

# CAD/BIM/DATA SPECIFICATIONS

Department of Port Control (DPC) Planning & Engineering (P&E)

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*Questions pertaining to these specifications can be addressed to the **Design Supervisor**. Any modifications to these specifications must be approved in writing by the Design Supervisor.*

## Table of Contents

RATIONALE: ..... 1

DEFINITIONS: ..... 2

BEST PRACTICES: ..... 2

DELIVERABLES: ..... 3

    CAD ..... 3

    POINT CLOUDS ..... 3

    GEOTECHNICAL ..... 4

### **RATIONALE:**

The intent of these specifications is to organize the electronic data collected from the various consultants hired by the owner for the purpose of creating a Computerized Asset Management System. These specifications can and will change over time as technology changes or the owner updates their systems. The electronic model data at each step of the project is considered the property of the owner and therefore its collection, organization, and format shall be under the owner’s direction.

## DEFINITIONS:

**As-builts:** During and after construction, field measurements shall be taken under the oversight of an independent licensed Professional Surveyor in the State of Ohio. As well as being used by construction management and the design consultant to verify that improvements were installed according to plan, a final set of improvement plans, labeled as-built will be certified and submitted to DPC P&E following the deliverable specifications.

**Coordinate System:** Ohio State Planes North Zone US Foot (OH83-NF)

**Design Supervisor:** Planning and Engineering Program Manager for Design Services

**Electronic Deliverables:** Shall include but not be limited to DWG, PDF, DGN, SHP, TXT etc...

**First Generation PDF:** The generation of any PDF from any design product should be done by use of the native tools built into the software. The purpose is to achieve a searchable file as well as have the ability to turn layers on and off. For example, Autodesk AutoCAD based products have a plotter type named DWG to PDF. This tool should be used in lieu of the Adobe Acrobat plotter because it will generate the searchable format desired. It is **not** acceptable to print to paper and then scan to PDF/TIF.

**Operating Software:** The DPC utilizes the following file types for the disciplines involved:

Architecture: **Autodesk Revit Architecture (RVT)**

Civil Engineering: **Autodesk Civil 3D (DWG)**

Mechanical, Electrical, Plumbing: **Autodesk Revit MEP (RVT)**

Structural: **Autodesk Revit Structure and Robot (RVT)**

GIS: **Autodesk Map (ESRI SHP)**

Project Management: **Autodesk Navisworks (NVD)**

**Owner:** Cleveland Department of Port Control, Planning & Engineering

**PDF:** Portable Document Format, originally created by Adobe, but can be generated by various design software.

**Point Cloud:** LIDAR data collected via aerial, terrestrial, or mobile methods shall be provided to the owner in both its RAW format and in a registered format. The data shall be provided in the file types requested by the owner.

## BEST PRACTICES:

### AutoCAD:

- 1) The base point of any DWG delivered to the owner shall be 0,0,0.
- 2) All deliverables to the owner shall have the UCS set to its default state. Only rotations utilizing DVIEW Twist will be accepted.
- 3) All drawing objects shall have their properties defined as BYLAYER.
- 4) Layers will meet the current DPC layer standards at the time of electronic drawing submittal.
- 5) Linework/models and their associated labels/text shall be on separate layers.
- 6) No exploded dimensions or drawing elements.

### Revit:

- 1) The base point and rotation of any Revit model will be referenced to the survey base point assigned by the project's site engineer/surveyor. In the event that the project is interior only, two outside building coordinates will be identified and used so that the model is geospatially accurate.

#### GIS:

- 1) All GIS data delivered to the owner shall be in the form of ESRI SHP files.

## DELIVERABLES:

### CAD

- A) All **Electronic Deliverables** delivered at every completion stage (30%, 60%, 90%, Bid Set and As-builts) shall be on the **coordinate system** directed by the **owner**. These deliverables shall also be in a format approved by the owner and dependent on the current **operating software**.
- B) Existing conditions files shall be provided to the owner in completed model form and raw data form ready for import and in the following formats:
  - 1) A PNEZD comma delimited coordinate file, post processed, on the coordinate system and using the DPC Survey Code List and line-work generation methodologies.
  - 2) An ETRANSMITTED DWG file representing the existing conditions in model form representing verbatim what is being submitted via PDF/copies. No alterations, exploding, bursting or other CAD detriment will be accepted.
  - 3) Each surface shall be submitted in a separate XML file, when applicable.
  - 4) Each alignment shall be submitted in a separate XML file, when applicable.
  - 5) The raw data provided should include everything necessary to generate the existing conditions base map without any additional manual drafting efforts. This includes but is not limited to:
    - a. The PNEZD file as described above
    - b. The Figure Prefix Library necessary to generate the linework as required
    - c. The Civil 3D template set up sufficiently to handle all the imported points, their descriptions, point styles and label styles for the purpose of generating a model of existing conditions.
    - d. Acceptance of the final deliverable will include the effort of importing the above information with the successful results ready for use.

### POINT CLOUDS

Point Cloud files are also the property of the owner and shall be provided to the owner in the following formats:

- 1) The RAW scans in the format provided by the hardware manufacturer.

- 2) A post processed, registered point cloud with a registration error report in the native hardware format. Registrations must meet the owner’s requirements.
- 3) The post-processed, registered point cloud in the RCP format for use with Autodesk modeling.
- 4) Data shall be delivered on a media approved for the size of the data sets including but not limited to, high speed USB flash drives, high speed external hard drives, blu-ray discs. Format to be coordinated and approved before delivery.
- 5) The consultant is expected to maintain a copy of this data for the entire project duration and a period of 3 years after final payment. In the event of extended projects, the consultant will maintain the data indefinitely until the owner provides a written release of responsibility for the point cloud data.

Point Clouds for as-built deliverables, in addition to the above requirements:

- 1) Point cloud comparisons will be provided in rendered results showing discrepancies. Both data sets used for these analyses shall be provided to the owner. A procedure list showing analysis technique steps will be provided to the owner as part of the as-built effort.
- 2) Standard project as-built line-work will be generated from the point cloud as well as surfaces for the purpose of comparison to proposed design.

## GEOTECHNICAL

All geotechnical exploration shall be submitted in the following format, tested and functional before final acceptance.

The following three comma separated values (CSV) are required:

- 1) **Location Details.csv** : this is **required** and contains the hole location details on the DPC coordinate system.
- 2) **Field Geological Descriptions.csv** : this is **required** and contains the geological strata information
- 3) **Orientation and Inclination.csv** : this file is optional and is used for inclined borings.

### 1) Location Details.csv

This file contains a row for each individual hole location, the table below gives details of the individual column headings and which fields are mandatory.

Column Heading	Description	Mandatory	Example
Location ID	Location unique ID	Yes	BH0001
Location Type	Type of activity at location	Yes	RC
Easting	Easting or longitude of the location of hole	Yes	123456.4
Northing	Northing or latitude of the location	Yes	232467.3
Ground Level	Ground level relative to datum of location or start of traverse	Yes	35.43
Final Depth	Final Depth		8.37

Below is an example of the **Location Details.csv**, note the case and spacing in the column headers. These headings must be exact or the data will not import properly into the DPC systems. Sample files can be provided upon request.

```
Location ID,Location Type,Easting,Northing,Ground Level,Final Depth
BH127,CP,399838.29,301075.08,13.45,12.5
BH128,CP,399809.58,301145.9,13.69,11.75
BH129,CP,399802.58,301195.2,13.6,21.95
BH130,CP,399758.58,301221,14,20
BH134,CP+RC,399757.08,301268.1,13.89,52.7
BH135,CP,399795.91,301272.33,13.69,30.15
BH136,CP,399725.18,301339,11.69,10.05
BH137,CP,399671.18,301433,6.4,10.05
BH138,CP,399657.18,301492,5.69,10.05
BH139,CP,399737.18,301399.9,5.19,6.1
BH140,CP,399796.18,301321.1,11.89,5.05
```

## 2) Field Geological Descriptions.csv

Contains the strata or banding data per location of stratum, the four columns Legend Code, Geology Code, Geology Code2 and BGS Lexicon are not all mandatory, but at least one should be fully populated to allow the software to correctly band the boreholes and strata.

Column Heading	Description	Mandatory	Example
Location ID	Location identifier	Yes	BH001
Depth Top	Depth to the TOP of stratum	Yes	7.43
Depth Base	Depth to the BASE of description	Yes	8.12
Legend Code	Legend code		102
Geology Code	Geology code		LC
Geology Code2	Second geology code		SAND

Below is an example of the **Field Geological Descriptions.csv**, note the case and spacing in the column headers. These headings must be exact or the data will not import properly into the DPC systems. Sample files can be provided upon request.

```
Location ID,Depth Top,Depth Base,Legend Code,Geology Code,Geology Code 2,BGS Lexicon,Description
BH127,0,0.65,101,FILL,,,TOPSOIL
BH127,0.65,1.1,102,FILL,,,Sandy grey brown soil with many fragments of glass and plastic. MADE GROU
BH127,1.1,2.7,404,GLACIAL TILL,,,Dense grey-brown SAND with medium poorly graded gravel of mudstone
BH127,2.7,9.2,220,BOULDER CLAY,,,Firm brown very sandy CLAY with a little subangular to subrounded r
BH127,9.2,12.5,205,BOULDER CLAY,,,Brown CLAY with a little well rounded medium cobbles.
BH128,0,2.6,101,FILL,,,TOPSOIL
BH128,2.6,6.3,404,GLACIAL TILL,,,Dense grey-brown SAND with medium poorly graded gravel of mudstone
BH128,6.3,11.75,220,BOULDER CLAY,,,Firm brown very sandy CLAY with a little subangular to subrounde
BH129,0,0.5,101,FILL,,,TOPSOIL
BH129,0.5,1.8,102,FILL,,,Sandy grey brown soil with many fragments of glass and plastic - MADE GROU
```

## 3) Orientation and Inclination.csv

The third file, **Orientation and Inclination.csv**, is optional and contains information on the direction of the bore hole.

Only entries for when the borehole is not vertical need to be added.

Note: the inclination for a standard vertical hole is 90°, and inclination of the 0° would create a horizontal borehole, and inclination of -90° would create a vertical hole going upwards.

Column Heading	Description	Mandatory	Example
Location ID	Location identifier	Yes	BH001
Orientation	Orientation of hole (degrees Clockwise from north)		135
Inclination	Inclination of hole (measured positively down from horizontal in deg)		75

Below is an example of the **Orientation and Inclination.CSV** file. Note the case and spacing in the column headers. These headings must be exact or the data will not import properly into the DPC systems. Sample files can be provided upon request.

```
Location ID,Orientation,Inclination  
BH129,210,74  
BH135,135,75  
CPT1,,90
```