CITY OF
COURTENAY

# SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 3200

SEPT 2025

**SUPPLEMENTARY DESIGN GUIDELINES**

This schedule contains supplementary design guidelines to be applied in conjunction with the Design Guideline Manual of the Master Municipal Construction Documents, dated 2014, both of which shall apply to all Works and Services constructed within the City of Courtenay.

Supplementary Design Guidelines contained within this Schedule supplement or supersede the Master Municipal Construction Document (MMCD). Where the City of Courtenay Supplementary Design Guidelines are in conflict with the MMCD, the City of Courtenay Supplementary Design Guidelines shall take precedence.

Section number and clause numbers in the City of Courtenay Supplementary Design Guidelines coincide with the MMCD numbering protocol.

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**SECTION**

7.0 TRAFFIC SIGNALS

## 1.0 GENERAL DESIGN CONSIDERATIONS

| | | | |
|---|---|---|---|
| **1.2** | **Independent Utilities** | Add Section 1.2.1 | Design for location and relocation of Canada Post Mailbox shall be coordinated with Canada Post. |

## 2.0 WATER DISTRIBUTION

**2.2 Metering** — Replace Section

For all single family residential homes without fire sprinklers the water meter setter size shall be 25mm except in the case where there is a demonstrated need for a larger meter. All other meters must be sized in accordance with AWWA M22 and form contained in Appendix A. It should be noted that this methodology is based on the fixture value method and not the fixture unit method employed in the BC Building Code for piping within buildings.

The maximum operating range for a water meter shall be less than 80% of the maximum instantaneous flow capacity as outlined by the meter manufacturer, with a maximum pressure loss of 48 kPa at the design flow rate. The size selection must not compromise the operating range or the long term life of the meter and must ensure that pressures supplied to property are appropriate for the intended use.

For developments that are proposed to be phased, the meter chamber and piping must be sized for the meter required for the ultimate buildout of the development. However, the initial meter installed must also be sized to accurately capture the range of flows for the first phase.

The Qualified Professional must ensure the meter selection and installation requirements are appropriate for the designed application.

A Qualified Professional must provide detailed sealed drawings and shop drawings of the installation and relevant calculations, to demonstrate the appropriateness of the sizing of the meter, for approval prior to installing the chamber.

**2.3 Per Capita Demand** — Replace Section

In the absence of reliable water consumption records, the following per capita demands shall be applied to future residential development:

- ADD: 635 L/c/d
- Peak Day: 2100 L/c/d
- Peak Hour: 3000 L/c/d

| | | | |
|---|---|---|---|
| **2.9** | **Minimum Pipe Diameter** | Delete | Service Connections: 19mm |
| | | Replace with | Service Connections: 25mm |
| **2.14** | **Valves** | Delete | • The valves shall be the same diameter as the watermain up to 300mm diameter<br>• The main line valves on mains 350 mm and 400 mm diameter may be smaller by one (10 size with the use of proper reducers<br>• The main line valves on mains 450 mm diameter and larger may be smaller by two (2) sizes with the use of proper reducers |
| | | Replace with | • The main line valves on mains of all sizes shall be of the same nominal diameter as the watermain. |
| **2.15** | **Hydrants** | Add Bullet | • STORZ connection must face the road or cul-de-sac at 90 degrees. |
| **2.18** | **Air Valves** | Replace Section | Combination air valves must be installed at the summits of all mains of 200 mm diameter and larger, except as follows:<br>• Where the difference in elevation between the summit and valley is less than 600 mm.<br>• Where it can be shown that air pockets will be carried by typical flows.<br>• Where active service connections are suitably located to dissipate trapped air.<br>Typical air valve sizes, subject to design analysis, are as follows (Table 2.18) |
| **2.21** | **Service Connections** | Add to Section | Every legal lot and each unit of residential duplex must be provided with a separate service connection. |

**Table 2.18 Typical Air Valve sizes**

| Watermain Size | Valve Size |
|---|---|
| 200 mm to 300 mm | 25 mm |
| 350 mm to 600 mm | 50 mm |
| Larger than 600 mm | Special Design |

Air Valves located in a flood plain shall be of a manual permanent blow type

**2.25.2 Design Features** Replace Section

General requirements for pressure reducing stations shall be as follows:

- Include a dual Pressure Reduction Valve (PRV) arrangement with separate domestic and fire flow PRV's.
    - Epoxy coated valve bodies both inside and out.
    - Fire flow PRV must be equipped with a position indicator (limit switch).
    - Domestic flow PRV must be equipped with position indicator and insertion flow meter.
    - Filters shall be provided on all valve control piping.
    - All piloting shall be set to fail close.
- Include a surge/high pressure relief valve with stainless steel mesh dechlorination basket (capable of housing a minimum of 8 – 65mm dechlorination pucks).
- Pressure relief valves and surge relief valves to include anti-cavitation trim where recommended by the manufacturer based on site specific differential pressures.
- Each PRV and surge relief valve must be provided with isolating valves such that individual components can be removed for repair and each component can be operated independently.
- Pressure gauges and pressure transducers complete with snubbers and isolating valves must be included to register both upstream and downstream pressure.
- All piping and fittings, including control piping, must be stainless steel;
- Grooved couplings must be included to assist in disassembly of piping as required.
- All equipment and controls must be mounted in an above ground secure, lockable cabinet, on a concrete foundation. The cabinet shall be as follows:
    - Include two separate compartments, including one for the electrical controls and another for the mechanical piping and valves. All compartments must be heated, lighted and the controls enclosure must be ventilated.
    - Include removable roof hatch above the Mechanical compartment.

  - Fabricated from powder coated aluminum.
  - Include a rubber gasket between the aluminum kiosk and the concrete to prevent water leakage into the kiosk.
- The PRV station include 8 hours of uninterruptible power (UPS) and a user control interface (HMI).
- The PRV station must be integrated with the City's SCADA system via ethernet or cellular telephone connection to monitor at a minimum:
  - PRV valve position.
  - Utility failure.
  - Access intrusion.
  - Limits switches.
  - High pressure relief.
  - Flow data.

## 3.0 SANITARY SEWERS

| | | | |
|---|---|---|---|
| **3.2** | **Per Capita Flow** | Replace Section | In the absence of sanitary sewer flow records, sanitary sewer system design should be based on an average daily dry weather flow (ADWF) of 360 litres per day per capita (L/d/c). |
| **3.8** | **Flow Velocities** | Delete | ▪ Force mains: 0.75 m/s |
| | | Replace with | ▪ Force mains: 0.9 m/s |
| **3.10** | **Minimum Pipe Diameter** | Replace Section | The minimum pipe diameter is 200mm.<br><br>Sewers must be designed to satisfy the following parameters:<br><br>▪ 200mm diameter and less: d/D < 0.5.<br>▪ 250mm diameter: d/D < 0.7.<br>▪ 300mm diameter and greater: d/D < 0.8. |
| **3.12** | **Curved Sewers** | Replace Section | On straight roads, sanitary sewers shall be installed in straight runs such that sewer mains and manholes are entirely under the road pavement and no closer than 1m to the curb. Curvilinear sewers are permitted on horizontal curves and shall have a constant offset from property line. The radius of curve shall not exceed 50% of the manufacturer's recommended maximum and shall not be less than 60m. The minimum grade shall be 1% and each joint shall be located by survey. Manholes are to be installed at the beginning and end of horizontal curve sections. Curvilinear sewers are not permitted on vertical curves<br><br>The minimum design velocity design velocity in curved sewers is 0.9 m/s. |
| **3.14.1** | **Locations** | Replace Section | Manholes are required at the following locations:<br><br>▪ Every change of pipe size.<br>▪ Every change in grade.<br>▪ Every change in direction.<br>▪ Every pipe intersection except for 100 mm and 150 mm service connections and junctions with trunk sewers 900 mm diameter and larger.<br>▪ Every future pipe intersection. |

- 150 m maximum spacing for pipe diameters up to 450 mm.
- 300 m maximum spacing for pipe diameter of 450 mm and larger.
- Every beginning and end of horizontal curves.

**3.14.2 Hydraulic Details**

Replace Table 3.14

**Table 3.14 Drop Structures**

| Invert Difference | Structure |
|---|---|
| Up to 0.25 m | Inside Ramp |
| 0.25 to 0.90 m | Outside Ramp |
| Greater than 0.90 m | Outside Drop* |
| *Inside drop structures are not permitted | |

Delete Sentence

If a manhole drop cannot be avoided, an inside drop pipe is required.

**3.16.3 Grade**

Delete

- 100 mm diameter pipe: 1.50%

Replace with

- 100mm diameter pipe: 2% min.

**3.16.4 Details**

Replace Section

Use standard wye fittings for connections to new mains. For connections to existing mains, strap on saddle and insertable tees are permitted.

The service connection centreline must not be below the sewer main centreline.

Residential service connections are not to be connected to manholes. All wye connections to be a minimum of 1.0 m downstream from manhole.

Inspection chambers are required on residential connections. Control manholes are required on industrial connections and commercial connections. Inspection manholes are required on service connections 200mm diameter and larger.
Connections exceeding 30 m in length will be treated as mains.

**3.18 Pump Stations**

Replace Section

Replace this section with the document “Standards for Sanitary Lift Stations”, provided in Schedule 4.

## 4.0 STORMWATER MANAGEMENT

**4.1.1 Drainage Planning** Add Section 4.1.1

The Developer shall prepare such plans prior to approval of the development applications. Such plans shall provide an in-depth review of stormwater opportunities and constraints on a specific watershed, and take into consideration the potential impacts and remediation measures for the affected watercourses.

Submission requirements for Developers are in accordance with 2014 MMCD Design Guideline Manual Stormwater Management Section 4.2: Stormwater Control Plan.

**4.1.2 Master Drainage Plan** Add Section 4.1.2

The Master Drainage Plan (MDP), Watershed Plan (WP) or Integrated Stormwater Management Plan (ISMP) proposes an optimum drainage servicing strategy that meets the ultimate land use in the watershed. If a City MDP is not available, developments with a cumulative phased development area greater than 5 hectares are required to provide an acceptable MDP. The proposed MDP must address all identified constraints and provide the following information as required:

- Conceptual schemes for storm drainage servicing including trunk storm sewers, catchment detention ponds, minor and major flow routes, and erosion protection.
- Department of Fisheries & Oceans and BC Ministry of Forests, Lands, Natural Resource Operations and & Rural Development review.
- Hydrological and hydraulic model of pre-development and ultimate development condition.
- Bio-inventory of creeks and watercourses.
- Hydrogeological Impact Assessment (in areas where DFO and MOE jointly require its consideration).
- Inventory of watercourses and trunk drainage facilities.
- Sizes and performance requirements of catchment detention areas.
- Priority of MDP recommendations.

| | | | |
|---|---|---|---|
| **4.3.1** | **The Minor System** | Replace Section | Consists of pipes, gutters, catch basins, driveway culverts, open channels, watercourses and stormwater management "best management practices" (BMPs) designed to capture, convey, treat or modify flows up to and including the 1 in 10 year return period storm event. |
| **4.3.2** | **The Major System** | Replace Section | Consists of surface flow paths, roadways culverts, watercourses, and stormwater management facilities designed to capture, convey, treat or modify larger flows up to and including the 1 in 100 year return period storm event.<br><br>If required to accommodate low building elevations, and if approved, a piped minor system may be enlarged or supplemented to accommodate major flows. |
| **4.3.3** | **Stormwater Detention Release Rates** | Add Section 4.3.3 | All stormwater detention facilities shall be designed to limit post-development peak flows to equal to the corresponding pre-development peak flows for the 1 in 2, 1 in 5, 1 in 10 and 1 in 25 year return period storm events. Overland escape routes must be provided to account for greater storms up to 1 in 100 year return period in a manner which does not result in flooding of any properties. Design rainfall intensities have been increased by 15% as indicated in Section 4.4.<br><br>The total volume of runoff generated during storms can also have a significant impact on receiving watercourses. To the extent possible, the total runoff generated from storms should be minimized through the application of site adaptive planning and the use of source controls. Site adaptive planning focuses on limiting total imperviousness at development sites and preserving natural features such as wetlands, forests and native soils. Source controls focus on reducing volume by retaining or enhancing opportunities for infiltration and evapotranspiration on development sites.<br><br>Discharge shall be controlled such that the downstream watercourses receiving outflow from detention facilities are protected from surcharge and erosion. Where stability cannot be maintained, measures to avoid or mitigate erosion shall be proposed. |

**4.4 Runoff Analysis**

Delete Bullet

- Hydrograph Method: Applicable for all areas larger than 10 hectares, more hydrologically complex catchments, and where stormwater management systems require more than basic conveyances. The computer program proposed for use is subject to approval by the local authority. The program should be selected to suit the complexity of the watershed and the hydrologic processes that need to be considered (e.g. detention, groundwater recharge and infiltration, evapotranspiration, continuous simulation, etc.) The most widely used programs (or software packages) are those that are SWMM based, however are constantly evolving, it is inappropriate for this guide document to state or endorse any particular ones.

Replace with

- Hydrograph Method: Applicable for complex systems involving multiple catchments with highly variable land use conditions, where flow attenuation features are involved (eg. detention pond, constructed wetland), or for gross areas exceeding 10 hectares. Computer models shall be based on the U.S. Environmental Protection Agency's SWMM software.

Add Bullet

- Mass Balance: Volumetric based computations may be used to supplement flow analysis for the design of water quality treatment BMPs and BMPs intended for stormwater detention.

Add to Section

Computer stormwater models shall utilize the 10 and 100 year return period design storm hyetographs provided in Table 4.4.2. These hyetographs have been derived using the Modified Chicago Distribution for a 24 hour storm duration. The hyetographs have also been adjusted to reflect a 15% increase in rainfall intensities.

**Note:** Performance of the drainage systems may be under the influence of ocean levels and pump stations, and therefore may surcharge under certain conditions. Aside from the runoff analysis method

applied, hydraulic grade lines shall be indicated in design drawings and associated system performance shall consider governing downstream hydraulic boundary conditions.

**Figure 4.4: Intensity Duration Frequency Curves – Courtenay Puntledge BCHP ID: 1021990**
**15% Increase from Historical Intensities (mm/hr)**
**Years of Record: 1964-1995 (35 Years)**

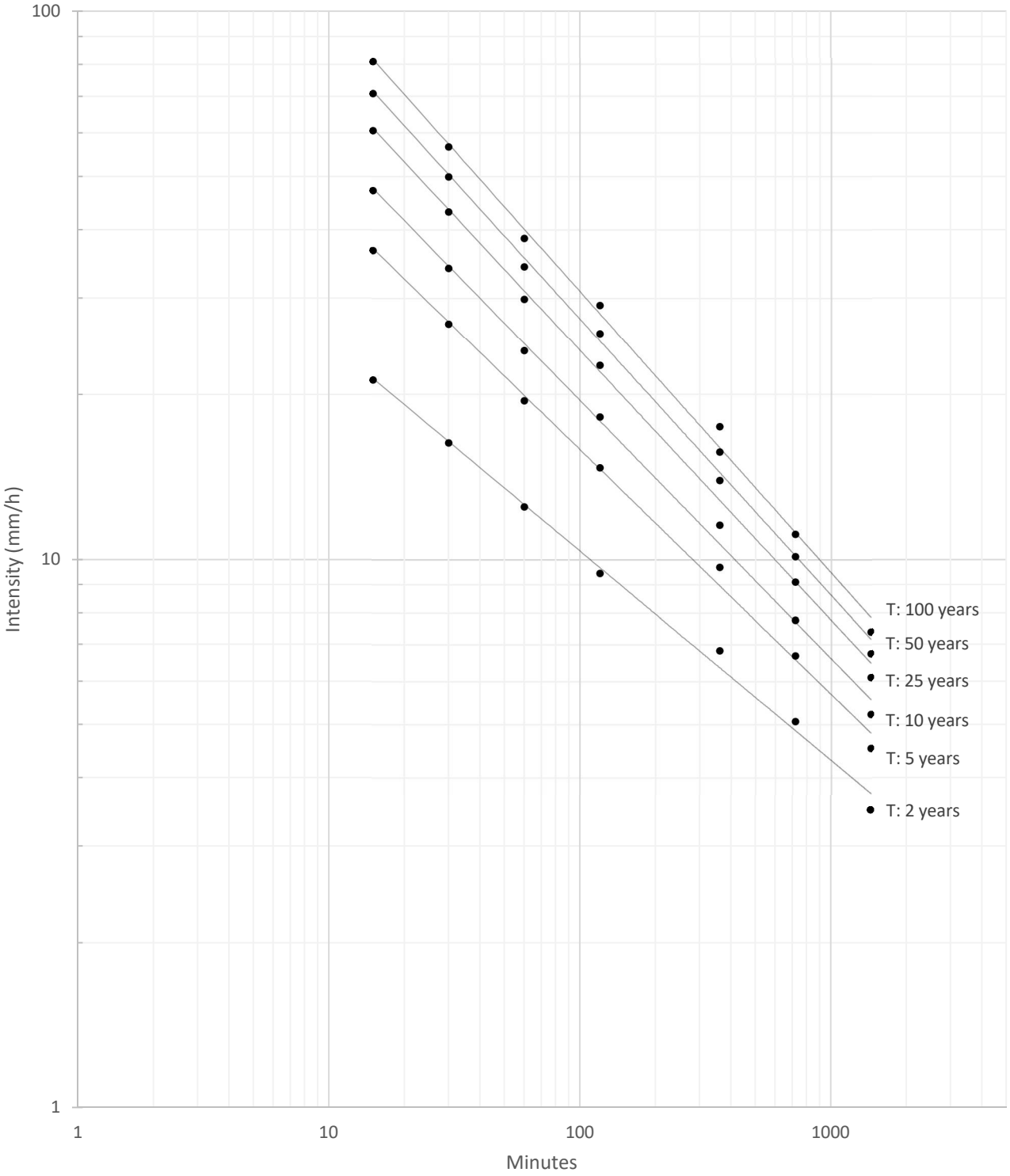

**Table 4.4.1: IDF Curve Intensity Table Summary**
**15% Increase from Historical Intensities (mm/hr)**

| Time | | Return Frequency | | | | | |
|---|---|---|---|---|---|---|---|
| Minutes | Hours | 2 yr | 5 yr | 10 yr | 25 yr | 50 yr | 100 yr |
| 15 | 0.25 | 21.3 | 36.7 | 47.2 | 60.7 | 70.8 | 80.9 |
| 30 | 0.5 | 16.3 | 26.9 | 34.1 | 43.1 | 49.9 | 56.7 |
| 60 | 1 | 12.5 | 19.5 | 24.1 | 29.9 | 34.3 | 38.6 |
| 120 | 2 | 9.5 | 14.7 | 18.2 | 22.6 | 25.9 | 29.1 |
| 360 | 6 | 6.8 | 9.7 | 11.6 | 14.0 | 15.7 | 17.5 |
| 720 | 12 | 5.1 | 6.7 | 7.8 | 9.1 | 10.1 | 11.1 |
| 1440 | 24 | 3.5 | 4.5 | 5.2 | 6.1 | 6.8 | 7.4 |

Note: 15 and 30 minute durations have been extrapolated from historical IDF Curve

**Table 4.4.2: Interpolation Equation of IDF Curve – Historical Data**
**$R = A * T^B$ where: R = Rainfall (mm/hr), A and B = Coefficients, based on return period**

| Parameters | Return Frequency | | | | | |
|---|---|---|---|---|---|---|
| | 2 yr | 5 yr | 10 yr | 25 yr | 50 yr | 100 yr |
| A | 11.0 | 17.5 | 21.9 | 27.3 | 31.4 | 35.5 |
| B | -0.386 | -0.452 | -0.477 | -0.499 | -0.511 | -0.521 |

Note: Coefficients are based on Historical Data - 15% must be added to resulting intensities

## Table 4.4.3: Modified Chicago Distribution – 24 Hr Design Storm Data (10 Minute Increment)
## 15% Increase from Historical Intensities (mm/hr)
## Years of Record: 1964-1995 (35 Years)

| Time (min) | Return Frequency | | | | |
|---|---|---|---|---|---|
| | 2 year | 5 year | 10 year | 25 Year | 100 year |
| 0 | 2.29 | 2.64 | 2.91 | 3.24 | 3.76 |
| 10 | 2.31 | 2.66 | 2.94 | 3.28 | 3.80 |
| 20 | 2.33 | 2.69 | 2.98 | 3.32 | 3.85 |
| 30 | 2.35 | 2.72 | 3.01 | 3.36 | 3.90 |
| 40 | 2.38 | 2.76 | 3.05 | 3.40 | 3.95 |
| 50 | 2.40 | 2.79 | 3.09 | 3.45 | 4.01 |
| 60 | 2.43 | 2.82 | 3.13 | 3.49 | 4.07 |
| 70 | 2.45 | 2.86 | 3.17 | 3.54 | 4.12 |
| 80 | 2.48 | 2.90 | 3.21 | 3.59 | 4.19 |
| 90 | 2.51 | 2.93 | 3.26 | 3.65 | 4.25 |
| 100 | 2.54 | 2.97 | 3.30 | 3.70 | 4.32 |
| 110 | 2.57 | 3.02 | 3.35 | 3.76 | 4.39 |
| 120 | 2.60 | 3.06 | 3.40 | 3.82 | 4.46 |
| 130 | 2.63 | 3.11 | 3.46 | 3.88 | 4.54 |
| 140 | 2.67 | 3.15 | 3.52 | 3.95 | 4.62 |
| 150 | 2.70 | 3.21 | 3.58 | 4.02 | 4.71 |
| 160 | 2.74 | 3.26 | 3.64 | 4.10 | 4.80 |
| 170 | 2.78 | 3.32 | 3.71 | 4.17 | 4.89 |
| 180 | 2.83 | 3.38 | 3.78 | 4.26 | 5.00 |
| 190 | 2.87 | 3.44 | 3.85 | 4.35 | 5.11 |
| 200 | 2.92 | 3.51 | 3.93 | 4.44 | 5.22 |
| 210 | 2.97 | 3.58 | 4.02 | 4.54 | 5.35 |
| 220 | 3.03 | 3.66 | 4.11 | 4.65 | 5.48 |
| 230 | 3.08 | 3.74 | 4.21 | 4.77 | 5.62 |
| 240 | 3.15 | 3.83 | 4.31 | 4.89 | 5.78 |
| 250 | 3.21 | 3.92 | 4.43 | 5.03 | 5.94 |
| 260 | 3.29 | 4.03 | 4.55 | 5.18 | 6.13 |
| 270 | 3.37 | 4.14 | 4.69 | 5.34 | 6.33 |
| 280 | 3.45 | 4.27 | 4.84 | 5.52 | 6.55 |
| 290 | 3.55 | 4.41 | 5.00 | 5.71 | 6.79 |
| 300 | 3.65 | 4.56 | 5.19 | 5.93 | 7.07 |
| 310 | 3.77 | 4.73 | 5.39 | 6.18 | 7.38 |
| 320 | 3.90 | 4.93 | 5.63 | 6.46 | 7.73 |
| 330 | 4.05 | 5.15 | 5.90 | 6.79 | 8.13 |
| 340 | 4.23 | 5.41 | 6.21 | 7.17 | 8.61 |
| 350 | 4.43 | 5.72 | 6.59 | 7.62 | 9.18 |
| 360 | 4.68 | 6.09 | 7.04 | 8.17 | 9.87 |
| 370 | 4.98 | 6.56 | 7.61 | 8.86 | 10.74 |
| 380 | 5.37 | 7.16 | 8.34 | 9.76 | 11.88 |
| 390 | 5.89 | 7.98 | 9.36 | 11.00 | 13.47 |
| 400 | 6.66 | 9.22 | 10.90 | 12.90 | 15.90 |
| 410 | 8.00 | 11.43 | 13.68 | 16.37 | 20.39 |
| 420 | 11.84 | 18.14 | 22.30 | 27.33 | 34.86 |
| 430 | 25.10 | 44.93 | 58.80 | 76.25 | 103.14 |
| 440 | 12.39 | 19.06 | 23.47 | 28.80 | 36.78 |
| 450 | 9.84 | 14.55 | 17.65 | 21.37 | 26.93 |
| 460 | 8.54 | 12.33 | 14.82 | 17.79 | 22.24 |
| 470 | 7.71 | 10.93 | 13.05 | 15.57 | 19.35 |
| 480 | 7.11 | 9.94 | 11.80 | 14.02 | 17.34 |

| Time (min) | Return Frequency | | | | |
|---|---|---|---|---|---|
| | 2 year | 5 year | 10 year | 25 Year | 100 year |
| 490 | 6.65 | 9.19 | 10.86 | 12.86 | 15.84 |
| 500 | 6.28 | 8.60 | 10.12 | 11.94 | 14.67 |
| 510 | 5.97 | 8.11 | 9.52 | 11.20 | 13.72 |
| 520 | 5.72 | 7.70 | 9.02 | 10.58 | 12.93 |
| 530 | 5.49 | 7.35 | 8.59 | 10.06 | 12.26 |
| 540 | 5.30 | 7.05 | 8.22 | 9.60 | 11.68 |
| 550 | 5.13 | 6.79 | 7.89 | 9.20 | 11.17 |
| 560 | 4.98 | 6.55 | 7.60 | 8.85 | 10.73 |
| 570 | 4.84 | 6.34 | 7.34 | 8.54 | 10.33 |
| 580 | 4.72 | 6.15 | 7.11 | 8.25 | 9.97 |
| 590 | 4.60 | 5.98 | 6.90 | 8.00 | 9.65 |
| 600 | 4.50 | 5.82 | 6.71 | 7.76 | 9.35 |
| 610 | 4.40 | 5.67 | 6.53 | 7.55 | 9.08 |
| 620 | 4.31 | 5.54 | 6.36 | 7.35 | 8.84 |
| 630 | 4.23 | 5.41 | 6.21 | 7.17 | 8.61 |
| 640 | 4.15 | 5.29 | 6.07 | 7.00 | 8.39 |
| 650 | 4.08 | 5.19 | 5.94 | 6.84 | 8.19 |
| 660 | 4.01 | 5.08 | 5.82 | 6.69 | 8.01 |
| 670 | 3.94 | 4.99 | 5.70 | 6.55 | 7.84 |
| 680 | 3.88 | 4.90 | 5.59 | 6.42 | 7.67 |
| 690 | 3.83 | 4.81 | 5.49 | 6.30 | 7.52 |
| 700 | 3.77 | 4.73 | 5.39 | 6.18 | 7.37 |
| 710 | 3.72 | 4.66 | 5.30 | 6.07 | 7.24 |
| 720 | 3.67 | 4.58 | 5.22 | 5.97 | 7.11 |
| 730 | 3.62 | 4.51 | 5.13 | 5.87 | 6.99 |
| 740 | 3.58 | 4.45 | 5.05 | 5.77 | 6.87 |
| 750 | 3.53 | 4.39 | 4.98 | 5.68 | 6.76 |
| 760 | 3.49 | 4.33 | 4.91 | 5.60 | 6.65 |
| 770 | 3.45 | 4.27 | 4.84 | 5.52 | 6.55 |
| 780 | 3.42 | 4.21 | 4.77 | 5.44 | 6.45 |
| 790 | 3.38 | 4.16 | 4.71 | 5.36 | 6.36 |
| 800 | 3.34 | 4.11 | 4.65 | 5.29 | 6.27 |
| 810 | 3.31 | 4.06 | 4.59 | 5.22 | 6.18 |
| 820 | 3.28 | 4.01 | 4.53 | 5.15 | 6.10 |
| 830 | 3.25 | 3.97 | 4.48 | 5.09 | 6.02 |
| 840 | 3.21 | 3.92 | 4.43 | 5.03 | 5.94 |
| 850 | 3.18 | 3.88 | 4.38 | 4.97 | 5.87 |
| 860 | 3.16 | 3.84 | 4.33 | 4.91 | 5.80 |
| 870 | 3.13 | 3.80 | 4.28 | 4.85 | 5.73 |
| 880 | 3.10 | 3.76 | 4.24 | 4.80 | 5.66 |
| 890 | 3.08 | 3.73 | 4.19 | 4.75 | 5.60 |
| 900 | 3.05 | 3.69 | 4.15 | 4.70 | 5.54 |
| 910 | 3.03 | 3.66 | 4.11 | 4.65 | 5.48 |
| 920 | 3.00 | 3.62 | 4.07 | 4.60 | 5.42 |
| 930 | 2.98 | 3.59 | 4.03 | 4.56 | 5.36 |
| 940 | 2.96 | 3.56 | 3.99 | 4.51 | 5.31 |
| 950 | 2.93 | 3.53 | 3.96 | 4.47 | 5.26 |
| 960 | 2.91 | 3.50 | 3.92 | 4.43 | 5.20 |
| 970 | 2.89 | 3.47 | 3.89 | 4.39 | 5.15 |

| Time (min) | Return Frequency | | | | |
|---|---|---|---|---|---|
| | 2 year | 5 year | 10 year | 25 Year | 100 year |
| 980 | 2.87 | 3.44 | 3.85 | 4.35 | 5.10 |
| 990 | 2.85 | 3.41 | 3.82 | 4.31 | 5.06 |
| 1000 | 2.83 | 3.38 | 3.79 | 4.27 | 5.01 |
| 1010 | 2.81 | 3.36 | 3.76 | 4.23 | 4.97 |
| 1020 | 2.80 | 3.33 | 3.73 | 4.20 | 4.92 |
| 1030 | 2.78 | 3.31 | 3.70 | 4.16 | 4.88 |
| 1040 | 2.76 | 3.28 | 3.67 | 4.13 | 4.84 |
| 1050 | 2.74 | 3.26 | 3.64 | 4.10 | 4.80 |
| 1060 | 2.73 | 3.24 | 3.61 | 4.06 | 4.76 |
| 1070 | 2.71 | 3.21 | 3.58 | 4.03 | 4.72 |
| 1080 | 2.69 | 3.19 | 3.56 | 4.00 | 4.68 |
| 1090 | 2.68 | 3.17 | 3.53 | 3.97 | 4.64 |
| 1100 | 2.66 | 3.15 | 3.51 | 3.94 | 4.61 |
| 1110 | 2.65 | 3.13 | 3.48 | 3.91 | 4.57 |
| 1120 | 2.63 | 3.11 | 3.46 | 3.88 | 4.54 |
| 1130 | 2.62 | 3.09 | 3.44 | 3.86 | 4.51 |
| 1140 | 2.60 | 3.07 | 3.41 | 3.83 | 4.47 |
| 1150 | 2.59 | 3.05 | 3.39 | 3.80 | 4.44 |
| 1160 | 2.58 | 3.03 | 3.37 | 3.78 | 4.41 |
| 1170 | 2.56 | 3.01 | 3.35 | 3.75 | 4.38 |
| 1180 | 2.55 | 2.99 | 3.32 | 3.73 | 4.35 |
| 1190 | 2.54 | 2.97 | 3.30 | 3.70 | 4.32 |
| 1200 | 2.52 | 2.96 | 3.28 | 3.68 | 4.29 |
| 1210 | 2.51 | 2.94 | 3.26 | 3.65 | 4.26 |
| 1220 | 2.50 | 2.92 | 3.24 | 3.63 | 4.23 |
| 1230 | 2.49 | 2.91 | 3.22 | 3.61 | 4.20 |
| 1240 | 2.47 | 2.89 | 3.21 | 3.59 | 4.18 |
| 1250 | 2.46 | 2.87 | 3.19 | 3.56 | 4.15 |
| 1260 | 2.45 | 2.86 | 3.17 | 3.54 | 4.12 |
| 1270 | 2.44 | 2.84 | 3.15 | 3.52 | 4.10 |
| 1280 | 2.43 | 2.83 | 3.13 | 3.50 | 4.07 |
| 1290 | 2.42 | 2.81 | 3.12 | 3.48 | 4.05 |
| 1300 | 2.41 | 2.80 | 3.10 | 3.46 | 4.03 |
| 1310 | 2.40 | 2.78 | 3.08 | 3.44 | 4.00 |
| 1320 | 2.39 | 2.77 | 3.06 | 3.42 | 3.98 |
| 1330 | 2.38 | 2.76 | 3.05 | 3.40 | 3.95 |
| 1340 | 2.37 | 2.74 | 3.03 | 3.38 | 3.93 |
| 1350 | 2.36 | 2.73 | 3.02 | 3.37 | 3.91 |
| 1360 | 2.35 | 2.72 | 3.00 | 3.35 | 3.89 |
| 1370 | 2.34 | 2.70 | 2.99 | 3.33 | 3.87 |
| 1380 | 2.33 | 2.69 | 2.97 | 3.31 | 3.84 |
| 1390 | 2.32 | 2.68 | 2.96 | 3.29 | 3.82 |
| 1400 | 2.31 | 2.66 | 2.94 | 3.28 | 3.80 |
| 1410 | 2.30 | 2.65 | 2.93 | 3.26 | 3.78 |
| 1420 | 2.29 | 2.64 | 2.91 | 3.25 | 3.76 |
| 1430 | 2.28 | 2.63 | 2.90 | 3.23 | 3.74 |
| 1440 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| **4.9.6** | **Minimum Pipe Diameter** | Replace Section | ▪ Storm Sewer 250 mm<br>▪ Culvert:<br>-Crossing Roads 450 mm<br>-Crossing Driveways 300 mm<br>▪ Catch Basin Leads 200 mm<br>▪ Service Connections:<br>-Residential 150 mm<br>-Commercial/industrial 150 mm<br><br>Downstream pipe sizes are not to be reduced unless the downstream pipe is 600 mm diameter or larger and increased grade provides adequate capacity. Detailed hydraulic analysis is required. That maximum reduction is two pipe sizes. |
| **4.9.8** | **Curved Sewers** | Replace Section | On straight roads, storm sewers shall be installed in straight runs such that sewer mains and manholes are entirely under the road pavement and no closer than 1m to the curb. Curvilinear sewers are permitted on horizontal curves and shall have a constant offset from property line. The radius of curve shall not exceed 50% of the manufacturer's recommended maximum and shall not be less than 60m. The minimum grade shall be 1% and each joint shall be located by survey. Manholes are to be installed at the beginning and end of horizontal curve sections. Curvilinear sewers are not permitted on vertical curves<br><br>The minimum design velocity in curved sewers is 0.9 m/s.<br><br>Sewers larger than 600 mm diameter may include deflections formed by mitred bends to a maximum mitre of 45°. |
| **4.9.10** | **Pipe Joints** | Replace Section | All pipe joints shall be gasketed and water tight. |
| **4.9.14** | **Service Connections** | Delete | ▪ Details<br><br>Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles or, if approved, insertable tees.<br><br>Service connections may be permitted into manholes if: |

- The connection is not oriented against the flow in the main.
- Manhole hydraulic requirements are met.

Replace with

- Details

Use standard wye fittings for connections to new PVC and HDPE mains. For connections to existing PVC and HDPE mains, strap on saddle and insertable tees are permitted. For connections to new or existing concrete mains, a cored tee is required.

The service connection centreline must not be below the sewer main centreline.

No services shall be directly connected to manholes, all wye connections must be a minimum of 1.0 m downstream from manholes.

**4.10.3 Surface Flow Capacity** — Add to Section

Surface swale shall only traverse three lots downstream before directing into a surface inlet. The swale shall be included in an across lot drainage easement.

**4.11.2 Underground Storage** — Add to Section

Other detention facilities such as underground storage will be considered for approval at the discretion of the City.

**4.11.3 Dry Detention Ponds** — Add to Section

**Design Details for Dry Ponds**

Dry ponds are an effective method of stormwater quantity control, and are typically not intended as water quality improvement facilities. Dry ponds may be constructed in areas where it is not feasible to include a wet pond due to topography or site plan constraints. Generally, dry ponds are used to control larger, less frequent flows while allowing smaller flows to pass through uncontrolled. A sedimentation forebay is required upstream of dry ponds to promote settlement of suspended solids.

a) Land Dedication Requirements

Dry ponds to be operated by the City of Courtenay are to be located on public property, which is to

encompass all lands subject to inundation from the 24 hour 1 in 25 year return period design high water level and shall encompass all maintenance access roads as outlined in Section i) below.

If the slope integrity may be jeopardized by cutting or filling of priority lots, a restrictive covenant will be placed on lots abutting the dry pond to control lot development so as not to compromise design requirements at the HWL. This is to ensure an adequate freeboard is maintained.

b) Minimum Pond Size

The City discourages the proliferation of large numbers of small ponds, with the resultant higher maintenance cost and lower efficiency impact. The storage size is determined on the basis of outflow control requirements as presented in this document.

c) Frequency of Operation

All dry ponds shall be off-line storage areas designed to temporarily detain excess runoff and thereby reduce the peak outflow rates to the connected downstream system. These facilities may be subject to prolonged inundation during winter due to the rainfall pattern in Courtenay.

d) Drain Time

Ponds shall be generally designed to completely drain within 40 hours of reaching maximum water surface level, but in no case longer than 72 hours.

e) Side Slopes

Side slopes subject to inundation upon filling of the dry pond shall have a maximum slope of 4 (horizontal) to 1 (vertical) within public property. A freeboard allowance of 0.6 m is required for all dry ponds.

f) Depth of Ponding

The maximum live storage limit in a dry pond is for 3.0 m for the 1 in 25-year return period storm event and

1.5 m for the 1 in 10-year event, as measured from the invert elevation of the outlet pipe.

g) Bottom Grading and Drainage

The dry pond shall be graded to properly drain all areas after its operation. The dry pond bottom shall have a minimum slope of 0.5% and a slope of 0.7% or greater is recommended where feasible. Lateral slopes for the pond bottom shall be 0.5% or greater. French drains or similar means may be required where it is anticipated that these slopes will not properly drain the dry pond bottom, or where dictated by multiple use or other special considerations.

h) Safety Provisions at Inlets and Outlets

All inlet and outlet structures associated with dry ponds shall have grates provided over their openings to restrict access. A maximum clear bar spacing of 0.150 m shall be used for gratings. Grated outlet structures, are to be designed with a hydraulic capacity of at least twice the required capacity to allow for possible plugging. Further, the arrangement of the structures and the location of the grating shall be such that the velocity of the flow passing through the grating will not exceed 1.0 m/s.

Appropriate fencing and guard-rails are to be provided to restrict access and reduce the hazard presented by structure head and wing walls.

i) Maintenance Access Requirements

A minimum 4.0 m wide, all-weather vehicle access shall be constructed from a public road to the inlet, sediment sump, outlet, emergency overflow and other works requiring maintenance. The maximum grade of the access shall be 8%. The surface shall be finished with gravel topped with path chip, geogrid, or rigid grass suitable for all weather maintenance truck access. A vehicle access route shall also be provided to the edge of all stormwater management ponds suitable to carry maintenance vehicles. This access shall also extend to the pond static (normal) water level. The access surface shall include a 1.0 m buffer from top of pond and an additional 1.0 m from edge of

access road to the edge of dedicated lands, and shall be accessible from and extend to a public road right-of-way. Sharp bends in this access route are to be avoided. Vehicle turning movements must accommodate a tandem axle 60,000lb flush truck and tandem axle dump truck.

j) Landscaping

Landscaping plans shall be submitted as part of the Engineering Drawings for dry ponds, and the completion of landscaping will be considered part of the improvement construction. The minimum requirement for landscaping of dry ponds shall be the establishment of grass cover. Preference should be given to use of native plant materials and, in no case, should non-native, aggressive ("invasive") plant materials be used.

k) Sediment Control

Use of storm ponds for sediment control is acceptable during construction of the first phase of a development, and must be remediated prior to acceptance of the Works and Services by the City of Courtenay. The City may accept the use of storm ponds for sediment control for multiple phases of a development if the appropriate maintenance agreement is established and the appropriate security is provided by the developer. The required security is 125% of the estimated remediation cost.

l) Operation and Maintenance Manual

Three copies of an operation and maintenance manual shall be submitted when the facility is completed and transferred to the Municipality and include:

- Record drawings of the completed facility.
- Brief description of the facility operation including design flows, design depths, and schematic diagrams of the inlet and outlet structures, connections, controls, valves, bypass, overflows, etc.
- List of manufacturer's operation, service and repair instructions and parts lists.

- Volume-stage-discharge relationships of all control structures.
- General maintenance requirements and emergency procedures.
- Copies of senior government environmental approvals if applicable.

**4.11.4 Wet Detention Ponds**

Add to Section

**Design Details for Wet Ponds**

Wet ponds are well suited for both quality and quantity control of stormwater runoff. Wet ponds incorporate a permanent pool which rises in response to rainfall events. Extended storage durations and strategic planting in the active storage zone can further improve water quality. Sedimentation forebays should still be incorporated upstream of wet ponds for preliminary settlement of larger suspended solids.

a) Land Dedication Requirements

Wet ponds to be operated by the City of Courtenay are to be located on Public property which is to encompass all lands subject to inundation from the 24 hour 1 in 25 year return period design high water level plus the edge treatment. This designation will also apply to all rights-of-way for access to and protection of inlet and outlet sewers and flow control facilities, maintenance access routes to the pond, and to a certain proportion of the lands fronting on the pond, from the upper edge of the area containing the edge treatment to the limit of the water's edge when the water surface is at the design high water elevation.

A restrictive covenant and/or a limit for the Minimum Building Elevation (MBE) will be placed upon those lots abutting the pond to guide lot development that design requirements of the stormwater storage facility are not compromised and that an adequate freeboard is maintained.

b) Minimum Pond Size

The City discourages the proliferation of large numbers of small ponds, with the resultant higher

maintenance cost and lower efficiency impact. The storage size is determined on the basis of outflow control requirements as presented in this document.

c) Drain Time

Ponds shall be generally designed to drain to normal water surface level within 40 hours of reaching maximum water surface level, but in no case longer than 72 hours.

d) Side Slopes

Areas covered by water, from the design high water level down to the normal water level shall have a maximum slope of 7 (horizontal) and 1 (vertical) and extend at a maximum slope of 7:1 (H:V), from normal water level to a depth of 0.43 m (i.e., a distance of 3 m horizontally into the pond for safety needs). Steeper side slopes, up to 4:1 (H:V), may be considered for areas separated from the public by a Concrete Rail Fence. A slope of 4:1 (H:V) shall be used from the 0.43 m depth point (below normal water level) to the pond bottom.

e) Minimum Depth

The minimum depth from normal water level to pond bottom (beyond the side slope area) shall be 1.5 m. The maximum live storage limit in a wet pond is for 3.0 m for the 1 in 25-year return period storm event and 1.5 m for the 1 in 10-year event, as measured from the invert elevation of the outlet pipe. A freeboard allowance of 0.6 m is required for all wet ponds.

f) Pond Bottom Material

For areas where the ground water table is below the Normal Water Level (NWL), the pond bottom and side slopes are to be composed of impervious material with a suitably low permeability (e.g. with a permeability coefficient in the order of $1 \times 10^{-6}$ cm/s).

For areas where the groundwater table is expected to be near or above the NWL, the pond bottom may be of a pervious material as dictated by geotechnical considerations.

g) Circulation Requirements

Narrow and/or dead bay areas where floating debris may accumulate are to be excluded at the design stage. Inlets and outlets should be located with consideration of the need to maximize detention time and circulation within the pond water body.

h) Inlet and Outlet Requirements

- Submergence of Inlets and Outlets

  Inlet and outlet pipe inverts are to be a minimum 0.1 m above the pond bottom. Forebays are to be constructed on pond bottom to accommodate extra depth requirements for placing inlet/outlet structures, as required.

- Provision for Free Outfall from Inlets to Ponds

  Where feasible, the invert elevation at the first manhole upstream from the pond in a minor system or the connecting or interconnecting pipe system, shall be at or above the normal water level of the pond to avoid deposition of sediments in the inlet pipe. To avoid backwater effects on the upstream sewers leading to the pond, the obvert of the inlet sewer at the first manhole upstream from the pond shall be at or above the pond level for the 1 in 10-year return period storm event. A drop structure upstream from the pond will generally be required to achieve this. “Inlet” and “outlet” control calculations are required to verify the mode of operation of the pond inlets. In cases where grades set limits on the above, special maintenance needs, such as periodic flushing/cleaning must be identified.

- Provisions for Water Level Measurements

  To permit direct measurement of water level in the pond, a manhole is to be provided hydraulically connected to the pond such that the level of water in the manhole will mimic the pond water surface level.

- Provisions for Lowering the Pond Level

  The provision of the means to drain the pond completely by gravity drainage is desirable. Where a gravity drain is not feasible, provisions are to be made in association with the outlet works or otherwise, so that mobile pumping equipment may be installed and used to drain the pond.

i) Sediment Removal Provisions

The pond design shall include an approved sedimentation removal process for control of heavy solids, which may be washed to the pond during the construction period associated with the development of the contributing drainage catchment.

Sediment basins shall be provided at all inlet locations for continued use after completion of the subdivision development. Stormwater storage/detention ponds shall not take the place of a development's sediment control storage basin.

j) Pond Edge Treatment

Edge treatment or shore protection is required and shall be compatible with the adjacent land use. The treatment used shall meet criteria for low maintenance, safety and habitat requirements. The edge treatment is to cover ground surfaces exposed or covered by water during a pond level fluctuation to 0.3 m below or above the normal water elevation, and shall be adequate to prevent erosion of the pond edge due to wave action. The typical acceptable edge treatment shall be, but is not limited to, a 250 mm deep layer of well graded washed rock with a 75 mm minimum size or alternatively appropriate edge vegetation.

k) Maintenance Access Requirements

A minimum 4.0 m wide, all-weather vehicle access shall be constructed from a public road to the inlet, sediment sump, outlet, emergency overflow and other works requiring maintenance. The maximum grade of the access shall be 8%. The surface shall be finished

with gravel topped with path chip, geogrid, or rigid grass suitable for all weather maintenance truck access. A vehicle access route shall also be provided to the edge of all stormwater management ponds suitable to carry maintenance vehicles. This access shall also extend to the pond static (normal) water level. The access surface shall include a 1.0 m buffer from top of pond and an additional 1.0 m from edge of access road to the edge of dedicated lands, and shall be accessible from and extend to a public road right-of-way. Sharp bends in this access route are to be avoided. Vehicle turning movements must accommodate a tandem axle 60,000lb flush truck and tandem axle dump truck.

l) Landscaping Requirements

Landscaping plans for areas bounding the pond shall be submitted as part of the Engineering Drawings. Landscaping of all proposed public lands included for purposes of the pond and of all proposed lands dedicated to the City for storm ponds on proposed private property, including all areas from the pond edge treatment to the limit of inundation when the pond is filled to the design high water level, is to be part of the pond construction requirement. The minimum requirement for landscaping shall be the establishment of grass cover. Native plant materials must be used.

m) Sediment Control

Use of storm ponds for sediment control is acceptable during construction of the first phase of a development, and must be remediated prior to acceptance of the Works and Services by the City of Courtenay. The City may accept the use of storm ponds for sediment control for multiple phases of a development if the appropriate maintenance agreement is established and the appropriate security is provided by the developer. The required security is 125% of the estimated remediation cost.

| | | | |
|---|---|---|---|
| | | | n) Operation and Maintenance Manual<br><br>Three copies of an operation and maintenance manual shall be submitted when the facility is completed and transferred to the Municipality and include:<br><br>▪ Record drawings of the completed facility.<br>▪ Brief description of the facility operation including design flows, design depths, and schematic diagrams of the inlet and outlet structures, connections, controls, valves, bypass, overflows, etc.<br>▪ List of manufacturer's operation, service and repair instructions and parts lists.<br>▪ Volume-stage-discharge relationships of all control structures.<br>▪ General maintenance requirements and emergency procedures.<br>▪ Copies of senior government environmental approvals if applicable. |
| **4.11.5** | **Subsurface Disposal / Infiltration Systems** | Delete<br><br>Replace With | ▪ May be located on-site or off-site<br><br>▪ Must be located on-site |
| **4.11.8** | **Oil and Grit Separators** | Replace Section | Oil and Grit Separators are required for sites with parking for 11 or more vehicles. Oil and Grit Separators must be in compliance with Building Bylaw 2323 and Storm Sewer Bylaw 1402, as amended. The maximum hydraulic loading rate (HLR) will be 27 L/s/m2. At the target HLR, the unit will be capable of settling coarse particles of D50 > 0.115mm at 5 C and specific gravity of 2.65, and capturing free oil droplets of D50> 0.465mm at 5 $^{0}$C and assuming a specific gravity of 0.88 for a “typical” motor oil. The target effluent shall meet a TSS removal rate of 85%. |
| **4.11.10** | **Alternate Design Standards** | Add Section 4.11.10 | The application of Sustainability Considerations, as described in Section 8.0 of the MMCD Design Guidelines 2014, as well as the Province’s “Stormwater Planning: A Guide for British Columbia” (May 2002), will be considered on a case by case basis by the City where practical. |

| | | | |
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| **4.12** | **Erosion and Sediment Control (ESC)** | Add to Section | Project specific ESC plans shall be prepared by a Qualified Professional and included with engineering drawing submissions. ESC plans are to include, at minimum:<br>▪ ESC plan drawing clearly indicating types and locations of BMP installations<br>▪ Notes describing any BMP phasing, inspection and documentation requirements, and good housekeeping practices<br>▪ Detail drawings of BMPs with specific material and installation requirements |

## 5.0 ROADS

**5.3 Cross-Section Elements** — Replace Section

Refer to the Courtenay Supplementary Standard Drawings for typical road cross sections for each road classifications. Typical road cross sections are to be applied where identified in the Official Community Plan – Bylaw No. 2387, Road Network – Map No. 3. Design speeds of the typical road sections are provided in Table 5.4 below.

**5.4.2 Vertical Curves** — Replace Table 5.4

Replace Table 5.4 as follows:

**Table 5.4 Alignment Standards**

| Classification | Design Speed (km/h) | Min. Radius (m) | Grade (%) | | K-Value | | | | Minimum Sight Distance (m) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Crest Curves | | Sag Curves | | | |
| | | | Min | Max | Min. | Desir. | Min. | Desir. | Stopping | Decision |
| Arterial Road Section: B | 60 | 120 | 0.5 | 8 | 10 | 13 | 8 | 9 | 95-235 | 95-235 |
| Collector Road Section: Urban – P | 50 | 85 | 0.5 | 10 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Collector Road Section: Urban – B | 50 | 85 | 0.5 | 10 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Collector Road Section: Residential – C | 50 | 85 | 0.5 | 10 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Collector Road Section: Residential – B | 50 | 85 | 0.5 | 10 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Collector Road Section: Residential | 50 | 85 | 0.5 | 10 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Collector Road Section: Rural | 60 | 120 | 0.5 | 10 | 10 | 13 | 8 | 9 | 95-235 | 95-235 |
| Local Road Section | 50 | 35 | 0.5 | 12 | 6 | 7 | 5 | 6 | 75-200 | 75-200 |
| Lane | 30 | 25 | 1.0 | 12 | 2 | 4 | 2 | 4 | 45 | - |
| Driveway Multi-Family | 30 | - | 0.5 | 12 | 2 | 4 | 2 | 4 | 45 | - |
| Driveway Single Family | - | - | 0.5 | 15 | - | - | - | - | - | - |
| Emergency Access[8] | 30 | 12 | 1.0 | 15 | 2 | 4 | 2 | 4 | 45 | - |
| Pedestrian Ramps | - | - | 1.0 | 8.3[6] | - | - | - | - | - | - |

**5.7 Railway Grade Crossings** — Replace Section

Locations and details of railway grade crossings are subject to requirements included in the latest edition of the Transportation Canada Grade Crossing Standards.

| | | | |
|---|---|---|---|
| | | | Railway crossing signs and pavement marking shall be in accordance with Transportation Canada Grade Crossing Standards. |
| **5.8** | **Traffic Control Devices** | Replace Section | Traffic control devices, signs, and pavement marking must be in accordance with the Manual of Uniform Traffic Control Devices for Canada. Pavement markings shall be thermoplastic and should be installed within 7 days of the final pavement lift on a clean and dry surface. |
| **5.9** | **Culs-De-Sac** | Delete | The maximum road length for a cul-de-sac, as measured from the edge of the intersecting through road to the centre of the cul-de-sac bulb, is 200m |
| | | Replace with | The maximum road length for a cul-de-sac, as measured from the edge of the intersecting through road to the centre of the cul-de-sac bulb, is 300m |
| **5.9.1** | **Temporary Turnaround** | Add Section 5.9.1 | Where a road terminates and there is future access to lands beyond; a turnaround shall be provided in a form acceptable to the City, and may be located on private property if protected by a right-of-way and covenant registered in favour of the City. The turnaround shall be signed as a 'fire access' with no parking allowed. The right-of-way and covenant shall be discharged when the road connection is completed. |
| **5.10.1** | **Traffic Barriers at Temporary Cul-De-Sac and Turnarounds** | Add Section 5.10.1 | A concrete barrier shall be located at the end of a temporary cul-de-sac and turnarounds. |
| **5.11.1** | **Sidewalk** | Replace Section | Sidewalk location and width shall be as per Courtenay Standard Detail Drawings for typical road cross sections for different road classifications. Minimum cross fall for sidewalk shall be 2% towards the gutter, except at driveway letdowns. |
| **5.11.2** | **Pedestrian Crossings** | Replace Section | The warrant for pedestrian crossings must be considered as part of a broader analysis process which should include an understanding of existing site conditions, pedestrian and traffic volumes, and pedestrian accessibility. This can be evaluated utilizing TAC Pedestrian Crossing Control Guide. |

| | | |
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| | | The pedestrian crossing width can range from a minimum of 2.5 m to as wide as 4.0 m. (TAC Design Guidelines, Section 2.3.14.1). The pavement marking and signage configuration for crossings must be designed in accordance with TAC.<br>Wheel chair ramps from sidewalks, medians and traffic islands to crosswalks must be provided at intersections and multiuse pathways. Locations and details of ramps and related pedestrian safety features must be in accordance with local bylaws and the TAC Geometric Design Guide.<br>Sidewalks, crosswalks, and pedestrian facilities must be designed in accordance with the following guidelines:<br>▪ TAC Geometric Design Guideline, 1999 (Section 2.2.6, Section 2.3.14, Section 3.3)<br>▪ TAC – Pedestrian Crossing Control Manual, 2012<br>▪ Pedestrian Crossing Control Manual for British Columbia, Second Edition, 1994<br>BC Ministry of Transportation – Manual of Standard Traffic Signs & Pavement Markings |
| **5.14.4 Driveway Grades** | Delete Sentence | For the first 10 m on private property, the maximum driveway grade is 15% if accessing a local or collector road. |
| | Replace with | For the first 10 m on private property, the maximum driveway grade is 12% if accessing a local or collector road. |
| **5.14.8 Driveway Surface** | Add Section 5.14.8 | New or altered driveways shall be concrete or asphalt within the road right-of-way. |
| **5.15.3 Signs and Poles** | Delete Sentence | Use of minimum clearance should be justified by safety appurtenances such as poles with break-away or frangible bases or sign poles of light weight fabrication. |
| **5.15.4 Trees** | Replace Section | Provide 1 boulevard tree per single residential or duplex dwelling lot where required. For all other developments provide 1 boulevard tree per 15-22m of lot frontage and/or flankage.<br>Boulevard trees are required on the same side of the street as sidewalks and are not required on rural roads. |

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| | | | Boulevard trees are to be located where there is a minimum space of 1.5m between the sidewalk and back of curb. Horizontal clearance from edge of driveway, curb return or above ground utility to tree trunk is 2.5m. Boulevard trees are to be located no closer than 6m from the adjacent street right of way at intersections.<br><br>Boulevard trees are to be a minimum of 3cm caliper.<br><br>The cost for each boulevard tree shall be $800.00. The cost includes the price of the tree, installation that may include root barriers, maintenance and replacement if the tree does not survive.<br><br>The Developer shall provide a boulevard tree layout plan showing the location and number of trees and the location of utilities, prepared by a Qualified Professional to the satisfaction of the Development Engineer. |
| **5.16** | **Underground Utility Locations** | Replace Section | Underground utility locations within a road right-of-way will vary with the road cross section. Refer to the Courtenay Supplementary Standard Drawings for the general location of underground utilities and minimum separation requirements within the various cross sections. |
| **5.17.3** | **Pavement Alternatives** | Replace Section | Pavement structure design must be based on site specific recommendations provided by a Qualified Professional and shall include the minimum pavement structure identified in the City of Courtenay Supplementary Standard Detail Drawing for the relevant road classification. |
| **5.21** | **Street Parking** | Replace Section | Refer to the Courtenay Standard Drawings for parking configuration for different road classifications. |
| **5.22** | **Retaining Walls** | Add Section 5.22 | Retaining wall shall be a maximum of 2.4 m in height. Where larger retaining walls heights are required, they must be constructed as a stepped wall. The step must have a minimum width of 1.8 meters or 75% of the height of the highest adjacent wall. |

## 6.0 ROADWAY LIGHTING

| | | | |
|---|---|---|---|
| **6.1** | **General** | Add to Section | Relevant publications of the Illuminating Society of North America (IESNA) including RP-8-14 |
| **6.2.2** | **Standards and Guidelines** | Add to Section | IESNA – Illuminating Engineering Society of North America<br>IDA – International Dark-Sky Association |
| **6.5.1** | **Light Sources and Luminaires** | Delete | Light sources shall be LED, Induction, High Pressure Sodium or Pulse Start Metal Halide.<br>The selection process shall be based on a review of energy efficiency, cost/benefit (installation and operational) and optical performance which shall be undertaken in consultation with the jurisdiction that will own and operate the lighting. |
| | | Replace with | Light sources shall only be LED. The selection process shall be undertaken in consultation with the City of Courtenay and will only include luminaire manufacturers listed in the current version of the City's Approved Product List. All streetlights shall include flat lenses.<br><br>If BC Hydro lease lights are used, they shall meet BC Hydro requirements. |
| **6.7** | **Sidewalk Lighting** | Delete | Sidewalk lighting levels for various pedestrian activity levels are defined in Figure 6.3, Sidewalk Illuminance Table below. |
| | | Replace with | Sidewalk lighting levels for various pedestrian activity levels are defined in Figure 6.7, Sidewalk Illuminance Table below. |
| **6.8** | **Intersection Lighting** | Delete | Intersection lighting levels for various street types and pedestrian activity levels are defined in the Intersection Horizontal Illuminance Table 6.4 below. |
| | | Replace with | Intersection lighting levels for various street types and pedestrian activity levels are defined in Figure 6.8 Horizontal Illuminance Table below. |
| **6.9** | **Crosswalk Lighting** | Delete | This can be achieved by placing poles in advance of the crosswalk (see Figure below) to create high levels of |

| | | | |
|---|---|---|---|
| | | | vertical illumination thus improving driver visibility of pedestrians. |
| | | Replace with | This can be achieved by placing poles in advance of the crosswalk (see Figure 6.5 below) to create high levels of vertical illumination thus improving driver visibility of pedestrians. |
| **6.13** | **Poles** | Delete | For rural roads, if approved by the local authority and the power company, lights may be installed on power poles. |
| | | Replace with | Luminaires may be installed on power poles, if approved by the City and BC Hydro. |
| **6.14** | **Pole Foundations** | Delete | Where soil conditions are in question a geotechnical engineer must be consulted to define the suitability of the base for the given soil's condition. |
| | | Replace with | Where standard MMCD foundations are not suitable for site soil conditions, custom foundations will be required, and shall be designed, signed and sealed by a Qualified Professional registered as a Professional Engineer in the province of British Columbia. |
| **6.15** | **Luminaires** | Delete | ▪ Colour temperature shall not exceed 4500 kelvin. |
| | | Replace with | ▪ LED luminaire colour temperature shall not exceed 3000 kelvin. |
| **6.16** | **Power Supply and Distribution** | Delete | Lighting system shall be fed via a service base or pole mounted cabinet which shall contain panel boards, breakers, lighting contactor(s) and photocell bypass switch as per MMCD Standard Specifications and Drawings. |
| | | Replace with | Lighting system shall be fed via a pad mount or pole mount cabinet which shall contain panel boards, breakers, lighting contactor(s) and bypass switch as per MMCD Standard Detail Drawings and Specifications. |
| | | Delete | Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals; however, some utility power providers may require metered services. |

| | | |
|---|---|---|
| | Replace with | Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals unless metering is required by BC Hydro. |
| | Delete | Services are to be "Underground Dip" type as shown on the MMCD Standard Specifications and Drawings unless otherwise accepted by the local Municipality/City |
| | Replace with | Services are to be "Underground Dip" type as shown on the MMCD Standard Specifications and Drawings or overhead drops, as specified on the design drawings. |
| **6.17.4 Drawing Requirements** | Add to Section | ▪ Design submissions for City approval shall include relevant load calculators for signal and sign poles as well as other relevant engineering calculations and design drawings<br>▪ Record drawings submissions shall include 3 - ½ size paper copy sets of drawings as well as pdf and AutoCAD electronic files of drawings |
| | Delete | Design drawings shall be submitted for approval along with signed and sealed computer lighting calculations. |

## 7.0 TRAFFIC SIGNALS

**7.3.1 Codes, Rules and Regulations** — Add to Section

- BC Motor Vehicle Act, Motor Vehicle Act Regulations, Division 23

**7.4 Signal Heads** — Replace Figure 7.4.2

Replace Figure 7.4.2 as follows:

**Table 7.4.2 Signal Head Sizes**

| Signal Head Type | Area Classification Lens Size and Shape |
|---|---|
| Primary | 300 mm round |
| Secondary and Auxiliary | 300 mm round |
| | 300 mm round |
| Pedestrian | Combination walk/don't walk indication 300 mm square |

**7.8 Signal Pre-Emption** — Add to Section

The City utilizes siren actuated emergency pre-emption equipment. Pre-emption equipment to be located 1 m right of the left most signal head.

**7.9 Audible Pedestrian Signals** — Add to Section

The City utilizes Accessible Pedestrian Signals.

**7.11 Detection Methods** — Replace Section

Traffic detection for signal actuation is accomplished by:

- Vehicle detector loops (induction)
- A vehicle detector loop is a coil of wire buried in the road surface. The coil detects the presence of a vehicle by the change in electrical induction. This change is sensed by the detector module in the traffic control cabinet. Detector loop details are indicated in the MMCD Standard Detail Drawings.

**7.15 Poles and Foundations** — Add to Section

Where standard MMCD foundations are not suitable for site soil conditions, custom foundations will be required, and shall be designed, signed and sealed by a Qualified Professional registered as a Professional Engineer in the province of British Columbia

**7.18 Power Supply and Distribution** — Add to Section

Traffic signal systems shall be fed via a pad mount or pole mount cabinet which shall contain panel boards, breakers, lighting contactor(s) and bypass switch as per MMCD Standard Detail Drawings and Specifications

| | | | |
|---|---|---|---|
| | | | Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals unless metering is required by BC Hydro.<br>Services are to be "Underground Dip" type as shown on the MMCD Standard Detail Drawings and Specifications or overhead drops, as specified on the design drawings. |
| **7.19** | **Uninterruptible Power Supplies (UPS's)** | Delete | UPS's are required where traffic signals are interconnected by grade crossing warning systems as per Transport Canada. UPS's shall be considered where power outages are a concern or the intersection is in a high collision or a high risk area. |
| | | Replace with | Uninterruptible power supplies shall be utilized at all new traffic signal installations. |
| **7.21** | **Drawing Requirements** | Add bullets | ▪ Design submissions for City approval shall include relevant load calculators for signal and sign poles as well as other relevant engineering calculations and design drawings<br>▪ Record drawings submissions shall include 3 - ½ size paper copy sets of drawings as well as pdf and AutoCAD electronic files of drawings |