TORONTO TRANSIT COMMISSION

CADD

STANDARDS AND PROCEDURES MANUAL

2010 EDITION

NON-PRINTABLE

COPY No.

CADD System Memo

CADD Users Manual 2010 Edition

PURPOSE

To provide a guide for establishing a consistency among drawings created between the various Design Sections of E&C and among the consultants retained by the Toronto Transit Commission with the adherence to this guide, the drawings produced will provide an avenue for the continued re-use of facility drawings for any future project design.

The new “CADD Standards and Procedures Manual” is the result of a TTC E&C CADD User Group and Signals & Train Control Engineering, Electrical Engineering, Communication Engineering, Track & Structure Engineering that was assembled to review current and new drawing standard processes and to provide solutions that would reflect improvements in software and section specific design process needs. As well revisions to standards that apply to the improvements and updates of the current CADD software applications.

CADD Manual will be available with a password protected PDF File Format (non printable) for internal staff and external consultants. For TTC Staff, the manual is accessible within the Intranet Access.

- This will ensure that the latest Intra Net On-Line copy is in circulation.
- PDF file contains hyperlinks which will provide the reader with improved mobility within the document. (Immediate access to related information that can be found within different sections of the manual).
- The CADD Manual is a controlled document. Hardcopy can only be requested thru Record Management Division of the Engineering and Construction Department.

IMPROVEMENTS / MAJOR CHANGES

All new revision changes are HIGHLIGHTED with yellow shading background (As per page number).

Page 7 : Mapping Coordinates – Word 3rd to 3 Degree *(changed)*.
Page 8 : Scale Factor – Word Liason to Liaison *(changed)*
Page 9 : Drawing Scale – Scale 1:10 *(added)*
Page 9 : New Drawings –dgnlibs; ocomm.dgnlib, ostce.dgnlib, ot_track_Structure.dgnlib, sg.dgnlib *(added)*
Page 11: Master Files – Proper usage of Models within the files (added).
Page 12: Naming Fields – Discipline Letters/Numbers;
g - Signals, 62 - Communications, 71 – Trackwork *(added)*
Page 16: Other Borders – The use of other department borders and special project *(added)*.
Page 18: Drawing Number – Abbreviations for Engineering Discipline *(added)*;
E – Electrical / Traction Power, G - General/Survey/Alignment, SG - Signal, T - Trackwork
Page 20: Title Block – the use of Consultants Company Logo*(added)*
Page 21: Title Block – Progress Stamp; Level 15 and Level 20 *(added)*.
Page 22: Title Block – Standard Graphical Elements placed with proper levels (common levels c.dgnlib)
Page 23: Cell Library Location – Models are used to create Cell Library drawings *(added)*.
Page 24: Orientation – Elevation and Longitudinal Sections *(added)*.
Page 24: Scale – drawings with Numeric Dimension Value *(added)*.
Page 24: Line Styles – Customized linestyles *(added)*.
Page 25: Text Settings – Border Text width *(added)*.
Page 26: Matchlines – Use of matchlines and sample ce *(added)*.
Page 26: Key Plans – North Arrow size *(added)*.
Page 27: Leader Lines – Placement Justification *(added)*..
Page 28: Dimensions – Preset Dimension Settings.
Page 33: North Arrow – Placement location *(added)*.
Page 34: Plotting media – Bond Paper *(added)*.
Page 42: Information Supplied by TTC – Documentations *(added)*.
Page 43: Information Submissions to TTC – PDF and Microstation Files *(added)*.
Page 44: CADD Data Submissions – Drawing Listing and Legacy Drawings *(added)*.
Page 45: Submission – Attached Reference Files *(revised)*
Page 46: Submission Process – Drawing Listing - FileList.xls *(added)*.
Page 50: Border Revision Box – Subsequent Addendum *(revised)*.
Page 51: Issued for Construction Submission – dgn, pdf and FileList.xls *(added)*.
Page 54: Asbuilt CADD File Preparation (TTC) – Division Name and reference page *(added)*.
Page 56: Appendix A – Dgnlibs to be automatically loaded within the seed file *(revised)*.
Page 59: Appendix C – CADD Files by Discipline – Mapping, Alignment, Property and Surveying Files *(revised)*.
Page 60: Appendix C – Civil and Geotechnical Files *(revised)*.
Page 61: Appendix C – Architectural Files *(revised)*.
Page 62: Appendix C – Structural Files *(revised)*.
Page 63: Appendix C – Signal Files *(added)*.
Page 64: Appendix C – Communications Files *(added)*.
Page 65: Appendix C – Trackwork Files *(added)*.
Page 66: Appendix C – Mechanical Files *(revised)*.
Page 67: Appendix C – Electrical Files *(revised)*.
Page 68: Appendix D – Sheet Series by Discipline *(revised)*.
Page 69: Appendix D – Structural *(revised)*.
Page 70: Appendix D – Signals Series *(added)*.
Page 71: Appendix D – Communication Series *(added)*.
Page 72: Appendix D – Mechanical Series *(revised)*.
Page 73: Appendix D – Mechanical Series – Project Story Board *(revised)*.
Page 74: Appendix D – Mechanical Series – Project Story Board - continued *(revised)*.
Page 75: Appendix D – Mechanical Series – Project Story Board Example *(revised)*.
Page 76: Appendix D – Mechanical Series – Project Story Board Example - continued *(revised)*.
Page 77: Appendix D – Electrical Series *(revised)*.
Page 78: Appendix D – Traction Power Series *(added)*.
Page 79: Appendix D – Trackwork Installation Series *(added)*.
Page 86: Appendix E – Mechanical Cell Library *(revised)*.
Page 90: Appendix E – Electrical Cell Library *(revised)*.
Page 93: Appendix G – Standard and Directive Drawings – Standard *(added)*.
Page 94: Appendix G – Standard and Directive Drawings – Directive *(added)*.
Page 95: Appendix H – CADD Disclaimer *(revised)*.

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Introduction

Introduction

Scope

The CADD Standards and Procedures Manual provide guidance and procedures for the preparation of Computer-Aided Design and Drafting products.
CADD data developed by, for, and on behalf of the Toronto Transit Commission are subject to Standards and Procedures as detailed in this Manual.
Unless specified otherwise, guidelines published by Canadian Standards Association are to be followed through creation of all documents.

Purpose

The purpose of this manual is to ensure TTC facilities and systems are prepared in a consistent and uniform standard.

Terms and Abbreviations

CADD	Computer Aided Design and Drafting
CADD Admin	TTC CADD System Administrators (refer to Contacts)
Consultant	Liaison / Representative of Company under contract to TTC
CSA	Canadian Standards Association
Iplot	Bentley InterPlot printing / plotting application
MicroStation	CADD product by Bentley
Legacy Project	Project data based upon standards preceding this manual
New Project	Project data based upon standards outlined in this manual
SPE	Senior Project Engineer (TTC)
TTC User	CADD User operating on TTC network & CADD environment
TTC Liaison	TTC Representative assigned to Project
TTC Eng.	Engineering Department of the TTC
TTC Ops.	Operations Department of the TTC
V7	Version 7 of MicroStation *dgn file
V8	Version 8 of MicroStation *dgn file
TTC	Toronto Transit Commission
*.pdf	Adobe Acrobat file
*.dgn	Bentley MicroStation drawing file
*.dgnlib	Microstation dgn library file
*.cel	Microstation cell library file
*.xls	Microsoft Excel file

CADD Data Format

The TTC creates and maintains CADD data in Bentley's MicroStation *.dgn file format.
Data files are provided and exchanged using MicroStation *.dgn version 8 (V8) file format.

On request to CADD Admin, CADD files may be provided in MicroStation *.dgn version 7 (V7) – compatible with earlier versions of MicroStation such as /J, SE, 95 and others.

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

Manual Revisions/Updates

This manual is intended to be neither static nor all-inclusive and thus will be updated and enhanced as appropriate.

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CADD Production Procedures

CADD Production

Drawing Setup

Seed File

All CADD files must be created using a common Seed file.
The seed file to be used is ***seed2d.dgn*** and will be located in the Project root directory (See Figure.1)

Consultants will be provided a seed file as part of the CADD Information Package at the initial Startup meeting. (See CADD Procedures for Consultants – Information Supplied by TTC)

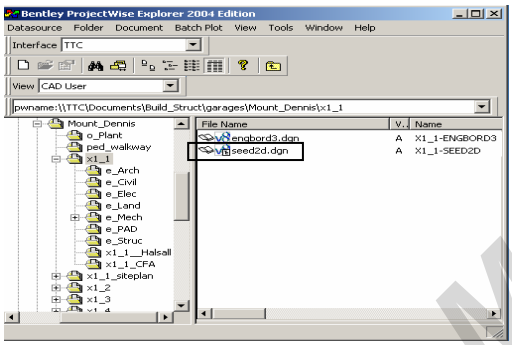


Figure 1 – Seed file Location

Mapping Coordinates

All CADD Files are drawn on the 3 degrees Modified Transverse Mercator (MTM) plane. The 'x' and 'y' coordinates are related to real world grid coordinates in the following way:

- To generate 'Northings' – add 4,000,000 to the 'y' coordinates.
- 'Eastings' are directly equivalent to the 'x' coordinates.

Global Origin

Global Origin (GO) is a point in space locating the origin of the Cartesian Coordinate System used in design plane coordinates. All CADD files use standard Global Origin contained in the standard seed file:

- **x = 295000 ; y = 825000 ; z = 0**

GO=-295000.0000,-825000.0000

Changes to the global origin are **not** permitted.

Scale Factor

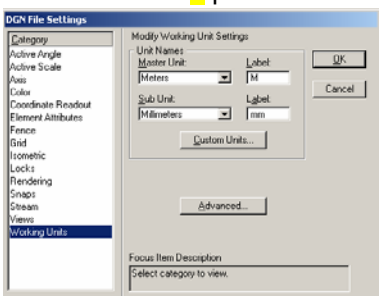
Scale factor is applicable to files prepared by alignment Designers, Surveyors and mapping Consultants. All other Designers need not be concerned with scale factors if their designs are localized within a site of 150m radius.

Projects requiring use of Scale Factor will be issued one by TTC **Liaison**. Scale factor must be applied to all data to generate ground distances. Alignments are designed using ground units of measure but drawn in the CADD environment in grid coordinates. All dimensions in alignment files shall be dimensioned manually to show ground measure.

Working Units

All CADD files use Units of Resolution as per Project seed file. (See Figure.2)

- Master Units = Meters (m)
- Sub Units = Millimeters (mm)
- Advanced Units of Resolution = 100000 per meter



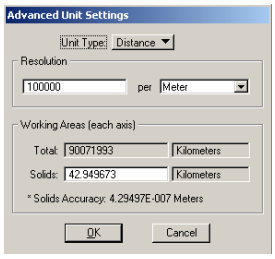


Figure 2 – Seed file Working Units

Working Units – Legacy Files

All legacy CADD files use Units of Resolution as contained in seed file issued and placed in Project folder.

Drawing Scale

All CADD files are drawn to scale using metric units. Master files are drawn exclusively to scale 1:1. Sheets are plotted at various scales obtained by scaling the referenced border to fit intended area of design.

- Adjust "Plotted Drawing" scale by scaling the attached reference border file to a scale that will fit the intended design area.
- Use Drawing Scales as provided in referenced border file only (see below)

The TTC border file contains several barscales representing commonly used drafting scales (matching commercially available drafter's "triangular scales/rulers"). Note barscales presented in grey colour are less common and may not have a direct equivalent ruler - use of these scale are not recommended.
Commonly accepted scales include 1:1, 1:5, **1:10;** 1:20, 1:25, 1:50: 1:75, 1:100, 1:125, 1:250, 1:300, 1:400, 1:500, 1:750, 1:1000, 1:1250, 1:2500 - and their 10x multiplications

Whenever possible, avoid creating drawing sheets containing multiple scales.
If multiple scales must be used on the same drawing sheet, subdivide the drawing into separate areas by the scale being used - include barscales for each different scale.

Level Structure

Levels are methods of organizing information into a logical system that allows for easier manipulation of different parts of the CADD file. Each element of a model should be placed on the corresponding level according to the structure in place for each discipline (*See Appendix A - Dgnlibs*)
Elements can either be placed with their own independent symbology (colour, weight, style, independent of the level library) or placed to use the symbology defined by the level library (placement ByLevel). The 'ByLevel' option for placing elements used in conjunction with the E&C standard level libraries is the most effective way to ensure file contents conform to the level standards.
Level structures are generated by the Seed file (***seed2d.dgn***) and the dgnlibrary files (****.dgnlib***), or a combination of the two.

New Drawings

Level Structures for new drawings are supplied by ***dgnlibs*** files (*See Appendix A - DgnLibs*). These files contain standardized preset Level Names & Numbers, Level Descriptions and graphical attributes (colour, weight and style)

The following dgnlibs are available from CADD System (*See Appendix A - Dgnlibs*);

c.dgnlib	Common Library
ea.dgnlib	Engineering Architectural
ec.dgnlib	Engineering Civil and Geotechnical
ee.dgnlib	Engineering Electrical and Power
em.dgnlib	Engineering Mechanical
es.dgnlib	Engineering Structural
ocomm.dgnlib	Ops. Communications
ostce.dgnlib	Ops. Signals and Train Control
ot_Track_Sturcture.dgnlib	Ops.Track & Structure
sg.dgnlib	Ops. Signals *(TYSSE)*

DgnLibs can be attached through Microstation's Level Manager (See Figure 3)

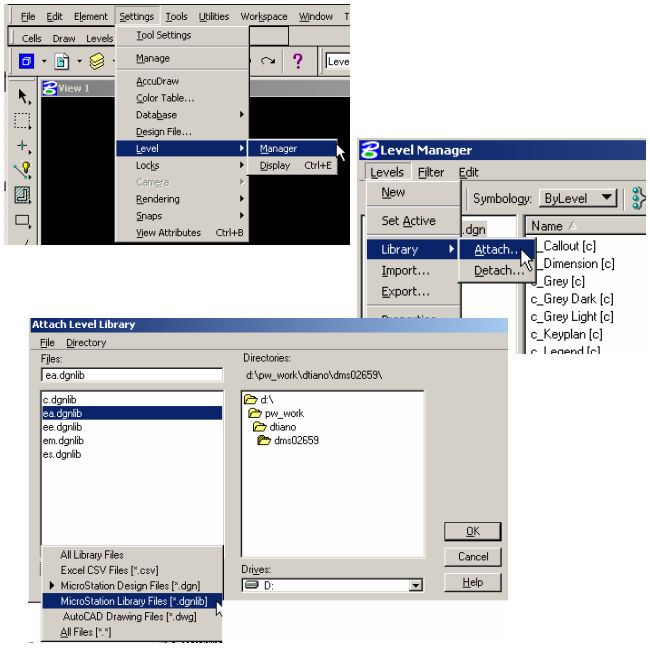


*Figure 3 – Attaching a **dgnLib** file*

Modification of levels within the standard dgnLibs is not permitted. Any adjustments must be submitted to CADD System for approval and possible inclusion into the standard dgnlib files.

TTC USERS – Common dgnlib and their respective Discipline dgnlib files are automatically loaded at launch of ProjectWise / Microstation V8.

Legacy Drawings

Level structure for legacy drawing is generated by the seed file (***seed2d.dgn***)

*Use level structure as described in **TTC CADD Manual – First Edition (1994)**, available from TTC Drawing Control in hard copy format.*

Folder Structure

All Projects shall have a standard project directory structure that will allow for ease of use, a certain familiarity between departments and projects, and a consistent method for locating reference files during drawing creation. Folder structure may also be utilized to apply security to single / groups of drawings / projects.
(For a list of TTC Project folders – see Appendix B)

New Projects

A ***Root*** folder is created under the appropriate Project Type / Facility. This ***Root*** folder is named after the Project/Contract number or the established Contract name/title. (See Figure 4)

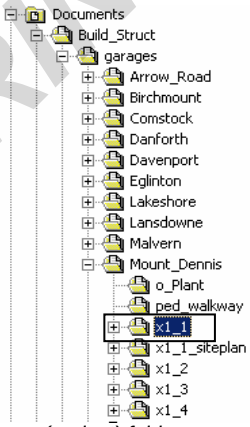


*Figure 4 – **Root** (project) folder*

Common project files are located within this folder (seed file, border, images etc…) (See Figure 5)

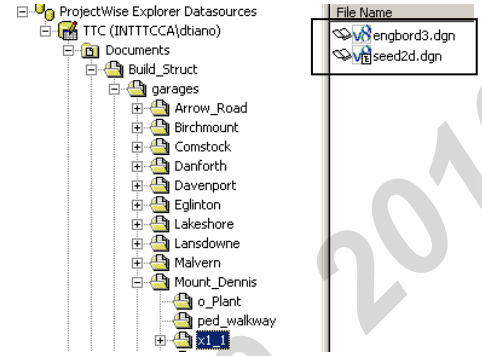


*Figure 5 – Common **Root** folder files*

Subfolders located under the Root folder are named after their respective Disciplines, or description of data contained within.

The following is a typical subfolder structure used by TTC for all new projects.

(***Engineering Branch subfolders***):

e_Arch	Architectural Section
e_Elec	Electrical and Power Section
e_Struc	Structural Section
e_Civil	Civil and Geotechnical Section
e_Mech	Mechanical Section
e_PAD	Property Alignment Section

(***Operations Branch subfolders***):

o_Plant	Plant Maintenance Department
o_SEC	Signals/ Electrical/ Communications Department
o_Track	Track & Structure Department

Note: **ONLY** CADD Admin will create project folders at the start of the project.

Legacy Projects

Legacy projects contain all Project files within the ***Root*** folder. The ***Root*** folder will be named after Project/Contract number or name, similar to the New Project naming convention.

CADD File Types

Master Files -'m' and 'mx'

A ***Master*** File contains all graphical data for a specific area of a Project and is drawn at full scale (scale 1:1).
Master files have "no limits" to the extent of area they encompass. Whenever possible, graphic elements are drawn within the ***Master*** file and then referenced into various ***Sheet*** files to create the "ready-to-plot" file.

Each discipline will have their own ***Master*** files, which will contain the data associated with their respective discipline.
Depending on the size of the project, each discipline will have a number of ***Master*** files that they are responsible to create. For a complete list of files by discipline - *see Appendix C*.
Some rules to follow when creating ***Master*** files are;

- Use seed file (seed2d.dgn) to create all ***Master*** files
- Include the 'm' (master) or 'mx' (master existing) designation when naming ***Master*** files (*see CADD File Naming Convention*)
- It is not recommended to use Models for creating additional sketches within the Master Files/Sheet Files. Models are only used in the creation of cell library drawings.

Sheet Files -'s'

A ***Sheet*** file is a selected view or portion of the ***Master*** file(s) assembled within a border to create the "ready-to-plot" file. (See Figure 6).
Sheet files should contain all text, notes, dimensions and other information pertinent to the project that cannot be located within the ***Master*** files.
Some rules to follow when creating ***Sheet*** files are;

- Use seed file (seed2d.dgn) to create all ***Sheet*** files
- Include the 's' designation when naming ***Sheet*** files (*see CADD File Naming Convention*)
- Ensure every ***Sheet*** file contains a visible border attached as a reference file.
- Every ***Sheet*** must include a drawing title, drawing number, sheet number (when assigned) and scale.
- ***Sheet*** files should never be referenced into other Sheet files.

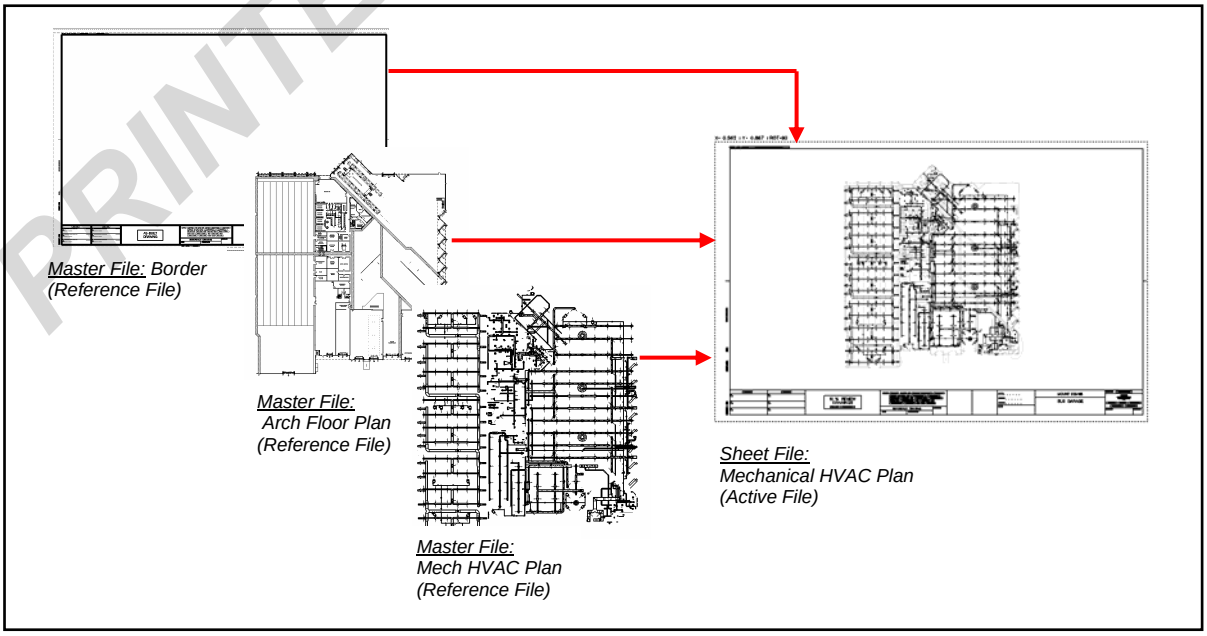


Figure 6 – Sheet File Assembly

Working Files -'w'

A ***Working*** File is equivalent to Master files but are intended not to be included in final project data sets. This includes copies, variations, superseded versions, data provided FYI and any other "temporary Master" files.
Some rules to follow when creating ***Sketch*** files are as follows;

- Use seed file (seed2d.dgn) to create all ***Working*** files
- Include the 'w' designation when naming ***Working*** files (*see CADD File Naming Convention*)
- Working files are for information only and will **not** be referenced or included in Project deliverables.

Sketch Files -'k'

A ***Sketch*** File is equivalent to Sheet files but are intended not to be included in project data sets. This includes design variations, sketches, info graphics and supporting/temporary CADD data that are classified as Plot files.
Some rules to follow when creating ***Sketch*** files are as follows;

- Use seed file (seed2d.dgn) to create all ***Sketch*** files
- Include the 'k' designation when naming ***Sketch*** files (*see CADD File Naming Convention*)
- Sketch files will not be referenced or included in Project deliverables.

Preliminary / Presentation Files -'p'

Preliminary/Presentation Files are files not intended to be included in project data sets but are used for preliminary design work and presentation purposes.
Some rules to follow when creating ***Sketch*** files are as follows;

- Use seed file (seed2d.dgn) to create all ***Preliminary / Presentation*** files
- Include the 'p' designation when naming ***Preliminary / Presentation*** files (*see CADD File Naming Convention*)

CADD File Naming Convention

Naming conventions for electronic drawing files (both Master files and Sheet files) allow CADD users to determine the contents of a drawing without actually displaying the file. They also provide a convenient and clear structure for organizing drawing.

General Rules to Follow

- Limit file names to maximum 32 characters (before **.ext**)
- Use A-Z Latin alphabet characters in upper and lower case.
- Use numerical characters
- Avoid and omit characters that can be confused with others (ie – capital 'O', capital 'I' and lowercase 'L')
- Use an underscore to separate the different fields.
  For clarity, Fields 1 & 2 need not be separated.
  (ie Field1Field2_Field3_Field4.dgn)
- Spaces and special characters are not to be used.

Naming Fields

CADD file names contain distinctive ***Naming Fields*** to easily identify *discipline*, *file type*, *drawing group* and *drawing description*.
(See Figure 7)

Field 1

Contains Discipline / Section designators

- **2** - Architectural
- **3** – Structural
- **g** - Signals
- **5** - Mapping and Utilities
- **7** - Civil and Geotechnical
- **62** – Communications
- **71** - Trackwork
- **81** - Mechanical
- **82** - Electrical

Field 2

Contains CADD file type designation

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'s'** – Sheet File
- **'w'** – Working File

- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

Contains section defined designation to drawing group or area of design.

- **'plan'** – All plan Drawings
- **'elev'** – Elevation Drawings
- **'sect'** – Section Drawings
- **'powr'** – Power Drawings
- **'hvac'** – HVAC Drawings

For a complete list sorted by discipline *see* *Appendix C*.

Field 4 +

Contains a drawing description

- **'1floor', 'mezz', 'roof'** – plan designators
- **'north' 'south'** – elevation designators

For a complete list sorted by discipline *see* *Appendix C*.

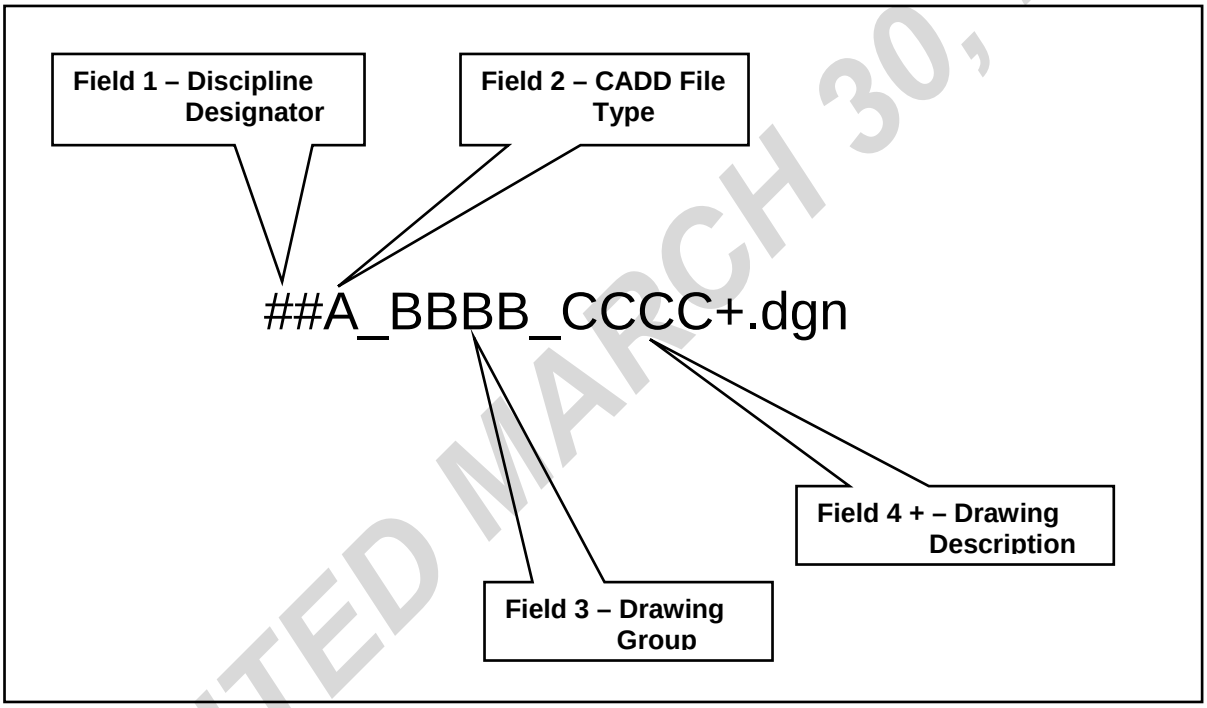


Figure 7 – CADD File Naming Convention

Consultant Prefix

Consultants must follow the file naming convention covered in the previous section with the following exception.
Consultants are required to use a prefix to identify file ownership. This prefix will consist of three, two or one characters derived from the Consultant's Company Name.
(see figure 8)

This prefix will be assigned by TTC CADD System for use.

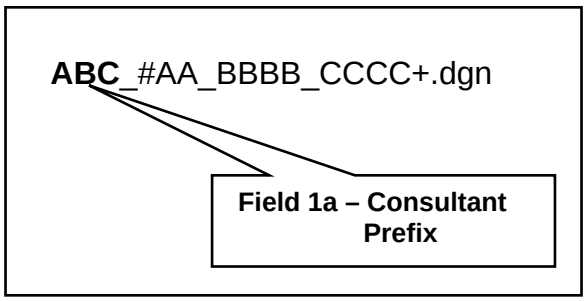


Figure 8 – Consultant Prefix

ProjectWise (Drawing Creation)

ProjectWise is a document management software utilized by the TTC for organization of CADD drawings.
New drawings can be created through ProjectWise and assigned different properties which streamlines project workflow and efficiency of file accessibility.

Creating A New Drawings (ProjectWise)

All CADD files must be created using a common Seed File (***seed2d.dgn***) and properly named as outlined in the previous section (See *CADD File Naming Convention*).
When creating a new drawing, the following must be followed in **ProjectWise**. (See also Figure 9 and 10)

- In the project root directory, select the file ***seed2d.dgn*** , right click with your mouse and select '***Copy***' from the popup window ❶
- In the '***Copy Document***' window click the '**Select**' button for the ***Folder Field*** and direct the file to the proper project directory location. ❷
- Using TTC ***CADD File Naming Convention*** type in the drawing file name, complete with the .dgn extension, in the ***File Name*** field ❸
- In the ***Description*** field type in a description of the drawing. ❹
  - If the drawing is a **Sheet** file – the description must be the title that will be placed in the Border.
  - If the drawing is a **Master** file – the description will begin with *Master* followed by a brief summary of what the file contains.
- In the ***Document Name*** field type in a distinct name for the file beginning with the project number.(All Document Names in a folder must be unique) ❺
  - If the drawing is a **Sheet** file – the document name must be the drawing number that will be placed in the Border.
  - If the drawing is a **Master** file – the document name will be the **project number** followed by the ***File Name***
- Accept by selecting the '**OK**' button ❻

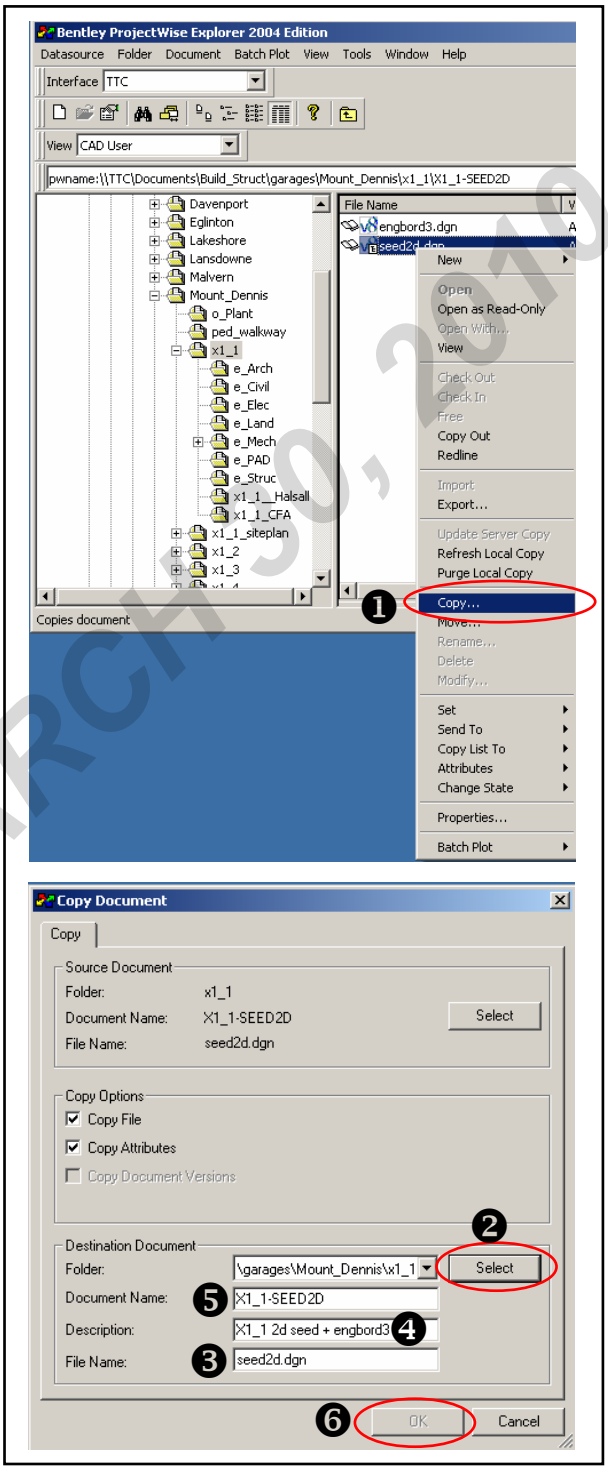


Figure 9 – ProjectWise Drawing Creation

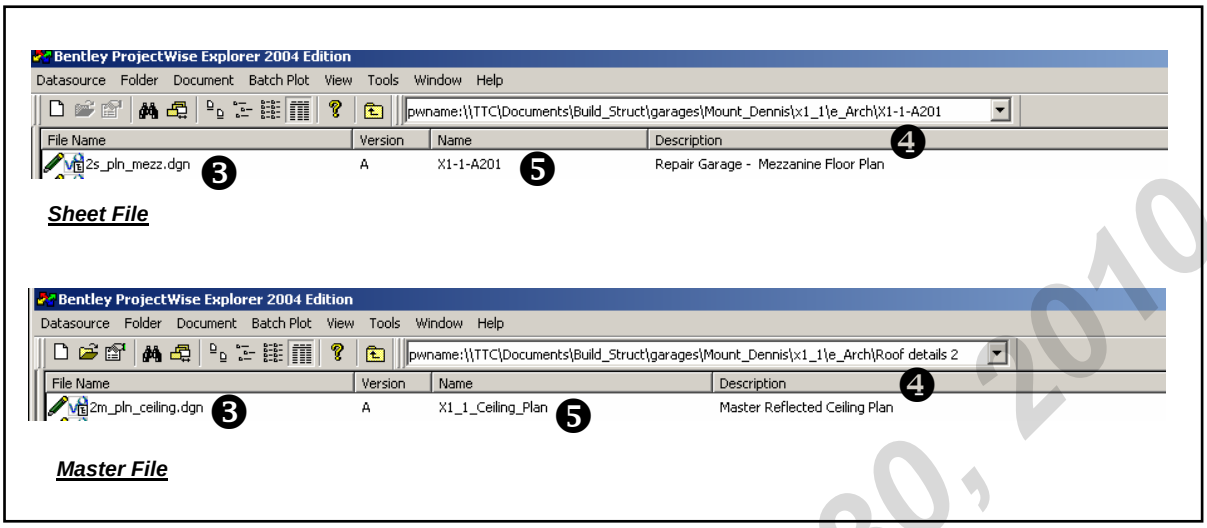


Figure 10 – ProjectWise Interface

Renaming of Files (ProjectWise)

In the ProjectWise environment, renaming is possible without any conflicts to files that reference the renamed file by updating the linkage between these files.

Renaming must be avoided if outside Consultants are also involved in the project and do not use ProjectWise. If renaming cannot be avoided, all parties involved in the project must be informed of the file name change.

Renaming of Files (Consultants)

Renaming of digital CADD files should be avoided as much as possible as this will create unresolved reference file links, inconsistent file submissions and incoherent data backups. Renaming may also create conflicts with submissions already in circulation.

Should a file rename become absolutely necessary, the Consultant must notify all of such a data change.

Title Block (Border File)

All Sheet files must contain a title block (**engbord3.dgn**) which is attached as a reference file. (See Figure 11)
Title Blocks can be moved, rotated and scaled, as required, to incorporate the necessary project areas and to the drawing scale required.
For Consultants use, TTC will provide a border file as part of the "*CADD Information Package*"
No changes to ***engbord3.dgn*** are permitted without approval by CADD System.

Other Borders

Other TTC borders being used by other divisions, particularly tailored for each department or special projects, are also available and stored within each contract folders in ProjectWise. Any changes or addition to these Borders must be approved by TTC CADD System Staff.(See Fig.11a,11b)

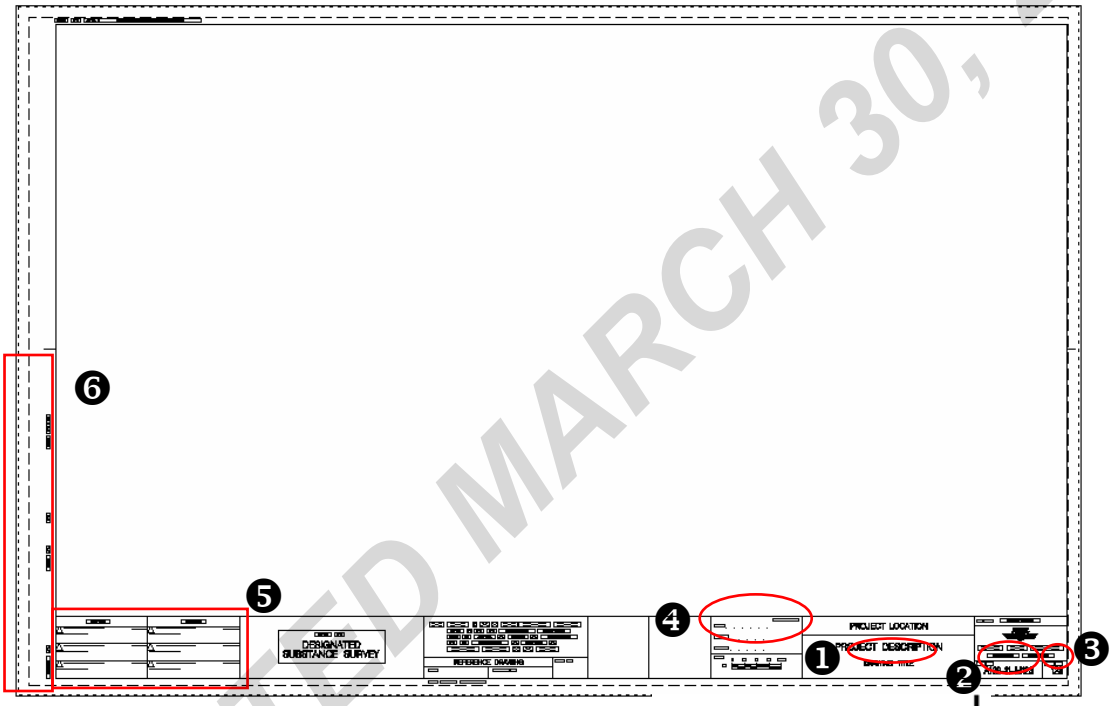


Figure 11 – TTC Standard Border File (engbord3.dgn)

Title Block – Data Information

The title block file contains elements, such as text and data fields with preset attributes, which must be **copied** into the active design file and then edited as required.
The following areas contain elements that need to be copied into the active design: (See Figure 11)

- Drawing Title❶
- Drawing Number❷
- Sheet Number❸
- File Creation and Checked field (including the Date) ❹
- Revision Box data fields ❺
- Filing Strip ❻

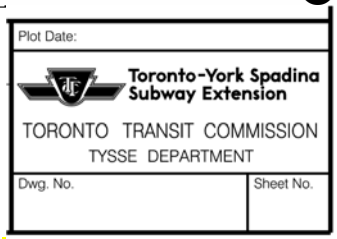


Figure 11a – Sample for (TYSSE) Toronto-York Spadina Subway Extension
Filename: engbord3.dgn

Figure 11b – Sample for Transit City
Filename: TCbord1.dgn

Title Block - Project Title (Single Location Projects)

For projects involving **single locations**, the project title area in the border file contains the following information fields (See Figure 12);

- Project Location or Facility Name (fixed value inputted by CADD System)
- Main Project Title (fixed value inputted by CADD System)
- Drawing Title (variable value entered by user)

Title Block - Project Title (Multiple Location Projects)

For projects involving **multiple locations**, the project title area in the border file contains the following information fields (See Figure 13);

- Main Project Title (fixed value inputted by CADD System)
- Project Location or Facility Name (variable value inputted by user)
- Drawing Title (variable value entered by user)

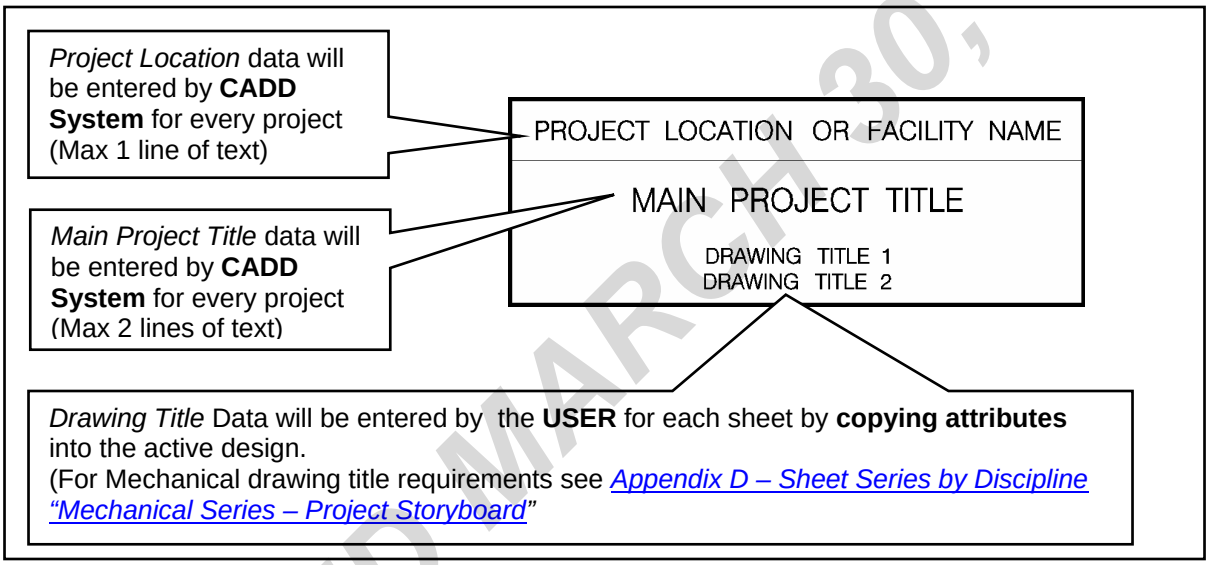


Figure 12 – Project Title (Single Location Projects)

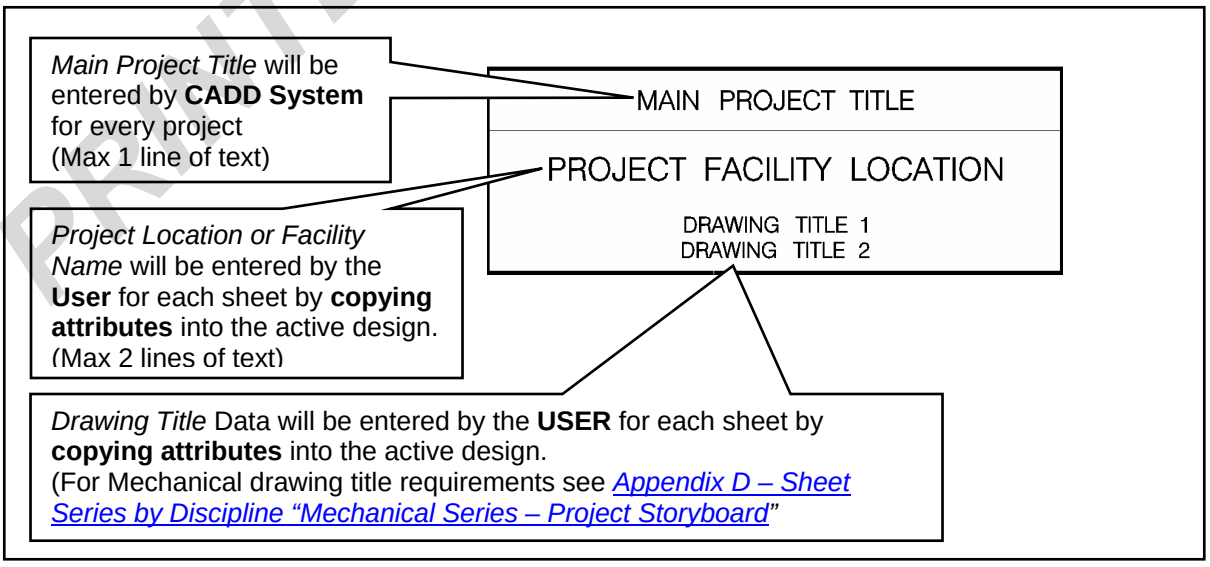


Figure 13 – Project Title (Multiple Location Projects)

Title Block – Drawing Number

The *Drawing Number* contains a project unique number consisting of 3 distinctive fields;

- **Contract Number** – This contains the TTC issued project designation (ie X1-123)
- **Discipline** – This contains the letter abbreviation of Discipline identifying the design section. (see Figure 14)
- **Sequence Number** – This contains a numerical value identifying the drawing sheet in ***3 digit format***. Each discipline has numerical series for sheets depending on the different types (ie plans, sections, details etc) For a complete list by discipline series *see Appendix D - Sheet Series*.

TTC uses the following abbreviations for Engineering Discipline ;

- A – *Architectural*
- C - *Civil*
- E – *Electrical/Traction Power*
- G – *General/Survey/Alignment*
- L – *Landscape*
- M – *Mechanical*
- P – *Paving*
- R - *Restoration*
- S – *Structural*
- SG – *Signal*
- T – *Trackwork*
- U – *Utilities*
- V – *Vehicles*
- X – *Communications*
- Z – *Specialty Work*

Figure 14 – Discipline Field (Drawing Number)

General rules to follow when assigning ***Drawing Numbers*** are;

- Use allowable characters as outlined in the *CADD File Naming Convention* section of this manual.
- Separate “Contract Number” and “Discipline” fields with ***hyphens.*** (See Figure 15)
- Use a maximum of 16 characters (including hyphens).
- Drawing numbers do not need to share common numbers with the Sheet number.
- Once a drawing number has been assigned and issued it must **not be modified**
- If a drawing is retired from a submission set, its number may **not** be **re-used**.
- If a new drawing is inserted into a submission set, the drawing number must be appended with an alpha character.
  (ie 100, 101, **101A, 101B,** 102)

To place a Drawing Number on a sheet, **copy** the preset text node from the referenced border file into the active drawing file – **modify** the copied text as required. (See Figure 15)

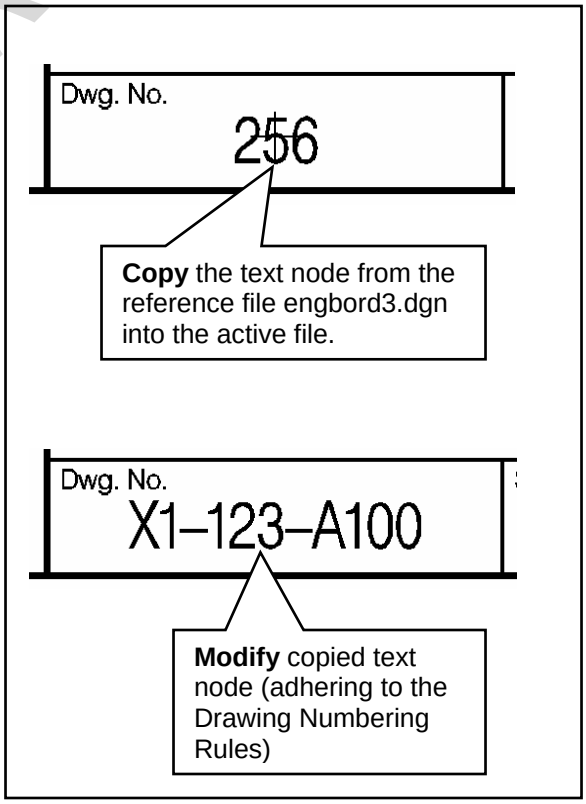


Figure 15 – Drawing Number

Title Block – Sheet Number

The *Sheet Number* contains a project unique 3 digit minimum, 5 digit maximum designator (ie 001, 002, 003…999, 1000, 1000A, etc)

General rules to follow when assigning ***Sheet Numbers*** are;

- Sheet numbers must be in sequential order
- They do not need to share common numbers with the Drawing number
- If a new sheet is inserted into a submission set, the sheet number must be appended with an alpha character.
  (ie 001, 002, **002A, 002B,** 003)

To place a Sheet Number, **copy** the preset text node from the referenced border file into the active drawing file – **modify** the copied text as required. (See Figure 16)

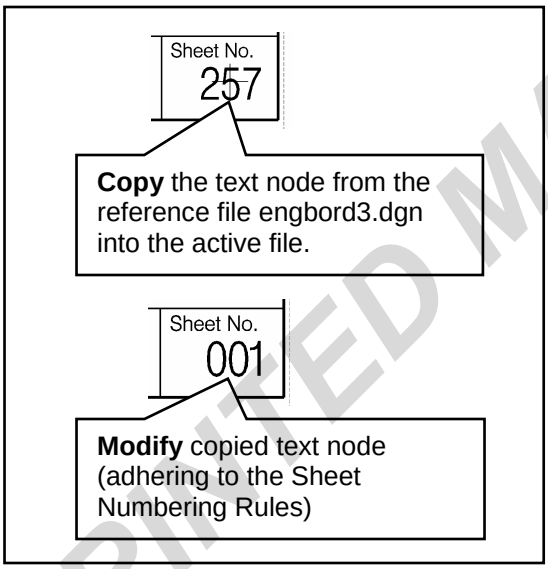


Figure 16 – Sheet Number

Title Block – File Creation and Checked Fields

The *File Creation and Checked* area of the border contains the names of the individuals responsible for the **Drawn**, **Checked** and **Correct** tasks of the drawing, and the dates these tasks were performed.

General rules to follow when filling in the File Creation and Checked are;

- Use first name initial (period) last name. (ie J.SMITH)
- The date will be entered by YYYY/MM/DD. (ie 2006/01/01)
- "Drawn" Date = date drawing was initially created and must not change once entered
- "Checked" Date = date the drawing was checked by named checker
- "Correct" Date = Date the 'Sealing' or 'Approving' individual has reviewed the drawing.
- **The "Checked" and "Correct" dates must change with each submittal up to and including the Tender submission. After Tender, these dates must not change and the dates will begin to be entered into the Revision Box area of the border.**

To place a *File Creation and Checked* data on a sheet, **copy** the data fields from the referenced border file into the active drawing file – **modify** the copied data fields as required. (See Figure 17)

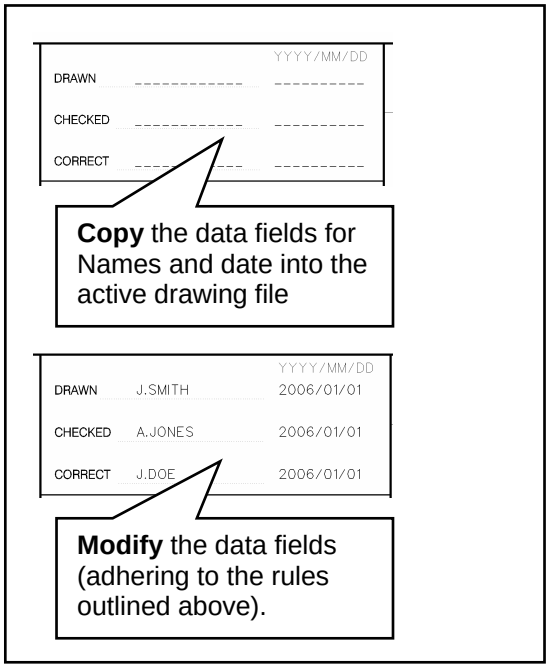


Figure 17 – Drawn, Checked and Correct Border Information

Title Block – Bar Scale

The Bar Scale area of the border contains a graphical bar and corresponding numerical value which represents the drafting scale used ***when plotted at a full drawing size.*** (See Figure 18)
If the information placed on the drawing sheet utilizes multiple scales, an **"AS NOTED"** is entered in the border area and the appropriate bar scales are placed under the title marker for each drawing. (See Figure 19)
Standard bar scales are located in the border file engbord3.dgn (See *Title Block - Standard Graphical Elements* Section).
For sheets that contain drawings that are all not to scale and do not have a numeric dimension value, an "**N.T.S.**" is entered in the border area.

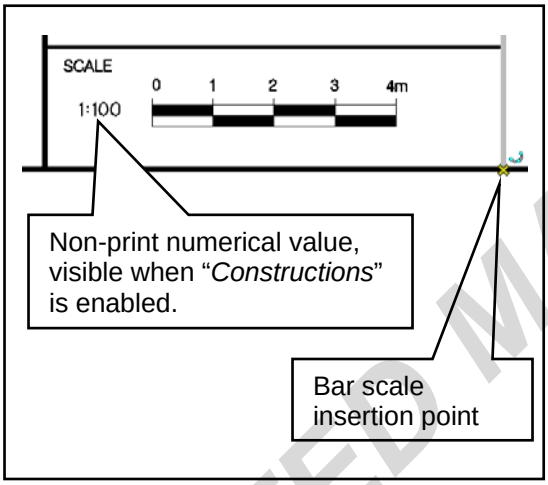


Figure 18 – Bar Scale (Single Scale Drawings)

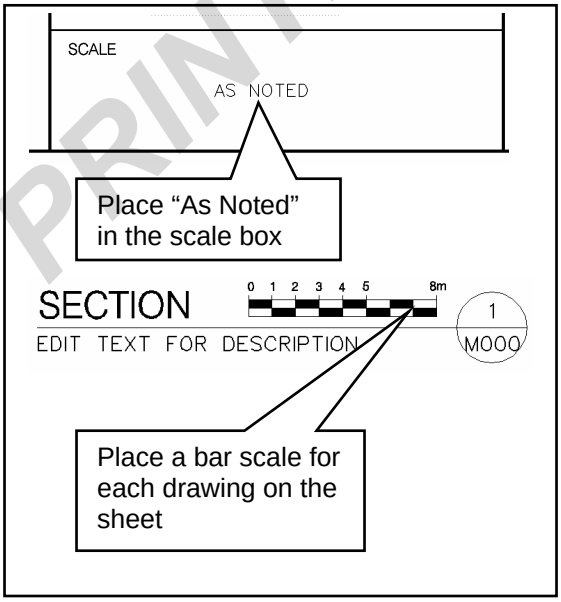


Figure 19 – Bar Scale (Multiple Scale Drawings)

Title Block – Professional Seals

Drawings that require a Professional seal/signature, shall be sealed, signed and dated by a Registered Professional in the appropriate border location (See Figure 20)

Electronic copies of seals are acceptable but signatures and dates must be applied manually. Seal and date must be legible.

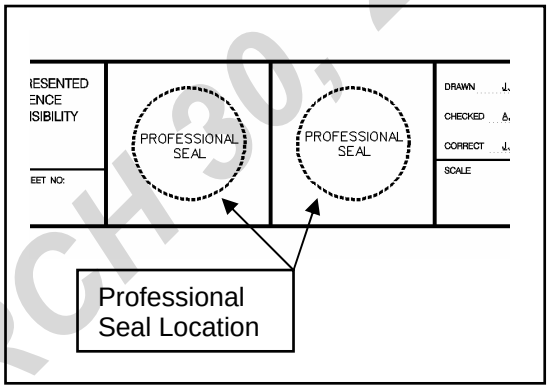


Figure 20 – Professional Seals

Title Block – Consultant's ID Box / Disclaimer Box

Consultant's name, logo and contact information should be placed in this location of the border. The Sub-Consultant's Logo may be included within the border if required. This area is also utilized for inclusion of any disclaimers or project related information (See Figure 20).

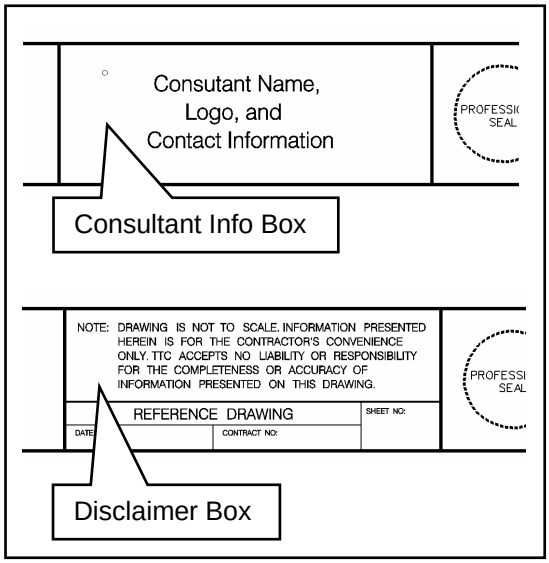


Figure 20 – Consultant Info or Disclaimer Box (TTC)

Title Block – Progress Stamp

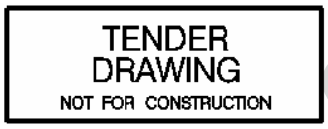
Progress stamps are used to identify the project design stage at each milestone or submission.
The SPE will instruct the project team to display the appropriate progress stamp on all sheet files.
All progress stamps required for a project are located on the referenced border file ***engbord3.dgn*** and are separated onto individual levels.
Once the SPE has instructed the design team of the new milestone;

- **turn off** the **previous progress stamp level** and
- **turn on** the **new progress stamp.**

At all times there **must be** a progress stamp visible and it **must be** consistent throughout the entire document set.

The following are standard progress stamps used;

LEVEL 19

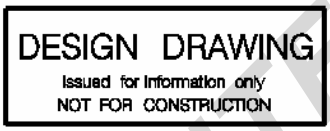


LEVEL 14

LEVEL 18

LEVEL 9

LEVEL 17



LEVEL 10

LEVEL 8

LEVEL 11

LEVEL 15

LEVEL 16

LEVEL 20

Title Block – Revision Box

Revisions made to drawings must always be made to the respective CADD digital files - **No *hand drawn*** modifications are permitted.

Revisions made during *Tender* and after *Issued for Construction* must be tracked in the **Revision Box** area of the border. Revisions are numbered, dated and briefly described by an Addendum number or Contract Change number (See the *Addendum* and/or *Contract Change Procedure* in this manual for further information)

.

To place a *Revision* notation;

- **copy** the data fields from the referenced border file into the active drawing file
- **modify** the copied data fields as required. (See Figure 21)

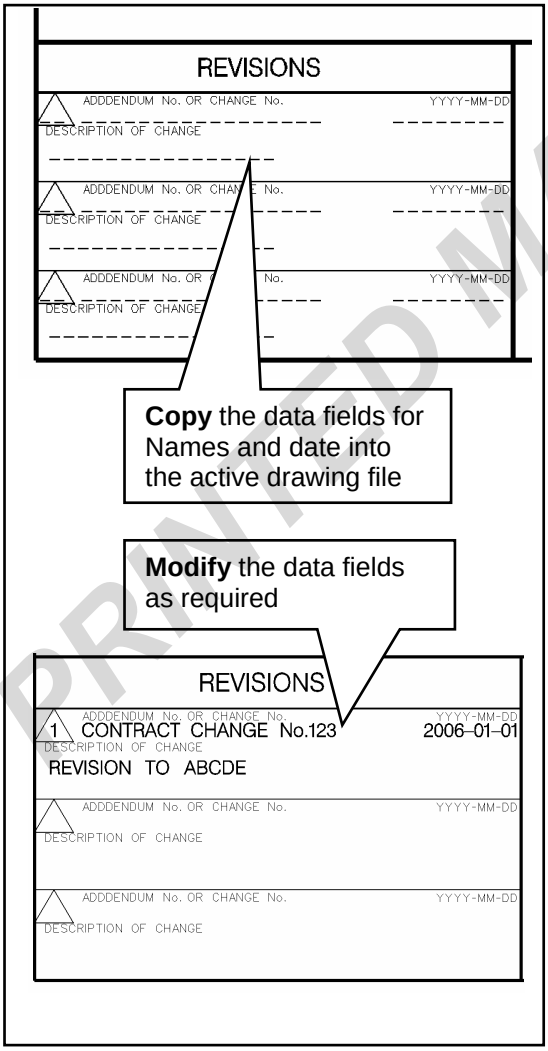


Figure 21 – Revision Box

Title Block – Standard Graphical Elements

The title block file (***engbord3.dgn***) has standard graphical elements along the right hand side that can be copied into the active design file and edited as required (See Figure 22). These are sample elements that can be copied into your contract drawing sheet and must be placed with proper levels (common levels c.dgnlib).

This includes;

- Standard North Arrow
- Bar Scales
- Title Markers
  (See *Callouts – Title Markers*)
- Section Markers
- Text and Font Standards
- Revision Cloud and Delta

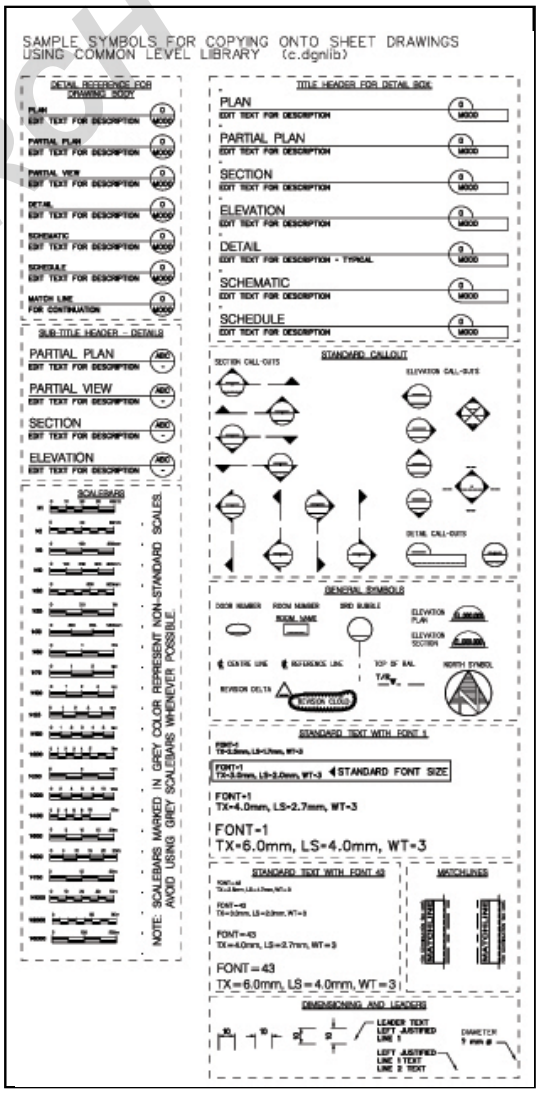


Figure 22 – Title Block Standard Graphical Elements

Cells and Cell Libraries

A ***cell*** is a combination of elements linked together as one symbol which can be placed into a drawing.
These standard cells are grouped (by using file models) in specific discipline **Cell Libraries** (having a **.cel* file extension).

Currently, there are a number of Standard Cell Libraries approved for use in design projects. For a complete list of cell libraries see *Appendix E*

Attaching a Cell Library

Cell libraries can be attached through Microstation's *Element* pull down menu (See Figure 23).

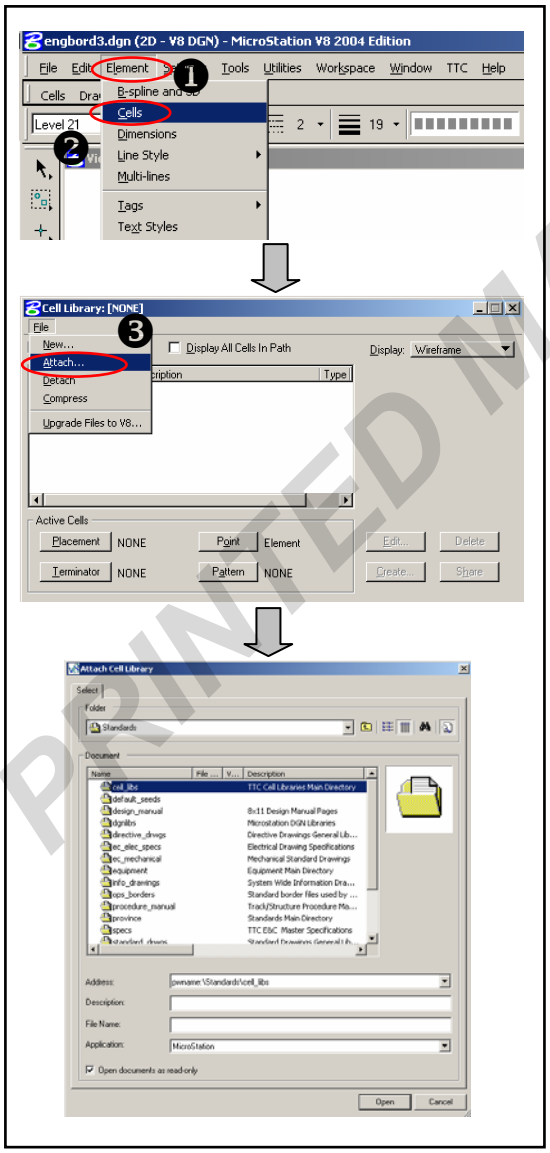


Figure 23 – Attaching a Cell Library

Cell Library Location

After selecting the *Attach* cell library command, the ProjectWise *Attach Cell Library* window will appear.
Direct to the location of the standard cell libraries ***Standards/cell-libs/ec_libraries*** and select the cell library to use. (see Figure 24)

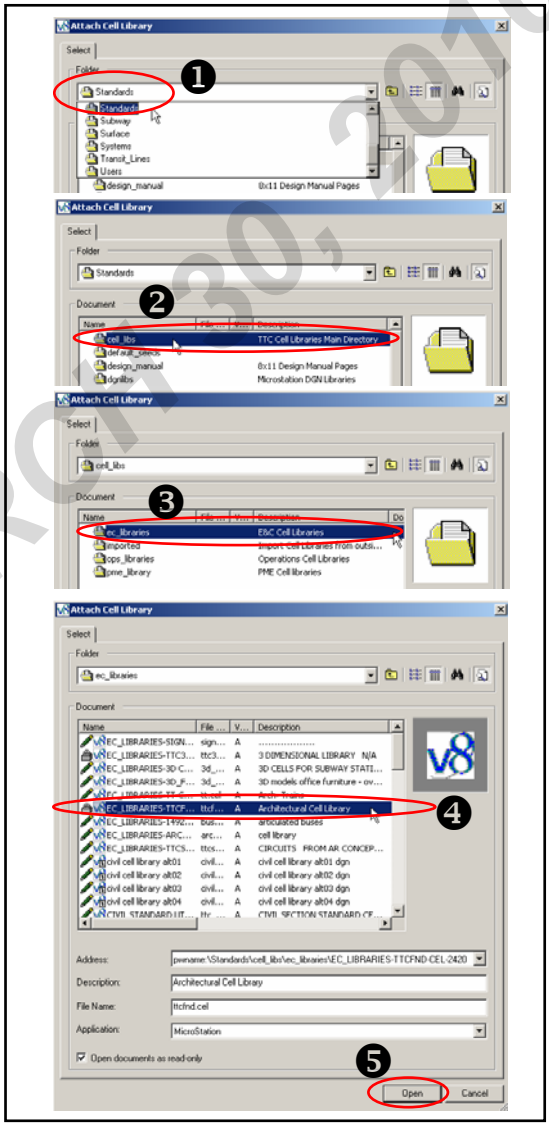


Figure 24 –Cell Library Location

General rules to follow when using cells are;

- Only use cells contained in the approved cell libraries or located on the right hand side of the border file ***engbord3.dgn.***
- Do **not** use shared cells
- Do **not** drop cells
- Models were used to create Cell Library drawings.

Drawing Settings – Drafting Standards.

Drawing settings / drafting standards provide the necessary tools required to prepare drawings which are consistent and show clarity throughout the entire design package. This is accomplished through the standardization of the following;

- Orientation
- Scale
- Line weights
- Line styles
- Patterns and Hatching
- Text Settings
- Drafting Abbreviations
- Gridlines
- Match Lines
- Key Plans
- Leader Lines
- Dimension Settings
- Callouts

Orientation

General rules to follow for the orientation of drawings;

- Plans must be oriented so that stationing progresses from left to right
- North points to the top of the sheet wherever possible.
- All plan views are oriented in the same direction.
- Notes and dimensions are to be read from bottom or right hand side of the sheet.
- **Do not** rotate the CADD files, **rotate the views** to orient the drawing horizontally / vertically.
- **Do not** move, scale or rotate plan view data.
- **Do not** move away from proper World Coordinates or Global Origin.
- Move, scale and rotate the referenced border file (as required)
- All Elevation Drawings and Longitudinal Sections must not be rotated (Set View Rotation setting – Top) With the exception of plan or part plan drawings which can be rotated to align with the station layout or alignment drawings.

Scale

General rules to follow for drawing scale;

- Produce Master files (‘m’) at **1:1 metric** scale.
- Produce Sheet files (‘s’) at scales ranging from **1:1 to 1:5000 metric** (as required)
- Do not create “**Not To Scale**” drawings except for schematics or wiring diagrams.
- Avoid using various drawing scales within the same sheet whenever possible.
- Any drawings that are labeled with numeric dimension value must be drawn to scale.

Line Weight

Line weights must show a clearly visible difference in plotted line weights on both full and half size plots.

The following line weights are used by TTC for full and half size plots;

Line Weight (on Screen)	**Plotted Line Thickness** (mm) **(Full Size)**		**Plotted Line Thickness** (mm) **(Half Size)**
0	0.125		0.064
1	0.205		0.105
2	0.290		0.150
3	0.370		0.190
5	0.525		0.275
6	0.605		0.320
7	0.690		0.360
10	0.930		0.490
12	1.090		0.575
15	1.330		0.700

Line Styles

Line styles, like line weights, aid in communicating different elements on a drawing. The standard line styles, shipped with MicroStation, must be used. Custom line styles should be avoided – if a custom line style is used, a digital file containing the definition of the line style must be included with each digital data submission. No Linestyle should be used without the approval from CADD System.

Patterns and Hatching

General rules to follow for the use of patterns and hatching;

- Apply hatching, only to large scale plans or detail drawings, for clarification (as required).
- Avoid using patterns on smaller scale drawings.
- Use the standard patterns shipped with MicroStation.

Text Settings - Style

Use the following two (2) fonts in the annotation of drawings.

- **Font 1 (Working)** for body text, notes and dimensions (See Figure 25a)
- **Font 43 (Filled)** for large text and Titles.(See Figure 25b)

Consultants will be provided an RSC file, containing Font 1 and Font 43, as part of the *CADD Information Package*

Annotations, including general notes, data fields and tags, shall all be **capital letters**. All General Notes and Legend should be located on the top right corner of the drawing.

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Figure 25a – Font 1 (Working)

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Figure 25b – Font 43 (Filled)

Text Settings – Height

Active text heights (as well as other font attributes) can be set by matching the text samples located on the right side of the border file (***engbord3.dgn***)

The following text heights are to be used (See Figure 26);

- **2.5mm** – used in areas where the default text size does not fit (to be avoided if possible)
- **3.0mm** – is the ***default size*** used for notes, dimensions, and common body text.
- **4.0mm** – used for subtitles and minor titles.
- **6.0mm** – used for major titles.

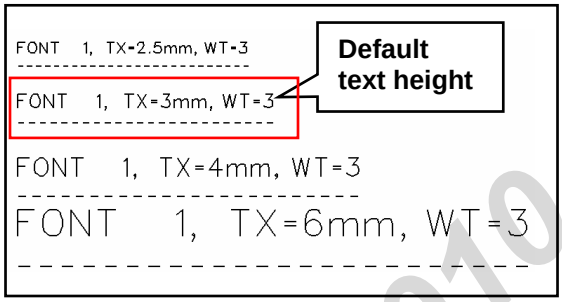


Figure 26 – Standard Text Heights

All text used in a drawing must maintain the fixed proportions of **width**, **height** and **line spacing** (3:3:2). (See Figure 27)

Name	Value
Font	WORKING
Width	0.0030
Height	0.0030
Slant Angle	0.000000
Line Spacing	0.0020

Figure 27 – Text Proportion Settings

The following chart outlines the text size settings (width, height and line spacing) for standard text located on the right side of the border file (***engbord3.dgn***).

Text Height (mm)	Width, Height and Line Spacing
2.5	0.0025:0.0025:0.0017
3.0	0.0030:0.0030:0.0020
4.0	0.0040:0.0040:0.0027
6.0	0.0060:0.0060:0.0030

General rules to follow with text are;

- Use only fonts and heights as indicated previously
- All text shall be placed with **Left** justification.
- Do not underline notes.
- Do not place notes over other graphics.
- Place all annotation (dimensions, notes, titles, etc) in a legible fashion and be fully readable when plotted at half size.
- Border Text width can be reduced if required to fit within the border box.

Drafting Abbreviations

Use of abbreviations shall only occur when space restricts the placement of the full word. For a complete listing of standard abbreviations, *see* *Appendix F*

Gridlines

General rules to follow for structural grids are;

- Continue existing structural wherever possible.
- Place grid bubbles and dimensions at the top and on the left hand side of all drawings.
- **Vertical** gridlines are ***numerical*** beginning at the **top left corner** with the number **'1'** and continuing to the right (or in the direction of future expansion)
- **Horizontal** gridlines are ***alphanumerical*** beginning at the **top left corner** with the letter **'A'** and continuing to the bottom (or in the direction of future expansion)

Match Lines

Where partial working areas are shown, display sheet limits by including match lines. Coordinate match lines with adjacent sheets, including drawing name along the match line, outside of the working area. (See Figure 28)

Figure 28 –Match Line

Key Plans

Key plans are used to show general location and extent of work areas and/or how it graphically relates to whole project.
Key plans should;

- be located at the **bottom right hand corner** of the drawing sheet
- indicate by a **hatch pattern**, the extent of area covered by the drawing (see Figure 29a)
- show section **cut lines** or **elevation marker** (for sections and elevations) – (see Figure 29b)
- contains a **north arrow**. (10mm Dia. Min)

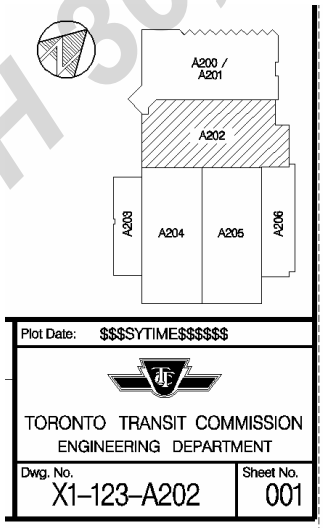


Figure 29a –Key Plan for Plan Drawings

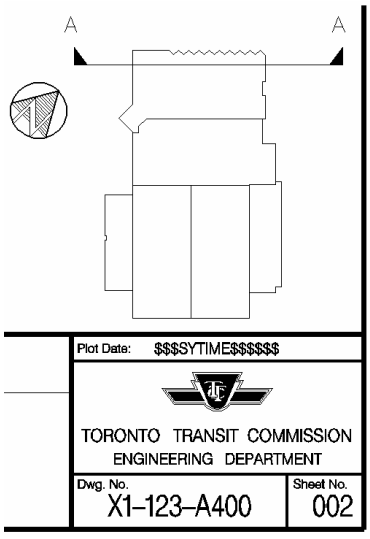


Figure 29b –Key Plan for Elevations and Section Drawings

Leader Lines

General rules to follow for leader lines are;

- Use filled arrowheads
- Leader lines can originate from the left or right side of notes and contain a short horizontal bar leading out from the text.(See Figure 30a)
- Do not overlap or cross with leaders from other notes (See Figure 30b)

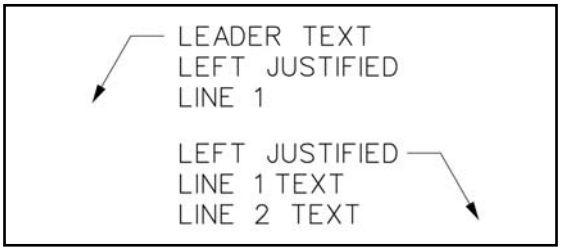


Figure 30a – Leader Line Placement (Left Justified)

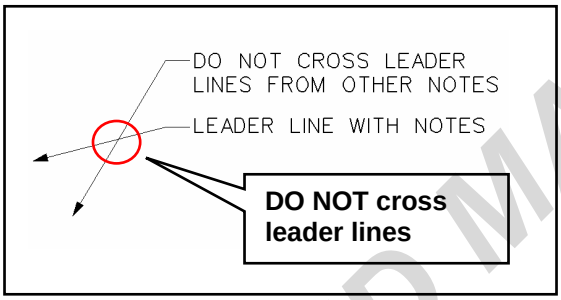


Figure 30b –Crossing of Leader Lines

Dimension Settings

All dimensions are shown in millimeters except for elevations, chainages, alignments and site drawings that are shown in meters.
Settings for dimensions are preset in the seed file (***seed2d.dgn***) used for all drawings
Dimensions should;

- Use automatic dimensioning (real size lengths)
- Use filled arrowheads for dimension terminators
- Be staggered and offset from each other, starting with **minor** dimensions [A] being placed close to the project area, followed by **major** dimensions [B] and finally **overall** dimensions [C]. (See Figure 31)

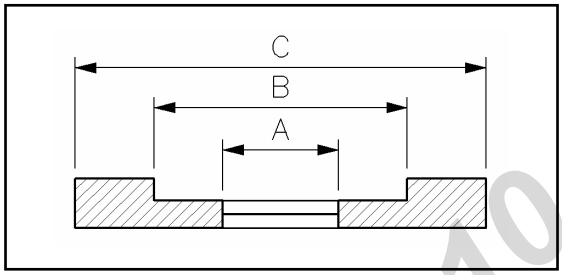
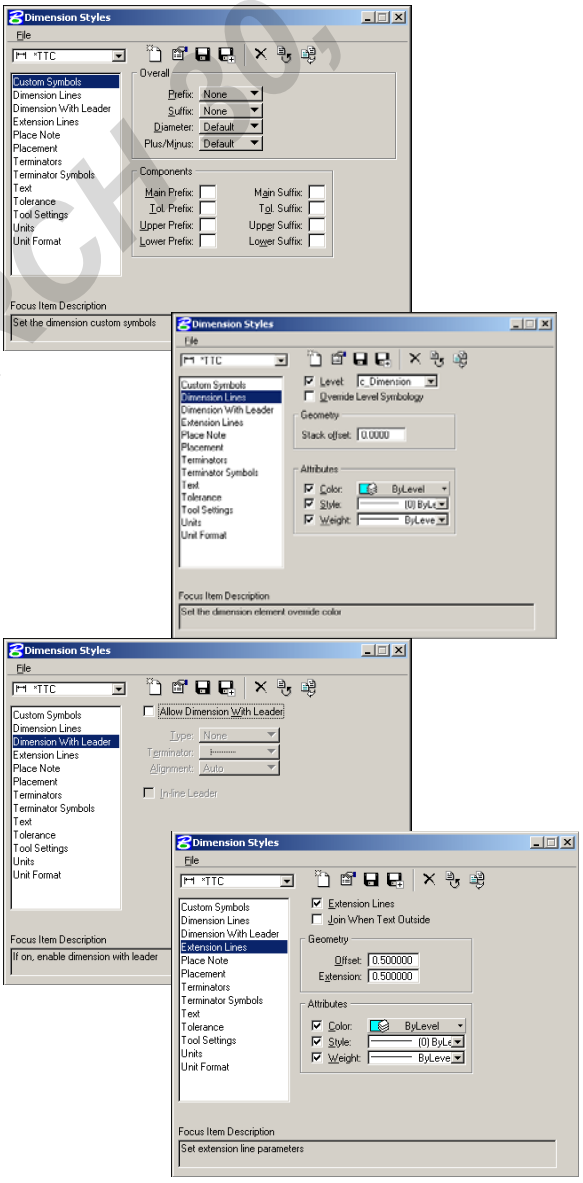
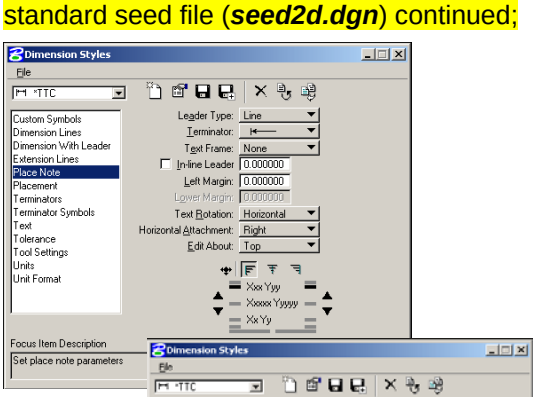


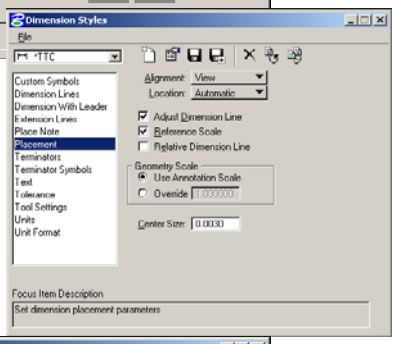
Figure 31 –Dimension Lines

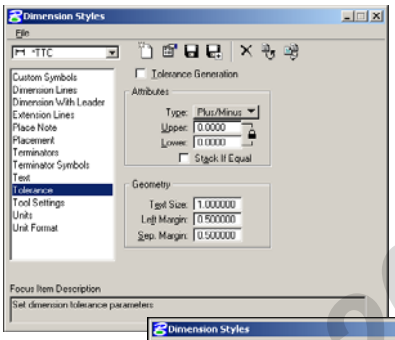
Preset dimension settings found in the standard seed file (***seed2d.dgn***) used for all TTC projects are as follows;

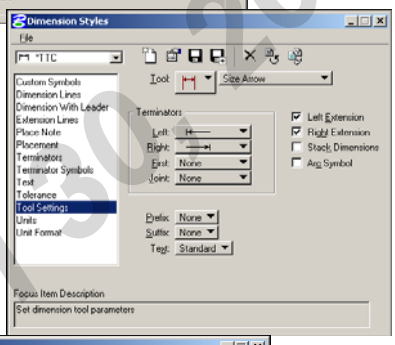


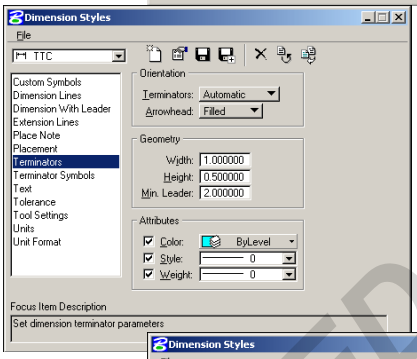
Preset dimension settings found in the standard seed file (***seed2d.dgn***) continued;

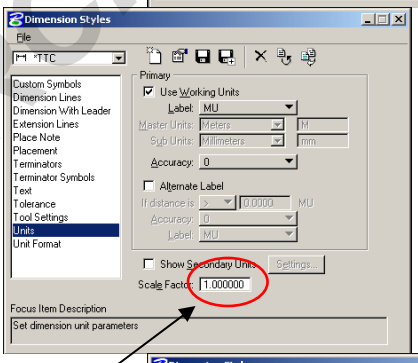




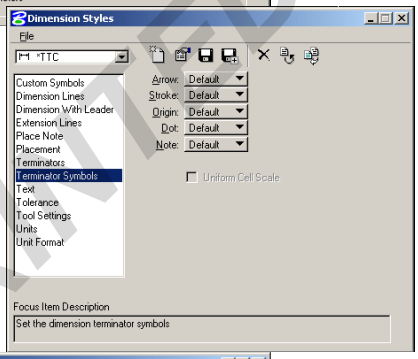


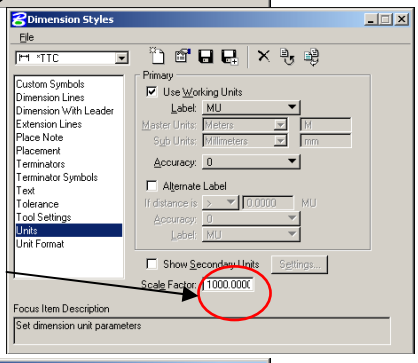




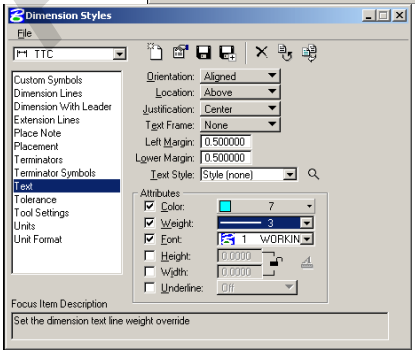


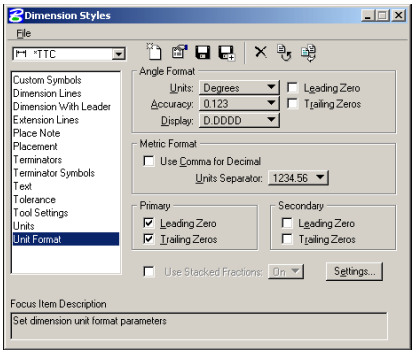
In Metres





In Millimetres





Callouts - General

Callouts are symbols placed on a drawing to direct the reader to another location in the document package.

Callouts can be used for;

- Sections
- Elevations
- Enlargement plans
- Details

Callouts – Section Markers

General rules to follow for section cuts are;

- Cut sections looking up and to the left unless another direction provides greater clarity.
- Look in the direction of increasing chainage
- For cross sections - identify sections with capital letters, omitting the letters 'O' and 'I'.
- For wall sections - identify sections with numbers.
- Identify the drawing number the section can be located on in the bottom portion of the callout.
- Section cut lines do not need to be continuous as long as the route is clearly definably

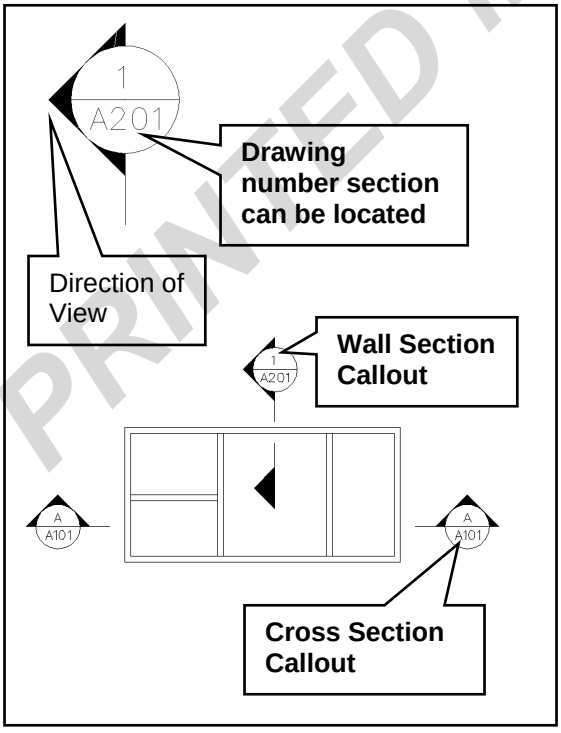


Figure 32 –Section Callouts

Callouts – Elevation Markers

Elevation callouts using numbers are direct the reader to drawings of both interior and exterior elevations.

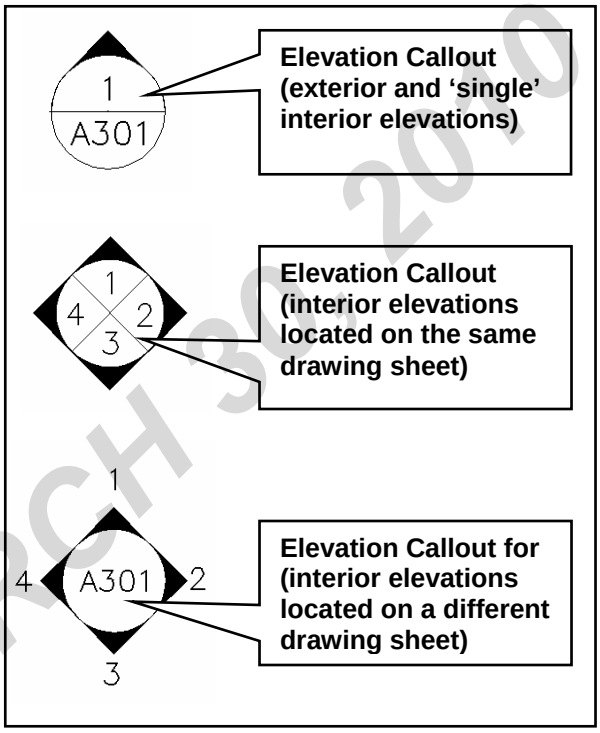


Figure 33 –Elevation Callouts

Callouts – Enlargement Plan & Detail Markers

To clarify design intent, plan enlargements and/or details are used and are identified using the following callout (see Figure 34).

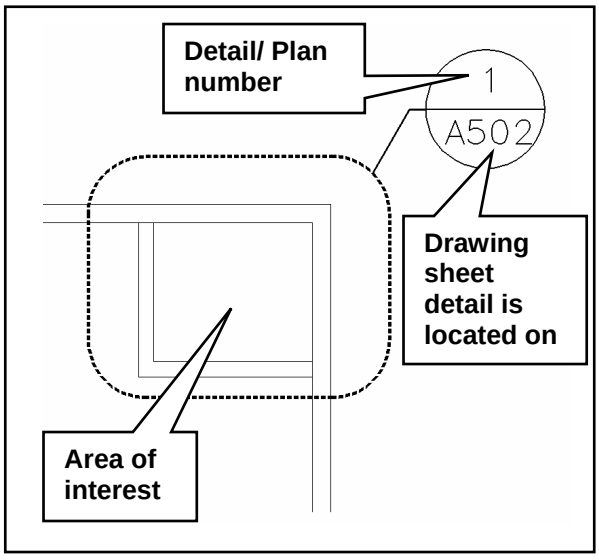


Figure 34 –Enlargement Plan and Detail Callouts

Callouts – Title Markers

Identify all drawings using the title callouts located along the right hand side of the title block file ***engbord3.dgn***

- **Copy** the Title Marker into the active drawing and edit the text
- **Add** a Bar Scale or N.T.S. (for Sub-title header only and if different from the main bar scale located in the border)
- **Add/edit** the detail number in the top portion of the callout bubble.
- **Add/edit** the drawing number in the bottom portion of the callout bubble. This drawing number should be the drawing from where the detail originated from.

  Note:
  If the detail is located on the same sheet that it is referenced from, include that sheet number in the detail bubble. Do not leave it blank or filled with a dash

There are 3 types of title marker callouts found on the border file engbord3.dgn;

- **Detail Reference for Drawing Body** (See Figure 35a), similar to *plan and detail markers,* these callouts are used for directing the reader to information found on other sheets. Used primary for all **mechanical drawing** preparation, these callout may also be used by other disciplines (for drawings that are not "over-crowded" with information – otherwise the *plan and detail markers* should be used).
- **Sub-Title Header – Referred to by a single sheet** (See Figure 35b). Inserted into drawing body for details that have been referred to by a single sheet.
- **Sub-Title Header – Referred to by multiple sheets** (See Figure 35c). Inserted into drawing body for details that have been referred to by multiple sheet.

General rules to follow;

- Do not drop callout – keep as a graphic group.
- Do not revise the top line of the title header
- Do not scale or modify properties in any way (text style, level, etc)
- If additional space is required for the drawing number field (*Sub-Title Header – Referred to by multiple sheets*), stretch the reference bubble "tail" to allow for the additional drawing number entries.

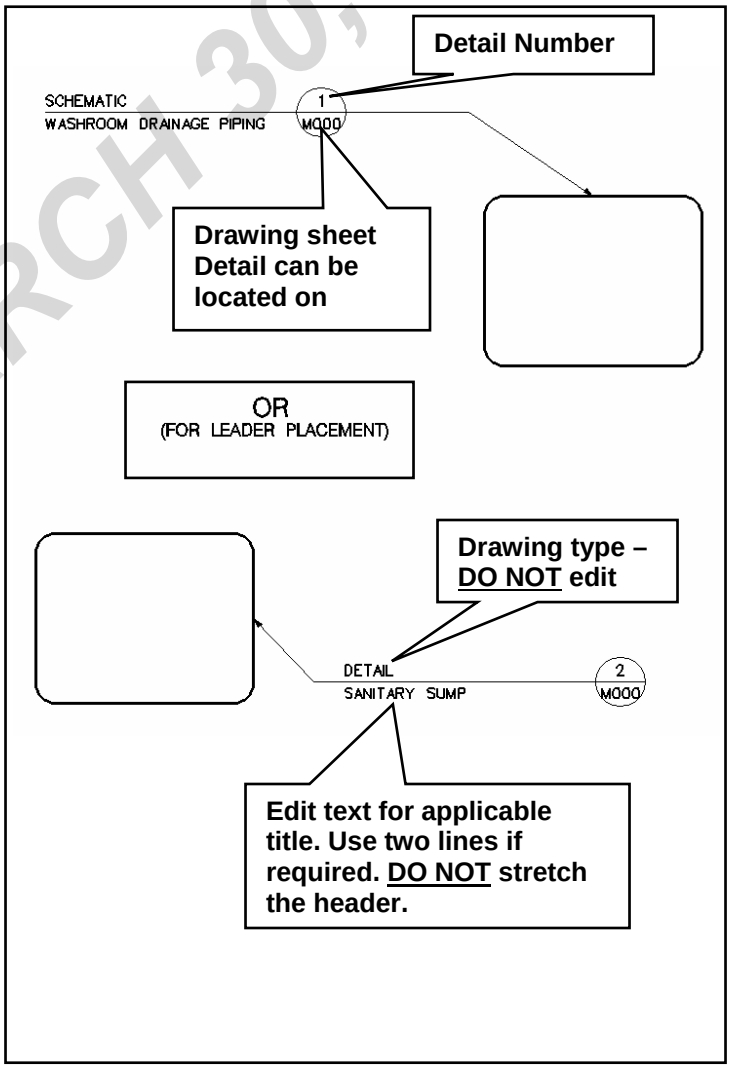


Figure 35a –Detail Reference for drawing body

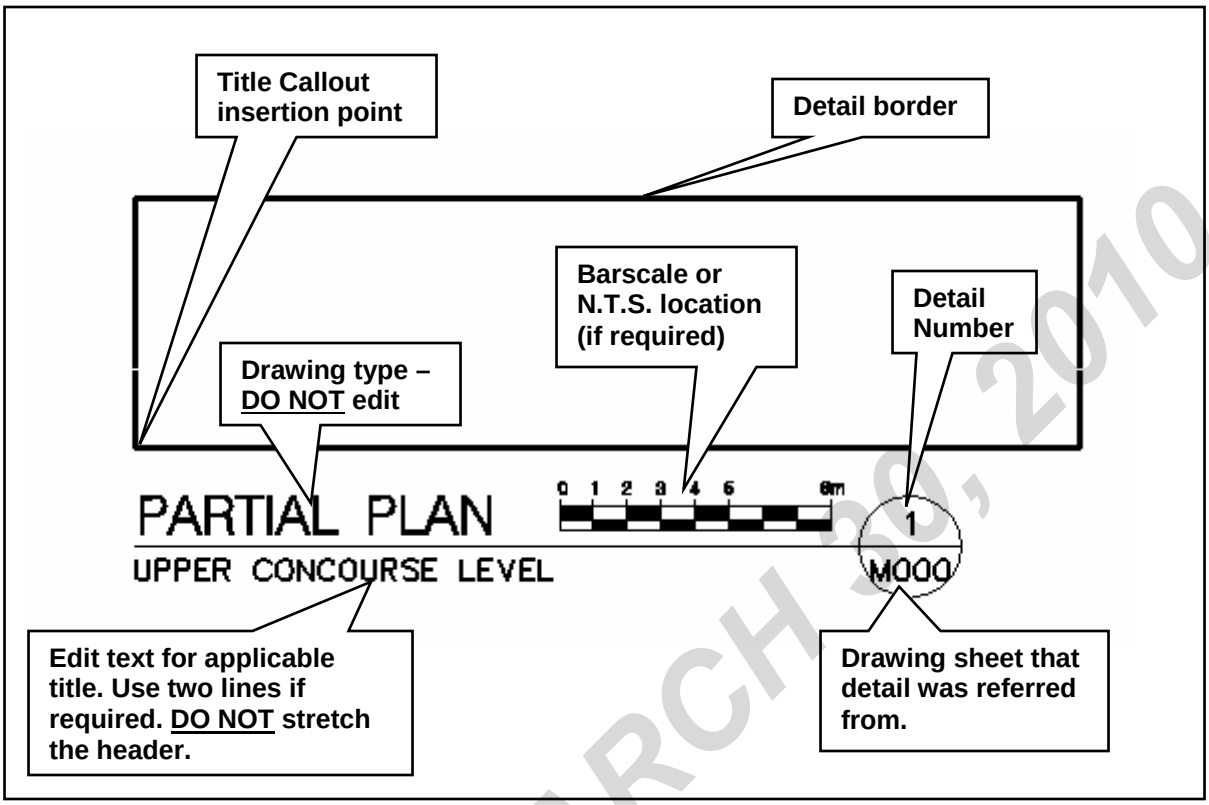


Figure 35b –Sub-Title Header (Referred to by a single sheet)

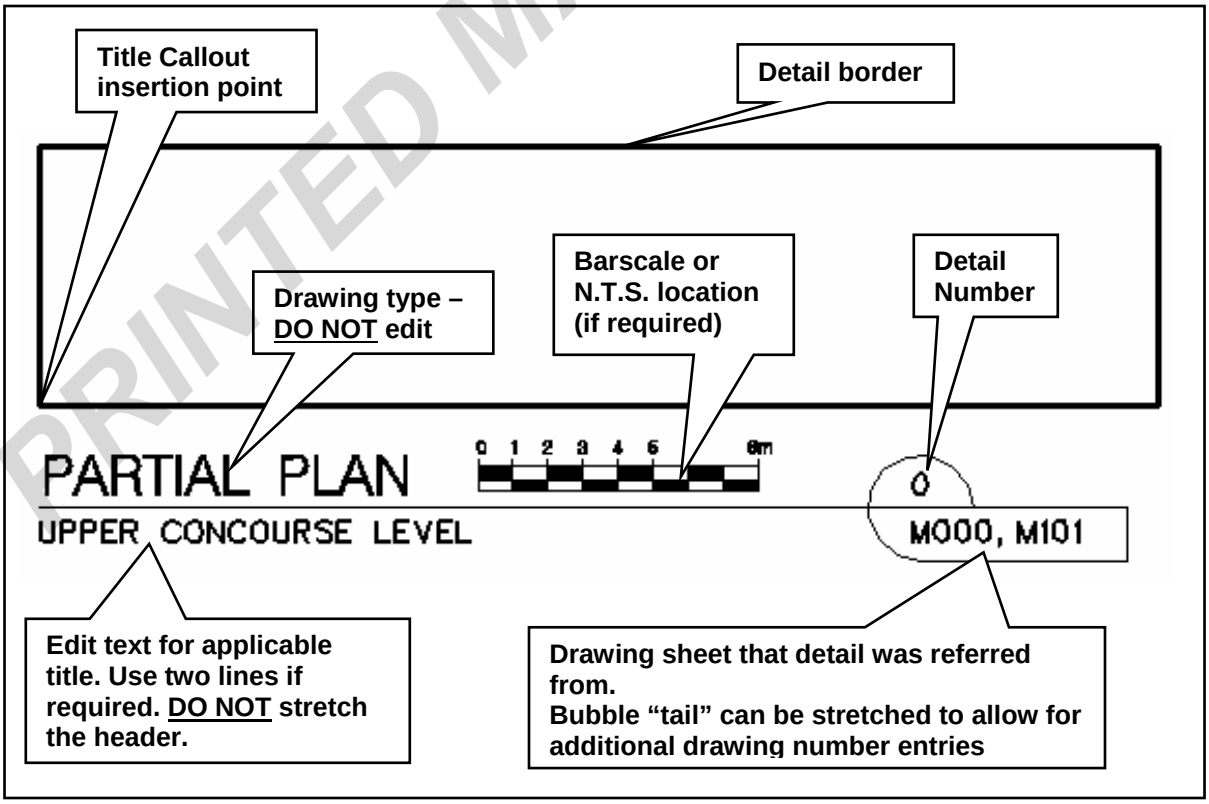


Figure 35c –Sub-Title Header (Referred to by a multiple sheets)

Sheet File Composition.

Sheet files assemble graphical data from one or more referenced "Master" files, the border file and the placement of all annotations required to become an "issue-able" drawing.

Reference File Attachment

After you have created a new file using the seed file ***seed2d.dgn*** and given it a proper name, you are ready to start adding reference files. (See Figure 36)

- From the *File* pull down menu ❶, select *Reference* ❷
- In the *Reference* window's *Tool* ❸ pull down menu, select *attach* ❹
- Select the master file you need to reference
- In the *Reference Attachment Settings* window check the following
  - Assign a "Logical Name" ❺
  - If it is the Border file, enter a scale value (all other files should remain 1:1) ❻
  - 'No Nesting' should be selected ❼

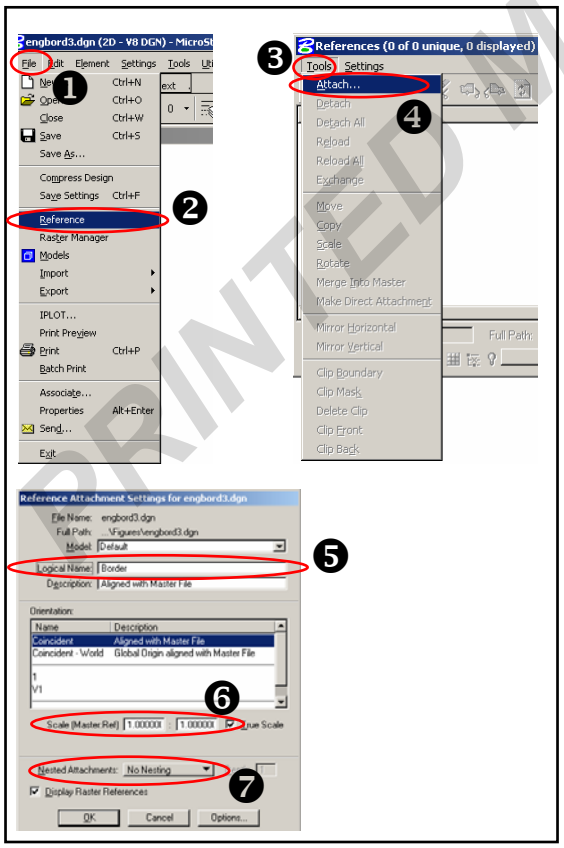


Figure 36 –Attaching a Reference File

Reference File Logical Naming

Some sheet files can have a large number of reference files attached (+20), therefore it becomes very important to give these reference files a ***'Logical'*** name for users to quickly decipher in what capacity the reference is being used. (See Figure 37)

- The TTC Border file must have ***Border*** as its logical name ❶
- Logical name description must begin with the discipline / section ❷ which created the file, followed by a brief description. ❸
- For reference files that require to be screened, an ***SCR*** designation must be placed before the logical name description. ❹
- For reference files that have been attached for information only and are not to be plotted – add an ***Noplot*** designation before the logical name. ❺ (This option is used for "on screen" visual co-ordination while not congesting the plotted drawing)

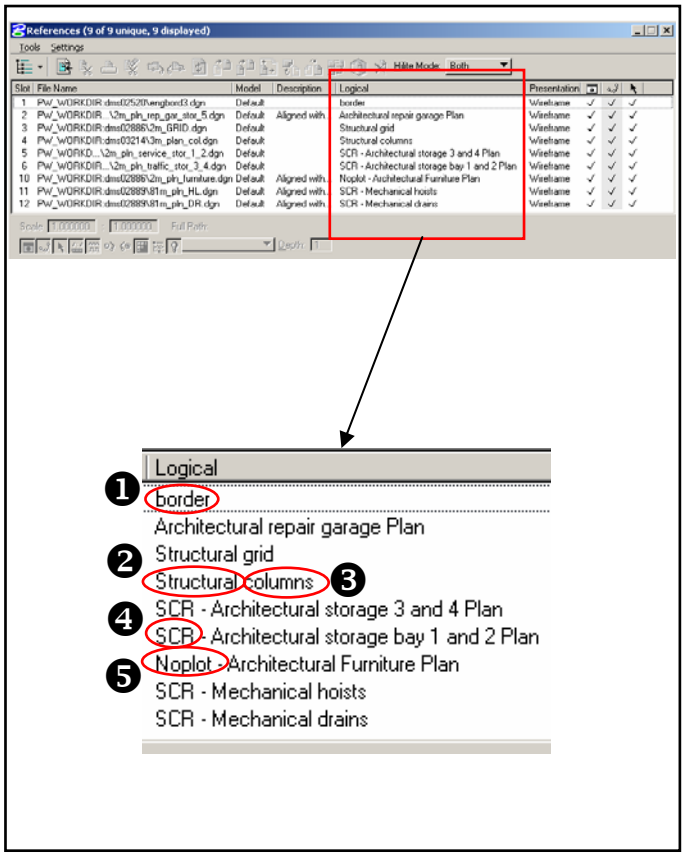


Figure 37 –Reference File Logical Names

Reference File - Assembly

After all reference files have been attached, rotate the drawing ***View*** so that the screen view is parallel to the design. (See Figure 38)

Reposition (**move, rotate and scale**) the referenced *border file* so that it frames the desired project area of the referenced master files. **Do not** reposition the other master files, **only** reposition the border (See Figure 39).

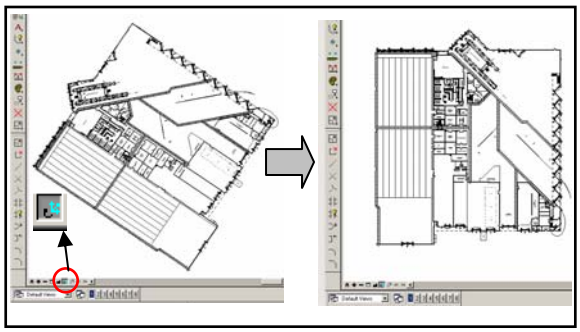


Figure 38 –View Rotation

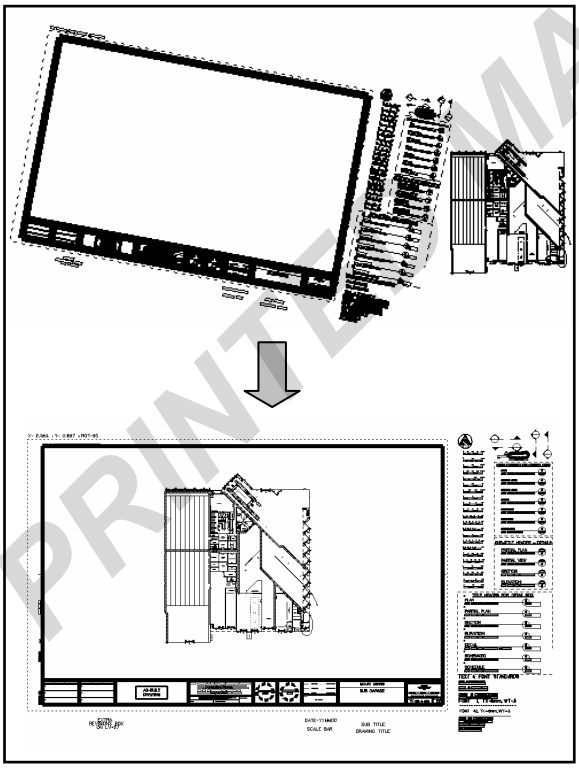


Figure 39 –Positioning of Border File

Annotation

Place all text, dimensions, callouts, border information (titles, drawing & sheet numbers, drawing creation information, etc) on the sheet file and not on the master files.
Placement of annotation shall not obscure other graphics.
Adhere to the settings and general rules outlined in the *Drawing Settings - Drafting Standards* section of this manual.

North Arrow

If the sheet file requires a north arrow (site plan, floor plans, plan details, etc) copy the ***North Arrow*** that is located on the right hand side of the border file (***engbord3.dgn***) into the **top right** hand side of the *active sheet* file (see Figure 40), rotate as required.

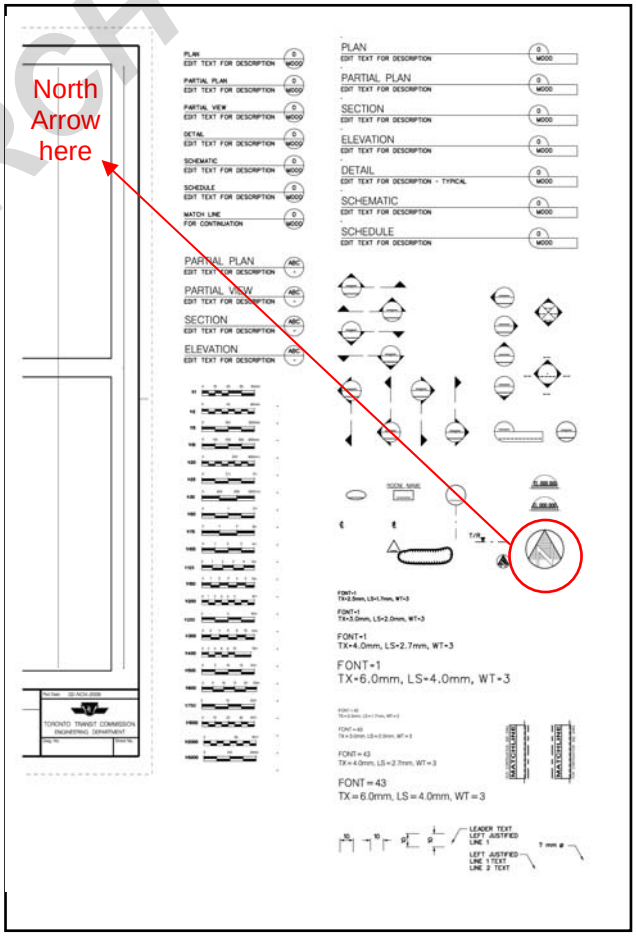


Figure 40 – North Arrow Placement

Plotting

TTC plotting environment utilizes the modified ***Interplot*** (*Iplot*) pen tables for large format and tabloid size devices. The following pen table files are used;

- **tds600.pen** Pen table for large format plotting
- **Vhalf.pen** Pen table for half size plotting
- **bw.ctb** Colour table for black and white plotting
- **color.ctb** Colour table for colour plotting.

Sheet Size

TTC border file includes plotting guidelines for ANSI D sheet size.
The following visible elements define the drawing frame. (See Figure 41)

- Outer border (solid line, non-printable)
  - ***867mm x 562mm***
- Inner border (dashed line, printable)
  - ***863mm x 559mm*** *(Comparable to 34" x 22" ANSI D)*

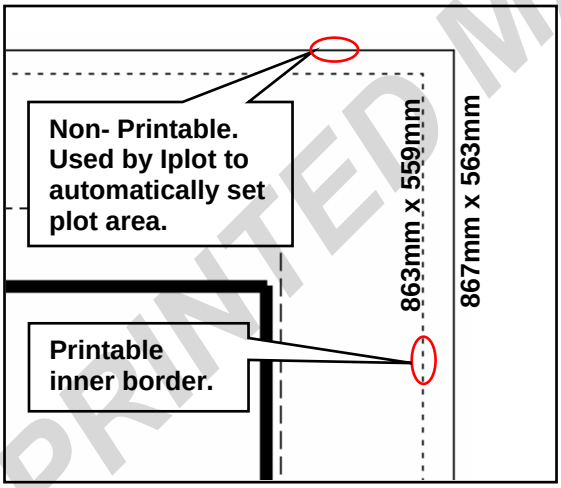


Figure 41 –Border Frames (Iplot)

For TTC in-house projects, the outer border is used by Iplot to automatically set the extents of plotted area.
For all other projects, a fence is place by selecting ***"Fence Type" – ELEMENT*** *and choosing the outer border.*

Final drawing size when printed at full size **(100%)** and measured along the *Inner Border* (dashed line) is **863 x 559mm**.
(34"x22" ANSI D).

Half size plots are plotted at **50%** of drawing full size scale for a sheet size of **11"x17"** (Tabloid, Ledger). (See Figure 42).

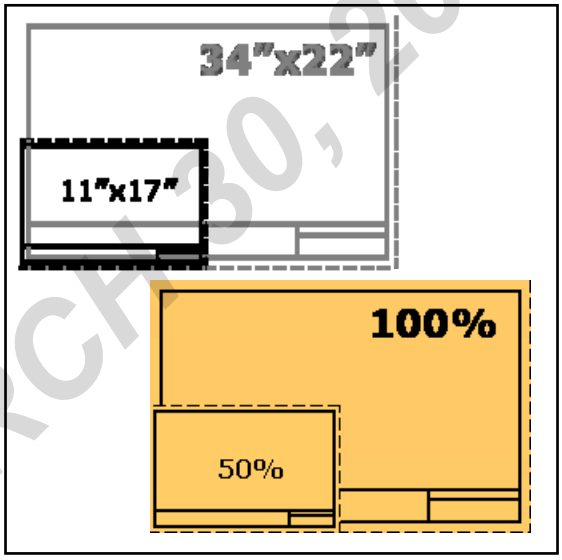


Figure 42 –Full and Half Size Plots

Using Iplot

Iplot is a plot generation and submission component for production plotting of MicroStation drawings.
To create a plot using Iplot, select ***Iplot*** from the *File* pulldown menu or the ***Print*** icon (See Figure 43)

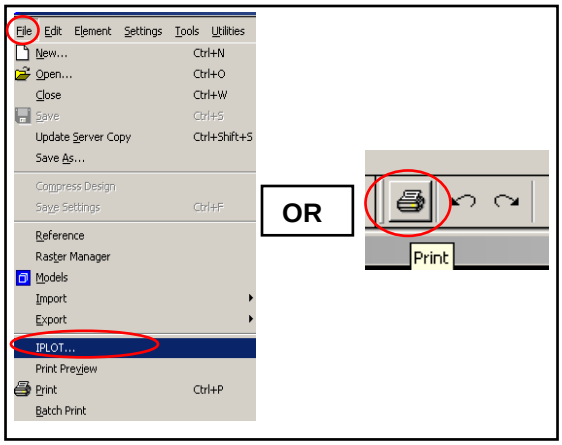


Figure 43 –Iplot Command

For *Half-Size* plots (See Figure 44);

- Select ***Iplot***
- ***Printer*** should be default 11"x17" printer ❶
- ***Paper Size*** should be 11x17 ❷
- *Select* ***Plot*** to submit❸

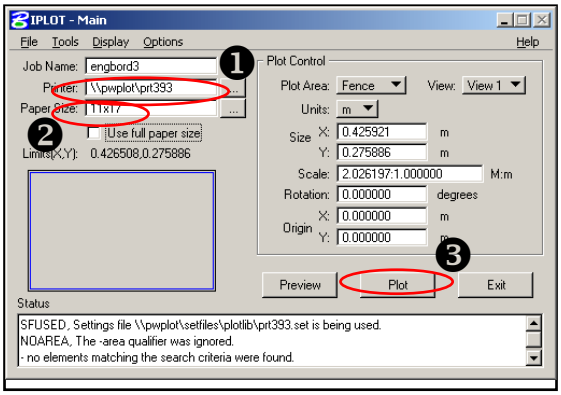


Figure 44 –Half Size Plots

For *Full-Size* plots (See Figure 45);

- Select ***Iplot***
- ***Printer*** select large format plotter (currently the **tds600**) ❶ to ❸
- *Verify* that the *Paper Size* is ***Bond (default) or Vellum (As-Builts)*** ❹
- *Adjust* the ***Plot Scale*** ❺
- *Verify* that the ***X*** or ***Y*** values are **0.867m** and **0.562m** ❻
- *Select* ***Plot*** to submit❼

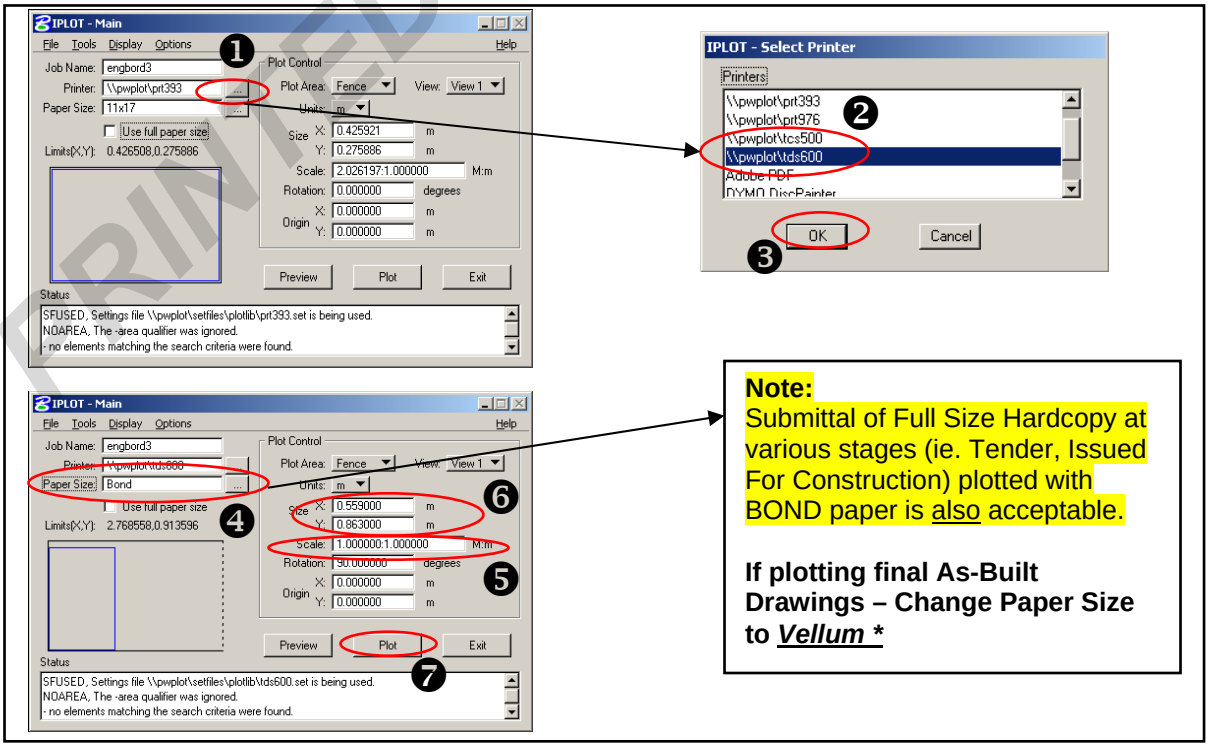


Figure 45 –Full Size Plots

Creating ***PDF*** plots (See Figure 46);

- Select ***Iplot***
- ***Printer*** select large format plotter (currently the **tds600**) ❶ to ❸
- *Verify* that the *Paper Size* is ***NONE*** *for Full Size* ❹
- *Adjust* the ***Plot Scale*** ❺ and set *Rotation* to **90 Deg** ❻
- From the ***File*** pulldown menu *select* **Export PDF**❼
- Press **Create PDF** ❽

Saving a ***PDF*** plots (See Figure 47);

- Press **Close**, bring next window ❾
- The **pdf** file that was created can be saved or stored as per desired folder directory similar to the **file name.**
- **Drawing Number** should be used as the final PDF filename for Drawing Sheets. ❿ (ie. ABC-12-A101.pdf)

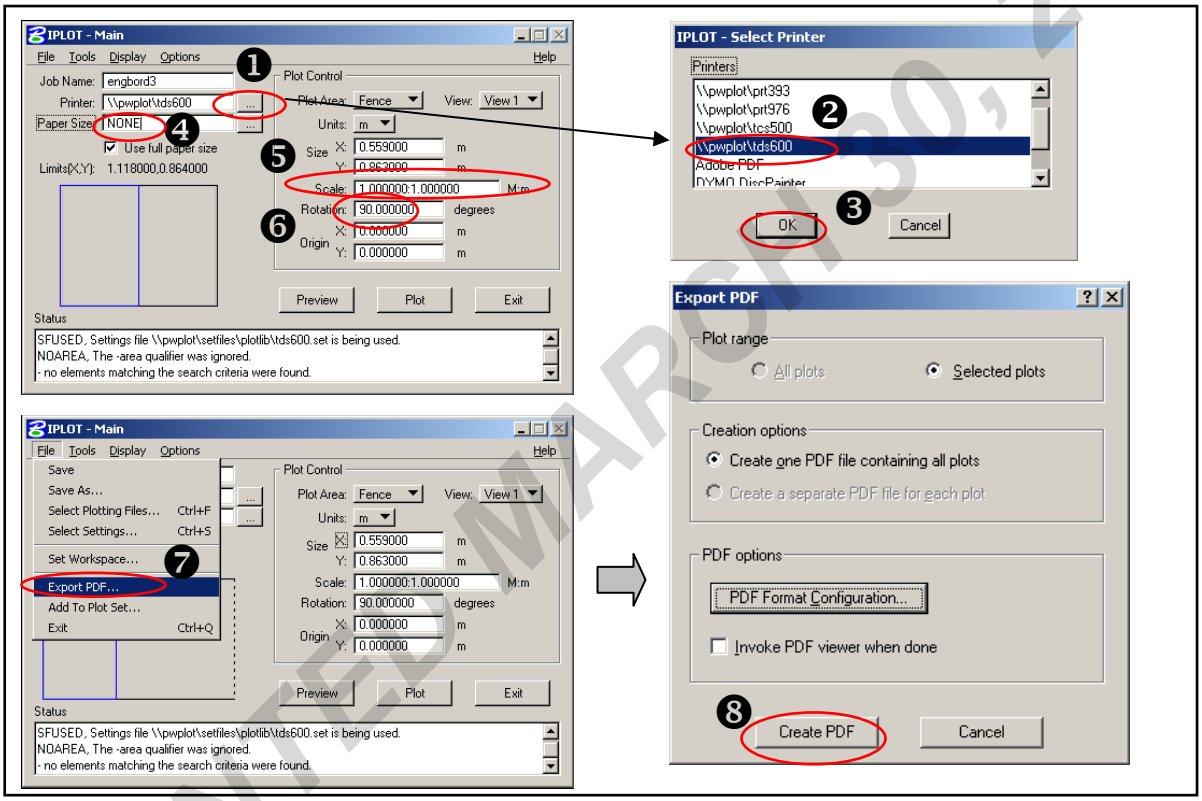


Figure 46 – PDF Full Size Plots

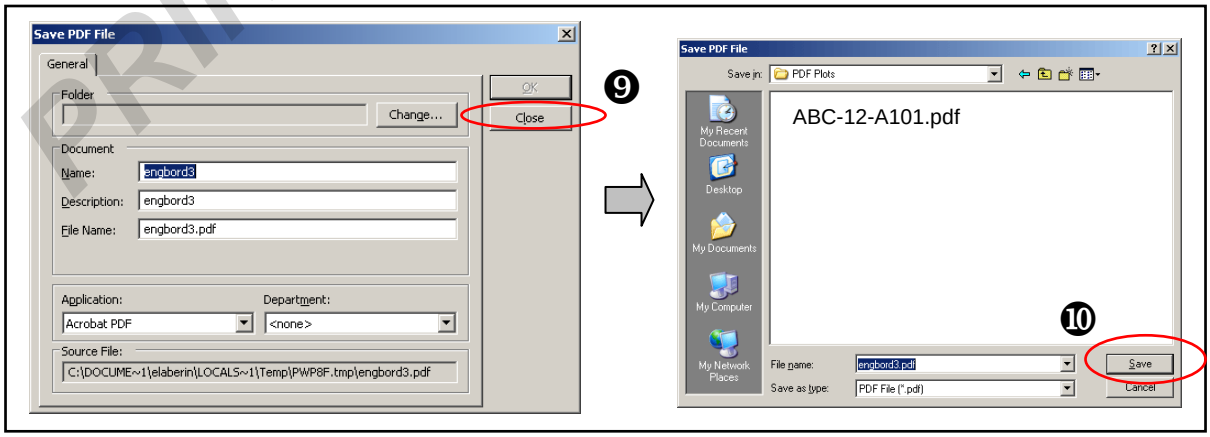


Figure 47 – Saving PDF File

Plotting Screen Colours

Background information and elements of secondary importance on a drawing may be plotted using a grey colour (a % of black).

New projects use the following methods to screen information;

- Place element on **Levels**;
  - o "*Light Grey*" 10% screen
  - o "*Grey*" 20% screen
  - o "*Dark Grey*" 30% screen

  (These levels should be used for any fills that require screening)
- Set **Element Attribute** to colour *160* to *167* (inclusive)
- If a reference file requires to be screened, add an ***SCR*** prefix to the *Logical Name* (See *Reference File Logical Naming* in the *Sheet File Composition* section of this manual)

Legacy projects use the following methods to screen information;

- Place element on *Level 50*
- Set **Element Attribute** to colour *160* to *167* (inclusive)
- If a reference file requires to be screened, add an ***SCR*** prefix to the *Logical Name* (See also *Reference File Logical Naming* in the *Sheet File Composition* section of this manual)

Using the "No Plot" Option

To ensure that data from an attached reference file will not be visible on a plot output, add the ***NOPLOT*** prefix to the reference file's *Logical Name* (See also *Reference File Logical Naming* in the *Sheet File Composition* section of this manual).

This option works very well in improving the legibility of plotted drawings, while still preserving the usefulness of the "on screen" visual cross-checking.

Drawing Path and File Name

In order to aid in tying plotted drawings back to their electronic CADD counterparts, the border file contains a ***CADD Path and File Name*** field in the top left corner of the sheet. (See Figure 48).

For TTC in-house projects, this field is automatically filled out by Iplot's modified pen table. For all other projects, this field must be **filled out manually**.

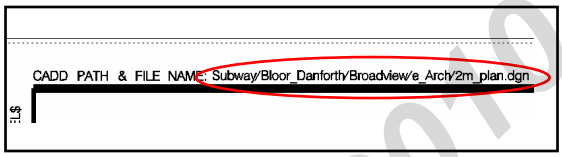


Figure 48 – CADD Path and File Name (Border File Field)

Submissions / Milestones

During the development of the design work plan covering a design assignment, the ***Design Review Submissions / Milestones*** will be established by Departmental Instruction and the project team (as directed by the Project Manager).

An example of a typical design review submission sequence could be:

- ***Scope Review*** - 30% Review
- ***Construction Review*** - 100% Review
- ***Other submissions as per PM directions***.

At each *Design Review*, **digital files** shall be submitted for ***review by CADD System*** to ensure compliancy with the standards contained within this Manual.

Other milestone submissions, not requiring Design Reviews, (but requiring CADD digital files to be submitted for review / record, if designed by a consultant), may include;

- **To Authorities**;
  - Site Plan Application
  - Building Permit
  - Ministry of the Environment (MOE)
- ***Tender*** - Issued for Tender
- ***Construction*** - Issued for Construction Drawings (which include all Addenda)
- ***As-Built*** - Final As-built drawings

Issued for Tender Submission

After design review drawings have had all comments addressed and are ready to be issued for tender, the following must be completed prior to plotting and issuance;

- **Activate** the “Issued for Tender” progress stamp (*Level 14 of engbord3.dgn reference file)*
- **Place** Profession seal (can be electronic version) and signature and date (must be manual).

Issued for Tender drawings may also be submitted to the Building Department for Permit Application concurrent with the Tender Submission

Issued for Construction Submission

Upon reaching the award of contract stage, the drawings used for tender must be prepared and plotted for the ***Issued For Construction*** milestone.

For this submission, the following must be completed to all drawings prior to plotting;

- **Remove** all revision information from the ***Revision Note*** area of the border.
- **Remove** all clouds and deltas.
- **Activate** the “Issued for Construction” progress stamp (*Level 18 of engbord3.dgn reference file*).
- **Place** Profession seal (can be electronic version) and signature and date (must be manual).

Revisions to CADD Files

All revisions to drawings shall be made to the digital CADD files. ***Hand drawn*** modifications are **not** permitted.

Revisions - Post Issued for Tender

Revisions to drawings are identified by a revision ***Cloud*** (encompassing the graphical change), ***Delta*** and ***Revision Note*** in the revision box of the titleblock.
Should the revision affect more than one area of the same drawing, a cloud and delta must be placed around each revision. If the revision is applicable to a large portion or most of the drawing, then the entire drawing area may be clouded. (See Figure 50)

*As with all Annotation, the Revision Cloud, Delta and Revision Notes must be placed on the **Sheet File** and not on the Master file.*

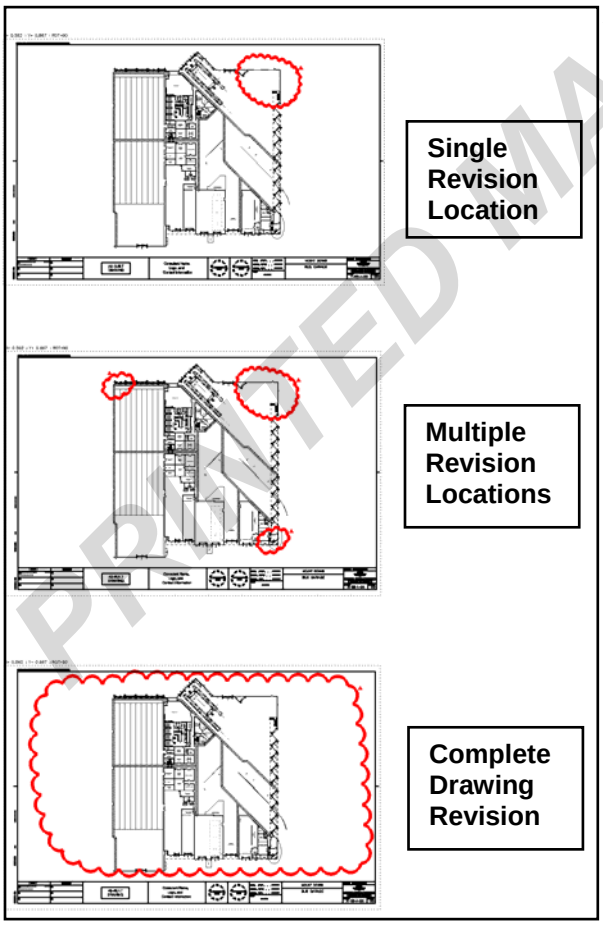


Figure 50 – Identifying Revisions

Subsequent Revisions

To identify subsequent revisions on a drawing, the following must be done (See Figure 51);

- **Remove** the *revision cloud* associated with the previous revision but **do not** remove the *revision delta* or *revision note*.
- **Place** a new *revision cloud* and *revision delta* to the revised area.
- **Add** the *revision note* to the titleblock

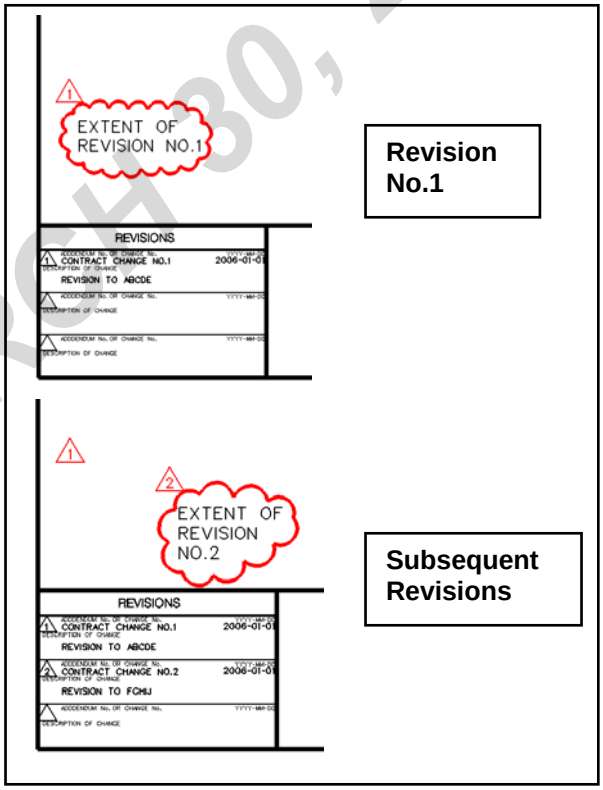


Figure 51 – Identifying Subsequent Revisions

Revision Delta

The revision delta symbol used to identify revisions is located on the right hand side of the titleblock file (*engbord3.dgn*). Copy into the active sheet file and revise the delta's data field accordingly.

Revision Cloud

The *revision cloud* can be added to the sheet file by using the ***Cloud – draw Revision Cloud*** command.
The command is located in the **TTC TextBar** under the **Draw** pulldown menu (See Figure 52)

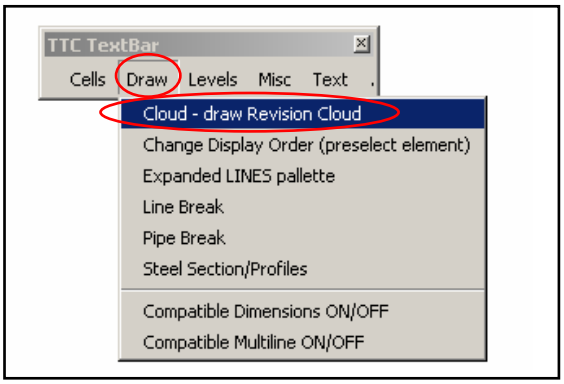


Figure 52 – Revision Cloud Command

To place the cloud (See Figure 53);

- From the ***SSCloud*** toolbar, select the *Place Revision Cloud* ❶
- In the *Place Revision Cloud* toolbar, check the *Radius* ❷ button and enter the radius amount ❸. (This amount must match the text height of the active sheet file)

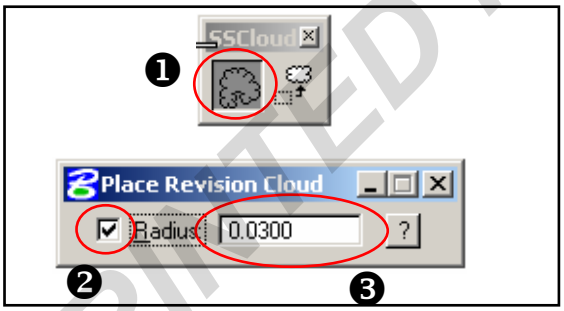


Figure 53 – Revision Cloud Settings/Placement

Revisions - Addenda

When changes are required to drawings after they have been *Issued for Tender*, the changes must be indicated by a ***cloud***, ***delta*** and ***Revision Note.*** For any subsequent revision, **remove** the ***previous cloud*** and place a new cloud, delta and revision note for the new revision. (See *Revisions – Post Issued for Tender*).

*Note: Any changes to drawings, after they have been 'Issued for Tender', can not occur until the project **SPE** has **issued** an **Addendum Number.** See Procedure for Addenda Revisions.*

Revisions – Post Issued For Construction

Once drawings have been issued for construction, any changes can only occur **AFTER** a ***Contract Change number*** has been issued.
Once a Contract Change No. has been issued, the changes must be indicated by a ***cloud***, ***delta*** and ***Revision Note.*** For any subsequent revision, **remove** the ***previous cloud*** and place a new cloud, delta and revision note for the new revision.

*See Contract Change Procedure for further information on changes that occur to drawings after they have been **Issued for Construction**.*

Revisions – As-Built Drawings

When project construction has completed, the CADD drawing files must be ***updated*** to reflect the actual "As-Built" condition.
This will be accomplished by incorporating all ***Contract Change*** information and any ***undocumented site changes / conditions***.
Finally, all revision ***clouds, deltas and revision notes*** must be ***removed*** from the drawings and the "***As-Built" progress stamp applied*** to the sheet file.

See As-Built Drawing Procedure for further information on the preparation of As-Built Drawings

Menus (TTC)

To provide Users with additional tools that are not included in the basic installation of Microstation, CADD System has incorporated **Custom** tools to aid in the production of CADD drawings.

TTC TextBar

TTC Textbar is a custom menu assembling scripts, macros, and applets that are not included in the standard Microstation installation. Individual functions are explained by use of the command wording. (hence the naming of the toolbar – **TextBar**).
The toolbar is initiated by selecting the ***Show TextBar*** command from the ***TTC*** pulldown menu (See Figure 54)
The content of the TextBar menu is controlled by CADD Administrators and is common to all TTC users at Microstation startup.

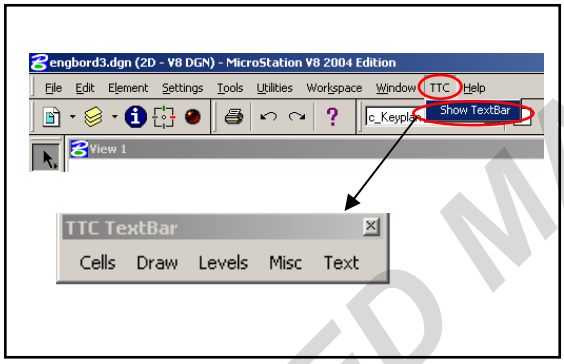


Figure 54 – TTC Pull down Menu

Function Keys

Function Keys provide users with the ability of attaching shortcut commands or various program scripts to keyboard function keys (F1, F2, F3 etc)
TTC uses a common function key file (*Funckey.mnu*) initially provided by CADD Admin.
Should the function key menu be ***customized*** by the ***individual user***, ensure that a backup of user changes is created.

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CADD Procedures for Consultants

CADD Procedures for Consultants

Scope

The Toronto Transit Commission contracts Consulting Firms to provide design services for many of their Facilities and Structures; part of this contract is the creation and submission of CADD drawings.
This creation is merely the initial process for the life span of these files. They will be shared, referenced, revised and expanded on by different consultants and by TTC design staff.
Therefore the drawings **must** adhere to a common **CADD Standard** in order to alleviate any potential conflict or confusion with subsequent users of the file.

It is to be noted that CADD deliverables **must** meet ***all standards and procedures*** provided in this manual.

Information Supplied by TTC

At the initial Project start-up meeting, the Project Manager (PM) will request the CADD System Group to provide the Information Package (Resource Files) containing the necessary information and documentation for the creation and submission of CADD data files for the consultants.

The Information will include;

- *Current - TTC CADD Standards and Procedures Manual*. (***TTC CADD Manual.pdf***)
- *TTC Engineering Border File* (***engbord3.dgn***)
- *TTC MicroStation Seed File* (***seed2d.dgn***)
- *File Description Spreadsheet* (***filelist.xls***)
- *Resource files (*.rsc)* (***fonts and linestyles***)
- *Discipline specific Dgn Libraries* (***.dgnlibs**)
- *Cell Libraries* (***.cel**)

On request from the Commission Representative, CADD System staff may also provide other project relevant CADD data.

CADD Data Format

All CADD data, provided by the TTC, will be in ***MicroStation Version 8*** (V8) dgn format. To obtain the data in MicroStation Version 7 (V7), contact TTC CADD System Staff.

Some external source data may only be available in drawing formats other than MicroStation. TTC will provide such data in its ***original format without any conversion***. Any conversion of the digital data will be the sole ***responsibility of the Consultant*** with TTC assuming no responsibility for any inaccuracies, discrepancies or missing information due to file conversion.

All translated files **must conform** to the standards and procedures outlined in this manual.

CADD Data Transfer (TTC Outgoing)

All outgoing CADD data transfers from the TTC must be completed exclusively by ***TTC CADD System Staff***.

CADD Data Transfer Method

CADD Systems staff may transfer files using one of the following methods;

- For data **less than 10 Megabytes**, an attachment to an email will be sent to the consultant. The attachment may be data that has been compressed into a **pkzip archive file** (*.zip) and **renamed to *.zip.ttc** to bypass common proxy filter settings. (ie ***filename.zip.ttc***)
- For data **larger than 10 Megabytes,** a CD-ROM or DVD-ROM will be created and sent to the consultant.
- Data may also be sent via a **Consultant FTP site** (if available). Login parameters must be provided to CADD System Staff during the initial project start-up meeting.

TTC Disclaimer

All file transfers will include a standard ***TTC CADD Disclaimer*** in pdf format (*See Appendix H*)

Information Submissions to TTC

During the development of the design work plan covering a design assignment, the ***Design Review Submission Milestones*** will be established by the project team (as directed by the Project Manager).

At each *Design Review*, **digital files** must be submitted and will be ***reviewed by CADD System*** to ensure compliancy with the standards contained within this Manual.

CADD Data Format / PDF Files

All CADD data submitted to the TTC **must be created** using ***MicroStation Version 8***. CADD data created in any other formats will not be accepted.

In addition to the above, each contract drawing shall also be submitted in ***Adobe *.pdf*** file format meeting the following requirements;

- The name of each digital *.pdf file set must match the contract drawing number.
- Pdf files may contain both vector or raster data.
- The content of each pdf file must be identical to the hard copy and Microstation CADD File of the submitted drawing

CADD Data Transfer Method - (Consultant)

Data shall be submitted to TTC using one of the following methods;

- For data **less than 10 Megabytes**, an attachment to an email can be sent to the Commission Representative. Data can be compressed into a **pkzip archive (*.zip)**, however the **file extension must be renamed to .ttc** in order to bypass the TTC email system filters.
- For data **larger than 10 Megabytes,** a CD-ROM or DVD-ROM will be created with data **uncompressed** and sent to the Commission Representative.

NOTE –The use of the "Packager" feature in Microstation is not acceptable for data submissions.

*The File Description Spreadsheet (**filelist.xls**), provided as part of the Initial Information Package, must be **completed and submitted** with every CADD data submission*

For submissions on CD-ROM / DVD-ROM, the **disk label must contain** the following information;

- TTC Contract Number
- TTC Contract Project Title
- "Issued for" Milestone/Submission
- Date of Issue
- Consultant's Company Logo
- If the submission spans multiple disks, number the disks in the set (i.e. *Disk 1 of 3*)

CADD Data Submission

CADD data files submitted to TTC must be files that have been **developed or modified** by the Consultant. Reference information provided to the Consultant by TTC, which has **not been altered,** must **not be included** in the submission.
CADD data files submitted to TTC must meet the following conditions;

- Files must be place into **Discipline specific folders** (ie – PAD, Civil, Arch, Struc, Mech, Elec).
- The **Border file** must be located in the Root Folder
- Master files referenced by multiple disciplines must only be **submitted once** at each submission and **located** in the **folder** of the **discipline responsible** for the file content.
- Drawing Listing (FileList.xls) for all Contract Drawing Sheets and Master Files.
- Legacy Microstation CADD Files drawings acquired from TTC for reference purposes must also be included with the submission for conducting the CADD File Format Review of digital files.

This will eliminate the possibility of file duplication, submitted in multiple locations.

All **Milestone Submissions** must include a complete set of digital files developed by the Consultant, including files that have not been modified since the previous submissions.

CADD Data Submission Review

All submissions of digital files will be reviewed by CADD System Staff, to ensure compliance with standards contained in this Manual. Submissions failing to meet all requirements will be returned to the Commission's Representative with a listing of non compliances that need to be addressed by the Consultant, corrected and resubmitted.

Tender, Issued for Construction and As-Built Submission

For submission of files during the *Tender*, *Issued for Construction* and *As-Built* stage, ensure that the following has been completed to all sheet files;

- All external references contained on sheet files must have **display** turned on. **Detach** any reference files that are not required, prior to submission.
- **Ensure** that all attached reference files are submitted at each submission stages.
- **Delete** all graphical elements located outside the border frame. *This does not apply to the standard elements contained in the border reference file (engbord3.dgn).*

Hard Copy Submission (Plots)

For details regarding the submission of drawings in hard copy format (plots), refer to the Project Documentation.

CADD Manual Updates

Amendments to the CADD Standards and Procedures Manual will be performed by TTC CADD System Staff.

For the latest version, visit the **cadd.ttc** web page through the TTC intranet (TTC Staff) or send an email request to TTC CADD System Staff (Consultants).

CADD Manual Contact

Any Questions regarding items not included in this manual, or interpretations of this manual should be addressed to TTC CADD System Staff.

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CADD Procedures

Design Review Submissions

General

During the development of the design work plan covering a design assignment, the ***Design Review Submission Milestones*** are established by Departmental Instruction and the project team

A Typical submission sequences is:

- ***Scope Review***
- ***Construction Review***
- ***Tender Issue***

At each *Design Review*, **digital files** shall be submitted for ***review by CADD System*** to ensure compliancy with the standards contained within this Manual.

Submission Process

For a design review submittal, the following steps will occur (See Figure 1):

- The SPE instructs the design team to ***prepare*** and ***submit*** the Design Review Package
- The design team turns on the ***progress stamp*** and ***plots*** and submits drawings to SPE
- The design team saves design files into a dgn and pdf format on electronic media and submits to SPE.
- The design team saves a drawing listing as per FileList.xls on electronic media and submits to SPE.
- SPE compiles and ***forwards*** the package to Technical Review, Engineering Department (***Design Review Technologist – D.R.T.***)
- D.R.T. will ***distribute*** copies to all reviewers for comments.
- CADD System will also receive the Digital CADD files (dgn & pdf) and Drawing Listing (FileList.xls) for review.
- Comments are ***returned*** to D.R.T. who will compile and forward to SPE.
- SPE will ***submit*** to design team for action.

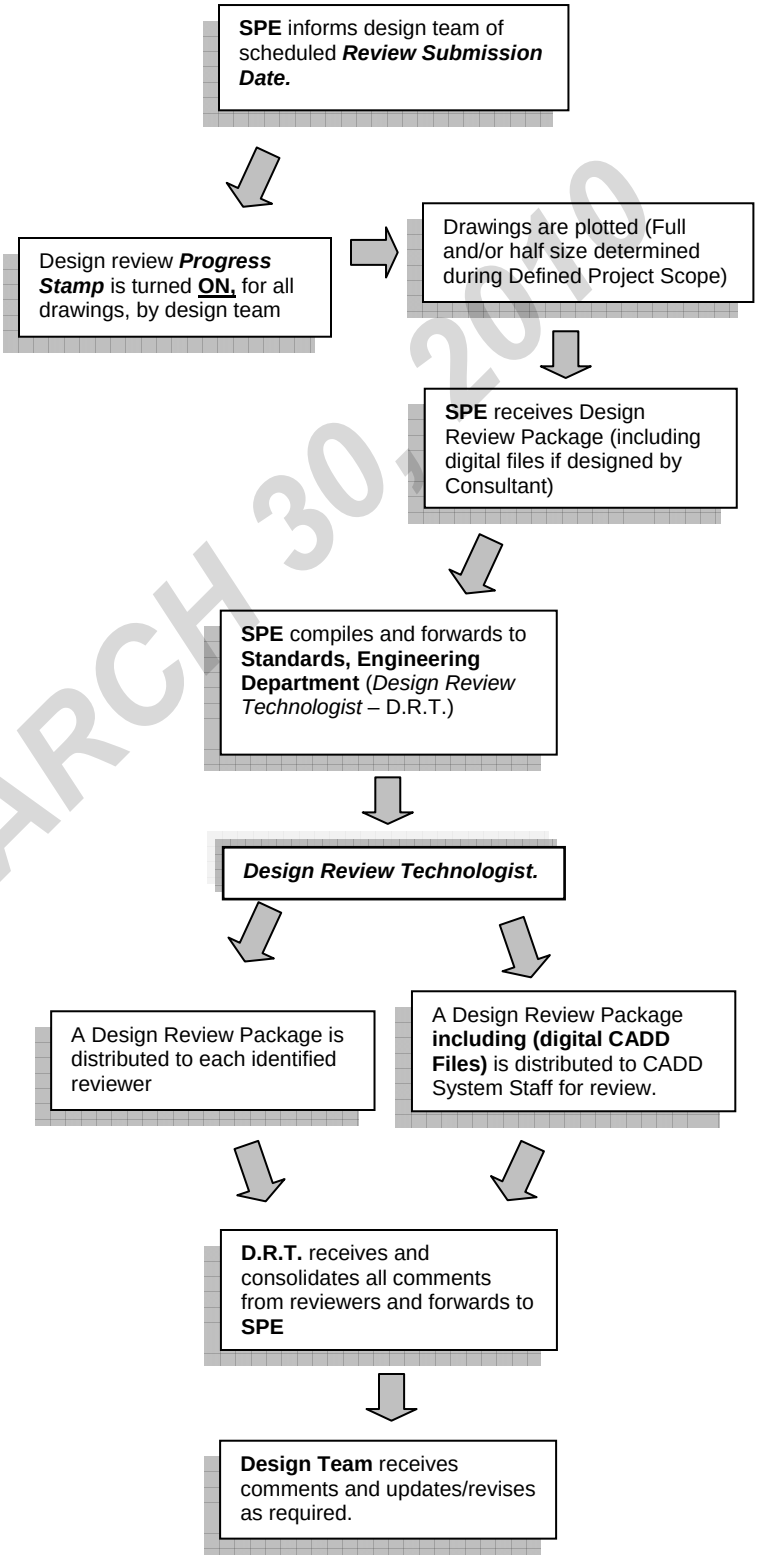

Figure 1 – Design Review Submission Process

Building Permit Submission

General

For some projects, prior to the printing of the Tender set, a set of drawings will be printed for the ***building permit application***.

Submission Process

For Building Permit Application drawing submittal, the following steps will occur (See Figure 1):

- The SPE instructs the design team to ***prepare*** and ***submit*** the ***Issued For Building Permit Set***
- ***"Issued for Building Permit"*** stamp is turned ***on***. (See Figure 2)
- If a ***digital Profession Seal*** is to be used, place in appropriate location on Title Block.
- Turn on Level 22 – ***Qualification and Registration*** information (See Figure 2)
- ***Vellum Plots*** are created, ***sealed*** (if not applied electronically), ***signed***, and ***dated.***
- ***Qualification and Registration*** information is ***signed*** and plots and all CADD files (dgn & pdf) -if a consultant project, are ***submitted*** to the SPE.
- Once the SPE has received the Permit Set, the Tender package can be prepared (See *Tender Submission Procedure*)

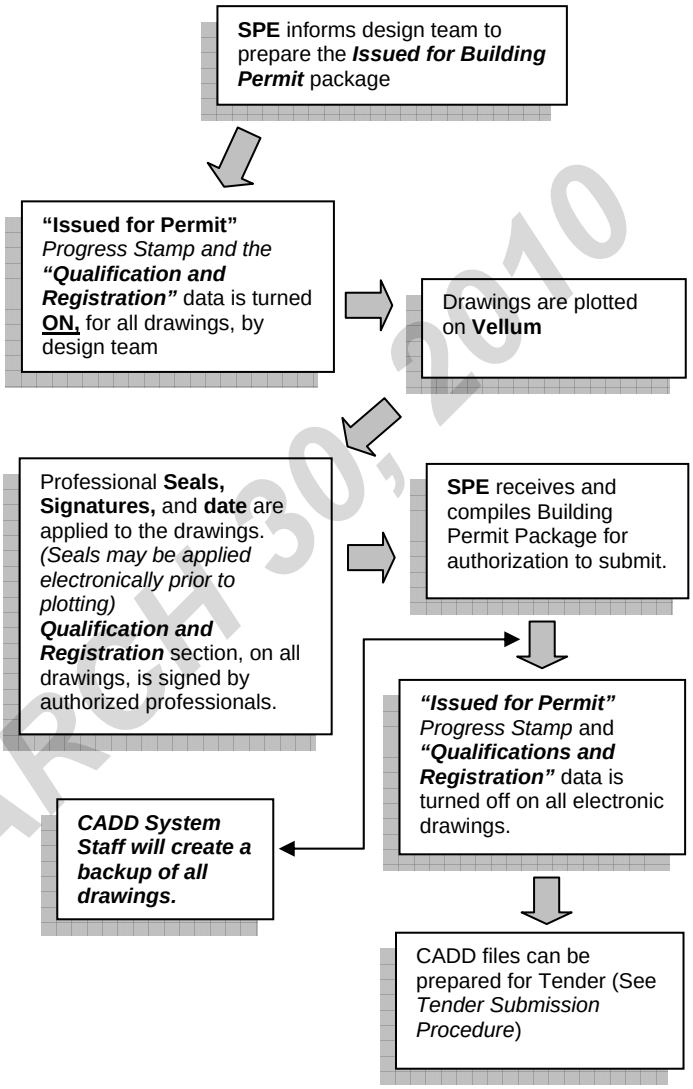

Figure 1 – Building Permit Submission

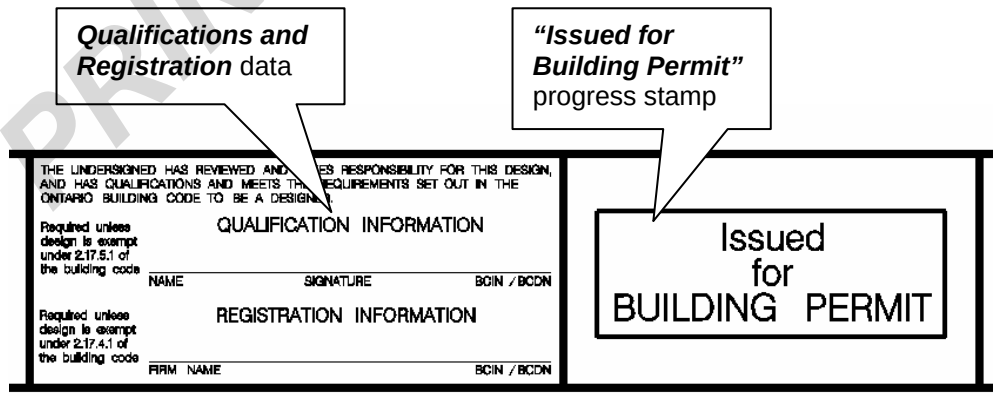

Figure 2 – Building Permit Set Border Information

Tender Submission

General

Once all ***Design Review Comments*** have been addressed and all required **sign-offs obtained,** the documents are **authorized** for tender release

Submission Process

For Tender submittal, the following steps will occur (See Figure 1):

- The SPE instructs the design team to ***prepare*** and ***submit*** the Tender Package
- ***"Tender Drawing"*** stamp is turned ***on***.
- If a ***digital Profession Seal*** is to be used, place in appropriate location on Title Block.
- ***Vellum Plots*** are created, ***sealed*** **(**if not applied electronically), ***signed*****,** and ***dated*** and ***submitted*** to SPE.
- ***Document Comment*** field in ProjectWise is updated to ***Issued for Tender*** (See Figure 2), a backup is created by CADD System staff and **no further revisions** to drawings may occur without specific **instructions from SPE** (See *Addenda Revisions Procedure*)

(Consultant Design)

- If project is by a Consultant, **all digital files** (dgn & pdf) are submitted to SPE along with the plotted files.
- SPE will ***forward CADD files*** (dgn & pdf) to CADD System for review.
- Files are placed into ProjectWise with the document comment ***Issued for Tender*** added.

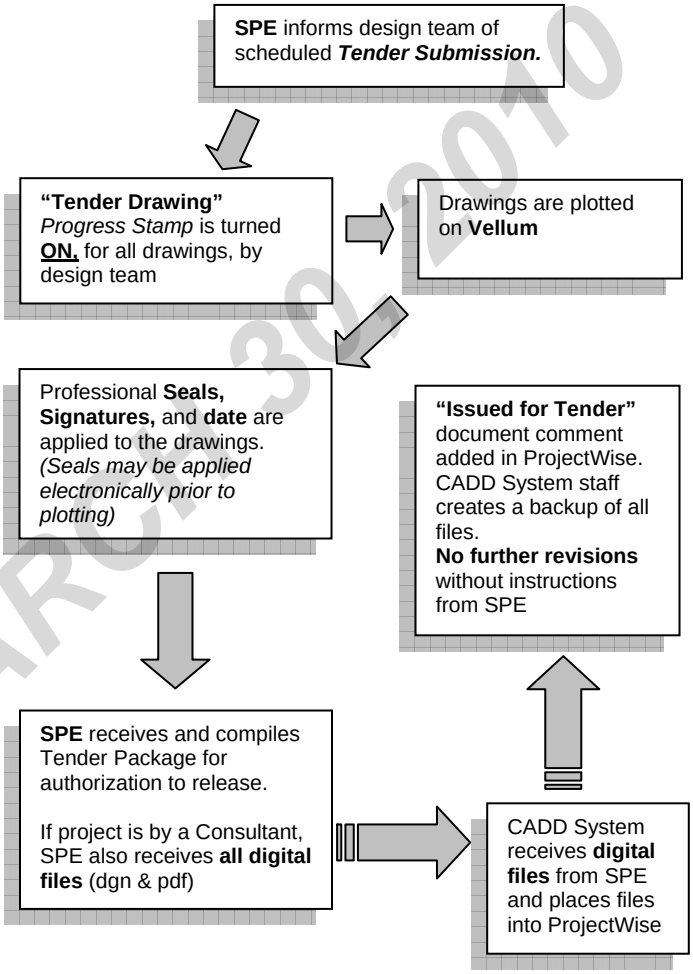

Figure 1 – Tender Submission

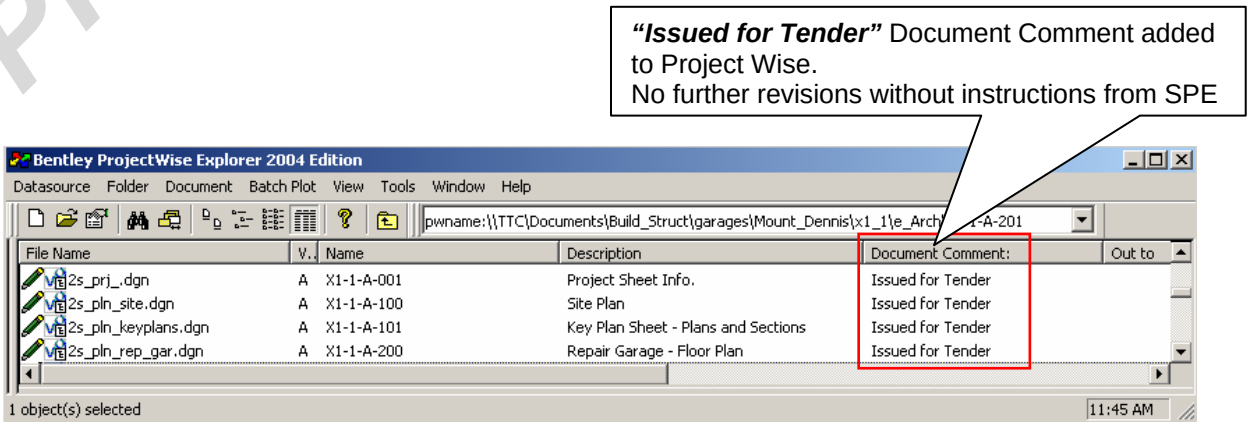

Figure 2 – ProjectWise Document Comments

Addenda Revisions

General

After a project has been issued for tender, **no revisions** can be made without instructions from the SPE. When it has been determined that a revision to the drawings is required, an addendum must be issued.

Preparing an Addendum

When creating an addendum, this procedure will be followed (See Figure 1):

- Designer advises SPE of ***proposed revisions.***
- The SPE ***approves and instructs*** the design team of the addenda requirements.
- Design team **applies** revisions to the drawings.
- A revision ***cloud, delta*** and ***revision note*** are placed following the ***"Revisions to CADD Files"*** section of this manual and the **Border Revision Box** procedure of this section
- ***Vellum Plots*** are created, ***sealed*** (if not applied electronically), ***signed***, and ***dated*** and ***submitted*** to SPE.
- SPE issues to Spec. Writer for issuance.
- ***Document Comment*** field in ProjectWise is updated to indicated ***Addendum Number***(See Figure 2)

(Consultant Design)

- If project is by a Consultant, **all digital files** (dgn & pdf) are submitted to SPE along with the plotted files (full size).
- SPE will ***forward CADD files*** (dgn & pdf) to CADD System for review.
- Files are placed into ProjectWise with the document comment indicating the ***Addendum Number.***

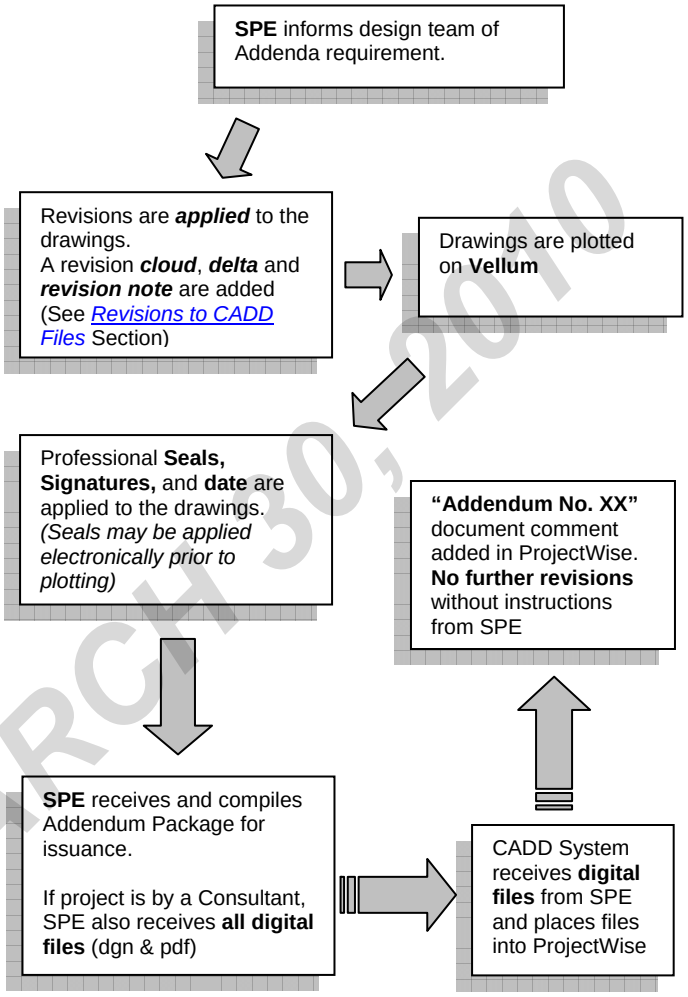

Figure 1 – Addendum Revision

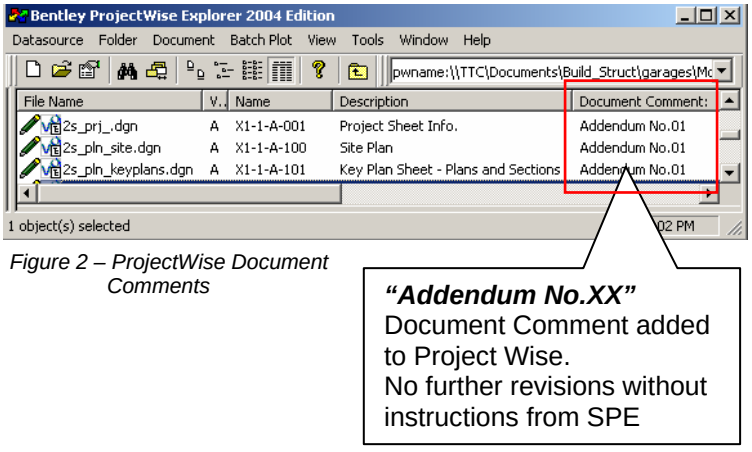

Figure 2 – ProjectWise Document Comments

"Addendum No.XX" Document Comment added to Project Wise.
No further revisions without instructions from SPE

Border Revision Box

Addenda information given by the SPE (Project Management) must be entered into the border revision box. This will include the ***Addendum number*** and the ***Date provided by the SPE.*** (See Figure 3)

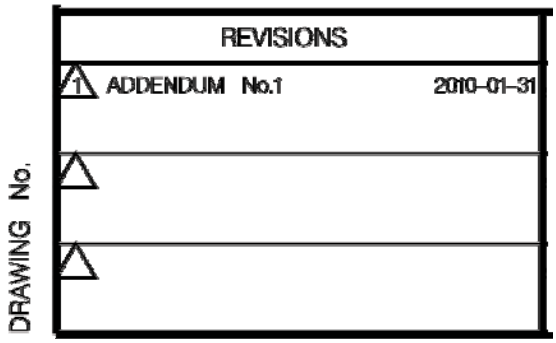

Figure 3 – Border Revision Box

Subsequent Addendum

When a subsequent addendum revision is required on a drawing that was previously issued for an addendum, the following must occur. (See Figure 4)

- **Remove** the previous **cloud** leaving only the delta and the revision information in the revision box as an indicator of the previous Addendum.
- **Place** a new **cloud** around the revised area with a consecutive revision numbered **delta**
- **Enter** the Addendum information given by the SPE into the **border revision box**.

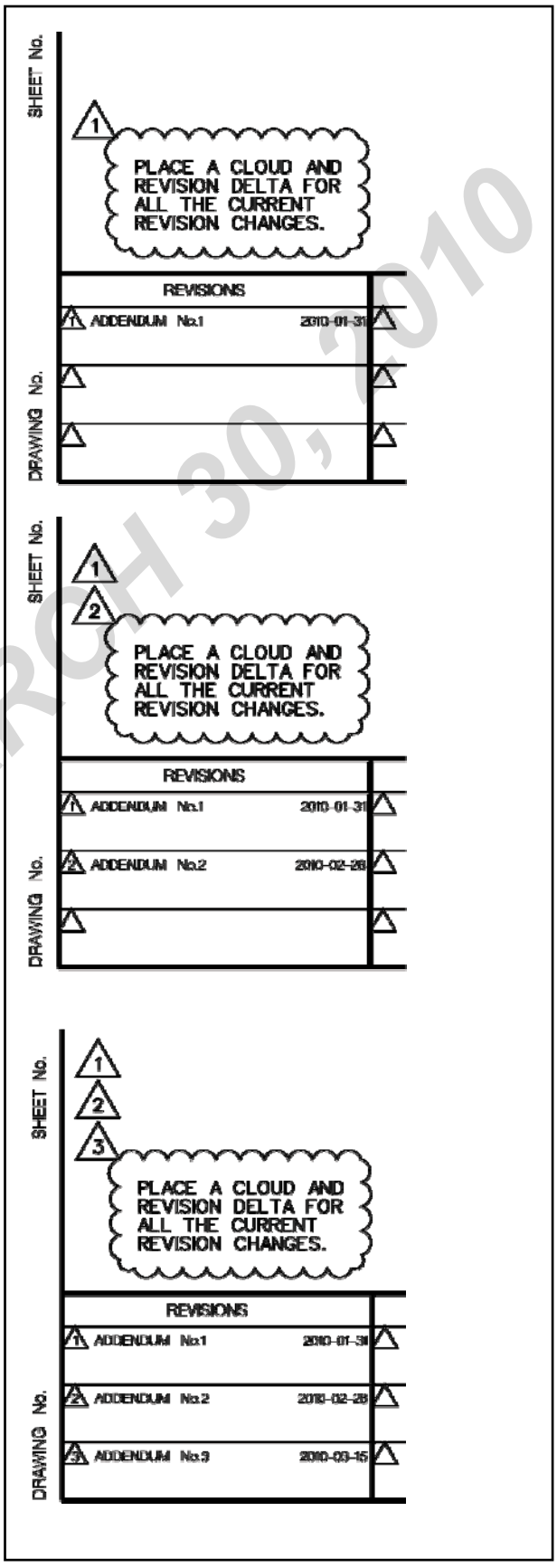

Figure 4 – Subsequent Addenda

Issued for Construction Submission

General

After the ***Tender*** has been awarded, a set of ***Issued for Construction (IFC)*** documents can be prepared.

IFC Submission Process

For an ***IFC*** submittal, the following steps will occur (See Figure 1):

- The SPE instructs the design team to ***prepare*** and ***submit*** the Construction Package. ***No revisions*** must have occurred to the drawings since the final Addendum was issued and continue not to occur without specific **instructions from the SPE** (See *Contract Change Procedure*)
- ***"Issued for Construction"*** stamp is turned ***on*** for all drawings.
- If a ***digital Profession Seal*** is to be used, place in appropriate location on the Title Block.
- ***Vellum Plots*** are created, ***sealed*** (if not applied electronically), ***signed***, and ***dated*** and ***submitted*** to the SPE.
- ***Document Comment*** field in ProjectWise is updated to ***Issued for Construction*** (See Figure 2), and a backup is created by CADD System staff

(Consultant Design)

- If project is by a Consultant, **all digital files** (dgn,pdf and FileList.xls) are submitted to SPE along with the plotted files.
- SPE will ***forward CADD files*** (dgn, pdf and FileList.xls) to CADD System for review.
- Files are placed into ProjectWise with the document comment ***Issued for Construction*** added.

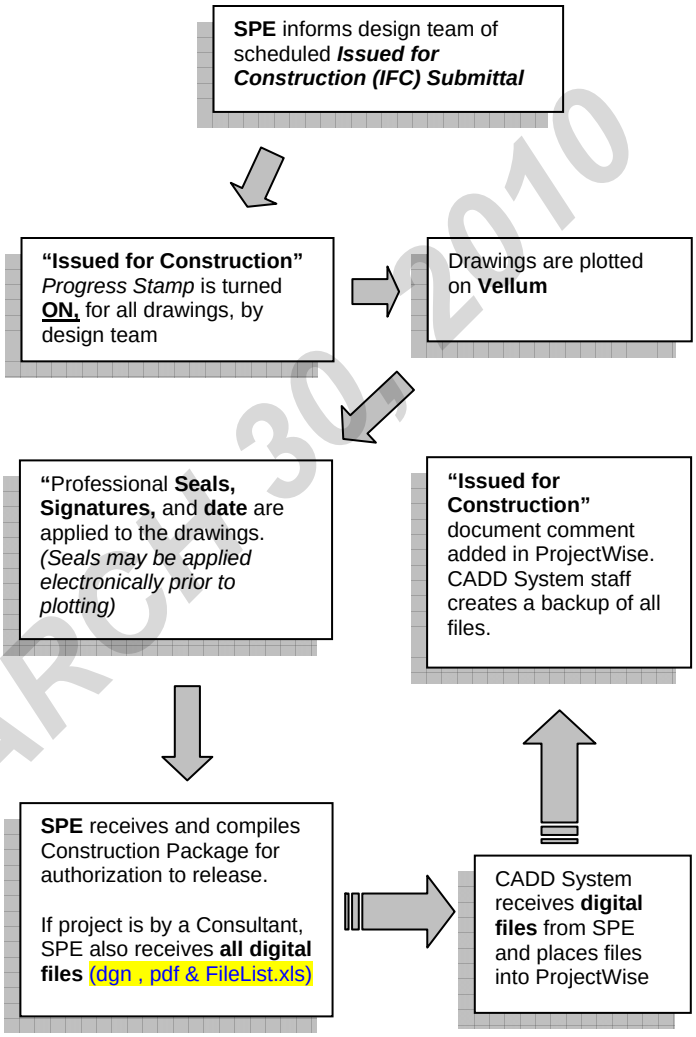

Figure 1 – Issued for Construction Submission

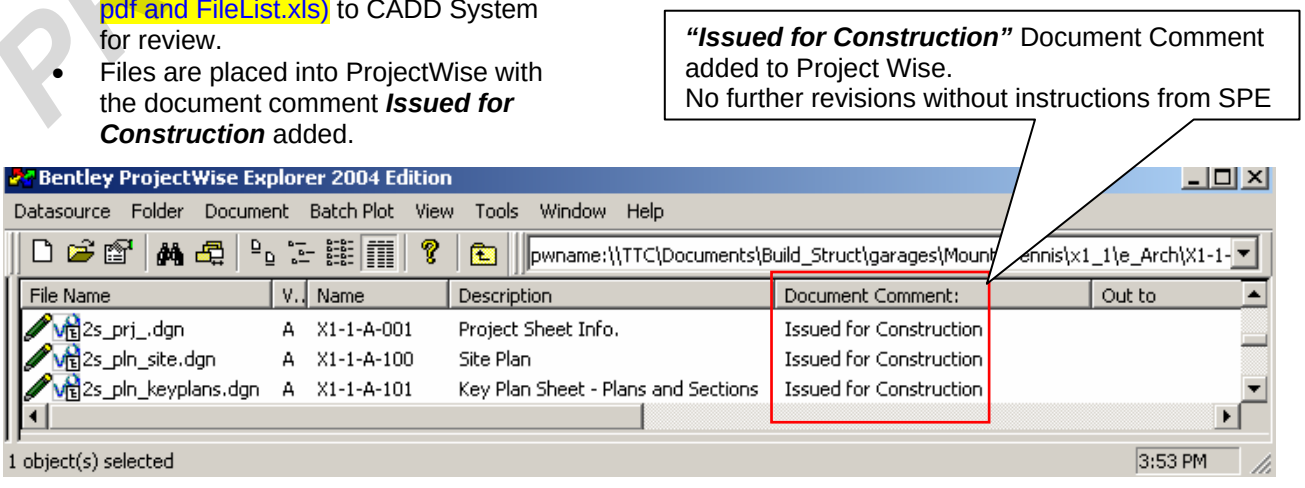

Figure 2 – ProjectWise Document Comments

Contract Change

General

Once drawings are Issued for Construction, revisions can only occur **AFTER** a Contract Change Number has been issued.
(See Figure 1)

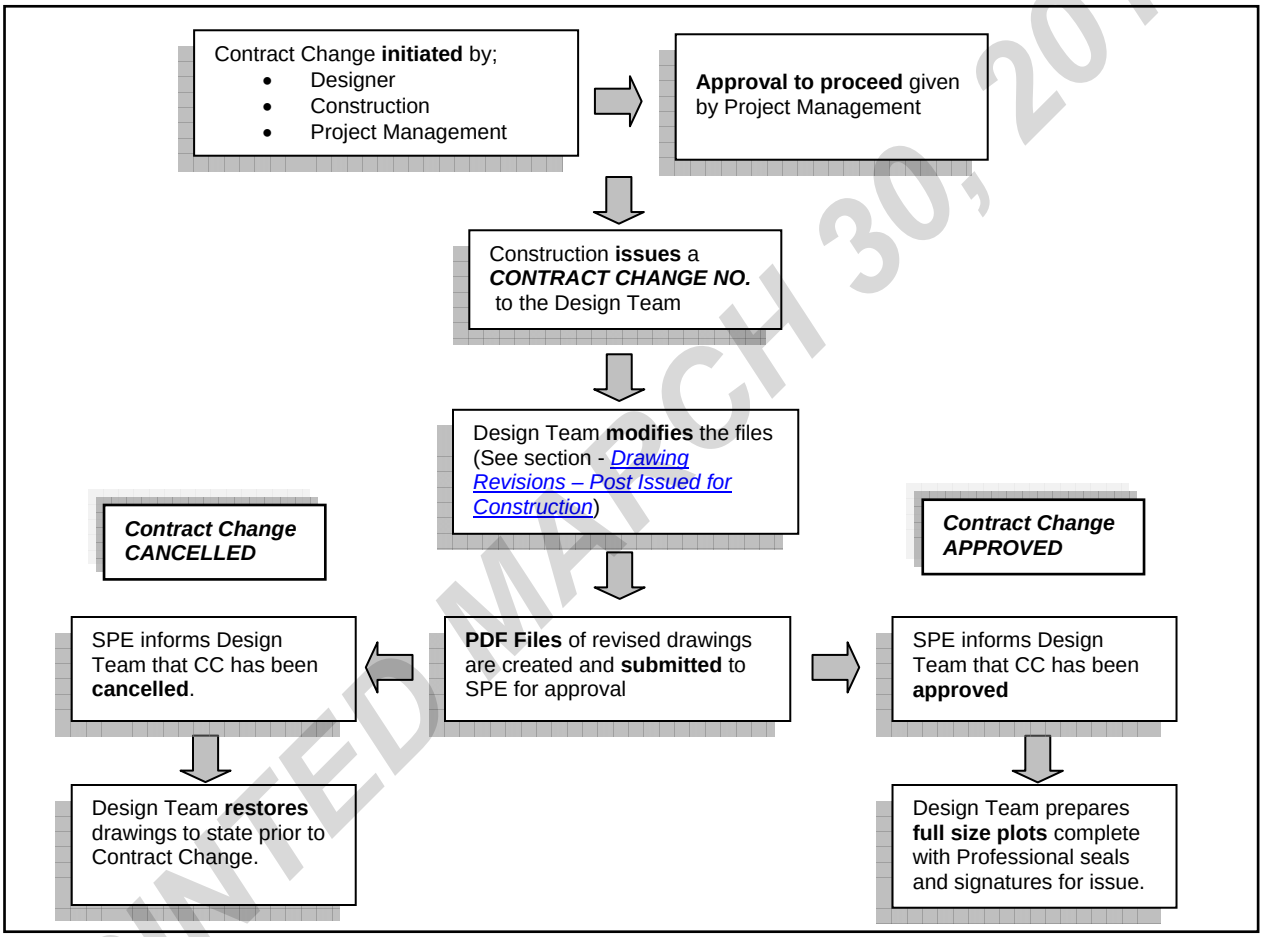

Figure 1 – Contract Change Process

Drawing Revisions After 'Issued for Construction'

After a Contract Number (CC) has been issued by Construction, revisions to drawings that were previously issued for construction can occur.

Revision Cloud and Delta

Revisions must be identified by a delta and a cloud encompassing the extent of the revision.
(See Figure 2)

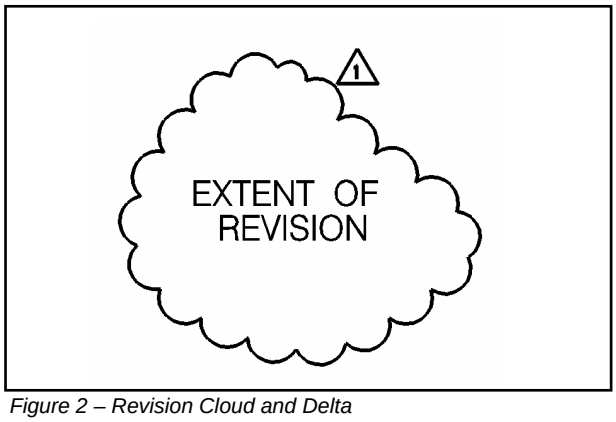

Figure 2 – Revision Cloud and Delta

Border Revision Box

Contract Change information given by Construction must be entered into the border revision box. This will include the ***contract change number***, the ***description of change*** and the ***date provided by the SPE.*** (See Figure 3)

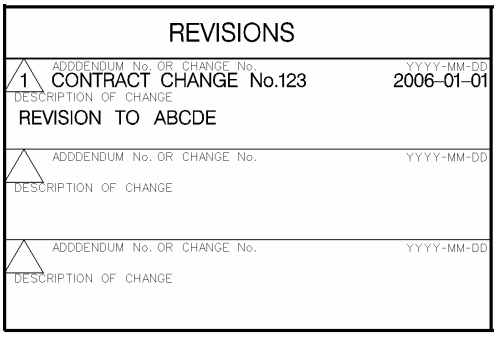

Figure 3 – Border Revision Box

Subsequent Revisions

If a drawing has several revisions, the following must occur. (See Figure 4)

- **Remove** the previous **cloud** leaving only the delta as an indicator of the previous revision.
- **Place** a new **cloud** around the revised area with a consecutive revision numbered **delta**
- **Enter** the contract change information given by Construction into the **border revision box**.

Consultant Design - Submission

- If project is by a Consultant, **all digital files** (dgn & pdf) are submitted to SPE along with the plotted files.
- SPE will ***forward CADD files*** (dgn & pdf) to CADD System for review.
- Files are placed into ProjectWise with the document comment ***description*** added. Example. ***Contract Change No.1***

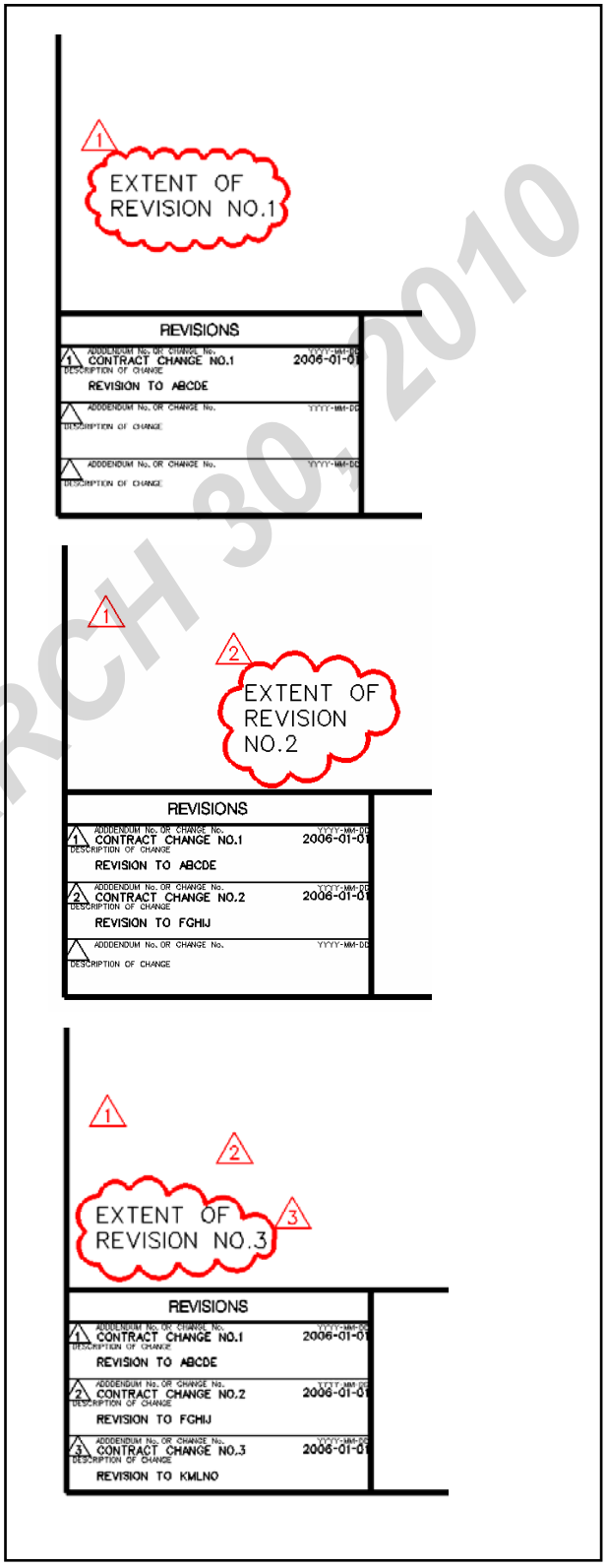

Figure 4 – Multiple Revisions

As-Built Drawings

General

As-built drawings provide a record of what was actually constructed, incorporating all changes made during construction, so that future work may be designed and built without encountering any unforeseen situations.

Note: *Drawings for Temporary Structures (Hoarding, Jersey Barriers, etc), Construction Staging, Demolition and Cancelled Work items will be included in the final As-Built set but as the Issued for Construction submitted drawings. These drawings will still have the "Issued for Construction" progress stamp and show only the conditions required for/during construction and not the "As-Built" conditions*

TTC standard contract requires that a complete master set of Contract Record Documents are to be kept up to date in the field office, by the contractor, throughout the life of the project. This will include having all Contract Changes, Field Instructions, site conditions, and other such changes noted on the documents.

As-Built CADD File Preparation (TTC Design)

After acceptance by Construction Staff, *Record Prints* are forwarded to Technical Review Section. Technical Review Staff of E&C Dept. will forward *Record Prints* to the respective TTC disciplines, or Consultant Designer, for the following changes to be incorporated onto the CADD files:

Graphical Update

- **Verify** that all contract change information (Contract Changes, Field Instructions, etc) is included on the electronic files.
- **Incorporate** the contractor's changes (undocumented site changes / conditions)
- **Remove** all revision deltas and clouds
- **Delete** all miscellaneous information or graphics that is outside the border file that is not required.

Reference Files

Detach all reference files that are not displayed or required (refer to page 44 - Tender, Issued for Construction and As-Built Submission).

Border File

- In the border reference file, **turn on** level 17 to display the As-Built Drawing stamp (See Figure 1)

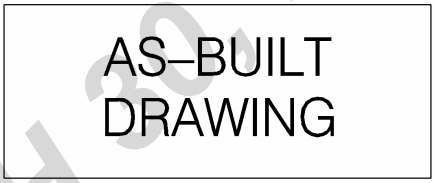

Figure 1 – As-Built Stamp

- **Remove** all revision notes and dates that are in the border "Revisions" section (See Figure 2)

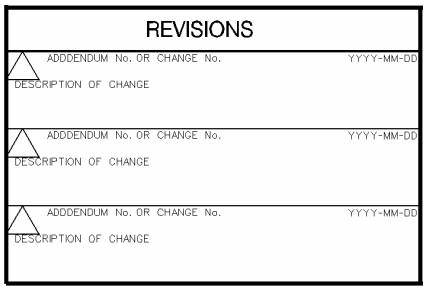

Figure 2 – Border 'Revision' Section

Plotting

- **Plot** full size Vellum drawings and submit, together with contractor's Record ('As-built') prints to Technical Review Staff.
- **Create** PDF files (Full Size) of **each** sheet files with their Contract Drawing Number and submit to CADD Systems for publication to the "*Digital Print Room" – DPR* (i.e. AB1-1-A001.pdf).

Document Comments (ProjectWise)

Once the drawing files have been plotted and PDF files created, add the "*As-built*" designation in the ***Document Comments*** section for all files by performing the following within ProjectWise (See Figure 3);

- Select all files ❶
- Right-click with your mouse and select ***Modify*** ❷
- In the *Modify Documents* window select the ***TTC*** tab ❸
- In the *Document Comment* field enter "As-Built" ❹ and Select ***Apply*** ❺
- Select ***Ok*** ❻
- All files should now have "As-Built" in the *Document Comment* field. ❼

As-Built Archiving

Once all drawings have been plotted, PDF files created and "Document Comments" applied (within ProjectWise), Standards Staff - D.R.T. will notify CADD System to change file accessibility to "**Read-Only**"

As-Built CADD File Preparation (Consultant Design)

In addition to adherence to the requirements of the previous section, consultants preparing as-built documents must also submit electronic CADD files (dgn & pdf) for compliance review and approval (see requirements in the *Information Submission to TTC* section of this manual.)

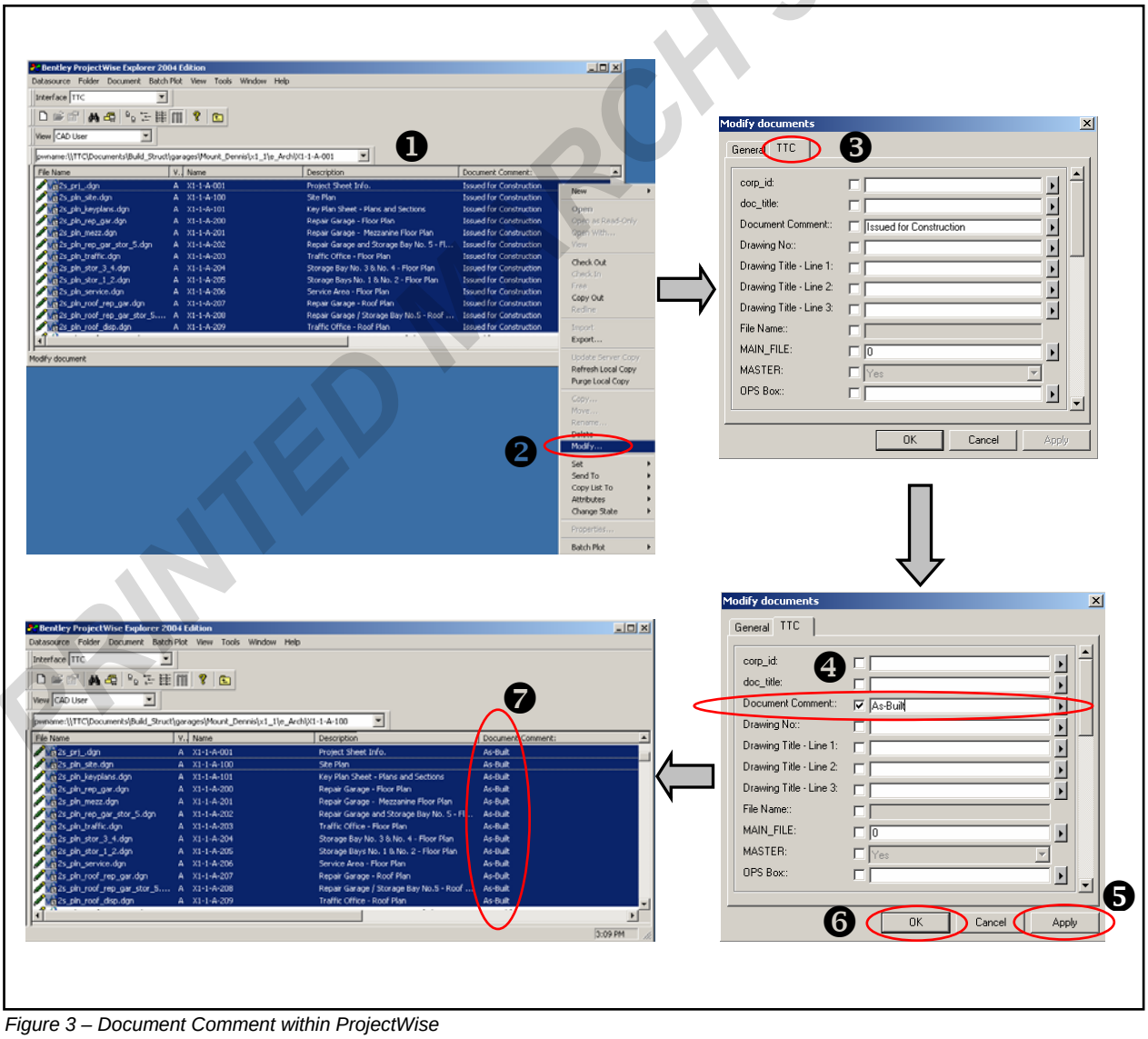

Figure 3 – Document Comment within ProjectWise

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Appendices

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Appendix 'A' - Dgnlibs

Appendix A – Dgnlibs

The current TTC Standard Discipline Level Library (dgnlib) can be acquired thru TTC CADD System Staff.

TTC USERS – Common dgnlib and their respective Section Discipline dgnlib files are automatically loaded at launch of ProjectWise / Microstation V8.

External (Consultants) – Common dgnlib and Section Discipline dgnlib files are already loaded within the seed file (seed2d.dgn). Also all Dgnlib Library(.dgnlib) will be provided as a resource files which can be attached or imported into the CADD file.*

c.dgnlib	Common Library
ea.dgnlib	Engineering Architectural
ec.dgnlib	Engineering Civil and Geotechnical
ee.dgnlib	Engineering Electrical and Power
em.dgnlib	Engineering Mechanical
es.dgnlib	Engineering Structural
ocomm.dgnlib	Operations Communications
ostce.dgnlib	Operations Signals and Train Control Engineering
ot_track_structure.dgnlib	Operations Track & Structure Engineering
sg.dgnlib	Operations Signals *(TYSSE)*

Modification of levels within the TTC Standard Level Structure Library (*. dgnlibs) is **not** permitted.
Any adjustments must be submitted to CADD System for approval and possible inclusion into the Standard Discipline dgnlib files.

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Appendix 'B' – Project Folders

Appendix B – Project Folders

ProjectWise Folder Structure

1st Folder Tier	2nd Folder Tier	3rd Folder Tier	4th Folder Tier	5th Folder Tier
Build_Struct	garages lighting_upgrades office_bldgs structures substations TO_Coach ug_tanks	*Location*	*Contract Number*	e_Arch e_Civil e_Elec e_Mech e_PAD e_Struct
G_Contracts	*Contract Number*	e_Arch e_Civil e_Elec e_Mech e_PAD e_Struct		
Layouts	*All TTC Locations*			
Property	data des_manual_PAD maps pucc surveys	*Various Folders*		
RTEPdata	Eglinton_W_Exp Shep_Yonge_Vic_P Sheppard_E_Ext SRT Wilson_yard York_Spadina	*Various Folders*		
seedfiles	ec_seed ops_seed			
Standards	cell_libs default_seeds design_manual dgnlibs directive_drwgs ec_elec_specs ec_mechanical equipment info_drawings ops_borders procedure_manual province specs standard_drwgs ttc_borders ttclib	*Various Folders*		
Subway	Bloor_LINE carhouses Danforth_LINE Eglinton_W_LINE ESB o_Plant o_SEC shafts Sheppard_LINE shops Spadina_EXTENSION Spadina_LINE University_LINE Yards Yonge_LINE	*Location*	*Contract Number*	e_Arch e_Civil e_Elec e_Mech e_PAD e_Struct
Surface	*All Surface Route Location*	*Contract Number*	e_Arch e_Civil e_Elec e_Mech e_PAD e_Struct	

Typical Contract Folder Structure (ProjectWise)

1st Folder Tier	2nd Folder Tier	3rd Folder Tier	4th Folder Tier	5th Folder Tier
Project Type *(Build_Struct)* *(Subway)* *(Surface)*	**Project Classification** *(Garages)* *(Office_Bldgs)* *(Carhouse)* *(Subway Line)*	**Location** *(Garage Location)* *(Carhouse Location)* *(Subway Station)*	**Contract Number**	**Discipline Folders** *e_Arch* *e_Civil* *e_Elec* *e_Mech* *e_PAD* *e_Struct*
EXAMPLES				
Build_Struct	**garages**	**Mount_Dennis**	**X1-1**	**e_Arch** **e_Civil** **e_Elec** **e_Mech** **e_PAD** **e_Struct**
Subway	**Bloor_LINE**	**Bathurst**	**B1-3**	**e_Arch** **e_Civil** **e_Elec** **e_Mech** **e_PAD** **e_Struct**
Surface	**carhouse**	**Russell**	**D6-11**	**e_Arch** **e_Civil** **e_Elec** **e_Mech** **e_PAD** **e_Struct**

Toronto
Transit
Commission

Appendix 'C' – CADD Files by Discipline

Appendix C – CADD Files by Discipline

Mapping, Alignment, Property and Surveying Files

Field 1

- **'5'** –Mapping, Alignment, Property and Surveying

Field 2

- **'m'** – Master File
- **'s'** – Sheet File
- **'p'** – Preliminary / Presentation File
- **'f'** – Foreign File

Field 3 (Master Files)

- **'pln'** – All Plan Drawings
- **'pro'** – All Profile Drawings
- **'ort'** – All Ortho Photos
- **'sec'** – All Section Drawings
- **'elv'** – All Elevation Drawings
- **'3df**' – All 3D Drawings

Field 4 (Master Files)

- **'ac'** – Alignment compilation
- **'ad'** – Alignment design
- **'as'** – Alignment survey
- **'bc'** – Building compilation
- **'bs'** – Building survey
- **'cc'** – Control compilation
- **'cs'** – Control survey
- **'dc'** – Design compilation
- **'gc'** – Gridline compilation
- **'gs'** – Gridline survey
- **'kp'** – Key Plan
- **'mc'** – Mapping compilation
- **'pc'** – Property compilation
- **'ps'** – Property survey
- **'tc'** – Topographical compilation
- **'tm'** – Terrain model
- **'ts'** – Topographical survey
- **'uc'** – Utility compilation
- **'us**' – Utility survey

Field 5 (Master Files)

- **'01' to '99'** – Numerical Designator

Field 6 (Master Files)

- **'pattern'** – Optional Comments
- **'text'** – Optional Comments
- **'bell'** – Optional Comments
- **etc**

Field 3 (Sheet Files and Foreign Files)

- **'001' to '999' –** Numerical Designator

Field 4 (Foreign Files)

- '*foreign*' – Filename for Foreign Files **(ie – royal5)**

Field 5 (Foreign Files)

- **'ttc'** – Conversion Comment

Examples (Master Files)

- **5m_pln_uc01_bell.dgn**
- **5m_pln_ps01_cells.dgn**
- **5m_pln_ps01_lines.dgn**

Examples (Sheet / Preliminary Files)

- **5p_001.dgn**
- **5p_002.dgn**
- **5s_001.dgn**
- **5s_002.dgn**

Examples (Foreign Files)

- **5f_001_royal5.dgn**
- **5f_001_royal5_ttc.dgn**
- **5f_001_P1.dgn**

Civil and Geotechnical Files

Field 1

- **'7'** – Civil and Geotechnical

Field 2

- **'m'** – Master File
- ~~**'mx'** – Master File Existing~~
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

- **'plan'** – All plan Drawings
- **'sect'** – Section Drawings
- **'detl'** – Detail Drawings
- **'prof'** – Profile Drawings

Field 4

- **'rm' –** Removal Drawings
- **'pa'** – Paving Drawings and Restoration
- **'pm'** – Paving Marking Drawings
- **'hr'** – Hoarding Drawings
- **'tr'** – Traffic Control Drawings
- **'ue'** – Existing Utility Drawings
- **'un'** – New Utility Drawings
- **'stg'** – Staging Drawings
- **'wo'** – Work Order Drawings
- **'geo'** – Geotechnical Drawings
- **'gen'** – General Drawings

Field 5

- **'100', '101', 102', etc**

Examples

- **7s_plan_hr_100.dgn**
- **7m_plan_gen_101.dgn**

Architectural Files

Field 1

- **'2'** – Architectural

Field 2

- **'m'** – Master File
- **'md'**-Master File Demolition
- **'mx'** – Master File Existing
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

- **'det'** – Miscellaneous Detail Drawings
- **'demo'** – All Demolition Drawings
- **'dlist'** – Drawing List
- **'elev' –** All Elevation Drawings
- **'esc' –** All Escalator Drawings
- **'elvr' –** All Elevator Drawings
- **'ffp'** – All Floor Finish Plans
- **'fsp'** – All Fire Separation Plans
- **'furn'** – All Furniture Layouts/Plans
- **'grid'** – All Building Grid Lines
- **'kpln'** – All key plan Drawings
- **'mlwk'** – All Millwork Drawings
- **'pinfo'** – Project info, OBC Matrix
- **'pln'** – All Floor Plan Drawings
- **'rcp'**- All Reflected Ceiling Plans
- **'sch'** – All Schedules
- **'sec'** – All Section Drawings
- **'sign'** – All Signage Drawings
- **'stair'** – All Stair Drawings
- **'stg'** – All Staging Plans & Hoardings

Field 4 (specific to project)

- **'2ndf', '3rdf'** *etc* .- Floor Level Drawings
- **'bplatf'** – Bus Platform
- **'concrs** – Concourse Level
- **'ldcp** – Landscape Drawings
- **'mezz'** – Mezzanine Level
- **'roof'** – Roof plan
- **'repair'** – Repair Garage
- **'traffic'** – traffic office
- **'site'** – Site Plan
- **'st'** – Street Level
- **'scplatf**' – Street Car Platform Level
- **'splatf'** – Subway Platform Level
- **'partial'** – Partial Plan Drawings
- **'North', 'South', 'East', 'West' –** *Direction*
- **'ext'** – Exterior Elevations
- **'int'** – Interior Elevations
- **'wall'** – Wall sections

Field 5

'01' to '99' – Numerical Designator

Examples

Master Files;

- **2m_sec.dgn**
- **2md_pln_mezz.dgn**
- **2mx_pln_splatf.dgn**

Sheet Files;

- **2s_demo_st.dgn**
- **2s_rcp_repair.dgn**
- **2s_det_02.dgn**

Structural Files

Field 1

- **'3'** – Structural

Field 2

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'md'** – Master File Demolition
- **'mr'** – Master File Remaining
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

- **'dlist'** – Drawing List
- **'gnotes'** – General Notes Drawing
- **'tdet'**- Typical Detail Drawings
- **'pln**' – All Plan Drawings
- **'sec' –** All Section Drawings
- **'elev'** – All Elevation Drawings
- **'det'** – Detail Drawings
- **'sch'** – Schedules
- **'hrdg'** – Hoarding Drawings
- **'stg'** – Staging Drawings
- **'cseq'** – Construction Sequence Drawings
- **'wo'** – Work Order Drawing
- **'plnsec'** – Combined Plan & Section Drawing
- **'plnelev'** – Combined Plan & Elevation Drawing
- **'secelev'** – Combined Section & Elevation Drawings
- **'secdet' –** Combined Section & Detail Drawings

Field 4

- **'fdn'** – Foundation Drawing
- **'platf'** – Platform Drawing
- **'mz'**- Mezzanine Drawing
- **'cncrs**' – Concourse Drawing
- **'st' –** Street Level Drawing
- **'2ndF', '3rdF' etc** – Floor Level Drawings
- **'rf'** – Roof Drawing
- **'bsmt'** – Basement Drawing
- **'vshf'** – Vent Shaft Drawing
- **'ftg'** – Footing Drawing
- **'bm'** – Beam Drawing
- **'col'** – Column Drawing
- **'jst'** – Joist Drawing
- **'Y2345'** – Tunnel Structure Drawing
- **'rwall'** – Retaining Wall Drawing
- **'shore'** – Shoring Drawing

Field 5

- **'01', '02', etc –** All Drawings except Master Files

Examples

- **3m_pln_fdn.dgn**
- **3mx_pln_platf.dgn**
- **3s_gnotes_01.dgn**
- **3s_pln_fdn_01.dgn**
- **3s_sect_01.dgn**

Signal Files

Field 1

– (Discipline / Section)

- **'g'** – Signals

Field 2

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'md'** – Master File Demolition
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

- **'gen'** – General/Notes Drawing
- **'intrlck'** – Interlocking
- **'loc'** – Location
- **'code'** – Code System
- **'contrl'** – Control System
- **'sgl'** – Signal
- **'pwr'** – Power
- **'comm'** – Communication
- **'det'** – Detail
- **'door'** – Door
- **'cir'**– Circuit

Field 4

- **'plan'** – Plan Drawing
- **'sect'** - Sections
- **'cnsl'** – Consoles
- **'pnl'** – Panels
- **'rm'** – Rooms
- **'lyout'** – Layouts
- **'sign'** – Signs
- **'schm'** – Schematics

Field 5

- **'01'** to **'99'** – Numerical Designator

Field 6 (TYSSE only) Interlocking Code

- **'SHW'** – Sheppard West
- **'FIW'** – Finch West
- **'YOU'** – York University
- **'STW'** – Steeles West
- **'407'** – Highway 407
- **'VCC'** – Vaughan Corporate Centre

Examples

- **gm_intrlck_plan.dgn**
- **gmx_loc_plan.dgn**

- **gs_gen_01.dgn**
- **gs_sgl_rm_01.dgn**
- **gs_comm_plan.dgn**
- **gs_door_sign_25.dgn**
- **gs_cir_schm_01.dgn**

Examples (TYSSE)

- **gm_sgl_plan_SHW.dgn**
- **gs_sgl_plan_01_SHW.dgn**
- **gs_sgl_plan_02_SHW.dgn**

Communications Files

Field 1
– (Discipline / Section)

- **'62'** – Communications

Field 2

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'md'** – Master File Demolition
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3 (Master Files)

- **'SCADA'** – Master SCADA Drawing
- **'CCTV'** – Master CCTV Drawing
- **'PA'** – Master PA Drawing
- **'radio'** – Master Radio and Antenna Drawing
- **'fibre_optic'** – Master Fibre Optic Drawing
- **'network'** – Master Industrial LAN Drawing
- **'fire_alarm'** – Master Fire Alarm Drawing
- **'tele_data'** – Master Telephone and Data Drawing

Field 3 (Sheet Files)

- **'SCADA'** – Sheet File for SCADA
- **'CCTV'** – Sheet File for CCTV
- **'PA'** – Sheet File for PA
- **'rad'** – Sheet File for Radio and Antenna
- **'fo'** – Sheet File for Fibre Optic
- **'net'** – Sheet File for Industrial LAN
- **'FA** – Sheet File for Fire Alarm
- **'tele_data'** – Sheet File for Telephone and Data
- **'wiring_chart'** – Sheet File for Wiring Chart
- **'term_chart'** – Sheet File for Termination Chart

Field 4 (Sheet Files)

- **'AREA'** – Area to be indicated as applicable (ie – Transit Control Centre)
- **'01, 02, etc.'** – Used to sequentially number various charts

Trackwork Files

Field 1
– (Discipline / Section)

- **'71'** – Traction Power

Field 2

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'md'** – Master File Demolition
- **'s'** – Sheet File
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3

- **'dlist'** – Drawing List
- **'gnotes'** – General Notes Drawing
- **'typdet'**- Typical Detail Drawings
- **'kpln**' – Key Plan
- **'trklyout'** – Track Layout
- **'pln**' – All Plan Drawings
- **'sect' –** All Section Drawings
- **'elev'** – All Elevation Drawings
- **'det'** – Detail Drawings
- **'sch'** – Schedules
- **'dbltlout' –** Double Tie Layout
- **'plnsect'** – Combined Plan & Section Drawing
- **'plnelev'** – Combined Plan & Elevation Drawing
- **'sectelev'** – Combined Section & Elevation Drawings
- **'sectdet' –** Combined Section & Detail Drawings
- **'sptrkwrk' –** Special Trackwork

Field 4

- **'01-99'** – Numerical Designator

Mechanical Files

Field 1 – (Discipline / Section)

- **'81'** – Mechanical

Field 2 – (CADD File Type)

- **'m'** – Master File
- **'mx'** – Master File Existing Data
- **'s'** – Sheet File *(1)*
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'**– Preliminary/Presentation File

Field 3 – (Series Designation)

- **'wp'** – Water Piping
- **'dp'** – Drainage Piping
- **'fp'** – Fire Protection
- **'sp'** – Service Piping
- **'hv'**– H.V.A.C.
- **'hl'** – Hoist and Lift Equipment
- **'sv'** – Subway Ventilation
- **'ms'–** Mechanical Services [2]
- **'xx_demo' –** demolition *(where xx denotes applicable series designation as indicated above)*

Field 4 – (File Description)

- **'dlist' –** Dwg List & Abbreviations
- **'legend' –** Legend & Symbols
- **'keyplan01 –** Keyplan [1]
- **'pln01'** – Plan [1]
- **'xd01'** – Sections & Details [1]
- **'pp01'–** Partial Plans [1]
- **'scm01'** – Schematics [1]
- **'scd01'** – Schedules [1]

Field 5 – (Building Level / Floor Description)

- **'con'** – Concourse Level
- **'mezz'** – Mezzanine Level
- **'plat'** – Platform Level
- **'str' –** Street Level
- **'rf'–** Roof Level
- **'bstr'–** Bus / Street Car Transfer
- **'repr' –** Repair Garage
- **'serv'–** Service Area
- **'stor' –** Storage Bay
- **'traf' –** Traffic Office

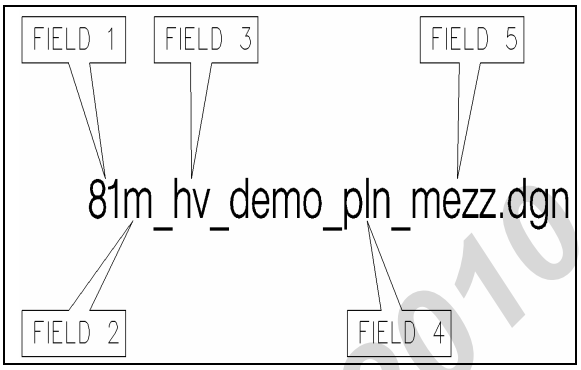

Figure 1 – CADD File Naming Convention (Mechanical)

General Rules – Master files 'm / mx'

- Separate **Master** plans are to be created for different designs. For example, one master plan for water piping mezzanine level, one master plan for drainage piping for mezzanine level, one master for HVAC design per level, etc.
- Do not incorporate all designs into one single master plan
- Each area (100 series, 200 series, 300 series, etc) shall have its own existing master (**'mx**') file. Do not combine existing plumbing services with drainage, storm, fire protection, etc. Create existing drawings for each series.

Examples of master plan & sheet file naming:

81m_wp_pln_con.dgn
81m_hv_pln_plat.dgn
81s_dp_pln_plat_demo.dgn
81s_hv_pln1_mezz.dgn,
81s_hv_pln2_mezz.dgn,
81s_wp_pln_repr.dgn
81s_wp_scm.dgn
81s_wp_scd.dgn

Foot Notes:

1 *Number '01' denotes consecutive file number when multiple dgn files are required.*

2 *Only used for projects having limited mechanical scope where multiple mechanical services (i.e. wp, fp, hvac, etc) are combined onto the same sheet files. Subject to TTC approval prior to implementing into project.*

Electrical Files

Field 1

- **'82'** – Electrical

Field 2

- **'m'** – Master File
- **'mx'** – Master File Existing
- **'md'** – Master File Demolition
- **'s'** – Sheet File
- **'sd'** – Sheet File Demolition
- **'w'** – Working File
- **'k'** – Sketch File
- **'p'** – Preliminary / Presentation File

Field 3 (Master Files)

- **'power_lighting_systems'** – Master drawing for power, lighting and system.
- **'power'** – Master Power Drawing
- **'lighting'** – Master Lighting Drawing
- **'grounding'**- Master Grounding Drawing
- **'buried_services**' – Master for buried services (power, lighting and systems.
- **'fire_alarm' –** Master Fire Alarm Drawing
- **'tele_data'** – Master Telephone and data Drawing
- **'PA_CCTV'** – Master Public Address, CCTV, Clock system and auxiliary systems
- **'BACS_GDS'** – Master Building Automation Control System & Gas Detection System

Field 3 (Sheet Files)

- **'pwr_ltg_sys'** – Sheet drawing for power, lighting and system.
- **'pwr'** – Sheet File for power.
- **'ltg'** – Sheet File for Lighting
- **'grd'**- Sheet File for Grounding
- **'buried**' – Sheet File for buried services (power, lighting and systems.
- **'FA' –** Sheet File for Fire Alarm
- **'tele_data'** – Sheet File for Telephone and data services
- **'PA_CCTV'** – Sheet File for Public Address, CCTV, Clock system and auxiliary systems
- **'pwr_panel'** – Sheet File for panelboard schedules.
- **'sch'** – Sheet File for schedules.

Field 4 (Sheet Files)

- **'*AREA*'** – Area to be indicated as applicable (ie – traffic office)
- **'01, 02 etc'** – Used to sequentially number Panelboard Schedules and other Schedules

Examples

- **82md_power_lighting_systems.dgn**
- **82m_power.dgn**
- **82m_lighting.dgn**

- **82sd_pwr_ltg_sys_Area.dgn**
- **82s_ltg_traffic.dgn**
- **82s_pwr_garage.dgn**

Appendix ‘D’ – Sheet Series by Discipline

Appendix D – Sheet Series by Discipline

Mapping, Alignment, Property and Surveying Files

G0000 – Location / Property
G1000 – Control Surveys
G2000 – Topographic Surveys
G3000 – Alignment / Clearance
G4000 – Construction Layout

Civil and Geotechnical Series

C0000 – General
C1000 – Geotechnical
C2000 – Hoarding, Removals, Traffic & Staging Staging
C3000 – Utilities
C4000 – Grading, Paving & Restoration

Architectural Series

AA000 – Legends, Abbreviations, Symbols, OBC, Wall & Roof Types
AF000 – Fire Separation Plans
AS000 – Staging Plans
AD000 – Demolition Drawings
AL000 – Landscaping Drawings
A1000 – Site Plans
A1500 – Key Plans
A2000 – Floor Plans & Roof Plans
A3000 – Reflected Ceiling Plans, Floor Finishing Plans & Furniture Layout
A4000 – Exterior Elevations & Interior Elevations
A5000 – Building Sections & Wall Sections
A6000 – Enlarged Plans, Sections & Elevations
A7000 – Enlarged Plans, Sections & Elevations for Stairs, Elevators & Escalators
A8000 – All Details (Plans & Sections – Including stairs, elevators, and escalator details).
A9000 – Schedules & Millwork
A9500 – Signage Location Plans

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Structural Series

Subway Projects

- **S0000** – General Drawings (Keyplans, Gen.Notes, Typ. Details, etc)
- **S1000** – Station Running Structure
- **S2000** – Station Entrances
- **S3000** – Bus Transfer
- **S4000** – Running Structure Vent Shafts, Emergency Building
- **S5000** – Tunnel
- **S6000** – Retaining Walls, Substation, etc
- **S7000** – Excavation Support System
- **S8000** – Demolitions
- **S9000** – Rehabilitation

Bus Garage Projects (Grouped by Area)

- **S0000** – General Drawings (Keyplans, Gen.Notes, Typ. Details, etc)
- **S1000** – Repair Garage
- **S2000** – Storage Bay
- **S3000** – Service Area
- **S4000** – Traffic Office
- **S5000** – Tank Farm

Bus Garage Projects (Grouped by Items)

- **S0000** – General Drawings (Keyplans, Gen.Notes, Typ. Details, etc)
- **S1000** – Foundation Plans
- **S2000** – Floor Plans
- **S3000** – Foundation, Sections, Schedules, Details
- **S4000** – Roof Framing Plan
- **S5000** – Roof Sections, Elevations, Details
- **S6000** - Schedules
- **S7000** – Demolitions
- **S8000** – Rehabilitation

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Signals Series

SG0000 – General Series
(Drawing Listing, Keyplan)

SG1000 – Interlocking

SG2000 – Signal Location Plan

SG3000 – Code System

SG4000 – Control Console/Panel

SG5000 – Signal Rooms

SG6000 – Signal Power / Communicaiton

SG7000 – Detail Layouts

SG8000 – Door / Signs

SG9000 – Circuit Schematic

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Communications Series

X0000 – General Series (Drawing Listing, Keyplan)

X1000 – SCADA Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X2000 – CCTV Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X3000 – PA Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X4000 – Radio Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X5000 – Fibre Optic Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X6000 – Network Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X7000 – Fire Alarm Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X8000 – Telephone & Data Series (Single-Line Diagrams, Plans, Sections, Elevations and Details)

X9000 – Charts (Wiring & Termination Charts, Cable & Conduit Schedules, etc.)

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Mechanical Series

Mechanical Series – Drawing Title Standard Format *(See figure 1)*

Drawing Title 1
Drawing Title 1 describes the type of system design. Drawing Title 1 and Drawing Series (drawing numbering system) always relate to one another. For example, all M100 series are always related to *Water Piping Design,* M200 related to *Drainage Piping Design,* etc.

Drawing Title 2

Drawing Title 2 describes the graphic or location of the drawing.

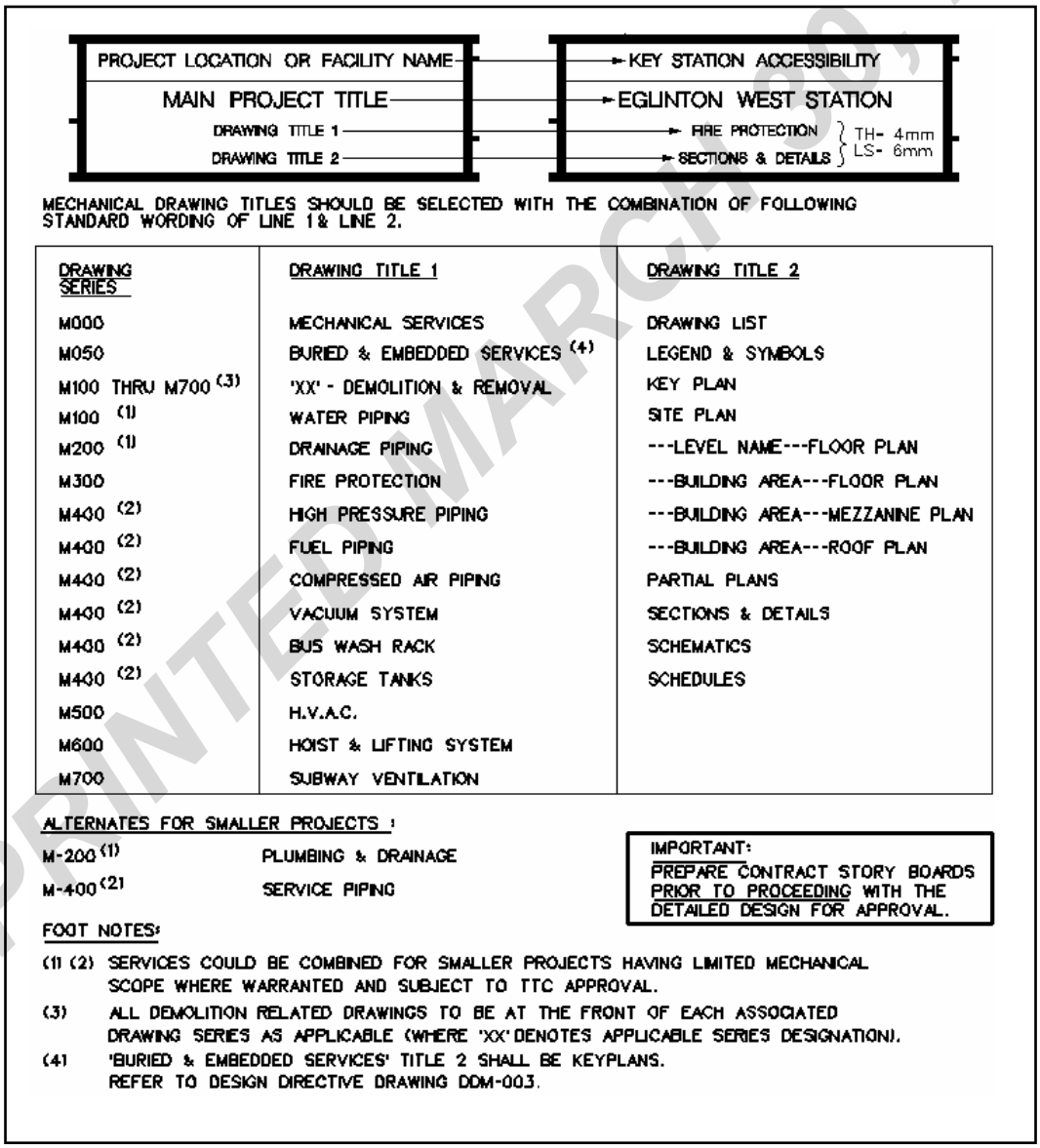

Figure 1. Drawing Title Standard Format

Mechanical Series – Project Story Board

A story board is comprised of a drawing numbering system that is in sequential order complete with standard drawing titles and the graphics outlining the intent of work. These story boards are prepared prior to proceeding with any detail design which is subject for reviews and approvals.

The Mechanical Story Board encompasses various systems. These systems are broken down to different levels of designs and categorized into drawing series. These series dictates the sequential order of all Mechanical story boards.(See chart below)

Drawing Number Series	Drawing Title 1 Drawing Title 2	Comments
M001 to M010	• MECHANICAL SERVICES DRAWING LIST	*Bulleted sections are mandatory for all Mechanical story boards. Depending on the complexity of the scope of work, there could be more than one sheet for each bulleted section*
	• MECHANICAL SERVICES LEGEND & SYMBOLS	
	• MECHANICAL SERVICES KEY PLANS	
M050 to M099	• BURIED & EMBEDDED SERVICES KEY PLANS	
100 SERIES - WATER PIPING		
M100 to M119	WATER PIPING *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M120 to M129	WATER PIPING SECTIONS & DETAILS	
M130 to M135	WATER PIPING SCHEMATICS	
M136 to M139	WATER PIPING SCHEDULES	
200 SERIES - DRAINAGE PIPING		
M200 to M219	DRAINAGE PIPING *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M220 to M229	DRAINAGE PIPING SECTIONS & DETAILS	
M230 to M235	DRAINAGE PIPING SCHEMATICS	
M236 to M239	DRAINAGE PIPING SCHEDULES	
300 SERIES - FIRE PROTECTION		
M300 to M319	FIRE PROTECTION *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M320 to M329	FIRE PROTECTION SECTIONS & DETAILS	
M330 to M335	FIRE PROTECTION SCHEMATICS	
M336 to M339	FIRE PROTECTION SCHEDULES	

Mechanical Series – Project Story Board (continued)

Drawing Number Series	Drawing Title 1 Drawing Title 2	Comments
400 SERIES - SERVICE PIPING		
M400 to M419	SERVICE PIPING *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M420 to M429	SERVICE PIPING SECTIONS & DETAILS	
M430 to M435	SERVICE PIPING SCHEMATICS	
M436 to M439	SERVICE PIPING SCHEDULES	
500 SERIES - H.V.A.C.		
M500 to M519	H.V.A.C. *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M520 to M549	H.V.A.C. SECTIONS & DETAILS	
M550 to M559	B.A.C.S. GENERAL ARRANGEMENTS SCHEMATICS	
M560 to M580	H.V.A.C. SCHEDULES	
600 SERIES - HOIST & LIFTING SYSTEM		
M600 to M619	HOIST & LIFTING SYSTEM *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M620 to M629	HOIST & LIFTING SYSTEM SECTIONS & DETAILS	
M630 to M635	HOIST & LIFTING SYSTEM SCHEMATICS	
700 SERIES - SUBWAY VENTILATION		
M700 to M719	SUBWAY VENTILATION *AREA NAME* FLOOR PLAN	*See note 1 and 2*
M720 to M729	SUBWAY VENTILATION SECTIONS & DETAILS	
M730 to M735	SUBWAY VENTILATION SCHEMATICS	
M736 to M740	SUBWAY VENTILATION SCHEDULES	

NOTES:
1. The CAD users shall edit 'TITLE' text that is in *italics* and red.
2. Demolition drawings and Partial plans are included within this group number system.
   Demolition related drawings to be at the beginning of the drawing number system
   Partial plans are always located at the end of the drawing number system

Mechanical Series – Project Story Board Example

APPENDIX 'E'

MECHANICAL PROJECT STORY BOARD – EXAMPLE

M001	MECHANICAL SERVICES LEGEND & SYMBOLS
M002	MECHANICAL SERVICES KEY PLAN
M101	WATER PIPING - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M102	WATER PIPING - DEMOLITION & REMOVAL SECTION & DETAILS
M103	WATER PIPING ---LEVEL NAME--- FLOOR PLAN
M104	WATER PIPING SECTION & DETAILS
M105	WATER PIPING SCHEMATICS
M106	WATER PIPING SCHEDULES
M201	DRAINAGE PIPING - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M202	DRAINAGE PIPING - DEMOLITION & REMOVAL SECTION & DETAILS
M203	DRAINAGE PIPING ---LEVEL NAME--- FLOOR PLAN
M204	DRAINAGE PIPING SECTION & DETAILS
M205	DRAINAGE PIPING SCHEMATICS
M206	DRAINAGE PIPING SCHEDULES
M301	FIRE PROTECTION - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M302	FIRE PROTECTION - DEMOLITION & REMOVAL SECTION & DETAILS
M303	FIRE PROTECTION ---LEVEL NAME--- FLOOR PLAN
M304	FIRE PROTECTION SECTION & DETAILS
M305	FIRE PROTECTION SCHEMATICS
M306	FIRE PROTECTION SCHEDULES

CONTINUED.....

Drawing: STANDARDS		Title: MECHANICAL PROJECT STORY BOARD – EXAMPLE		
Appd SSS: ---	Appd CE: ---	Dsn'n: JSM	Check: MB	Status: APPROVED
Scale: 1:1 (0 10 20 30 40mm)		Date: YYYY/MM/DD 2001/08/15	Dwg No.: DDM-SK-05	Rev.: 01

Toronto Transit Commission

Plot date: $$$$SYTIME$$$$ Filename: $$$$DGNSPEC$$$$

Mechanical Series – Project Story Board Example (continued)

APPENDIX 'E'

MECHANICAL PROJECT STORY BOARD – EXAMPLE

M401	HIGH PRESSURE PIPING - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M402	HIGH PRESSURE PIPING - DEMOLITION & REMOVAL SECTION & DETAILS
M403	HIGH PRESSURE PIPING ---LEVEL NAME--- FLOOR PLAN
M404	HIGH PRESSURE PIPING SECTION & DETAILS
M405	HIGH PRESSURE PIPING SCHEMATICS
M406	HIGH PRESSURE PIPING SCHEDULES
M501	HVAC - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M502	HVAC - DEMOLITION & REMOVAL SECTION & DETAILS
M503	HVAC ---LEVEL NAME--- FLOOR PLAN
M504	HVAC ROOF PLAN
M505	HVAC SECTION & DETAILS
M506	HVAC SCHEMATICS
M507	HVAC SCHEDULES
M601	HOIST & LIFTING SYSTEM - DEMOLITION & REMOVAL ---LEVEL NAME--- FLOOR PLAN
M602	HOIST & LIFTING SYSTEM - DEMOLITION & REMOVAL SECTION & DETAILS
M603	HOIST & LIFTING SYSTEM ---LEVEL NAME--- FLOOR PLAN
M604	HOIST & LIFTING SYSTEM SECTION & DETAILS
M605	HOIST & LIFTING SYSTEM SCHEMATICS
M606	HOIST & LIFTING SYSTEM SCHEDULES

Drawing: STANDARDS		Title: MECHANICAL PROJECT STORY BOARD – EXAMPLE			
Appd SSE: ---	Appd CE: ---	Drawn: JSM	Correct: MB	Status: APPROVED	Toronto Transit Commission
Scale: 1:1 (0 10 20 30 40mm)		Date: YYYY/MM/DD 2001/08/15	Dwg No.: DDM-SK-06	Rev: 01	

Plot date: [illegible] Filename: [illegible]

PRINTED MARCH 30, 2010

Electrical Series

E0000 – **General Series**
(Drawing Listing, Keyplans)
E1000 – **Power Series**
(Single-Line Diagrams, Plans, Sections, Elevations and Details)
E2000 – **Lighting Series**
(Plans, Sections, Elevations and Details)
E3000 – **Grounding Series** (Plans, Sections, Elevations and Details)
E4000 – **Buried Services Series** (Plans, Sections, Elevations and Details)
E5000 – **Fire Alarm Series** (Riser Diagrams, Plans, Sections, Elevations and Details)
E6000 – **Telephone & Data Series** (Riser Diagrams, Plans, Sections, Elevations and Details)
E6500 – **Public Address (PA) and CCTV Series** (Riser Diagrams, Plans, Sections, Elevations and Details)
E7000 – **Building Automation Control System Series (BACS)** (Riser Diagrams, Plans, Sections, Elevations and Details)
E8000 – **Schematic Diagrams & Block Diagrams**
E9000 – **Schedules** (Panelboards, Safety Switches, Cable & Conduit Schedules etc)

The Electrical demolition drawing series should keep and follow the Electrical Series. And to be arranged in sequence, (demolition drawings placed first in drawing set), followed by the new construction series drawings. However, the word *'DEMOLITION'* should be placed first in the sub-title within the Drawing Title Block.

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Traction Power Series

T1001 – T1099	Cover
T1101 – T1199	Equipment and raceway layouts, elevation section
T1201 – T1299	Single Line Diagrams
T1301 – T1399	Schematic Diagram
T1401 – T1499	Interconnection Diagrams
T1501 – T1599	Panel, Cubical, Console, I/O racks layouts
T1601 – T1620	Motor List
T1621 – T1630	Cable List
T1631 – T1640	Conduits List
T1641 – T1650	Tray List
T1651 – T1670	Cable Summary
T1671 – T1680	Cable Code List
T1681 – T1690	Electrical Box List
T1691 – T1699	Electrical Indentification List
T1701 – T1799	Distribution Panel Schedule
T1801 – T1899	Spare
T1901 – T1999	Riser and Block Diagram

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

Trackwork Installation Series

T0000 – Cover
T0001 – General Abbreviations
T0010 – Track Services Drawing List (Drawing List)
T0100 – Track Schematic Layout (Tables, Keyplans)
T0200 – Storage and Dropshaft
T0500 – Track Demolition
T1000 – Horizontal and Vertical Alignment (Layout Curve Data)
T2000 – Track Component Layout - Rail
T3000 – Track Component Layout – Rail Support (Ties, Timbers, Double Ties, Cas-In-Place Slab)
T4000 – Special Trackwork (Turnouts, Crossovers, Double Slips, crossings.
T5000 – Track Details
T6000 – Track – Traction Power Component Installation
T7000 – Track – Signalling Component Installation
T8000 – Materials Specifications
T9000 – Spare

Note:
For all Capital Contract Projects, drawing sheets are numbered with three (3) numeric digits (ie. A001)
Except for Toronto York Spadina Subway Extension (TYSSE) which are numbered with four (4) numeric digits (ie. A0001)

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Appendix 'E' – Cell Libraries

Appendix E – Cell Libraries

Civil and Geotechnical Cell Library

Refer to ***ttc_utility_civil.cel*, *CIVIL-CELLS-1A*** (Figure 1) and ***CIVIL-CELLS-1B*** (Figure 2).

Figures 1 and 2 (following pages) have been attached for **information only** – always refer to the **ttc_utility_civil.cel** library file provided at the initial Project start-up meeting for the latest Standard Civil Cells to be used (Consultant Projects)

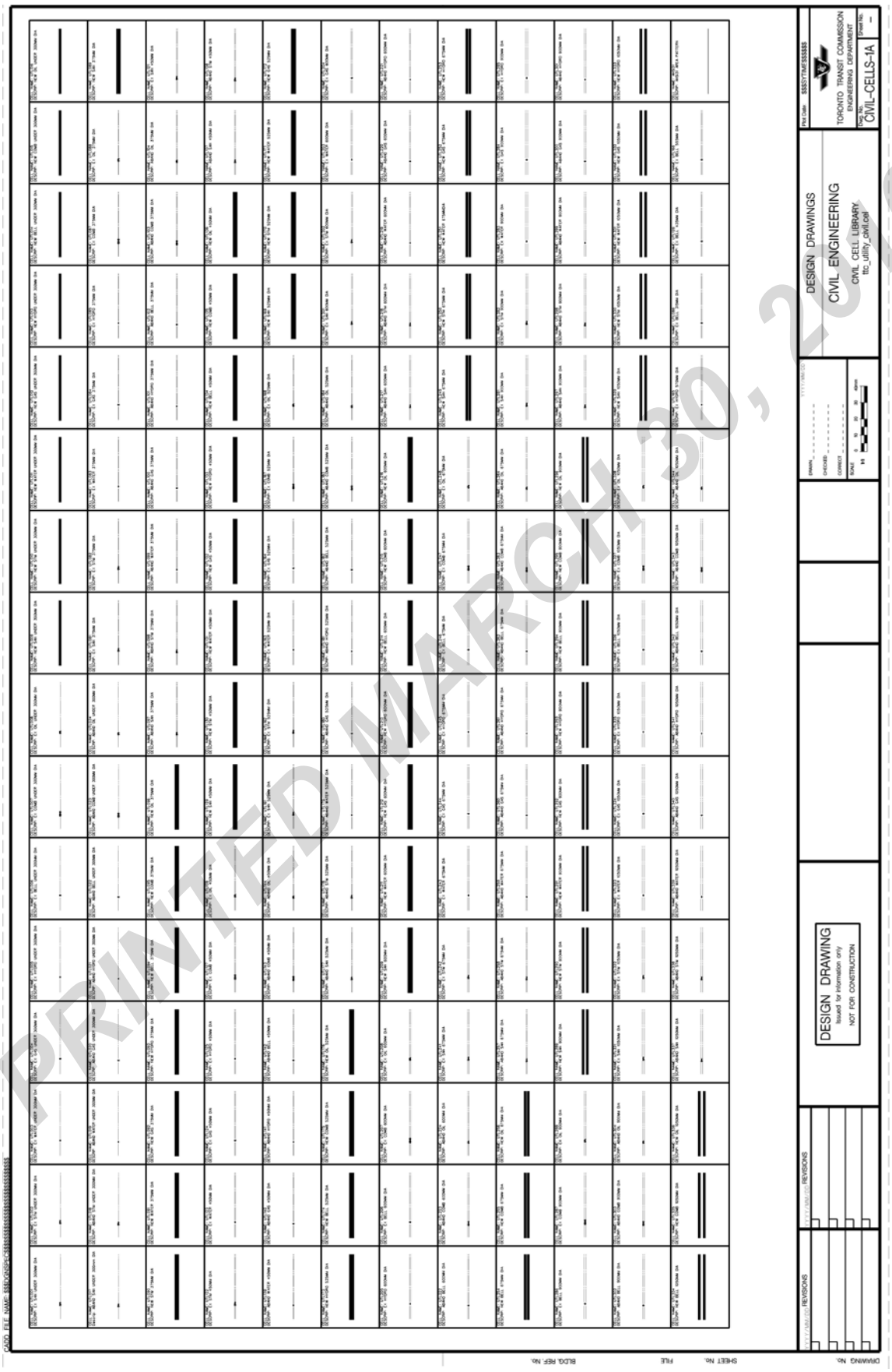

Figure 1 – CIVIL-CELLS-1A (Civil Cell Library)

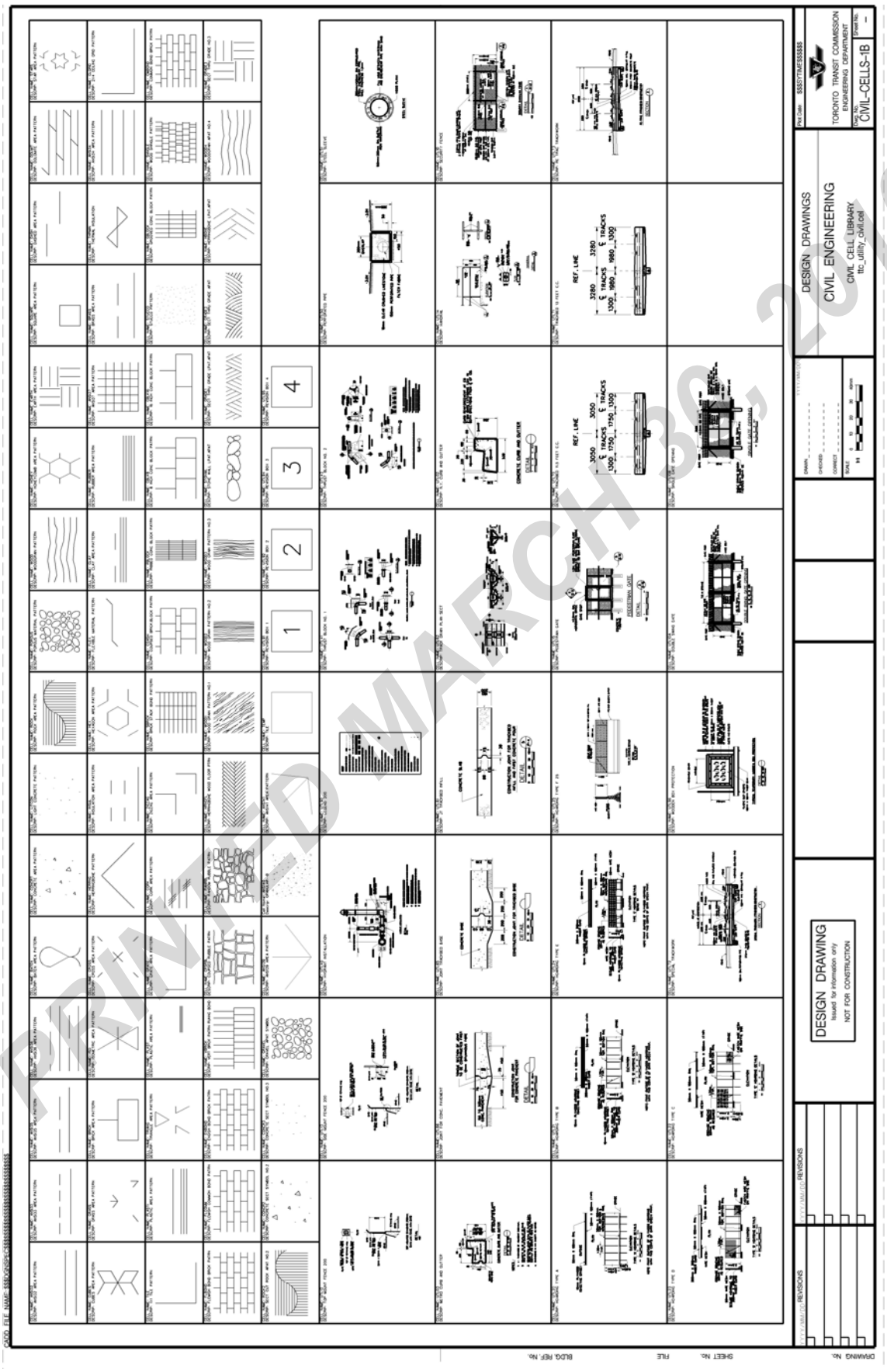

Figure 2 – CIVIL-CELLS-1B (Civil Cell Library)

Mapping and Utilities Cell Library

Under Construction / Development

Architectural Cell Library

Under Construction / Development

Structural Cell Library

Under Construction / Development

Mechanical Cell Library

Refer to ***ttcmne.cel***, ***DD-M-CELLS*** (Figure 1) and ***M001-A*** and ***M001-B*** (Figure 2 and 3).

Figures 1 to 3 (following pages) have been attached for **information only** – always refer to the **ttcmne.cel** library file provided at the initial Project start-up meeting for the latest Standard Mechanical Cells to be used (Consultant Projects)

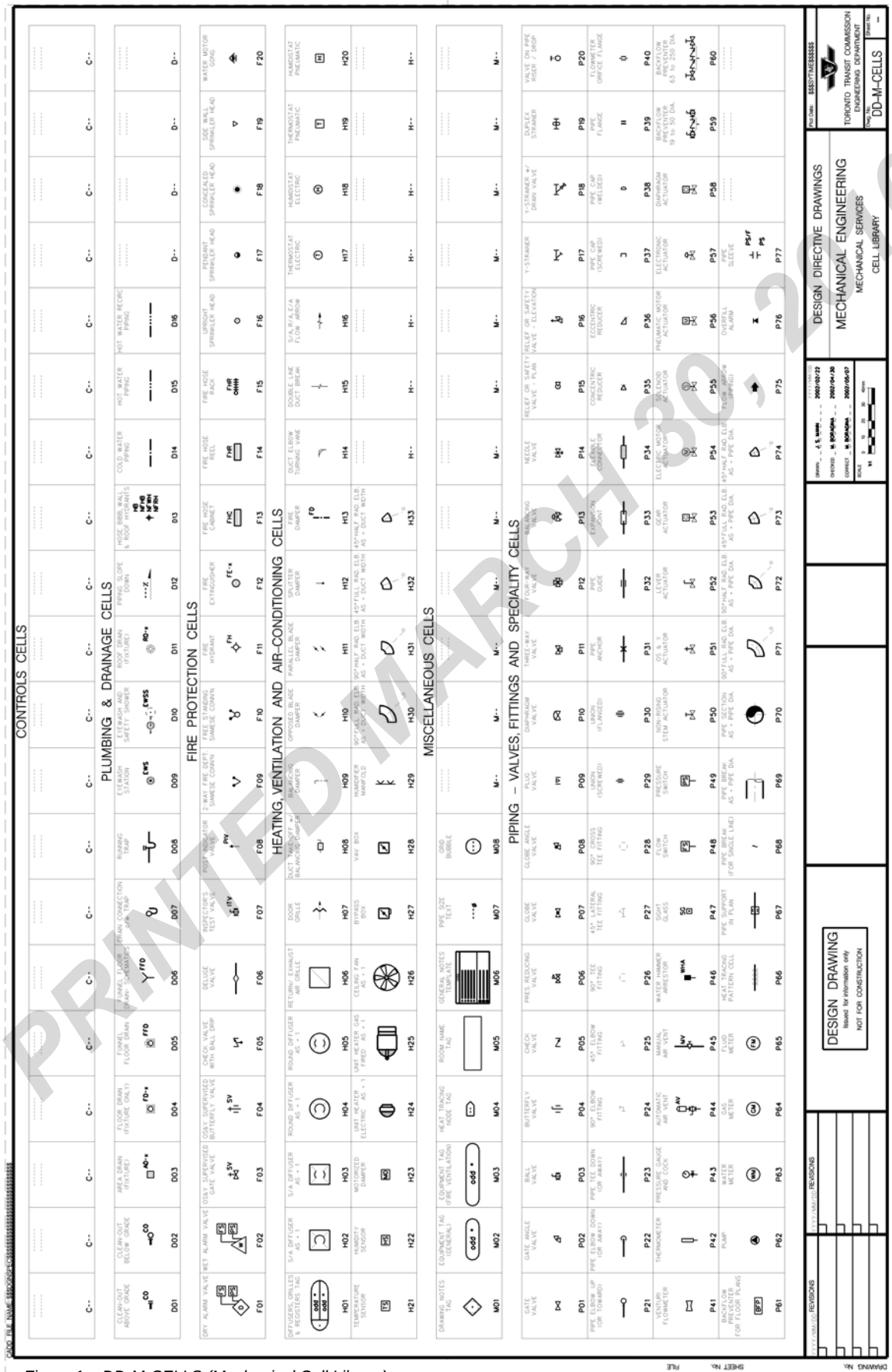

Figure 1 – DD-M-CELLS (Mechanical Cell Library)

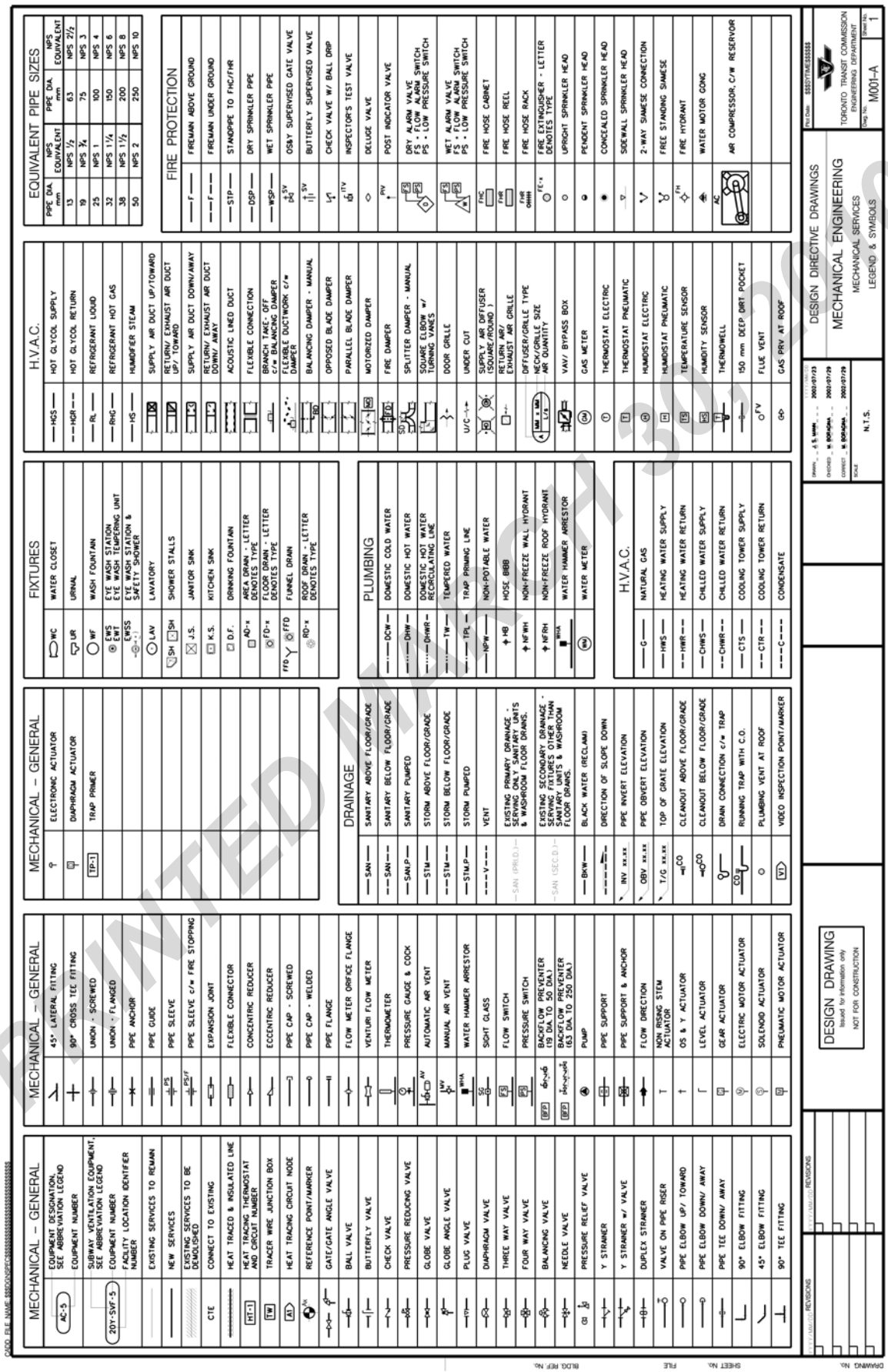

Figure 2 – M001-A LEGEND & SYMBOLS

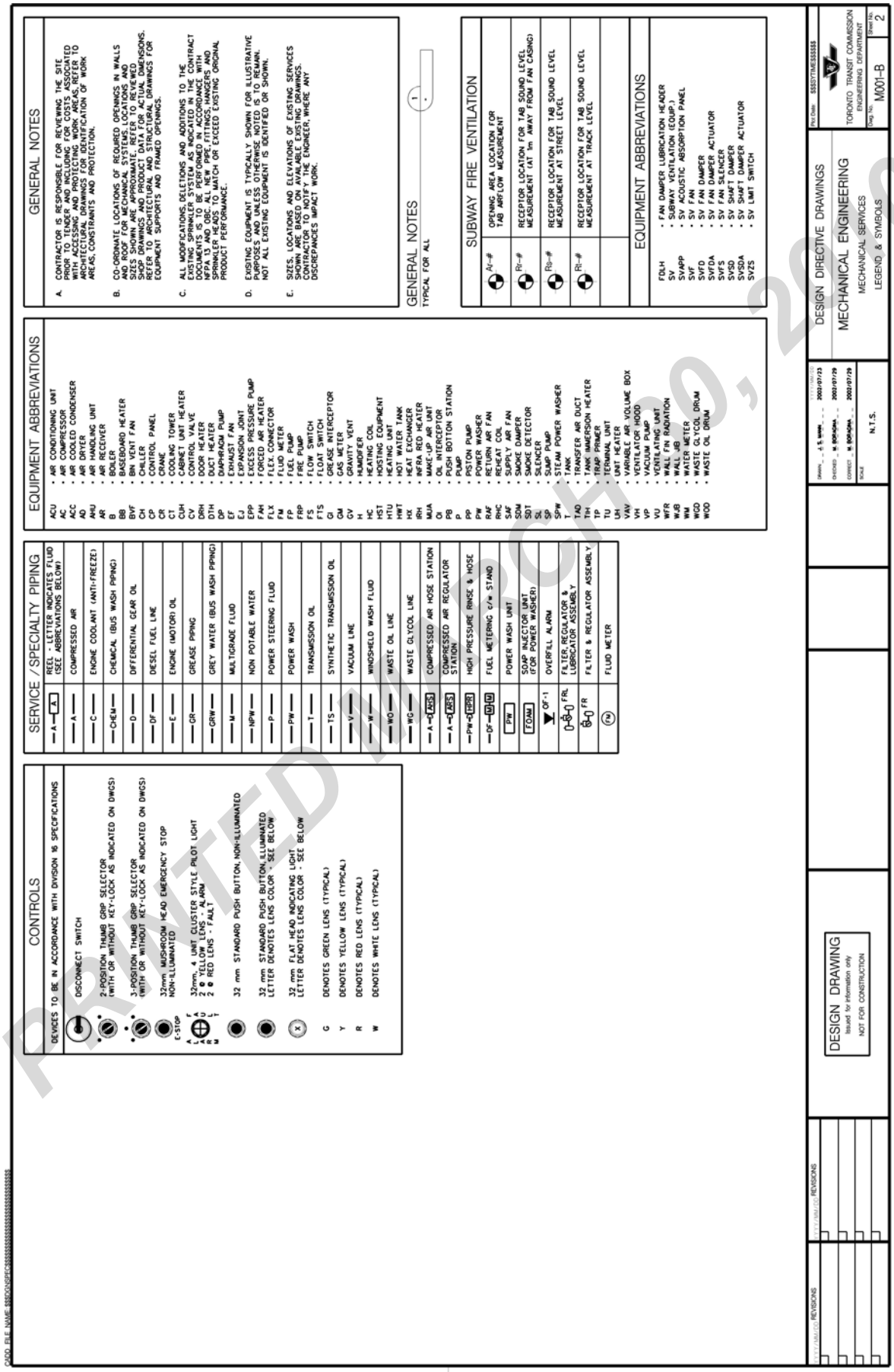

Figure 3 – M001-B LEGEND & SYMBOLS

PLEASE ENSURE TO USE THE CURRENT VERSION OF THE TTC CADD MANUAL WHEN CREATING MICROSTATION DRAWINGS

Electrical Cell Library

Refer to ***ttcele.cel*** file, and ***ELECT-CELLS*** (Figure 1)

Figure 1 has been attached for **information only** – always refer to the **ttcele.cel** library file provided at the initial Project start-up meeting for the latest Standard Electrical Cells to be used (Consultant Projects)

As for the demolition;

For Electrical Cell library, change the lifestyles (i.e. dashed, hidden with a 45 degree hatching) for demolition drawings. The electrical symbols should keep the same level name and colour.

A note or label should also be added to indicate the element or area that is to be demolished.

For electrical symbols that are to be relocated, place an “RL” text beside the symbol. An “RL” text for *Relocation* should also be included within your Drawing Legend.

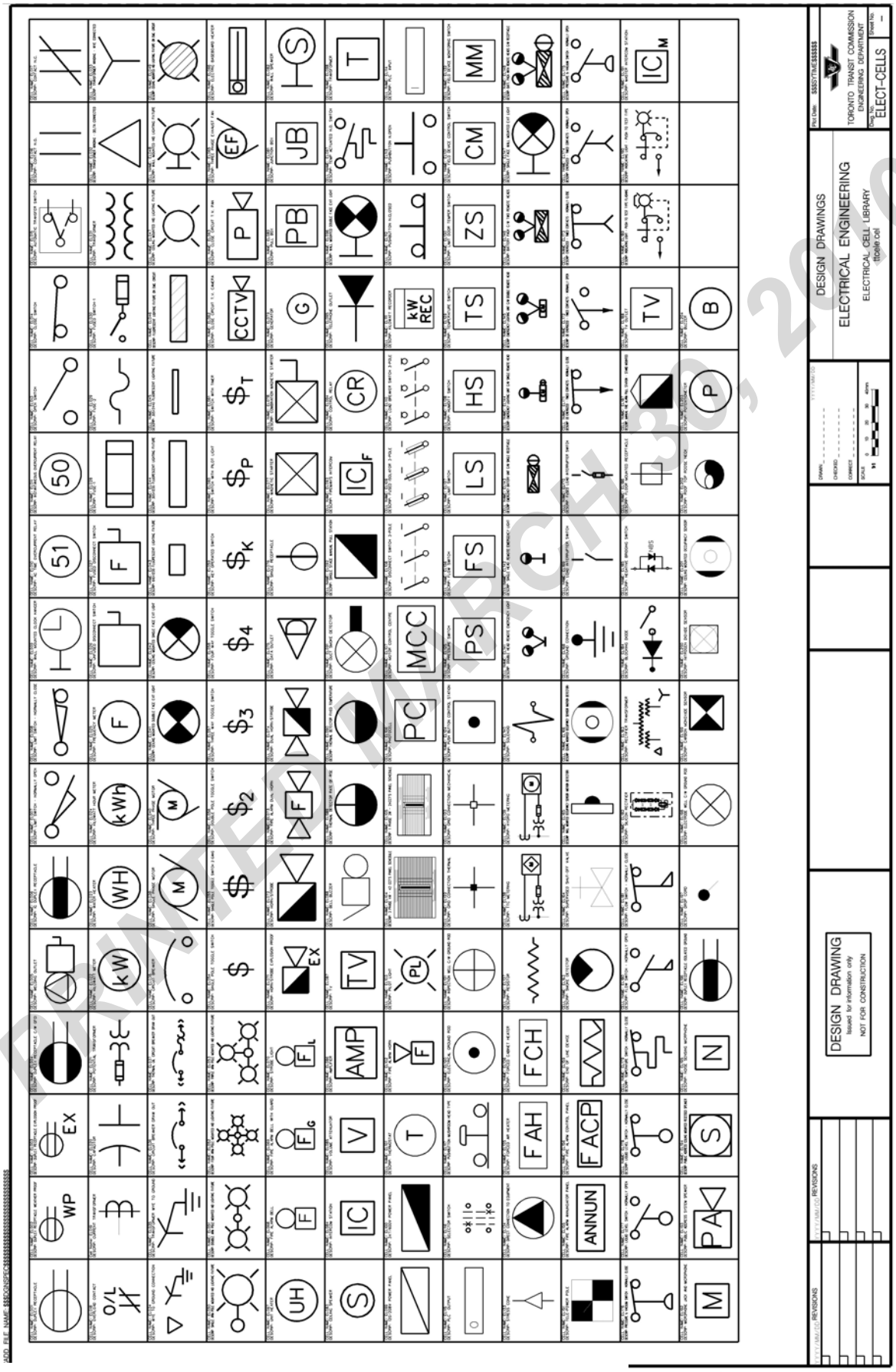

Figure 1 – ELECT-CELLS (Electrical Cell Library)

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Appendix 'F' – Abbreviations

Appendix F – Abbreviations

See Standard Drawing – ***General Abbreviations – Drawing No. S01420.01 Rev.P4*** for the latest list of abbreviations.

A copy has been attached for information.

Plot date: 19-APR-2007 Filename Standards\standard_drwgs\s01\final\S0142001.dgn

ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS	CONC.	CONCRETE	FLR.	FLOOR	L.L.V.	LONG LEG VERTICAL	P.I.	POINT OF INTERSECTION	Ts	TANGENT
ABR.	ABRASIVE	C.S.W.	CONCRETE SIDEWALK	F.D.	FLOOR DRAIN	LV.	LOUVRE	P.S.	POINT OF SWITCH	+	TONNE
ACST.	ACOUSTIC	CONSTR.	CONSTRUCTION	FLH.	FLUSH	L.L.	LOWER LAYER	POL.	POLISHED	T.C.	TANGENT TO CURVE
ADD.	ADDENDUM	CONT.	CONTINUATION	FTG.	FOOTING	L Tan	LONG TANGENT OF SPIRAL	PVC	POLYVINYL CHLORIDE	Tc	TANGENT FROM S.C. TO C.P.I.
ADH.	ADHESIVE	CONT. JT	CONTRACTION JOINT	FND.	FOUNDATION	LONGIT.	LONGITUDINAL	P.E.	PORCELAIN ENAMEL	T.S.	TANGENT TO SPIRAL
AGG.	AGGREGATE	CU	COPPER	FR.	FRAME	LX	LUX	POS. or +VE	POSITIVE	Tel.	TELEPHONE
ALT.	ALTERNATE	CORR.	CORRUGATED	F.A.I.	FRESH AIR INTAKE			POT.	POTENTIAL	TEMP.STL.	TEMPERATURE STEEL
AC.	ALTERNATING CURRENT	CORR. I.P.	CORRUGATED IRON PIPE	F.S.	FULL SIZE	MACH.	MACHINE	PRCST.	PRECAST	TEM.	TEMPLATE
AL.	ALUMINUM	COR.	CORNER	FUT.	FUTURE	M.B.	MACHINE BOLT	PREFAB.	PREFABRICATED	TERR.	TERRAZZO
A/S	ALUMINUM SHEATHED CABLE	CTSK.	COUNTERSUNK			M.S.	MACHINE SCREW	PRI.	PRIMARY	THK.	THICKNESS
A	AMPERES	CRS.	COURSES	GALV.	GALVANIZED	M/H	MAINTENANCE HOLE	PROP.	PROPOSED	MCM	THOUSAND CIRCULAR MILS
A.BT.	ANCHOR BOLT	m³	CUBIC METRE	GA.	GAUGE	M.I.	MALLEABLE IRON	P.A.	PUBLIC ADDRESS	TLL	TOP LOWER LAYER
&	AND	C.S.	CURVE TO SPIRAL	GENL.	GENERAL	M.A.	MASONRY ANCHOR	P.B.	PULL BOX	TUL	TOP UPPER LAYER
L	ANGLE (METAL)	C.T.	CURVE TO TANGENT	G.B.M.	GEODETIC BENCH MARK	M.O.	MASONRY OPENING			T.T.	TOP T.
ANN.	ANNUNCIATOR	CYL. L.	CYLINDER LOCK	GL.	GLASS	MATL.	MATERIAL	Q	QUARRY TILE	T.& B.	TOP AND BOTTOM
ANOD.	ANODIZED			GL. BLK.	GLASS BLOCK	MAX.	MAXIMUM			T/C	TOP OF CONCRETE
APPD.	APPROVED	DP.	DAMPERPROOFING	G.F.M.	GLASS FACED MASONRY	MECH.	MECHANICAL	R	RADIUS	T/R	TOP OF RAIL
APPROX.	APPROXIMATE	(°) OR DEG.	DEGREE	GL.T.	GLAZED TILE	MPa	MEGA PASCAL	RLG	RAILING	T.O.S.	TOP OF STEEL
ARCH.	ARCHITECTURAL	DET.	DETAIL	GL.C.T.	GLAZED CERAMIC TILE	MEMB.	MEMBRANCE	R.W.L.	RAIN WATER LEADER	TR.	TRACK
ASB.	ASBESTOS	DIAG.	DIAGONAL	GL.F.T.	GLAZED FACING TILE	MET.	METAL	RECT.	RECTIFIER	TRANS.	TRANSFORMER
A.C.BD.	ASBESTOS CEMENT BOARD	Ø OR DIA.	DIAMETER	G.	GRADE	M.C.	METAL CLAD	REF.	REFERENCE	TD.	TREAD
ASPH.	ASPHALT	D.C.	DIRECT CURRENT	GRTG.	GRATING	M.C.ASB.	METAL CLAD ASBESTOS	R/L or ℄	REFERENCE LINE	TYP.	TYPICAL
@	AT	DIM.	DIMENSION	GR.	GRILLE	M.C.PLW.	METAL CLAD PLYWOOD	REG.	REGISTER	TP.	TYPE
AUX.	AUXILIARY	DIST.	DISTANCE	GRD.	GROUND	m	METRE	REINF.	REINFORCING		
AVG.	AVERAGE	D.G.	DOUBLE GLASS	GYP.	GYPSON	MEZZ.	MEZZANINE	R.C.	REINFORCED CONCRETE	U/S	UNDERSIDE
		D/H	DOUBLE HUNG			mm	MILLIMETRES	REQ.	REQUIRED	U/N	UNLESS OTHERWISE NOTED
		DWL.	DOWEL	H.RD.	HALF ROUND	MIC	MINERAL INSULATED CABLE	RET.	RETAINING	USGPM	UNITED STATES GALLONS PER MINUTE
B.PL	BASE (BEARING) PLATE	DN.	DOWN	H.R.	HAND RAIL	MIN.	MINIMUM	REV.	REVISION	U.L.	UPPER LAYER
BM	BEAM	DWG.	DRAWING	HDW	HARDWARE	-	MINUS	R.H.	RIGHT HAND	UR.	URINAL
BRG.	BEARING	DR.P.	DRAIN PIT	HDWD.	HARDWOOD	(')	MINUTE (ANGLE)	R.H.R.	RIGHT HAND REVERSE		
B.C.	BEGINNING OF CURVE	D.B.	DUCT BANK	HD.	HEAD	MISC.	MISCELLANEOUS	R.O.W.	RIGHT-OF-WAY		
B.V.C	BEGINNING OF VERTICAL CURVE	D.I.	DUCTILE IRON	HGT.	HEIGHT	MLDG.	MOULDING	R.	RISER	V.B.	VAPOUR BARRIER
				HZ	HERTZ	M.T.	MOSAIC TILE	R.D.	ROOF DRAIN	V	VELOCITY, IN Km/h
BLDG	BUILDING	EA.	EACH	H.P.	HIGH POINT			RFG.	ROOFING	V.	VENT
B/L	BUILDING LINE	Eq	ACTUAL SUPERELEVATION TO BE CONSTRUCTED	H.M.	HOLLOW METAL	N.F.	NEAR FACE	RGH.	ROUGH	V/S	VENT SHAFT
BEV.	BEVELLED			H.M.D.	HOLLOW METAL DOOR	NEG.	NEGATIVE	RD.	ROUND	VERT.	VERTICAL
BLK.	BLOCK	E.E.	EACH END	H.T.	HOLLOW TILE	N	NEWTON	R.H.	ROUND HEAD SCREW	V.C.	VERTICAL CURVE
BD.	BOARD	E.F.	EACH FACE	HTE	HOOK ONE END	N.M.	NON-METALLIC	R.H.S.		V.I.F.	VERTICAL INSIDE FACE
BT.	BOLT	E.S.	EACH SIDE	H2E	HOOK TWO ENDS	N.S.	NON-SLIP			V.O.F.	VERTICAL OUTSIDE FACE
BOT.	BOTTOM	E.W.	EACH WAY	HOR.	HORIZONTAL	N	NORTH	SAN.	SANITARY SEWER	V.P.I.	VERTICAL POINT OF INTERSECTION
BLL	BOTTOM LOWER LAYER	E	EAST	H.C.	HORIZONTAL CURVE	N/B	NORTH BOUND	SCR.	SCREW	VEST.	VESTIBULE
BUL	BOTTOM UPPER LAYER	E/B	EASTBOUND	H.W.	HOT WATER	N/A	NOT AVAILABLE.	SC.D.	SCUPPER DRAIN	V.T.	VITREOUS TILE
BOX	BOX STRUCTURE	ELEC.	ELECTRICAL	H.L.	HOT LAID		NOT APPLICABLE	(")	SECOND (ANGLE)	V.P.	VITRIFIED PIPE
BKR	BREAKER	E.HTR.	ELECTRIC HEATER	H.S.S.	HOLLOW STRUCTURAL SECTION	N.T.S.	NOT TO SCALE	SEC.	SECONDARY		
BRK	BRICK	EMT	ELECTRIC METALLIC TUBING			N.P.C.	NOT PART OF CONTRACT	2ND L.	SECONDARY LAYER		
BRDG.	BRIDGING	EL.	ELEVATION (ABOVE DATUM)	I	I BEAM	NO. or #	NUMBER	SECT.	SECTION	W.PL.	WALL PLATE
		ELEV.	ELEVATION (VIEW)	ILL.S.	ILLUMINATED SIGN			S.T.S.	SELF TAPPING SCREW	W.RM.	WASHROOM
CSA	CANADIAN STANDARDS ASSOCIATION	EM.	EMERGENCY	INCL.	INCLUDED	Ω	OHMS	SEW.	SEWER	W.R.	WASTE RECEPTICAL
CISC	CANADIAN INSTITUTE OF STEEL CONSTRUCTION	EEB	EMERGENCY EXIT BUILDING	I.D.	INSIDE DIAMETER	O.B.C.	ONTARIO BUILDING CODE	SHTHG.	SHEATHING	W.W.	WEATHERSTRIP
		E.T.	EMERGENCY TRIP	I.F.	INSIDE FACE	O.C.	ON CENTER	SH.	SHEET	W.P.	WATERPROOFING
CAP.	CAPACITY	ENC.	ENCASED	INS.	INSULATION	OPNG.	OPENING	S.M.S.	SHEET METAL SCREW	W.C.	WATER CLOSET
C.PL	CAP PLATE	ENCL.	ENCLOSURE	INT.	INTERIOR	O.W.S.J.	OPEN WEB STEEL JOIST	S Tan	SHORT TANGENT OF SPIRAL	W.S.	WEATHER STRIP
CSTG.	CASTING	E.C.	END OF CURVE	INV.	INVERT	O.W.S.S.J.	OPEN WEB SHORT SPAN JOIST	SLT.	SILT TRAP	W.H.	WEEPHOLE
C.I.	CAST IRON	E.V.C.	END OF VERTICAL CURVE			O.W.L.S.J.	OPEN WEB LONG SPAN JOIST	SL.	SLEEVE	WT.	WEIGHT
C.I.P.	CAST IRON PIPE	ENG.	ENGINEERING	JKT.	JACKETED	O.B.	OUTLET BOX	S	SOUTH	WWM	WELDED WIRE MESH
C.B.	CATCH BASIN	ENT.	ENTRANCE	JT.	JOINT	O.D.	OUTSIDE DIAMETER	S/B	SOUTHBOUND	W	WEST
CLKG.	CAULKING	ESC.	ESCALATOR	JST.	JOIST	O.F.	OUTSIDE FACE	SPEC.	SPECIFICATIONS	W/B	WEST BOUND
CLG.	CEILING	EXC.	EXCAVATE	JCT.	JUNCTION	O.H.S.	OVAL HEAD SCREW	SP.	SPIRAL	WWF	WELDED WIDE FLANGE
CEM.	CEMENT	EXIST.	EXISTING			O.A.	OVERALL	△s	SPIRAL ANGLE	WF	WIDE FLANGE
CTR.	CENTRE	EXP. JT.	EXPANSION JOINT	kg	KILOGRAM	OVHD.	OVERHEAD	S.P. I.	SPIRAL CURVE P.I.	WDG.	WINDING
℄	CENTRE-LINE	EXP.SH. & BT.	EXPANSION SHIELD & BOLT	km/h	KILOMETRES PER HOUR			S.C.	SPIRAL TO CURVE	W.GL.	WIRE GLASS
O/C or C.C.	CENTRE TO CENTRE	EXT.	EXTERIOR	KN	KILONEWTON	P	DIST. FROM CENTRE OF CIRC. CURVE TO TANGENT WINUS R	S.T.	SPIRAL TO TANGENT	WD.	WOOD
△	CENTRE ANGLE = P.I. ANGLE	EX.H.	EXTRA HEAVY	kW	KILOWATT			SPL.	SPLICING	W.S.	WOOD SCREW
CHAM.	CHAMFER	EXTR.	EXTRUDED	kW.H	KILOWATT HOUR			SQ.	SQUARE	WP.	WORKING POINT
——/	CHANNEL	EQ.	EQUAL	KVA	KILO VOLT AMPERES	PTD.	PAINTED	m²	SQUARE METRE	W.I.	WROUGHT IRON
CHK.	CHECK	EXTc	DISTANCE, CURVE P.I. TO CENTRE CURVE			PR.	PAIR	S.ST.	STAINLESS STEEL		
CCT.	CIRCUIT	EXTs	DISTANCE, OVERALL P.I. TO CURVE CENTRE	LAD.	LADDER	PNL.	PANEL	STG.	STAGGERED	Xs	DISTANCE FROM T.S. TO Ys ALONG MAIN TANGENT
CIRC.	CIRCULAR			LDG.	LANDING	PARTN.	PARTITION	STD.	STANDARD	Ys	OFFSET FROM Ts TO S.C.
△c	CIRCULAR CURVE ANGLE			LAV.	LAVATORY	PASS.	PASSAGE	STA.	STATION (CHAINAGE)		
C.P.I.	CIRCULAR CURVE P.I.	F. TO F.	FACE TO FACE	L.H.	LEFT HAND	Pa	PASCAL	STN.	STATION (STRUCTURE)		
CL. RM.	CLEANERS' ROOM	F.T.	FACING TILE	L.H.R.	LEFT HAND REVERSE	PED.	PEDESTAL	STL.	STEEL		
C.O.	CLEAN OUT	F.F.	FAR FACE	LG.	LENGTH, LONG	/	PER	STIF.	STIFFENER		
CL.	CLEARANCE	FIG.	FIGURE	Lc.	LENGTH OF CURVE	%	PERCENT	STIR.	STIRRUP		
CL. GL.	CLEAR GLASS	FIN.	FINISH	Ls.	LENGTH OF SPIRAL	PH.	PHASE	STM.	STORM SEWER		
C.C.TV.	CLOSE CIRCUIT TELEVISION	F/F	FINISH FACE	L.V.C.	LENGTH OF VERTICAL CURVE	PCS.	PIECES	S/L	STREET LINE		
C.W.	COLD WATER	FBRK.	FIREBRICK	LEV.	LEVEL	P.	PIPE	STG.	STRINGER		
COLL.	COLLAPSIBLE	F. DR.	FIRE DOOR	LTG.	LIGHTING	P.RLG.	PIPE RAILING	STRUCT.	STRUCTURAL		
COL. CEM.	COLORED CEMENT	F.H.C.	FIRE HOSE CABINET	L.R.T.	LIGHT RAIL TRANSIT	PLAS.	PLASTER	STRUCT. GL.	STRUCTURAL GLASS		
COL.	COLUMN	1ST.L.	FIRST LAYER	L.R.V.	LIGHT RAIL VEHICLE	P.F.DOOR	PLASTIC FACED DOOR	SUPR.	SUPERVISORY		
C.T.	COLUMN TIE	FIX.	FIXTURE	L.W.C.	LIGHTWEIGHT CONCRETE	PL	PLATE	SUPT.	SUPPORT		
COMM.	COMMUNICATION	FL.	FLANGE	LIN.m.	LINEAR METRE	PL GL.	PLATE GLASS	SURF.	SURFACE		
COMB.	COMBINED SEWER	FLG.	FLASHING	L.L.	LIVE LOAD	PLAT.	PLATFORM	SUSP.	SUSPENDED		
C/W	COMPLETE WITH	F.H.	FLAT HEAD	LKR.	LOCKER	+	PLUS	SWBD.	SWITCHBOARD		
				L.L.H.	LONG LEG HORIZONTAL	±	PLUS OR MINUS	SYM.	SYMMETRICAL		

Drawing	Title							
STANDARD	GENERAL ABBREVIATIONS							
Scale	Drawn	Checked	Approved SSS	Status	Date YEAR/MO/DY	Dwg No.	Rev.	Toronto Transit Commission
PLOTTED DRAWING TO FIT	e.LABERINTO	B. O'NEILL	A. VERMES	DRAFT	2007/04/20	S01420.01	P4	

(FORMERLY S03000.01)

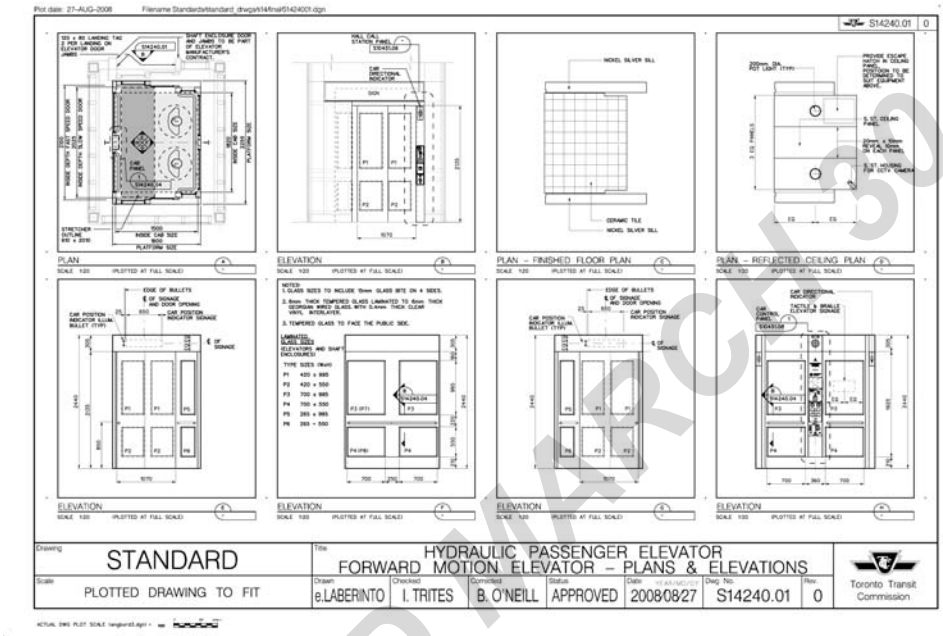
ACTUAL DWG PLOT SCALE (engbord3) =

Appendix G – Standard and Directive Drawings

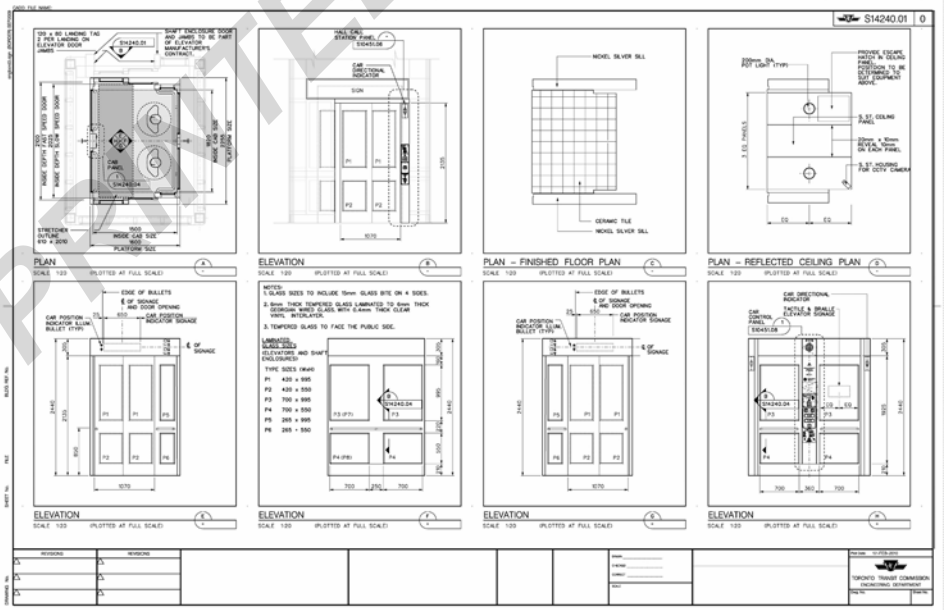
Standard drawings must be used as they are, and not to be edited or manipulated in any way.

Standard drawings are not allowed to be issued to consultant in Microstation Format. If the Standard Drawing is to be used, the contents can be imported as a raster image within the TTC Standard A1 size border and given a proper contract sheet drawing number.

See sample of a Standard Drawing below;
– ***Drawing No. S14240.01 - Hydraulic Passenger Elevator***



Sample of a Standard Drawing with contents inserted as raster image for contract drawing sheet;



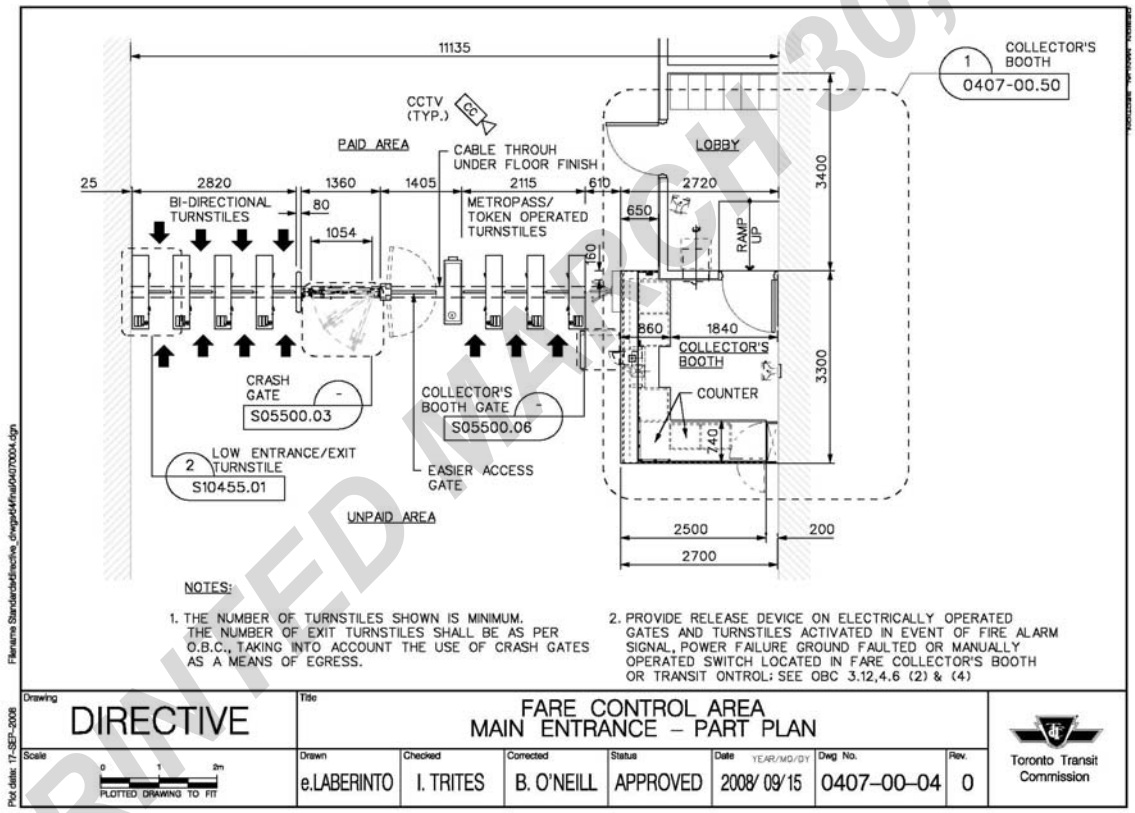
Appendix G – Standard and Directive Drawings - continue

Directive Drawings may be edited, within the criteria and guidelines of the Design Manual, to form the basis of any evolving design solution.

Directive Drawings are not intended to be used as contract drawings. Where a Directive Drawing is used in its entirety, a contract drawing number would replace the TTC Directive Drawing number.

Directive Drawings are available in Microstation Format and can be provided to consultants if requested.

See Directive Drawing sample below;
– ***Drawing No. 0407-00.04 P5 - Main Entrance – Subway Station – Fare Control Line***



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Appendix 'H' – CADD Disclaimer

Appendix H – CADD Disclaimer

1.0 Information supplied by the Toronto Transit Commission, 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,

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(ii) the User 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

(iii) the said information is not included under the seals or certificates, if any, on any accompanying plans or printed material; and

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