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DRAWING STANDARDS

1.01 GENERAL REQUIREMENTS

- .1 A complete set of construction drawings shall consist of separate drawings of some or all of the following as determined by the City Engineer: **(REVISED NOVEMBER 2009)**
 - (a) Site plan and key plan
 - (b) Plan and profile for roads, drainage and storm sewers
 - (c) Plan and profile for sanitary sewers and watermains
 - (d) Plan and profile for sanitary and storm sewers for common trench designs
 - (e) Plan of proposed street lighting, hydro, telephone, cablevision and gas
 - (f) Plan of proposed signage and pavement markings
 - (g) Plan of proposed landscaping and irrigation. **(REVISED NOVEMBER 2009)**
 - (h) Additional plans showing any special details and cross sections. **(REVISED NOVEMBER 2009)**
- .2 Maximum drawing size shall be 610 mm x 915 mm (24" X 36").
- .3 The City of Nanaimo's Contract Drawings and CAD Standards are based on the current versions of the industry standard software by AutoDesk: AutoCAD, Land Desktop and Civil 3D. All drawings submitted to the City of Nanaimo must be in either DXF or DWG format using AutoCAD 2004 or higher. Drafting Methods shall be as per the CAD Standards, Sections 1.20-1.31. **(REVISED NOVEMBER 2009)**
- .4 All drawings shall be metric. Drawing scales and dimensions shall be shown on all drawings.
- .5 The drawings shall be neat and legible with adequate clearance margins between the drawing information and the title block border. Notes and text shall locate and describe the proposed work in sufficient detail to facilitate construction. Limits of construction and match lines shall be clearly marked on the drawing.
- .6 Plan and profile drawings shall be drawn with the profile on the bottom of the drawing sheet, lined up under the plan if possible. Utility and road stationing, inverts and material and grade information shall be located across the bottom of the profile.
- .7 North arrow shall be oriented in the two northerly quadrants, if possible.
- .8 Lettering shall be to Leroy metric heights and widths. The minimum height of lettering for proposed work is 2.25 mm and for existing structures is 1.80 mm. Vertical upper case lettering is preferred. Lettering shall be unobstructed by linework and other drawing information. Conflicts between linework, symbols, dimensioning or text shall be removed. **(REVISED NOVEMBER 2009)**
- .9 Construction notes shall be boxed and located around the perimeter of the drawing, tagged to the drawing feature.
- .10 All elevations shown on drawings shall be metric geodetic datum. The source and location of the datum shall be clearly noted on each drawing. Refer to CAD Standards, Section 1.22.

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- .11 The drawing title block shall be the City of Nanaimo Standard Title Block and shall include the project name, project location, type of drawing (i.e. Site Plan) and Engineer's name and/or company name and logo, drawing scale, Engineering File No. and the City of Nanaimo drawing number.
- .12 Plan and Profile drawings shall be to the following scales unless otherwise approved:

Horizontal - 1:500 (for simple, one-utility drawings or pavement / signage drawings only) or 1:250 (for all other drawings)
Vertical - 1:50
- .13 The following notes shall be shown on either the site plan or the first drawing of the set:
- (a) "All work and materials are as described in the City of Nanaimo Manual of 'Engineering Standards and Specifications' or as otherwise approved by the City Engineer."
 - (b) "Connection to, or alteration of, existing City-owned utilities, requires authorization by the City Engineer."
 - (c) "A 'Permit to Install Works Within Streets, Lanes and City Property Areas', will be required where construction is to be undertaken in City of Nanaimo right-of-ways and/or on City of Nanaimo owned utilities or properties."
 - (d) "Upon approval of the permit the City of Nanaimo's Engineering Construction Branch shall be notified forty-eight (48) hours prior to commencement of work."
- .14 Standard details such as manholes, catch basins, hydrants, etc., that are shown and described in the City of Nanaimo Standard Drawings need not be shown in detail on the drawings; the Standard Drawing No. shall be quoted on the plan for reference. Standard symbols for the various utilities as shown on Standard Drawing No.'s G-2 and G-2A - Standard Symbols and Abbreviations, and G-3 - Standard Materials and Hatch Patterns, shall be used and may be shown in a legend on the drawings.
- .15 All drawings shall bear the dated stamp/seal and signature of the professional engineer responsible for the design.
- .16 Provision shall be made on all drawings for the insertion of the City of Nanaimo drawing number in the space provided labeled "Drawing No." The City of Nanaimo will provide the number for insertion on the drawing. Consultant drawing number will be placed immediately above in the space labeled for that purpose.
- .17 Provision shall be made on all drawings for the City of Nanaimo Engineering file number in the space provided. The City of Nanaimo will provide the file number for insertion on the drawing
- .18 Numerical values shown on the Construction drawings shall be shown to two (2) decimal places unless accuracy warrants otherwise.

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1.02 SITE PLAN AND KEY PLAN

- .1 The Site Plan of the construction works shall be to a scale of not less than 1:1000.
- .2 The site plan shall include but is not limited to the following: **(REVISED NOVEMBER 2009)**
 - (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) street addresses **(REVISED NOVEMBER 2009)**
 - (j) one metre contour lines for slopes greater than 10% existing and proposed
 - (k) power and telephone and street light poles
 - (l) plan and profile drawing reference numbers
 - (m) gas mains, underground hydro, telephone, street lights and cable and their related appurtenances
 - (n) survey control monuments
 - (o) routing of all major storm flows including the 100 year storm.
- .3 A Key Plan to a small scale, (e.g., 1:10000), showing the location of the works in relation to major streets, shall be provided in the upper right-hand section of the drawing sheet.
- .4 A drawing index shall be provided and include the drawing titles, sheet numbers, and the City of Nanaimo drawing number.
- .5 Refer to Standard Drawing No. G-5E for a sample Cover Sheet including the Site Plan and Key Plan.

1.03 PLAN AND PROFILE DRAWINGS - GENERAL

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

- .1 All cadastral information including property, right-of-way and easement lines and dimensions in sufficient detail to relate design to surrounding and adjacent properties. To be included on all drawing submissions.
- .2 Legal description and civic addresses of existing properties.
- .3 Road allowance dimensions.
- .4 Existing pavement, curbs, sidewalks, ditches, driveways, lanes, retaining walls, buildings, trees and shrubs within the right-of-way. Note significant trees on and within 5 metres of the right of way.

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- .5 All existing underground and surface utilities and services (with offsets, elevations, size, age and material type and as-built references) including but not limited to the following:
 - (a) sanitary sewers, storm sewers, watermains and appurtenances
 - (b) street light poles, conduit and appurtenances
 - (c) hydro poles and underground wiring ducts and appurtenances
 - (d) telephone poles, underground wiring ducts and appurtenances and fibre optic cables
 - (e) gas mains and appurtenances
 - (f) cable television ducts and appurtenances
 - (g) traffic control devices, poles, conduits, signs and painting
 - (h) irrigation systems
- .6 All relevant topographic information. For slopes greater than 10 percent, one (1) meter contour lines are required.
- .7 Bench mark elevation, identification number and location shall be shown in the 'Reference data' section of each title block.
- .8 Right-of-way and/or road centreline stationing shall be to metric standards (0+000) at 20 metre intervals and shall be related geometrically to legal property lines or survey monuments. Stationing shall run left to right where possible and upstream on gravity pipes.
- .9 Where possible, plan views shall be horizontal across the drawing sheet, and shall be aligned vertically by centre line stationing with the profile view below.
- .10 Profile elevations shall be placed at both sides of the profile. Split profiles must show elevations on both sides of the break.

1.04 ROADS

The following shall be shown in addition to the information required in section 1.03:

1. All proposed roadworks, complete with offsets from road centerline, including: pavement, curbs, sidewalks and poles.
- .2 Stations of the BC & EC of road centreline and curb return horizontal curves together with the curve information including delta angle, radius, tangent length and arc length.
- .3 Details of intersections with spot elevations at all critical points including grades and elevations of curb returns.
- .4 Catchbasin rim elevations and stations related to road centerline chainage. To include lead locations to main, lead diameters and material in a table.
- .5 Existing ground profile and finished pavement profile along the pavement centerline with elevations at 20 metre intervals.
- .6 Crossfall or crown information with gutter elevations at change points.
- .7 Proposed road centreline grade.
- .8 Stations and elevations of BVC, EVC, and VPI.

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- .9 Vertical curve information including the length of curve and sag or crest K value, where K equals the length of the vertical curve in metres divided by the algebraic difference in grades, percent.
- .10 Elevations along the vertical curve at ten (10) metre intervals.
- .11 Elevation and station of low and high spots of vertical curves.
- .12 Where the slope of existing ground is greater than 10% across the right-of-way, cross-sections shall be shown at intervals not exceeding twenty (20) metres.
- .13 Where there is an elevation difference of more than 1.2 m from the design road centre line to a suitable building site on the adjacent parcel, driveway grades and profiles shall be shown on the drawings.
- .14 Where only a half road is being constructed, full width design cross-sections shall be provided as required to ensure the design suits the future development of adjacent properties.
- .15 Typical road cross-section showing right-of-way width, proposed road design structure, pavement width, sidewalks, curbs, underground utilities, hydro, power and street light poles, hydrants and their related offsets.
- .16 Existing monument with label (note: no monuments shall be destroyed during construction). **(REVISED NOVEMBER 2009)**
- .17 Additional design details as required.
- .18 Refer to Standard Drawing No.G-5A for a road plan and profile sample drawing.

1.05 STORM AND SANITARY SEWERS

The following shall be shown in addition to the information required in section 1.03:

- .1 Include common trench designs on the same construction drawing.
- .2 All proposed storm and sanitary works including manholes, drop pipes, cleanouts, catchbasins, inlet/outlet structures, pipe work, ditches, culverts, inspection chambers, services and wyes, complete with offsets for mains, rim elevations, stations related to the road centreline, and pipe inverts at manholes and pipe grade breaks. **(REVISED NOVEMBER 2009)**
- .3 Existing ground profile and finished ground or pavement profile along the centerline of the proposed sewer.
- .4 Distance between manholes with proposed grade of pipe.
- .5 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.
- .6 Stations and elevations of BVC, EVC and VPI.

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- .7 Vertical curve information including the length of vertical and maximum pipe deflection.
- .8 Elevations along vertical curves at ten (10) metre intervals.
- .9 Size, type and class of pipe.
- .10 Existing or proposed pipe crossings to be shown in profile and to include pipe inverts.
- .11 Proposed inverts and offset locations to property line of service connections at property lines. Offset distance to include prefix "S" for sanitary and "D" for storm, (i.e. S 2.4m or D 3.0m). Reference Standard Drawing No. T-7, Section 4.
- .12 Location of existing buildings on properties served by storm and sanitary sewers.
- .13 Basement elevations for existing buildings at the discretion of the City Engineer.
(REVISED NOVEMBER 2009)
- .14 Elevation of existing ground at the lowest point on the proposed lot.
- .15 Routing of all major storm flows including the 100 year storm with minimum basement floor elevations provided for properties with the potential to be affected by the major storm flows.
- .16 Additional design details as required.
- .17 Refer to Standard Drawing No.'s G-5B and G-5C for sanitary and storm plan and profile sample drawings.
- .18 Materials, types, size, inverts and flow direction to be shown for all proposed and existing culverts.

1.06 WATERWORKS

The following shall be shown in addition to the information required in section 1.03:

- .1 All proposed waterworks including size, type and class of pipe, hydrants, valves, joint restraints, fittings and all related appurtenances with offsets and stationing related to road centreline.
- .2 Locations of proposed service connections including an offset distance from an iron pin or lot corner. Offset distance to include the prefix "W", (i.e. W 1.2m).
- .3 Existing ground profile and finished ground or pavement profile, and invert profile along the centerline of the proposed watermain.
- .4 All other pertinent service crossings to be shown in profile (e.g., sewer mains, gas mains, etc.). **(REVISED NOVEMBER 2009)**
- .5 Extent of work required in making the connection to existing watermains.

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- .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 (10) metre intervals.
 - (d) proposed grades.
- .7 Pipes requiring joint restraints shall be shaded, labeled and dimensioned from adjacent fitting showing the length of pipe requiring restraint.
- .8 Additional design details as required.
- .9 Refer to Standard Drawing No. G-5D for a watermain plan and profile sample drawing.
- 1.07 ORNAMENTAL STREET LIGHTING, TRAFFIC CONTROL SIGNALS, HYDRO, PHONE, GAS AND CABLEVISION FIBRE OPTICS (COMMERCIAL AND PRIVATE)
- .1 The following information shall be shown in addition to the information required for the plan view in section 1.03:
- (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.
 - (d) details of detector loops and all other wiring circuits on traffic signals.
- .2 Street lights shall be numbered and pertinent information, (i.e. wattage, lamp type, pole height and location (Nad 83 CSRS ground level co-ordinates), included as attribute data or in table format as per Standard Drawing No. G-7. **(REVISED NOVEMBER 2009)**
- .3 The plan shall be to a scale of 1:1000, 1:500 or 1:250. **(REVISED NOVEMBER 2009)**
- .4 Traffic signal drawings shall generally conform to Section 10.02.
- 1.08 SIGNAGE AND PAVEMENT MARKINGS
- .1 A separate plan shall be prepared in all cases for road surface works. This plan shall detail all eradications, alterations, additions and new regulatory and advisory signage and line painting. The design shall conform to MUTCD and City of Nanaimo Traffic and Highway Installation Guidelines. The following information shall be shown:
- (a) Dimensions, lengths and colour of proposed lane or curb markings, medians, and cross walks.
 - (b) Lane widths, median radii and taper ratios.
 - (c) Dimensioned location and type of new or relocated signs.
 - (d) Completed Traffic Sign Table as per Standard Drawing No. G-7. **(REVISED NOVEMBER 2009)**

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- .2 The plan shall be to a scale of 1:1000, 1:500 or 1:250. *(REVISED NOVEMBER 2009)*
- .3 For drawing clarity, show curb locations only. Do not show utilities, legal information or addresses.

1.09 DETAIL SHEET AND CROSS-SECTIONS

- .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 Scale shall be determined by the designer to suit the design detail, and shall be included on the detail drawing.
- .3 Where road cross-sections are required they may be provided on a separate sheet.
- .4 Cross-sections shall be to a scale of 1:250 (H) to 1:50 (V) unless otherwise approved.
- .5 Starting at the lower left hand corner of the drawing sheet, cross-sections shall be placed up the sheet in order of increasing stationing. Grid elevations shall be shown at the left hand side of each cross-section and stationing shall be shown above each cross-section. Adequate space shall be left between cross-sections so as to ensure clarity.
- .6 Cross-sections shall include:
 - (a) Design road cross-section within the right-of-way.
 - (b) Existing ground cross-section extending into the adjacent properties as required.

1.10 LAND ACQUISITION

- .1 Where the proposed construction of capital works is over private lands and requires a right-of-way, a separate land acquisition drawing will be prepared for every lot affected.
- .2 The sketch is an attachment required with every "permission to enter" form and condition sheet signed by the owner.
- .3 The drawing will be on a 11x17 or 8 ½x11 sheet of paper at a scale no less than 1:500.
- .4 The drawing shall include the legal lot information, adjoining properties and street names, and a north arrow.
- .5 The civic address and registered owners will be listed in the bottom right hand corner above the title block.
- .6 The plan will show the area of the proposed new right of way and of the total lot area through which the right of way will go.
- .7 A dimension perpendicular to the adjacent lot line and any other dimensions required to clarify the extent of the proposed right of way will be shown.
- .8 Refer to Standard Drawing G-6 for a sample Land Acquisition Sketch.

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1.11 LANDSCAPE AND IRRIGATION PLAN PREPARATION

- .1 All landscape related construction drawings and inspections required under this Section shall be undertaken by a Landscape Architect registered with the British Columbia Society of Landscape Architects (BCSLA).
- .2 The landscape architect shall coordinate the landscape design within the street right-of-way with existing or proposed landscape on private property fronting the road, so as avoid over planting or conflicts with sight distance, existing trees or buildings.
- .3 The following information shall be shown in addition to the information required for the plan view in Section 1.03:
 - (a) Sight distance triangles at intersections
 - (b) Proposed slopes steeper than 3:1 to be indicated with slope direction arrow and slope ratio, contours and/or top and bottom of slope lines and elevations.
 - (c) Proposed tree locations showing trunk center and approximate canopy spread at 15 years age.
 - (d) Location of all shrub and groundcover beds and grass areas.
 - (e) Extent of proposed decorative paving and/or street furnishings.
 - (f) Plant labels and an associated plant list which indicates quantity, scientific name, common name, plant size, condition (e.g. container or B&B), spacing, and comments.
- .4 A typical R.O.W. cross section drawing indicating the relationship of all plantings to overhead, above-ground and below-ground utilities, and pavement and other structures shall be referenced and shown on the landscape plan or, if there is insufficient room, on a details and cross-section sheet.
- .5 Typical tree, shrub and groundcover cross section planting details shall be referenced to specific City of Nanaimo standard details Section 14, or if alternate details are proposed, these shall be included on the landscape construction drawings.
- .6 An irrigation plan shall be produced, using the same base information, which shows:
 - (a) Location of all heads, emitter devices and driplines; lateral and mainline pipe locations and sizes; sleeves; valve sizes and locations; and location of backflow prevention device and water service connection;
 - (b) An irrigation equipment legend, and schedule of hydraulic data in metric to include flow and precipitation rate for each valve zone; and
 - (c) Water service/backflow prevention connection detail, valve and head installation details including all equipment, fittings and related valve boxes, by reference to City of Nanaimo standard details Section 14 or if an alternative is proposed, by details shown on the landscape construction drawings.

1.12 DESIGN SUBMISSIONS FOR CITY OF NANAIMO CAPITAL PROJECTS

- .1 Design submissions will be submitted to the City of Nanaimo and undergo a review process at the 50%, 95% and 100% stages of design.

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- .2 Minimum 50% submission requirements for storm, sanitary and water drawings are shown on the sample 50% drawing G-5G and are as follows:

Plan view:

- (a) Existing topographical survey with identifying text as required;
- (b) Existing sewers, watermains and utilities, including individual service connections, with text noting size, material and type of utility;
- (c) Legal lot lines and descriptions, street names and civic addresses;
- (d) North arrow;
- (e) Preliminary design including but not limited to: centerline alignment and stationing, alignment and size of pipe, manholes, cleanouts, water valves, hydrants, sanitary, storm and water services, catchbasins, (labeling not critical).

Profile view:

- (a) Existing centerline, ditch, and rock profiles;
- (b) Existing underground sewers, watermains and utilities;
- (c) Basement and manhole rim elevations;
- (d) Preliminary design including but not limited to: pipes with size, grade and material, manholes with stationing and inverts, headwalls, drop structures.

Title Block:

- (a) Project street name and extents;
- (b) Title detailing the type of works proposed;
- (c) Horizontal and vertical scales;
- (d) Date and initials of designer and drafter;
- (e) Reference data for monuments used in survey;
- (f) AutoCAD drawing name and project.

Additional information for 50% submissions required:

- (a) Cost estimate using the City of Nanaimo's Cost Estimate master;
- (b) Draft geotechnical, environmental reports;
- (c) Summary of design criteria, assumptions, in a design brief (could include storm and sanitary calculation sheets);
- (d) Property acquisition drawings
- (e) Environmental mitigation, erosion and sediment control drawings.

- .4 Minimum 95% submission requirements for storm, sanitary and water drawings, in addition to the 50% information, are shown in red on the sample 95% drawing G-5H and are as follows:

- (a) Final design with all required dimensions;
- (b) Proposed curbs, if applicable;
- (c) Construction notes for sanitary, storm and water works;
- (d) General notes;
- (e) Match lines and drawings continuation blocks, if required;
- (f) Drawing number and Engineering file number, assigned by City of Nanaimo;
- (g) Consultant Drawing number;
- (h) Date and initials of plan checker;

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- (i) Details and cover sheet, if required.

Additional information for 95% submissions required:

- (a) Updated cost estimate;
- (b) Final geotechnical, environmental reports;
- (c) Cost estimate and designs from private utilities;

- .5 Minimum 50% submission requirements for Road drawings are shown on the sample 50% drawing G-5J and are as follows:

Plan view:

- (a) Existing topographical survey with identifying text as required;
- (b) Existing sewers, watermains and utilities with text noting size, material and type of utility;
- (c) Legal lot lines and descriptions, street names and civic addresses;
- (d) North arrow;
- (e) Preliminary design including but not limited to: centerline alignment and stationing, curb or edge of pavement, sidewalks, retaining walls, property acquisitions, limits of driveway construction, catchbasins.

Profile view:

- (a) Existing centerline, ditch and rock profiles;
- (b) Existing underground sewers, watermains and utilities;
- (c) Basement and manhole rim elevations;
- (d) Preliminary design including, but not limited to: centerline and gutter profiles, centerline stationing and grades.

Title Block:

- (a) Project street name and extents;
- (b) Title detailing the type of works proposed;
- (c) Horizontal and vertical scales;
- (d) Date and initials of designer and drafter;
- (e) Reference data for monuments used in survey;
- (f) AutoCAD drawing name and project.

Additional information for 50% submissions required:

- (a) Cost estimate using the City of Nanaimo's Cost Estimate master;
- (b) Draft geotechnical, environmental reports;
- (c) Summary of design criteria, assumptions, in a design brief (could include storm and sanitary calculation sheets);
- (d) Property acquisition drawings
- (e) Environmental mitigation, erosion and sediment control drawings.

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- .6 Minimum 95% submission requirements for Road drawings, in addition to the 50% information, are shown in red on the sample 95% drawing G-5K and are as follows:
- (a) Final design with all required dimensions;
 - (b) Gutter grades;
 - (c) Curb return data;
 - (d) Construction notes for road works;
 - (e) General notes;
 - (f) Match lines and drawing continuation blocks, if required;
 - (g) Consultant Drawing number;
 - (h) Pavement markings and signage drawing;
 - (i) Details, typical cross sections, cover sheet, if required.

Additional information for 95% submissions required:

- (a) Updated cost estimate;
 - (b) Final geotechnical, environmental reports;
 - (c) Cost estimate and designs from private utilities;
- .7 The 100% submission, in addition to 95% information for both roads and utilities, shall include but not be limited to:
- (a) All final notes and dimensions;
 - (b) "100% Design complete" note in revision box;
 - (c) Drawing number and Engineering file number, assigned by City of Nanaimo;
 - (d) All permits from agencies (e.g. LWBC, WLAP, MOT, MOH, E&N) and private utilities (eg. Telus, BC Hydro, Shaw. Terasen);
 - (e) Date, initials and seal of Approving Engineer;
 - (f) Digital submission on a CD (Autodesk drawing and files, cost estimates).
- .8 Digital design submissions shall be per the CAD Standards, Sections 1.20 - 1.31 and must include a copy of the CAD Standards Checker Report. Submissions will be reviewed for compliance. (REVISED NOVEMBER 2009)

1.13 AS-BUILT SUBMISSIONS

- .1 Drawings shall include all information as specified elsewhere for the construction drawings, but shall be corrected upon completion of construction to note all works removed or abandoned during construction. This information shall be retained in the digital file on layer (CAT1-Rem- or Abd-) but not displayed on the final print (plan view only). Note abandoned services and reflect As-Built conditions for permanent records. **(REVISED NOVEMBER 2009)**
- .2 All dimensions, elevations and inverts shown 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 are As-Built. **(REVISED NOVEMBER 2009)**

SECTION 1 - GENERAL DRAFTING REQUIREMENTS DRAWING STANDARDS

- .3 All As-Built features shall be surveyed and survey points imported into the digital drawing. The As-Built drawing shall reflect the true elevation and location of all constructed features, in both the plan and profile views.
- (a) Tolerance for moving features in the plan view drawings will be >0.9m (e.g. manholes installed less than 0.9m from design location do not need to be shifted on the digital as-builts/drawings).
 - (b) Tolerance for moving features in the profile view drawings will be >0.3m (e.g. manhole inverts installed less than 0.3m from the design location do not need to be shifted on the digital as-built/drawings). **(REVISED NOVEMBER 2009)**
- .4 The As-Built drawings shall be submitted on 3 mil Mylar so that they can be reproduced to provide clear and legible prints. A digital copy in AutoCAD 2004 format or later must be provided.
- .5 Line work for all constructed works shown on the drawings shall retain the thicker line density, and correct topology as per section 1.25.3. Proposed construction for future phases of the project shall not be shown on the As-Built drawings. **(REVISED NOVEMBER 2009)**
- .6 All As-Built 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.
 - (d) A detail for each tie in point to existing utilities and locations where restrainers are required. **(REVISED NOVEMBER 2009)**
 - (e) The In Service Date for all as-built infrastructure shall be included on the as-built drawings. **(REVISED NOVEMBER 2009)**

The following information shall be submitted with the as-built drawings:

- .8 Irrigation As-Built documents shall include the following information:
- (a) Revisions made during construction affecting the main line pipe, controller and valve locations, and all laterals and sprinkler heads.
 - (b) Approved substitutions including size, material and manufacturer's name and model name and catalogue number.
 - (c) Written irrigation operating and maintenance manuals.
- .9 Planting As-Built documents shall include the following information:
- (a) The as-planted location, species and size of all trees, and all changes in species, size and quantity of shrubs and ground cover in an updated plant list on the construction drawings.

SECTION 1 - GENERAL DRAFTING REQUIREMENTS DRAWING STANDARDS

- .10 A summary sheet in accordance with Appendix E and entitled "SUBSTANTIAL COMPLETION STATISTICS RECORD UTILITIES AND WORKS" submitted on a CD in a spreadsheet format compatible with Excel 2003 or higher.
- .11 A completed Service Sheet in accordance with Appendix F1 shall be submitted for each lot showing the As Built location of all service connections.
- .12 Approved and registered statutory right-of-way drawings, if required. **(REVISED NOVEMBER 2009)**
- .13 All required testing results including an interpretation and summary of the results by a Professional Engineer.
- .14 A copy of the final inspection deficiency list.
- .15 Certification of the works in accordance with Section 1.15
- .16 A Water Meter Information Sheet in accordance with Appendix F2 for all developer installed water meters and detector check valves.
- .17 Revised storm drainage calculations, if required, to reflect changes during the storm sewer construction.
- .18 Revised sanitary sewer calculations, if required, to reflect changes during the sanitary sewer construction.
- .19 Revised street light calculations, if required, to reflect changes during the street light installation.
- .20 Maintenance manuals and product information if required, for sanitary sewer pump stations, water booster pumps, pressure reducing stations, traffic signal controllers, etc.
- .21 A copy of the CAD Standards Checker report. **(REVISED NOVEMBER 2009)**

SECTION 1 - GENERAL DRAFTING REQUIREMENTS OTHER DESIGN REQUIREMENTS

OTHER GENERAL REQUIREMENTS

1.15 CERTIFICATION OF WORKS

- .1 A certification of design conforming to Appendix G1 and signed and sealed by a professional Engineer shall be submitted with the design drawings.
- .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 G2 and signed and sealed by a Professional Engineer.
 - (b) A Certification of Street Light Installation conforming to Appendix G3 and signed and sealed by a Professional Electrical Engineer.
 - (c) A Province of British Columbia Electrical Inspectors certification of the street lighting.
 - (d) A Certification of Landscape Installation conforming to Appendix G4 and signed and sealed by the Landscape Architect.

1.16 SURVEY CONTROL MONUMENTS

- .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 inter-visible at one and a half (1.5) metres 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 G-11.
- .2 The monuments shall meet the specifications on and be installed in accordance with, the standard drawings for survey monument G-9 and survey monument box casting G-10. The brass plugs are to be accurately drilled by a registered British Columbia Land Surveyor.
- .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.

SECTION 1 - GENERAL DRAFTING REQUIREMENTS CAD STANDARDS

CAD STANDARDS

1.20 COMPUTER AIDED DRAFTING STANDARDS

- .1 City of Nanaimo CAD Standards are applicable to data collection and reduction (survey, base plan and DTM), design drawings and contract documentation, and construction as-built submissions.
- .2 Standards were developed for use in the AutoCAD, Land Development Desktop and Civil 3D Environments. All City of Nanaimo standard files and drawings are based on the 2008 version of AutoDesk software. **(REVISED NOVEMBER 2009)**
- .3 Section 1.31 provides a list of Standard Digital Drawings and Files to be used by consultants working on projects within the City of Nanaimo.
- .4 A CAD Standards Checker program to aid in producing drawings to City Standards is available on City website. **(REVISED NOVEMBER 2009)**

1.21 PROTOTYPE DRAWINGS

- .1 City of Nanaimo prototype drawings, also referred to as drawing templates, (AutoCAD file extension .dwt) are available to engineering and survey consultants for the creation of survey and design drawings.
 - (a) CON 250- 2008. DWT **(REVISED NOVEMBER 2009)**
 - (b) C3D 2008 - CON 250.DWT **(REVISED NOVEMBER 2009)**
- .2 Prototype drawings contain standard layer definitions and scale-dependent paper space layout definitions with standard title blocks, text styles and dimension styles. **(REVISED NOVEMBER 2009)**

1.22 CO-ORDINATE SYSTEM

- .1 All digital drawings submitted to the City of Nanaimo must reference UTM NAD83 (CSRS) ground level coordinates.
- .2 City of Nanaimo base plan drawing coordinates are derived from survey monuments and traverse hubs which are brought into the original drawing using the Land Desktop Drawing Setup – Zone - **'No datum, no projection,'** setting.

1.23 LAYER NAMING CONVENTIONS

- .1 Layer naming conventions for existing and proposed conditions shall be adhered to. In the event that new layers are required, the consultant shall create the layer name using the standard City of Nanaimo layer naming convention and notify the project manager.

SECTION 1 - GENERAL DRAFTING REQUIREMENTS CAD STANDARDS

- .2 The City of Nanaimo incorporates a categorized CAT layer naming convention used to represent existing and proposed conditions. The naming convention is as follows: **(REVISED NOVEMBER 2009)**

CAT1-CAT2-CAT3

- (a) CAT1 represents the feature stage - e.g. EX (for existing), PR (for proposed), REM (for Removed) or ABD (for Abandoned) **(REVISED NOVEMBER 2009)**
 - (b) CAT2 is used to describe the major feature such as STM (storm), SAN (sanitary), WAT (water), RD (road), etc.
 - (c) CAT3 is an additional identifier such as TXT (text), PROF (profile), PNTS (points), etc.
 - (e) For clarity, each category is delimited by a dash. (eg. PR-WAT-TXT) **(REVISED NOVEMBER 2009)**
 - (f) A tilde (~) will be used as a prefix for all new layers in order to conform with CAD Checker program. **(REVISED NOVEMBER 2009)**
 - (g) When an alignment name is required in the profile layers generated by LDD or C3D, the @ symbol must be used with the usual * symbol prefix for CAD Checker layer acceptance. (e.g. *@grid=roadname@grid). **(REVISED NOVEMBER 2009)**
- .3 Refer to Drawing G-1 or CAD Checker program for the list of standard layer names and properties, (linetypes, colours, pen weights) used in City of Nanaimo design drawings. **(REVISED NOVEMBER 2009)**

1.24 DRAWING ORGANIZATION

- .1 Base plan and proposed works shall be drawn in model space. Paper space layouts shall be set up as individual cut sheets with construction notes and pertinent details.
- .2 City of Nanaimo standard title blocks are located on the paper space layout definitions. All drawings must be assembled such that final plotting is done from paper space, utilizing viewports to show different views of the model space drawing.
- (a) Copy existing layout definitions to create other layouts and views. Copying a layout definition not only duplicates the layout parameters, but also the entities (Title Block and viewports) located on the layout.
- .3 Attribute tables will accompany each utility identifying attributes for existing and new work. These attributes will include diameters, materials, types, nodes, ownership, elevations, depths and coordinate values where necessary. See attribute tables on Standard Drawing No. G-13 to Standard Drawing No. G-15. **(REVISED NOVEMBER 2009)**
- .4 Drawings containing either Civil 3D pipe works or linework with the required attribute data will not require the use of the attribute tables described in 1.24.3. **(REVISED NOVEMBER 2009)**

SECTION 1 - GENERAL DRAFTING REQUIREMENTS CAD STANDARDS

1.25 BASE PLAN PREPARATION

- .1 All base plans shall be created to either 1:250 or 1:500 scale using the appropriate prototype drawing and project.
- .2 Base plan linework shall be created with AutoCAD polylines to use as fault lines for creating a DTM.
- .3 Proposed pipework topology must be correct. Lines (pipes) must be snapped to the nodes (manholes, cleanouts, headwalls, etc.) to form a continuous network. **(REVISED NOVEMBER 2009)**
- .4 Drawings are to be created with text styles located in the prototype drawing. The following text styles are to be used:

Style Name	250 Scale Height (mm)	500 Scale Height (mm)		Letter Height (mm)
L18	.450	.900		1.80
L25	.563	1.125		2.25
L35	.875	1.75		3.5
L50	1.25	2.5		5.0
L70	1.75	3.5		7.0

(REVISED NOVEMBER 2009)

1.26 STANDARD SYMBOLS AND ABBREVIATIONS

- .1 The City of Nanaimo requires that engineering and construction consultants use City of Nanaimo approved standard symbols and abbreviations for the preparation of the design drawings. **(REVISED NOVEMBER 2009)**
- .2 The standard symbols and abbreviations for both existing and proposed conditions are shown in Drawing G-2 and G-2A.
- .3 Standard materials and their representative AutoCAD hatch patterns are shown in Drawing G-3.
- .4 Drawing G-4 shows the individual drawings that make up the City of Nanaimo standard symbols library.
- .5 Refer to the NCS CAD Checker for list of standard symbols. **(REVISED NOVEMBER 2009)**

1.28 PLOTTING CONVENTIONS

- .1 The City of Nanaimo uses colour dependent plot styles (CTB's) with line weights assigned to the colours.

SECTION 1 - GENERAL DRAFTING REQUIREMENTS CAD STANDARDS

- .2 The City of Nanaimo colour plot style table (CTB) files shall be obtained from the City of Nanaimo website, or the City of Nanaimo project manager will provide the files to the consultants working on a City of Nanaimo project. **(REVISED NOVEMBER 2009)**
 - (a) CON COLOUR.ctb for plots with the existing services plotted in colour in both the plan and profile sections of the drawing,
 - (b) CON BLACK AND WHITE.ctb for all black and white plots.

1.29 SAMPLE DRAWINGS

Sample drawings (G-5A - G-5K) for sanitary, storm, water and road projects are provided to the consultant by the City of Nanaimo.

Sample drawings shown are for reference only and are not intended as Design Guidelines.

1.30 SURVEY STANDARDS

- .1 Point data submitted by survey contractors shall conform to City of Nanaimo standard format and be submitted in a PNEZD, comma delimited, ASCII text file format for input into Land Desktop or Civil 3D. **(REVISED NOVEMBER 2009)**
- .2 City of Nanaimo standard survey code descriptions are shown on Drawing G-8 and G-8A of this document. A Description Key File is used to automate symbol insertion and linework.
- .3 The Description Key File found in the prototype project references City of Nanaimo standard field descriptions. Consultants can either use CON standard field descriptions or make a copy of the description key file and modify it to reference a different field description standard.
- .4 Field notes for features that require additional explanation shall reside in the drawing file and be placed on the 'Surveyors Notes' layer.

1.31 STANDARD FILES PROVIDED TO CONSULTANTS

The following files are provided to survey and engineering consultants by the City of Nanaimo:

Drawing Templates: C3D 2008 – CON 250. DWT and CON 250 – 2008. DWT **(REVISED NOVEMBER 2009)**

LDD Prototype Projects: CON 500 and CON 250

Plotting CTB Files: CON COLOUR.ctb and CON BLACK AND WHITE.ctb

City of Nanaimo Symbols Library (individual drawings)

Sample Drawings for Road, Sanitary, Storm and Water projects

Survey Descriptions: In the prototype project or as ascii files - 250 Scale – acad250desc.txt and 500 Scale – acad500desc.txt

City of Nanaimo CAD Standards Checker software **(REVISED NOVEMBER 2009)**

SECTION 1 - GENERAL DRAFTING REQUIREMENTS CAD STANDARDS

1.32 DRAWING SUBMISSION CHECKLISTS

- .1 Refer to the drawing content checklist on Drawings G-12, G-12A and G-12B for an itemized checklist of drawing contents.