PORT of vancouver | Vancouver Fraser Port Authority

# Record drawing standards for projects

Version 2.4

Department: Spatial Data Group – Engineering and Maintenance

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Canada

# Contents

# 1. Introduction

The Vancouver Fraser Port Authority has created this document to support the standards and procedures required for the completion of infrastructure and land development projects in the CAD environment.

These standards adhere to Master Municipal Construction Documents Association (MMCD) templates for AutoCAD and Civil 3D.

Hereinafter the term “CAD” means drawings created using AutoCAD or Civil 3D. Any suggestions or recommended changes to this manual are welcomed and should be directed to:

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# 2. General standards

## 2.1. Drawing standards

The port authority will require CAD files for the final record drawing submission created using the above mentioned MMCD template. The use of a consistent standard is required to maintain consistency in appearance and internal drawing structure to facilitate post-construction record drawing submissions. The MMCD template can be used with both AutoCAD Civil 3D and AutoCAD. Record drawings that are not in compliance will be returned for correction.

## 2.2. Digital submission of record drawings

The consultant must provide digital submissions (in both CAD and PDF formats) of the Issued for Construction drawings in UTM NAD83 coordinate system at the earliest convenience before construction begins. Record drawings in UTM NAD83 coordinate system must be submitted in CAD and PDF format with an engineer’s stamp where applicable at the end of the project.

Submitted PDF files should be able to be opened by Adobe Acrobat with no activation of security settings or password protection. For best results, drawings in Acrobat PDF file should be created directly from the CAD file at the original intended scale that is being certified correct. The PDF file name must correspond to the port authority’s record drawing index number (Section 2.4 below).

The port authority requires separate water, drainage, sanitary, road, communication, streetlight, and traffic record drawings. For instance, drainage and sanitary records cannot be combined, nor can roads and water.

All files associated with the CAD file (such as external references) must be included in either a ZIP archive, XML file, or e-Transmit for the final submission and send to the project’s primary contact.

## 2.3. Title blocks

The port authority will supply title blocks for all sheet sizes. Title blocks and drawing numbers will be provided at the beginning of the project. The consultant can modify the title block to accommodate his own numbering system, but the port authority’s project number with drawing number must be dominant in the bottom right corner of the drawing.

## 2.4. Drawing numbers

The port authority uses a four part numbering system (i.e., ###-###-DI-###). The first two or three digits represent the port authority site number that the project falls under. The next set of digits (after the first hyphen) is the port authority-assigned project number. The next two to three letters are the discipline identifier. The last three digits are for sheet numbers.

Example: **34-123-UT-001** refers to port authority site **34** (Roberts Bank)-**123** (Project Number assigned by the port authority)-**UT** (discipline identifier and in this example “utilities”)-**001** (sequential sheet number).

**Discipline identifier list:**

| | |
|---|---|
| AR | Architectural |
| CI | Civil |
| CM | Communications |
| EL | Electrical (fibre optic cable, hydro, overhead lines, underground lines, utility poles) |
| EV | Environmental (test holes, boreholes) |
| FP | Fire protection |
| GA | General |
| GT | Geotechnical |
| HM | Hazardous materials |
| LS | Landscape |
| MA | Marine |
| ME | Mechanical (plumbing, HVAC) |
| RD | Road |
| RL | Rail |
| SE | Security |
| SL | Street lighting |
| ST | Structural |
| SV | Survey |
| UT | Utilities (water, storm, sanitary, gas lines, fuel lines, telephone) |

For demolition drawings, add ‘D’ to discipline identifier (i.e., AR-D for architectural demolition, CI-D for civil demolition, ST-D for structural demolition).

# 3. Drawing preparation – general

a) The record drawing submission shall include a drawing index that lists all drawing sheets contained in the project; partial submissions are not accepted

b) A letter of certification or professional engineer’s electronic seal and digital signature applied to the submitted PDF drawing file(s) confirming the accuracy of the record drawings must be provided

c) Each plan sheet should be considered a standalone record. All notes that refer to the sheet should be shown on that sheet. A separate plan sheet containing notes that refer to various sheets within the project is not acceptable. Exceptions to this rule are references to standard details or key plans.

d) CAD drawings are required for all projects. All associated files (such as xref’s, special fonts, and ctb files) used to create the drawings should be included.

e) All construction or modifications are to be shown and distinguished from the existing items by different line weights

f) Notes pertaining to the construction or modifications are to be shown on that drawing

g) All elevations and coordinates are to be in meters and displayed to the nearest 0.001 meters. The dimensions and offsets for service connections, wyes, etc. are to be shown to the nearest 0.1 meters. Those dimensions and offsets are for the convenience of port authority maintenance workers for location purposes only.

h) A key plan is required to indicate the location and scope of the works where locations are not obvious

i) In the CAD model space, all features are to be drawn at a 1:1 metric scale. For example, a feature measuring one meter length will be drawn as one unit long. Model space features should never be rescaled for plotting purposes.
j) All information will be audited to ensure accuracy, completeness and compliance with these specifications
k) All spot elevations and contour lines are to be hidden in the PDF versions
l) For service connections, all offsets from the property line must be indicated. In addition, the invert elevation, diameter, material, and depth at property line from existing ground level must be shown.
m) Drawing must be to scale, meaning if length or location are changed during construction, the drawing (not just dimensions) should be changed

## 3.1. AutoCAD Civil 3D/AutoCAD layers

The port authority does not require that consultants follow our specific layer standard. We do ask that all layer names be descriptive in nature and non-cryptic so as to be easily understood. We incorporate major infrastructure improvements into our GIS system and need all layer names to be easily identifiable. We prefer longer descriptive layer names to short cryptic ones.

## 3.2. Coordinate system

The port authority uses Universal Transverse Mercator (U.T.M.) Zone 10 North NAD83 coordinate system for all engineering drawings. If you are using an assumed coordinate system you must ensure that all new construction is surveyed and tied into UTM monuments. All surveys must be connected to the Integrated Survey System. AutoCAD drawing units should be set to meters and three decimal places.

## 3.3. Datum

For Burrard Inlet, all structures on the water (i.e., piers, dolphins, wharfs, docks, etc.) the port authority uses the Hydrographic (chart) datum. Chart datum = geodetic datum + 2.975m. Structures not associated with marine activity can be geodetic datum. The datum type must be shown either on the drawing or in the general notes. Please contact Supervisor, Spatial Data Group for datums to be used on Fraser River.

## 3.4. Record drawing content

a) Project cover sheet showing key plan of the overall site and the area of construction/repair
b) Drawing index with reference to all drawings in the contract in port authority record drawing number style (see **Section 2.4 Drawing numbers** for details)
c) Symbol legend to be included in the drawing set
d) Design criteria to be included in general notes
e) Drawings and procedures are to follow MMCD standards where applicable
f) For all water mains and storm and sanitary sewers, profiles must be provided with plan and profile views on the same sheet

## 3.5. Plan view

a) The plan view is to be drawn to a scale that appropriately shows the scope of work and the vertical profiles are to be exaggerated to clearly show the grade difference
b) All offsets of both existing and new services shall be indicated to the nearest 0.1 m and referenced to a property line. If property line is not known or inconvenient then the offset from the chainage line or edge of pavement should be included. Service connections are to be dimensioned from some known point (i.e., a property line or edge of a building).
c) Benchmarks or survey monuments are to be shown where known
d) A north arrow is to be clearly marked and all the street names indicated outside of the road boundaries
e) New works are to be drafted in bold lines and existing services in a light color (grey preferred)
f) All work done must be shown (e.g., removal/replacement of manholes, valve chambers, cleanouts) and clearly noted on the appropriate drawing

g) All drawings must clearly show the abandoned/removed utilities at exact locations and extent to which it applies. Abandoned services must also include capped connection locations and/or notes pertaining to how they were left in the field (i.e., grout filled for abandoned pipe, grouted stub ends for removed catch basins).
h) The rim, invert and depth are to be shown for all new manholes and existing ones being tied into. Manhole tables may be used to simplify this.
i) All services must be shown in their correct geospatial location
j) Where existing services are uncovered, the location and invert (or depth) of cover shall be noted on drawing

## 3.6. Profile view

a) The profile view will show:
    - Chainage should be noted at the baseline for all profiles
    - Elevations of new and existing works
    - New and existing service connections
    - Mains/services being crossed by the new works (and their elevations)
    - All data pertaining to the design of the works including diameter, material and slope for pipes and rim elevations and inverts for all manholes are to be clearly marked
    - All data will be based on U.T.M. grid coordinates
b) All grade changes are to show ties to lot corners
c) Profiles are to line up with the plan view
d) The material types, class, and size (e.g., PVC C900, Concrete CL III) must be shown on the profile for all pipes
e) All manhole and clean-out sizes are to be noted
f) Profiles must be shown for all sanitary (for pipes greater than 100 mm diameter) and storm services (for pipes greater than 150 mm diameter) except where the installation of connections from an existing main is the only work performed
g) Note additional requirements pertaining to specific drawings in Section 4

# 4. Drawing preparation – specific plan types

The port authority requires separate water, drainage, sanitary, road, streetlight, and traffic record drawings. Drainage and sanitary, or water and roads cannot be combined.

## 4.1. Storm and sanitary sewers

a) Connections of 100 mm diameter and greater shall be shown and noted on the plan with locations from lot corners
b) Main size, class, material, and manhole size are to be shown along with all elevations
c) Where a main ties to an existing stub, the balance of the distance to the existing manhole (from the design main) is to be shown
d) All lawn drains are to be dimensioned from the lot corners and include the size, material and rim elevation, along with the size, material and elevation of the lead
e) Minimum building elevations (MBE) are required
f) The 100 year hydraulic grade line (HGL) for storm is to be shown, plotted on profile of the system components, and compared with MBE in order to demonstrate flood protection
g) Detention pond information required:
    - All pipes with size, inverts and location
    - Capacity, high water elevation, base elevation
    - Control device(s) particulars

- Location, size, and elevation of all manholes, catch basins, etc.

h) Catch basins are to show rim elevation, offsets from property lines, and catch basin lead length

i) Particular attention should be paid to the requirement that location of service connections be shown both at the main “wye” and at the property line with the depth, size and invert

## 4.2. Water

a) All connections and fittings used are to be shown dimensioned related to the property line, where possible in reference to some easily recognizable surface feature. (e.g., building, edge of pavement, utility pole). If no reference point is available then a surveyed reference co-ordinate shall be provided complete with invert

b) Water connections 100 mm diameter and greater shall show size with elevation on plan view. Service box type shall be indicated on the plan.

c) The location of all bend points along horizontal or vertical curves are to be dimensioned related to the property line

d) Between each grade change, show the length and grade of that segment. A list of materials with manufacturers name and model number for all fittings is to be provided. Consultant is to verify connections, whether hub, flanged or mechanical.

e) Details shall be provided in areas such as tee and cross intersections where dimensioning and other information cannot be adequately conveyed at the main drawing scale

f) Water mains smaller than 100 mm diameter do not require a profile unless directed by the engineering department.

g) All lengths of pipe are to be labeled with the length, size, material and class of pipe

h) Special fittings, coating, cathodic protection systems, etc. must be detailed on the drawings. All appurtenances shall show manufacturers name and/or material type.

## 4.3. Electrical drawings

a) Electrical drawings (including fibre optic cable, hydro, telephone, communication, etc.):
   - Must show the duct bank run
   - Must clearly show the branches coming off from the duct bank
   - Must show all junction boxes, vaults, kiosks, service cabinets, transformers, substations etc.
   - All duct banks and branches should have detailed description notes stating number of conduits and sizes. The same is required for each conduit the wires/cables installed inside and the voltage where applicable.
   - Ownership of cables and service provided should be stated if known
   - For multiple conduits in a duct bank, a section showing details and cross section of the arrangement and depth of cover should be included

b) Street lighting:
   - The drawings will only include plan views. No profiles are required. All improvements (e.g., service boxes, poles) are to be related to property lines;
   - Drawings are to include illumination design data such as street name, land use, road classification, illumination type, illumination level, and uniformity ratio
   - Pertinent information (e.g., notes on existing lighting and service locations) must be retained. All other underground services and non-essential information should be removed from the plan.

## 4.4. Roads

a) A table showing horizontal curve and curve return data is to be shown on the road drawing
b) Pavement tapers are to be dimensioned with length of taper and the offset to existing pavement
c) The record drawing is to indicate the width of sidewalk, type of materials used and surface elevations. The offset of the sidewalk to the property line is to be shown.
d) Show all street furniture and features such as trees, traffic devices/signals, lamp standards, concrete barriers, guard rails, hand rails, integrated survey control monuments, etc.
e) The drawing will show the road geometrics and road markings

## 4.5. Test/bore holes

a) UTM coordinates for the test hole locations
b) Where a plan shows bore holes, an accompanying drawing must be included to show bore/test-hole data. No reference should be made to a separate report for data.

## 4.6. Monitoring survey drawings

a) Monitoring survey drawings should be in UTM NAD 83 coordinate system
b) Must include metadata (especially the vertical datum used)

## 4.7. Miscellaneous services

a) Gas/fuel lines and others should conform to content under water mains and sewers where applicable, however, profiles are not mandatory
b) Existing Infrastructure within the project area should be clearly shown including:
    - Water infrastructure services
    - Storm infrastructure services
    - Sanitary infrastructure services
    - Utility poles
    - Gas lines
    - Underground and overhead electrical lines
    - Edge of pavement
    - Ditches
c) Utilities discovered in the field that are different from plan should be noted for service, material, diameter, and location either by GPS or hand measured with reference to some identifiable object (e.g., building, edge of sidewalk, fire hydrant).