

CITY OF WHITEHORSE SERVICING STANDARDS MANUAL
PART 2 - DESIGN CRITERIA
SECTION 2.2 – PREPARATION OF ENGINEERING DRAWINGS

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SECTION 2.2 – PREPARATION OF ENGINEERING DRAWINGS

2.2.1 SCOPE

The following specifications govern the preparation of engineering drawings.

For specifications governing the submission and approval process, refer to Section 1.2 of this manual.

Drawing examples can be provided by the City of Whitehorse Engineering Services Department upon request.

2.2.2 GENERAL REQUIREMENTS FOR ALL DRAWINGS

2.2.2.1 TITLEBLOCK INFORMATION

Each plan comprising the drawing set is to have a Titleblock with information located on the right hand side of the sheet.

The Title Block is to include the following information:

- Project Title and Location;
- Lot numbers, plan numbers, civic addresses, street names and legal description of the properties relevant to the plan;
- The Consultant's name, contact details and logo;
- Drawing Scale;
- Legend;
- Unique drawing identifier or number; and
- Revisions and Issues section indicating the description of drawing submissions (issues) and revisions, the relative date, the party responsible for drafting the plan or revisions to the plan, and the party responsible for reviewing and approving the plan.

At approval stage, each drawing is to include space for the following in the Titleblock:

- Consultant's approval information;
- Consulting Engineer's seal and signature; and
- City of Whitehorse Approvals Signature Block.

All drawings are to be signed & sealed by a Professional Engineer authorized to practice in the Yukon in accordance with the Statutes of the Yukon 2002, Chapter 75 - Engineering Profession Act, Part 6.

2.2.2.2 GENERAL DRAWING LAYOUT

The standard drawing size of A1 (594 mm x 841 mm) is to be used.

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Originals for design approval are to be prepared on hardcopy set plotted at full size.

Plan/Profile sheets are to incorporate the plan information at the top of the sheet with the profile information located directly below. The plan area of the drawing is not to extend onto the profile area. All profiles must be located on the profile section of the drawing.

A north arrow is to be provided on each applicable drawing. Plans are to be oriented with north at the top of the page where possible.

2.2.2.3 SCALES

The following are standard scales for sheets included in a typical engineering drawing set:

| | | |
|----------------|-------------------|--|
| Overall Plans | 1:1000 preferred. | Smaller scale accepted to suit the project |
| Plan/Profile | Horizontal 1:500 | Vertical 1:50 |
| Cross-Sections | Horizontal 1:100 | Vertical scale to suit |

2.2.2.4 DRAWING TECHNIQUES

Text, symbols and linetypes are to be clearly legible, and in accordance with Appendix 2B - Symbols Legend.

Minimum text height is to be 2 mm when plotted at A1 size.

Standard City of Whitehorse symbols are to be inserted at a scale of 1.

Care is to be exercised to ensure balanced distribution of detail throughout the drawing.

Lines are to be continual, coplanar and snapped together.

All linetypes are to be presented consistently on all sheets in drawing set.

Dimensions on engineering drawings are extremely important and should be indicated in a clear format eliminating misinterpretation. Dimensions should be given from a legal pin, lot line, chainage station, centerline, or any other reference that can be readily established. All dimensions are to be provided in SI units and text is to a minimum 2.0 mm height when plotted at A1 size.

All elevations are to be referenced to a Geodetic Survey of Canada datum with the reference benchmark and elevation indicated on the drawings. Benchmark numbers, locations, and elevations can be obtained from the City of Whitehorse Engineering Services Department.

The City of Whitehorse standard template file (dwt) containing all standard blocks, linetypes and layers is available on the Engineering Services webpage along with a City of Whitehorse ctb file for use when plotting.

Also, refer to the Standard Legend Sheet - Appendix 2B of this manual.

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2.2.3 COVER SHEET

The Cover Sheet is to indicate the project title, phase of development, year of construction, submission title, submission date, and names and/or logos for the Developer and Consultant.

2.2.4 DRAWING LIST

The Drawing List is to indicate the drawing title and related number for each sheet comprising the drawing set.

If the Drawing List is relatively small, it can be included on the Cover Sheet or Legend Sheet.

2.2.5 LEGEND SHEET

Each drawing set is to include a Legend Sheet.

The legend sheet is to provide a graphical representation and description for each linetype and symbol used in the drawing set.

All linetypes and symbols used in the drawing set are to conform to Appendix 2B of this manual.

If the legend is relatively small, it can be included on individual drawing sheets as required.

2.2.6 OVERALL PLANS

The following overall plans are to form a part of each drawing set.

2.2.6.1 INDEX

Index plans are to be provided for both Surface Works and Utilities and are to be prepared on a scale of 1:1000 or a reduction thereof to fit the standard size sheet.

Each Index Plan is to indicate the portion of the overall project that relates to individual sheets in the drawing set.

The index plan may also contain a key plan or location plan indicating the overall project location on a larger scale.

2.2.6.2 PRE-GRADING

The Overall Pre-Grading Plan is to be drawn to 1:1000 or a reduction thereof to fit the standard size sheet, and is to indicate the following items as they apply to the project:

- Project Boundaries;
- Location of roads, sidewalks, trails and other relevant surface appurtenances and amenities;
- All existing and proposed property boundaries, lot numbers and easements;
- Original ground contours at a 0.25m interval complete with contour labels plotted at 2.0 mm height;

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- Proposed pre-grading elevations (corresponding to location of design elevations) at finished lot corners and along property line at grade breaks in accordance with the Lot Drainage Type (for urban subdivisions only);
- Labels for all roads and laneways; and
- Labels for all current, future and existing phases of development.

2.2.6.3 GRADING AND DRAINAGE PLAN

The Overall Grading and Drainage Plan is to be drawn to a scale of 1:1000 or a reduction thereof to fit the standard size sheet and is to indicate the following items as they apply to the project:

- Project Boundaries;
- Location of roads, laneways, sidewalks, trails and other relevant surface appurtenances and amenities;
- All existing and proposed property boundaries, lot numbers and easements;
- Locations of catchbasins, manholes, curbs and sidewalks;
- Curb type, at lip of gutter, identified in accordance with linetype indicated on Legend Sheet. Text included in linetype is to be 2mm when plotted;
- All drainage features such as swales, bio swales, ditches, retaining walls and any other type of drainage structure or retention structure;
- Outfall structures including drainage detention and erosion control;
- Original ground contours at a 0.25m interval complete with contour labels plotted at 2.0 mm height;
- Proposed finished lot corner elevations and elevations along property line at grade breaks in accordance with the Lot Drainage Type (for urban subdivisions only);
- Proposed or existing elevations at perimeter of project boundary;
- Lot Drainage Type in accordance with the City of Whitehorse Standard Detail Drawings provided in Section 4 of this manual;
- Labels for all duplex and row housing lots;
- Design drainage pattern for duplex and row housing development complete with drainage arrows;
- Surface slope of roadways labeled with percent grade along with spot elevations at lip of gutter at all grade breaks and points of overflow;
- Indicate ponding depth and extents for a 1 in 100 year event at each catch basin location;

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- Escarpment set back lines (if applicable);
- Direction of major overland surface drainage flows;
- Drainage catchment areas corresponding to storm capacity calculations;
- Supplemental cross sections as required to clarify overland flow;
- Labels for all roads and laneways; and
- Labels for all current, future and existing phases of development.

2.2.6.4 SURFACE WORKS

The Overall Surface Works Plan is to be drawn to a scale of 1:1000 or a reduction thereof to fit the standard size sheet, and is to indicate the following items as they apply to the project:

- Project Boundaries;
- Alignments and widths of roads, sidewalks, laneways, bike lanes and trails;
- Location of all surface improvements including roads, laneways, bike lanes, sidewalks, trails, traffic calming features, catch basins, manholes, curbs, curb cuts, bollards, barricades, gates, guardrails, entrance features, telecommunication pedestals, mailboxes (and their pads), street lights, transformers, switching cubicles, hydrants, valves, planters and all other relevant surface appurtenances and amenities;
- Curb type, at lip of gutter, identified in accordance with linetype indicated on Legend Sheet. Text included in linetype is to be 2mm when plotted;
- All proposed pavement markings and signage;
- All existing and proposed property boundaries, lot numbers and easements;
- Anticipated driveway locations and orientation;
- Zoning for all proposed and existing lots;
- Power and irrigation crossings (full shallow utilities alignments not required);
- Labels for all roads and laneways; and
- Labels for all current, future and existing phases of development.

The Consultant is to have the flexibility to combine the Overall Surface Works Plan with the Overall Drainage Plan for smaller developments and un-serviced rural developments.

2.2.6.5 HYDRANT COVERAGE

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The Overall Hydrant Coverage Plan is to be drawn to a scale of 1:1000 or a reduction thereof to fit the standard size sheet, and is to indicate the following items as they apply to the project:

- Project Boundaries;
- Location of all roads, laneways, sidewalks and trails;
- Alignments for water, sanitary and stormwater mains;
- Location of all water hydrants and all other utility related appurtenances;
- All existing and proposed property boundaries, lot numbers and easements;
- Hydrant coverage radius graphically represented with solid light grey shading and coordinated with required coverages noted in Section 2.3 of this Manual; and
- Labels for all roads and laneways.

2.2.6.6 UTILITIES

The Overall Utilities Plan is to be drawn to a scale of 1:1000 or a reduction thereof to fit the standard size sheet and is to indicate the following items as they apply to the project:

- Project Boundaries;
- Alignments for water, sanitary and stormwater mains and location of all related appurtenances complete with identifiers assigned by the City of Whitehorse Engineering Department;
- Direction of flow;
- Requirements for pressure reducing valves;
- Location of roads, laneways, sidewalks, trails and other relevant surface appurtenances and amenities;
- Location of sanitary and water services for all lots that are not subject to standard placement;
- Alignment of each shallow utility (power, telephone and cable) and location of related appurtenances as received from the relevant Utility to illustrate coordination and absence of conflicts;
- Labels for all roads and laneways; and
- Labels for all current, future and existing phases of development.

Note that depths, locations and required clearances for shallow utilities are to comply with the all other Sections of this Manual.

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2.2.6.7 PLANTING / LANDSCAPING

When applicable, the Planting/Landscaping plan is to indicate the following items as they apply to the project:

- Project Boundaries;
- All existing and proposed property boundaries, lot numbers and easements;
- Location of all curb returns, signage, intersections, driveways, property lines, underground utilities; lighting and other relevant surface appurtenances and amenities;
- Labels for all roads and laneways;
- Identification of proposed trees, shrubs, perennials and ground cover species, clearly labelled and cross-referenced to the plant species schedule;
- Location of proposed planting, complete with dimensions to curb returns, signage, intersections, driveways, property lines, underground utilities; lighting and other relevant surface appurtenances and amenities;
- Location of proposed and existing surface treatments including, but not limited to:
 - Mulched planting beds;
 - Sodded areas; and
 - Hard surfaced areas.
- Location of existing features to be retained, if applicable;
- Large Scale planting details and cross sections as required on a project specific basis, shown at an appropriate scale and cross-referenced to the planting plan;
- Planting details of road islands and medians as required on a project specific basis, drawn at an appropriate scale illustrating suitable rooting zones and indicating:
 - Above and below ground utility alignments within 3.0 m of road island;
 - Curb face;
 - Back of curb, verge or walk;
 - Tree and shrub setbacks;
 - Proposed planting and spacing;
 - Landscape mulches; and
 - Freestanding features, (i.e. signs, gates, pedestals, sculptures and light poles).
- Planting Schedule including:

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- Common name/variety and botanical name;
- Total quantities for each plant species;
- Root treatment (e.g. balled and burlapped, tree spade, bare root or potted);
- Plant material height and/or spread at planting;
- Minimum tree branching height (for streetscape applications only);
- Minimum caliper;
- Maximum caliper/height; and,
- Remarks including special comments or unique installation criteria.
- Schedule of required clearances in accordance with Section 2.8 of this manual;
- Proposed seed and sod mix descriptions, including standard application rate; and
- General planting notes ,to be read in conjunction with project technical specifications, including but not limited to:
 - Scope of work;
 - Applicable reference standards;
 - Minimum and maximum branching heights;
 - Acceptance procedures for substitution of species; and
 - Other general requirements.

Tree symbols included on Planting/Landscaping Plan are to be drawn to indicate mature spread, as per the recommended spacing.

2.2.6.8 IRRIGATION

When applicable, the Irrigation Plan is to indicate the following items as they apply to the project:

- Project Boundaries;
- All existing and proposed property boundaries, lot numbers and easements;
- Alignments for water, sanitary and stormwater mains and all related appurtenances;
- Location of roads, laneways, sidewalks, trails and other relevant surface appurtenances and amenities;
- Labels for all roads and laneways;

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- Alignment of each shallow utility (power, telephone and cable) and location of related appurtenances as received from the relevant Utility to illustrate coordination and absence of conflicts;
- Location of irrigation system in relation to design surface works and underground utilities;
- Schedule of double check valve assemblies;
- Location and detail of irrigation system tie-in to water main along with a materials list for each connection point; and
- Typical assembly, system component, installation, connection and trenching details.

2.2.7 DETAILED PLAN / PROFILE DRAWINGS

Detailed plan/profile drawings are to be drawn to a scale of 1:500 horizontal and 1:50 vertical. Surface Works and Deep Utilities are to be documented on separate sets of plan/profile drawings. The following information is to be included on the detailed plan/profile drawings.

2.2.7.1 SURFACE WORKS PLAN / PROFILE

The following information is to be shown in plan view:

- Road, laneway, and trail alignments;
- Road, laneway and trail names or identifiers;
- Surrounding existing and proposed roads, laneways, trails and surface appurtenances;
- Location of proposed and existing bike laneways;
- Widths of roads, laneways, bike lanes, and trails;
- Design grades at proposed lot corners;
- Proposed edge of walk elevations if applicable;
- Existing or proposed back of lot elevations located adjacent to proposed trail locations;
- Location of existing and proposed bus stop pads and walk connections;
- All existing and proposed property boundaries, lot numbers and easements;
- Offsets to curbs (lip of gutter) and design centerline measured from the property line;
- Drainage flow arrows along gutter line;
- Horizontal curve data including the chainage for beginning of curve, end of curve, delta angle, radius, and arc length at center line;

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- Lip of gutter elevations for beginning of curve, end of curve, and mid-point on all curves and grade change points on roads;
- Point of intersection of road or laneway alignments;
- Location of existing and proposed manholes; catchbasins, hydrants and valves; and
- Lip of gutter elevation at catchbasins; and
- Location of other applicable surface appurtenances.

The following information is to be shown on the profile:

- Existing ground profile (to two decimal places) for the left and right property boundaries and at design centerline;
- Design profile at centerline of road, laneway or trail;
- Design percent grade (to two decimal places) at centerline of road, laneway or trail;
- The chainage (to three decimal places) and elevations (to three decimal places) for beginning of vertical curve, end of vertical curve, and point of vertical intersection;
- Vertical Curve Data: K factor, length of vertical curve, and absolute difference of grade;
- The elevations and chainage (to three decimal places) of the low spot of sag curves or the high spot of crest curves;
- Location, rim elevation, offset from centerline and chainage of existing and proposed sanitary and stormwater manholes;
- Location, flange elevation, and chainage of hydrants; and
- Location of and valves.

Additional requirements for Surface Works Plan / Profile Drawings are:

- Label manholes, catch basins, valves, and hydrants with identifiers as assigned by the City of Whitehorse Engineering Department;
- Reference to legal boundaries in a manner that provides for uncomplicated layout in the field;
- Show the profile at true centerline length and projected below the plan in as close a relationship as possible; and
- Include cross sections where required to clarify design (i.e.: Cross section for typical grading in PUL). Note this element can also be included on Detail Sheets.

2.2.7.2 DEEP UTILITIES PLAN / PROFILE

The following information is to be shown in plan view:

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- Road, laneway, and trail alignment;
- Road, laneway and trail names or identifiers;
- Surrounding existing and proposed roads, laneways, trails;
- All existing and proposed property boundaries, lot numbers and easements;
- Location of existing and proposed manholes and catchbasins;
- Location of hydrants, valves, cleanouts and surface appurtenances;
- Offsets from property line to water, sanitary and stormwater mains;
- Size of water, sanitary and stormwater mains;
- Location of sanitary and water services;
- Size and material of services;
- The design depth of sanitary invert at property line and related design surface elevation at the same location; and
- Length and percent grade (to two decimal places) of catchbasin leads.

The following information is to be shown on the profile:

- Existing ground profile (to two decimal places) for the left and right property boundaries and at design centerline;
- Design profile at centerline of road, laneway or trail;
- Design percent grade (to two decimal places) at centerline of road, laneway or trail to two decimal places
- Profiles of existing and proposed water, sanitary and stormwater mains indicating horizontal length measured from center of manhole to center of manhole and percent grades between manholes (to two decimal places);
- Size and material of existing and proposed water, sanitary and stormwater mains;
- Location, rim elevation, offset from centerline and chainage of proposed and existing manholes;
- Location, flange elevation, and chainage of existing and proposed hydrants;
- Location of existing and proposed valves;
- Invert elevations at all inlets and outlets of existing and proposed manholes;
- The chainage (to three decimal places) and elevations (to three decimal places) of beginning of vertical curve, end of vertical curve, and point of vertical intersection; and

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- Vertical Curve Data: K factor, length of vertical curve, and absolute difference of grade.

Additional requirements for Deep Utilities Plan / Profile Drawings are:

- Indicate identifiers for manholes, catch basins, valves, and hydrants as assigned by the City of Whitehorse Engineering Department;
- Indicate the extent of work required in making the connection to the existing water main, show boundary valves;
- Provide a materials list for all connection points;
- Provide top of slab elevation for manholes larger than 1200 mm diameter; and
- Indicate pipe capacity and velocity information for Storm and Sanitary Sewers:
 - Storm Design – Flow m/s, Capacity m/s and Velocity m/s
 - Sanitary Design – Flow m/s, Capacity m/s and Velocity m/s

2.2.8 CURB RETURN AND INTERSECTION GRADING

As the size and nature of a project dictates, a Curb Return and Intersection Grading Plan might be required. The Curb Return and Intersection Grading Plan is to indicate:

- Location of property lines, curbs, sidewalks, crossings, medians, islands, pararamps, catchbasins, manholes, valves and other relevant surface appurtenances;
- Pavement Markings;
- Road laneways, parking spaces and bicycle lanes;
- Road names;
- Lot Numbers;
- Chainages for road, trail and laneway alignments;
- Curb return labels;
- Curb return data including radius, tangent, length, delta, BC and EC; and
- Proposed elevations at:
 - BC, EC and along curb return;
 - Property corners;
 - Centerline of roads, trails and laneways; and
 - Catchbasins.

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2.2.9 SIGNAGE AND PAVEMENT MARKINGS

A Signage and Pavement Markings Plan is to be drawn to a standard metric scale dictated by the size and nature of the project.

The Signage and Pavement Markings Plan is to indicate the following as they apply to the project:

- Project boundaries;
- Location of roads, bike lanes, sidewalks, trails, traffic calming features, curb cuts, bollards, barricades, gates, guardrails, entrance features and other relevant surface appurtenances and amenities;
- All existing and proposed property boundaries, lot numbers and easements;
- Labels for all roads and laneways;
- Design speeds for roads;
- Location of all proposed parking spaces;
- Proposed bus routing and locations of bus stops / bus stop pads;
- Pavement Markings
 - Location of all existing and proposed pavement markings and all proposed pavement marking modifications; and
 - Dimensions and colour of proposed pavement markings.
- Signage
 - Location of existing and proposed signage and all proposed signage modifications;
 - Graphic representation and label for each sign; and
 - Standard drawing symbol identifying specific orientation, rotation and placement for each sign.
- Drawing Legend
 - Symbols for existing and proposed signs; and
 - Graphic representation and label for all signs.

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2.2.10 TYPICAL CROSS SECTIONS

The Typical Cross Sections Plan is to be drawn to a scale of 1:100 or a reduction thereof to fit the standard size sheet and is to indicate the following items as they apply to the project:

- Design centerline location;
- Pavement structure and crown profile;
- Curb profile and location dimensioned from centerline;
- Side slope conditions;
- Location of street furniture including, but not limited to, hydrants, sidewalks, streetlights, landscaping and medians;
- Width of roads, laneways, trails, sidewalks, bike lanes, road shoulders and other relevant surface conditions dimensioned continuously from design centerline ; and
- Location and depth of underground deep and shallow utilities.

2.2.11 TYPICAL DETAILS

The Typical Detail Plan is to include all of the pertinent details of the project including, but not limited to, the following:

- Typical culvert installations;
- Typical pipe bedding detail;
- Typical details for manholes, catch basins, manhole and catch basin covers, hydrants, valves, bollards, and reaction blocks;
- Typical line painting details;
- Typical details for lot drainage type in accordance with Standard Details in Section 4 of this manual;
- Typical water and sewer connection details;
- Typical water and sewer crossing details;
- Typical curb profiles and crossing details;
- Typical common trench detail indicating distance between pipes and class of pipe; and
- All other details as required.

Details are to conform to those included in Section 4 – Standard Detail Drawings. These details are available in pdf format on the City of Whitehorse Engineering Services webpage.

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2.2.12 RECORD DRAWINGS

Record Drawings are to be in accordance with Section 1.6 and submitted to the Engineer within 60 days of issuance of CCC.

The procedure described pertains to Record Drawings of the following structures:

- Storm sewers, sanitary sewers, water mains and their services;
- Trench plugs;
- Roads, curbs, sidewalks, culverts, and shallow utilities; and
- Other miscellaneous permanent structures.

Any field changes or additions made in the course of construction (not included on the IFC Drawing Set) must be noted along with the following information (if applicable to the project):

- Dimensioned locations of all hydrants, control valves, tees, bends, valves, reducers and plugs from property lines;
- Type and class of all pipes;
- Location of all service test points;
- Dimensions to manhole locations from property lines in two directions;
- All revisions to typical cross-sections; and
- Location of all abandoned water and sanitary mains, noted accordingly.

Entities shown as existing on the design drawings and removed during construction are to be removed from the Record Drawing Set.

All pages of Record Drawing Sets are to be clearly marked “Plan of Record” are to include the following:

- Signed Seal and Permit to Practice for of Engineer of Record; and
- Plan of Record stamp filled out and signed by the Contractor.