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S E C T I O N 2

GENERAL DESIGN REQUIREMENTS

DRAWING STANDARDS

2.1 SCOPE

This section shall govern the preparation of engineering drawings associated with development approval and the Municipal works and services.

2.2 GENERAL REQUIREMENTS

A complete set of construction drawings shall consist of separate drawings of some or all of the following:

(a) Site plan and key plan.

(b) Landscaping plan (see Parks and Recreation Dept. Landscaping Guidelines).

(c) Drainage area plan.

(d) Plan and profile for roads, drainage and storm sewers.

(e) Plan and profile for sanitary sewers and watermains.

(f) Plan and profile for sanitary and storm sewers for common trench designs.

(g) Plan of proposed street lighting, hydro, telephone, cablevision and gas.

(h) Additional plans showing any special details and cross-sections.

2.2.1 Maximum drawing size shall be 6l0 mm x 9l5 mm.

2.2.2 Drawings shall be prepared by utilizing computer or manual drafting methods using reproducible black drawing ink on Mylar. Pencil drawings will not be accepted. Computer drafting methods as per Section 2.12 are the desired standard for all drawings submitted to the Town of Ladysmith.

2.2.3 Drawing scales and dimensions shall be shown. To facilitate scaling and to allow for reproductions from microfilm, graphical scales shall be indicated on all reproducible drawings. Bar scales, 50 mm long, divided at l0 mm intervals shall be drawn on each drawing sheet, as shown on Standard Drawing Gl.

2.2.4 In all cases lettering shall be done with sufficient care to permit clear, one-half size reduction. The quality of the character definition shall be such that drawings may be reduced to 35 mm microfilm and blown back full size by micro-reproduction process without showing evidence of filled-in loops or leaching of character to character and line to line.

2.2.5 The drawings shall be neat and legible and they shall clearly locate and describe the work in sufficient detail to facilitate construction, with clearly defined limits of construction.

2.2.6 Plan profile drawings shall be drawn with the profile on the bottom of the drawing sheet.

2.2.7 Lettering on drawings shall conform to Canadian General Standards Board Standard CAN2-72.7-M78 unless otherwise noted in these standards.

2.2.8 Standard drafting procedures shall be used for dimensioning, arrowheads, line densities, etc. Lettering shall be to Leroy metric heights and widths with the minimum height of lettering being 2.5 mm. Vertical upper case lettering is preferred. Conflicts between linework, symbols, dimensioning or text shall be removed.

2.2.9 All elevations shown on drawings shall be metric geodetic datum and the source and location of datum shall be clearly noted on each drawing.

2.2.10 Drawing title block shall include the project name, project location, type of drawing (i.e. Site Plan) and Engineer's name and/or company name and logo.

2.2.11 Plan and Profile drawings shall be to the following scales unless otherwise approved:

Horizontal	l:500 or l:250
Vertical	l:50

2.2.12 The following notes shall be shown on either the site plan or the first drawing of the set:

(a) "All work and materials are to be as described in the Town of Ladysmith 'Engineering Standards and Specifications' or as otherwise approved by the Engineer."

(b) "Connection to, or alteration of, existing Town-owned utilities, will be undertaken by Town of Ladysmith forces only, unless otherwise authorized by the Engineer."

(c) "A 'Construction Permit to Install Works Within Streets, Lanes and Town Property Areas', will be required where construction is to be undertaken in Town of Ladysmith right-of-ways and/or on Town of Ladysmith owned utilities or properties."

(d) "Upon approval of the permit the Town of Ladysmith Engineer shall be notified forty-eight (48) hours prior to commencement of work."

2.2.13 Standard details such as manholes, catch basins, hydrants, etc., that are shown and described in the Town of Ladysmith Standard Drawings need not be shown in detail on the drawings. Standard symbols for the various facilities as shown on Standard Drawing G2 Standard Symbols and Abbreviations shall be used and shown in a legend on all drawings.

2.2.14 All drawings shall bear the dated stamp/seal and signature of the professional engineer responsible for the design.

2.2.15 Provision shall be made on all drawings for the insertion of the Town of Ladysmith as-built file number in the lower right-hand corner of the drawing sheet. The space provided shall be a minimum ten (l0) mm high by fifty (50) mm long.

2.2.16 Numerical values shown on the Construction drawings shall reflect the decimal precision of the

numbers. Generally numbers shall be shown to three (3) decimals unless accuracy warrants otherwise.

2.3 SITE PLAN AND KEY PLAN

2.3.1 The Site Plan of the construction works shall be to a scale of not less than l:l000.

2.3.2 The following existing and proposed information shall be shown on the Site Plan:

(a) existing watercourses

(b) pavement, curbs

(c) ditches, culverts, storm sewers, manholes cleanouts, inlet/outlet structures and catch basins

(d) sanitary sewers, manholes, cleanouts

(e) watermains, valves, hydrants, prvs, air valves, flushouts

(f) all pertinent property, right-of-way and easement lines

(g) road allowance and easement dimensions

(h) lot numbers and existing legal plan numbers

(i) one metre contour lines for slopes greater than l0% existing and proposed

(j) plan and profile drawing reference numbers

(k) gas mains, underground hydro, telephone, streetlights and cable and their related appurtenances

(l) survey control monuments

(m) traffic control devices, poles, conduits, signs and painting

(n) routing of all major storm flows including the l00 year storm

(o) approved street name from the Town street name list

(p) location of community and centralized mail centres (CMC)

2.3.3 A Key Plan to a small scale (e.g. l:l0,000), showing the location of the works in relation to major streets, shall be provided in the upper right-hand section of the drawing sheet.

2.3.4 A drawing index shall be provided and include the drawing titles, drawing numbers and provision for the Town of Ladysmith as-built field number.

2.4 DRAINAGE AREA PLAN

2.4.1 A drainage area plan with a (1:2500 scale) must accompany storm drainage calculations for a subdivision or development. The plan shall include the following information:

(a) onsite and offsite drainage areas

(b) existing and proposed drainage system

(c) the 100 year storm flood routing plans

(d) contours

(e) existing and proposed road and lot layout

2.5 BUILDING GRADE PLAN

2.5.1 The Engineer may require building grade plans in areas where driveway grades, drainage outlets, servicing elevations, etc. may have a critical impact on the development of the lot.

2.5.2 The scale shall be 1:500

2.5.3 The plans shall include the following information:

(a) existing ground elevations of lot corners and proposed building site. Include the location and depth of any fill areas.

(b) location and invert elevations for storm and sanitary services.

(c) location of water service.

(d) minimum footing elevation (MFE) and critical finished landscape elevations.

(e) direction of surface drainage and location of drainage swales, ditches and catch basins.

(f) proposed driveway location and grade.

2.6 PLAN AND PROFILE DRAWINGS - GENERAL

Each base plan and profile shall show but not be limited to the following information:

2.6.l All cadastral information including property, right-of-way and easement lines and dimensions in sufficient detail to relate design to surrounding and adjacent properties.

2.6.2 Legal description of properties.

2.6.3 Road allowance dimensions.

2.6.4 Existing pavement, curbs, sidewalks ditches, driveways, lanes, retaining walls, buildings, trees and

shrubs within right-of-way.

2.6.5 Street addresses of existing buildings.

2.6.6 Approved street name from the Town of Ladysmith street name list.

2.6.7 Existing underground and surface utilities and services with offsets including but not limited to the following:

(a) sanitary sewers, storm sewers, watermains and appurtenances

(b) street light poles, conduit and appurtenances

(c) B.C. Hydro poles and underground wiring ducts and appurtenances

(d) B.C. Telephone poles and underground wiring ducts and appurtenances

(e) gas mains and appurtenances

(f) cable vision ducts and appurtenances

(g) traffic control devices, conduits, signs and painting

(h) location of community and centralized mail centres (CMC)

2.6.8 All relevant topographic information. For slopes greater than l0 percent, one (l) metre contour lines are required.

2.6.9 Plan and profile drawing reference number.

2.6.10 Bench mark elevation, identification number and location shall be shown in the notes section of each drawing.

2.6.l1 Right-of-way and/or road centreline stationing to metric standards (0 + 000) at 20 metre intervals and shall be related geometrically to legal property lines or survey monuments.

2.6.12 Where possible, plan views shall be horizontal across the drawing sheet and shall be aligned vertically be centre line stationing with the profile view.

2.7 ROADS

The following shall be shown in addition to the information required in section 2.6:

2.7.l All proposed roadworks including pavement, curbs, sidewalks, traffic control devices, poles, signs and painting, complete with offsets from road centre line.

2.7.2 Stations of the BC and EC of road centreline and curb return horizontal curbs together with the curve information including delta angle, centreline radius tangent length and centreline arc length.

2.7.3 Details of intersections with spot elevations at all critical points including grades and elevations of

curb returns.

2.7.4 Catchbasin rim elevations and stations related to road centreline chainage.

2.7.5 Existing ground profile and finished pavement profile along the pavement centreline with elevations at 20 metre intervals.

2.7.6 Crossfall or crown information with gutter elevations at change points.

2.7.7 Proposed road centreline grade.

2.7.8 Stations and elevations of BVC, EVC and VPI.

2.7.9 Vertical curb information including the length of curve and sag or crest K value, where K equals the length of the vertical curb in metres divided by the algebraic difference in grades, percent.

2.7.10 Elevations along the vertical curve at ten (l0) metre intervals.

2.7.11 Elevation and station of low and high spots of vertical curves.

2.7.12 Where the slope of existing ground is greater than l0% across the right-of-way, cross-sections shall be shown at intervals not exceeding twenty (20 metres).

2.7.13 Typical road cross-section showing right-of-way, pavement width, sidewalks, curbs, underground utilities, hydro, power and street light poles, hydrants and their related offsets.

2.7.14 Proposed monument locations.

2.7.15 Additional design details as required.

2.8 STORM AND SANITARY SEWERS

The following shall be shown in addition to the information required in section 2.6:

2.8.1 All proposed storm and sanitary works including manholes, drop pipes, cleanouts, catchbasins, inlet/outlet structures, pipe work, ditches, culverts, and wyes, complete with offsets and stations related to the road centreline, and pipe inverts.

2.8.2 Existing ground profile and finished ground or pavement profile along the centreline of the proposed sewer.

2.8.3 Distance between manholes with proposed grade.

2.8.4 Stations and elevations of the BC and EC of all horizontal curves with the curve information including delta angle, radius, tangent length and arc length.

2.8.5 Stations and elevations of BVC, EVC and VPI.

2.8.6 Vertical curve information including the length of vertical and maximum pipe deflection.

2.8.7 Elevations along vertical curves at ten (l0) metre intervals.

2.8.8 Size, type and class of pipe.

2.8.9 Existing or proposed pipe crossings to be shown in profile.

2.8.10 Proposed inverts and offset locations to property line of service connections at property lines.

2.8.11 Location of existing buildings on properties served by storm and sanitary sewers.

2.8.12 Invert of existing sanitary and storm outlets at existing buildings.

2.8.13 Elevation of existing ground at the lowest point on the proposed lot.

2.8.14 Routing of all major storm flows including the l00 year storm with minimum basement floor elevations provided for properties with the potential to be affected by the major storm flows.

2.8.15 Additional design details as required.

2.9 WATERWORKS

The following shall be shown in addition to the information in section 2.6:

2.9.1 All proposed waterworks including size, type and class of pipe, hydrants, valves, fittings and all related appurtenances with offsets and stationing related to road centreline.

2.9.2 Locations of proposed service connections including an offset distance from an iron pin or lot corner.

2.9.3 Existing ground profile and finished ground or pavement profile, and invert profile along the centreline of the proposed watermain.

2.9.4 All other service crossings to be shown in profile (e.g., sewer mains gas mains, etc.).

2.9.5 Extent of work required in making the connection to existing watermains.

2.9.6 If the proposed watermain alignment or profile varies from the road centreline, the following shall be provided:

(a) stations of the BC and EC of horizontal curves together with curve information including delta angle, radius, tangent length and arc length.

(b) stations and elevations of the BVC, EVC and VPI of vertical curves together with curve Information including curve length and maximum pipe deflection required.

(c) elevations along vertical curves at ten (l0) meter intervals.

(d) proposed grades.

2.9.7 Additional design details as required.

2.10 STREET LIGHTING, B.C. HYDRO, B.C. TEL, GAS

2.10.1 The following information shall be shown in additional to the information required for the plan view in Section 2.6:

(a) pole, conduit and appurtenances locations with offsets and stationing related to road centreline.

(b) size, type, class of conduits.

(c) schematics of wiring details for street lights and traffic signals.

2.10.2 The plan shall be to a scale of l:l00 or l:500.

2.11 DETAIL SHEET AND CROSS-SECTIONS

2.11.1 Where there is not sufficient room on the plan and profile drawings, design details for the particular drawing may be provided on a separate sheet.

2.11.2 Scale shall be determined by the designer to suit the design details, and shall be included with the detail drawing. Scale of the detail shall allow for legibility when reduced to one-half size.

2.11.3 Where road cross-sections are required they may be provided on a separate sheet.

2.11.4 Cross-sections shall be to a scale of l:250 (H) to l:50 (V) unless otherwise approved.

2.11.5 Starting at the lower left hand corner of the drawing sheet, cross-sections shall be placed up the sheet order of increasing stationing. Grid elevations shall be shown at the left-hand side of each cross-section and stationing shall be shown below each cross-section. Adequate space shall be left between cross-sections so as to ensure clarity.

2.11.6 Cross-sections shall include:

(a) design and road cross-section within the right-of-way.

(b) existing ground cross-section extending into the adjacent properties as required.

2.12 AS-BUILT DRAWINGS

2.12.1 Drawings shall include all information as specified elsewhere for the construction drawings, but shall be corrected upon completion of construction to eliminate all works removed during construction and reflect "As-Built" conditions for permanent records.

2.12.2 All dimensions shall reflect the "As-Built" conditions of the construction and all references to "Proposed" shall be removed. "As-Built" drawings shall be to scale in accordance with the "As-Built" dimensions shown. The Revision Table shall be completed indicating the drawings as "As-Built".

2.12.3 The "As-Built" drawings shall be submitted on 3 mil Mylar so that they can be reproduced by standard

blue-line processes to provide clear and legible prints.

2.12.4 Line work for all constructed works shown on the drawings shall be drawn with the thicker line density (as for proposed works) for ease of determining the extent of works covered by the drawings. Proposed construction for future phases of the project shall not be shown on the "As-Built" drawings.

2.12.5 All drawings shall also include the following information:

(a) the location and elevation of all existing utilities and services encountered in the construction operation.

(b) the location and invert elevation at property line of all individual service connections, and the wye chainage, at the main for all constructed and existing works.

(c) A note on each drawing describing the type of trench material (sand, gravel, clay, hard pan, etc.) encountered during construction and the location and profile of all rock.

The following information shall be submitted with the "As-Built" drawings:

2.12.6 A summary sheet in accordance with Appendix F and entitled "Municipal Works Statistics" submitted on a completed form in the format shown on the appendix sheet.

2.12.7 A service card in accordance with Appendix G shall be submitted for each lot showing the "As-Built" location of all service connections.

2.12.8 Street names approved by the Municipality.

2.12.9 Approved and registered statutory right-of-way drawings.

2.12.10 All required testing results including an interpretation and summary of the results by a Professional Engineer.

2.12.11 A copy of the final inspection deficiency list.

2.12.12 Certification of the works in accordance with Section 2.l5.

2.12.13 Revised storm drainage calculations, if required, to reflect changes during the storm sewer construction.

2.12.14 Revised sanitary sewer calculations, if required, to reflect changes during the sanitary sewer construction.

2.12.15 Revised street light calculations, if required, to reflect changes during the street light installation.

2.13 SITE PLAN

The Site Plan shall be revised to conform to the "As-Built" drawings and where possible, submitted in CAD

format as noted below. These drawings will be used as the basis for Municipal servicing overlays, and must clearly show the following information:

(a) Standard information as noted in Section 2.2.

(b) Road alignment and lot layout.

(c) Schematic layout of water, sewer and storm drain systems, including the location of all valves, hydrants, manholes, catchbasins and other appurtenances.

(d) Size and material type of all watermains, sewers and storm drains.

(e) Labeling of manholes and cleanouts to conform to municipal labeling convention.

(f) Sidewalk location where required.

(g) Location of street lighting.

(h) Index of plan/profile design drawings.

2.14 COMPUTER DRAFTING STANDARDS

The following are guidelines to assist in the standardization of computer generated drawings submitted to the Town of Ladysmith:

2.14.1 Drawings shall be l00% compatible with AUTO CAD.

2.14.2 Drawing layers, pen colour and line types shall conform to Town of Ladysmith standards.

2.14.3 Drawings shall be submitted on an approved storage media indicating the software and version number used.

2.14.4 A READ.ME file shall be provided in the root directory containing:

- directory and subdirectory structure
- plotter used and pen configuration
- other information required to produce the drawing.

2.15 CERTIFICATION OF WORKS

2.15.1 A certification of design conforming to Appendix C and signed and sealed by a Professional Engineer shall be submitted with the design drawings.

2.15.2 The following certifications shall be submitted with the "As-Built" drawings upon completion of the construction:

(a) A certification of Installed Works conforming to Appendix D and signed and sealed by Professional Engineer.

(b) A certification of Street Light installation conforming to Appendix E and signed and sealed by a Professional Engineer.

(c) A Province of British Columbia Electrical Inspectors certification of the street lighting.

2.16 SURVEY CONTROL MONUMENTS

2.16.1 In areas where survey control monuments are installed, the following shall be considered in the location of the monuments:

(a) Survey control monuments shall not be located closer than 2.0 metres horizontally from the centreline of underground utilities and services unless otherwise approved.

(b) Survey control monuments shall have a maximum spacing of approximately five hundred (500) metres or two (2) city blocks, whichever is less.

(c) Survey control monuments shall be intervisible at one and a half (l.5) meters above the brass plugs, in pairs.

(d) The preferred location for survey monuments is flush mounted in the concrete curb and gutter as shown on Standard Drawing G5.

2.16.2 The monuments shall meet the specifications on and be installed in accordance with, the standard drawings for survey monument and survey monument box casting. The brass plugs are to be accurately drilled by a registered British Columbia Land Surveyor.

2.16.3 Survey control monuments shall be installed in accordance with Specifications for Control Surveys as prepared by the Province of British Columbia Ministry of Environment, Lands and parks, Surveys and Resource Mapping Branch.