

SCHEDULE I

**STANDARDS FOR THE PREPARATION OF
ENGINEERING DRAWINGS**

This is Schedule I of the City of
Vernon Subdivision and Development
Servicing Bylaw No. 3843, 1992
Amended October 26, 2009 with Bylaw 5225

"Margaret Bailey"
City Clerk

BYLAW NUMBER 3843
SCHEDULE I – ENGINEERING DRAWINGS

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**STANDARDS FOR THE PREPARATION OF
ENGINEERING DRAWINGS**

1.00 GENERAL REQUIREMENTS

This section outlines the minimum Drafting Standards and requirements that the City of Vernon will accept for Design and "As-Built" submissions for engineering work(s).

All drawings provided must be consistent and clear. Drawings must provide all additional information necessary to indicate current features of the site, proposed works and completed development. Drawings must demonstrate the proposed design and installation techniques to address any non-typical situations. Drawings shall clearly show the existing and proposed locations of all utilities using offsets from property lines or boundaries of rights-of-way. Limits of construction must be shown with future extension works to be provided at a lesser line weight.

Distances and location dimensions are to be provided in metres to 2 decimal places. If the lots are of same dimensions and side by side, only the two outside lots need have the dimensions shown.

Elevations shall be relative to geodetic datum. The horizontal coordinates shall be referenced to the UTM Zone 11 North coordinate system.

Baselines and proposed works are to be referenced to legal corner(s) on each sheet. Chainage shall increase from left to right and from bottom to top on a drawing. North should be towards the top or right side of a drawing.

All drawings submitted shall be signed and sealed by a Professional Engineer registered in The Province of British Columbia. A minimum of two paper sets and dwf electronic set are required for design submission.

Where no standard is defined in this schedule for the preparation of a drawing to portray a particular service, structure, or other items, instructions and requirements must be obtained through discussion with the City of Vernon Engineering Department.

As built plans and service cards are must be complete and accepted before securities may be released. As built drawings and Lot Service Record Cards (LSRC's), are to be submitted within four (4) weeks of the final inspection. The developer's engineer shall deliver one paper copy and email an electronic version in dwf format for City review prior to submission of the final as-built drawings. Upon acceptance of the asbuilt submission a full set of required plans, as detailed in section 4.00 of this Schedule must be provided.

Standard plan profile sheets are divided into two parts: Plan and profile viewports. Both plan and profile stationing must be tied to a property line or road boundary.

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Plan View: Must be on the upper half of the sheet. Must show all legal descriptions, lot dimensions and bordering property data (including addressing and road names), surface features, the surface of features of all underground utilities and their locations within the public right-of-way and related pertinent data. Drawings shall also show existing dwellings, fences, trees, hedges, unusual ground features, existing roads and driveways including the type, such as asphalt, concrete or gravel. For clarity separate sheets may be used for sanitary and storm mains provided all utility crossings are clearly shown on all drawings in plan and profile. Chainages of the B.C. and E.C. of horizontal curves shall be shown together with the centerline radius.

Profile View: The profile shows elevations, chainages, surface and utility grades with related data. Elevations are placed at the right and left hand side of the profile and repeated when there is a break in the profile.

Curb information shall be shown and should include curb type at all changes, radius, delta angle, tangent length, and arc length and all elevations. Curb return information through all corners and at all intersections must be provided on a separate sheet.

2.00 DRAWING STANDARDS

2.01 Sheet Size

Drawings shall be submitted using the following standard sheet sizes (outside dimensions):

A1 - 841 mm x 594 mm (Border to be no more than 810mm x 540mm)

A3 - 420 mm x 297 mm

2.02 Title Block

The City has current AutoCAD Civil 3D template drawings which contain the layers, border, blocks and profile grid for the drawings and can be down loaded from the COV website. The title shall describe the contents of the drawing (e.g. key plan, road, etc.) and shall clearly indicate the location of the works by road name and addresses rather than chainage.

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2.03 Scales

The following scales shall normally be used:

Location Plans	- 1:2500; 1:5000; 1:10000
Composite / Legend Plans	- 1:500
Details	- 1:5 to 1:250
Plan/Profile	
Horizontal	- 1:250 or 1:500
Vertical Exaggeration	- 1:5 or 1:10

Cross-Sections

Horizontal	- 1:100 or 1:50
Vertical Exaggeration	- 1:1, 1:2 or 1:4

Alternate scales which provide increased clarity that are specific to project parameters may be permitted for use upon approval by the City Engineer.

2.04 Media Submissions

Drawings shall be submitted upon the following media types:

- Design drawings – paper (2 sets) and digitally (current software version) DWF file emailed to City.
- As-built drawings – paper (1 set) and digitally (current software version being used by the City of AutoCAD Civil 3D or approved compatible version) DWG, DWF or DWFx and PDF (of the sealed plans) file formats.

2.05 Drawing Appearance

The following are based on AutoCAD conventions and plotted drawing appearance. Note: COV Engineering Drawing Submission Requirement Base Layers are included in the COV AutoCAD Civil 3D template drawing.

Text Height (All Text simplex)

Style - Plotted Height

ACAD 1.0mm - 1.0 mm	C3D	1.8mm – 1.8 mm
ACAD 1.8mm - 1.8 mm	C3D	2.5mm – 2.5 mm
ACAD 2.0mm - 2.0 mm	PS	2.0mm – 2.0 mm
ACAD 2.5mm - 2.5 mm	PS	2.8mm – 2.8 mm
ACAD 3.0mm - 3.0 mm	PS	4.0mm - 4.0 mm
ACAD 4.0mm - 4.0 mm	PS	8.0mm - 8.0 mm
ACAD 5.0mm - 5.0 mm		

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AutoCAD Color and Pen Widths (COV-PLAN PRO.ctb)

<u>Colour</u>	<u>Plotted Pen Width</u>
1 – Red	0.50 mm
2 – Yellow	0.25 mm
3 – Green	0.15 mm
4 – Cyan	0.25 mm
5 – Blue	0.25 mm
6 – Magenta	0.50 mm
7 – White	0.25 mm
8 – Grey	0.13 mm
9 - Grey	0.13 mm
10-Red	0.25 mm
11 to 255	Various

CAD drawings must use paper space and be set up with a plot scale of 1:1. CAD drawings must use CAD drawing units should be meters and model space base drawings should be georeferenced to the correct location and thus should not be moved and/or rotated from the correct geographic location in the UTM coordinate system.

3.00 REQUIRED DRAWINGS

Each set of drawings shall include the following drawings and shall be presented in the same order: Note: As built drawings shall not be combined (unless noted or mutually agreed for that specific project); i.e. storm and sanitary drawings shall not be combined with the road drawings. However, construction drawings may combine various services on one plan but must be clear and legible. Drawings submitted shall contain the following sheet sets as a minimum, each of which must adhere to the requirements noted for each sheet type. For site specific works where water, sanitary, storm and road works are not being installed those sheets relative to the works not being installed may be omitted. For smaller projects individual sheet requirements are to be combined provided clarity of the required information is maintained:

	Required Sheet	For Design	For As built
3.01	Cover sheet	Y	Y
3.02	Composite layout and site service plan	Y	Y
3.03	Legend plan	Y	Y
3.04	Road drawings	Y	Y
3.05	Curb return drawings	Y	N
3.06	Water drawings, (may be combined with Road drawings)	Y	Y
3.07	Sanitary and Storm Sewer drawings	Y	Y
3.08	Composite Lot Grading Plan	Y	Y

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3.09	Storm Water Management Plan	Y	Y
3.10	Erosion and Sediment Control Plan	Y	N*
3.11	Street Lighting Plan	Y	N
3.12	Street Signs, Paint Markings and Traffic Control Devices Plan	Y	N
3.13	Traffic Management Plan	Y	N
3.14	Construction Details	Y	N*
3.15	Composite Shallow Utility Plan	Y	N
3.16	Road Cross-Section Drawings	Y	N
3.17	Lot Service Record Card Location Plan	N	Y

* Unless required by the City Engineer to be included in the submission.

3.01 Cover Sheet

Must identify the location of the site relative to the City center and other development in the general area. Key features and major roads must be indicated on this plan. The cover sheet shall note the consultant's name and phone number, a description of the project, the City project number (where applicable), legal description of the lands involved, a site location plan and a design drawing index.

This sheet must also include a table, in an exportable format, providing detailed information of existing infrastructure being replaced and new infrastructure being installed. This must include the linear meters of all pipe, conduit and curb and gutter, the area of all asphalt and sidewalk and number of all other items in the design such as manholes, streetlights, water valves, etc.

3.02 Composite Layout and Site Service Plan

Shall be scaled to show all existing and proposed works and services for the entire site. Multiple sheets are permitted for larger sites to provide clarity at an acceptable scale. (May be revised for as built submission to create for Lot Service Record Card Location Plan.)

3.03 Legend Plan

Shall show drawing view frames, area being served with lot and plan numbers identifying all the plan and profile sheets relative to the site. (this is waived for developments with only one plan profile sheet).

3.04 Road Drawings (Plan/Profile)

Drawings shall show width of road, width of shoulders, and the offset of curb from property line. Curb radii are required on curb returns at intersections and at the end of cul-de-sacs.

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The following information shall be shown on the PLAN VIEW:

- (a) Information as detailed under "General Requirements " and "Drawing Standards".
- (b) Centerline curve data in table format for each curve. Each curve must be labeled at the EC and BC of the curve and on the top of the data table. The table must include the BC and EC chainage, radius, tangent length and design speed.
- (c) Existing ground elevation along the centreline of proposed roadway and/or the edge of existing asphalt.
- (d) Existing curbs, gutters, manholes, valves, catch-basins, vaults, kiosks, sidewalks, let downs, drop curbs streetlights and other surface features.
- (e) Elevation of driveways, doorways, and sidewalks at property line, and any other relevant information.

The following information shall be shown on the PROFILE VIEW:

- (a) Information as detailed under "General Requirements" and "Drawing Standards".
- (b) The profile shall be shown at true centerline length and projected to the above plan view as close as possible.
- (c) The designed gutter and/or centreline grade and catch-basin chainage and rim elevations.
- (d) Vertical curve information including chainage, elevations of B.C., E.C. and P.I., length of vertical curve, chainage and elevation of the low and high point of curves and K value of vertical curvature (crest on sag).
- (e) Super elevated curve information including cross fall sections and a profile of each gutter with pertinent gutter elevations.

3.05 Curb Return Drawings

Required for all intersection and cul-de-sac curb returns. Each plan/ profile detail must be cross referenced to its location on the road plan profile. These plans shall be scaled 1:100 horizontal and 1:50 vertical and shall note the proposed gutter elevations at the noted stations. Stations are to be at regular intervals suited to accurately depict the situation and verify conformance with Bylaw standards. The distance between stations shall be provided. All grades between stations less than 1% must be indicated on the plan. Low and high points along the gutter and centerline of the road shall be included. Catch-basins grate elevations must be included. The elevation of the center of the cul-de-sac must be shown. Where the road centerline grade is transitioning a profile of that centerline with stationing and point elevations must be included.

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3.06 Water Plan/Profile Drawings

The drawings shall show the structural details of all works such as vaults, chambers, etc. not covered by standard drawings.

The pressure zones must be indicated and for larger systems a schematic provided indicating location and elevation of all pumpstations, reservoirs and PRV's.

The following information shall be shown on the PLAN VIEW:

- (a) Information as detailed under "General Requirements" and "Drawing Standards".
- (b) Offset of pipelines from property lines.
- (c) The length and size of pipe.
- (d) Offset of connections from property lines.
- (e) The locations of chambers, vaults, blow-offs and services relating to property lines.
- (f) Information on any curves or deflections, if applicable, to pipe design.
- (g) SROW's and Easements; existing and/or required.
- (h) Future curb and gutter lines.
- (i) The extent of work required to make the connection(s) to existing live mains.
- (j) The location of tees, hydrants, valves, end of the main, services and other appurtenances tied to the nearest property line.

The following information shall be shown on the PROFILE VIEW:

- (a) Information as detailed under "General Requirements" and "Drawing Standards".
- (b) Surface profiles (existing and design) over the proposed main.
- (c) Length, size, type, material of pipe and grade (e.g. 84 m – 200 mm WATER DR18 PVC @ 1.15%).
- (d) Profiles of invert and crown of pipes.
- (e) Percent grades to two decimal places.
- (f) Bedding, backfill, depth of cover material and surface restoration requirements.
- (g) Location, type and invert elevation of all crossing utilities c/w outer wall separation.
- (h) Profile only of any existing or proposed storm or sanitary sewers and culverts.

3.07 Sanitary and Storm Sewer Drawings (Plan/Profile)

The drawings shall show the structural details of all manholes, catch-basins and chambers, etc. not covered by standard drawings. Where the sanitary and storm sewers are proposed to be installed in a common trench, a typical cross-section showing vertical and horizontal distances between pipes and classes of pipe and bedding shall be shown. Installations with over a meter vertical separation in pipe inverts must provide a typical section verifying adequate separation to prevent undermining.

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The following information shall be shown on the PLAN VIEW:

- (a) Information as detailed under "General Requirements" and "Drawing Standards".
- (b) Offset of pipelines from property lines.
- (c) The size of pipe.
- (d) Offset of connections from property lines.
- (e) The locations of manholes, clean-outs and services relating to property lines.
- (f) Information on any curves or deflections, if applicable, to pipe design.
- (g) SROW's and Easements; existing and/or required.
- (h) Future curb and gutter lines as required.
- (i) The extent of work required by the City of Vernon to make the connection(s) to existing live mains.
- (j) Manhole identification numbers.
- (k) For pipes servicing lots, inverts of connections at property line (inverts entered in CADD table for data extraction and linking internal CADD object information).
- (l) For pipes servicing lots, basement elevations on each house.
- (m) For sanitary sewer, where service connections are required, location of existing septic tanks and decommissioning notes.
- (n) For storm surface drainage, features such as ditches, culverts, streams, channels, etc.
- (o) Flow direction arrows at manholes.

The following information shall be shown on the PROFILE VIEW:

- (a) Information as detailed under "General Requirements" and "Drawing Standards".
- (b) Surface profiles (existing and design, if applicable) over proposed main.
- (c) Length, size, type, material of pipe and grade (e.g. 84 m – 200 mm SAN/STM SDR35 PVC @ 1.15%).
- (d) Profiles of invert of pipes.
- (e) Percent grades to two decimal places.
- (f) Bedding, backfill, depth of cover and surface restoration requirements.
- (g) Location, type and invert elevation of all crossing utilities.
- (h) Invert elevations at both inlet and outlet of manholes.
- (i) Designation of manhole stationing to center of barrel.
- (j) Manhole rim elevations (at center of lid) of proposed or adjusted manholes and identification number.
- (k) Proposed building lower floor elevation for each lot and horizontal limits of building footprint.
- (l) The hydraulic grade line (HGL), of the system and or ground water, where applicable.
- (m) For services, invert elevations at the property line.
- (n) Lot Grading Profile (proposed finished ground) at the front yard setback

3.08 Composite Lot Grading Plan

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The drawing shall show current and proposed property corner elevations, grade change elevations, pad elevations and cut and fill information (relative to original conditions using hatching and contour depth of cut and fill). The drawing shall also note:

- (a) the pre-development contour lines extending a minimum 30.0 m outside the development site;
- (b) all predevelopment lot corner and building setback corner elevations (text);
- (c) all proposed lot corner, building setback corner and grade brake elevations (text in circle);
- (d) the proposed building envelope with the proposed Main Floor Elevation (MFE), and Minimum Basement Elevation (MBE);
- (e) The location and extent of structural fill placed over the entire site including depths of fill
- (f) the slope of the lot (directional arrow), noting the minimum percent grade on the lots;
- (g) the minor (5 year event for low density residential; 10 year event for all others) storm sewer system with the flows noted per section and the accumulated flows from all upstream sections. Provision must be made for upstream conditions including development potential existing and future;
- (h) the major (100 year return) system, showing the routing and flows for the 100 year return storm;
- (i) all swales and other features indicated in the Storm Water and Erosion Management Plans;
- (j) the affect of the development proposal on adjacent lands. Proposed elevations should match existing elevations along the development boundary.
- (k) a legend noting all items proposed in the Storm Water Management Plan.

Applicable "General Notes" should also be included.

3.09 Storm Water Management Plan (SMP)

- (a) Site and surrounding area (400 m minimum outside development) showing roads and major features (1:2500 scale). A small location plan of the catchment basin indicating relation to the development area is also to be included.
- (b) Contours of existing ground (1.0 m intervals where slope <20%, 2.0 m >20%) for the site and surrounding area mentioned above.
- (c) Major flood routing (1:100 year); show as arrows and indicate if in pipe or on surface show an "open" arrow for surface routes and the same arrow "shaded" for routes in pipes).
- (d) Detention facility details.
- (e) Area, in hectares, of development and the total area of the larger catchment above and below.
- (f) Directional arrows of flow within the site and on surrounding areas.
- (g) Sub-catchment boundaries, coefficients and areas.
- (h) Pipe system including size, grade, and minor and major flows (a table may be utilized).

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- (i) The subject development is to be highlighted.
- (j) Storm Water detention Calculations

3.10 Erosion and Sediment Control Plan

This plan is to detail methods and procedures that will be used to prevent or minimize soil displacement and transport of sediment from the Development site. This is to include methods to prevent or minimize soil transport onto adjacent properties or onto existing roads adjacent to the site (i.e. wind or tracking from vehicles). Preventative methods of soil displacement on the site are to be detailed. The drawing shall show the following:

- (a) Existing contours of the site at an interval sufficient to determine drainage patterns.
- (b) Final contours if the existing contours are changed by more than half a contour interval.
- (c) Final drainage patterns/boundaries.
- (d) Existing vegetation such as significant trees, shrubs, grass, and unique vegetation.
- (e) Limits of clearing and grading.
- (f) Erosion and sediment control measures (temporary and permanent) including locations, names and details, in accordance with Develop with Care: Environmental Guidelines for Urban & Rural Land Development in B.C. (www.env.gov.bc.ca/wid/BMP/bmpintro.html) and Land Development guidelines for the Protection of Aquatic Habitat (MOE & DFO).
- (g) Storm Drainage systems including drain inlets, outlets, pipes, and other permanent drainage facilities (swales, waterways, etc.).

The plan must describe the land, the disturbing activity and details of the methods used for controlling erosion and sedimentation including a description of the procedures for construction and maintenance of the control measures and identify the persons involved in maintenance. A maintenance schedule of those works must also be included.

3.11 Street Lighting Plan

Shall be at 1:500 (plan view) scale of the street lighting proposal. There shall be General Notes included on the Plan noting reference(s) to MMCD and Schedule G for the appropriate design criteria. This plan must include a schematic of the works including the proposed power supply location, a photometric contour plan of existing and proposed lighting and a table verifying the average illumination and uniformity. Details of the streetlight style, height and colour are required.

3.12 Street Signs, Paint Markings and Traffic Control Devices Plan

A drawing identifying signs, paint markings and control devices as specified by Manual of Uniform Traffic Control Devices (Canada), Manual of Standard Traffic signs and Pavement Markings (MOT) and Traffic Control for Works on Roadways (MOT). Detailed drawings may be required for traffic control devices.

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- 3.13 Traffic Management Plan (Not required for new development not working in or impacting existing COV roads.)

A drawing identifying detailed routes for construction traffic and traffic (including pedestrians and cyclists) controls for traffic on existing roads affected by construction as specified by Traffic Management Guidelines for Work on Roadways (MOT) and Traffic Control for Works on Roadways (MOT).

- 3.14 Construction Details

Specific to the design. Must include typical road cross sections, road and sidewalk structural sections and details which are not covered or specifically detailed in the COV Subdivision and Development Servicing Bylaw or MMCD Standards and Specifications. It is not necessary to include or repeat these typical drawings however any standards used must conform to the COV Subdivision and Development Servicing Bylaw and a drawing index must be provided which specifically identifies the drawings being referred to from COV Standard Drawings and Cross-referenced to MMCD Standard Drawings. .

- 3.15 Composite Shallow Utility Plan

Must be based on the individual plans submitted by each utility for the proposed works and clearly indicate all potential conflicts with other major utilities, services and appurtenances.

- 3.16 Road Cross-Section Drawings

Shall be scaled at 1:100 horizontal and 1:50 vertical and shall note the existing ground elevation, the proposed elevations of the road centre line, the curb and gutter (or road edge) and property lines. Cross-sections are required at 20.0 m intervals unless otherwise required to provide clarity and approved by the City engineer. The City Engineer may increase (10.0 m or less) or reduce the number of sections required where the information is not beneficial. Additional sections are required where excessive cuts or fills are involved.

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3.16 Lot Service Record Card Location Plan

Shall be scaled to show all existing and proposed works and services for the entire site. Multiple sheets are permitted for larger sites to provide clarity at an acceptable scale. Must include the water, sanitary and storm services to each lot with each scaled to a property corner. The invert at property line for each service must be provided. A typical comment that identifies the materials and sizes used for the services must be included and specific notes for each service that is nonconforming to this is required. The legal and civic address for each lot must be included.

4.00 **AS-BUILT DRAWINGS AND LOT SERVICE RECORD CARDS**

As-built drawings and lot service record connection cards (LSRC's) must be submitted to the COV Engineering Department. As-built drawings shall include construction information relevant to the drawing. Design notes shall be deleted unless modified notes are necessary to provide clarity.

AutoCAD data that is forwarded to the COV by the Consultant must conform to the requirements and formats set out herein. Failure to comply will result in work being returned to the Consultant for correction at the Consultant's expense.

The following procedures shall be followed in the submission of "As-Built" drawings for municipal acceptance:

- (a) Drawings must contain the following statement, duly signed and sealed by the Consultant:
"I hereby certify the new works and services shown on this drawing were inspected during construction and installed in accordance with this drawing, and the City of Vernon Subdivision, Development & Servicing Bylaw, including amendments.
Consultant's Seal
Consultant's Signature: _____
Date of Consultant's Signature: _____
- (b) Upon acceptance of the initial submission the project engineer shall submit one set of paper prints, digital files (pdf of the sealed plans, dwf and AutoCAD versions [or approved equivalent], with electronic seal) and a complete set of LSRC's. Furthermore, the project engineer shall submit a post-construction GIS submission as outlined in section 4.02.
- (c) The Engineer must also submit the Schedule M "Assurance of Professional Field Inspection and Compliance Form".

The current LSRC AutoCAD template is available on the COV web site. Forward the LSRC information to the COV Engineering Department at the time of submission of the as-built drawings. The LSRC's shall clearly show the location of all services. If connections are skewed to the property line, the location of the main connection and service at property line shall be provided.

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4.01 PROCEDURE FOR ACCEPTANCE:

When consultants present their drawing submissions, the Engineering Development division will review the submission for conformance to Bylaw standards. Should any errors or omissions of the required information be noted one marked-up set of the as-builts and or LSRC's will be returned to the Consultant for revisions. Upon and correction of any errors or omissions the project engineer is to submit the final as-built information as identified in this section (Schedule I) of the Bylaw.

4.02 POST CONSTRUCTION GIS SUBMISSIONS

An AutoCAD Civil 3D drawing file, or approved equivalent that is compatible, is to be submitted with the as-built drawing containing the subsurface features (pipes) reflecting the post construction field observations. This information will be used to enter into the City of Vernon GIS.