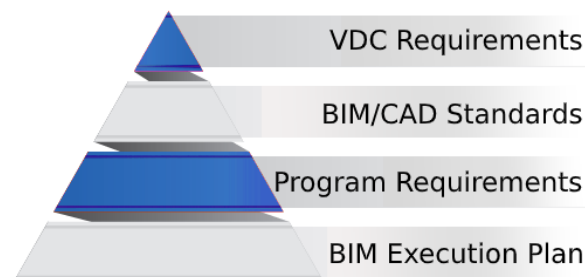
### 1.1 PURPOSE

The Port Authority of NY & NJ (Authority) Building Information Modeling (BIM) standard details the technical requirements to support projects, collect, and analyze data to be consistent, relevant and in high quality. This standard supports the deployment of Virtual Design and Construction (VDC) within the Authority. This document should be read in conjunction with the following:

**Table 1-1 - Associated Materials**

| DOCUMENT                  | TYPE          | OWNER                         |
|---------------------------|---------------|-------------------------------|
| VDC Requirements          | Requirements  | The Port Authority of NY & NJ |
| CAD Standard              | Standard      | The Port Authority of NY & NJ |
| Information Delivery Plan | Specification | The Port Authority of NY & NJ |
| Support files             | Templates     | The Port Authority of NY & NJ |

### 1.2 DOCUMENT HIERARCHY



**Figure 1-1 - Document Hierarchy**

### 1.3 APPLICABILITY

The 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 DOCUMENT OWNERSHIP

Questions regarding the Authority's BIM and/or CAD 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)



## 2.0 BIM WORKFLOW

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

### 2.1 GENERAL BIM USES

**NOTE:**

Refer to [Section 2.0 Objectives in the VDC Requirements](#) to access the Agency overall strategic objectives.

**Table 2-1 – General BIM Uses**

| CONCEPTUALIZATION & ANALYSIS | DESIGN & DOCUMENTATION      | MANAGEMENT & CONSTRUCTION             | MAINTENANCE & OPERATIONS    |
|------------------------------|-----------------------------|---------------------------------------|-----------------------------|
| Existing Conditions          | Design Review               | 3D Coordination                       | Record Model                |
| Cost Estimation              | Design Authoring            | Site and Logistics Planning           | Maintenance Schedule        |
| Phase Planning               | Lighting Analysis           | Construction System Design            | Building System Analysis    |
| Programming                  | Energy Analysis             | Digital Fabrication                   | Facility / Asset Management |
| Site Analysis                | Mechanical Analysis         | Schedule Control and Planning         | Space management            |
|                              | LEED Evaluation             | Cost Tracking and Management          | Disaster Planning           |
|                              | Code Validation             | Commissioning                         |                             |
|                              | Design Coordination         | Project Interface Management          |                             |
|                              | Constructability Review     | Cost and Schedule Forecast            |                             |
|                              | Value Engineering           | Accurate As-Built Documentation       |                             |
|                              | Design Management           | Quality Assurance and Quality Control |                             |
|                              | Cost and Schedule Forecast  | Change Management                     |                             |
|                              | Virtual Mockups             |                                       |                             |
|                              | Site and Logistics Planning |                                       |                             |

### 2.2 PANYNJ PROJECT PHASES

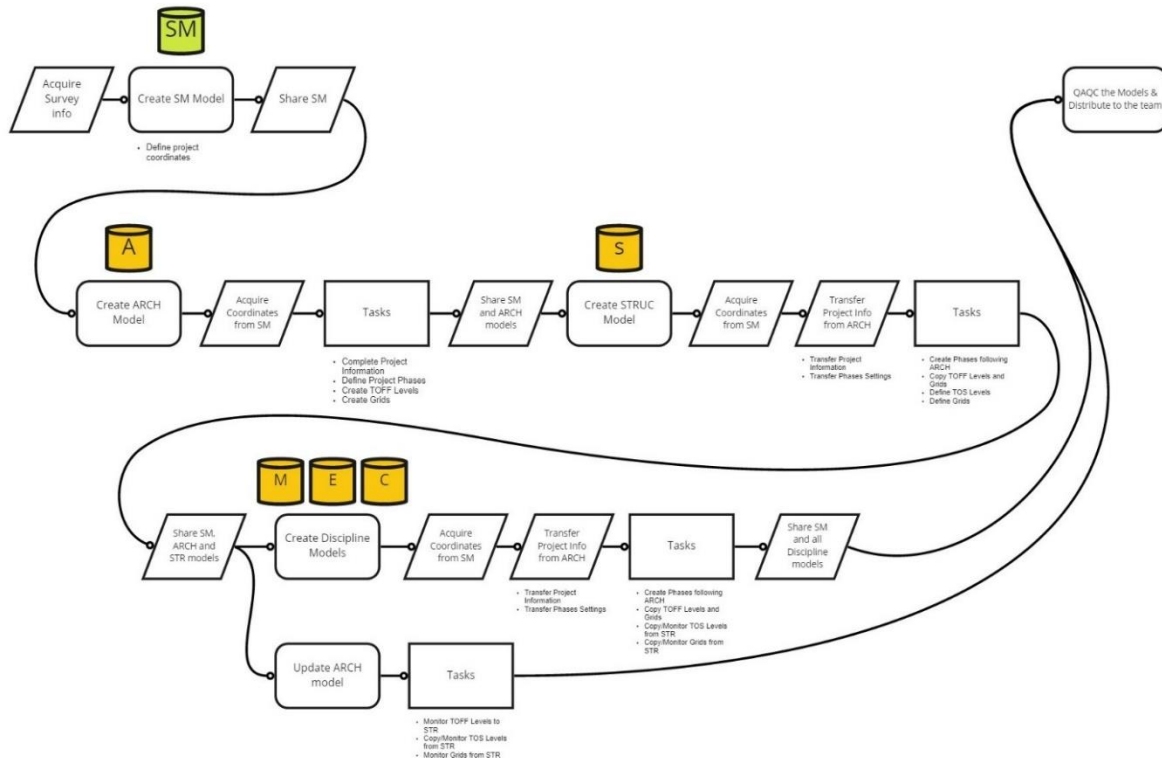
The phases indicated in the table below relate directly to distinct stages of a BIM project's lifecycle development at The Port Authority of NY & NJ.

**Table 2-2 - BIM Project Phases**

| BIM PHASE                    | PANYNJ STAGE | DESCRIPTION            |
|------------------------------|--------------|------------------------|
| Conceptualization & Analysis | Stage I      | Conceptual Design      |
| Design & Documentation       | Stage II     | Design Development     |
|                              | Stage III    | Construction Documents |
| Management & Construction    | Stage IV     | Construction           |
| Maintenance & Operations     | Stage V      | Operations             |

## 2.2.1 DESIGN

At the beginning of a project, Revit models should be setup for all Disciplines involved. In order to properly coordinate the project, the following workflow should be followed:



- A Site Model (SM) file is created by the VDC Group for each Revit project. This file holds the project coordinates system and controls the location, rotation, and elevation of all Revit-based Models linked to it. All models need to be linked by Shared Coordinates and coordinated with the Site Model.
- The Architectural Group will link and acquire coordinates from the SM. If the discipline represents the Lead discipline for the project, it will be responsible for the completion of the Project Information. The main responsibilities for this discipline is to define the project Phases and Phase settings to be used, create the TOFF Levels and Grids. Once defined, the model will be shared to Structure.
- The Structural Group will link and acquire coordinates from the SM. Then they will link the Architectural Model and transfer the Project Information and Phase Settings from there. TOFF and grids will be copy/monitored. After that the Structural Group will define the TOS Levels and redefine the grids location. Once defined, the Structural Group will share their Model with the Architectural Group.
- The Architectural Group will link the Structural Model into their Architectural model. TOS Levels and Grids will be copy/monitored to enable notifications and coordination.
- The Architectural and Structural models will be shared with the rest of the disciplines.
- All other disciplines will link the SM, Architectural and Structural models. Project Coordinates will be acquired from the SM. TOFF Levels will be copy/monitored from the Architectural model. TOS Levels and Grids will be copy/monitored from the Structural model. Files will be shared with the rest of the disciplines.

### **2.2.2 CONSTRUCTION**

Once Design Phase is finished and Construction is awarded, new Models should be created; existing Design Models could be used for reference. These Models are living files that will evolve during the Construction Phase by incorporating all related information during that process.

Construction Milestones are as follows:

#### **Milestone 1: Base of Design**

A new model is developed by the Contractor using the information received from the previous stage (Design - Stage III). These models will be coordinated in order to detect any Design issues, if necessary, those should be addressed as PACCs.

#### **Milestone 2: Construction**

All submittals received during the Construction Phase should be incorporated into the model. After an element is approved by the CMD department, the specification should be reflected in the family used. Use of specific Parameters is requested and should be used accordingly for status tracking.

#### **Milestone 3: As Constructed**

When the project is completed, a final "As-Constructed" model should be delivered reflecting Construction real conditions, also captured as a laser scanning.

### **2.2.3 MAINTENANCE AND OPERATIONS**

Elements of special interest by the Authority have been identified in the specific "EAMPick" Tab on the Information Delivery Plan spreadsheet, for the As-Constructed Model. The Information Delivery Plan spreadsheet also defines all applicable attributes/parameters for each Unifomat level. Each of these attributes are included as parameter in the PANYNJ's standard Shared Parameter files, under 7D parameters group.

#### **NOTE:**

For more clarification and information about Asset Management contact the Port Authority's Enterprise Asset Management (EAM) Group.

## **3.0 CONTENT MANAGEMENT**

The Authority CAD & BIM Standards can be found in different locations depending on who is accessing the information:

Internal Link:

[K\\_Drive\Documentation\Standards Documents](#)

[VDC Sharepoint Site](#)

External Link:

<https://www.panynj.gov/port-authority/en/business-opportunities/engineering-available-documents.html>

### 3.1 BIM SUPPORT FILES

**Table 3-1 – Support Documentation**

|                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| K:\Documentation\Standards Documents                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | Contains the "BIM-Standard-Manual".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| K:\Application\EAD\BIM_Standards\2018\Content                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| All Disciplines                                               | Contains all cross-discipline support files and content.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <Discipline>                                                  | Contains all discipline specific support files and content.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| K:\Application\EAD\BIM_Standards\2018\Contract Borders        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 22x34                                                         | 22x34 border for PA Contract, Presentation, Report and Title sheet drawings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 34x56                                                         | 34x56 border for PA Contract, Presentation, Report and Title sheet drawings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| K:\Application\EAD\BIM_Standards\2018\Contract Borders\Stamps |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 22x34                                                         | <ul style="list-style-type: none"> <li>-Law Review, Preliminary, Quality Assurance and Percent submission stamp for use on 22x34 borders.</li> <li>-Confidential Privileged Warning sign for use on stamp for use on 22x34 borders for CP drawings.</li> <li>-Confidential stamp for use on 22x34 borders for C drawings.</li> <li>-One and Multiple consultant company providing NJ &amp; NY PE signatures on 22x34 drawings.</li> <li>-One and Multiple consultant company providing NJ &amp; NY RA signatures on 22x34 drawings.</li> </ul> |
| 34x56                                                         | <ul style="list-style-type: none"> <li>-Law Review, Preliminary, Quality Assurance and Percent submission stamp for use on 34x56 borders.</li> <li>-Confidential Privileged Warning sign for use on stamp for use on 34x56 borders for CP drawings.</li> <li>-Confidential stamp for use on 34x56 borders for C drawings.</li> <li>-One and Multiple consultant company providing NJ &amp; NY PE signatures on 34x56 drawings.</li> <li>-One and Multiple consultant company providing NJ &amp; NY RA signatures on 34x56 drawings.</li> </ul> |
| K:\Application\EAD\BIM_Standards\2018\Lookup Tables           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | Includes the support files for Conduits and Pipes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| K:\Application\EAD\BIM_Standards\2018\Sample Folder Structure |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | Includes the Folder Structure templates to address both the Central File and the Local File.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| K:\Application\EAD\BIM_Standards\2018\Shared Parameters       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| PA - Shared_Parameters.txt                                    | Includes the Port Authority of NY & NJ custom Shared Parameters file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| K:\Application\EAD\BIM_Standards\2018\Support                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | Includes support files for importing and exporting AutoCAD files to and from Revit, a Navisworks template for creating sets when doing clash detections.                                                                                                                                                                                                                                                                                                                                                                                       |
| K:\Application\EAD\BIM_Standards\2018\Templates               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | Includes the discipline-specific template files for the Architectural, Electrical, Mechanical, and Structural disciplines.                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 3.2 REVIT TEMPLATES

To promote consistency in the Contract Set as well as the Revit models created, the PANYNJ Revit templates contain several predefined 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.

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 one of the templates provided with the BIM Standard, which are:

- PA-SITE-ProjectTemplate.rte
- PA-ARCH-ProjectTemplate.rte
- PA-MEP-ProjectTemplate.rte
- PA-STRUC-ProjectTemplate.rte

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.

## 3.3 REVIT LIBRARY

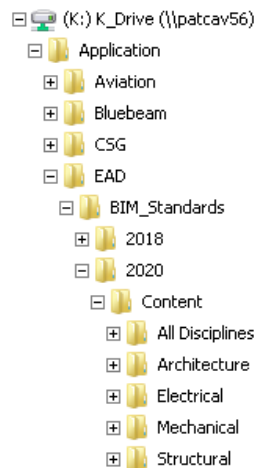
### 3.3.1 REVIT LOADABLE FAMILIES

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

Loadable families such as Equipment, Furniture, Doors, etc. are permitted, but need to use the correct naming convention. Depending on who is accessing the information, the files can be accessed using the following links:

Internal Link:

[K:\Application\EAD\BIM\\_Standards\2018\Content](K:\Application\EAD\BIM_Standards\2018\Content)



**Figure 3-1 - BIM Content Library Folder Structure**

External Link:

<https://www.panynj.gov/port-authority/en/business-opportunities/engineering-available-documents.html>

The content folder contains the on-going BIM library. It contains 2D detail components and 3D families. The library holds multi-discipline families to make the modeling process easier and more efficient.

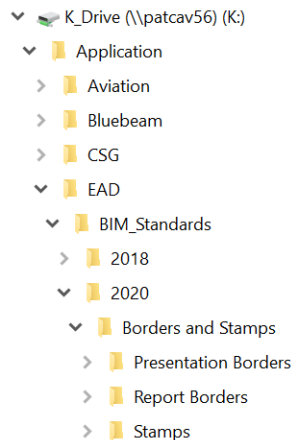
### 3.3.2 REVIT TITLE-BLOCK FAMILIES

All project sheets must be created using one of the Title Sheet and or Contract Border provided as part of the shared content. Images showing the official Port Authority of NY & NJ Title Sheets and Contract Borders for both sizes, 22x34 and 34x56 are included in [Appendix C – Title Sheets & Contract Borders](#).

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

Internal Link:

[K\\_Admin\Application\EAD\BIM\\_Standards\2020\Borders and Stamps](#)



**Figure 3-2 - BIM Contract Borders Folder**

External Link:

<https://www.panynj.gov/port-authority/en/business-opportunities/engineering-available-documents.html>

## 4.0 BIM EXECUTION PLAN (BEP)

At the start of every BIM project, a BEP must be submitted to the Port Authority VDC Group. Refer to [Appendix E & F: BIM Execution Plan](#) for each Phase BEP Templates.

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

## 5.0 NAMING CONVENTION

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

### 5.1 FILES NAMING CONVENTION

All electronic files should be named following the File Naming Convention.

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

DPID–SN/DT–Description

**Table 5-1 - File naming convention**

| ITEM                       | DESCRIPTION                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D                          | Discipline Code                                                                                                                                                |
| PID                        | Eight-digit PID Number                                                                                                                                         |
| DT/SN<br>(Optional*)       | Drawing Type / Sequence Number<br>(Drawing Type or Two-digit consecutive numbers starting with 01)                                                             |
| Description<br>(Optional*) | Brief User Description (up to 24 characters)<br>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 or Description or both.

#### 5.1.1 DISCIPLINE CODES

There are eight 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 5-2 - Discipline Codes**

| DISCIPLINE CODE | DISCIPLINE NAME |
|-----------------|-----------------|
| A               | Architectural   |
| C               | Civil           |
| E               | Electrical      |
| N               | Environmental   |
| G               | Geotechnical    |
| M               | Mechanical      |
| S               | Structural      |
| T               | Traffic         |

### 5.1.2 REVIT CENTRAL FILE

The Central file should be named beginning with the Discipline Code, an eight-digit PID Number, a dash, a Model Type, an underscore and the word "CENTRAL". Once defined, the Central File name should not change through the life of the project.

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 be an issue.

For example:

The Architectural Discipline may split a large building into a Core model and a Shell model. Another situation that may need a single Discipline creating multiple separated models if the design work is divided among multiple consultants. For instance, Plumbing and Fire Protection might be handled by two different specialty consultants, in which case each will need to create their own model with a unique file name.

If a Discipline only has one Model file, the "GN" Type Code shall be used.

As a general rule, the filename should take the form of: DPID-MT\_CENTRAL.rvt

**Table 5-3 - Revit Model Naming Convention**

| ITEM    | DESCRIPTION                             |
|---------|-----------------------------------------|
| D       | Discipline Code                         |
| PID     | Eight-digit PID Number                  |
| MT      | Model Type Code<br>Refer to chart below |
| CENTRAL | This shall stay as is                   |



## 5.1.2.1 MODEL TYPES

Table 5-4 - Model Type Codes

| MODEL TYPE CODE      | DESCRIPTION                                |
|----------------------|--------------------------------------------|
| <b>GENERAL</b>       |                                            |
| 3D                   | 3D Model                                   |
| 4D                   | 4D Simulation                              |
| GN                   | General                                    |
| EC                   | Existing Conditions Model                  |
| PC                   | Point Cloud Model                          |
| SC                   | Site Context Model                         |
| RM                   | Removal                                    |
| BR                   | Bridges                                    |
| PBB                  | Pedestrian Boarding Bridges                |
| TR                   | Terminal                                   |
| <b>ARCHITECTURAL</b> |                                            |
| CNP                  | Canopy                                     |
| 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>    |                                            |
| BH                   | Baggage Handling                           |
| HVAC                 | Heating, ventilation, and air conditioning |
| FP                   | Fire Protection                            |
| PL                   | Plumbing                                   |
| <b>STRUCTURAL</b>    |                                            |
| SS                   | Superstructure                             |
| SB                   | Substructure                               |

As an example, the Architectural Group is saving their Revit Model as a Central File to a network drive.  
The file should be named as follows: A07963000-GN\_CENTRAL.rvt

#### Revit Local File:

The filename should take the form of: DPID-MT\_CENTRAL\_username.rvt

As an example, the Architectural Group is saving their Revit Model as a Local File to their local drives.  
The file should be named as follows: A07963000-GN\_CENTRAL\_username.rvt

### 5.1.3 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 5-5 - Plotsheet Naming Convention**

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

When using Series Numbers, either Level 1 or Level 2, as described in [Section 5.3.2 Sheet 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 Level 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

### 5.1.4 AUTOCAD FILES

The filename should take the form of: DPID-MTSN-Description.dwg

### 5.1.5 POINT CLOUD FILES

The filename should take the form of: F-CN\_YY-MM-DD\_AOI.rcs

| ITEM | DESCRIPTION      |
|------|------------------|
| F    | Facility         |
| CN   | Contract Number  |
| YY   | Year             |
| MM   | Month            |
| DD   | Day              |
| AOI  | Area of Interest |

### 5.1.6 OTHER FILES

Other filenames should take the form of: PID-DESCRIPTION.extension

## 5.2 REVIT COMPONENTS NAMING CONVENTION

### 5.2.1 MODEL FAMILY FILES

Revit Model Family shall be named beginning with the Revit Object Category followed by the Manufacturer of the product or the word "Generic", ending with a Description and/or a Model Number.

The filename should take the form of:

CATEGORY-MANUFACTURER-DESCRIPTION/MODEL NUMBER.rfa

**Table 5-6 - Revit Model Families Naming Convention**

| ITEM                            | DESCRIPTION                                                                    |
|---------------------------------|--------------------------------------------------------------------------------|
| Category                        | Names the element that the family creates                                      |
| Manufacturer                    | Manufacturer Name or the word "Generic". No spaces or dashes should be used.   |
| Description and/or Model Number | A brief Description and/or a Model Number. No spaces or dashes should be used. |

When naming Family Files keep in mind the following:

- Capitalize the leading letters in each portion of the 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.

For example:

- Windows-Andersen-DoubleHung400SeriesArchtop.rfa
- Plumbing Fixtures-Generic-OvalUndercounterSink.rfa
- Electrical Equipment-SquareD-DistributionPanelboard.rfa

### 5.2.2 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.

For example:

- Windows-Andersen-DoubleHung400SeriesArchtop.rfa
  - WA1832
- Plumbing Fixtures-Generic-OvalUndercounterSink.rfa
  - Standard Height
  - ADA Height

### 5.2.3 ANNOTATION FAMILY FILES

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)

For example:

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

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

**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.

### 5.2.4 WORKSETS

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 the use of it:

#### 5.2.4.1 DEFAULT WORKSETS

These worksets should not be renamed or deleted.

- **Workset 1:** Default workset to be used for all elements not specifically categorized in other worksets.
- **Shared Levels and Grids:** Default workset to be used for all Levels, Grids, Scope Boxes, Reference Planes, and Work Planes.

#### 5.2.4.2 USER WORKSETS FOR LINKED FILES

Additional worksets to be created for linked files such as:

- CAD links
- Revit links (1 workset per model)
- Point Cloud links (1 workset per level)

Naming Conventions should take format of: LINK-DESCRIPTION

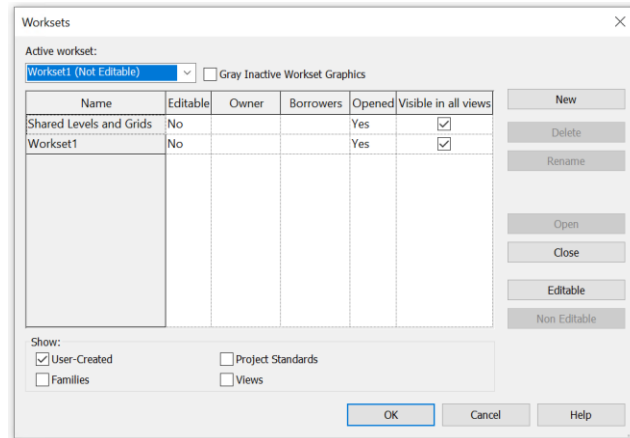


Figure 5-1 - Default Worksets

#### 5.2.4.3 USER WORKSETS FOR ELEMENTS

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

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

The Workset name for this case should take the form of: DISCIPLINECODE-DESCRIPTION

For example:

- A-LIGHTING
- A-ELECTRICAL
- S-FOUNDATION
- M-PLUMBING
- E-POWER

**NOTE:**

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

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

**5.2.4.4 WORKSET PROPERTIES**

- **Active Workset:** The workset to which new elements are added.
- **Editing & Ownership:** All worksets have the ability to be edited, either by borrowing elements or checking out the entire workset. If a workset is Editable, the workset is checked out which removes editing capability for all elements on that workset 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 workset 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.

**5.2.5 VIEWS**

The Views should take the form of: VIEW-LEVEL/LOCATION/SEQUENCE-DESCRIPTION

**Table 5-7 - Views Naming Convention**

| ITEM                                   | DESCRIPTION                                                                                                                                                      |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VIEW                                   | View Type Code<br>Refer to charts below                                                                                                                          |
| LEVEL/LOCATION/SEQUENCE<br>(Optional*) | Level Number or Location or Sequence Number<br>(Two-digit integer)                                                                                               |
| DESCRIPTION<br>(Optional*)             | Brief User Description (up to 24 characters)<br>The following characters should not be used as part of the description<br>@ \$ % ^ & < > / \ " ' : ; ? *   , ' , |

**NOTE:**

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

## All Disciplines Type Codes:

Table 5-8 - 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 5-9 - Architectural Type Codes**

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

**Electrical Type Codes:****Table 5-10 - 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 5-11 - 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 5-12 - 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            |

**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

**5.2.6 LEVELS**

The Levels should take the form of:

D-LEVEL

**Table 5-13 - Levels Naming Convention**

| ITEM  | DESCRIPTION              |
|-------|--------------------------|
| D     | Level Description/Number |
| Level | This shall stay as is    |

At the beginning of each project, the main discipline will determine the Level Name that will be used for all Disciplines of the project.

**NOTE:**

Once defined by the main discipline, all other trades 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).

**5.2.7 PHASES**

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

If applicable for the project, additional Phases shall be created and should be named consistently across all Revit models.

**NOTE:**

At the beginning of each project, the LE/A will determine how many Phases the project might have so each Discipline's Task Leader can duplicate and map them on their own Revit Models.

**5.3 SHEETS NAMING CONVENTION**

Sheets within the Project shall be named beginning with the Drawing Number dash the Title of the sheet.

The Sheet Name should take the form of: DRAWING NUMBER-SHEET TITLE

**NOTE:**

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

### 5.3.1 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:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <small>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 architect, if the document bearing the seal of an engineer or architect is altered, the altering engineer or architect affixes to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.</small> |                       |
| Designed by                                                                                                                                                                                                                                                                                                                                                                                                                                                    | T. Bal                |
| Drawn by                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N. Dellarosa          |
| Checked by                                                                                                                                                                                                                                                                                                                                                                                                                                                     | J. Quiroz             |
| Date                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 08/01/2015            |
| Contract<br>Number                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>WORK ORDER No.</b> |
| Drawing<br>Number                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>S001</b>           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PID#                  |

Figure 5-2 - Example of Drawing Type Name

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

**Table 5-14 - 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                        |
| STRUCTURAL      |                                                |
| S               | Structural                                     |
| TRAFFIC         |                                                |
| ITS             | Intelligent Transportation Systems             |
| MT              | Maintenance of Traffic                         |
| SG              | Signal Plan                                    |
| T               | Traffic                                        |

### 5.3.2 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.

#### 5.3.2.1 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.

D\_Series Number\_Drawing Counter

**Example:** S101

### 5.3.2.2 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.

D\_Series Number\_Drawing Counter

**Example:** S0101

### 5.3.2.3 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”

D\_Counter Number

**Example:** S001

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

**Figure 5-3 - Drawing Number options**

|                 |             |
|-----------------|-------------|
| Designed by     | DES         |
| Drawn by        | DWN         |
| Checked by      | CHK         |
| Date            | MM/DD/YYYY  |
| Contract Number | FAC-XXX.XXX |
| Drawing Number  | S101        |
| PID# NUMBER     |             |

Option I

|                 |             |
|-----------------|-------------|
| Designed by     | DES         |
| Drawn by        | DWN         |
| Checked by      | CHK         |
| Date            | MM/DD/YYYY  |
| Contract Number | FAC-XXX.XXX |
| Drawing Number  | S0101       |
| PID# NUMBER     |             |

Option II

|                 |             |
|-----------------|-------------|
| Designed by     | DES         |
| Drawn by        | DWN         |
| Checked by      | CHK         |
| Date            | MM/DD/YYYY  |
| Contract Number | FAC-XXX.XXX |
| Drawing Number  | S001        |
| PID# NUMBER     |             |

Option III

### 5.3.3 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

## 6.0 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.

### 6.1 SOFTWARE

**NOTE:**

Refer to [Section 5.1 Software in the VDC Requirements](#) for access to the complete list of approved Software to be used.

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

Unless otherwise agreed upon, all active BIM models 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.

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

**Table 6-1 - Software**

| SOFTWARE NAME                     | USE                                                                                                                                                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Autodesk Revit</b>             | Design and Construction Models development and update, typically all trades.<br>Models are used for Drawings development, Trades Coordination, Construction phasing, Quantity Take-Off, Scheduling. |
| <b>Autodesk Civil 3D</b>          | Develop Surfaces, Profiles, Alignments, Corridors, Pipe Networks and Quantity Take-offs.                                                                                                            |
| <b>Autodesk Navisworks Manage</b> | Design and Construction Models fly through, Interference/Clash Detection, 4D and 5D simulation. Site Planning and logistics. Program wide review                                                    |
| <b>Autodesk Recap</b>             | LiDAR Point cloud view and manipulation.                                                                                                                                                            |

**NOTE:**

Based on the backwards compatibility issues of the Revit-based 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 versions used is v.2020.

## 6.2 MODEL 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 Port Authority of NY & NJ.

## 6.3 COORDINATE SYSTEMS

For all Authority projects the default horizontal coordinate systems is State Plane NAD83 New York East and Long Island Foot systems.

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

**NOTE:**

Depending on the project location, 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.

## 6.4 LEVEL OF DEVELOPMENT (LOD)

The Level of Development (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 Level of Development is cumulative and should progress along with the design from stage to stage.

For Level of Development, 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/>.

This document shall be used along with the project specific Information Delivery Plan (IPD) spreadsheet prepared by the Port Authority as a base for each element LOD assignment.

**NOTE:**

Base MDS may be modified by the PANYNJ to fit the particular needs of some projects. Project-specific MDS will be handed over at the Project BIM Kick-off meeting. Consultants/Contractor shall include this as an annex to the project BEP.

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



## 6.5 MODEL GRANULARITY

The Design BIM model may not represent the complete design intent and may not indicate all elements required for Construction.

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

Refer to Information Delivery Plan spreadsheet to determine the level of granularity needed for each component.

## 6.6 MODEL EXCLUSIONS

There is no requirement to model the following objects:

**Table 6-2 - Model Exclusions**

| DISCIPLINE      | OBJECTS                                                                                                                          |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------|
| Structural      | <ul style="list-style-type: none"><li>• Rebar</li></ul>                                                                          |
| Fire Protection | <ul style="list-style-type: none"><li>• Hangers</li></ul>                                                                        |
| HVAC            | <ul style="list-style-type: none"><li>• Duct Insulation</li><li>• Pipe Insulation</li><li>• Filters</li><li>• *Hangers</li></ul> |
| Electronics     | <ul style="list-style-type: none"><li>• *Hangers</li></ul>                                                                       |
| Electrical      | <ul style="list-style-type: none"><li>• Cables</li><li>• Wires</li></ul>                                                         |
| Plumbing        | <ul style="list-style-type: none"><li>• *Hangers</li></ul>                                                                       |

**NOTE:**

\*Hangers should be modeled during Construction; the exception only applies for Projects under Design Stages.

## 7.0 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 both Phases (Design and Construction) should be considered and specific process will be outlined in the BEP.

**NOTE:**

By default, all Design Requirements are applicable during Construction.

### 7.1 GOALS AND USES

Design Model is a tool or instrument to facilitate design coordination and generate Construction Documents.

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

- 3D coordination between all disciplines.
- 2D Documentation linked to the 3D model.
- Risk mitigation, by providing reliable information earlier in time (compared to a non-BIM methodology).
- Quantity takeoff easily obtained by using the available tools.
- Data recollection on relevant situations.

### 7.2 PROJECT 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 of this structure is to improve coordination among all functional groups within the PANYNJ Divisions and their Consultants/Contractors, as well as to develop BIM projects in a way that will facilitate the further use of the electronic information beyond the initial contract.

#### 7.2.1 FACILITY FOLDER

All Port Authority of NY & NJ E/A Design Division BIM projects are stored on a central server, which has internally been mapped using the drive letter "R." The Engineering BIM Server (R:\ drive) is divided into Facility Folders using the following Facility Codes.

The table below shows the list of PA Facility Folders within BIM projects.

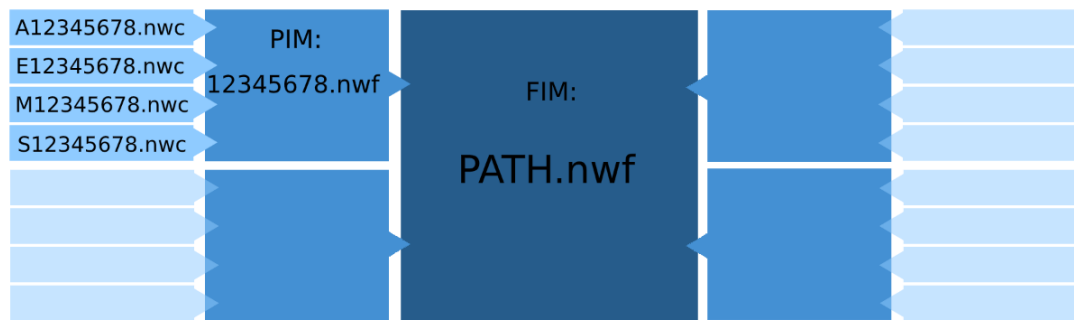
**Table 7-1 - Facility Folder Codes**

| 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                       |

## 7.2.2 FIM (FACILITY INFORMATION MODEL)

The Facility Information Model (FIM) file stores the latest and most current version of the Facility 3D Model; completed projects are uploaded here. The following image shows the workflow for BIM projects at The Port Authority of NY & NJ.

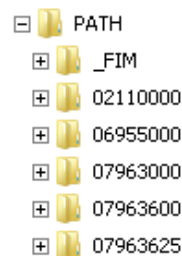
The FIM is stored as a Navisworks File Set (\*.nwf) and composed of Navisworks Federated Files (nwf).



**Figure 7-1- Facility Information Model Flow Chart**

The root of each Facility Folder contains the FIM sub-folder, which stores the most recent 3D Model of that specific Facility.

The image below illustrates this concept using the FIM Folder at the root of PATH:



**Figure 7-2 - FIM: Facility Information Model Folder Location**

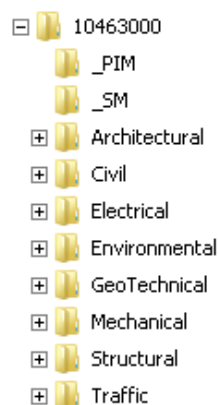
**NOTE:**

The VDC Group is responsible for the maintenance of the PIM Folder.

### 7.2.3 PID FOLDER (PROJECT IDENTIFICATION)

The PID Number is a unique identifier assigned for all Port Authority of NY & NJ BIM projects. Every Facility Folder within the Engineering BIM Server has been divided into project folders using an eight-digit PID Number.

The image below illustrates this concept using a project at PATH with the PID Number of 10463000, which includes the PIM Folder, the SM folder and eight pre-defined Discipline Folders.



**Figure 7-3 - Example of Folder structure within a PID folder**

The Lead Engineer/Architect (LE/A) shall request the creation of the Project Folder Structure on the Engineering BIM Server through the VDC Group. Consultants are required to get this number from either the LE/A or the discipline's Task Leader (TL) at the project kickoff.

## 7.2.4 PID INTERNAL FOLDERS RULES

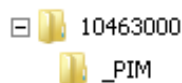
**Table 7-2 - Rules for Project Folders**

| FOLDER              | RULES                 |                                         |                                                     |          |
|---------------------|-----------------------|-----------------------------------------|-----------------------------------------------------|----------|
|                     | Sub-folders Permitted | Read-write Permissions (per discipline) | Access for Other Disciplines (Read-only Permission) | Archived |
| SM                  |                       |                                         | ✓                                                   | ✓        |
| DISCIPLINE          |                       | ✓                                       | ✓                                                   | ✓        |
| FROM OTHER PROJECTS | ✓                     | ✓                                       |                                                     |          |
| MANAGEMENT DOCS     | ✓                     | ✓                                       |                                                     | ✓        |
| MODEL               |                       | ✓                                       | ✓                                                   | ✓        |
| PHOTOS              | ✓                     | ✓                                       | ✓                                                   | ✓        |
| PLOTSHEETS          |                       | ✓                                       | ✓                                                   | ✓        |
| PUBLISH             |                       | ✓                                       | ✓                                                   | ✓        |
| RECEIVED            | ✓                     | ✓                                       |                                                     |          |
| RELEASED            | ✓                     | ✓                                       |                                                     |          |
| RENDERINGS          | ✓                     | ✓                                       | ✓                                                   | ✓        |
| SCHEMES             | ✓                     | ✓                                       |                                                     |          |
| SHARED              | ✓                     | ✓                                       | ✓                                                   |          |
| SUBMITTALS          |                       | ✓                                       | ✓                                                   | ✓        |

## 7.2.5 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 Models. Each discipline should be exported as Navisworks file (nwc).

Each PID Folder contains a PIM sub-folder that stores the most recent 3D Model of that specific project. The image below illustrates this concept using a project with the PID Number of 10463000, which includes the PIM Folder at the top of the folder:



**Figure 7-4 - Project Information Model, Folder Location**

At the completion of the project, the PIM Folder will include one Model per discipline.

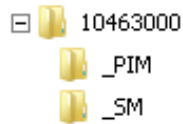
### **NOTE:**

The VDC Group is responsible for the maintenance of the PIM Folder.

### 7.2.6 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, rotation, and elevation of all Revit-based Models.

The image below illustrates this concept using a project with the PID Number of 10463000, which includes the SM Folder.



**Figure 7-5 - Site Model Folder location**

The Site Model Folder stores two files, an AutoCAD file in DWG format and a Revit file in RVT format, both named after the eight-digit PID Number followed by letters SM.

**NOTE:**

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

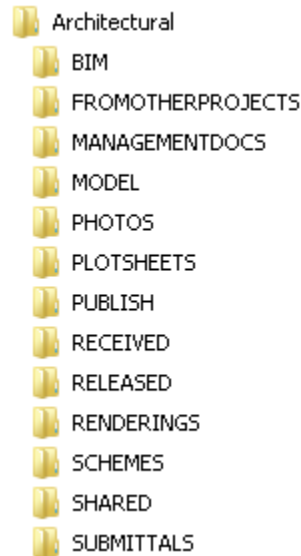
### 7.2.7 DISCIPLINE FOLDER

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
- 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 7-6 - Discipline Folder Structure**

### **7.2.8 FROM OTHER PROJECTS FOLDER**

This folder stores data that relates to the recent project and is needed only as a reference. If a drawing needs to be part of the Contract Set, it should be either moved or copied into the BACKGROUNDS folder and renamed accordingly.

### **7.2.9 MANAGEMENTDOCS FOLDER**

This folder stores non-drawing project-related data such as e-mails, memos, spreadsheets, documents, estimates, specs, etc.

### **7.2.10 MODEL FOLDER**

This folder stores the Central Revit Model file.

### **7.2.11 PHOTOS FOLDER**

This folder stores digital photographs relevant to the project.

If a photo needs to be part of the Contract Set, it should be moved or copied into the BACKGROUNDS folder and renamed accordingly.

### **7.2.12 PLOTSHEETS FOLDER**

This folder 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 SUBMITTALS folder for the milestone will be either deleted from the PDF folder or overwritten in place.

### **7.2.13 PUBLISH FOLDER**

This folder is used as a sharing mechanism between disciplines using the Revit-based applications and Civil 3D. BIM Models will be exported as DWG files and saved within this folder.

#### **7.2.14 RECEIVED FOLDER**

This folder contains a dated archive of design information received from outside sources.

This folder is a record intended to identify exactly when and what information was provided by a consultant.

#### **7.2.15 RELEASED FOLDER**

This folder contains a dated archive of design information provided to outside sources.

This folder is a record intended to identify exactly when and what information was provided to a consultant.

#### **7.2.16 RENDERING FOLDER**

This folder stores Rendering files such as JPGs, PNGs, TIFs, etc.

#### **7.2.17 SCHEMES FOLDER**

This folder stores various schemes of a design when using Civil 3D, providing the designer with an area in which to make trial changes to a design. Refer to the **CAD Standard** for proper use.

When using the Revit-based applications, Design Options is the preferred method to accomplish schemes.

#### **7.2.18 SHARED FOLDER**

This folder is used as a sharing mechanism for non-CAD\BIM-related information between disciplines, such as e-mails, memos, spreadsheets, documents, estimates, specs, etc.

A discipline may copy its files into its own SHARED folder, making them available for other disciplines to use.

#### **7.2.19 SUBMITTALS FOLDER**

This folder is to be used for storing project information as it appears at each milestone of the project. Standardized sub-folders are provided for each Stage of the project, all percentage milestone included.

**NOTE:**

While most of the folders contain working information that changes throughout the life of project, the SUBMITTALS folder preserves the state of those files at the moment of each milestone.

Before every submission, BIM Models should be purged of all unused information.

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

#### **7.2.20 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



For example: 2020-04-01-Filled Sketches

**Table 7-3 – 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)<br>The following characters should not be used as part of the description: @ \$ % ^ & < > / \ " ' ; : ? *   , ' , |

## 7.3 SITE MODEL

The Site Model (SM) file is created for each Revit project. This Site Model file has a combination of Aerial Photometry and CAD Files based on The Port Authority of NY & NJ BMMS (Base Map Management System). This file holds the project coordinate system and controls the location, rotation, and elevation of all Revit-based Models (Architectural, Electrical, Mechanical and Structural) linked to it. All models need to be linked by Shared Coordinates and coordinated with the Site Model.

This file is created and distributed by the VDC Group at the Projects BIM Kick-off meeting.

### **NOTE:**

Refer to [Section 8.3 Site Model](#) for Site Model specific requirements during Construction.

## 7.4 DESIGN INTENT MODEL

### 7.4.1 LINKING FILES

As a general rule all files should be Linked, not imported. Specific rules apply when linking files.

#### 7.4.1.1 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.

#### 7.4.1.2 LINKING AUTOCAD FILES

There are two types of AutoCAD Drawings that might need to be linked into Revit, Reference Drawings and Manufacturer Detail Drawings.

- The first type refers to drawing 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 second type of files refer to specific Manufacturer Details, that will be included as part of the Contract Set.

Both types of files required the following minimal settings before being link into Revit:

- Linked files should not contain External References.

*PANYNJ BIM Standard*

- In order 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.
- Avoid exploding 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.

**7.4.1.2.1 REFERENCE DRAWINGS**

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 Revit in order to be correctly aligned.
- Elements within the DWG cannot be more than 2 miles apart from each other.

**7.4.1.2.2 MANUFACTURER DETAIL DRAWINGS**

Manufacturer Detail Drawings are typically linked into Drafting Views and/or Legend Views and are usually used as part of the Contract Set. Same requirements described above.

**7.4.2 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.

### 7.4.3 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.

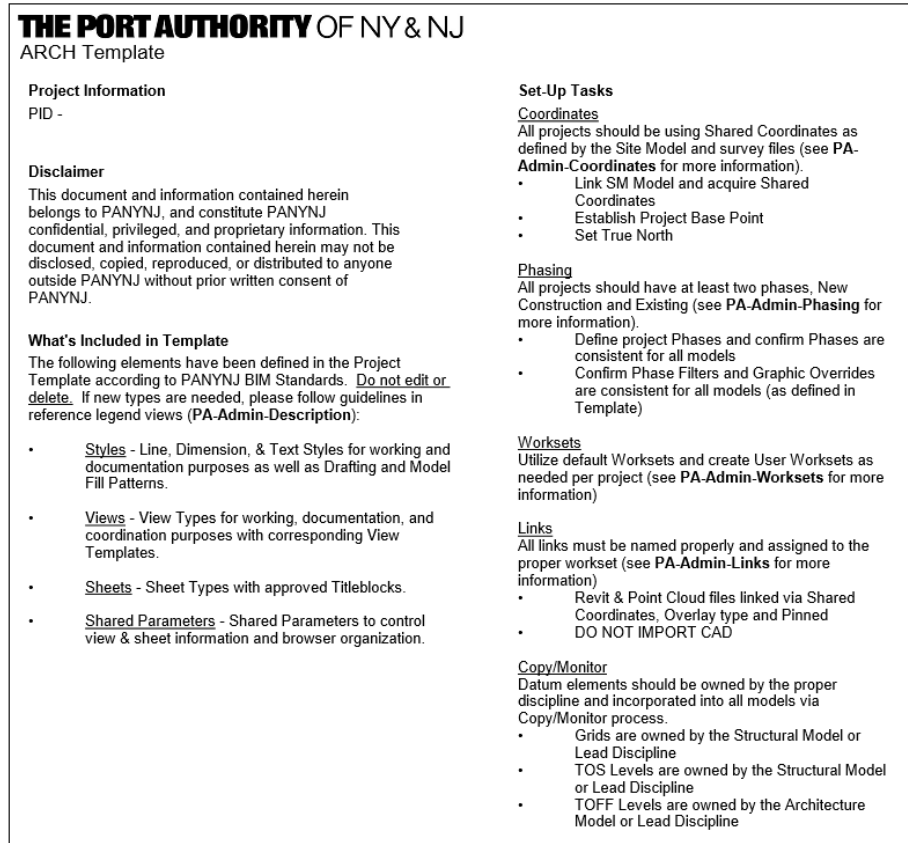


Figure 7-7 - Example of Starting View

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.

#### 7.4.4 PROJECT INFORMATION

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

| 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             |

Figure 7-8 – Project Information

### 7.4.5 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 7-4 - 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.                                                                                                                                                                                                 |

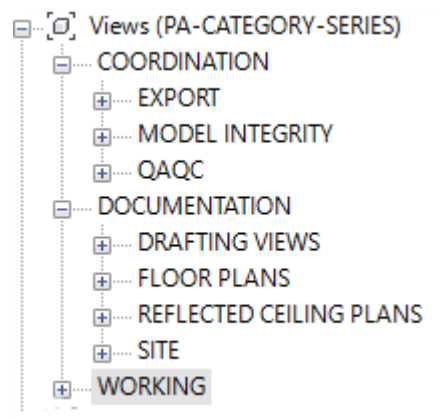
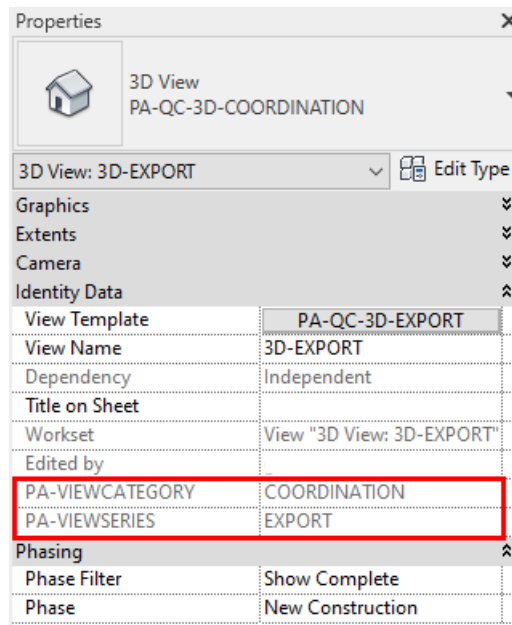


Figure 7-9 - General Project Browser

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 7-10 - Highlighted PA-VIEW CATEGORY and PA-VIEWSERIES parameters.**

#### 7.4.6 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, please follow the same naming convention:

“ORIGINATOR-CATEGORY-DESCRIPTOR-SUBDESCRIPTOR”

Start with two letters for the ORIGINATOR “XX”, followed by the use of the text style, the font and size, followed by other attributes if applicable.

Only ARIAL font style is allowed in Text Styles.

### 7.4.7 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 text style is needed, please follow the same naming convention:

“ORIGINATOR-CATEGORY-DESCRIPTOR-SUBDESCRIPTOR”

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

Only ARIAL font style is allowed in Dimensions Styles.

### 7.4.8 LINE STYLES

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

**Table 7-5 - 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-GRAY20-SOLID-PEN08 | 8 (0.0480") | Solid Gray  |
| PA-GRAY40-SOLID-PEN06 | 6 (0.0280") | Solid Gray  |
| PA-GRAY60-SOLID-PEN04 | 4 (0.0150") | Solid Gray  |
| PA-GRAY80-SOLID-PEN02 | 2 (0.0080") | Solid Gray  |

#### 7.4.9 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 7-6 - 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" |

#### 7.4.10 ANNOTATION SYMBOLS

Different Annotation symbols, 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 Symbols loaded are not needed, those should be deleted at the beginning of the project to avoid mistakes.

If you need to add a new symbol, please follow the same naming convention:

ORIGINATOR-SYM-DESCRIPTION1-DESCRIPTION2

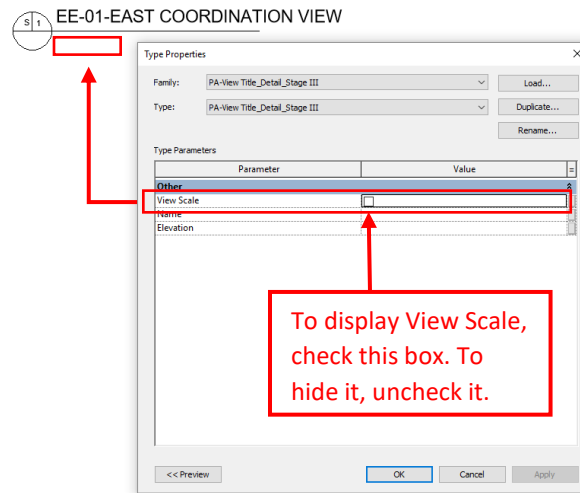
Start with two letters for the ORIGINATOR "XX", followed by the SYMBOL TYPE, then DESCRIPTION 1, followed by DESCRIPTION 2 if applicable.

Only ARIAL font style is allowed in Text Styles.



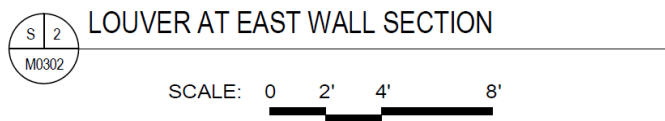
### 7.4.11 VIEW TITLE

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 7-11 - 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 7-12 - Example of View Title family and Type Properties**

### 7.4.12 GRIDS

Two Standard Grids have been provided as follows:

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

### 7.4.13 ELEVATIONS

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

- EE-01-EAST COORDINATION VIEW
- EE-02-WEST COORDINATION VIEW
- EE-03-SOUTH COORDINATION VIEW
- EE-04-WEST COORDINATION VIEW

#### 7.4.14 FILLED REGIONS

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

**Table 7-7 - Filled Regions**

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

**NOTE:**

Other “Out-of-the-Box” line patterns exist within the template to use.

#### 7.4.15 FILL PATTERNS

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 7-8 - 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” line patterns exist within the template to use.

**7.4.16 SCHEDULES**

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

The Header and Body Text size of any custom Schedules needs to be set within the Appearance Tab as described in the Table below.

**Table 7-9 - Schedule text styles**

| SCHEDULES          |             |       |         |
|--------------------|-------------|-------|---------|
| TEXT STYLE         | DESCRIPTION | FONT  | HEIGHT  |
| PA-SCHEDULE TEXT 1 | Header Text | Arial | 19/128” |
| PA-SCHEDULE TEXT 2 | Body Text   | Arial | 13/128” |

**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”.

**7.4.17 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. Refer to [Section 5.2.7 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.

Phasing

Project Phases Phase Filters Graphic Overrides

|   | Filter Name          | New           | Existing      | Demolished    | Temporary     |
|---|----------------------|---------------|---------------|---------------|---------------|
| 1 | Show All             | By Category   | Overridden    | Overridden    | Overridden    |
| 2 | Show Complete        | By Category   | By Category   | Not Displayed | Not Displayed |
| 3 | Show Demo            | Not Displayed | Not Displayed | Overridden    | Not Displayed |
| 4 | Show Demo + New      | By Category   | Not Displayed | Overridden    | Overridden    |
| 5 | Show Existing        | Not Displayed | Overridden    | Not Displayed | Not Displayed |
| 6 | Show Existing + Demo | Not Displayed | Overridden    | Overridden    | Not Displayed |
| 7 | Show Existing + New  | By Category   | Overridden    | Not Displayed | Not Displayed |
| 8 | Show New             | By Category   | Not Displayed | Not Displayed | Not Displayed |

New Delete

OK Cancel Apply Help

Figure 7-13 – Phase Filters

Phasing

Project Phases Phase Filters Graphic Overrides

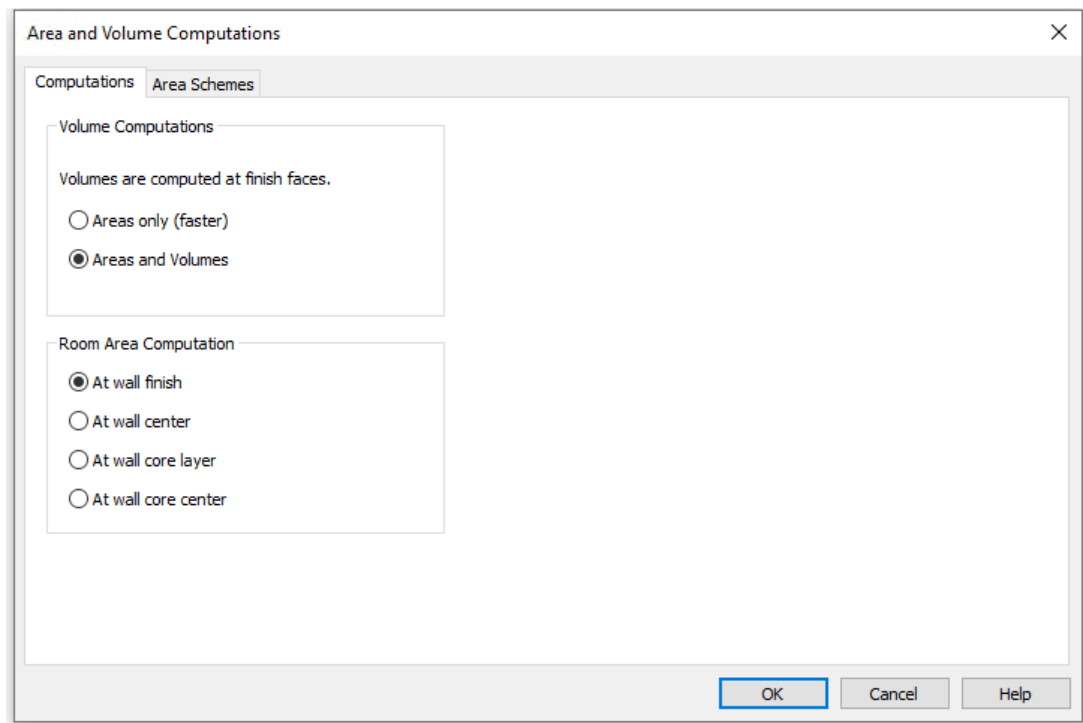
| Phase Status | Projection/Surface |          | Cut   |          | Halftone                 | Material |
|--------------|--------------------|----------|-------|----------|--------------------------|----------|
|              | Lines              | Patterns | Lines | Patterns |                          |          |
| Existing     |                    |          |       |          | <input type="checkbox"/> |          |
| Demolished   |                    |          |       |          | <input type="checkbox"/> |          |
| New          |                    |          |       |          | <input type="checkbox"/> |          |
| Temporary    |                    |          |       |          | <input type="checkbox"/> |          |

OK Cancel Apply Help

Figure 7-14 – Graphic Overrides

### 7.4.18 ROOM COMPUTATION

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



**Figure 7-15 -Area and Volume Computation Dialog Box**

## 7.5 FEDERATED MODEL

The LE/A is responsible for setting up Inter-Disciplinary Interference Check Sessions as often as the project requires.

The Cross-Discipline Interference Check will be performed by the project LE/A using Autodesk Navisworks. Each discipline's TL, including the Lead Discipline, is responsible for creating a Navisworks file out of their Revit Models.

### 7.5.1 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 7-10 - 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.

### 7.5.2 INTERFERENCE CHECK / CLASH DETECTION

The use of Interference Check Tools will have 3 possible outcomes within our BIM practice:

**No Clash:** This will be the perfect case scenario.

**Soft Clash:** Such as Ducts going through Partition Walls for example.

This type of Clash will not require any additional action from the Team.

**Hard Clash:** Such as Columns going through Equipment for example.

This type of Clash will require action from the Team.

**NOTE:**

The Interference Check Tool should be used during the design process to coordinate major building elements and systems allowing the identification of interferences earlier in the design process.

#### **7.5.2.1 SINGLE-DISCIPLINE INTERFERENCE CHECK**

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

#### **7.5.2.2 CROSS-DISCIPLINE INTERFERENCE CHECK: CLASH DETECTIONS**

The Project Leader is responsible for setting up Inter-Disciplinary Interference Check Sessions as often as the project requires, usually defined in the BEP (BIM Execution Plan).

The Cross-Discipline Interference Check will be performed by the Project Leader using Autodesk Navisworks. Each Discipline Leader, including the Lead Discipline, is responsible for creating a Navisworks file out of their Revit Models.

#### **7.5.3 NAVISWORKS CLASH REPORT SETTINGS**

The BIM Project Leader is responsible for compiling all the discipline specific Navisworks Cache files (NWC) into a single Master Navisworks file (NWF) for coordination purposes.

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

Following every Coordination meeting, an NWD file shall be issued to the Port Authority NY & NJ Project Leaders for distribution to Discipline Leaders. The NWD file shall contain Saved Viewpoints of all clashes that are *New* or *Existing*.

### **7.6 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.

#### **7.6.1 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.

#### **7.6.2 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 6 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).

### **7.6.3 SUBMISSION PROCESS**

All project-related files 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 Master files
- NWC: Autodesk Navisworks Cache files
- PDF: Adobe 2D Portable Document Format files
- 3D DWF: Autodesk 3D Design Web Format files
- Navisworks Clash Report (submitted in PDF format)



## 8.0 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.

### 8.1 GOALS AND USES

As an owner, it is of paramount importance for the Agency that projects are delivered on time and within budget, keeping delays on Site to a minimum, facilitating project controls and maximizing the use of preventive actions over corrective actions. Clear, consistent and reliable information is critical for obtaining these goals. Thus, it is the main objective of this section to provide the proper framework for all Stakeholders to be able to deliver and receive consistent information throughout construction.

Secondarily, it is the Authority's intention to further streamline the exchange of data across multiple stages of the project, beyond construction.

In general terms, this section aims to facilitate:

- Reutilization of information available from Stages I-III.
- Standardization and assurance of information developed in Stage IV, for analysis.
- Preparation of final deliverables to the Authority, for records and further use in Stage V: Operations and Maintenance.

Construction Model is, above all, a tool or instrument to facilitate information so more educated decisions can be made regarding the Project.

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

- Risk mitigation, by providing reliable information earlier in time (compared to a non-BIM methodology)
- 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.

### 8.2 PROJECT 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 of this structure is to improve coordination among all functional groups within the CMD Division and their contractors, as well as to develop BIM projects in a way that will facilitate the further use of the electronic information beyond the initial contract.

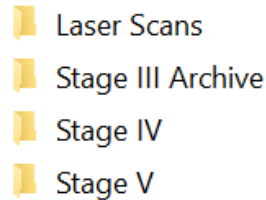
**NOTE:**

This folder structure is used for PA Internal purposes, outside Consultants and Contractors do not need to replicate it.

All Port Authority of NY & NJ E/A CMD Division BIM projects are stored on a Stage IV Folder within the drive:

<\\patccsrv3\Data>

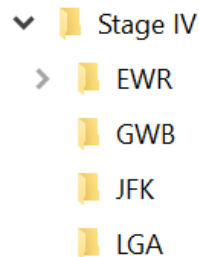
The Data drive is divided into sub-folders:



**Figure 8-1 - Data Drive organization**

### 8.2.1 FACILITY FOLDER

The Stage IV Folder is divided into Facility Folders using the following Facility Codes. The image below illustrates this concept.



**Figure 8-2 - Stage IV Folder organization**

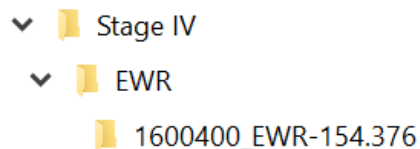
### 8.2.2 PID AND CONTRACT NUMBER FOLDER

Every Facility Folder within the Engineering BIM Server has been divided into project folders using the PID and the Contract number.

The project folder name should take the form of:

PID\_CN

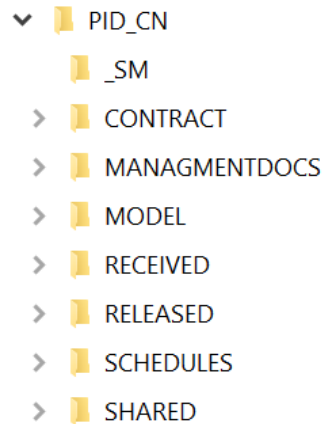
The image below illustrates this concept using a project at EWR with the PID Number of 1600400 and the Contract Number of 154.376.



**Figure 8-3 - Stage IV Project Folder Example**

Each PID and Contract Number folder has a series of standardized sub-folders in which all construction related data is to be stored.

The image below illustrates these standardized sub-folders:

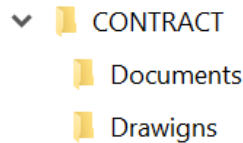


**Figure 8-4 - Project folder organization**

#### 8.2.2.1 CONTRACT FOLDER

This folder stores all documents and drawings from the contract.

Inside the Contract Folder we have the following sub-folders:

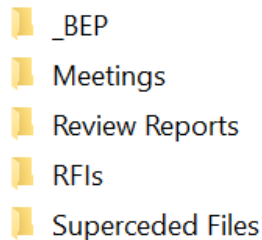


**Figure 8-5 - Contract Folder**

#### 8.2.2.2 MANAGEMENTDOCS FOLDER

This folder stores non-drawing project-related data such as e-mails, memos, spreadsheets, reports, RFIs, documents, estimates, specs, etc.

Inside the Managementdocs Folder we have the following standardized sub-folders:

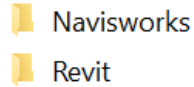


**Figure 8-6 - Management Folder**

### 8.2.2.3 MODEL FOLDER

This folder stores all models.

The image below illustrates the standardized sub-folders provided within the MODEL Folder.



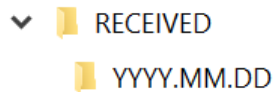
**Figure 8-7 - Model Folder**

### 8.2.2.4 RECEIVED FOLDER

This folder contains a dated archive of Construction information received from outside sources.

This folder is a record intended to identify exactly when and what information was provided by a Contractor.

The image below illustrates this concept.



**Figure 8-8 - Received Folder**

### 8.2.2.5 RELEASED FOLDER

This folder contains a dated archive of Construction information provided to outside sources.

This folder is a record intended to identify exactly when and what information was provided to a Contractor.

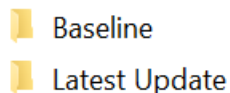
The image below illustrates this concept



**Figure 8-9 - Released Folder**

### 8.2.2.6 SCHEDULES FOLDER

The image below illustrates the standardized sub-folders provided within the Schedules Folder.



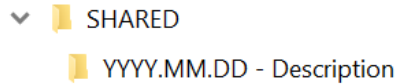
**Figure 8-10 - Schedules Folder**

### 8.2.2.7 SHARED FOLDER

This folder is used as a sharing mechanism for non-CAD\BIM-related information between disciplines, such as e-mails, memos, spreadsheets, documents, estimates, specs, etc.

A discipline may copy its files into its own SHARED folder, making them available for other disciplines to use.

The image below illustrates this concept



**Figure 8-11 - Shared Folder**

## 8.3 SITE MODEL

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

BIM methodologies can assist construction activities and site logistics in various manners. Perhaps the most evident one, is to leverage on the powerful visualization provided by a 3D model that somehow represents temporary works, construction activities, hazards, etc.

Once construction activities starts and site geometries are set up according to their Start and End Dates in relation to the Schedule, a Construction Model (which Site Model is an important part of) becomes also a site planning and risk management tool.

In other words, the Site Model is a subcomponent of the Construction Model, and it needs to work in close relation to the schedule in order to develop its full potential and provide real value.

It is also worth mentioning that, due to the types of project in the PANYNJ portfolio and their potential locations, Site Model requirements can greatly vary between projects. BIM Execution Plan as submitted to the Authority for review and approval, shall record all Site Model requirements particular to the project.

### 8.3.1 GOALS AND USES

As part of the Construction Model (CM), Site Model (SM) shares the same overall goals.

Specific goals pursued by the SM include:

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

The following uses intend to support these goals:

#### 8.3.1.1 INTENDED USES BY THE PANYNJ

SM will be used for:

- **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.

*PANYNJ BIM Standard*

- **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 Site 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 site 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.

**8.3.1.2 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 SM, starting from the Model as provided by the VDC group. 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:

- Use SM 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.).
- Use Model for 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.

**8.3.2 SITE MODEL LIFECYCLE**

As stated before, Site Model has some unique issues compared to other models developed by the BIM Authors. One of these special features is the unique life cycle that it follows.

Whilst typically all Model templates provided by the Authority will be empty "container" files, Site Model will have some basic content already introduced by the VDC group (Refer to [Section 7.3 Site Model](#)).

During the BIM Kick-off meeting, the Site Model will be handed over to the Contractor's BIM Lead Coordinator, who will take ownership of it. Only if the Site Model coordinates are incorrect, it may return to the Authority for amendment.

Throughout construction, the Contractor shall include elements as per requirements stated in this clause.

Finally, Site Model will be submitted to the Authority for record only (not approval) at project closeout. The reason that it is not submitted for final approval, is that the SM does not contain any final work\*, only temporary. This means it does not contain information relevant for Operation and Maintenance

**NOTE:**

If permanent improvements or modifications to the site are part of the Scope of Work, a separate Model will be created for this specific purpose. Site Model will continue to exist in this scenario, containing only temporary work as defined herein.

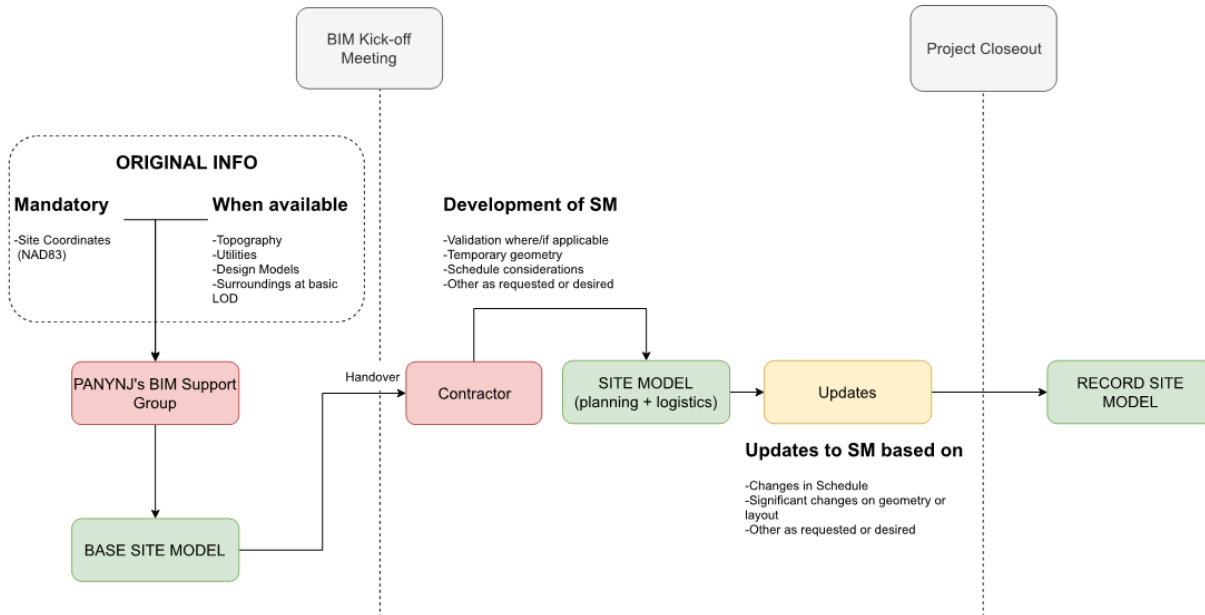


Figure 8-12 - Site Model Lifecycle

### 8.3.2.1 INITIAL SETUP AND HANDOVER TO CONTRACTOR

The starting Site Model (or Base SM) will be developed by the VDC Group prior to the formal beginning of the Project.

This basic Model will contain the project coordinates to be used across all other models, for the rest of the Project. This is the only mandatory information that the Site Model must contain at the time of the Kick-off meeting, when it will be handed over to the Contractor.

Additionally, depending of the available information for a specific project, the model may also contain:

- Project specific design Models (Stage I-III) \*
- Topographical surface.
- Underground Utilities.
- Roads, roadways, bridges, pedestrian walkways and other traffic components.
- “Blocks” representing buildings and structures within a certain radius from project limits. Radius will depend on specific project surroundings.

#### **DISCLAIMER:**

Design Models provided by the Authority to Contractors are for visual information only. Each Contractor may decide to either share Design Models with Subcontractors or withhold them for internal use and reference. In any case, 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 Contractor decides to use these for the processes and deliverables described in this Standard, they are thoroughly validated with all Contract information first (drawings, specifications, etc.).

### 8.3.2.2 VALIDATION AND DEVELOPMENT

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

Contractor will modify the site model as needed based on this, by adjusting the elements previously included previously by the VDC Group and incorporating additional elements as described on the [Section 8.3.4 Represented Elements and Entities](#).

Unlike other Models (trade models) SM will not typically undergo a LOD transformation throughout the process, since it will mostly be elemental geometry acting as place holder for temporary works. Refer to [Section 8.3.3 Modeling Requirements](#).

### 8.3.2.3 UPDATES

Contractor shall maintain the site 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 SM presents no modifications.

## 8.3.3 MODELING REQUIREMENTS

Unlike trade models, SM will not contain any final work and will 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 as a reference on SM content.
- Template 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 Workset conventions are clearly stated in the BEP.
- As a general rule, LOD requirements for elements in the SM 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 6.4 Level of Development](#)
- No permanent work is to be included in the Site Model.
- The Site 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 Civil3D Pipe networks, that will be treated on a case-by-case scenario).
- Elements Family Name and Type, when defined by the Contractor, must be suggestive to what they are representing.
- Categories used to represent any element should be the closest to as possible (a fence can technically be represented with a "Generic Element", but using Revit's "Wall" tool is recommended)
- Use of the "Model in place" tool to create geometry, is accepted in the SM (unlike trade models). Careful use is recommended.
- To avoid rework, consider the Project schedule requirements when creating content in the Site Model, as some elements extent may be limited by some activities duration (e.g.: activity duration limited to "x" days may determine how excavation geometry is modeled)



### 8.3.4 REPRESENTED ELEMENTS AND ENTITIES

The following table includes elements to be represented by the Contractor on the SM.

Guidelines are mere suggestions on acceptable representation. Contractor is encouraged to include more representative geometry when available (e.g., some cranes and other vehicles may be free content available from manufacturers).

**Table 8-1 - Elements to be included in the SM**

| 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)<br>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                                                                 |

Contractor is encouraged to include also 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.

## 8.4 CONSTRUCTION MODEL

In an attempt to keep the language simple, the concept of Construction Model may be used colloquially in this Section. Depending on context, “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).

Additionally, it is worth noting that the concept of Construction Model is not tied to a specific LOD, or progress status. Quite on the contrary, it is expected that both geometry and data change, and are progressively more defined as information becomes available.

**The Construction Model is of a highly dynamic nature by the simple fact that it affects, and is in turn affected by, the construction process itself. In order for Model to meet its purpose, information contained in it must always be as current and as reliable as possible.**

### 8.4.1 CONSTRUCTION MODEL BREAKDOWN

Since the Construction Model is to correlate to the construction itself, different development statuses may coexist in the same model.

As an example, consider a two-story facility, where:

- Mechanical Room in the lower level has already been installed. Field verified locations have been recorded and incorporated into the model. Required asset information has also been confirmed in the different trade Models.
- The MEP+FP models on the lower level have all been modeled to the Target LOD, and the area has been signed off for coordination, but no installation has occurred.
- The upper level has been modeled as per Contract Documents but has not been updated with manufacturer content (approved submittals) yet. Coordination is pending.

Clearly, stating that the Construction Model is on one particular construction status and development stage is not possible.

In order 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)

#### 8.4.1.1 CONSTRUCTION MODEL MILESTONES

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 as defined as follows:

- **Basis of Design (BOD):** Models have been prepared as per Contract Documentation, plus any variation requested from or approved by the Authority (like PACCs, returned RFIs, approved Change requests). Regarding coordination, location of elements is approximate, not final.
- **Coordination Sign-off model:** trade models have reached the Target LOD, plus all elements are in their final position. Model is accepted as the “single source of truth” for coordination purposes. As part of the sign-off process, all parties agree to install layouts as shown on the model.

- **As-Constructed Model:** elements identified in the MDS have been updated as per field-verified locations. Additionally, information relevant to the Enterprise Asset Management System has been incorporated to the trade models. Refer to [Section 8.5 As-Constructed Model](#) for requirements specific to the As-Constructed model data

#### 8.4.1.2 AREAS OF INTEREST (AOIs)

AOI are a spatial division or breakdown of the project. These are defined by the Constructor 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 trades 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.

##### 8.4.1.2.1 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 G: 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.

##### 8.4.1.2.2 RELATION BETWEEN CM MILESTONES, AOIs AND MDS

The Model Development Specification (MDS) is closely related to the other two concepts presented. 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. Columns in the MDS under Construction Model define the Model Milestones discussed in this section.

**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

### PANYNJ BIM Standard

As stated in Requirement XXX, the Authority leverages on the concepts of Current LOD and Target LOD. In relation to the MDS, it should become apparent that Current LOD cannot be less than the Basis of Design LOD. In the same spirit, Target LOD is defined for each milestone by the MDS.

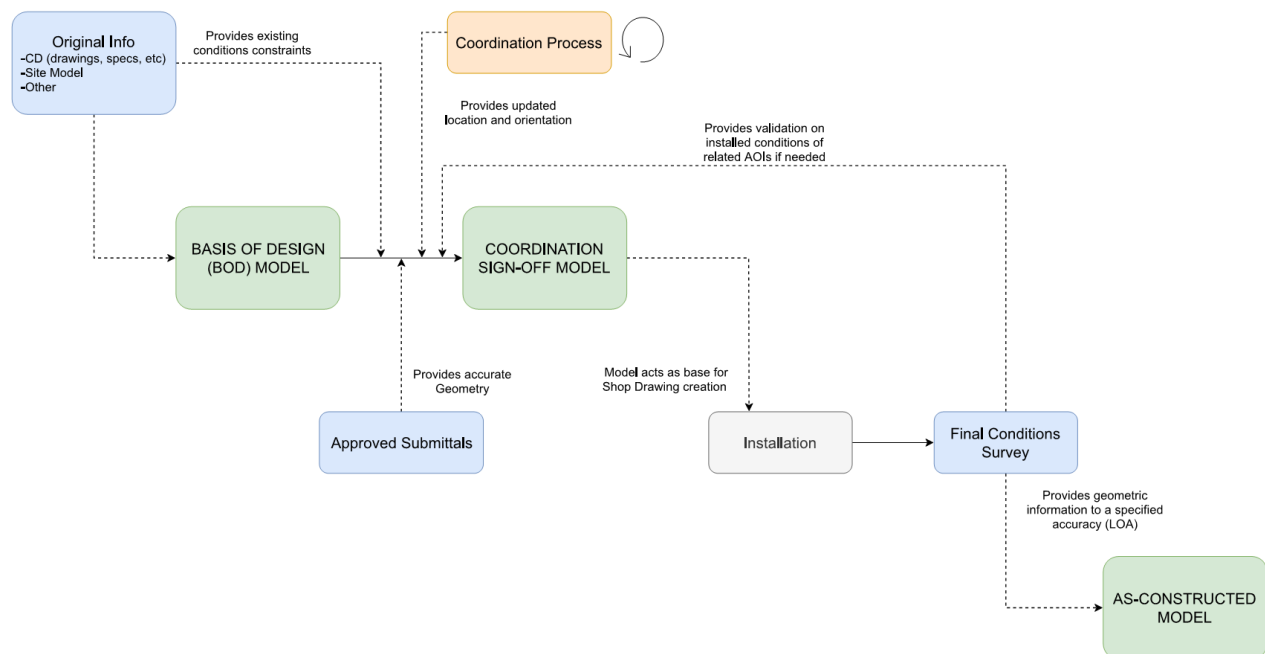
In relation to the LOD, the division into AOIs is only to allow for scheduling and tracking development to the target LOD. The Level of Development as stated for each Milestones in the MDS must eventually be achieved uniformly across the entire Construction Model.

## 8.4.2 FEDERATED MODEL

### 8.4.2.1 BIM COORDINATION WORKFLOW

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 reality this will be repeated for each Area of Interest.



**Figure 8-13 - Simplified Construction Model workflow**

### 8.4.2.2 BIM COORDINATION PROCESS DEFINITION

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. 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 8.4.2.5 Coordination Sign-off](#) for sign-off procedures and documentation.

### 8.4.2.3 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.

#### 8.4.2.3.1 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.).

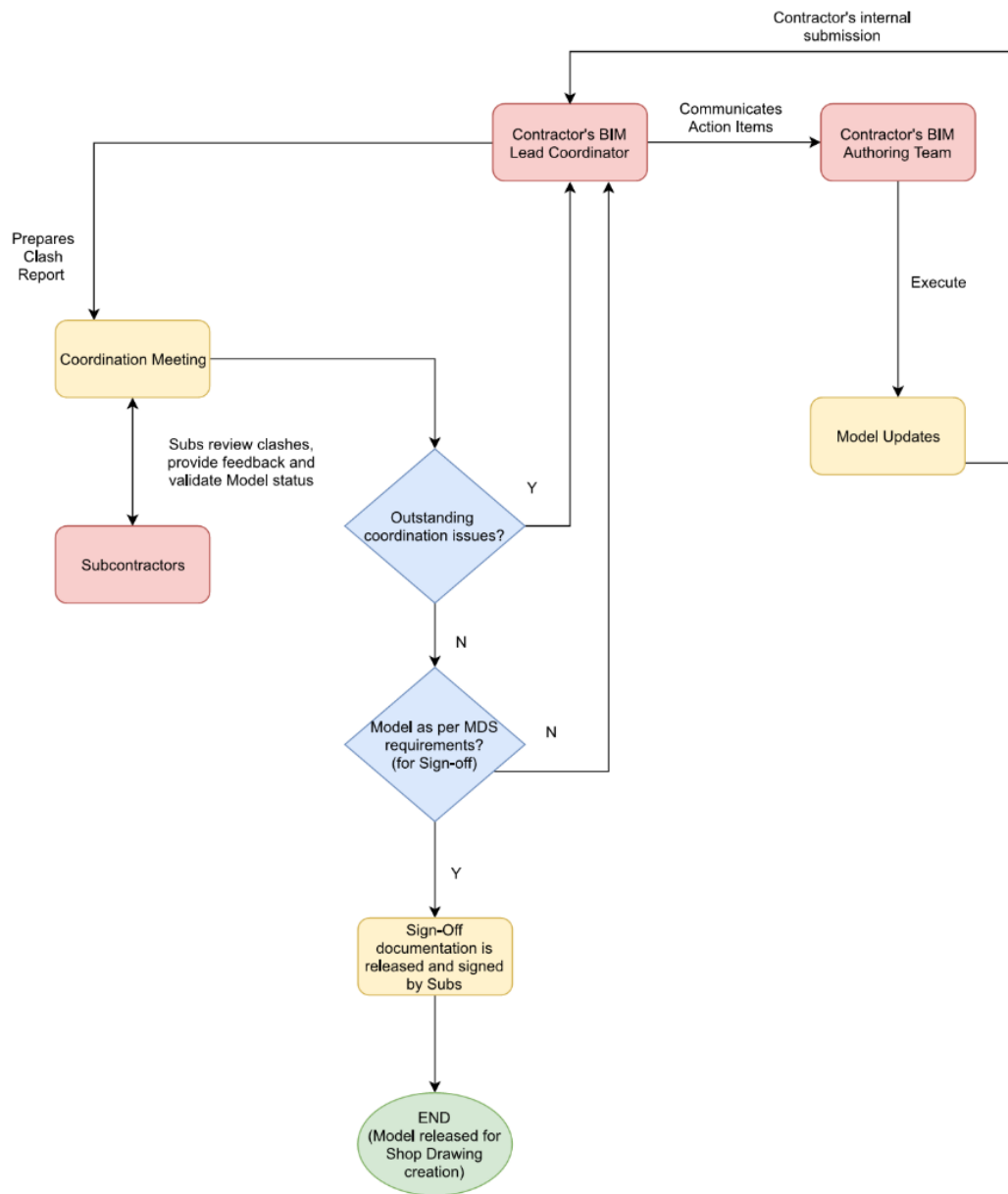
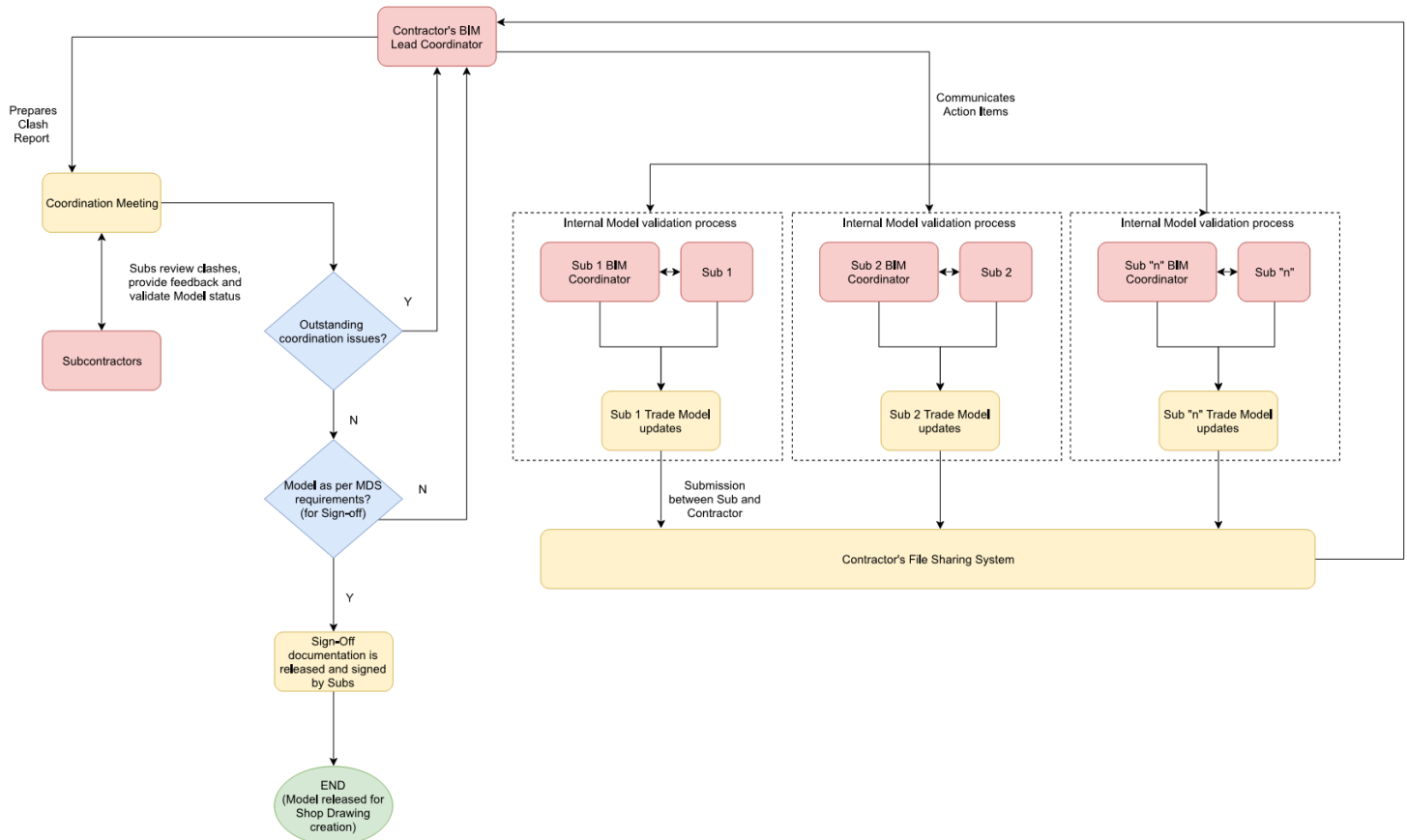


Figure 8-14 - BIM Coordination Scenario A

#### 8.4.2.3.2 SCENARIO B: EACH SUBCONTRACTOR IS IN CHARGE OF EACH TRADE MODEL AUTHORIZING

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



**Figure 8-15 - BIM Coordination Scenario B**

#### 8.4.2.4 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 MDS requirements, a meeting between BIM Lead Coordinator 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 Subcontractor is not the direct author of the Trade Model, 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 PANYNJ representatives 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.

#### 8.4.2.5 COORDINATION SIGN-OFF

Once a Model achieves this status (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.

For this reason, sign-off Model must be the base for all Shop Drawing creation.

##### 8.4.2.5.1 CONDITIONS FOR SIGN-OFF ELIGIBILITY

Essentially, two requirements must be met:

- Geometry has to be according to the LOD stated in the MDS; the reason is that intended location of Model elements may be affected by changes in geometry, connection points of equipment, etc.
- Acceptable interference resolution; a 100% 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 consider 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 interference with basic walls, where penetrations are not necessary modeled
  - Intentional MEP interference with floating ceiling; such as sprinkler, lighting fixtures, 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

**8.4.2.5.2 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.

**8.4.2.6 RECOMMENDED BEST PRACTICES FOR SPATIAL COORDINATION**

Spatial Coordination between trades is, as stated before, a process that is mainly defined by the Contractor and its BLC (BIM Lead Coordinator). However, there are some requirements made by the PANYNJ so some basic level of consistency can be reached across projects.

**8.4.2.6.1 FINAL GEOMETRY VS COORDINATION EFFORTS**

Ideally, individual model elements' geometry would first be upgraded to the LOD as required in the MDS, and then fully coordinated between trades. By pursuing a "clash-free" Model without having the final geometry incorporated, there is risk of rework.

On the other hand, if no coordination efforts are done at all before modeled geometry is fully upgraded, there is risk of delays on Coordination sign-off, with subsequent delays on shop drawing creation and even installation/construction activities.

Geometry will likely be upgraded as coordination is on-going, coordination process may take place with geometry that has not yet been fully developed to the target LOD.

The BIM Lead Coordinator will have to define the quantity and quality of interferences that are acceptable for the level of completion that has been reached at any point. This does not mean however, that the PANYNJ will accept any type of interference under the reason of the model not being complete. Clash Report shall demonstrate that reasonable and conscious coordination is being carried out.

**8.4.2.6.2 GROUPING CLASHES (WHEN REPORTING TO THE PANYNJ)**

Clash/Interference count is an important indicator of a Model's coordination status, particularly on the final stages of the process (i.e., when close to Sign-off). Naturally, grouping clashes may greatly affect this number.

The BLC 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 BLC 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 be always be pursued.



*PANYNJ BIM Standard*

- “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.
- For example, MEP components that intentionally penetrate basic walls (no shear walls or rated walls).

**8.4.2.7 SPECIFIC REQUIREMENTS**

An NWF template will be provided by the VDC group at the BIM Kickoff meeting. This Model will be an empty container with initial setups like starting viewpoints, default search sets, appearance profiler, TimeLiner’s Activity Types and visibility, amongst others.

It is the Contractor’s responsibility to append all trade models to it and develop the template to the project specific NWF 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 Annex for this purpose, that can be updated and submitted for Record as needed, without the need to resubmit the entire BEP.

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.

This being said, it is recommended that there are as few Federated Models as possible. Ideally, there should be only one per AOI or group of AOIs as defined 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.**

**8.4.2.7.1 MINIMUM 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.

Failure to comply with More than 2 elements on the list below will result on a Not Approved 4D model as it is not suitable for a complete analysis.

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 (Site 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 EAD Standard-1.16.4.1 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)
- 4D Animation Appearance (Appearances must be set up for: Start, Simulation, End, Early and Late Appearances on TimeLiner)
- Project Schedule (Schedule information must fill TimeLiner columns for Task Name, Activity IDs, Paned Start, Planned End, Actual Start, Actual End and Status)
- 4D Set Up (All TimeLiner tasks must be attached to search Sets, complying with no unattached Items, no items contained in multiple tasks and no items contained on overlapping tasks)
- 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)

**8.4.2.7.2 PROJECT BREAKDOWN INTO MULTIPLE FEDERATED MODELS**

Depending on the size of the project, it may be convenient to split it into more than one Federated model, each one containing one or multiple Areas of Interest.

To avoid the potential miscommunication explained in 4.1.5, each AOI may, as a general rule, only be contained in one Federated Model. There could be approved exceptions to this general rule\*, but they will be treated on a case-by-case basis.

**As part of the BEP, the Contractor shall provide a table showing which AOIs are contained in which Federated Model.**

(\*) An exception could be, for example, a Riser federated model that for reference purposes needs to be included in other container files. BIM Lead Coordinator must take all necessary precautions in these cases to prevent any confusion from any of the parties involved.

#### **8.4.2.7.3 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 AOIs 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.

#### **8.4.2.7.4 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. BLC shall whenever possible, abide by 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 Lead Coordinator will define the Sets as appropriate for the project, and state them in the corresponding BEP Annex.

#### 8.4.2.7.5 COLOR SCHEMES

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.

#### 8.4.2.7.6 APPEARANCE PROFILER

Different uses of the Federated Model may require different visibility settings. For instance, visualization of construction status (Basis of Design, As per Approved Submittal, 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).

##### **8.4.2.7.6.1 VISUALIZATION CONFIGURATION IN USE BY THE AUTHORITY**

The Authority will provide Search Sets (\*.DAT files) for loading into each Federated Model, at the beginning of the project. These Sets must be refreshed and updated during the initial NWF setup by the BLC, and checked prior to any submission to the Authority to verify they still meet their purpose and are working correctly.

Additionally:

- The color schema of each App. Profiler may be changed only if explicitly requested from the Authority.
- After initial setup, each of the \*.DAT files shall be returned to the Authority.

##### **8.4.2.7.6.2 VISUALIZATION CONFIGURATION IN USE BY THE CONTRACTOR**

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

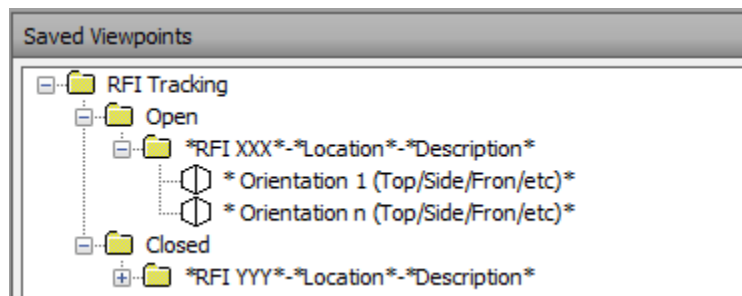
Contractor is welcomed to create and maintain different profilers as deemed appropriate, as long as they are:

- Detailed in the BEP, with sets and coloring schema in use, and intended purpose.

- Consistent throughout the different Federated Models submitted to the Authority, if more than one.

#### 8.4.2.7.7 RFI TRACKING

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



**Figure 8-16 - RFI Folder structure**

For new RFIs, the BLC 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 8-17 -Sample RFI Comment log**

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

### 8.4.3 4D 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.**

#### 8.4.3.1 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 on a particular methodology that uses software in use by PA Contractor 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 as defined in 4.3. 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

#### 8.4.3.2 4D MODEL REQUIREMENTS

##### 8.4.3.2.1 AUTHORIZING MODEL (NATIVE FILES)

With the purpose of allowing the Authority to quickly determine any element status and activities associated to it, the Contractor is responsible for keeping the following parameters up to date in all native files (trade Models).

## PANYNJ BIM Standard

- 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 MDS 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 MDS 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 MDS. Refer to [Section 8.5.2.3 Level of Accuracy](#) for clarification on LOA values.
- Submittal No.: this parameter shall incorporate a value equal to the PANYNJ approved submittal number, corresponding to that element. This is critical for the Authority to be able to validate that the element has been accurately defined; this should simplify reporting by the Contractor.
- Activity ID parameter: 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 in regards to model granularity. This is important so components can be properly associated to tasks/activities without creating logic violations or misrepresentations in the construction sequence.

#### 8.4.3.2.2 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. In order 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.

#### 8.4.3.2.3 4D ANIMATION (VIDEO FILE)

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.
- 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.

#### 8.4.3.3 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.

##### 8.4.3.3.1 AUTHORIZING MODELS PREPARATION AND EXPORT

Every trade Model as well as the Site Model needs first to incorporate the Activity ID parameter as described in 0. 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 are 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.

##### 8.4.3.3.2 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 \*.nwf file. Folder structure should be previously set up in a way that allows for both file types to be easily shared with the Authority.

##### 8.4.3.3.3 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.

#### **8.4.3.3.4 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 Site 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)

## **8.5 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.

### **8.5.1 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.

#### **8.5.1.1 INTENDED USES BY THE PANYNJ**

As-Constructed Model will be used for:

- Provide basic asset information for the Authority to export to the FM software in use.
- As design input for future expansions and/or renovations made to the facility.

#### **8.5.1.2 POTENTIAL USES BY THE CONTRACTOR**

The Authority encourages the use of Point Cloud and Laser Scan 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.

## 8.5.2 BASIC DEFINITIONS AND CLASSIFICATIONS

### 8.5.2.1 REAL WORLD CONDITIONS

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

- **Existing conditions:** they are considered as the aggregate of any and all material objects or element that Contractor must work with and around of, in order 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 Project Model Development Spec.

### 8.5.2.2 DATA TYPES

The Authority Recognizes Two Basics 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. Additionally, Asset Information can be Tier 1 or Tier 2 data, where:
  - Tier 1: Refers to all information that can be acquired without the element to be actually installed. Example: Manufacturer, Model, Make, Serial Number, etc.
  - Tier 2: Refers to information that does not fall on Tier 1. Example: Installation date, testing results (if requested), etc.

### 8.5.2.3 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 MDS for each Unifomat line item. LOA values shall only refer to intended dimensions, unless specified otherwise.

### 8.5.2.4 TERRESTRIAL LASER SCAN (TLS)

TLS, 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.

**8.5.2.5 SPECIFIC 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
- Data Capture
- Data validation (Assurance)
- Data delivery and handover

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

**8.5.2.5.1 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 LOA1 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 LOA2 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.

- Related to Asset Information: Contractor shall include as part of the BEP, the following information at minimum;
  - A copy of the list of elements that will incorporate all asset information as requested by the PANYNJ for that specific project. If no list is provided, the Contractor shall propose one, based on the project specific MDS requirements.
  - Approximate dates where Tier 1 and Tier 2 information will be incorporated to the models.
  - Overall description of the process that will be utilized to incorporate information to the models, especially in relation to the geometric data.

**8.5.2.5.2 DATA CAPTURE REQUIREMENTS**

- Geometric information: There are many methodologies to measure shape and position of a constructed or existing element: tape measure, laser measure, long tape, measuring wheel, etc. Naturally, the LOA1 that can be guaranteed from each can greatly vary.

Considering the Authority's requirements for LOA1 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 LOA1 requirements can be met. Evidence may consist on Manufacturer information, calibration certificates, white papers from or endorsed by a recognized entity, etc.

- Asset information: elements of special interest by the Authority have been identified in the specific "Asset" column on the MDS, for the As-Constructed Model. MDS also defines all applicable attributes/parameters for each Unifomat level. Each of these attributes are included as parameter in the PANYNJ's standard Shared Parameter files, under parameter group "Asset Management".

Contractor shall use these fields for data entry in the BIMs, regardless of other forms of delivery of this information (e.g., Shop drawings, Manufacturer cut-sheets, O&M Manuals, etc.) required elsewhere in the Contract.

**8.5.2.5.3 DATA VALIDATION (ASSURANCE)**

- Geometric information: Contractor must use the available As-Constructed shared parameter (YES/NO parameter type) to identify any element that has been adjusted as per field verified information or Survey. The PANYNJ will verify the accuracy to which said elements have been represented (LOA2) by comparing them to the survey data provided by the Contractor. Depending on the survey method used, Contractor may provide one of the following:

a) If TST is used:

- Table showing the following g 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.

b) If a LiDAR equipment is used:

- Unified RCS Point Cloud file with shared coordinates system
- A table similar to the one described for TST survey, but for control Points used to reference the Point Cloud to the project coordinate system.

- Asset information: 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 AM Tier 1 and AM Tier 2 shared parameters (both YES/NO parameter types) to identify any and all elements that have incorporated the respective Tier information. This will help the both the Contractor and the Authority to quickly filter and locate elements for checking the associated data.

The Contractor shall also regularly submit a list of all elements including Tier 1 and 2 information, highlighting any new entries since last submission. This list will be due with every submission of the Construction Model to the Authority, unless specifically requested otherwise.

## **8.6 CONSTRUCTION DELIVERABLES**

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

### **8.6.1 SITE 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.

#### **8.6.1.1 FIRST SUBMISSION**

Contractor will submit the SM 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 trade Models).

#### **8.6.1.2 REGULAR UPDATES**

Contractor will submit the SM with every regular Construction Model submission as stated on the BEP. Contrary to the trade Models, the Authority will not review the SM for BIM compliance. Regardless of the SM being submitted "For Record Only", the BIM Support 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 regards to naming convention, size of families imported to the model, appropriate model categories, etc.).

### **8.6.2 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).

#### **8.6.2.1 BASIS OF DESIGN SUBMISSION**

Within 60 calendar days after the initial BIM kick-off meeting, the contractor 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.

#### **8.6.2.2 MONTHLY PROGRESS UPDATES**

Contractor 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.

### 8.6.3 4D 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 Model based on the latest version of the Construction Model and the revised schedule.

#### 8.6.3.1 4D SUBMISSION PROTOCOL

To stress the fact that 4D submission is an entirely different aspect and deliverable from traditional Schedule submissions, both simplified processes are presented on the following image. Error! Reference source not found. Vertical line represents a “contractual” division, separating Contractor from the Owner’s Construction Management Division. The horizontal line is a more conceptual division between traditional construction roles and BIM project roles. Real project roles may defer.

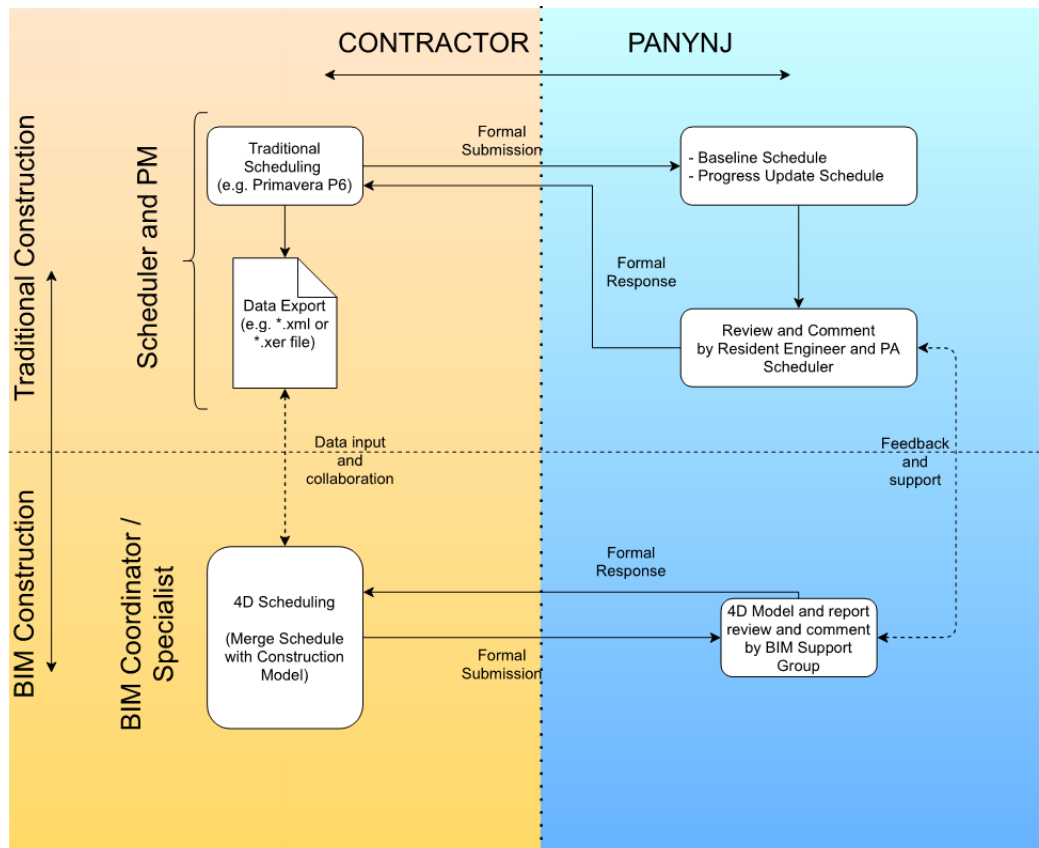


Figure 8-18 - 4D vs. Traditional Schedule submission

### 8.6.4 AS-CONSTRUCTED MODEL SUBMISSION

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

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, 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.

**8.6.4.1 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 MDS 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, Civil 3D if applicable) as well as a Navisworks NWD\* federated file.

**NOTE:**

NWD file shall be a data-rich model. Prevision must be taken by the BIM Lead Coordinator 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.

**8.6.4.2 APPROVAL PROCESS**

The Authority's BIM 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.

### 8.6.5 ASSET DATA DELIVERABLE

Refer to the following table for format and typical frequency of deliverables related to As-Constructed conditions and Asset information, as well as a high level summary of the requirements made on this section. Frequency needs to be validated in the BEP on a project-by-project basis.

**Table 8-2 - Asset Data deliverable**

| DELIVERABLE                          | FREQUENCY                                                              | SPECIAL REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point Cloud (Partial)                | Two weeks at the latest, after every survey                            | <ul style="list-style-type: none"> <li>To be delivered in a portable format (e.g. Flash drive).</li> <li>Unified format (RCS) mandatory.</li> <li>Must consistently incorporate Area identifier and survey date in the RCS file name.</li> <li>Same shared coordinates as the Construction Model.</li> <li>Must provide separate record of Survey Points used to align Point Cloud to project coordinates.</li> </ul>                                                                                                                                       |
| Point Cloud (Full extent of project) | Only once, as part of the final As-Constructed Model submission.       | <ul style="list-style-type: none"> <li>Same as partial Point Clouds, plus:</li> <li>Include only the latest survey for every area, if more than one.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             |
| Survey Points (for survey using TST) | Two weeks at the latest, after every survey                            | <ul style="list-style-type: none"> <li>Point identification number.</li> <li>X, Y, Z coordinates.</li> <li>Identification Comment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               |
| Tier 1 and Tier 2 information        | With every Construction Model submission                               | <ul style="list-style-type: none"> <li>Information must be included as soon as it becomes available.</li> <li>Information must be embedded in the trade models</li> <li>Contractor must use shared parameter created by the Authority.</li> </ul>                                                                                                                                                                                                                                                                                                           |
| As-Constructed Model progress report | With every Construction Model submission, as part of the Model Report. | <ul style="list-style-type: none"> <li>Aggregate list of all elements that have been surveyed and adjusted to final conditions. New elements since previous submission need to be highlighted.</li> <li>Aggregate list of all elements that have incorporated Tier 1 and/or Tier 2 information. New elements since previous submission need to be highlighted.</li> <li>Both lists must match reports (Revit Schedules) exported from the Models, using the tracking parameters mentioned in this section (As-Constructed, AM Tier 1, AM Tier 2)</li> </ul> |



## 9.0 BIM REVIEW PROCESS

For consistency on the design and the data through the project files shall pass the compliance report.

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

The VDC Group has developed several report which allows for the rating of BIM Standards compliance on every project.

BIM Standards reviews are applicable to all projects, in-house and/or consultant that are issued either for construction contracts or work orders at all project Stages.

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

In order to complete a Review Request form, the LEA or RE should use the following link:

<https://panynj.sharepoint.com/sites/Engineering/Apps/BIMCADResourceCenter/Lists/BIMCAD%20Request%20for%20CADBIM%20Review/AllItems.aspx>

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

The following steps and information should be completed:

1. **Select PID from the Dropdown.** 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 go ahead and fix it.
3. Complete the remaining fields:
  - **Submittal Percentage/Number** (indicate % for Design projects and Submittal number for Construction projects).
  - **Folder Path**, indicate where the files have been saved.
4. Indicate Models to be reviewed by Discipline and the following information:
  - **Group:** Select CAD or BIM accordingly.
  - **Task Leader**, just applicable for Design Stages, for Construction leave it empty.
  - **Consultant/Contractor** from the dropdown list.
  - **Use the + to add more files to the list.**
  - **Add Comments/Notes to be considered during the Review.**
5. Save your request.

## REQUEST FOR VDC (BIM/CAD) REVIEW

Date \* 
 Review Type \*

PID \* 
 Submittal Percentage / Number \*

Facility Name \* 
 Confidentiality Level \*

Contract Number \* 
 Lead Discipline \*

Project Title \* 
 LEA \*

Stage \* 
 RE

Folder Path \*

**Pre-Audit Validation Requirements:**

- All required files have been submitted
- All required files have been saved in the correct location
- All required files are named according to PA naming conventions
- All required files do not exceed size limit

| Discipline/Revi...   | Group                | Task Leader          | Consultant/Co...     |
|----------------------|----------------------|----------------------|----------------------|
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Comments/Notes
 

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Save Cancel

Figure 9-1 -Request for VDC (BIM/CAD) Review

## 9.2 INSTANCES OF REVIEW AND SPECIFICATIONS

### 9.2.1 INTERIM REVIEW

- 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 for 3D Coordination and As-Constructed (Stage IV).
  - Navisworks files used for 3D Coordination and 4D Simulation. (All Stages)

- Synchro files used for 4D Simulation. (All Stages)
- Requirements
  - When:
    - **During Design** is required at 50% milestone and 100% submission, 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.
- Report is issued to the Assistant Chiefs, Principals, LEA, Task Leaders and RE.

### 9.2.2 PA WIDE BIM REVIEW

- BIM Review is mandatory for:
  - BIM models used to produce Construction Documents.
- Review process:
  - An initial compliance report is issued to the LEA and Task Leaders.
  - 2 weeks are provided for the correction of non-compliant model files.
  - At the end of the 2-week period the final BIM Review Reports are issued to the Assistant Chiefs, Principals, LEA and Task Leaders.
- Requirements
  - When: Required at the onset of PA Wide Review.
  - A PA Wide BIM Review is initiated by the LEA via an EOL request form.
    - Upon receipt of the request, the VDC Group is to upload the files to Live Link for electronic review and notify the Contract Engineer of the initiation of PA Wide Review.

### 9.2.3 AS-CONSTRUCTED BIM REVIEW

BIM Review is mandatory for:

- BIM models used to produce As-Constructed models.
- Review process:
  - An initial compliance report is issued to the RE and Contractor.
  - 2 weeks are provided for the correction of non-compliant model files.
  - At the end of the 2-week period the final BIM Review Reports are issued to the RE.
- Requirements
  - When: Required at the onset of Stage IV.
  - The final BIM Review is initiated by the RE via an EOL request form.

### 9.3 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 **Drawing Performance Summary** sections, indicating compliance with BIM Standards results.
- **Notes:** Contain general comments referred to the review, BIM Standard Sections to refer to, etc. This notes 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.

See images below:



Engineering Operations Project Controls - VDC Group

#### BIM - DISCIPLINE COMPLIANCE REPORT

|                        |                                 |                                |                          |
|------------------------|---------------------------------|--------------------------------|--------------------------|
| ACCEPTED               |                                 | Reviewed By:                   | Kozameh, Gabriela        |
| PROJECT INFORMATION    |                                 |                                |                          |
| Facility Name:         | Port Authority Trans-Hudson     | Review Type:                   | Stage IV Submittal       |
| Contract Number:       | PAT024031                       | Submittal Percentage / Number: | 1298                     |
| PID Number:            | 08969000                        | Date Submitted:                | 01/11/2021               |
| Project Title:         | Replacement of Substation #7    | Date Reviewed:                 | 01/15/2021               |
| Stage:                 | 4                               | Due Date:                      | 01/29/2021               |
| Lead Discipline:       | Architecture                    | Task Leader:                   |                          |
| LEA:                   | Stern, Jerome                   | Discipline:                    | Architecture             |
| Resident Engineer:     | May, Robert (ENG)               | File Reviewed:                 | A08969000-3D_CENTRAL.rvt |
| Consultant/Contractor: | Mass. Electric Construction Co. | Confidentiality Level:         | Not Confidential         |

Figure 9-2 - Example of BIM Discipline Compliance Report – Project Information

| PRE-AUDIT                    |     |                          |     |                        |     |
|------------------------------|-----|--------------------------|-----|------------------------|-----|
| <b>PRE-AUDIT</b>             | YES |                          |     |                        |     |
| Folder Structure             | N/A |                          |     |                        |     |
| File Location                | Yes |                          |     |                        |     |
| File Submitted               | Yes |                          |     |                        |     |
| File Naming Convention       | Yes |                          |     |                        |     |
| File Size                    | Yes |                          |     |                        |     |
| PERFORMANCE SUMMARY          |     |                          |     |                        |     |
| <b>PROJECT SETUP</b>         | NO  | <b>NAMING CONVENTION</b> | YES | <b>MODEL INTEGRITY</b> | NO  |
| Project Coordinates          | No  | Levels                   | Yes | Phases                 | Yes |
| Project Information          | Yes | Families                 | Yes | Worksets               | Yes |
| Project Browser              | Yes | Phases                   | Yes | Family Size            | Yes |
| Project Level                | Yes | Room                     | N/A | Rooms Setup            | Yes |
| Project Grids                | Yes | Worksets                 | Yes | Views Category         | Yes |
| Project Units                | Yes | Views                    | Yes | Sheets Category        | N/A |
| AutoCAD Links                | N/A | Sheet Names              | N/A | Schedules              | N/A |
| Revit Links                  | Yes | Sheet Numbers            | N/A | Overlaps               | No  |
| Point Clouds Links           | N/A | <b>GENERAL</b>           | YES | Duplicates             | Yes |
| Phase Setup                  | Yes | BIM Execution Plan       | N/A | Object Hosting         | Yes |
| Phase Settings               | Yes |                          |     | Floating Content       | Yes |
| Symbol Settings              | N/A |                          |     | Object Category        | Yes |
| Fill Pattern Settings        | N/A |                          |     | Parameter Assignment   | Yes |
| PDF Export Settings          | N/A |                          |     | Model Cleanup          | Yes |
| DRAWINGS PERFORMANCE SUMMARY |     |                          |     |                        |     |
| <b>PLAN SET PREPARATION</b>  | N/A | <b>STYLES</b>            | N/A |                        |     |
| Title Sheet (Lead)           |     | Objects                  |     |                        |     |
| Contract Border              |     | Text                     |     |                        |     |
| Drawing Information          |     | Dimensions               |     |                        |     |
| Consultant Information       |     | Lines                    |     |                        |     |
| No Linework in Sheets        |     | Symbols                  |     |                        |     |
| PDFs Setup                   |     | Tags                     |     |                        |     |
|                              |     | Fill Regions             |     |                        |     |

Figure 9-3 - Example of BIM Discipline Compliance Report – Review sections

| NOTES                                                                                                                                                                                                               |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>PROJECT SETTINGS</b>                                                                                                                                                                                             |  |
| 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". |  |
| <b>MODEL INTEGRITY</b>                                                                                                                                                                                              |  |
| 1. Exterior Railings need to be adjusted.                                                                                                                                                                           |  |
| 2. Some doors are overlapping with walls. Door ID258129 vs Wall ID320358.                                                                                                                                           |  |
| <b>MITIGATION</b>                                                                                                                                                                                                   |  |
| No action was needed                                                                                                                                                                                                |  |

Figure 9-4 - Example of BIM Discipline Compliance Report – Notes

### 9.3.1 BIM - DISCIPLINE COMPLIANCE REVIEW FIELDS

BIM Discipline Compliance Report checks for compliance in the submitted RVT files in the following fields among others:

- PRE-AUDIT:**

| ITEM                           | DESCRIPTION                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------|
| <b>Folder Structure</b>        | Project folder structure has been set up following the Standards.                              |
| <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. |

- GENERAL:**

| ITEM                      | DESCRIPTION                                                    |
|---------------------------|----------------------------------------------------------------|
| <b>BIM Execution Plan</b> | Ensure all necessary information has been outlined in the BEP. |

- PROJECT SETUP:**

| ITEM                         | DESCRIPTION                                                                                                                                                    |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Coordinates</b>   | Project Coordinates need to be consistent across models and with the SM.                                                                                       |
| <b>Project Information</b>   | Project Information related 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 consistent across all files and are copy/monitored.                                                                                                 |
| <b>Project Grids</b>         | Grids are copy/monitored by other disciplines.                                                                                                                 |
| <b>Project Units</b>         | Project Units set up in the project are consistent with the 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. |
| <b>Symbol Settings</b>       | Symbols are used based on the Templates.                                                                                                                       |
| <b>Fill Pattern Settings</b> | Fill Patterns are used based on the Templates.                                                                                                                 |
| <b>PDF Export Settings</b>   | Revit should be set up in order to ensure PDFs are exported in Full size and Black and White.                                                                  |

• **NAMING CONVENTION:**

| ITEM                 | DESCRIPTION                                                                                                                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Levels Name</b>   | Ensure Levels are following the PA Naming Convention. Levels naming convention: D-LEVEL                                                                                                                                                             |
| <b>Phases Name</b>   | Ensure Phases are following the PA Naming Convention.                                                                                                                                                                                               |
| <b>Worksets Name</b> | Ensure Worksets are following the PA Naming Convention. Default Worksets should be maintained. Worksets naming convention: DISCIPLINECODE-DESCRIPTION                                                                                               |
| <b>Views Name</b>    | Ensure Views are following the PA Naming Convention. Views naming convention: VIEW-LEVEL/LOCATION/SEQUENCE-DESCRIPTION                                                                                                                              |
| <b>Room Names</b>    | Ensure Rooms are named consistently across the project.                                                                                                                                                                                             |
| <b>Sheet Name</b>    | Ensure Sheets are following the PA Naming Convention.                                                                                                                                                                                               |
| <b>Sheet Number</b>  | Ensure Sheets Numbers are following the PA Naming Convention.                                                                                                                                                                                       |
| <b>Families Name</b> | Ensure Families in use are following the PA Naming Convention. <ul style="list-style-type: none"> <li>Model Families: CATEGORY-MANUFACTURER-DESCRIPTION/MODEL NUMBER</li> <li>Annotation Families: CI-CATEGORY-DESCRIPTION1-DESCRIPTION2</li> </ul> |

• **MODEL INTEGRITY:**

| ITEM                        | DESCRIPTION                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Phases</b>               | Ensure elements are assigned to phases properly.                                                                     |
| <b>Worksets</b>             | Ensure elements are assigned to worksets properly.                                                                   |
| <b>Family Size</b>          | The Family Size should neither be excessive nor interrupt the normal performance of the Revit Model.                 |
| <b>Rooms Setup</b>          | There should be no duplicated or floating rooms in the model.                                                        |
| <b>Views Category</b>       | Ensure Views are assigned to the correct Category based on their use.                                                |
| <b>Sheets Category</b>      | Ensure Sheets are assigned to the correct Category based on their use.                                               |
| <b>Schedules</b>            | All Schedules in the Project should be created bringing information from the model.                                  |
| <b>Overlaps/Duplicates</b>  | Ensure there are no Clashes or Duplicated elements within the model.                                                 |
| <b>Object Hosting</b>       | Ensure all elements are hosted.                                                                                      |
| <b>Floating Content</b>     | Check that no element is loose or floating                                                                           |
| <b>Object Category</b>      | By default, Generic Models should not be used, but if needed those should be renamed and re-categorized accordingly. |
| <b>Parameter Assignment</b> | All required parameters should be completed.                                                                         |
| <b>Model Cleanup</b>        | Revit Models must be cleaned before every submission by purging, deleting temporary views, etc.                      |

- PLAN SET PREPARATION:**

| ITEM                          | DESCRIPTION                                                                                                                                                                                                          |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Title Sheet (Lead)</b>     | PA Official Titlesheet 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>    | Review 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; please include all other objects in either separate Drafting Views, or in the Design Views that they belong to. |
| <b>PDFs Setup</b>             | Ensure PDFs have been exported in full size and in Black and White.                                                                                                                                                  |

- STYLES:**

| ITEM                | DESCRIPTION                                                   |
|---------------------|---------------------------------------------------------------|
| <b>Objects</b>      | Object Styles should be set as in the templates.              |
| <b>Text</b>         | Text in use are per the ones defined in the template.         |
| <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.        |
| <b>Symbols</b>      | Symbols in use are per the ones defined in the template.      |
| <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. |

**NOTE:**

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



## 9.4 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. This 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.

See images below:



Engineering Operations Project Controls - VDC Group

### BIM - 3D COORDINATION REPORT

|                     |                              |                                |                                 |
|---------------------|------------------------------|--------------------------------|---------------------------------|
| ACCEPTED            |                              | Reviewed By:                   | Kozameh, Gabriela               |
| PROJECT INFORMATION |                              |                                |                                 |
| Facility Name:      | Port Authority Trans-Hudson  | Review Type:                   | Stage IV Submittal              |
| Contract Number:    | PAT024031                    | Submittal Percentage / Number: | 1298                            |
| PID Number:         | 08969000                     | Date Submitted:                | 01/11/2021                      |
| Project Title:      | Replacement of Substation #7 | Date Reviewed:                 | 01/15/2021                      |
| Stage:              | 4                            | Due Date:                      | 01/29/2021                      |
| Lead Discipline:    | Architecture                 | LEA:                           | Kearse, Rhonda                  |
| Resident Engineer:  | May, Robert (ENG)            | Consultant/Contractor:         | Mass. Electric Construction Co. |
| File Reviewed:      | 08969000-4D.nwd              | Confidentiality Level:         | Not Confidential                |

Figure 9-5 - Example of BIM 3D Coordination Report – Project Information.

| PRE-AUDIT              |     |                  |     |                             |     |
|------------------------|-----|------------------|-----|-----------------------------|-----|
| PRE-AUDIT              | YES |                  |     |                             |     |
| Files Submitted        | Yes |                  |     |                             |     |
| Folder Structure       | Yes |                  |     |                             |     |
| File Location          | Yes |                  |     |                             |     |
| File Naming Convention | Yes |                  |     |                             |     |
| PERFORMANCE SUMMARY    |     |                  |     |                             |     |
| GENERAL                | YES | MODEL INTEGRITY  | NO  | COORDINATION                | NO  |
| BIM Progress Report    | Yes | Models Alignment | Yes | Clash Report                | No  |
| PROJECT SETUP          | YES | Site Context     | No  | Clash Tests                 | Yes |
|                        |     | Color Scheme     | Yes | Clash Settings              | Yes |
| All Links              | Yes | Rooms            | Yes | Clash Grouping              | Yes |
| Appended Files Format  | Yes | 2D Elements      | Yes | Clash Status                | No  |
| Search Sets            | Yes |                  |     | Viewpoints Folder Structure | Yes |
| Areas of Interest      | Yes |                  |     | Coordination Viewpoints     | Yes |
| NAMING CONVENTION      | NO  |                  |     |                             |     |
| Appended File Name     | No  |                  |     |                             |     |

Figure 9-6 - Example of BIM 3D Coordination Report – Review sections.

## NOTES

## NAMING CONVENTION

1. Site Model name differs from name in Revit model.

## MODEL INTEGRITY

1. The Site Context is basic and should be improved.

## COORDINATION

1. The BIM Report information does not match with the active clashes shown in the file.

Figure 9-7 - Example of BIM 3D Coordination Report – Notes.

### 9.4.1 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>Folder Structure</b>        | Project folder structure has been set up following the Standards.        |
| <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. NWD & NWF should follow: PID-3D  |

- **GENERAL:**

| ITEM                       | DESCRIPTION                                                                     |
|----------------------------|---------------------------------------------------------------------------------|
| <b>BIM Progress Report</b> | Ensure BIM Progress report has been completed showing the updates of the month. |

- **PROJECT SETUP:**

| ITEM                         | DESCRIPTION                                                                                   |
|------------------------------|-----------------------------------------------------------------------------------------------|
| <b>All Links</b>             | Ensure 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> | Ensure all appended files are showing aligned to each other based on their coordinates.                                                                                  |
| <b>Site Context</b>     | Site Model should be completed in order to include site context information such as: site topography, project limits, adjacent building, roads, sidewalks, among others. |
| <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 in order to avoid interferences while running clash detection tools.                                                 |

- **COORDINATION**

| ITEM                               | DESCRIPTION                                                                                                                                           |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Clash Report</b>                | Clash Report should be provided in order to reflect the latest results of the coordination meeting.                                                   |
| <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 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.                                                                    |
| <b>Coordination Viewpoints</b>     | All reported coordination issues must have at least one Viewpoint that shows the issue in detail.                                                     |

## 9.5 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. This 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.

See images below:



Engineering Operations Project Controls - VDC Group

### BIM - 4D SIMULATION REPORT

|                     |                              |                                |                                 |
|---------------------|------------------------------|--------------------------------|---------------------------------|
| ACCEPTED            |                              | Reviewed By:                   | Kozameh, Gabriela               |
| PROJECT INFORMATION |                              |                                |                                 |
| Facility Name:      | Port Authority Trans-Hudson  | Review Type:                   | Stage IV Submittal              |
| Contract Number:    | PAT024031                    | Submittal Percentage / Number: | 1298                            |
| PID Number:         | 08969000                     | Date Submitted:                | 01/11/2021                      |
| Project Title:      | Replacement of Substation #7 | Date Reviewed:                 | 01/15/2021                      |
| Stage:              | 4                            | Due Date:                      | 01/29/2021                      |
| Lead Discipline:    | Architecture                 | LEA:                           | Kearse, Rhonda                  |
| Resident Engineer:  | May, Robert (ENG)            | Consultant / Contractor:       | Mass. Electric Construction Co. |
| File Reviewed:      | 08969000-4D.nwd              | Confidentiality Level:         | Not Confidential                |

Figure 9-8 - Example of BIM 4D Simulation Report – Project Information.

|                        |     |                                |     |
|------------------------|-----|--------------------------------|-----|
| PRE-AUDIT              |     |                                |     |
| PRE-AUDIT              | YES |                                |     |
| Files Submitted        | Yes |                                |     |
| Folder Structure       | Yes |                                |     |
| File Location          | Yes |                                |     |
| File Naming Convention | Yes |                                |     |
| PERFORMANCE SUMMARY    |     |                                |     |
| GENERAL                | YES | MODEL INTEGRITY                | YES |
| BIM Progress Report    | Yes | Task Names                     | Yes |
|                        |     | Task Activity IDs              | Yes |
| PROJECT SETUP          | YES | Planned Dates                  | Yes |
| Appearance Profiler    | Yes | Actual Dates                   | Yes |
| Schedule Data Source   | Yes | Attached By Sets               | Yes |
|                        |     | Attached By Explicit Selection | Yes |
|                        |     | Unattached Items               | Yes |
|                        |     | Items in Multiple Tasks        | Yes |
|                        |     | Items in Overlapping Tasks     | Yes |

Figure 9-9 - Example of BIM 4D Simulation Report – Review sections.

## NOTES

MITIGATION  
No action was needed

Figure 9-10 - Example of BIM 4D Simulation Report – Notes.

### 9.5.1 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>Folder Structure</b>        | Project folder structure has been set up following the Standards.                  |
| <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. NWD & NWF or Synchro should follow: PID-4D |

- GENERAL:**

| ITEM                       | DESCRIPTION                                                                     |
|----------------------------|---------------------------------------------------------------------------------|
| <b>BIM Progress Report</b> | Ensure BIM Progress report has been completed showing the updates of the month. |

- PROJECT SETUP:**

| ITEM                        | DESCRIPTION                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Appearance Profiler</b>  | Timeliner 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. |

- MODEL INTEGRITY:**

| ITEM                     | DESCRIPTION                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Task Names</b>        | All Activities on Schedule must have a Name.                                                              |
| <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.                                        |

## APPENDIX A: UPDATES AND REVISIONS

### REQUEST TO CHANGE BIM STANDARD FORM

The dynamic nature of BIM technology dictates that this document will change over time. Changes to this document will be made by following strict procedures and guidelines.

Changes may be made based on errors and omissions, as well as to enhance or update the standard based on changes in the BIM environment.

All requested changes to this document must be accompanied by a Request to Change BIM Standard Form provided below.

The Request to Change Standards form must be provided to the VDC Group. All requests will be reviewed on a periodic basis. If the change is approved, it will be incorporated into the next draft of this document and all support files will be modified.

The creation of Standards Content may be made based on Components used and approved by the VDC Group.

The Request to Change Standards form must be provided to the VDC Group.

Updates to this document and the related support files will be made as required and will be posted on:

<https://www.panynj.gov/port-authority/en/business-opportunities/engineering-available-documents.html>

| REQUESTOR INFORMATION   |                          |                               |                          |
|-------------------------|--------------------------|-------------------------------|--------------------------|
| <b>Name:</b>            | <input type="text"/>     |                               |                          |
| <b>Company:</b>         | <input type="text"/>     |                               |                          |
| <b>Address:</b>         | <input type="text"/>     |                               |                          |
| <b>City:</b>            | <input type="text"/>     |                               |                          |
| <b>State:</b>           | <input type="text"/>     |                               |                          |
| <b>Zip Code:</b>        | <input type="text"/>     |                               |                          |
| <b>Email:</b>           | <input type="text"/>     |                               |                          |
| <b>Phone:</b>           | <input type="text"/>     |                               |                          |
| CATEGORY CHANGE         |                          |                               |                          |
| Document Correction     | <input type="checkbox"/> | Naming Conventions            | <input type="checkbox"/> |
| Environment Setup       | <input type="checkbox"/> | Best Practices and Procedures | <input type="checkbox"/> |
| Sample Folder Structure | <input type="checkbox"/> | Support Files                 | <input type="checkbox"/> |
| Line Patterns           | <input type="checkbox"/> | Object Line Weights           | <input type="checkbox"/> |
| View Templates          | <input type="checkbox"/> | Filters                       | <input type="checkbox"/> |
| <b>Other (Specify):</b> | <input type="text"/>     |                               |                          |
|                         | <input type="text"/>     |                               |                          |

|                                                                                                                              |  |
|------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                              |  |
| <b>DESCRIPTION</b>                                                                                                           |  |
| Please be specific about any change or enhancements you would like to request and include why you are requesting the change. |  |

**DISCLAIMER:**

By making this submission you, the submitter, agrees that no contractual confidential relationship is established between you and the issuer of this Standard. If your material is incorporated into this Standard, you will not be compensated. In addition, if the material which you have submitted on this form is protected by any copyright, patent, trademark, or other proprietary right, then you are granting the issuer of this Standard a non-exclusive, royalty-free, perpetual and fully transferable license to use the materials in connection with this Standard.

**REQUEST TO CREATE BIM CONTENT FORM**

|                                                                                                                                                                                                |                          |                 |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|--------------------------|
| <b>REQUESTOR INFORMATION</b>                                                                                                                                                                   |                          |                 |                          |
| Name:                                                                                                                                                                                          |                          |                 |                          |
| Company:                                                                                                                                                                                       |                          |                 |                          |
| Address:                                                                                                                                                                                       |                          |                 |                          |
| City:                                                                                                                                                                                          |                          |                 |                          |
| State:                                                                                                                                                                                         |                          |                 |                          |
| Zip Code:                                                                                                                                                                                      |                          |                 |                          |
| Email:                                                                                                                                                                                         |                          |                 |                          |
| Phone:                                                                                                                                                                                         |                          |                 |                          |
| <b>CATEGORY</b>                                                                                                                                                                                |                          |                 |                          |
| Family File                                                                                                                                                                                    | <input type="checkbox"/> | Family Types    | <input type="checkbox"/> |
| Type Catalog                                                                                                                                                                                   | <input type="checkbox"/> | Materials       | <input type="checkbox"/> |
| Symbol                                                                                                                                                                                         | <input type="checkbox"/> | Tag             | <input type="checkbox"/> |
| Line Pattern                                                                                                                                                                                   | <input type="checkbox"/> | Fill Region     | <input type="checkbox"/> |
| Text Style                                                                                                                                                                                     | <input type="checkbox"/> | Dimension Style | <input type="checkbox"/> |
| Other (Specify):                                                                                                                                                                               |                          |                 |                          |
|                                                                                                                                                                                                |                          |                 |                          |
|                                                                                                                                                                                                |                          |                 |                          |
| <b>DESCRIPTION</b>                                                                                                                                                                             |                          |                 |                          |
| Please be specific about if the information requested, such as a Family, its Types and dimensions along with its Unifomat Classification Code. Include any sample files, drawings or sketches. |                          |                 |                          |



**DISCLAIMER:**

By making this submission you, the submitter, agrees that no contractual confidential relationship is established between you and the issuer of this Standard. If your material is incorporated into this Standard, you will not be compensated. In addition, if the material which you have submitted on this form is protected by any copyright, patent, trademark, or other proprietary right, then you are granting the issuer of this Standard a non-exclusive, royalty-free, perpetual and fully transferable license to use the materials in connection with this Standard.

## APPENDIX B: 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 considered to be 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:

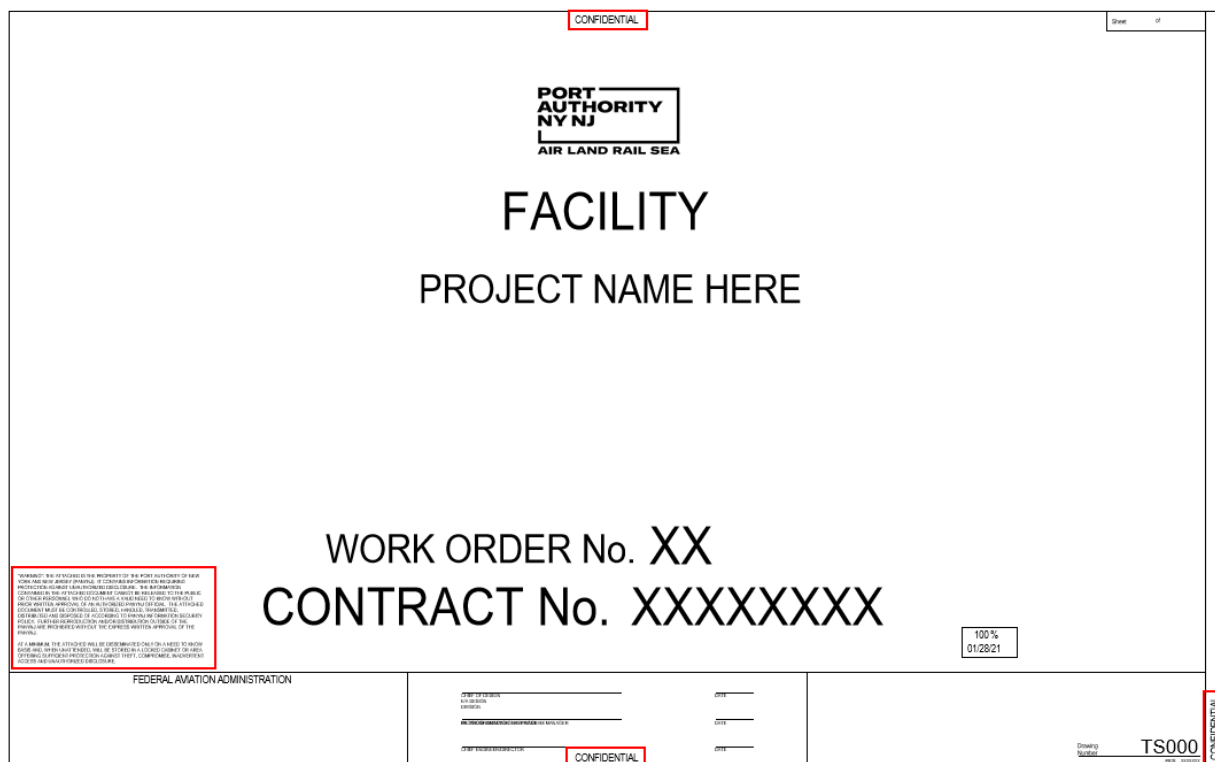
"WARNING": THE ATTACHED IS THE PROPERTY OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY (PANYNJ). IT CONTAINS INFORMATION REQUIRING PROTECTION AGAINST UNAUTHORIZED DISCLOSURE. THE INFORMATION CONTAINED IN THE ATTACHED DOCUMENT CANNOT BE RELEASED TO THE PUBLIC OR OTHER PERSONNEL WHO DO NOT HAVE A VALID 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 11-1 - 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.



The image shows a title sheet for a confidential project. At the top center is the Port Authority NY NJ logo with the text "AIR LAND RAIL SEA". Below the logo, the word "FACILITY" is written in large, bold, sans-serif font, followed by "PROJECT NAME HERE" in a slightly smaller font. In the center, "WORK ORDER No. XX" is displayed above "CONTRACT No. XXXXXXXXX". A small box in the bottom right corner indicates "100% 01/28/21". The bottom of the sheet is divided into three sections: "FEDERAL AVIATION ADMINISTRATION" on the left, a central area with lines for "PROJECT NUMBER", "DRAWING NUMBER", and "DATE", and a right section with "Drawing Title" and "TS000". Confidential stamps are visible: "CONFIDENTIAL" at the top center, bottom center, and on the right margin. A small text box in the bottom left corner contains a disclaimer about the use of the drawing.

Figure 0-2 - 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.

*PANYNJ BIM Standard*

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. The Warning Sign and Confidential markings can be set to display by setting a check mark in the box next to the "Warning Sign" parameter and the "Confidential Sheet" parameter, respectively, in the properties set for the Contract border.

All the Confidential Markings for interior pages are displayed in the following image:

Figure 11-3 – Example of Interior Confidential Page

**NOTE:**

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 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 11-4 — 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 considered to be 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:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                    |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| CONFIDENTIAL PRIVILEGED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                    | Sheet 1 of 1 |
| <br><h1 style="margin: 0;">FACILITY</h1> <h2 style="margin: 0;">PROJECT NAME HERE</h2>                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                    |              |
| <h3 style="margin: 0;">WORK ORDER No. XX</h3> <h2 style="margin: 0;">CONTRACT No. XXXXXXXXX</h2>                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                    |              |
| <small> <p>1. ANY INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE. IT IS THE POLICY OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY TO RELEASE INFORMATION TO THE PUBLIC TO THE MAXIMUM EXTENT POSSIBLE. IT IS THE POLICY OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY TO RELEASE INFORMATION TO THE PUBLIC TO THE MAXIMUM EXTENT POSSIBLE. IT IS THE POLICY OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY TO RELEASE INFORMATION TO THE PUBLIC TO THE MAXIMUM EXTENT POSSIBLE.</p> </small> | <div style="border: 1px solid black; padding: 2px;">100%<br/>01/28/21</div>                                                                                                                                                                                                        |              |
| <small>FEDERAL AVIATION ADMINISTRATION</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <div style="display: flex; justify-content: space-between;"> <div> <small> <p>DESIGNED BY _____ DATE _____</p> <p>CHECKED BY _____ DATE _____</p> <p>APPROVED BY _____ DATE _____</p> </small> </div> <div style="text-align: right;"> <small> <p>TS000</p> </small> </div> </div> |              |
| CONFIDENTIAL PRIVILEGED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                    |              |

Figure 0-5 - 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.

The image displays a template for a Confidential Privileged sheet. The main area is a large rectangle. At the top center, bottom center, and right edge, there are red-bordered boxes containing the text "CONFIDENTIAL PRIVILEGED". On the right side, there is a vertical strip containing the following elements from top to bottom:

- PORT AUTHORITY NY NJ logo with "AIR LAND RAIL SEA" below it.
- ORIGINAL SIGNED BY: \_\_\_\_\_
- CHECK NAME NAME: \_\_\_\_\_
- A grid for facility information with columns labeled "FACILITY", "SUBJECT NAME HERE", and "SHEET NAME".
- CONFIDENTIAL PRIVILEGED DOCUMENT CONTROL NUMBER: XXXXXXXX
- Designated by: \_\_\_\_\_
- Checked by: \_\_\_\_\_
- Date: \_\_\_\_\_
- Current Number: \_\_\_\_\_
- Drawn to: \_\_\_\_\_
- Number: A100
- FIG 80000000

Figure 11-6 - Interior pages of Confidential Privileged Projects

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

## APPENDIX C: TITLE SHEETS & CONTRACT BORDERS

The following pages shows images of the official Authority Title Sheets and Contract Borders for both sizes, 22x34 and 34x56, used on Engineering and PATH projects.

### TITLE SHEET ENGINEERING

|                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                 |                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="text-align: center;"> <br/> <b>FACILITY</b><br/>         PROJECT NAME HERE       </div>                                                                                                                               |                                                                                                                                                                                                                                                                                 |                                                                                                                                               |
| <div style="text-align: center;">         WORK ORDER No. XX<br/> <b>CONTRACT No. XXXXXXXXX</b> </div>                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |                                                                                                                                               |
| <small>           THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY<br/>           OFFICE OF THE CHIEF ENGINEER<br/>           100 WALL STREET, 10TH FLOOR<br/>           NEW YORK, NY 10038-5000<br/>           TEL: (212) 512-2000<br/>           FAX: (212) 512-2001<br/>           WWW.PANYNJ.GOV         </small> | <small>           FEDERAL AVIATION ADMINISTRATION<br/>           1200 MOUNTAIN VIEW AVENUE<br/>           MCLEOD BUILDING<br/>           WASHINGTON, DC 20515<br/>           TEL: (202) 267-2141<br/>           FAX: (202) 267-2142<br/>           WWW.FAA.GOV         </small> | <div style="text-align: right;"> <br/> <b>TS000</b> </div> |

Figure 12-1 - Example of Title Sheet Engineering 22x34

### TITLE SHEET PATH

|                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                 |                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="text-align: center;"> <br/> <b>FACILITY</b><br/>         PROJECT NAME HERE       </div>                                                                                                                             |                                                                                                                                                                                                                                                                                 |                                                                                                                                                 |
| <div style="text-align: center;">         WORK ORDER No. XX<br/> <b>CONTRACT No. XXXXXXXXX</b> </div>                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |                                                                                                                                                 |
| <small>           THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY<br/>           OFFICE OF THE CHIEF ENGINEER<br/>           100 WALL STREET, 10TH FLOOR<br/>           NEW YORK, NY 10038-5000<br/>           TEL: (212) 512-2000<br/>           FAX: (212) 512-2001<br/>           WWW.PANYNJ.GOV         </small> | <small>           FEDERAL AVIATION ADMINISTRATION<br/>           1200 MOUNTAIN VIEW AVENUE<br/>           MCLEOD BUILDING<br/>           WASHINGTON, DC 20515<br/>           TEL: (202) 267-2141<br/>           FAX: (202) 267-2142<br/>           WWW.FAA.GOV         </small> | <div style="text-align: right;"> <br/> <b>TS000</b> </div> |

Figure 12-2 - Example of Title Sheet PATH 22x34



[illegible]

## CONTRACT BORDER PATH

[illegible]

*Last Updated: 01/01/2021*  
*Reviewed/Released 2021 v1.0*

## APPENDIX D: ACRONYMS AND GLOSSARY OF TERMS

### ACRONYMS

**Table 13-1 - Acronyms**

| ACRONYMS    | DESCRIPTION                      |
|-------------|----------------------------------|
| <b>BIM</b>  | Building Information Model       |
| <b>CMD</b>  | Construction Management Division |
| <b>C3D</b>  | Civil 3D                         |
| <b>E/AD</b> | Engineering/Architecture Design  |
| <b>FIM</b>  | Facility Information Model       |
| <b>IPD</b>  | Integrated Project Delivery      |
| <b>LE/A</b> | Lead Engineer/Architect          |
| <b>LOD</b>  | Level of Development             |
| <b>PIM</b>  | Project Information Model        |
| <b>PWS</b>  | Project Website                  |
| <b>SM</b>   | Site Model                       |
| <b>TL</b>   | Task Leader                      |
| <b>WCS</b>  | World Coordinates System         |

### GLOSSARY OF TERMS

**Table 13-2 -Glossary of Terms**

| TERM                              | DESCRIPTION                                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3D Model</b>                   | A three-dimensional representation of a building and/or structure generated out of a CAD and/or BIM application                                                                                                                                                        |
| <b>Building Information Model</b> | A Building Information Model (BIM) is a digital representation of the physical and functional characteristics of a building and/or structure                                                                                                                           |
| <b>VDC Manager</b>                | The System Administrator for all CAD & BIM projects, in this case the BIM/CAD Support Group                                                                                                                                                                            |
| <b>Central File</b>               | The Master Project File that is saved to a network drive and acts as the distribution point for publishing work to the rest of the team. The Central File stores the current ownership information for all the elements of the project                                 |
| <b>Contract Drawing</b>           | A drawing sheet of the Contract Set                                                                                                                                                                                                                                    |
| <b>Contract Set</b>               | The legal set of issued drawings originally signed and sealed by a PE or RA                                                                                                                                                                                            |
| <b>Element Borrowing</b>          | The ability to edit an element located in a Workset without needing to take ownership of the entire Workset. If no one owns the Workset, permission to borrow the element is automatically granted. If Workset is owned individual permission must be granted to edit. |

| TERM                                | DESCRIPTION                                                                                                                                                                                                                                             |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Facility Information Model</b>   | The Facility Information Model (FIM) stores the most current Revit-based and Civil 3D-based models of that facility                                                                                                                                     |
| <b>Intelligent Objects</b>          | An Object or Set of Objects that represents not only the geometry of a component but also has much more information that can be extracted in multiple ways depending on the user needs                                                                  |
| <b>Integrated Project Delivery</b>  | Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, and practices to optimize efficiency through all phases of design, fabrication and construction                                                       |
| <b>Lead Engineer/Architect</b>      | Lead Engineer/Architect (LE/A) refers to the project coordinator among all disciplines involved in the project                                                                                                                                          |
| <b>Local File</b>                   | The copy of the Central File located directly on the user's workstation. The main purpose of the Local File is faster data access. The Workset processes establish a link between the Central File and the Local File for data sharing                  |
| <b>Level of Development</b>         | Categorized as Phases I-IV, refers to the level of project completion                                                                                                                                                                                   |
| <b>PDF</b>                          | A Portable Document Format is a file format that provides an electronic image of text or text and graphics that looks like a printed document and can be viewed, printed, and electronically transmitted                                                |
| <b>Project Information Model</b>    | The Project Information Model (PIM) stores the finalized Revit-based and Civil 3D-based models as a record of a completed project                                                                                                                       |
| <b>Point Cloud</b>                  | A Point Cloud is a large collection of points placed on a 3D Coordinate System which creates a 3D representation of an object or space.                                                                                                                 |
| <b>Revit Families</b>               | Revit Families are groups of elements with a common set of parameters, identical use, and similar graphical representation                                                                                                                              |
| <b>Shared Parameters</b>            | Shared Parameters can be connected to projects and families. They give the ability to add specific parameters/ data that does not already exist in the Revit-based applications                                                                         |
| <b>Site Model</b>                   | The Site Model (SM) is the centralized Revit-based file where all models share coordinates with each other and at the same time will control true north, project north, and elevations                                                                  |
| <b>Task Leader</b>                  | Task Leader (TL) refers to each discipline's responsible team member. This person will be in charge of managing the 3D Model in terms of Worksets and rights                                                                                            |
| <b>Traditional Project Delivery</b> | Traditional Project Delivery (TPD), such as Conceptual Design, Design Development, and Final Design, creates well-defined workflow boundaries that do not align with a collaborative process                                                            |
| <b>Worksets</b>                     | Worksets create the ability to divide the project in functional areas allowing the propagation and coordination of changes between designers, enabling multiple members of a team the ability to simultaneously work on different portions of a project |

## APPENDIX E: BIM EXECUTION PLAN - TEMPLATE FOR DESIGN

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

<https://www.panynj.gov/business-opportunities/docs-engineering/EAD-BIM-Support-Files.zip>

| BIM EXECUTION PLAN<br>THE PORT AUTHORITY OF NY & NJ<br><span style="color: red;">[PROJECT NAME]</span>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | BIM EXECUTION PLAN<br>THE PORT AUTHORITY OF NY & NJ<br><span style="color: red;">[PROJECT NAME]</span>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p style="color: red; font-size: small;">[Instructions for completing the BEP as well as editable fields are shown in red. Review, replace and/or remove all text in red with current project information before completion of final BEP]</p> <div style="text-align: center; margin: 20px 0;"> <span style="color: red; font-size: 24px; font-weight: bold;">[Project Name]</span><br/> <b>BIM Execution Plan</b><br/> <small>(Stages I, II, III)</small> </div> <div style="border: 1px solid black; width: 200px; height: 100px; margin: 20px auto; text-align: center; color: red; font-size: small;">           INSERT IMAGE HERE         </div> <div style="text-align: center; margin: 20px 0;"> <small>[Version 1.0 Month Day, YYYY]</small><br/> <b>DESIGN FIRM: [NAME OF THE CONSULTANT]</b><br/> <div style="border: 1px solid black; width: 80px; height: 30px; margin: 5px auto; text-align: center; color: red; font-size: x-small;">[COMPANY LOGO]</div> <div style="display: flex; justify-content: center; gap: 20px; font-size: x-small;"> <div>PID:</div> <div>CONTRACT #:</div> </div> </div> | <p><b>1.0 INTRODUCTION</b></p> <p><b>1.1 PURPOSE</b></p> <p>The objective of the BIM Execution Plan (BEP) is to define a framework for collaboration among the PANYNJ's VDC Group, Consultants, Engineering Architecture Design Division (EAD), and Subcontractors, in order to guarantee the success of the utilization of BIM during the project lifecycle.</p> <p>This BIM Execution Plan will:</p> <ul style="list-style-type: none"> <li>Define and facilitate the exchange of information between all participants.</li> <li>Establish coordination procedures and consistency among all trades.</li> <li>Organize all BIM-related activities around a philosophy of collaborative design.</li> <li>Emphasize BIM's role in the beneficial re-use of project data throughout the whole life-cycle.</li> </ul> <p>The purpose is to ensure all BIM related information provided by all participants during the execution of the project is consistent and useful throughout Design Stage.</p> <p><b>1.2 OVERVIEW</b></p> <p>The BEP is a live document and will be updated if major changes to the process are needed as a result of lessons learned and/or changes in technology that would provide significant advantages to the project. All changes are subject to Port Authority of NY &amp; NJ approval.</p> <p><b>1.3 SCOPE</b></p> <p>This BEP reflects and records all refinements made to the PANYNJ BIM standard, specifically for the afore mentioned project.</p> <p>Any aspect not addressed explicitly on this document is ruled by the PANYNJ BIM Standard Manual.<br/> <small>(remove statement above if project is part of a program with specific BIM requirements)</small></p> <p>Any aspect not addressed explicitly on this document is ruled by the Program BIM requirements. If not addressed by the program, then that aspect is ruled by the PANYNJ BIM Standard<br/> <small>(remove statement above if project is NOT part of a program, or if there are no program-specific requirements)</small></p> <p><b>2.0 PROJECT INFORMATION</b></p> <p>For large projects and programs that are divided into multiple projects the following information must be provided for each project:</p> <p><b>2.1 PROJECT NAME</b></p> <p><small>(Enter project name here)</small></p> <p><b>2.2 PROJECT NUMBER</b></p> <p><small>(Enter the PID Number)</small></p> <div style="display: flex; justify-content: space-between; font-size: x-small; margin-top: 20px;"> <span>Last Updated: 04/01/2020<br/>Reviewed/Released 2020 v1.0</span> <span>Page 4</span> </div> |

## APPENDIX F: BIM EXECUTION PLAN - TEMPLATE FOR CONSTRUCTION

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

<https://www.panynj.gov/business-opportunities/docs-engineering/EAD-BIM-Support-Files.zip>

| <small>BIM EXECUTION PLAN</small> <div style="float: right; text-align: right;"> <small>THE PORT AUTHORITY OF NY &amp; NJ</small><br/> <small>[PROJECT NAME]</small> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <small>BIM EXECUTION PLAN</small> <div style="float: right; text-align: right;"> <small>THE PORT AUTHORITY OF NY &amp; NJ</small><br/> <small>[PROJECT NAME]</small> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <p style="color: red; font-size: small;">[Instructions for completing the BEP as well as editable fields are shown in red. Review, replace and/or remove all text in red with current project information before completion of final BEP]</p> <div style="text-align: center; margin: 20px 0;"> <span style="color: red; font-size: 24px; font-weight: bold;">[Project Name]</span><br/> <span style="font-size: 24px; font-weight: bold;">BIM Execution Plan</span><br/> <span style="color: gray; font-size: 12px;">(Stage IV)</span> </div> <div style="border: 1px solid black; width: 250px; height: 100px; margin: 20px auto; text-align: center; color: red; font-size: 10px;">[INSERT IMAGE HERE]</div> <p style="color: red; font-size: 10px; text-align: center;">[Version 1.0 Month Day, YYYY]</p> <p style="color: red; font-size: 12px;">GENERAL CONTRACTOR: [NAME OF THE CONTRACTOR]</p> <div style="border: 1px solid black; width: 80px; height: 30px; margin: 10px auto; text-align: center; color: red; font-size: 8px;">[COMPANY LOGO]</div> <p style="font-size: 8px;">PID:<br/>CONTRACT #:</p> | <p><b>1.0 INTRODUCTION</b></p> <p><b>1.1 PURPOSE</b></p> <p>The objective of the BIM Execution Plan (BEP) is to define a framework for collaboration among the PANYNJ's VDC Group, General Contractor, Subcontractors, Construction Management Division (CMD) and Designers, in order to guarantee the success of the utilization of BIM during the project lifecycle.</p> <p>This BIM Execution Plan will:</p> <ul style="list-style-type: none"> <li>Define and facilitate the exchange of information between all participants.</li> <li>Establish coordination procedures and consistency among all trades.</li> <li>Organize all BIM-related activities around a philosophy of collaborative design.</li> <li>Emphasize BIM's role in the beneficial re-use of project data throughout the whole life-cycle.</li> </ul> <p>The purpose is to ensure all BIM related information provided by all participants during the execution of the project is consistent and useful throughout Construction Stage.</p> <p><b>1.2 OVERVIEW</b></p> <p>The BEP is a live document and will be updated if major changes to the process are needed as a result of lessons learned and/or changes in technology that would provide significant advantages to the project. All changes are subject to Port Authority of NY &amp; NJ approval.</p> <p><b>1.3 SCOPE</b></p> <p>This BEP reflects and records all refinements made to the PANYNJ BIM standard, specifically for the aforementioned project.</p> <p style="color: red; font-size: 8px;">Any aspect not addressed explicitly on this document is ruled by the PANYNJ BIM Standard Manual.<br/>(remove statement above if project is part of a program with specific BIM requirements)</p> <p style="color: red; font-size: 8px;">Any aspect not addressed explicitly on this document is ruled by the Program BIM requirements. If not addressed by the program, then that aspect is ruled by the PANYNJ BIM Standard<br/>(remove statement above if project is NOT part of a program, or if there are no program-specific requirements)</p> <p><b>2.0 PROJECT INFORMATION</b></p> <p style="color: red; font-size: 8px;">For large projects and programs that are divided into multiple projects the following information must be provided for each project:</p> <p><b>2.1 PROJECT NAME</b></p> <p style="color: red; font-size: 8px;">(Enter project name here)</p> <p><b>2.2 PROJECT NUMBER</b></p> <p style="color: red; font-size: 8px;">(Enter the PID Number)</p> <div style="font-size: 8px; margin-top: 20px;"> <div style="float: left;">Last Updated: 04/01/2020<br/>Reviewed/Released 2020 v1.0</div> <div style="float: right;">Page 4</div> </div> |

## APPENDIX G: BIM PROGRESS REPORT TEMPLATE

To download the BIM Progress Report Template for Construction follow the link below:

<https://www.panynj.gov/business-opportunities/docs-engineering/EAD-BIM-Support-Files.zip>

| BIM PROGRESS REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | THE PORT AUTHORITY OF NY & NJ<br>[PROJECT NAME] |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
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| <div style="color: red; font-size: 1.2em; margin-bottom: 10px;">[Project Name]</div> <div style="font-size: 1.1em; margin-bottom: 10px;">BIM Submission Report</div> <div style="font-size: 0.8em; margin-bottom: 10px;">(Stage IV)</div> <div style="border: 1px solid black; width: 80%; margin: 10px auto; height: 150px; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); color: red; font-size: 0.8em;">[INSERT IMAGE HERE]</div> </div> <div style="color: red; font-size: 0.8em; margin-top: 10px;">[Version 1.0 Month Day, YYYY]</div> <div style="margin-top: 10px;">GENERAL CONTRACTOR: [NAME OF THE CONTRACTOR]</div> <div style="border: 1px solid black; width: 80%; margin: 10px auto; height: 40px; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); color: red; font-size: 0.8em;">[COMPANY LOGO]</div> </div> <div style="margin-top: 10px;">PID:</div> <div style="margin-top: 5px;">CONTRACT #:</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| <div style="text-align: right; font-size: 0.8em; color: red;">[PROJECT NAME]</div> <div style="margin-top: 10px;"> <b>1.0 PROJECT SUBMISSION INFORMATION</b><br/><br/> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <div> Project: Project Name<br/> PID: 00000000<br/> Contract Number: AAA-000.000<br/> Submission for: Month, YYYY </div> <div> BLC (Contractor): BIM Lead Coordinator Name<br/> PANYNJ BIM Coordinator: Name<br/> Date of Submission: 00/00/0000 </div> </div> </div> <div style="margin-top: 10px;"> <b>1.1 SUBMISSION SUMMARY</b><br/> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 0.8em;"> <tr style="background-color: #2c5e8c; color: white;"> <th colspan="2">CONSTRUCTION MODEL UPDATES</th> </tr> <tr><td>Completeness</td><td></td></tr> <tr><td>Spatial coordination</td><td></td></tr> <tr><td>PACCS/RIFs</td><td></td></tr> <tr><td>Other</td><td></td></tr> <tr style="background-color: #2c5e8c; color: white;"> <th colspan="2">4D MODEL AND SIMULATIONS</th> </tr> <tr><td>Baseline Simulation</td><td></td></tr> <tr><td>Updated Progress Schedule</td><td></td></tr> <tr><td>Other</td><td></td></tr> <tr style="background-color: #2c5e8c; color: white;"> <th colspan="2">AS-CONSTRUCTED INFORMATION</th> </tr> <tr><td>Captured conditions</td><td></td></tr> <tr><td>Asset Information</td><td></td></tr> <tr><td>Other</td><td></td></tr> </table> <div style="font-size: 0.7em; color: red; margin-top: 5px;">Mark with an X, depending on the contents of the submission.</div> </div> <div style="margin-top: 10px;"> <b>2.0 CONSTRUCTION MODEL</b><br/><br/> <b>2.1 MODELS INCLUDED IN THE CURRENT SUBMISSION</b><br/> <div style="font-size: 0.8em; color: red;"> Model 1 Name<br/> Model 2 Name<br/> Model 3 Name<br/> Model 4 Name<br/> Model ... Name </div> </div> |                                                 | CONSTRUCTION MODEL UPDATES |  | Completeness |  | Spatial coordination |  | PACCS/RIFs |  | Other |  | 4D MODEL AND SIMULATIONS |  | Baseline Simulation |  | Updated Progress Schedule |  | Other |  | AS-CONSTRUCTED INFORMATION |  | Captured conditions |  | Asset Information |  | Other |  |
| CONSTRUCTION MODEL UPDATES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Completeness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Spatial coordination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| PACCS/RIFs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| 4D MODEL AND SIMULATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Baseline Simulation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Updated Progress Schedule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| AS-CONSTRUCTED INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Captured conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Asset Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |
| <div style="display: flex; justify-content: space-between; font-size: 0.7em;"> <span>Last Updated: 04/01/2020<br/>Reviewed/Released 2020 v1.0</span> <span>Page 2</span> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                 |                            |  |              |  |                      |  |            |  |       |  |                          |  |                     |  |                           |  |       |  |                            |  |                     |  |                   |  |       |  |