

CADD SPECIFICATION MANUAL



Third Edition – 1st Revision
January 2022



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CADD Specification Manual



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City of Toronto – CADD Specification Manual

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3rd Edition, 1st Revision – January 2022

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Introduction

We've written the Linear Infrastructure CADD Specification Manual to assist Design & Construction – Linear Underground Infrastructure and Transportation Infrastructure unit staff along with consulting engineers retained by the City of Toronto when preparing engineering drawings for capital projects for the Engineering & Construction Services division.

This manual gives an overview of the CADD drawing standards and specifications you will need when preparing any engineering drawing.

What This Manual Contains

Chapter 1 – Drawing Setup – covers drawing setup and settings for seed files, mapping co-ordinates, global origin, working units, drawing scale, level structure, DGNLIBs, resource files, colour tables and pen tables.

Chapter 2 – Project Setup – covers ProjectWise folder structure, PTP letter codes and file extensions, multi-discipline models, project drawing sheet and logical file names.

Chapter 3 – Title Blocks and Revisions – covers title blocks, professional seals and drawing revision notes.

Chapter 4 – Drawing and Plotting – covers aspects of drawing and plotting CADD files and specification checker.

Chapter 5 – Procedures for Consultants – covers the data transfer of outgoing files from the City, data incoming from consulting engineers, submission review and plotting of drawings.

Appendix A – Digital CADD Data Disclaimer – contains the standard digital data disclaimer notice regarding information supplied by the City.

Appendix B – Digital File Submission Form – contains the standard digital file submission form which must be completed and submitted with any corresponding digital files.

Appendix C – Bentley MicroStation Resources – contains a list of MicroStation filenames and their respective description.

Appendix D – Additional Documentation – contains a list of additional documents (some referred to in this manual) that may provide more information about the CADD specification.

Appendix E – Model Contents – contains mapping model descriptions and road, watermain, storm, sanitary and InRoads design model descriptions.

Glossary – an alphabetical list of technical terms used in this manual relating to computer aided design and drafting and their definitions.

Chapter 1 – Drawing Setup

Computer aided design and drafting (CADD) data produced by the Linear Underground Infrastructure or Transportation Infrastructure units in the Engineering & Construction Services division is subject to the standards, specifications and procedures as detailed in this manual. Additional documents mentioned should be used to supplement the information contained in this manual.

The Engineering & Construction Services division creates and maintains CADD data in Bentley MicroStation design file (.dgn) format. Data files are provided and exchanged using the MicroStation version 8 (V8i) file format.

Data originating from outside parties, such as contractors and suppliers, will be made available in its original format, without data conversion.

CADD files are exported, locked and packaged out of ProjectWise retaining its folder structure compressed in ZIP format with the CADD specification manual.

Recommended Software

The following software is utilized by staff in their day to day operations:

- Microsoft™ Windows 10 Pro
- Microsoft™ Office 2013
- Bentley™ MicroStation v8i (Select series 4)
- Bentley™ InRoads v8i (Select series 4)
- Bentley™ ProjectWise InterPlot Organizer (connect Edition)
- Bentley™ ProjectWise Explorer (version 10.00.02.265)
- Adobe Acrobat Version 9 (or better)

Seed File

All CADD files are created using City standard MicroStation seed files. These seed files are provided as part of the CADD information package.

There are nine seed files available and are listed in the following table.

Table 1: MicroStation seed files

Seed file name	Usage
CONTRACT.dgn	Contract Master File
PROJECT_SHEETS.dgn	Project Master Sheets
PROJECT_MAP.dgn	Base Mapping File
PROJECT_BF.dgn	Basement Flooding Project Design
PROJECT_RD.dgn	Road Design
PROJECT_SAN.dgn	Sanitary Sewer Design
PROJECT_STM.dgn	Storm Sewer Design
PROJECT_TTC.dgn	TTC Design
PROJECT_WM.dgn	Watermain Design
PROJECT_ALG.dgn	Alignment File
PROJECT_IRD.dgn	Design Corridor File
PROJECT_DTM.dgn	Digital Terrain Model File

Global Origin

The global origin (GO) is a point in space indicating the origin of the Cartesian co-ordinate system used in design plane co-ordinates. All CADD files use a standard global origin in the seed file of $x = 0$ and $y = 0$ for 2D files and $x = 0$, $y = 0$ and $z = 0$ for 3D files. This places the origin (0,0) of the design plane in the bottom left corner making all co-ordinates in the design plane positive.

A change to the global origin is not permitted.

Working Units

All CADD files have units of resolution as per the City standard seed files. The table below shows the settings for working units in the seed files.

A change to the units of resolution is not permitted.

Table 2: MicroStation working units

Setting	Value
Master Unit	Meters (m)
Sub Unit	Centimeters (cm)
Format	MU (master units)
Resolution	2500 units per meter

Mapping Co-ordinates

The City of Toronto's operational co-ordinate system is the 3-degree Modified Transverse Mercator (MTM), Ontario Zone 10, North American Datum 1927 (NAD27). All CADD files are drawn using this co-ordinate system. The X and Y co-ordinates are related to real world grid co-ordinates.

Within the geographic vicinity of the city of Toronto, metric co-ordinate values are in the range $\pm 4,800,000$ metres (northing) along the Y-axis and $\pm 300,000$ metres (easting) along the X-axis.

City base mapping and subsequent reference files are co-ordinated to this grid system (3° MTM).

All CADD files, when referenced together, shall represent the final work in its entirety.

Table 3: Co-ordinate system

Setting	Value
Datum	North American Datum 1927 (NAD27)
Projection	3° Modified Transverse Mercator (MTM)
Zone	10

Drawing Scale

Linear Design Work

All CADD files should be drawn to scale using metric units. Design files are drawn exclusively to a scale of 1:1. Master design files are plotted at a scale of 1:200. Available surrounds are pre-set at 1:1 and must be scaled to plot at 1:200. Commands in "Task Manger" are available to perform this scaling.

The number of the drawing sheet is dependent on the length and shape of the contract area.

Level Structure

Levels are used to separate various types of data. All elements in the design drawing files must be placed on their own pre-assigned level(s).

A "by-level" approach in the level structure is used. Each level is assigned a unique symbology such as colour, weight and line style that must be adhered to.

The level structure is stored in the V8_levels_ml_txts_dms_3.0.dgnlib DGN library (DGNLIB). Attaching DGN libraries (DGNLIBs) is described in the next section, "New Drawing, Making Resources Available", of this manual.

All files in the project must adhere to the same level structure. Changes to the level structure are not permitted.

A miscellaneous level is provided for instances of element must be drawn and shown on drawing that is not covered by level structure. User is permitted to change this level's attribute to suite. Use of this level shall be of last resort. Adding or changing level name is not permitted.

Additional Documentation

For more information about the level structure, see Linear Infrastructure – Version 3.0 MicroStation Levels reference

document. Each level in the graphic specification is documented with the following information:

- Level Name
- Level Number
- Level Description
- Level Line Style (by-level)
- Level Weight (by-level)
- Level Colour Number (by-level)
- Level RGB Colour Value

For document file name, see Appendix D, *Additional Documentation*.

New Drawing

All resources required for new drawings are contained in various files, with four main file types:

- dgnlib (DGN library)
- rsc (resource file)
- ctb (colour table file)
- cel (cell library)

The modification of any resource files is not permitted.

DGN Library

The DGN library, or dgnlib, is a special design file that contains data that is shared throughout files and among users. These shared resources consist of things that you define and name, which are used as standards by members of a workgroup.

The following data is stored in the supplied dgnlibs

- level definitions
- task shortcuts
- multi-line settings
- dimension settings
- text settings.

The following table lists the dgnlibs required for Version 3.0.

Table 4: DGN libraries

DGN library	Contains
V8_levels_ml_txts_dms_3.0.dgnlib	levels, multi-line settings, text styles; dimension settings
V8_tasks_3.0.dgnlib	task shortcuts

Resource File

The resource files, supplied with this version, contain various custom (user defined) line styles and fonts. The following table lists the resource files required for this version.

Table 5: Resource files

Resource file	Contains
svlstyl.rsc	engineering survey line styles
esm_udls.rsc	topographic mapping line styles
englstyl.rsc	engineering line styles (compatibility)
acadlstyl.rsc	AutoCAD line styles
v8_custom_linestyles_3.0.rsc	Linear infrastructure line styles
xfont.rsc	fonts

Colour Table File

The colour table file defines the colours associated with the levels. The following table lists the colour table file.

Table 6: Colour table files

Colour table file	Contains
bw.ctb	black and white colour table
engcolor.ctb	engineering colour table

Pen Table File

The pen table file defines plot priority correlated with logical name of reference files; controls colour, line style and weight associated with the levels. The following table lists the pen table file.

Table 7: Pen table file

Pen table file	Contains
plot_des.pen	pen table for large format plotting

Chapter 2 – Project Setup

ProjectWise Folder Structure

The Engineering & Construction Services (ECS) division uses Bentley ProjectWise Explorer document management system to store and track Microstation CAD files for Capital Works Projects.

Capital Works Project related folders and CAD files will be created during project initiation by ProjectWise administrators.

The following is a sample of the Capital Works Project structure in ProjectWise.

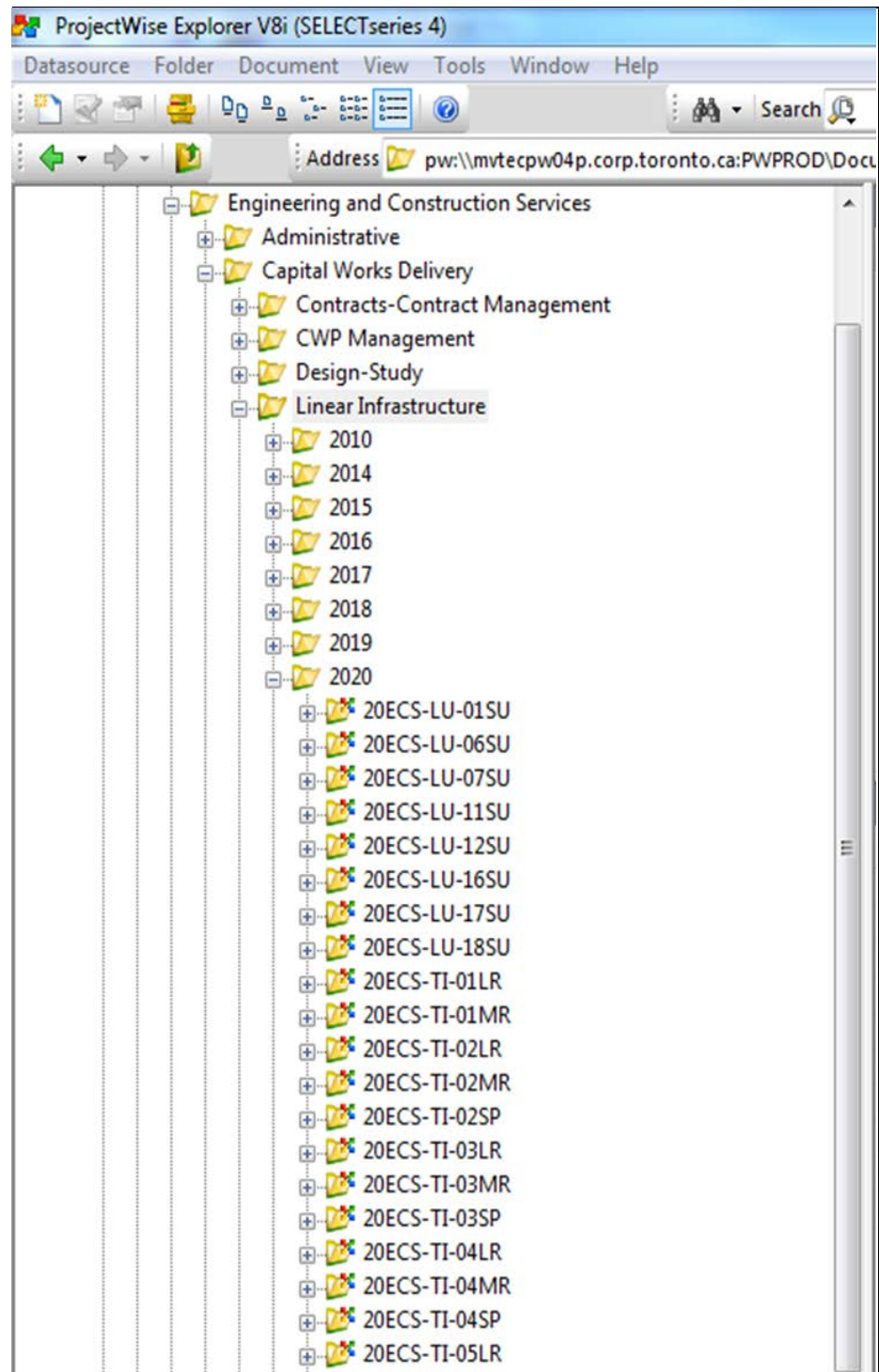


Figure 1: Capital works project structure

Project Set-up

Contract folders are setup in ProjectWise based on the year and contract number.

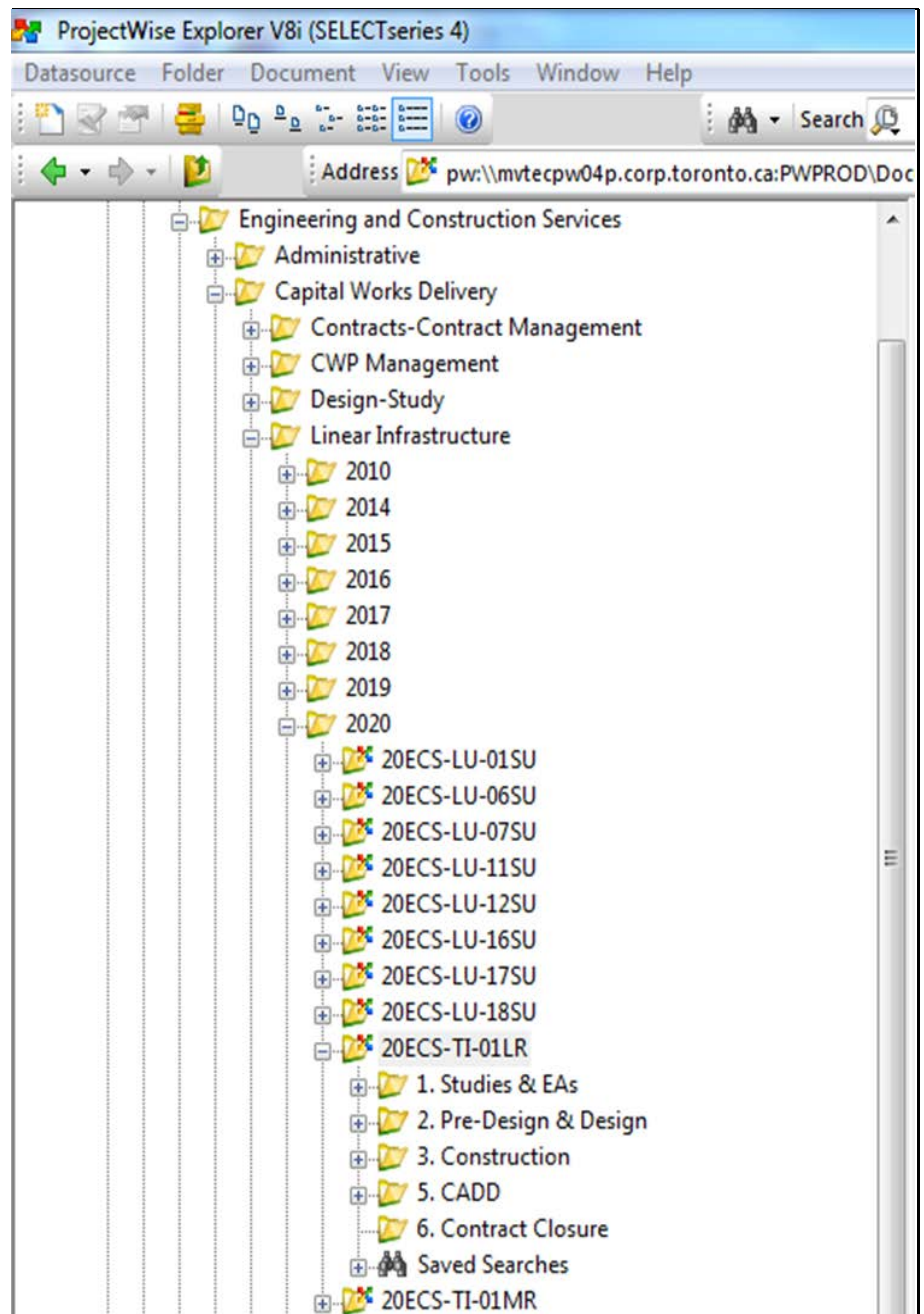


Figure 2: Contract folder structure

The CADD folder will contain all projects in the contract. Each project will contain three subfolders;

1. Design
2. Support Data
3. Survey

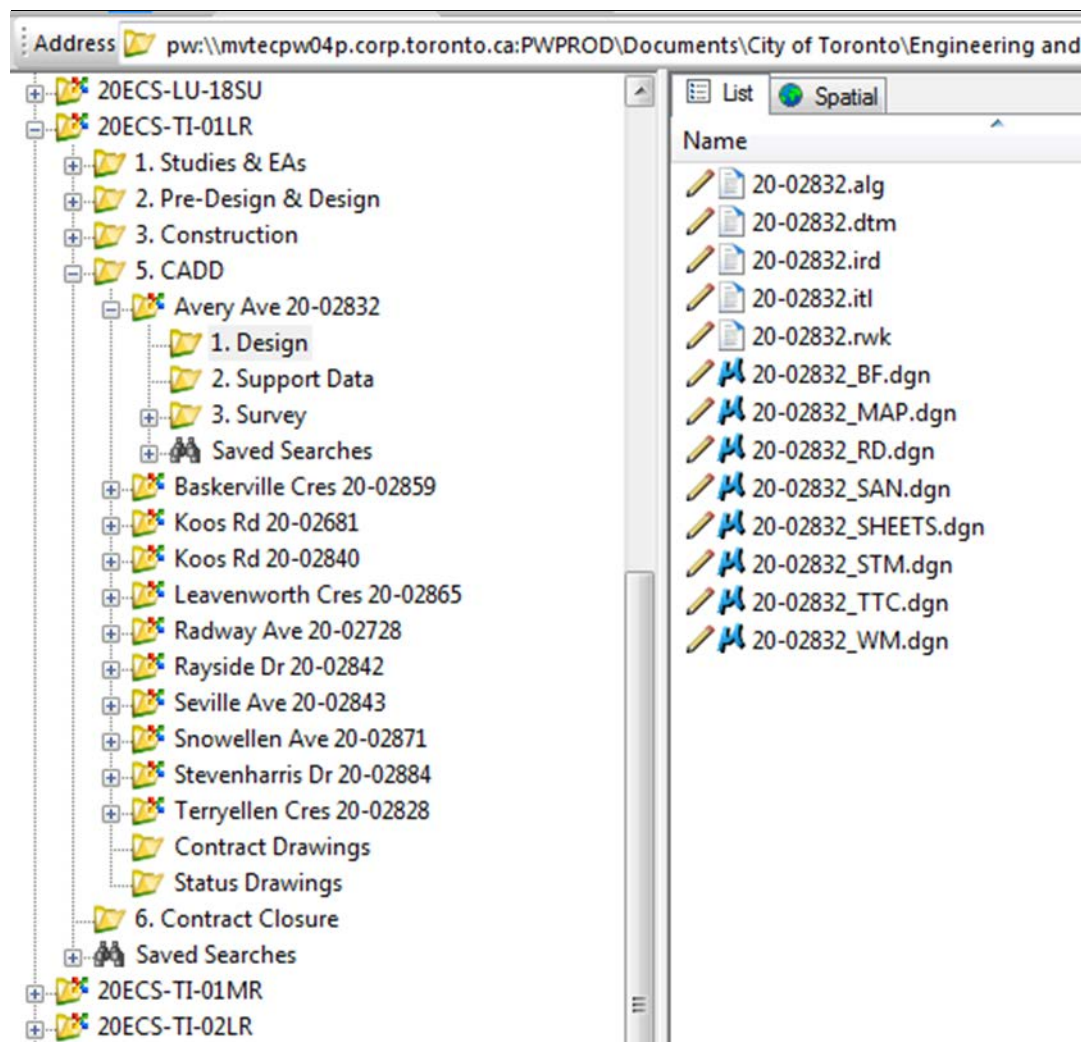


Figure 3: CADD folder structure

Design unit's CAD files will reside in the Design folder.

Utility circulation responses, client functional design, external source files and all related support documents will reside in the Support Data folder.

Survey unit's survey files will reside in the Survey folder.

Each project will be identified by the street name and the PTP number. See Figure 3 above for example.

File Creation and Letter Codes

Microstation files will be created for each project during initiation. The files are based on PTP number and letter code. A version will be made of the MAP file during the load, to retain the original data. The following table illustrates the initial MicroStation files generated based on PTP number with letter codes and the file descriptions.

Table 8: PTP letter codes

PTP number	Letter code	File description
19-00001	SHEETS	Project Drawing Sheets
19-00001	MAP	Mapping
19-00001	RD	Road Design
19-00001	SAN	Sanitary Sewer Design
19-00001	STM	Storm Sewer Design
19-00001	TTC	TTC Design
19-00001	WM	Watermain Design
19-00001	ALG	Alignment
19-00001	IRD	Design Corridor
19-00001	DTM	Digital Terrain Model

InRoads files will be created for each project during initiation using PTP number with file extension determine the file types.

Table 9: PTP file extension

File	Description
19-00001.alg	Alignment File
19-00001.dtm	Digital Terrain Model
19-00001.ird	InRoads Roadway Design
19-00001.itl	InRoads Template
19-00001.rwk	InRoads Project File

Filename Syntax

Drawing sheets filename will have the following format:

PTP Number_Letter Code.dgn

Example: 19-00001_SHEETS.dgn

Base mapping filename will have the following format:

<PTP Number> + "_" + <Letter Code>.dgn

Example: 19-00001_MAP.dgn

Design MicroStation filenames will have the following format:

<PTP Number> + "_" + <Letter Code>.dgn

Example: 19-00001_RD.dgn; 19-00001_WM.dgn and so on.

Design InRoads filenames will have the following format:

<PTP Number> + file extension

Example: 19-00001.alg; 19-00001.itl and so on.

Survey filenames will have the following format:

<PTP Number> + "_" + <Letter Code>.dgn

Example: 19-00001_PSVY.dgn and so on.

Multiple Files of Same Name

Where multiple files are required that would have the same name, the first file will be appended with "_1" and additional files will be appended with "_" + sequential number without leading zeros.

Use of Models

A standard set of models will be provided in the initial CADD files, as shown on Table 10 below. Additional models can be created as needed by the user.

Multi-discipline projects that have duplicate models within multiple files should only use one model throughout the design. The user shall use the model that appears first in the table below.

Table 10: Multi-discipline models

File	Initial models	Description
RD	PD	Road and/or sidewalk design (plan view)
	PF	Design profile (profile view)
	SH	Shapes, shading and pattern for design (plan view)
	INR2D	InRoads working file
TTC	ROW	TTC track allowance design (plan view)
	PD	Road and/or sidewalk design (plan view)
	PF	Design profile
	EUPL	TTC electrical design inclusive of electrical related items e.g. poles handwell, conduits
	SH	Shapes, shading and pattern for design (plan view)
	INR2D	InRoads working file
WM	WAT	Watermain design (plan view)
	WATPF	Watermain design profile
	SH	Shapes, shading and pattern for design (plan view)
SAN	SAN	Sanitary design (plan view)
	SANPF	Sanitary design profile
	SANDA	Sanitary drainage area design
	SH	Shapes, shading and pattern for design (plan view)
STM	STM	Storm design (plan view)
	STMPF	Storm design profile
	STMDA	Storm drainage area design
	SH	Shapes, shading and pattern for design (plan view)

Table 10: Multi-discipline models (continued)

File	Initial models	Description
MAP	KEY	Key map/general location plan
	PSL	Property lines and address
	TOP	ESM topographic mapping
	UGS	Existing utility information from TPUCC or CUMAP data, utility circulation
	SVY	Survey field pickup
	SUE	Subsurface underground evaluation used to supplement UGS file

Microstation files for InRoads will have standard set of models, user can create additional models as needed.

Table 11: InRoads additional models

File	Initial models	Description
ALG	ALG	Design Alignment
IRD	IRD	Design Corridor
DTM	Exist	Survey digital terrain model
	Prop	Design digital terrain model

Multiple Models of Same Name within a File

Where multiple models are required that would have the same name, the first file will be appended with "_1" and additional files will be appended with "_" + sequential number without leading zeros.

Additional models

Where additional models are required that are not part of initial model creation, Table 12 outlines the naming suffixes to be

used as reference for how to name the models within the design files.

Table 12: Additional models

File	Model	Description
RD, TTC, WM, SAN, STM	ARCH	Architectural design
	DET	Details and sections
	ELEV	Optional additional design elevation separate from PD
	ELEC	Electrical design
	REM	Large scale removals (plan view)
	SEL	Street lighting design
	SSC	Street scaping and landscaping design
	RAD	Radii reduction assessment
	TCS	Traffic control signal design
	TSP	Traffic control or staging plan
	UD	Third party utility design
	PVM	Pavement marking
MAP	ASB	File updated by as built information
	CON	EMS Contours
	TUP	Topographic update not surveyed

Survey Files

Survey files will be loaded into the project CADD survey folder and the survey staff will set the document state to 'Final', which will prevent ECS CADD users from editing the file.

19-00001_PSVY.dgn
 19-00001_PSVY2D.dgn
 19-00001_PSVYEL.dgn
 19-00001_PSVY.alg
 19-00001_PSVY.dtm

The design team will merge content from the survey files into the SVY model of MAP file for editing.

Project Drawing Sheets

Design models will be used to produce all drawing sheets.

One file will be placed in each project's Design folder for the drawing sheets. Sheets will be produced in separate design models. Project drawings will be numbered using the PTP number followed by a dash and a sequential number from 1 to n, as a three digit number with leading zeros. Model names must match the drawing numbers.

For example, a project that contains:

- road design – 4 sheets
- watermain design – 3 sheets
- storm sewer design – 1 sheet

will have drawing numbers

19-00001-001
19-00001-002
19-00001-003
19-00001-004
19-00001-005
19-00001-006
19-00001-007
19-00001-008

Table 13: Project drawing numbers

File	Model	Description
19-00001_SHEET	19-00001-001	Drawing Sheet
	19-00001-002	Drawing Sheet
	19-00001-003	Drawing Sheet
	19-00001-004	Drawing Sheet
	19-00001-005	Drawing Sheet
	19-00001-006	Drawing Sheet
	19-00001-007	Drawing Sheet
	19-00001-008	Drawing Sheet

Miscellaneous Drawings

Additional drawings needed to circulate to approval agencies or other purposes will also be created in the SHEETS file. These will be given drawing numbers in the following format:

<PTP Number> + "-M" + two digit number with a leading zero

Example: 19-00001-M01
 19-00001-M02
 19-00001-M03

Consultant Drawings

Consultants will follow the same naming convention as internal design. For internal projects where consultants are submitting drawings in addition to our internal design, each consultant will be given a number to use in the hundreds column to use for drawing numbers.

For example:

Consultant 1 will start at 19-00001-101

Consultant 2 will start at 19-00001-201

Traffic signal pedestrian crossing or PX drawing numbers will remain the same as they are received.

Contract Master Sheets

One CADD file will be placed in Contract Drawing sub folder in the CADD folder, which will have models for the cover sheet, general notes, and other general / contract level sheets. The filename will be:

Contract.dgn

The file shall be renamed by design staff to match the contract number.

Example: 19ECS-TI-01SP.dgn

Drawing numbers for the cover sheet and general notes will be:

<contract number> + "-G" + sequential number from 1 with no leading zeros.

Example: 19ECS-TI-01SP-G1

Reference Files and Logical Names

When referencing models into the drawing sheets logical names are to be used. Logical names are to be the same as the model names.

Table 14: Logical model names

Model	Logical name
PD	PD
PF	PF
SH	SH
INR2D	INR2D
ROW	ROW
PF	PF
EUPL	EUPL
INR2D	INR2D
WAT	WAT
WATPF	WATPF
SAN	SAN
SANPF	SANPF
SANDA	SANDA
STM	STM
STMPF	STMPF
STMDA	STMDA
KEY	KEY
PSL	PSL
TOP	TOP
UGS	UGS
SVY	SVY
SUE	SUE

Table 14: Logical model names (continued)

Model	Logical name
ARCH	ARCH
DET	DET
ELEV	ELEV
ELEC	ELEC
REM	REM
SEL	SEL
SSC	SSC
RAD	RAD
TCS	TCS
TSP	TSP
UD	UD
PVM	PVM
ASB	ASB
CON	CON
TUP	TUP

Where the same model is attached multiple times to the same file, the logical name of first attachment will be appended with "-1" and additional reference attachment will be appended with "-"+ sequential number without leading zeros.

Pavement Marking and Traffic Signal Drawings

Transportation Services will assign their own drawing numbers, and ECS will use those drawing numbers in our tender. ECS will require a hard copy, and a pdf of these drawings.

Chapter 3 – Title Blocks and Revisions

Title Block

All drawing sheet must have a title block. A standardized title block is created by placing the appropriate "surround" cell from the v8_linear_cells_3.0.cel cell library. The blank fields in the standard surround cell, generally "tagged" text, must be filled in or edited accordingly. A blank title block is shown in Figure 4 below.

----- CONSULTANTS							
<p style="text-align: center;">STREET NAME PROJECT LIMITS WORK TYPE DRAWING TITLE</p>							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING #		SHEET X OF X	
DATE	DATE						

Figure 4: Blank title block

For in-house design projects, the levels of the consultants signature line and surrounding boxes shall be turned off.

Main Information

The "Main Information" area contains the following "tagged" text fields to fill in:

- project street name or structure name
- limits (from | to) shown on the particular sheet
- project work type; can include multiple work types
- drawing title for plan or plan and profile

Figure 5 shows the "Main Information" area field in the title block.

<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Main Information Area </div>							
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> STREET NAME PROJECT LIMITS WORK TYPE DRAWING TITLE </div>							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 5: Blank title block showing "Main Information" area

Date

The "Date" area field has the date of the last change made and is shown using the "month, year" format (for example — July, 2019). All submitted drawings will include the latest up-to-date "Date". The "Date" is a "tagged" text field

<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Date Area </div>							
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> STREET NAME PROJECT LIMITS WORK TYPE DRAWING TITLE </div>							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 6: Blank title block showing "Date" area

Drawing Number

The "Drawing Number" area "tagged" text field must be populated with the correct drawing number. The drawing number naming convention for the title block drawing number is described in detail in Chapter 2, *Drawing Setup*.

Figure 7 shows the "Drawing Number" area field in the title block.

CONSULTANTS						Drawing Number Area	
STREET NAME PROJECT LIMITS WORK TYPE DRAWING TITLE							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 7: Blank title block showing "Drawing Number" area

Scale

For linear work the "Scale" area field is shown in horizontal for plan view and vertical for profile view. All Linear Underground Infrastructure and Transportation Infrastructure plans shall be drawn to the following scales:

Horizontal 1 : 200
Vertical 1 : 100

If only "horizontal" information is shown on the drawing, then the "vertical" component can be excluded, that is to say deleted. If only "vertical" information is shown on the drawing, then the "horizontal" component can be excluded, that is to say deleted. The "Scale" area field is not a "tagged" text field.

Figure 8 shows the "Scale" area field in the title block of the linear design surround.

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Scale Area </div>							
CONSULTANTS							
STREET NAME							
PROJECT LIMITS							
WORK TYPE							
DRAWING TITLE							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 8: Blank title block showing "Scale" area

Design, Drawn and Checked

The "Design, Drawn and Checked" area fields must include the first and last initials with no period of any individuals who performed these tasks. The "Design, Drawn and Checked" area is a "tagged" text field.

Figure 9 shows the "Design, Drawn and Checked" area fields in the title block.

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Design, Drawn and Checked Area </div>							
CONSULTANTS							
STREET							
PROJECT LIMITS							
WORK TYPE							
DRAWING TITLE							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 9: Blank title block showing "Design, Drawn and Checked" area

Contract Number

The "Contract Number" area field is only filled in for final tendered contract drawings. There may be more than one contract number for a given project depending on the type of work. The "Contract Number" area is a "tagged" text field.

Figure 10 shows the "Contract Number" area field in the title block.

DESIGN						CONTRACT No.		CONTRACT NUMBER	
SCALE						DRAWING NUMBER		DRAWING #	
DATE						SHEET		X OF X	

Figure 10: Blank title block showing "Contract Number" area

Sheet

The "Sheet" area field is for tracking multiple sheets for the same project. The "Sheet" area is a "tagged" text field.

For linear design work, something like "1 of xx" should be used to indicate the number of sheets.

Figure 11 shows the "Sheet" area field in the title block.

CONSULTANTS							
<div style="text-align: center;"> STREET PROJECT WORK TYPE DRAWING TITLE </div>							
DESIGN	DESIGN	DRAWN	DRAWN	CHECKED	CHECKED	CONTRACT No.	CONTRACT NUMBER
SCALE	HORIZONTAL 1:200 VERTICAL 1:XXX			DRAWING NUMBER		DRAWING #	
DATE	DATE					SHEET X OF X	

Figure 11: Blank title block showing "Sheet" area

Professional Seals

Drawings that require a professional signature will be sealed, signed and dated by a professional engineer licensed to practice in the province of Ontario. Apply seal, sign and date by hand.

Signature and date must be applied by hand. The seal and date must be clearly legible.

Figure 12 shows the "Professional Seals" area.



 Engineering & Construction Services			
		MICHAEL D'ANDREA, P.ENG CHIEF ENGINEER and EXECUTIVE DIRECTOR Engineering & Construction Services	FRANK CLARIZIO, P.ENG. Director, Design & Construction Transportation Infrastructure
			LUIS DE JESUS, P.ENG. Manager, Design & Construction Transportation Infrastructure Local Roads

Figure 12: Engineer's professional seal and manager's signature

Engineer's Information and Disclaimer

The engineer's seal area of the title block shall be filled in by the City engineer overseeing the project or by the consulting engineer retained by the City.



For in-house design projects the delivery unit's manager shall sign the drawings. Signature shall be placed above unit managers' name and title.

All revisions to any CADD drawing will be made to the respective CADD digital file. Hand drawn modifications are not permitted.

The revision notes box must have the fields filled in after the revision to the CADD digital drawing is completed.

Table 15: Revision notes fields

Field name	Description
No.	Sequential number beginning at the number one (1)
Date	Current date in month-day-year format (06-25-2019)
Revisions	Short description of the revision made
Initial	Initials of the individual that completed the revision
Signed	Signature of individual that completed the revision

	Mo.Day.Yr	ELEVATIONS REVISED AT NORTH WEST CORNER OF INTERSECTION X	XX	
	Mo.Day.Yr	PROP CB AND LEAD ADDED AT STA X+XX.XX	XX	
No.	DATE	REVISIONS	INITIAL	SIGNED

A revision symbol will be placed in the body of the drawing indicating the location to which the title block revision note applies to. This revision symbol will be shown as a triangle with the corresponding revision number inside the triangle.

Chapter 4 – Drawing and Plotting

Drawing

Task Manager

The MicroStation Task Manager is a tool to facilitate automatic drawing functions associated with design. It is part of the available MicroStation tools.

All linear features such as multi-lines, cells, models, text settings, dimension settings and so on have been incorporated into the Task Manager to enable design staff to automatically place design features and to manage various CADD settings associated with design. The Task Manager has been configured to allow element placement without having to set any graphic attributes such as level, line style, colour, weight and so on. The designer need only to select the required task and Task Manager will automatically place elements with the correct settings and attributes.

Additional Documentation

For more information about the Task Manager and its use, see the reference document Linear Infrastructure MicroStation Linear Tasks (Tree Structure) – v3.0.

For document file name, see Appendix D, *Additional Documentation*.

Cells

Standard cells are stored in a cell library. This library file contains a ".cel" file extension.

Shared cells are not to be used. Cells should not be dropped—broken into individual graphic components. The exception to dropping cells is for "surround" cells which require the title block information to be modified for each project.

The following table lists the available cell libraries delivered in the information package.

Table 16: Cell DGN libraries

DGN library	Contains
v8_linear_cells_3.0.cel	models for patterning; terminators; miscellaneous; InRoads; surrounds; cover pages; utilities and fittings
areapat.cel	additional models for patterning

Additional Documentation

For more information about the cells, see the Linear Infrastructure – Version 3.0 MicroStation Cells reference document. All cells from the cell DGN libraries are shown in this document.

For document file name, see Appendix D, *Additional Documentation*.

Orientation

- Orient plans so that north points up, whenever possible.
- Insert a standard north arrow in the top right corner of the plan view.
- The direction of the drawing set shall start at the project limit with the higher road classification and end at the project limit with the lower road classification, dead end or mid-block if applicable.
- Orient views in the same direction.
- Do not move, rotate or scale plan view CADD data for "linear" work.
- Move and rotate border surround as required.

Scale

Elements placed within a MicroStation design file should be drawn at a scale of 1:1—no scaling. This is the case for all linear design work.

Line Weight

Line weight differences must be clearly visible on both full and half size plots. The following table is to be used as a guide.

Table 17: MicroStation line weight to metric width chart

MicroStation line weight (wt=)	Metric width (mm)
0	0.13
1	0.18
2	0.20
3	0.25
4	0.30
5	0.35
6	0.40
7	0.45
8	0.50
9	0.60
10	0.70
11	0.80
12	1.00
13	1.20
14	1.40
15	1.50
16	1.60
17	1.80
18	2.00
19	2.25
20	3.00

For information about the recommended line weights and corresponding metric width when plotted in full size, go to the Plotting section in this chapter.

Line Styles

Line styles are stored in resource (rsc) files and should be loaded through a MicroStation "WorkSpace" —as previously discussed on page 5. The following table lists the resource line style files delivered in the information package.

Table 18: Line style resource files

Resource file	Contains
svylstyl.rsc	engineering survey line styles
esm_udls.rsc	topographic mapping line styles
englstyl.rsc	engineering line styles (compatibility)
acadlstyl.rsc	AutoCAD line styles
v8_custom_linestyles_3.0.rsc	Linear Infrastructure line styles

Most custom line styles developed by the City for design work will be located in the v8_custom_linestyles_3.0.rsc file.

The creation of new line styles is not permitted.

Additional Documentation

For more information about the line styles, see the Linear Infrastructure – Version 3.0 MicroStation Line Styles reference document. All line styles from the resource files are shown in the document.

For document file name, see Appendix D, *Additional Documentation*.

Patterns and Hatching

Apply any necessary patterns to detail on small scale drawings. Use the standard patterns as delivered with MicroStation or as provided in the areapat cel and v8_linear_cells_3.0.cel cell libraries.

Using MicroStation "Task Manager" will simplify drafting operations by setting the correct pattern or hatching based on

the selected task. It is up to the designer to select the correct tool for patterns and hatching, depending on the type of element(s) that is to be patterned or hatched.

Text Style and Size

Fill text nodes, data fields and tags with text using uppercase letters only.

Use standard fonts as delivered with MicroStation or as provided in the v8_levels_ml_txts_dms_3.0.dgnlib DGN library.

Font is Segoe UI Light for existing feature text and Arial for proposed feature text.

All text attributes are pre-set in the MicroStation "Task Manager".

Additional Documentation

For more information about the text styles, see the Linear Infrastructure – Version 3.0 MicroStation Text Styles reference document. Text styles from the DGN library are shown in the document.

For document file name, see Appendix D, *Additional Documentation*.

Drafting Abbreviations

Use abbreviations only when space restricts the spelling of the full word.

Match Lines

Where partial working areas are shown, display sheet limits by including match lines. Coordinate match lines with adjacent sheets by including the drawing name along the match line and outside of the working area. Match lines shall be perpendicular with the baseline, with the entire right-of-way visible within the drawing.

Key Plan

The key plan will be used to show the extent of the working area and spatially relate the project to the surrounding area.

Some things to note about key plans:

- The key plan is to be located in the top right corner of the surround.
- The key plan is to include a north arrow.
- The key plan is to highlight the project street and have a least two (2) major arterial roads visible.
- Outline the extent of work covered by each sheet and shade the working area accordingly.
- Key plans must match the level structure.

Leader Lines

Leader lines should have a short horizontal bar leading in and leading out from the text. Use filled arrowheads.

Leader lines and auto dimensioning is pre-set in the MicroStation Task Manager. The v8_levels_ml_txts_dms_3.0.dgnlib DGN library contains these settings.

Multi-Lines

Multi-lines are pre-set in the MicroStation Task Manager. These settings reside in the v8_levels_ml_txts_dms_3.0.dgnlib DGN library.

Additional Documentation

For more information about multi line styles, see the Linear Infrastructure – Version 3.0 MicroStation Multi Line Styles reference document. Multi line styles from the DGN library are shown in the document.

For document file name, see Appendix D, *Additional Documentation*.

Dimensions

All dimensions should be shown in metres. Geodetic elevations, chainages, alignments and site drawings should be shown in metres.

Dimensions settings are contained in the v8_levels_ml_txts_dms_3.0.dgnlib DGN library.

Using MicroStation "Task Manager" will simplify drafting operations by setting the correct dimension style based on the selected task. It is up to the designer to select the correct tool for the dimensioning, depending on where or type of dimension to be placed, for example linear, angular and so on.

Some things to note about dimensioning:

- Use automatic dimensioning — real size length.
- Use filled arrowheads for dimension terminators.
- Stagger and offset dimension lines from each other starting with minor dimensions placed close to the working area, then major dimensions and then overall dimension lines.
- Use three (3) decimal places for proposed features (182.137) and two (2) decimal places for existing features (182.14).

Additional Documentation

For more information about the dimension styles, see the Linear Infrastructure – Version 3.0 MicroStation Dimension Styles reference document. Dimension styles from the DGN library are shown in the document.

For document file name, see Appendix D, *Additional Documentation*.

InRoads

InRoads is an application for road design from Bentley Systems Incorporated that is used in conjunction with MicroStation.

Features in InRoads will be generated using the level names and symbology provided.

The following table shows files that must be delivered by the consulting engineer on completion of the project.

Table 19: InRoads seed files

File type	Extension	Description	Required
geometry projects	alg	All related alignments	yes
surfaces	dtm	All digital terrain models, existing and proposed	yes
template libraries	itl	All template files	yes
reports	various	All supporting reports	yes
InRoads projects	rwk	All InRoads projects	optional

A copy of the v8_civil_3.0.xin file for InRoads is available as part of the consultant package.

Specification Checker

To ensure that design CADD files adhere to the graphic specification defined by this version, a specification checker is available for this purpose. The specification checker, developed by Business Improvement and Standards unit, is a VBA macro launched from MicroStation. Single files or multiple files can be checked with a report generated to indicate any discrepancies. The specification checker can be launched from "Task Manager".

The following table lists the files required for the specification checker.

Table 20: Files required for specification checker

File name	Purpose
spec_checker_v7.mvba	MicroStation VBA macro application.
log_viewer.mvba	Add on tool for specification checker which provides ability to analyze error logs
spec_checker_batch_3_0.bprc	Settings files for run specification checker in batch
spec_checker_cmd_3_.txt	

All generated CADD files should be scanned by the specification checker with non-compliant elements corrected before submission.

Additional Documentation

For more information about the specification checker, see the *Specification_Checker_User_Guide*. All aspects of the specification checker are covered in this document.

For document file name, see Appendix D, *Additional Documentation*.

Plotting

The plotting environment includes the modified Bentley InterPlot (lplot) pen tables for large format and tabloid size devices. The following table lists files available for the plotting environment.

Table 21: Files required for lplot plotting environment

File	Description
plot_des.pen	Pen table for large format plotting
engcolor.ctb	Colour table for colour plotting
bw.ctb	Colour table for black and white plotting

Sheet Size

Surround cells include outer selection points which can be used to place a fence block for Bentley InterPlot (lplot). When these selection points are used and Bentley InterPlot (lplot) activated, the settings file will attach the default attributes to produce plots on 24 inch paper at a scale of 1:200. Sheet sizes of 24 inch x 36 inch, 24 inch x 48 inch or 24 inch x 60 inch will determine the length of each plot.

Each set of plots for a project must contain the same size plots.

The default is 24 x 60 inch sheets.

Drawing Path and File Name

City Bentley InterPlot (lplot) users will have a plot label added automatically by the lplot server at the end of each plot using the following label string format:

\$qpr_reqname submitted by \$qpr_orig_user from \$qpr_host on
\$date at \$time

Plot Material

The project check plot submission will be plotted on 20 pound minimum bond paper.

For the final submission, plots will be plotted on 4-mil thick mylar with a matte finish.

Drawing Sheet Plot

The plot limit will be set to the outermost boundary box.

For Bentley InterPlot (Iplot) users, the colour table bw_3.0.ctb and pen table plot_des_3.0.ctb should be used, see Table 6 and 7, respectively.

For non-Iplot users, the next table shows the recommended line weights and corresponding metric width, when plotted in full size.

Table 22: Recommended line weights when plotted in full size

MicroStation line weight (wt=)	Metric width (mm)
0	0.13
1	0.18
3	0.25
4	0.35
7	0.50
10	0.70
15	1.50

Standard Drafting Practices

The following commonly accepted engineering drafting practices shall be followed when preparing capital works project drawings:

- A north arrow shall be placed on every drawing, in the top right corner of the plan view.
- A legend shall be placed on every drawing.
- All text on the drawing shall be uppercase.
- All text on the drawing shall be rotated to be parallel with the drawing surround.

- Text should not overlap with other text or heavy proposed line work.
- Abbreviations should only be used when space restricts the spelling of the full word.
- Dimension line and leader lines should not cross with other dimensions or leader lines.
- Match lines shall not be placed within intersecting streets.
- Text shall not be placed upside down on a drawing. If text is perpendicular (right angle) to the drawing surround or on an acute angle, it shall be placed to read from bottom up. If text is on an obtuse angle, it shall be placed to read from top down.

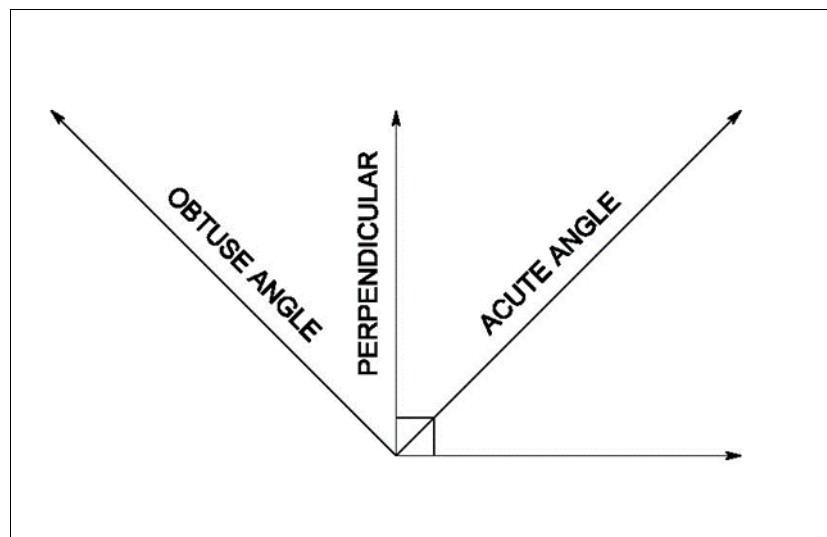


Figure 14: Text orientation angle

Chapter 5 – Procedures for Consultants

At the project start-up meeting, the consulting engineer will receive all files required to complete the assignment via download from a FTP site.

The download will contain the following:

- CADD Specification Manual prepared by the Engineering & Construction Services division for use on sewer, watermain and road construction projects.
- Supporting documents referred to in the CADD Specification Manual.
- The external workspace package of which a self-extracting ZIP executable which will un-package all resource files to the path C:\Toronto\Workspace.

Data Format and Conversion

All computer aided design and drafting (CADD) data is provided in Bentley MicroStation version 8 (V8) design file (dgn) format. Any conversion of digital data is not allowed, and shall be rejected by the City.

The City is not responsible for any inaccuracies, discrepancies or missing information derived from data that is converted outside of the Bentley MicroStation format.

Data Transfer – Data Outgoing from the City

All CADD data transfers outgoing from the City will be prepared by BIS staff and transferred to project manager or engineer.

Data will be transferred and delivered via an FTP site or by email message.

Linear Infrastructure Disclaimer

All data file transfers come with a City CADD disclaimer. The full text of the disclaimer is shown in Appendix A, *Digital CADD Data Disclaimer*.

Digital Data Submitted to the City

The consulting engineer is required to submit a CADD digital file at each contract milestone as specified in the project documentation. This includes a full submission at the time when the project reaches any of the following milestones, if any such milestones are identified in the contract specification:

- 100% design review
- Issue for tender
- Issue for construction
- As-built

Additional milestones may be applicable. All file submissions will be delivered to the project manager or engineer, who in turn forwards the digital file to BIS unit staff to reload back into ProjectWise.

All CADD data submitted must be delivered in Bentley MicroStation version 8 (V8) design file (dgn) format. CADD data in formats other than MicroStation will not be accepted.

Data shall be submitted by email or download from an FTP site.

Any milestone submission will include a complete set of all digital files prepared by the consulting engineer, including any files that have not been modified since any previous submissions, as long as such files are still significant to the project as a whole.

A *Digital Submission Form* must be completed by the consultant for each submission made. A sample of a completed form can be found in Appendix B, *Digital File Submission Form*.

Submission Review

The submission of all digital files will be reviewed by City staff to ensure compliance with the standards and specifications identified in this manual.

Files submitted will be checked with a MicroStation specification checker macro. Submissions failing to meet any of the standards and specifications will be returned to the project engineer along with a listing of all the non-compliant items which will need to be resolved by the consulting engineer.

Plotting of Drawings

The City utilizes Bentley InterPlot (Iplot) to produce all hard copy plots of CADD data. For more information about plotting, go to Chapter 4, *Drawing and Plotting*.

For details regarding submission of drawings in hard copy format, such as frequency and quantities, refer to the specific requirements for your project, or contact the City project manager responsible for the project.

Appendix A – Digital CADD Data Disclaimer

Digital Data Disclaimer

Information supplied by the City of Toronto, on portable media or transmitted by electronic means, is provided for convenience only. While efforts are made to see that the information contained hereon is accurate and up-to-date

- neither the City of Toronto nor any of its employees, officers or servants shall be liable for damages arising from any errors or inaccuracies therein, nor from any misuse, misinterpretation or misapplication thereof; and
- the consultant accepts full responsibility for verifying the accuracy and completeness of the data supplied hereon and assumes full responsibility for any risk associated with the use, misuse, misinterpretation or misapplication thereof; and
- the said information is not included under the seals or certificates, if any, on any accompanying plans or printed material; and
- in the event of inconsistencies between said information and hard copy data, the hard copy data shall govern.

All data provided remains the property of the City of Toronto. All rights reserved. No portion of this document may be copied or distributed without prior written consent.

The City of Toronto considers any information that is not part of the public domain, such as parts of drawings that identify non-public areas to be confidential. Any confidential information is transmitted subject to the terms of your contract with the City, or subject to the non-disclosure agreement executed with the City for this purpose.

Appendix C – Bentley Microstation Resources

File Names

Table 23: MicroStation file names

File name	Description
Contract.dgn	Contract master file, e.g. cover sheet, general notes
Project_SHEETS.dgn	Project master sheets
Project_ALG.dgn	Alignment
Project_BF.dgn	Basement flooding project design
Project_DTM.dgn	Digital terrain model
Project_IRD.dgn	Design corridor
Project_RD.dgn	Road design
Project_SAN.dgn	Sanitary sewer design
Project_STM.dgn	Storm sewer design
Project_TTC.dgn	TTC design
Project_WM.dgn	Watermain design
Project_MAP.dgn	Base mapping file
v8_dcli_3.0.ucf	MicroStation user configuration file
acadlstyl.rsc	AutoCAD line styles
englstyl.rsc	Engineering line styles
esm_udls.rsc	Topographic mapping line styles
svylstyl.rsc	Engineering survey line styles
v8_custom_linestyles_3.0.rsc	Custom line styles
xfont.rsc	Text fonts
engcolor.ctb	Engineering colour table
v8_levels_ml_txts_dms_3.0.dgnlib	Levels; multi-line settings; dimension settings; text settings; tasks

Table 23: MicroStation file names (continued)

File name	Description
plot_des.pen	lplot pen table for large format plotting
bw.ctb	Colour table for black and white plotting
v8_linear_cell_3.0.cel	Cell models for patterning; terminators; miscellaneous; InRoads; surrounds; cover pages; utilities and fittings
areapat.cel	Additional models for patterns
Spec_Checker_v7.mvba	Specification checker VBA macro
Spec_Checker_Cmd_3_0.txt	Settings file for specification checker macro
V8_Tasks_3.0.dgnlib	Expanded listing of all tasks

Appendix D – Additional Documentation

The following table lists the supplementary documentation.

Table 24: Available additional documentation for Version 3.0

Document title	Document file name	Document contents
Linear Infrastructure Version 3.0 MicroStation Levels	LI_Level_Name_3.0.pdf	List of level names and associated graphic attributes.
Linear Infrastructure Version 3.0 MicroStation Cells	LI_Cells_3.0.pdf	List of cells and their graphic representation.
Linear Infrastructure Version 3.0 MicroStation Line Styles	LI_LineStyles_3.0.pdf	List of line styles and their graphic representation.
Linear Infrastructure Version 3.0 MicroStation Multi Line Styles	LI_MultiLineStyles_3.0.pdf	List of multi-line styles and their graphic representation.
Linear Infrastructure Version 3.0 MicroStation Text Styles	LI_TextStyles_3.0.pdf	List of text styles and their graphic representation.
Linear Infrastructure Version 3.0 MicroStation Dimension Styles	LI_DimensionStyles_3.0.pdf	List of dimension styles and their graphic representation.

Table 24: Available additional documentation for Version 3.0 (continued)

Document title	Document file name	Document contents
Linear Infrastructure MicroStation Linear Tasks (Tree Structure) – v3.0	V8_Tasks_3.0.dgnlib	List of all tasks associated with "Task Manager" and their hierarchy. This is also an on-line help file.
ECS CADD Graphic Specification Checker for Bentley MicroStation Design Files	Specification_Checker_User_Guide.pdf	User guide for the specification checker.
<no title>	Miscellaneous_Help_DCLI.pdf	Various examples of labels, lines styles, design notes and other information. This is also an on-line help file.
<no title>	Cover_Sheet_Example.pdf	Example cover sheet.
<no title>	Detail_Sheet_Example.pdf	Example detail sheet.
<no title>	Watermain_Design_Example.pdf	Example watermain design drawing.
<no title>	TTC_Road_Resurfacing_Example.pdf	Example TTC road resurfacing drawing.

Appendix E – Model Contents

Mapping Models

Mapping

19-00001_MAP.dgn

Table 25: Mapping models

Model	Description
Default	Default – Blank model, no elements shall be drawn in this model
TOP	<p>Original topographic download from City datasets by ProjectWise Administrator at project initiation.</p> <p>Areas covered by full pre engineering survey shall be deleted from this model. Elements in the TOP model at the limits of the survey shall be modified to create a seamless transition from the topo data and survey data.</p> <p>Topo features which were not part of the original survey shall be left in the TOP model, that is to say a Bell box in the boulevard was not surveyed as part of a simple line resurfacing survey.</p> <p>Survey features shall not be copied into TOP model.</p> <p>All topo updates except actual field survey shall be placed in “TUP” model.</p> <p>For additional mapping models, see Table 12 on page 17.</p>
UGS	<p>Original CUMAP or DMOG download from City datasets by ProjectWise Administrator at project initiation.</p> <p>All underground utility lines and utility labels shall be placed in this model.</p> <p>Surface features received as part of a utility circulation mark-up which were not part of the original survey shall be placed in the TUP model, not in the UGS model. (i.e. a Bell box in the boulevard was not surveyed as part of a simple line resurfacing survey).</p> <p>Original utility leader line labels from the DMOG download shall be replaced using standard CAD specification leader line labels from the Task Manager and placed in groups beyond the streetline where possible.</p> <p>Pipe identifier, size and material text in the CUMAP—outside former City of Toronto—shall be deleted and replaced using standard CAD specification leader line labels from the Task Manager and placed in groups beyond the streetline where possible.</p>

Table 25: Mapping models (continued)

Model	Description
UGS (cont'd)	Utilities located by SUE level B shall be deleted from UGS model. Utilities in the UGS model at the limits of the SUE shall be modified to create a seamless transition between the UGS data and SUE data.
PSL	Original property, streetline, street name and address numbers download from City datasets by ProjectWise Administrator at project initiation. Address text shall be rotated to be horizontal with the drawing surround.
SVY	Contents from original survey file (19-00001_PSVY2D) shall be copied into this model. Text shall be rotated, moved and decluttered for clarity. Overlapping text should be avoided. Elements surveyed shall be deleted from the TOP model. Survey features shall not be moved or copied into any other model.
SUE	Contents from original survey SUE file (19-00001_PSVYSU) shall be copied into this model. The single line centrelines shall be offset half the diameter of the pipe to create a multiline look. The level of outside lines shall be changed to the appropriate level. Utilities located by the SUE shall be deleted from the UGS model. Labels shall remain in UGS model.
KEY	Streetline download at project initiation shall be used as source to create key plans as well as any general location plan.

Additional Mapping Models

The following mapping models can be created by the user as necessary for specific project needs. Mapping models to be created in the MAP file.

Table 26: Additional mapping models

Model	Description
ASB	Elements or utilities updated by as-built information
CON	Contours
TUP	Topographic update not surveyed

Key Plan

The key plan shall show the working area with the shape provided in the key plan cell placed around the project limits to highlight project extents.

Shading is to be placed around limits of current sheet only.

Drawing numbers provided in the key plan cell shall be placed for the current sheet and all adjacent sheets.

- The key plan is to be located in the top right corner of the surround.
- The key plan is to include a north arrow.
- The key plan is to have a least two major arterial roads visible

Side street text in the key plan to be font Segoe UI Light. Project street text to be font Arial. Font sizes vary depending on project length, typically between MicroStation text size of 0.3 or 0.4.

Watermain information is not required on key plans.

Sheet Models

Drawings 19-00001_SHEETS.dgn

The user can create as many models as required to complete the drawing set. For multi discipline projects the drawings will be numbered sequentially starting with surface drawings first with underground drawings to follow.

Models

19-00001-001
19-00001-002
19-00001-003
19-00001-004 and so on.

Drawings – Sheet size shall be chosen from Task Manager. Default sheet size is 24x60 inches. All sheets within same contract shall be the same size.

Surround – Tagged title box shall be used. Executive director, director and manager name cell to be placed in appropriate boxes. Tags shall not be dropped.

Date – shown as month, year format, for example June, 2019.

Design, Drawn and Checked – initials with no periods. Design supervisor initials in CAD.

Digital Information – models used for final plot shall be listed in full file name with model(s) displayed in brackets.

Example:

Design – 19-00001_RD.dgn (PD, PF, SH, ...)

Base – 19-00001_MAP.dgn (PSL, TOP, UGS, SVY, SUE, ...)

Non-displayed model(s) shall be detached from reference when it is not part of final drawing.

Miscellaneous Drawings

Users can create additional drawings needed for submissions to approval agencies or other purposes in the SHEETS file, for example sewer drainage area plan, 8.5x11 Ministry of Environment, Parks and Conservation (MEPC) key sheet and so on.

Drawing numbers for these drawings will use the PTP number followed by "-M" + a two digit number with a leading zero.

Example: 19-00001-M01
19-00001-M02

Design Models

Road Design 19-00001_RD.dgn

Table 27: Road design models

Model	Description
PD	Proposed road, sidewalk and surface design in plan. Design cross sections and profiles should not be in the PD model.
PF	Proposed road, sidewalk and surface design profile and existing utility profile. Proposed road PI flags shall be changed using the appropriate flags provided in Task Manager. Design cross sections and multiple profile versions should not be in the PF model.
SH	Proposed shading and patterning.
INR2D	INR2D – InRoads working file. This model is to be used to generate alignments, profiles and cross sections during the design process. Once design is finalized, or reached a project milestone, graphics can then be copied or regenerated into the appropriate design models. This model is not to be referenced into master sheets. For InRoads SS4, see Table 32 InRoads SS4 files on page 63.

Watermain Design 19-00001_WM.dgn

Table 28: Watermain design models

Model	Description
WAT	Proposed watermain design in plan.
WATPF	Proposed watermain profile and existing utility profile.
SH	Proposed road resurfacing patterning for trench restoration. Use SH model from RD file when it is combined with surface project.

Storm Sewer Design *19-00001_STM.dgn***Table 29: Storm sewer design models**

Model	Description
STM	Proposed storm sewer design in plan.
STMPF	Proposed storm sewer profile and existing utility profile.
STMDA	Proposed storm sewer drainage areas.
SH	Proposed road resurfacing patterning for trench restoration. Use SH model from RD file when it is combined with surface project.

Sanitary Sewer Design *19-00001_SAN.dgn***Table 30: Sanitary sewer design models**

Model	Description
SAN	Proposed sanitary sewer design in plan.
SANPF	Proposed sanitary sewer profile and existing utility profile.
SANDA	Proposed sanitary sewer drainage areas.
SH	Proposed road resurfacing patterning for trench restoration. Use SH model from RD file when it is combined with surface project.

*InRoads Files***Table 31: InRoads design models**

Model	Description
19-00001.alg	Horizontal and vertical alignment library; contains multiple horizontal and vertical alignments as needed for project needs.
19-00001.itl	Template library; contains multiple templates as needed for project needs.
19-00001.ird	Roadway corridor library; contains multiple corridors as needed for project needs.
19-00001.dtm	Proposed digital terrain model; if multiple dtm's are required, copy and paste original file in the same folder in ProjectWise and rename with suffix -2, -3, and so on.
19-00001.rwk	Shortcut to open multiple InRoads files at the same time; users not required to use.

*InRoads SS4 Microstation Files***Table 32: InRoad SS4 files**

Model	Description
19-00001_ALG.dgn	<p>Contains project geometries; horizontal and vertical alignments.</p> <p>The user can create additional alignment and models as necessary for project needs.</p> <p>Alignment should be created by using native InRoads horizontal and vertical alignment commands.</p> <p>Importing Microstation lines into SS4 alignment should be avoided.</p> <p>In order for user to annotate geometry on sheet, the user should export geometries in SS2 format.</p>
19-00001_IRD.dgn	<p>SS4 design corridor with parametric constraints, point controls, target aliasing or template drops or both.</p> <p>Name of design corridor should follow name of design geometry.</p> <p>User can create additional corridor models as necessary for project needs.</p>
19-00001_DTM.dgn	<p>If existing model contains existing survey DTM, it shall not be deleted or modified.</p> <p>Design DTM shall be created in PROP model.</p> <p>User can create an additional PROP model, as necessary for project needs.</p>

Additional Design Models

The following design models can be created by the user as necessary for specific project needs. Design models to be created in the RD, WM, STM, SAN files.

Table 33: Additional design models

Model	Description
ARCH	Architectural design for structural work
DET	Details and sections
ELEC	Electrical design
REM	Removals
SEL	Street lighting design
SSC	Streetscaping and landscaping design
TCS	Traffic control signal design
TSP	Traffic staging plan design
UD	Third party utility design
PVM	Pavement markings
RAD	Autoturn for radii reduction assessments; accepted final results to be integrated into PD model.

Cover Sheet and General Notes

One MicroStation file using the contract number as the file name will be created in the Contract Folder in ProjectWise, for example 19ECS-TI-01LR.dgn. Only one cover sheet and general notes sheet is required per contract.

Drawing numbers for the cover sheet and general notes will use the contract number followed by -G" + sequential number from 1.

Example: 19ECS-TI-01LR-G1
 19ECS-TI-01LR-G2

Separate models for the cover sheet and general notes sheet shall be created in this file, using the drawing numbers as the model names.

The cover sheet shall have a key plan showing the location and administrative information about the project. Multiple key plans shall be displayed when the contract consists of multiple separate locations. All drawing number associated with the contract shall be listed in accordance with location headings.

The general notes sheet shall contain applicable notes pertaining to the entire contract. Non applicable general notes shall be deleted. Standard General Notes shall not be edited, additional notes are permitted to be appended to the last numbered notes without contradicting any previous notes.

Glossary

Bentley Systems Incorporated or Bentley – The developer and vendor of CADD software (MicroStation, InRoads, etc.) used for design by the Engineering & Construction Services division.

BIS – Business Improvement and Standards unit in the Engineering Support Services section in the Engineering & Construction Services division.

By-Level – MicroStation methodology where symbology is explicitly defined for each level. Only that symbology can be used for the level.

CADD – Computer Aided Design and Drafting.

City – The City of Toronto—the corporation—and will be referred to as the City for the purposes of this document.

Consultant – Consulting engineering firm retained by, or on behalf of the city. This reference may also include municipal staff depending on the context.

Consulting Engineer – A professional engineer, firm of engineers or a developer retained by the City, skilled and experienced in municipal work and land development projects and registered with the Professional Engineers of Ontario.

Contract Administrator – The individual or firm responsible for overseeing the construction of the works and representing the City's interest.

CTB or .CTB – Bentley Systems Incorporated MicroStation colour table file used to define a colour palette for design files.

CUMAP – Combined Utility Mapping. This mapping product contains water and sewer information (and some miscellaneous features) for areas outside the former city of Toronto.

DGN or .DGN – Bentley Systems Incorporated MicroStation design (drawing) file.

DGNLIB or .DGNLIB – Bentley Systems Incorporated MicroStation design library file.

DMOG – Digital Map Owners Group. This mapping product contains water, sewer and other utility information (cable, telephone, gas, etc.) for the former city of Toronto.

Engineer – The licensed individual or firm responsible for the design of the works or their designate. Also may be referred to as the design engineer.

ESM – Enterprise Stereo Model. This is the topographic mapping data set.

InRoads – A CADD road design vertical application from Bentley Systems Incorporated.

InterPlot or Iplot – Bentley Systems Incorporated printing and plotting application for CADD designs.

LI – Linear Underground Infrastructure and Transportation Infrastructure units in the Engineering & Construction Services division of the City of Toronto.

Linear Infrastructure Design Work – CADD design for watermain, sewer and road projects.

MicroStation – A CADD product from Bentley Systems Incorporated.

New project – CADD data based upon standards and specifications included in this manual.

Project Wise – is a suite of software from Bentley Systems aimed at helping manage, find, and share CAD, project data, and Office documents.

TPUCC – Toronto Public Utilities Coordinating Committee.

TTC – Toronto Transit Commission.

V8 – Version 8i of Bentley MicroStation. This is the current MicroStation CADD engine using floating point for calculations and is the format used by the Engineering & Construction Services division.

ZIP – PkZip compressed archive file.

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City of Toronto

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