

**City of Kitchener
Infrastructure Services Department
Engineering Services Division**

CAD Standards for Engineering



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Table of Contents

1. Introduction.....	1
2. Standards.....	1
2.1. General.....	1
2.2. Conformance Requirements.....	1
3. Legal Survey	2
4. Topographic Survey	2
5. Existing Conditions Plan and Profile.....	2
6. Proposed Conditions Plan and Profile.....	2
7. Surface Elevation Plan	2
8. Pavement Marking Plan	2
9. Layers	3
9.1. General.....	3
9.2. Existing Condition Layer State.....	3
9.3. Proposed Condition Layer State.....	6
10. Named Plot Styles.....	9
11. Sheets.....	9
12. Symbols	9
13. Model Space / Paper Space	9
14. AutoCAD Workflow	9
15. Conclusion	10

1. Introduction

This manual has been developed to assist consultants in the preparation of contract drawings for the City of Kitchener' Engineering Services Division using Autodesk's AutoCAD software platform.

2. Standards

2.1. General

The City of Kitchener has developed over the years a number of sheets, blocks, linetypes and procedures to ensure that our engineering contract drawings are comprehensive and consistent.

The standard has also been developed to achieve the following goals:

- Provide a look and feel to the drawings that is easy to read,
- Provide all of the necessary information on the drawings so that asset information can be visually extracted from the drawings at a later date,
- Make the integration of engineering drawings into the GIS database as seamless as possible,
- Ensure that the data provided to be contained within our database is as accurate as possible.

All drawings shall be created using the City of Kitchener's template package available for download on the City's website at <http://www.kitchener.ca/>. Files contained in this package are updated regularly so it is important that the consultant frequently visit the website to make sure they are using the up to date version of the template package. Revisions are also tracked at the beginning of this document. The package contains the following files;

- COK-Engineering.stb (plot style table)
- Civil_3D_City of Kitchener_2012.dwt
- Consultant Sheet Template_City of Kitchener_2012.dwt
- Cover Sheets.dwt
- COK_Engineering CAD Standards.pdf

2.2. Conformance Requirements

The standards as outlined in this document shall apply to the consultant working on a project where the City of Kitchener is designated as the 'Owner' of the works being constructed. This case applies mostly to Capital and Development Charge projects such as a road reconstruction or the construction of a new trunk sewer.

Where the City of Kitchener is a member of the project team or where the City of Kitchener is the approval agency then only the As Recorded Drawing Submission section of this document shall apply regardless of constructed works ownership. This case applies mostly to projects such as a subdivision or site plan development. While it is not mandatory for private sector developments to follow standards such as layer names until the 'As Recorded' stage it is highly recommended to reduce the amount of work required later to change layers. Alternative methods of layer conversion are available with AutoCAD such as the Layer Translator' however the method of arrival is left at the discretion of the consultant preparing the drawings.

If further clarification is required please consult with your project manager / City of Kitchener contact prior to project commencement.

3. Legal Survey

Legal data should be a composite plan prepared by an Ontario Land Surveyor showing front and side property lines, including all intersecting streets, private and municipal property, easements, rights-of-way and control points used.

The coordinate system of the plan is scaled to ground UTM NAD 83 Zone 17 coordinates. Translate plan coordinates onto a defined base point which is at its true UTM coordinate value and provide the average combined scale factor used. Supply the true UTM Zone 17 NAD 83 coordinates and the combined scale factor for a minimum of three points within the drawing.

4. Topographic Survey

All topographical surveys shall be conducted in accordance with the City of Kitchener's Guidelines for total station engineering/topographical surveys.

5. Existing Conditions Plan and Profile

The existing conditions plan should include all existing topographical, above ground and underground information and assets with accurate location. Profiles detailing the underground features may also be included where required.

Underground details should include but are not limited to, sewers, water mains, gas mains, and other utilities should be shown in their actual vertical location in the profile view of the drawing. Above ground detail should include but are not limited to, sewers, water mains, gas mains, underground telecommunications lines, underground electrical lines.

6. Proposed Conditions Plan and Profile

The proposed conditions plan should include all proposed topographical, above ground and underground information and assets with accurate location. Profiles detailing the underground features may also be included where required. Existing detail and assets which are to be removed during construction shall **not** be shown.

Underground details should include but are not limited to, sewers, water mains, gas mains, and other utilities should be shown in their actual vertical location in the profile view of the drawing. Above ground detail should include but are not limited to, sewers, water mains, gas mains, underground telecommunications lines, underground electrical lines.

7. Surface Elevation Plan

This plan should represent the proposed conditions to be constructed as well as showing existing conditions to remain. Proposed elevations at key locations (every 10m stations, PVI, BVC, EVC, BHC, EVC, etc.) should be shown on the centerline of the roadway, edge of pavement, front face of sidewalk, and back of sidewalk. Existing elevations shall be shown at every 10m stations at the centerline of the roadway and the back of sidewalk.

8. Pavement Marking Plan

The pavement marking plan should be at a scale of 1:250 and must use the Region of Waterloo's line painting legend. For line types not included in the legend consult the City of Kitchener's project manager. All line markings and symbols should be drawn to scale.

9. Layers

9.1. General

Where the user deems it necessary additional layers may be added so long as the format set out below is followed.

9.2. Existing Condition Layer State

Layers for the Existing Conditions Drawings shall be shown in the state as outlined below;

Name	Colour	Linetype	Lineweight	Description
ALIGN_EX_CL	221	DASHED	Default	Existing centerline alignment
EX_BDG	32	Continuous	Default	Existing building outline
EX_BDG_HATCH	32	Continuous	Default	Existing building hatching
EX_BDG_TEXT	32	Continuous	Default	Existing building address label
EX_CONTROL	Magenta	Continuous	Default	Existing survey controls (e.g. benchmark)
EX_CURB	White	Continuous	Default	Existing back of curb line
EX_DETAIL	250	Continuous	Default	Existing detail (e.g. rocks)
EX_DETAIL_TEXT	250	Continuous	Default	Existing detail label
EX_DIMS	White	Continuous	Default	Existing dimensions
EX_DITCH	65	ACAD_ISO08W100	Default	Existing centerline of a ditch
EX_DW	White	Continuous	Default	Existing edge of driveway (asphalt, concrete, or other material)
EX_ELEC_AG	214	Continuous	Default	Existing above ground electrical cable
EX_ELEC_UG	214	DIVIDE2	Default	Existing under ground electrical cable
EX_ELEC_TEXT	214	Continuous	Default	Existing electrical cable text
EX_EMBANKMENT	205	ACAD_ISO08W100	Default	Existing edge of top or bottom of slope
EX_EP	White	Continuous	Default	Existing edge of pavement (roadway)
EX_FB	Green	Continuous	Default	Existing outline of flower garden
EX_FENCE	32	FENCELINE3	Default	Existing fence line
EX_GAS_MAIN	56	DASHED	By Object	Existing gas main
EX_GAS_SERVICE	56	DASHED	By Object	Existing gas service
EX_GAS_VALVE	56	Continuous	Default	Existing gas valve
EX_GAS_TEXT	56	Continuous	Default	Existing gas label
EX_GRAVEL	31	Continuous	Default	Existing edge of gravel (roadway)
EX_GUIDERAIL	White	By Block	Default	Existing guiderail
EX_HANDRAIL	White	Continuous	Default	Existing pedestrian hand railing
EX_LEGAL_BARS	250	Continuous	Default	Existing property bars
EX_LEGAL_ROW	250	PHANTOM2	0.60	Existing property right-of-way limits
EX_LEGAL_LOT	250	PHANTOM2	Default	Existing property lot lines
EX_LEGAL_TEXT	250	Continuous	Default	Existing property labels
EX_LINE	White	Continuous	Default	Existing miscellaneous linework
EX_RETWALL	252	Continuous	Default	Existing retaining wall
EX_RIVER	142	Continuous	Default	Existing water line
EX_RR	White	By Block	Default	Existing centerline of railway tracks
EX_SAN_HATCH	13	Continuous	Default	Existing sanitary pipe hatching

Existing Condition Layer State - continued

Name	Colour	Linetype	Lineweight	Description
EX_SAN_MAIN	14	Continuous	Default (Plan) 0.30 (Profile)	Existing sanitary pipe wall
EX_SAN_MH	14	Continuous	Default	Existing sanitary manhole
EX_SAN_SERV	14	Continuous	Default	Existing sanitary service
EX_SAN_TEXT	14	Continuous	Default	Existing sanitary label
EX_SIGNS	32	Continuous	Default	Existing roadway signs
EX_STM_CB	108	Continuous	Default	Existing catchbasin
EX_STM_HATCH	113	Continuous	Default	Existing storm hatch
EX_STM_MAIN	108	DASHED	Default (Plan) 0.30 (Profile)	Existing storm pipe walls
EX_STM_MH	108	Continuous	Default	Existing storm manhole
EX_STM_SERV	108	DASHED	Default	Existing storm service
EX_STM_TEXT	108	Continuous	Default	Existing storm label
EX_SW	White	Continuous	Default	Existing sidewalk
EX_TELE_COND	214	DASHDOT2	Default	Existing telecomm conduit
EX_TELE_MH	212	Continuous	Default	Existing telecomm structure
EX_TELE_TEXT	212	Continuous	Default	Existing telecomm label
EX_TEXT	42	Continuous	Default	Existing misc. label
EX_TRAF_SIGN	212	Continuous	Default	Existing traffic signal
EX_TRAF_TEXT	212	Continuous	Default	Existing traffic signal label
EX_UTIL_POLES	42	Continuous	Default	Existing utility poles
EX_UTIL_POLES_TEXT	42	Continuous	Default	Existing utility poles
EX_VEG	104	Continuous	Default	Existing tree, shrub, tree line
EX_VEG_TEXT	104	Continuous	Default	Existing tree, shrub, tree line label
EX_WAT_HATCH	151	Continuous	Default	Existing water main hatch
EX_WAT_HYD	172	Continuous	Default	Existing hydrant
EX_WAT_MAIN	172	CENTERX2	Default (Plan) 0.30 (Profile)	Existing water main pipe wall
EX_WAT_SERV	172	CENTERX2	Default	Existing water service
EX_WAT_TEXT	172	Continuous	Default	Existing water main label
EX_WAT_VALVE	172	Continuous	Default	Existing water main valve
EX_WAT_WELL	172	Continuous	Default	Existing well
GEOTECH	250	Continuous	Default	Geotechnical boreholes, test pits
GRD_MJR	252	Continuous	0.40	Major grid lines in profile
GRD_MNR	252	Continuous	Default	Minor grid lines in profile
LIMIT OF CONST	252	Continuous	0.50	Limit of construction impact
REM_CURB	253	Continuous	Default	Existing Curb for removal
REM_DIMS	253	Continuous	Default	Existing Dimension for removal
REM_DW	253	Continuous	Default	Existing driveway for removal
REM_EP	253	Continuous	Default	Existing edge of pavement for removal
REM_FENCE	43	FENCELINE3	Default	Existing fenceline for removal

Existing Condition Layer State – continued

Name	Colour	Linetype	Lineweight	Description
REM_GAS_MAIN	253	DASHED	By Object	Existing gas main for removal
REM_GAS_SERVICE	253	DASHED	By Object	Existing Gas service for removal
REM_GAS_TEXT	253	Continuous	Default	Existing Gas label for removal
REM_LEGAL_BARS	250	Continuous	Default	Existing Legal bar for removal
REM_LEGAL_FABRIC	250	PHANTOM2	Default	Existing Legal fabric for removal
REM_LEGAL_TEXT	250	Continuous	Default	Existing Legal fabric label for removal
REM_RETWALL	253	Continuous	Default	Existing Retaining wall for removal
REM_SAN_HATCH	13	Continuous	Default	Existing sanitary pipe hatching for removal
REM_SAN_MAIN	13	Continuous	Default (Plan) 0.30 (Profile)	Existing sanitary main for removal
REM_SAN_MH	13	Continuous	Default	Existing sanitary manhole for removal
REM_SAN_SERV	13	Continuous	Default	Existing sanitary service for removal
REM_SAN_TEXT	13	Continuous	Default	Existing sanitary label for removal
REM_STM_CB	113	Continuous	Default	Existing catchbasin for removal
REM_STM_HATCH	113	Continuous	Default	Existing storm pipe hatching for removal
REM_STM_MAIN	113	DASHED2	Default (Plan) 0.30 (Profile)	Existing storm main for removal
REM_STM_MH	113	Continuous	Default	Existing storm manhole for removal
REM_STM_TEXT	113	Continuous	Default	Existing storm label for removal
REM_SW	253	Continuous	Default	Existing sidewalk for removal
REM_TEXT	42	Continuous	Default	Existing miscellaneous text for removal
REM_TRAF_SIGN	253	Continuous	Default	Existing traffic signal for removal
REM_TRAF_TEXT	253	Continuous	Default	Existing traffic signal label for removal
REM_VEG	112	Continuous	Default	Existing tree, shrub, tree line for removal
REM_VEG_TEXT	112	Continuous	Default	Existing tree, shrub, tree line label for removal
REM_WAT_HATCH	151	Continuous	Default	Existing water main hatch for removal
REM_WAT_HYD	151	Continuous	Default	Existing hydrant for removal
REM_WAT_MAIN	151	CENTERX2	Default (Plan) 0.30 (Profile)	Existing water main pipe wall for removal
REM_WAT_SERV	151	CENTERX2	Default	Existing water service for removal
REM_WAT_TEXT	151	Continuous	Default	Existing water main label for removal
REM_WAT_VALVE	151	Continuous	Default	Existing water main valve for removal
REM_WAT_WELL	151	Continuous	Default	Existing well for removal

9.3. Proposed Condition Layer State

Layers for the Proposed Conditions Drawings shall be shown in the state as outlined below;

Name	Colour	Linetype	Lineweight	Description
ALIGN_PR_CL	214	CENTER	Default	Proposed centerline alignment
ALIGN_PR_STA	30	Continuous	Default	Proposed alignment stations
EX_BDG	43	Continuous	Default	Existing building outline
EX_BDG_HATCH	43	Continuous	Default	Existing building hatching
EX_BDG_TEXT	43	Continuous	Default	Existing building address label
EX_CURB	253	Continuous	Default	Existing back of curb line
EX_DETAIL	253	Continuous	Default	Existing detail (e.g. rocks
EX_DIMS	253	Continuous	Default	Existing dimensions
EX_DITCH	65	ACAD_ISO08W100	Default	Existing centerline of a ditch
EX_DW	White	Continuous	Default	Existing edge of driveway (asphalt, concrete, or other material)
EX_ELEC_AG	205	Continuous	Default	Existing above ground electrical cable
EX_ELEC_UG	205	DIVIDE2	Default	Existing under ground electrical cable
EX_ELEC_TEXT	205	Continuous	Default	Existing electrical cable text
EX_EMBANKMENT	205	ACAD_ISO08W100	Default	Existing edge of top or bottom of slope
EX_EP	253	Continuous	Default	Existing edge of pavement (roadway)
EX_FB	Green	Continuous	Default	Existing outline of flower garden
EX_FENCE	32	FENCELINE3	Default	Existing fence line
EX_GAS_MAIN	56	DASHED	By Object	Existing gas main
EX_GAS_SERVICE	56	DASHED	By Object	Existing gas service
EX_GAS_VALVE	56	Continuous	Default	Existing gas valve
EX_GAS_TEXT	56	Continuous	Default	Existing gas label
EX_GRAVEL	31	Continuous	Default	Existing edge of gravel (roadway)
EX_GUIDERAIL	252	By Block	Default	Existing guiderail
EX_LEGAL_BARS	250	Continuous	Default	Existing property bars
EX_LEGAL_ROW	250	PHANTOM2	0.60	Existing property right-of-way limits
EX_LEGAL_LOT	250	PHANTOM2	Default	Existing property lot lines
EX_LEGAL_TEXT	250	Continuous	Default	Existing property labels
EX_LINE	White	Continuous	Default	Existing miscellaneous linework
EX_RETWALL	252	Continuous	Default	Existing retaining wall
EX_RIVER	142	Continuous	Default	Existing water line
EX_RR	White	Continuous	Default	Existing centerline of railway tracks
EX_SAN_HATCH	13	Continuous	Default	Existing sanitary pipe hatching
EX_SAN_MAIN	13	Continuous	Default (Plan) 0.30 (Profile)	Existing sanitary pipe wall
EX_SAN_MH	13	Continuous	Default	Existing sanitary manhole
EX_SAN_SERV	13	Continuous	Default	Existing sanitary service
EX_SAN_TEXT	13	Continuous	Default	Existing sanitary label
EX_SIGNS	43	Continuous	Default	Existing roadway signs
EX_STM_CB	113	Continuous	Default	Existing catchbasin
EX_STM_HATCH	113	Continuous	Default	Existing storm hatch

Proposed Condition Layer State – continued

Name	Colour	Linetype	Lineweight	Description
EX_STM_MAIN	113	DASHED	Default (Plan) 0.30 (Profile)	Existing storm pipe walls
EX_STM_MH	113	Continuous	Default	Existing storm manhole
EX_STM_SERV	113	DASHED	Default	Existing storm service
EX_STM_TEXT	113	Continuous	Default	Existing storm label
EX_SW	253	Continuous	Default	Existing sidewalk
EX_TELE_COND	214	DASHDOT2	Default	Existing telecomm conduit
EX_TELE_MH	212	Continuous	Default	Existing telecomm structure
EX_TELE_TEXT	212	Continuous	Default	Existing telecomm label
EX_TEXT	42	Continuous	Default	Existing misc. label
EX_TRAF_SIGN	201	Continuous	Default	Existing traffic signal
EX_TRAF_TEXT	201	Continuous	Default	Existing traffic signal label
EX_UTILITY_POLES	42	Continuous	Default	Existing utility poles
EX_VEG	112	Continuous	Default	Existing tree, shrub, tree line
EX_VEG_TEXT	112	Continuous	Default	Existing tree, shrub, tree line label
EX_WAT_HATCH	151	Continuous	Default	Existing water main hatch
EX_WAT_HYD	151	Continuous	Default	Existing hydrant
EX_WAT_MAIN	151	CENTERX2	Default (Plan) 0.30 (Profile)	Existing water main pipe wall
EX_WAT_SERV	151	CENTERX2	Default	Existing water service
EX_WAT_TEXT	151	Continuous	Default	Existing water main label
EX_WAT_VALVE	151	Continuous	Default	Existing water main valve
EX_WAT_WELL	151	Continuous	Default	Existing well
GEOTECH	250	Continuous	Default	Geotechnical boreholes, test pits
GRD_MJR	252	Continuous	0.40	Major grid lines in profile
GRD_MNR	252	Continuous	Default	Minor grid lines in profile
LIMIT OF CONST	252	Continuous	0.50	Limit of construction impact
PR_CURB	White	Continuous	Default	Proposed back of curb and gutter line (roadway)
PR_DIMS	White	Continuous	Default	Proposed dimensions
PR_DIMS_WAT	White	Continuous	Default	As-recorded watermain ties
PR_DITCH	65	ACAD_ISO08W100	0.30	Existing centerline of a ditch
PR_DW	White	Continuous	Default	Proposed driveway
PR_DW_HATCH	254	Continuous	Default	Proposed driveway hatching for material
PR_EMBANKMENT	205	ACAD_ISO08W100	0.30	Proposed top or bottom of slope
PR_EP	White	Continuous	Default	Proposed edge of pavement (roadway)
PR_GAS_MAIN	45	DASHED	Default	Proposed gas main
PR_GAS_TEXT	45	Continuous	Default	Proposed gas label
PR_GAS_VALVE	45	Continuous	Default	Proposed gas valve
PR_GRADES	30	Continuous	Default	Proposed elevations
PR_GRADES_ELEV	30	Continuous	Default	Proposed elevation labels
PR_PMARKING	White	Continuous	By Object	Proposed pavement markings
PR_RESTITUTION	White	RESTORATION	0.30	Proposed limit of restoration

Proposed Condition Layer State – continued

Name	Colour	Linetype	Lineweight	Description
PR_SAN_HATCH	241	Continuous	Default	Proposed sanitary hatching
PR_SAN_MAIN	14	Continuous	Default (Plan) 0.60 (Profile)	Proposed sanitary pipe wall
PR_SAN_MH	14	Continuous	Default	Proposed sanitary manhole
PR_SAN_PLUG	14	Continuous	Default	Proposed sanitary plug
PR_SAN_SERV	14	Continuous	Default	Proposed sanitary service
PR_SAN_SPS	14	Continuous	Default	Proposed sanitary pumping station
PR_SAN_STUB	14	Continuous	Default	Proposed sanitary stub (for future connection)
PR_SAN_TEXT	14	Continuous	Default	Proposed sanitary label
PR_STM_CB	108	Continuous	Default	Proposed catchbasin
PR_STM_CU	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed culvert
PR_STM_FAC	108	Continuous	Default	Proposed above ground stormwater facility
PR_STM_HATCH	93	Continuous	Default	Proposed storm hatch
PR_STM_HW	108	Continuous	Default	Proposed headwall
PR_STM_IG	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed infiltration gallery
PR_STM_LEAD	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed storm pipe wall from catchbasin to main line
PR_STM_MAIN	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed storm pipe wall
PR_STM_MH	108	Continuous	Default	Proposed storm manhole
PR_STM_OGS	108	Continuous	Default	Proposed stormwater quality device
PR_STM_PLUG	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed storm plug
PR_STM_SERV	108	DASHED2	Default	Proposed storm service
PR_STM_STUB	108	DASHED2	Default (Plan) 0.60 (Profile)	Proposed storm stub
PR_STM_TEXT	108	Continuous	Default	Proposed storm label
PR_SW	White	Continuous	Default	Proposed sidewalk
PR_TEXT	White	Continuous	Default	Proposed miscellaneous text label
PR_TELECOM_COND	203	DASHDOT2	0.30	Proposed telecomm conduit
PR_TRAF_SIGN	212	Continuous	Default	Proposed traffic signal
PR_TRAF_TEXT	212	Continuous	Default	Proposed traffic signal label
PR_VEG	112	Continuous	Default	Proposed tree, shrub, tree line
PR_VEG_TEXT	112	Continuous	Default	Proposed tree, shrub, tree line label
PR_WAT_ANODE	172	Continuous	Default	Proposed water main anode
PR_WAT_CASING	White	Continuous	Default	Proposed water main casing
PR_WAT_CHAMBER	172	Continuous	Default	Proposed water main valve chamber
PR_WAT_HATCH	171	Continuous	Default	Proposed water main hatch
PR_WAT_HYD	172	Continuous	Default	Proposed hydrant
PR_WAT_MAIN	172	CENTERX2	Default (Plan) 0.60 (Profile)	Proposed water main pipe wall
PR_WAT_MAIN_VALVE	172	Continuous	Default	Proposed water main valve
PR_WAT_OTHER	172	Continuous	Default	Proposed water main fittings (Plan view only)
PR_WAT_SERV	172	CENTERX2	Default	Proposed water service (incl. curb stop)
PR_WAT_SERV_VALVE	172	Continuous	Default	Proposed water service valves
PR_WAT_TEXT	172	Continuous	Default	Proposed water main label

10. Named Plot Styles

The City of Kitchener uses named plot styles (COK-Engineering.stb) to control how objects are plotted. The colour scheme used has been selected to provide a clear and concise colour or monochrome drawing. When plotted in colour, identification of assets is easier for purposes of review by those not completely familiar with civil engineering drawings.

11. Sheets

Standard sheet templates have been developed and are available for download from the City's website as a part of the CAD Standards package to be used for all projects.

12. Symbols

The City of Kitchener standard block set shall be used for all projects as shown in the legends sheet. Unique blocks will be accepted to graphically represent an unorthodox structure (i.e. box manhole) which does not appear in the standard block set.

13. Model Space / Paper Space

All linework and design work is to be produced in the model space environment. Sheets for engineering contract drawings are to be produced in the paper space environment. The viewport is to be scaled to represent the scale shown in the title block. The title block is to be plotted from the layout at a 1:1 scale.

14. AutoCAD Workflow

There are two recommended methods of workflow. Regardless of the workflow outlined below the title sheet and legend drawings are to be a separate file.

The first method is to produce all work in a singular model-space environment. This is the preferred method for those working in an AutoCAD environment. This method can be followed in an AutoCAD Civil 3D environment for smaller projects.

The second method is to break up the project into individual sub categories, where each component would be contained in their own drawing. This method is beneficial where multiple design / drafters are required on the same project and when the project is complex enough to warrant this method.

Figure 5 is an example of the second method and based on the size of the project and number of staff assigned to the project, the number of drawing files and references are subject to change and are at the discretion of each individual consultant to determine based on their own best practices procedures when working with AutoCAD Civil 3D.

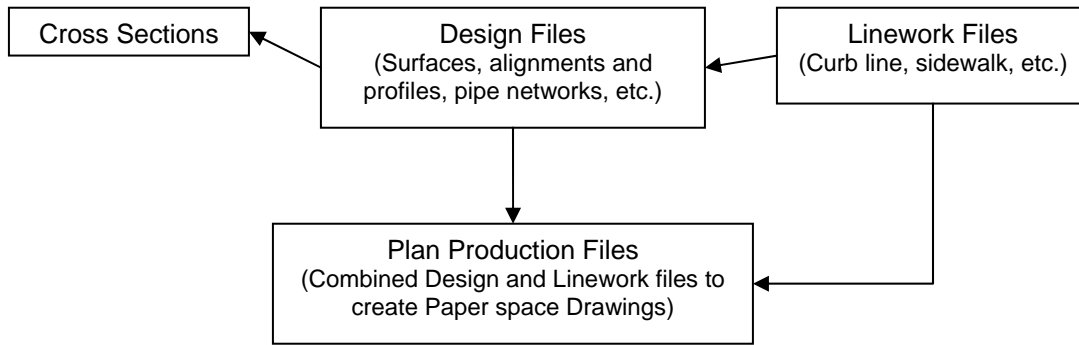


Figure 1: Suggested project workflow example

15. Conclusion

This manual has been created to assist Consultants in the preparation of contract drawings for the City of Kitchener.

Please direct your comments to the following email address engineering@kitchener.ca with the subject line 'Engineering CAD Standards'.