# City of Quesnel

# SCHEDULE B – DESIGN AND CONSTRUCTION MANUAL

# City of Quesnel

# DESIGN AND CONSTRUCTION MANUAL

December 2021

*Approved by:*

Director of Capital Works and Infrastructure

Date: _____

YYYY / MM / DD

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# PART A GENERAL

# 1. INTRODUCTION

The City of Quesnel has adopted the "MMCD Design Guidelines 2014" and the "MMCD for Unit Price Contracts Platinum Edition". This document supplements these requirements and outlines additional and/or alternate design criteria and specifications that must be considered in the planning, detailed design, and construction phases for the roads and utilities within the City of Quesnel. In all situations where there is reference to decisions by the utility owner this shall mean the Director of Capital Works and Infrastructure. Where decisions are referred to the local authority this shall mean the Director of Capital Works and Infrastructure where the City of Quesnel has authority.

# 2. RELATIONSHIP TO DEVELOPMENT SERVICING BYLAW

The requirements in this Manual are to be read in conjunction with City's Development Servicing Bylaw No. 1916, 2021, and the Development Servicing Bylaw takes precedence.

# 3. REVISIONS

This Manual replaces all its previous versions, and the contents of this Manual are subject to constant review and the City will make amendments when necessary. Amendments between printed versions will be available at the City website.

# 4. DEFINITIONS

City means the City of Quesnel.

Development Servicing Bylaw means the City of Quesnel Development Servicing Bylaw No.1916, 2021 as amended from time to time.

Director of Capital Works and Infrastructure means that person appointed by the City to be responsible for capital works and infrastructure for the City, or the designate.

Manual means the current City's Design and Construction Manual, as amended from time to time.

Owner has the same meaning as in the Land title Act and includes a person authorized by an Owner to make a subdivision or development application in respect of the owner's land.

Professional Engineer means a person who is registered or duly licensed as a professional engineer under the provisions of the Engineers and Geoscientists Act.

Professional Landscape Architect means a person wo is registered or duly licensed as a professional landscape architect under the provisions of the Architects (Landscape) Act.

Works and Services means highways, sidewalks, boulevards, boulevard crossings, transit bays, street lighting, underground wiring, overhead wiring, third party utilities, water distribution systems, fire hydrant systems, sewage collection systems, sewage disposal systems, drainage collections systems, and drainage disposal systems.

# PART B SUPPLEMENTARY DESIGN GUIDELINES

# 1. MMCD SECTION 1.0 – GENERAL DESIGN CONSIDERATIONS

## MMCD 1.3 – Utility Rights-of-Way

### *Table 1.3 Right of Way Widths*

Single service - Delete “4.5m minimum width” and replace with “6m minimum width”

Two services within the same trench - Delete “5.5m minimum width” and replace with “6m minimum width”

## MMCD 1.4 – Utility Separation

### *1.4.2 Vertical Separation*

Delete phrase in first bullet:

…packed with compound and wrapped with petrolatum tape in accordance with …

### *1.4.1 Horizontal Separation*

Delete phrase:

…packed with compound and wrapped with petrolatum tape in accordance with …

Add the following:

With approval of local health authority.

## 2. MMCD SECTION 2.0 – WATER DISTRIBUTION

### MMCD 2.2 - Metering

Add the following at the end of Section 2.2:

- All commercial, industrial and institutional buildings need to be meter ready. This includes an area or room within the building with a removable spool piece to accept future metering. Strata and mobile home developments require a meter vault complete with a removable spool piece to accept future metering.

### MMCD 2.9 - Minimum Pipe Diameter

Delete "Service connections 19mm" and replace with "Service Connections 25mm"

### MMCD 2.11 - Minimum Depth of Cover

Delete the first bullet and replace with:

- Prevent freezing. Soil type and groundwater should be considered. Minimum depth of cover to be 2.2 m in all areas.

### MMCD 2.12 - Grade

Replace "20%" with "10%"

### MMCD 2.14 – Valves

Revise the first bullet to read:

- 4 valves at "X" intersection
- 3 valves at "T" intersection

Add the following bullet at the end of 2.14:

- Valve boxes installed in gravel roads need to be installed a minimum of 100mm below the finished road elevation.

### MMCD 2.15 - Hydrants

Insert bullet as follows:

- Hydrant spacing for high density residential, commercial and industrial not more than 100m apart nor more than 45m from a building.

### MMCD 2.21 – Service Connections

Replace "100 mm dia." with "50 mm dia."

Add "to be paid for and maintained by the property Owner" after "check valve at the property side of the shut-off".

## MMCD 2.25.2 – Design Features

Delete “Figure 2-1 Minimum Pipe Cover Depth for Frost Protection”.

## Add 2.26 – Community Wells

All community wells should be designed in accordance with all Federal and Provincial legislation. Well design parameters should be reviewed and approved by the local authority before detailed design proceeds.

# 3. MMCD SECTION 3.0 – SANITARY SEWERS

## MMCD 3.13 – Depth

Delete second bullet and replace with the following:

Minimum cover for sanitary sewers and sanitary connections:

- 1.5 m for gravity sewer mains.
- 2.2 m for sanitary sewer force mains.

## MMCD 3.14.1 - Manholes

Add to the end of 3.14.1:

Midblock cleanout and end block cleanout are only allowed:

- if approved by the Director of Capital Works and Infrastructure, and
- as a temporary measure.

## MMCD 3.16.4 – Details

Add to the end of 3.16.4:

Refer to Supplemental Detail Drawing for details of the sanitary sewer service connections.

## MMCD 3.20 – Onsite Wastewater Disposal System

Onsite wastewater disposal systems will only be allowed in areas of the City that do not have access to the Public Sewer System and based on the following conditions:

- The Onsite Wastewater Disposal System must be design and installed under the direct supervision of a Qualified Professional as designated in the Province of BC Municipal Wastewater Regulation.
- Sewage lagoons will only be allowed in specific areas on the City and must be approved by the Director of Capital Works and Infrastructure.

# 4. MMCD SECTION 4.0 – STORMWATER MANAGEMENT

## MMCD 4.2 – Stormwater Control Plan

Add the following additional stormwater control plan requirements to this section:

- Detention storage
- Landscaping
- Removal of sediments
- Source control
- Erosion protection
- Groundwater infiltration
- Subsurface disposal

## MMCD 4.4 – Runoff Analysis

Delete "This factor will vary by region, and for example the factor being applied in Greater Vancouver is suggested as 1.15" and replace with "The factor that should be applied to the analysis is 1.10".

## MMCD 4.5 – Site and Lot Grading

Delete "Use 1% minimum grade" and replace with "Use 2% minimum grade".

## MMCD 4.9.1 – Level of Service

Add the following to this section:

- First 12mm of rainfall must be stored onsite.

## MMCD 4.9.6 – Minimum Pipe Diameter

Delete first bullet below "Service Connections" and replace with:

- Residential - 100 mm in West Quesnel, refer to section 4.9.14

Add the following note to the text below the Minimum Pipe Diameter Table:

- When designing driveway culverts upstream ditch flows need to be considered to ensure that the driveway culvert has the capacity for the design storm.

## MMCD 4.9.9 – Depth

Delete the second bullet and replace with:

- Prevent freezing. Minimum depth of cover for storm mains is 1.2 metres.

## MMCD 4.9.12 – Manholes

Delete the second to last bullet and replace with:

- 120 m maximum spacing for pipes smaller than 900 mm dia.

## MMCD 4.9.14 – Service Connections

Add the following sentence after paragraph 3:

- In the West Quesnel Land Stability Area (WQLSA), roof drains are to be connected to the residential storm sewer service connections as noted on the level of service mapping. Roof drains for all other areas of the City are not allowed to be connected to the residential storm sewer service connections.
- Roof Leaders from Commercial, Institutional, and Industrial lots can be connected to the storm sewer services if they meet the requirements of the following section of this manual and as approved by the Director of Capital Works and Infrastructure.

# 5. MMCD SECTION 5.0 - ROADS

## MMCD 5.3 – Cross-Section Elements

Delete Table 5.1 Road Cross-Section Summary, delete Table 5.2 Road Cross-Section Derivation and delete Table 5.3 Lane Width Design Domain.

Replace with new Table 5.1 below.

Add 5.3.1

Refer to Road Cross-Sections contained in Schedule A.

Table 5.1 Road Cross-Section Elements (Note 1)

| | Minimum Border | Sidewalk | Shoulder (Paved) | Parking Lane (Paved) | Bike Lane (Note 2) | Travel Lane (Paved) | Travel Lane (Paved) | Travel Lane (Paved) | Travel Lane (Paved) | Parking Lane (Paved) | Shoulder (Paved) | Sidewalk | Minimum Border | Total Width | Minimum ROW Width | Power | Streetlights |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arterial | 1 (Note 3) | 2.5 | | | | 3.6 | 3.6 | 3.6 | 3.6 | | | 2.5 | 1 | 21.4 | 25 | OH | Yes |
| Commercial Collector | 1 | 2.5 | | 2.6 | | | 4.0 | 4.0 | | 2.6 | | 2.5 | 1 | 20.2 | 25 | UG | Yes |
| Residential Collector | 1 | | | 2.6 | 1.5 | | 3.6 | 3.6 | | 2.6 | | 1.8 | 1 | 17.7 | 20 | OH | BCH (Note 4) |
| Local | 1 | | | 2.6 | | | 3.6 | 3.6 | | 2.6 | | 1.8 | 1 | 16.2 | 20 | OH | BCH |
| Rural Collector/ Industrial | 1 | | 1.5 | | 1.5 | | 3.6 | 3.6 | | | 2.5 | | 1 | 14.7 | 20 | OH | BCH |
| Rural Residential | 1 | | 2.0 | | | | 3.6 | 3.6 | | | 2.0 | | 1 | 13.2 | 20 | OH | BCH |
| Downtown Commercial | 1 | 3 | | | | | 3.6 | 3.6 | | | | 3 | 1 | 15.2 | 20 | OH (in Alley) | Decorative |

**Note 1:** Dimensions in Table 5.1 apply to road cross sections moving from left to right. Refer to Road Cross-Sections contained in Schedule A.

**Note 2:** Additional bike lane width may be required to comply with requirements of the City Active Transportation expectations.

**Note 3:** All dimensions in this table are in metres.

**Note 4:** BCH means that streetlights are installed on BC Hydro utility poles.

### MMCD 5.4 – Alignments

Delete  maximum grades and replace with the following:

- Arterial: 8%
- Collector Road: 9%
- Lane: 10%
- Local/ uphill cul-de-sac: 10%
- Downhill cul-de-sac: 8%, 7% at bulb
- Emergency Access: 12%

### MMCD 5.11.2 – Pedestrian Crossings

Add the following to the first paragraph: All pedestrian crossings to be designed with accessibility in mind.

### MMCD 5.17.3 – Pavement Alternatives

Delete Table 5.17.3.1 with Minimum Pavement Structure for Asphaltic Concrete Pavement and replace with the following.

Table 5.17.3.1 Minimum Pavement Structure of Asphaltic Concrete (A.C.) Pavement

| Road Classification | Compacted Sub-base Thickness | Compacted Base Thickness | Compacted Asphalt Thickness |
|---|---|---|---|
| Arterial | 550 mm | 75 mm | 75 mm |
| Collector | 475 mm | 75 mm | 65 mm |
| Local | 475 mm | 75 mm | 65 mm |
| Cul-de-sac | 475 mm | 75 mm | 65 mm |
| Commercial | 475 mm | 75 mm | 65 mm |
| Lane | 475 mm | 75 mm | 65 mm |

# 6. MMCD SECTION 6.0 – ROADWAY LIGHTING

## MMCD 6.13.1 Grounding

Add the following:

Grounding pole to grounding rod at each pole and service kiosk and installation of continuous ground conductor in the conduit system shall be provided in accordance with the BC Electrical Code, #8 size, colour coded green.

## MMCD 6.13.2 Pole Finish

Add the following:

All decorative poles to be powder coated in accordance with specifications Colour to be RAL 7015 Grey.

## MMCD 6.15.1 LED Luminaires

Add the following:

All Luminaires to be in accordance with the City of Quesnel Approved Products list.

## MMCD 6.15.2 Luminaire Finish

Add the following:

All decorative luminaires to be powder coated in accordance with specifications Colour to be RAL 7015 Grey.

## 7. MMCD SECTION 7.0 – TRAFFIC SIGNALS

No Supplemental Guidelines.

## 8. MMCD SECTION 8.0 – SUSTAINABILITY CONSIDERATIONS 2014 – WATER DISTRIBUTION

This section is used for reference only.

## 9. MMCD SECTION 9.0 – SUSTAINABILITY CONSIDERATIONS 2014 – ROADS

This section is used for reference only.

## 10. MMCD SECTION 10.0 – SUSTAINABILITY CONSIDERATIONS 2014 – LIGHTING AND SIGNALIZATION

This section is used for reference only.

## 11. MMCD SECTION 11.0 – CHANGE SUMMARY

This section is used for reference only.

# 12. LANDSCAPING

## 1. Objectives

These design standards are intended to enhance the safety, aesthetics and sustainability of public lands and to ensure efficiency and effectiveness of maintenance and operations of these lands.

## 2. Related Standards

This standard shall be referenced to and integrated with, at minimum, the following:

- Canadian Landscape Standard, Current Edition
- National Guide to Sustainable Municipal Infrastructure (Canada)
- Irrigation Association – Landscape Irrigation Best Management Practices

## 3. Application of Standard

These standards apply to the following types of public lands:

- Boulevards
- Recreation Corridors
- Public Access Routes
- Stormwater Management Facilities
- Erosion Control
- Amenity areas (i.e. seating areas, playgrounds, games courts, picnic areas)

## 4. Landscape Consultant

The Owner shall retain a Professional Landscape Architect; or alternatively a Landscape Design Consultant or Certified Irrigation Designer working under supervision of a Registered Landscape Architect, to prepare all necessary landscape and irrigation drawings. Landscape drawings and specifications shall be sealed by a Professional Landscape Architect. Irrigation drawings and specifications shall be prepared by a Certified Irrigation Designer.

## 5. Landscape Plan

The Landscape Consultant shall consider, at minimum, the following criteria:

- The functional relationship of the landscape design to existing and proposed land uses, utilities, flood patterns, drainage facilities, roads, driveways and pedestrian facilities
- Accessibility as it relates to pedestrians, cyclists and people with limited physical or visual abilities
- Horticultural use of plant material, including plant suitability, survival rate, growth habit, size, disease resistance and water demand
- Appearance of the proposed plant material and site landscape, including appropriateness, aesthetics, visual screening and sight lines

- Protection of existing trees
- Placement of proposed trees
- Protection of the natural environment and restoration or enhancement of natural habitat
- Site drainage, water levels, ponding and overland flow
- Minimization of the opportunity for crime and undesirable behavior
- Weed control
- Erosion control
- Fire hazard reduction
- The estimated costs and efficiency of maintenance practices that will be required for the Public Land
- Restoration of disturbed areas

## 6. Boulevards

Boulevards within public road rights-of-way having an urban cross-section:

- Grass surfaces are permitted
- The area between the back of curb and or back of sidewalk shall be landscaped in commercial areas only
- Street trees may only be installed in Public Access Routes only if permitted by the Director of Capital Works and Infrastructure
- Landscaping materials should be hardy and should provide visual interest throughout the seasons.

## 7. Public Access Routes and Recreational Corridors

Lighting of all public access routes and recreational corridors shall be provided as required by the Director of Capital Works and Infrastructure.

## 8. Stormwater Management Facilities

Wet Ponds

- Between the normal water level and the top of bank the side slopes shall be naturalized with low maintenance riparian plantings in 100mm minimum depth growing medium
- Above the top of bank the ground surface shall be seeded with the City of Quesnel Type A or Type B seed mix 100mm depth smooth growing medium, with a maximum slope of 4 (horizontal) to 1 (vertical), except as required for vehicle access and pedestrian surfaces
- Shrubs and trees shall be selected, planted and maintained to provide screening, habitat, shade and aesthetics as required
- Irrigation system per Section 16 of Schedule B.
- Meet all criteria listed in MMCD Section 4 – Stormwater and Schedule B.

Dry Ponds

- The bottom of dry ponds and infiltration basins shall be seeded with the City of Quesnel Type A or Type B seed mix 100mm depth smooth growing medium, if approved or required by the *Director of Capital Works and Infrastructure*, a hard-surfaced recreational surface
- Side slopes with a 4 (horizontal) to 1 (vertical) or shallower slope shall have a turf surface on 50mm minimum depth smooth growing medium. Side slopes steeper than 4 (horizontal) to 1 (vertical) slope shall be naturalized with low maintenance riparian plantings in 100mm minimum depth growing medium
- Above the design high water level the ground surface shall be turf on 50mm depth smooth growing medium, with a maximum slope of 4 (horizontal) to 1 (vertical), except as required for vehicle access and pedestrian surfaces
- Shrubs and trees shall be selected, planted and maintained to provide screening, habitat, shade and aesthetics as required
- Irrigation system per Section 16 of Schedule B.
- Meet all criteria listed in MMCD Section 4 – Stormwater and Schedule B.

## 9. Erosion Control

Land proposed as Public Land where there is evidence of active or historic erosion that may have maintenance or liability implications for the *City* will not be accepted by the Director of Capital Works and Infrastructure as Public Land.

The Owner shall be responsible for undertaking erosion control and restoration works on proposed Public Land as necessary for the long-term prevention and control of erosion.

At the discretion of the Director of Capital Works and Infrastructure, the *Owner* may be required to prepare and submit an erosion control plan covering some or all of the proposed Public Land.

The Owner is responsible for preventing and controlling erosion, and for restoring sites impacted by erosion, for the term of the Maintenance Period.

The *Owner* shall develop an erosion and sediment control plan for construction in accordance to MMCD Section 4 – Stormwater and Schedule B.

## 10. Fire Management

At the discretion of the *Director of Capital Works and Infrastructure*, the *Owner* may be required to prepare and submit a Fuel Management Plan covering some or all of the proposed Public Land.

The Fuel Management Plan shall be prepared by a Registered Professional Forester (RPF) and shall follow industry standards such as the FireSmart Guidelines endorsed by the BC Ministry of Forests. The Fuel Management Plan shall include but not be limited to the following aspects:

- Map(s) showing existing and proposed vegetation, structures, trails, access points, hard surfaces, utility service lines (whether overhead or underground) and firebreaks on Public Lands and vegetated land adjacent to the site, including an assessment of the fuel hazard in these areas

- Priority Zones, as per the FireSmart Guidelines, around all existing or planned structures. Fuel modification prescriptions for these Priority Zones shall be developed based upon proximity to structures and target stand conditions
- Establishment of strategic firebreaks adjacent to structures and hazardous fuel types, which may also serve as recreational trails. Breaks shall be a minimum of 1.5 m wide with a 100 mm minimum gravel base
- Deciduous trees shall be retained where possible
- Access points shall be provided from the roadway between lots to provide access to Public Land containing natural vegetation as required for land maintenance and fire hazard management
- Access points shall enable emergency and maintenance vehicles. Hydrants shall be located in the road dedication adjacent to the access point

## 11. Irrigation

An irrigation system shall be designed, installed, operated and maintained to provide sufficient application of water to maintain the plants and grass of the landscape *works and* services in a healthy and growing condition for the irrigation of Public Land to be maintained by the *Owner*(s). If an irrigation system is not required at the time of construction, but will be required in the future, sufficient design, servicing and construction shall be performed to enable the irrigation system to be readily installed, connected and operated in future.

Where Public Land is to be maintained by the City, an irrigation system shall be designed, operated and maintained until the end of the Maintenance Period. One (1) metered water service and one (1) metered electrical service (120 volts, 60 amps) shall be provided for each park, open space, drainage facility, boulevard, median, roundabout, traffic circle and cul-de-sac island at a location acceptable to the *Director of Capital Works and Infrastructure*. The service shall include the establishment of water and electrical service accounts, testing and certification of the backflow prevention device, a plumbing permit, an electrical permit, and all materials, labour, fees and utility costs necessary to provide the service until the end of the Maintenance Period.

## 12. Fencing

A standard fence is to be constructed in accordance to the Zoning Bylaw and is subject to approval of the *Director of Capital Works and Infrastructure*.

## 13. Seeding

Upon completion of earthworks, all excavation and embankment slopes shall be covered with a minimum 100 mm thickness of organic topsoil with clean sand mix and seeded as follows:

- Schedule all operations to ensure optimum environmental protection and seeding operations. Schedule seeding to follow as soon as practical after growing medium placement and finish grading to provide vegetative cover as soon as possible.
- Schedule seeding after frost has left ground and before October.

- Do not perform work under adverse field conditions such as winds greater than 10 km per hour, frozen soil, hot and arid conditions, excessively wet or dry soil or soil covered with snow, ice or standing water.
- No seeding shall be carried out in areas or over surfaces that are not properly prepared. The Owner is to examine the site before starting work to verify all surfaces are properly prepared.
- All seed, mulch, fertilizers and related materials, where required, are to be stored in dry, weatherproof storage place and to be protected from damage by heat, moisture, rodents or other causes until time of seeding. Labels or other identification are not to be removed or defaced.
- A slow release fertilizer formulation based on analysis of soil to be seeded shall be applied in conjunction with the seed.
- Mulch shall be specially prepared wood cellulose and/or textile fabric of a type commonly used and approved for hydraulic seeding.
- Blend seed application into adjacent grass and forest to form uniform surfaces.
- Maintain seeded areas as necessary to establish a complete coverage of grass in a healthy and growing condition until final acceptance.
- Seeded areas will be accepted when seeded areas are uniformly established and areas are free of rutted, eroded, bare or dead spots and free of weeds.

## 14. Products - Seed

Grass seed to meet requirements of Canada Seed Act for Canada No. 1 seed.

Seed mixes shall be supplied by a recognized supplier of certified seed.

Seed to be packed and delivered in original containers clearly showing:

- Name of supplier
- Analysis of seed mixture
- Percentage of pure seed
- Year of production
- Net weight
- Date and location of bagging

Installed seed mixes and application rates are to take into account site specific variables such as altitude, micro-climate, soil type, and soil organic content, as well as water availability, seed availability, seed germination rates, and time of seeding.

All seed species, installed on sites where no additional water supplementation is to be applied other than natural rainfall, shall be drought tolerant varieties.

A seed mix shall be specified from the following seed species for a typical installation in populated areas i.e., *subdivisions*, roadside cover slopes, and empty lots:

- TYPE A Seed Mix: Apply at any areas that are intended to be maintained, partially maintained; or, that may receive periodic maintenance (mown) over the long term. These areas may require irrigation to establish but may or may not be irrigated over the long term.
    - Seed Rate = 100kg/ha
    - Species Percentage by Weight
        - Perennial Ryegrass 20-30%
        - Tall Fescue 40-50%
        - Kentucky Bluegrass 30%
- TYPE B Seed Mix : Apply at any areas that WILL NOT be either, maintained (mown) or irrigated.
    - Seed Rate = 60kg/ha
    - Species Percentage by Weight
        - Perennial Ryegrass 20-30%
        - Tall Fescue 50-60%
        - Kentucky Bluegrass 20-30%

Custom site-specific blends will be allowed; however, not less than four (4) of the species, excluding annual rye, listed in Seed Mix "A" or Seed Mix "B", shall be incorporated into the custom blend for each similarly specified area.

Percentages and application rate for custom mixes shall be specified by the supplier and shall be applied at a combined rate of not less than 60 kg/ha. Seeding should be done in two applications at right angles to each other.

Nitrogen fixing legumes such as clover may be used in limited quantity in seed mixes where a quick short term (less than 3 years) cover crop is required to control erosion. Inclusion of legumes in seed mixes intended for use on sites with coverage beyond 3 years is prohibited. Inclusion of legumes in any seed mix is to be approved prior to application.

## 13. RETAINING WALLS

### 1. Conditions Requiring Retention

Retention of land shall be required in the following conditions:

- Where it is deemed necessary, by the *Director of Capital Works and Infrastructure* or a *Professional Engineer* to:
    - Provide stability to existing or altered slopes or to control potential erosion
    - Protect *Works and Services* or provide access to *Works and Services*
    - To retain other land or structures
    - Control surface drainage by altering the contours of the land

- Where the slopes either existing or altered are steeper than their natural geological angle of repose, or steeper than 2 horizontal to 1 vertical whether terraced or otherwise. Allowable slope steepness to be confirmed by the Owner's Professional Engineer.
- Where a retaining wall is allowed as noted in the City's Zoning Bylaw, or Building Code.
- In accordance to Section 18, Site Grading in Schedule B.

## 2. Design and Inspection

The design and inspection of any retention system or structure above 1.2m shall be prepared and carried out by the *Professional Engineer* who shall be responsible to acquire geotechnical consultation and advice where conditions present the need for it, as designated by the BC Building Code.

Evaluation of the aesthetic appearance will be completed by the *Director of Capital Works and Infrastructure* prior to construction. The following types of structures may be permitted pending aesthetic approval from the *Director of Capital Works and Infrastructure* as permanent structures:

- Lock blocks (concrete blocks approximately 750mm x 750mm x 1,500mm) unless:
    - No more than 2 courses of blocks are exposed with the top surface being flat without locking stubs
    - Ends of the system include sloping transition blocks where topography is sloping
    - Exposed faces and surfaces, including the top surfaces of such system, are faced or surfaced with either exposed aggregate or other decorative finish
    - Footings in accordance to *Professional Engineer*'s requirements
    - Geogrid reinforced in accordance to *Professional Engineer*'s requirements
- Segmented block retaining wall
    - In accordance to manufacturers requirements
    - Walls to be designed by a Professional Engineer
- Gabion (wire baskets filled with rocks) except for in-stream or waterfront erosion protection, not more than 2 baskets high. Rock material and construction method to be approved by the Director of Capital Works and Infrastructure. Design shall be aesthetically pleasing
- Cast in place concrete retaining walls:
    - Where required, retaining walls shall be designed by a *Professional Engineer*.
- Stacked Rock Walls:
    - In accordance with this section.
- Guardrails or Fences:
    - Guardrails or fences shall be required at the top of retention structure where the difference in elevation between adjacent levels exceeds 1m
    - Landscaping alternatives may be used providing it is of a dense thorny type to discourage access to the top of the retention structure area and providing the difference in elevation between adjacent levels does not exceed 1.5m

## 3. Submissions for Retention Structures

Engineering submissions are required for all retention structures which are more than 1.2m high and/or terraced at a slope steeper than 2 horizontal to 1 vertical. Allowable slope steepness to be confirmed by the *Owner's Professional Engineer*.

Submissions shall be accompanied by the following documentation signed and sealed by the *Professional Engineer*:

- Scaled structural, geotechnical and drainage details
- Scaled site plan showing the location of the retention structures in relation to any property lines. Rights-of-way or easements, tanks, other structures, underground works and services or natural features and confirmed by a Professional BC Land Surveyor if deemed necessary
- Letters of Assurance of Design and Field Review

City Building Inspector to provide approval for submission.

## 4. Completion of Retention Works

The *Owner* shall take all necessary measures, temporary and permanent to provide any necessary protection.

All required retention works are required to be completed prior to:

- Provisional Completion of a subdivision or issuance of building permit

# 14. SITE GRADING

## 1. Site Grading General

The *Owner* shall execute site grading work in accordance with the regulations, standards and specifications set out in this Section. Through areas of steep topography the *Owner* shall undertake site grading work as requested by the *Director of Capital Works and Infrastructure* in order to provide developable building sites, reasonable lot access, and accommodate or enhance drainage.

## 2. Conceptual Review Submission Requirements

The *Owner* shall provide a conceptual grading plan at least one (1) month prior to the submission of the *subdivision* design to enable the *City* to provide comments regarding the overall grading scheme.

## 3. Approval of Engineering Drawings Required Prior to Construction

Prior to commencement of construction, engineering drawings for site grading work shall be submitted to the Director of Capital Works and Infrastructure for approval. These drawings shall explicitly show:

- Clearing and grubbing boundaries
- Fill and excavation areas (by shading)
- Structural fill areas
- Lot grading elevations and sections
- Drainage works
- Siltation abatement and control
- Profiles along excavation and embankment control lines
- Where applicable, temporary emergency access points

No construction of the work shall commence until the *Owner* has received written approval from the Director of Capital Works and Infrastructure. The Director of Capital Works and Infrastructure may, at their discretion, request a new set of drawings if they feel that available existing drawings are out of date.

## 4. Geotechnical Evaluation

In addition to the geotechnical overview undertaken during the initial phases of the project, the *Owner* shall engage the services of a qualified *Professional Engineer* to investigate surface soil and sub-surface conditions with respect to site grading within the proposed *subdivision*s. The *Professional Engineer* shall prepare a report outlining their findings and shall provide clear, definitive recommendations on the geometry and placement of fill sections, compaction requirements for structural and non-structural fills, cut and fill slope geometry, pavement structures for roads and any other geotechnical issues affecting site grading construction within the proposed *subdivision*. A copy of the geotechnical evaluation shall be submitted for approval to the Director of Capital Works and Infrastructure with the site grading or engineering drawings.

## 5. Drainage

Supplemental to the requirements for drainage systems outlined in MMCD Section 4 – Stormwater and Schedule B. The *Owner* shall design site grading and drainage works to:

- Accommodate drainage throughout the site
- Accommodate drainage generated on-site
- Mitigate drainage at all building locations
- Drainage for back and side yard of property should be directed to street and not be conveyed over adjacent properties.
- Mitigate sub-surface drainage/groundwater problems
- Mitigate soil erosion potential
- Mitigate siltation of adjacent or receiving *City* storm and sanitary mains or ditches and receiving streams and watercourses

The *Professional Engineer* shall prepare and seal the appropriate drawings to explicitly show the works required to accommodate site drainage.

## 6. Detailed Site Survey

Detailed site surveys are required throughout the site and of relevant areas beyond the site to ensure grading in accordance with the requirements of this Manual with respect to assuring the competence of non-structural and structural fills and to accommodate site drainage during and after construction of the *subdivision* or *development*.

## 7. Design Criteria - General

The intent of site grading plans is to ensure that the following parameters are accommodated:

- Overall site drainage to provide:
    - Conveyance of off-site runoff onto and through the site
    - Conveyance of on-site runoff into existing watercourses or new drainage infrastructure
    - Abatement of drainage from one lot to another
    - Abatement of sub-surface groundwater problems
    - In accordance with MMCD Section 4 – Stormwater and Schedule B
- Build-able lots are created that provide:
    - Access from fronting roadways
    - Drainage from each lot and into drainage infrastructure
    - Structural competence of undisturbed and embanked soils to support building loads
    - Provide drawings that are easy to interpret by approving authorities, contractors, and builders to construct the work

## 8. Site Preparation

All areas of the site where excavations or embankments are to be constructed shall be cleared of trees, structures and debris, grubbed and stripped of organic topsoil.

Timber, waste wood, roots, structures and debris shall be loaded, hauled and disposed of at an approved location off-site, or ground/chipped onsite.

Dust control measures shall be put in place during construction.

## 9. Excavation and Embankment Slopes

Unless specified otherwise by the *Professional Engineer* or Worksafe B.C., maximum (steepest) excavation and embankment slopes shall be 2.0m horizontal to 1.0m vertical.

## 10. Compaction

Unless specified otherwise by the *Professional Engineer* all embankment shall be compacted as follows:

- Non-Structural Embankments – *Owner's Professional Engineer* shall confirm Minimum Standard Maximum Proctor Dry Densities
- Structural Embankments – *Owner's Professional Engineer* shall confirm Minimum Standard Maximum Proctor Dry Densities

## 11. Lot Grading

Wherever possible, lots shall be graded towards roadways, and in no case shall lots be permitted to drain onto an adjacent lot. Through areas where site topography prohibits drainage to roadways, lots may be graded to lot lines with drainage swales graded out to the roadways. Drainage swales shall be protected by registration of a covenant and a statutory right-of-way on the lot title.

Where lot grading is undertaken maximum lot grades shall be 15% graded to 20 m back from the front property line with minimum lot grades of 2%.

## 12. Lot Access

Maximum 10% access grades measured from the curb to property line elevation shall be provided to each lot. Design driveways in accordance with MMCD Section 5 – Roads and Schedule B.

## 13. Landscaping and Seeding

Upon completion of earthworks, all excavation and embankment slopes seeded in accordance with Schedule B.

## 14. Siltation Abatement and Erosion Control

Shall be in accordance with MMCD Section 4 – Stormwater and Schedule B.

# 15. QUALITY CONTROL AND ASSURANCE

## 1. General

This Section sets out the *City's* minimum standards for quality in design, quality in construction and quality in record-keeping for the *Works and Services* to be designed and constructed in accordance with this Manual.

Minimum design standards are set out in MMCD Sections 1 – 10 and through this entire Schedule B.

## 2. Engineering Requirements

- The *Owner* shall demonstrate to the satisfaction of the *Director of Capital Works and Infrastructure* that the *Owner* has retained or shall retain the services of a *Professional Engineer* to undertake the design, inspection, testing and record-keeping for the *Works and Services*
- The *Owner* shall complete and provide the *Director of Capital Works and Infrastructure* with the following information in the *Owner/Professional Engineering* confirmation letter to demonstrate that the *Professional Engineer* is qualified to undertake the *Works and Services* and more particularly, has successfully undertaken projects similar in scope, nature and value to the *Works and Services*:
    - The name and address of the *Professional Engineer* and a summary of the projects that the *Professional Engineer* has undertaken that are similar in scope, nature and value to the *works and services*
    - The names of the individuals assigned to various aspects of the project by the *Professional Engineer* together with a summary of the projects that the individual *Professional* Engineers have undertaken that are similar in scope, nature and value to the *Works and Services*
    - The names and the resumé (curriculum vitae) for the person(s) that the *Professional* Engineer proposes/has retained to undertake the inspections and testing on their behalf during the construction of the *Works and Services* together with a summary of the projects that the person(s) has completed that are similar in scope, nature and value to the W*orks and Services*
    - The names and addresses of all sub-consultants that the *Professional Engineer* has/proposes to retain and a summary of the projects that the sub-consultants have completed that are similar in scope, nature and value to the *Works and Services*
    - The *Owner* shall ensure the *Professional Engineer* designs all *Works and Services* in accordance with this Manual.
    - The *Owner* shall also confirm that the *Professional Engineer* will provide the Design, Construction and Record-keeping Quality Control and Assurance Plans described herein. A copy of the agreement shall be filed with the Director of Capital Works and Infrastructure.

## 3. Construction Requirements

- The *Owner* shall demonstrate to the satisfaction of the *Director of Capital Works and Infrastructure* that the *Owner* has or shall retain the services of one or more qualified Contractors to undertake

the construction of the *Works and Services*. The *Owner* shall provide the *City* with the name and address of its Contractor(s) together with a summary of the projects that the Contractor(s) has undertaken that are similar in scope, nature and value to the Works prior to awarding the contract(s) to the Contractor

In the case where the Contractor has not performed similar *Works and Services* in the *City* of Quesnel, the *Director of Capital Works and Infrastructure* may require that the *Owner* provide a list of projects and references from other municipalities that demonstrates that the Contractor(s) is qualified to undertake the *Works and Services*

- The *Owner* shall ensure that its Contractor(s) constructs the *Works and Services* in accordance with the design, drawings, plans and specifications approved for construction by the *Director of Capital Works and Infrastructure*

## 4. Quality Control and Assurance Plans

The Design Quality Control and Assurance Plan is as follows:

- The Owner shall submit or cause the Professional Engineer to submit a Design Quality Control and Assurance Plan to the City for approval coincident with submission of the first design drawings.
- The Owner's proposed Design Quality Control and Assurance Plan shall detail the procedures that will be used to ensure and verify that the design for the Works and Services, including all plans, drawings and specifications, shall be completed in accordance with the minimum design standards set out in this Manual.
- In the case of design items related to pump stations, structures, structural fills, geotechnical or hydro-geotechnical items or any item not described in MMCD Sections 1 – 10 and Schedule B, the Design Quality Control and Assurance Plan shall show such specialist and/or sub-consultants with suitable experience in these works.

Construction Quality Control and Assurance Plan is as follows:

- The *Owner* shall submit or cause the *Professional Engineer* to submit a Construction Quality Control and Assurance Plan to the *Director of Capital Works and Infrastructure* coincident with submission of the first design drawing to the *City*.
- The *Owner's* proposed Construction Quality Control and Assurance Plan must detail the procedures that will be used to ensure and verify that the *Works and Services* shall be constructed in accordance with the *Professional Engineer's* design, plans, drawings and specifications. The Construction Quality Control and Assurance Plan must include:
    - A proposed Construction Schedule showing milestone dates and the dates of Substantial and Total Performance of the *Works and Services*
    - The nature and frequency (periodic or full-time resident) of the proposed site inspections during construction to ensure that all *Works and Services* constructed satisfy the intent of the design and conform with the drawings, plans and specifications
    - The nature and frequency of the proposed field and laboratory testing requirements for the *Works and Services* including what materials and equipment are to be tested, what types of tests will be performed and when these tests are to take place

- Other information as the *Director of Capital Works and Infrastructure* may stipulate from time to time

Record-keeping Quality Control and Assurance Plan is as follows:

- The *Owner* shall submit or cause its *Professional Engineer* to submit a Record-keeping Quality Control and Assurance Plan to the *Director of Capital Works and Infrastructure* coincident with submission of the first Design Drawings.
- The *Owner's* proposed Record-keeping Quality Control and Assurance Plan shall detail the procedures that will be used to ensure and verify that proper records will be kept and maintained throughout the design, construction and warranty phases of the *Works and Services*. The Record-keeping Quality and Assurance Control Plan shall ensure that the following records are kept as a minimum:
  - Quality manual and standards
  - Details of any field design or construction changes to the drawings, plans and specifications to which changes are approved in writing by the City
  - Deficiency Identification Forms (Items of the Works that are either not supplied or constructed in accordance with the design (drawings, plans and specifications) or that require remedial or corrective action)
  - Deficiency Disposition/Verification Forms (List of the foregoing Items of the Works that have been corrected)
  - Inspection and Test Records
  - Field measurement records of completed *Works and Services* that have been used by the *Professional Engineer* to accurately prepare reproducible as-built drawings that are filed with the *City*
- Notwithstanding the generality of the foregoing, the *Owner* shall ensure that its *Professional* Engineer provides the *City* with the following at the times and in the manner set out below:
  - Certification, prior to paving, that items of the *Works and Services* that are below areas to be paved (such as roads, walkways, driveways and parking lots) have been inspected by the Professional Engineer and comply with the design (drawings, plans and specifications). Such certification shall be accompanied by all test and inspection reports and by video tapes and reports on pipe lines
  - Certification, prior to acceptance, by the City that surface works including paving, drainage, curbs and gutters, sidewalks, street lights, etc. have been constructed in accordance with the design (drawings, plans and specifications)
- Copies of inspection reports & record drawings shall be submitted to the City (in PDF format for inspection reports and both PDF and AutoCAD formats for record drawings).

# 16. STANDARDS FOR SUBMISSION BY DEVELOPER

## 1. General

### .1 Introduction

This Section outlines the minimum standards and requirements for design and record drawing submissions for engineering work(s).

Where a *City* standard drawing exists, it shall be sufficient to refer to the appropriate drawing by reference number and date of issue. Where a standard drawing does not exist, or is unsuitable for a particular case, detail drawings shall be prepared to accurately portray the various elements of the installation.

Where no standard is defined in this Section for the preparation of a drawing to portray a particular service, structure, or other item, instructions and requirements may be obtained by discussion with *City* staff.

## 2. General Requirements

Drawings shall clearly show existing and proposed locations of all utilities using offsets from property lines or boundaries of rights-of-way.

All drawings shall be signed and sealed by a *Professional Engineer* registered in the Province of British Columbia.

Elevations shall be relative to geodetic datum. Horizontal coordinates shall be referenced to UTM coordinate system UTM NAD 83 Zone 10.

### .1 Abbreviations

| | |
|---|---|
| UTM | Universal Transverse Mercator |
| NAD 83 | 1983 North American Datum |
| BOC | Back of Curb |
| EC | End of Curve |
| BC | Beginning of Curve |
| PI | Point of Intersection |

## 3. Drafting Standards

### .1 Sheet Layout

Drawing sheet layout(s) shall conform to and include the following:

- Sheet size to be ANSI D 22x34in (558.8x863.6mm)
- A north arrow shall be placed close to the top right side of each plan view on the sheet

- A title block which describes the contents of the drawing (e.g. Key plan, road, etc.) and shall clearly indicate the location of the works by road name(s) and/or legal description
- Drawing scale, date, revision history block, and a detailed legend shall also be included on each sheet layout

## 4. Dimensions and Units

The following conventions must be used:

- Dimensions and units must be shown in metric. No imperial units are permitted
- All distances, elevations, and coordinates shall be given in meters to accuracy of 3 decimal places
- Grades shall be given as a percentage to accuracy of 2 decimal places
- Areas shall be in square meters rounded to the nearest square meter
- All pipe sizes shall be given in millimeters as per ASTM specifications using:

  1 inch = 25mm
- Existing imperial dimensions, except for pipe sizes, are to be soft converted using the factors:

  1 inch = 25.4 millimeters

  1 foot = 0.3048 meters

### .1 Lettering

- Lettering is to be an open style of Vertical Gothic (e.g. Leroy or AutoCAD – 'romans')
- All lettering to maintain a 1:10 ratio between plotted text height and plotted pen thickness
- The minimum plotted text height shall be 1.5mm
- The maximum plotted text height shall be 5.0mm
- The standard lettering height is 2.0mm

### .2 Scales

The following scales shall be normally used:

- Location and Key Plans 1:1000; 1:2500; 1:5000; 1:10000
- Composite Plans 1:500; 1:1000; 1:2500
- Plan/Profile Drawings Horizontal 1:250 or 1:500 Vertical 1:25 or 1:50
- Cross Sections Horizontal 1:100 Vertical 1:50
- Details 1:10; 1;20; 1:100; 1:500

## 5. Drawing Standards (digital)

### .1 General Requirements

The *Owner* shall submit a complete set of electronic drawings of the *subdivision* or *development* in AutoCAD DWG format upon completion of the proposed works.

All drawing objects colour and linetype properties shall be set to 'bylayer'.

All drawings must be purged of all unnecessary information prior to submission to the *City*.

### .2 Drawing Conventions

### .3 Layer Names and Colour

The *City* uses the following convention for naming AutoCAD layers:

*<category>-<object>-<type>*

Where the available '*categories*' are defined in Table 15-1; and '*objects*' could be lines, mains, manholes, valves, walls, fences, and text; and '*type*' describes the type of object.

For example, concrete could be used to describe a 'type' of sidewalk as in ROAD-WALK-CONCRETE or ROAD-WALK-TEXT would describe text associated with the sidewalk.

Table 15-1: Layer Names and Colour

| Layer Category | Category Description | Colour Pen # |
|---|---|---|
| COM | Communications (e.g. Tel or Cable) | 230-239 |
| ELEC | Electrical | 190-199 |
| GAS | Gas | 190-199 |
| LAND | Landscape Information | 70-79 |
| LGL | Legal Information | 140-149 |
| ROAD | Roads | 20-29 |
| SAN | Sanitary Sewer | 10-19 |
| STM | Storm Drainage | 90-99 |
| STRUC | Structures and Hard Surface Features | 220-229 |
| SURV | Survey Information (e.g. Control points) | 40-49 |
| TOPO | Topography (e.g. Contours) | 60-69 |
| WAT | Water | 150-159 |

Some common layer examples are:

- SAN-MAIN-200mm

- ROAD-EDGE-ASPHALT
- SURV-POINT-CONTROL

If required layer names may be prefixed as in Table K2 to signify either existing, proposed, or future works.

Table 15-2: Layer Names - Prefix

| Prefix | Description | Range |
|---|---|---|
| E- | Existing Features | Colours 11-249 odd |
| P- | Proposed Works | Colours 10-248 even |
| F- | Future works | 250-255 |

### .4 Special Layers

Exceptions to the layer naming convention described above are described in Table 15-3.

Table 15-3: Layer Names - Exceptions

| Layer Category | Category Description | Colour Pen # |
|---|---|---|
| _MVIEW | Viewports | 0 |
| _IMAGE | Externally Referenced Images | 0 |
| _TITLE | Title Block Data (text and line work) | 180-189 |

### .5 Lineweight Conventions

Colours 1-9 are generally used for Title blocks and miscellaneous text and notes.

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.20 | black | 6 | 0.30 | black |
| 2 | 0.30 | black | 7 | 0.20 | black |
| 3 | 0.35 | black | 8 | 0.15 | black |
| 4 | 0.60 | black | 9 | 0.10 | black |
| 5 | 0.20 | black | | | |

Colours 250-255 are generally used for FUTURE works and hatch patterns.

| | | | | | |
|---|---|---|---|---|---|
| 250 | 0.10 | grey | 252 | 0.20 | grey |
| 251 | 0.15 | grey | 253 - 255 | 0.25 | grey |

Colours 10-248 (even) are generally used for proposed works, as follows:

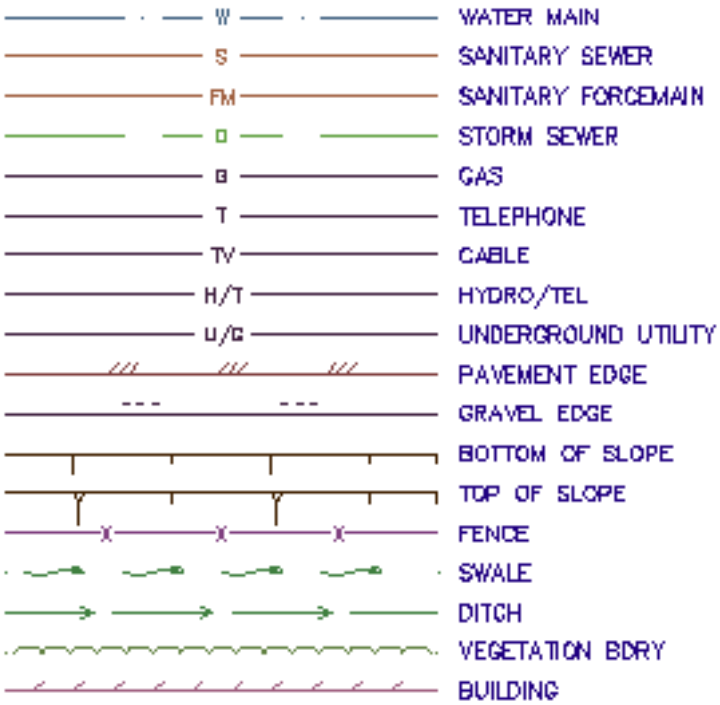
| | | | | | |
|---|---|---|---|---|---|
| 10, 20, 150... | 0.60 | black | 16, 26, 156... | 0.30 | black |
| 12, 22, 152... | 0.40 | black | 18, 28, 158... | 0.20 | black |

| | | |
|---|---|---|
| 14, 24, 154... | 0.35 | black |

Colours 11-249 (odd) are generally used for existing works, as follows:

| | | | | | |
|---|---|---|---|---|---|
| 11, 21, 151... | 0.20 | black | 17, 27, 157... | 0.10 | screen 60 |
| 13, 23, 153... | 0.15 | black | 19, 29, 159... | 0.10 | screen 30 |
| 15, 25, 155... | 0.10 | black | | | |

### .6 Line Types




## 6. Required Drawings

### .1 Cover Sheet (Title Page)

The cover sheet shall show the following information:

- Name of *development* or project
- Name, phone number and address of *Owner* and *Professional Engineer*
- Site location plan of *development* or project
- A description of the project
- Legal description of subject properties
- File numbers of approving authorities. (i.e. *City* and/or Ministry)
- Complete drawing index of all sheets belonging to the set
- Other pertinent information

### .2 Key Plan(s)

Key Plans shall show the following information:

- Lot numbers, plan numbers, and road names of the subject development and adjoining properties
- Cross reference of the drawings by outlining the area contained in each drawing and referencing that drawing by drawing number
- General construction notes
- Other pertinent information

### .3 Building Envelope Plan (if applicable)

Building Envelope Plan shall show the following information:

- Overall plan of current phase
- Lot numbers
- Roads, curbs, gutters and sidewalks
- Rights-of-way and easements
- Offset lines from all property boundaries indicating required building setbacks
- 10 metre by 10 metre square on each *parcel* indicating the required minimum building envelope
- Notes that indicate the required setbacks from all property boundaries pursuant to the Zoning Bylaw
- Other pertinent information

### .4 Composite Plan(s) (as required)

Composite Plans shall show the following information:

- All existing and proposed utilities, roads, walkways, and sidewalks
- All rights-of-way and easements including widths
- Control monuments with identification number
- All legal information, including bearings, dimensions, lot numbers, block numbers, legal plan numbers, and street names. All lots must be numbered
- Show legal lot line dimensions
- All roadway dimensions including width of right-of-way, BOC to BOC and BOC to edge of *right-of-way*
- Area of each *parcel*
- Other pertinent information

### .5 Plan / Profile Drawings

Plan/Profile drawings shall show the following information:

### .6 General

The following criteria shall apply to all drawings:

- Both plan and profile stationing must be tied to a property line or road boundary
- The profile shall be shown at true centerline length and projected below the plan in as close a horizontal relationship as possible
- The top half of a Plan/Profile sheet shall show the plan view and shall show the legal layout with legal descriptions of all properties, the location of all sidewalks, catch basins, underground utilities such as sewer, water, telephone, television power, manholes, valves, hydrants, and all survey monuments, etc.
- Drawings shall also show existing dwellings, fences, trees, hedges, unusual ground features, existing roads and driveways including the type such as asphalt, concrete or gravel
- Plan/Profile drawings for various services may be combined on one plan providing the plans are clear and readable. Plan/profile drawings may combine the following services:
    - Roads & Storm Drains
    - Sanitary Sewers & Water
    - Roads, Storm Drains, Sanitary Sewers and Water may be included on one drawing depending on the complexity of the design and at the discretion of the *Director of Capital Works and Infrastructure*

### .7 Road Plan/Profile Drawings (may be combined with Storm Drains)

Road *plan* views shall show the following information:

- Drawings shall show width of road, width of shoulders, and the offset of curb from property line
- Chainages of the B.C. and E.C. of horizontal curves shall be shown together with the delta angle, centerline radius, tangent length, and centerline arc length. Curb radii are not required if the centerline radius and road width are shown, except on curb returns at intersections and at the end of cul-de-sacs

Road *profiles* views shall show the following information:

- The design gutter and/or centerline grade (%)
- Vertical curve chainage and elevations of B.C., E.C. and P.I.:
    - the external value, e
    - the length of vertical curve
    - the chainage and elevation of the low spot of sag curves

- K value of vertical curvature (crest on sag)

- Existing ground elevation along the centerline of the proposed roadway and/or the edge of existing asphalt

### .8 Water Plan/Profile Drawings (may be combined with Sanitary Sewer)

Water *plan* views shall show the following information:

- Offset of pipelines from property lines
- Length and size of pipe
- Offset of connections from property lines
- The locations of manholes, hydrants, valves, services, end-of-main, or other appurtenances referenced to the nearest property line
- Information on any curves or pipe deflections
- Easements (existing and/or required)

Water *profiles* views shall show the following information:

- Surface profiles (existing and design, if applicable) over proposed main
- Length, size, grade, type, and material of pipe
- Profiles of invert and crown of pipes
- Location, type and invert elevation of all crossing utilities

### .9 Storm Drains and Sanitary Sewer Plan/Profile Drawings

Storm and Sanitary *plan* views shall show the following information:

- The structural details of all manholes and chambers, etc. not covered by standard drawings. Where the sanitary sewers and storm drains or other utilities are to be installed in a common trench, a typical cross-section showing vertical and horizontal distances between pipes and classes of pipe and bedding shall be shown
- Offset of pipelines from property lines
- The size of pipe
- Offset of connections from property lines
- The locations of manholes, clean-outs and services relating to property lines
- Information on any curves or pipe deflections
- Easements (existing and/or required)
- Future curb and gutter lines (if applicable)
- Manhole identification numbers
- Inverts of service connections at property line (if applicable)

- For storm drainage, features such as ditches, culverts, streams, channels, etc.

Storm and Sanitary profiles views shall show the following information:

- Surface profiles (existing and design, if applicable) over proposed main
- Length, size, grade, type, and material of pipe
- Profiles of invert and crown of pipes
- Location, type and invert elevation of all crossing utilities
- Invert elevations of manholes
- Alignment station of manholes
- Manhole identification number
- Rim elevations of proposed or adjusted manholes

### .10 Grading Plan(s)

In addition to any other requirements presented in this Section, grading plans shall show the following information:

General

- Pre-development contour lines. The topographic information shall extend a minimum 30.0m outside the development site
- Proposed contours, slopes, grades, and spot elevations
- The minor (5 year return) storm sewer system with the flows calculated per section and the accumulated flows from all upstream sections. Provision must be made for upstream development potential where applicable
- The major (100-year return) system. The *Professional Engineer* shall note wherever the major system is not in the pipe or the roadway, showing the routing and flows for the 100-year return storm
- All swales proposed to affect the submitted Stormwater Management Plan
- The development proposal shall meet existing land and utility elevations along the development boundary unless specifically approved by the Director of Capital Works and Infrastructure
- A legend noting all items proposed in the Stormwater Management Plan. Applicable "General Notes" should also be included

### .11 Lot Grading

- All existing corner lot elevations (uncircled)
- All proposed corner lot elevations (circled)
- The proposed building envelope with the Minimum Building Elevation noted

- The slope of the lot (directional arrow), noting a minimum 2% grade on the lots

### .12 Landscape Plan(s)

Landscape plans shall show the following information:

- Extent of proposed landscape works and services
- Existing and proposed property information, including lot lines, easements, legal descriptions, addresses and dimensions
- Existing and proposed contours, slopes, grades and spot elevations for landscaped areas (if not already shown on grading plan)
- Existing and proposed buildings, structures, roads, curbs, sidewalks, walls, fences, signs, site features and other appurtenances
- Existing vegetation proposed to be removed, relocated or retained
- Areas of proposed preservation, naturalization, restoration, lawn and landscaping, including soil types, depths and amendments
- Proposed plant species name (botanical and common), size and planting condition
- Existing and proposed irrigation systems
- Construction details and specifications or other pertinent information as required

### .13 Stormwater Management Plan (SMP)

In addition to any other requirements presented in this Section, Stormwater Management Plans shall show the following information:

- Site and surrounding area (400m minimum outside development) showing roads and major features. A small location plan of the watershed is also to be included
- Contours of existing ground (1.0m intervals where slope <20%, 2.0m >20%) for the site and surrounding area mentioned above
- Major flood routing (1:100 year) show as arrows and indicate if in pipe or on surface show an "open" arrow for surface routes and the same arrow "shaded" for routes in pipes
- Detention pond details, if applicable
- Area, in hectares, of development and the total area of drainage basin
- Directional arrows of flow within the site and on surrounding areas
- Sub-catchment boundaries, coefficients and areas
- Pipe system including size, grade, and minor and major flows (a table may be utilized)
- The subject development is to be highlighted
- Other pertinent information

### .14 Erosion and Sediment Control Plan(s)

As noted in MMCD Section 4 – Erosion and Sediment Control for Construction:

- Existing contours of the site at an interval sufficient to determine drainage patterns
- Final contours if the existing contours are to be significantly changed
- Final drainage patterns/boundaries
- Existing vegetation such as significant trees, shrubs, grass, and unique vegetation
- Limits of clearing and grading
- Erosion and sediment control measures (temporary and permanent) including locations, names and details, in accordance with "Land Development Guidelines for the Protection of Aquatic Habitat"
- Storm Drainage systems including drain inlets, outlets, pipes, and other permanent drainage facilities (swales, waterways, etc.)

### .15 Street Lighting Plan(s)

A plan view of the street lighting shall be provided. General notes on the plan shall reference Municipal Standards, Specifications and appropriate design criteria as outlined in MMCD Section 6 – Roadway Lighting and Schedule B.

### .16 Street Sign, Paint Marking, and Traffic Control Device Plans

A drawing identifying signs, markings, and required control devices. Detailed drawings may be required for traffic control devices. These plans can be added to road plan drawings if the plan is clear and readable.

### .17 Traffic Management Plan(s)

Detail routes for construction traffic and traffic controls for traffic on existing roads affected by construction only required if requested by the *Director of Capital Works and Infrastructure*.

### .18 Road Cross Section Plan(s)

Shall be scaled at 1:100 horizontal and 1:50 vertical and shall note the existing ground elevation, the proposed elevations of the road centreline, the curb and gutter (or road edge) and property lines. Cross-sections are required at critical locations as required by the *Director of Capital Works and Infrastructure*.

### .19 Construction Details

Show all proposals for construction which are not covered or specifically detailed in the *City* Standards and Specifications. Where there is a *City* standard, it is expected to refer to the Drawing Number. It is not necessary to include or provide work(s) for which there is a *Standard Drawing*.

### .20 Electrical, Gas, and Communication Utilities

Per appropriate authority (*Owners Professional Engineer* shall obtain and submit utility drawings when requested by *Director of Capital Works and Infrastructure*).

## 7. Drawing Submissions

### .1 Design Submissions

Half-size (11X17) drawings will be considered for design submissions with prior approval from Director of Capital Works and Infrastructure.

6 paper copies of all design drawings are required for design submissions.

### .2 Record Drawings

Record Drawings shall be submitted prior to issuance of a *Certificate of Total Completion*. Record Drawings must be delivered in both paper and electronic format(s) to the *City*. Record Drawings shall include all drawings in approved design submission or as requested by *Director of Capital Works and Infrastructure*.

The *Owner* shall submit to the *City* a complete set of electronic drawings of the subdivision or development in DWG format compatible with the current version of AutoCAD, as currently used by the City of Quesnel, in addition to a digital hard copy in Adobe PDF format in accordance with Schedule B.

The final version of AutoCAD drawings must include the data required to be able to be transferred into the City's GIS system and asset management system.

### .3 Electronic Drawings

#### .1 General Requirements

The *Owner* shall submit to the *City* a complete set of electronic drawings of the *subdivision* or *development* in AutoCAD DXF or DWG format.

The electronic drawing shall be prepared in accordance with this section.

All external files associated with the electronic drawing (e.g., special fonts, line types, and/or images) shall be supplied with the electronic drawing submission.

No drawing shall be submitted that contains any external references (xrefs). All externally referenced drawings shall be bound prior to submittal.

### .4 Digital Hard Copies

A digital hard copy is any digital file that is reproducible without the ability to modify the drawings contents or appearance.

### .1 General Requirements

Portable Document Format (*.pdf) is the preferred file type. However alternatives may be considered. Alternative formats might be Autodesk's Drawing Web Format (*.dwf) or scanned .tif or .jpg images.

Drawing sets submitted as a digital hard copy shall be electronically sealed by the *Professional Engineer*.

## .5 Device/Document Settings for Plotting Adobe Portable Document Format

Ensure all text is legible and the shading and hatching ordered so as not to block or hide other line work and/or text.

The following settings shall be used when plotting the drawings to Adobe PDF:

- Paper size to be ANSI D 22" x 34"
- Layout to be "landscape"
- Graphic print quality to be no less than "600 dpi"

# PART C SUPPLEMENTARY GENERAL CONDITIONS AND SPECIFICATIONS

# 1. SUPPLEMENTARY GENERAL CONDITIONS

## SGC 1.0.1 Clarification

1.0.1 The MMCD General Conditions for the purpose for this Manual are referred to for construction specifications only. MMCD General Conditions do not apply as they are in reference to contractual obligations between the Owner and potential Contractors the Owner may choose to engage with for the construction of the Owner's development.

## 2. SUPPLEMENTARY SPECIFICATIONS

The following Supplementary Specifications included in this section are modifications or additions to the Specifications in the Master Municipal Construction Document Volume II (Platinum Edition):

### SS 01 00 00 General Clarifications

Add Measurement and Payment clause as follows:

#### 1.1 Measurement and Payment

The MMCD specifications and supplemental specifications for the purpose for this Manual are referred to for construction specifications only. All measurement and payment clauses do not apply with respect to this Manual.

### SS 01 42 00 Reference Specifications

#### 1.1 Nomenclature

Delete reference 1.1.26 .‡

.26 NAAPI North American Association of Pipeline Inspectors

#### 1.2 Referenced Specifications

Delete Referenced Specifications 1.2.15.1, .2, .5, .10 and .11‡

Add Referenced Specification:‡

1.2.18.36 CSA A3000 Cementitious Materials Compendium

### SS 01 55 00 Traffic Control, Vehicle Access and Parking

#### 1.4 Traffic Control

Delete section 1.4.10.3 and replace with the following: ‡

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

### SS 03 30 20 Concrete Walks, Curbs and Gutters

#### 2.1 Materials

Delete section 2.1.5.1 and replace with the following: ‡

.1 Hand-formed and hand-placed concrete:

| | |
|---|---|
| Slump: | 80 mm. |
| Air entrainment: | 5 to 8%. |
| Maximum aggregate size: | 20 mm. |

| | |
|---|---|
| Minimum cement content: | 335 kg/$m^3$. |
| Minimum 28 day compressive strength: | 32 MPa. |

## SS 03 30 53 Cast-In-Place Concrete

### 2.1 Materials

Delete section 2.1.1 and replace with the following: ‡

.1 Portland cement: to CSA A3000

Delete section 2.1.2 and replace with the following: ‡

.2 Supplementary cementing materials: to CSA A3000

Add section 2.1.10 as follows:

.10 Type 50 (High Sulphate Resistant) concrete to be used for the manufacture of all concrete products incorporated into this project.

## SS 03 40 01 Precast Concrete

### 2.1 Materials

Add section 2.1.2 as follows:

.2 Type 50 (High Sulphate Resistant) concrete to be used for the manufacture of all concrete products incorporated into this project.

## 2.7 Granular Pipe Bedding and Surround Material

Delete section 2.7.1 and replace with the following: ‡

| Percent Passing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sieve Designation | | Type 1* | | | Type 2* | | | Type 3* | | | |
| 50.0 | mm | | | 100 | | | 100 | 100 | - | 100 | |
| 38.0 | mm | | | 100 | | | 100 | 90 | - | 100 | |
| 25.0 | mm | | | 100 | | | 100 | 20 | - | 60 | |
| 19.0 | mm | 90 | - | 100 | 90 | - | 100 | 0 | - | 15 | |
| 12.5 | mm | 65 | - | 85 | 70 | - | 100 | | | | |
| 9.5 | mm | 50 | - | 75 | | | | 0 | - | 5 | |
| 4.75 | mm | 25 | - | 50 | 40 | - | 70 | | | | |
| 2.36 | mm | 10 | - | 35 | 25 | - | 52 | | | | |
| 1.18 | mm | 6 | - | 26 | 15 | - | 38 | | | | |
| 0.600 | mm | 3 | - | 17 | 6 | - | 27 | | | | |
| 0.300 | mm | | | | 3 | - | 20 | | | | |
| 0.075 | mm | 0 | - | 5 | 0 | - | 8 | | | | |

*Type 1:*standard gradation*

*Type 2: *to be used only in dry trench conditions and with Director of Capital Works and Infrastructure's approval*

*Type 3: *minimum 40% Porosity*

Recycled concrete free from contaminated and other extraneous material, confirming to the Type 1 gradations, may be used as pipe bedding and surround material.

## 2.11 Recycled Aggregate Material

Delete section 2.11.1 and replace with the following: ‡

.1 Aggregates containing recycled material may be utilized if approved by the Director of Capital Works and Infrastructure. In addition to meeting all other conditions of this specification, recycled material should not reduce the quality of construction

achievable with quarried materials. Recycled material shall consist only of aggregates, crushed portland cement concrete, or asphalt that is free of impurities.

Add section 2.11.2 as follows: ‡

.2 Recycled Concrete and Asphalt (RCA): To be well graded mixture of aggregates, crushed portland cement concrete, or asphalt, substantially free from lumps and impurities. This material shall be manufactured to conform to the following gradation

| Sieve Designation | Percent Passing |
|---|---|
| 25 mm | 100 |
| 19 mm | 80 - 100 |
| 9.5 mm | 50 - 85 |
| 4.75 mm | 35 - 70 |
| 2.36 mm | 25 - 50 |
| 1.18 mm | 15 - 35 |
| 0.300 mm | 5 - 20 |
| 0.075 mm | 0 - 6 |
| .1 California Bearing Ratio of the supplied materials shall be a minimum of 20% and shall be tested at every 5,000 tonnes. | |

Add section 2.11.3 as follows: ‡

.3 Virgin Materials: All aggregates and granular materials shall consist of entirely virgin materials, except recycled aggregate materials.

## 2.13 Recycled Asphalt Pavement (RAP)

Add sections 2.13.1, 2.13.2 and 2.13.3 as follows: ‡

.1 Recycled Asphalt Pavement (RAP) shall consist of asphalt concrete free from organic matter, contaminated and other extraneous material.

.2 Source of RAP shall be from asphalt removal, surplus generated during plant start-up, transition between mixes, plant clean out, or excess mix produced that could not be placed.

.3 RAP gradation shall not exceed the maximum aggregate size for the specific asphalt mix.

### 3.1 Handling

Add section 3.1.3 as follows: ‡

.3 Handling and storage of RAP shall be in accordance with National Asphalt Pavement Association (NAPA) – Quality Improvement Series 129 Best Practices for RAP and RAS Management.

## SS 31 22 01 Site Grading

### Clause 3.3.1 ‡

Delete Table 1 and replace with the following:

| TABLE 2: TOLERANCES FOR SUBGRADES WHERE GROWING MEDIUM (TOPSOIL) TO BE PLACED OVER SUBGRADE | | |
|---|---|---|
| Conditions | Intended Growing Medium Depth | Tolerance |
| Within 3 m from fixed elevations (e.g., paving edges, curbs, etc.) | 0 – 150 mm | ± 25 mm |
| | 151 – 300 mm | ± 25 mm |
| | 301 – 600 mm | ± 50 mm |
| Other areas | 0 – 150 mm | ± 25 mm |
| | 151 – 300 mm | ± 50 mm |
| | 301 – 600 mm | ± 50 mm |

## SS 31 23 01 Excavating Trenching and Backfilling

### 3.5 Backfill and Compaction

Delete section 3.5.4 and replace with the following:

.4 Compaction: place backfill and compact to following Standard Proctor Maximum Dry densities (SPMDD) in compliance with ASTM D698. (All following references to density imply compliance with ASTM D698).

.1 Boulevards and easements to minimum 98%, or as specified by the owner's professional engineer.

.2 Roads, driveways, shoulders, re-shaped ditches and sidewalks to minimum 98% or as specified by the owner's professional engineer.

.3 Use caution in pipe zone to ensure no damage to pipe.

### 3.6 Surface Restoration

Delete section 3.6.2.2 and replace with the following:

.2 Restore unimproved and grassed surfaces with approved topsoil and hydraulic seeding as required by the Director of Capital Works and Infrastructure.

## SS 31 23 23 Controlled Density Fill

### 2.1 Materials

Delete section 2.1.1 and replace with the following:

.1 Portland Cement: to CSA A3000.

Delete section 2.1.2 and replace with the following:

.2 Fly ash: to CSA A3000.

## SS 31 24 13 Roadway Excavation, Embankment and Compaction

### 2.2 Specified Materials

Add section 2.2.1.5 as follows: ‡

.5 Recycled concrete and asphalt (RCA)

### 3.3 Inspection of Native Surface

Delete section 3.3.1 and replace with the following:

.1 Prior to placing embankment fill, proof roll graded native surface using fully loaded single or dual axle dump truck. Director of Capital Works and Infrastructure may authorize use of other acceptable proof rolling equipment. Remove soft or other unstable material. Replace with approved embankment fill and compact replacement fill to minimum 98% Standard Proctor Maximum Dry Density in compliance with ASTM D698. (All following references to density imply compliance with ASTM D698).

### 3.5 Compaction

Delete section 3.5.2 and replace with the following:

.2 Compact to a density of not less than 98% Standard Proctor Maximum Dry Density.

## SS 31 37 10 Riprap

### 2.1 Riprap

Delete Table in 2.1.1.1.1 and replace with the following: ‡

| Percent Heavier Than | Percent Lighter Than | Equivalent | | |
|---|---|---|---|---|
| | | Mass (kg) | Weight (N) | Diameter (mm) |
| 0 | 100 | | As specified | |
| 50 | 50 | | In | |
| 100 | 0 | | Contract Documents | |

## SS 32 11 16.1 Granular Subbase

### 2.1 Specified Materials

Add 2.1.1.8 as follows: ‡

.8 Recycled concrete and asphalt (RCA)

### 3.3 Compaction

Delete section 3.3.2 and replace with the following:

.2 Compact to a density of not less than 98% Standard Proctor Maximum Dry Density.

## SS 32 11 23 Granular Base

### 3.1 Inspection of Underlying Subbase

Delete section 3.1.1 and replace with the following:

.1 Ensure underlying subbase surface true to the cross section and grade, and of the specified material compacted to 98% Standard Proctor Maximum Dry Density, in compliance with ASTM D698. Do not place granular base until finished subbase surface is inspected and approved by the Director of Capital Works and Infrastructure.

### 3.3 Compaction

Delete section 3.3.2 and replace with the following:

.2 Compact to a density of not less than 100% Standard Proctor Maximum Dry Density.

## SS 32 12 16 Hot Mix and Warm Mix AC Paving

### 1.0 General

Delete section 1.0.1 and replace with the following: ‡

.1 Section 32 12 16 refers to those portions of the work that are unique to the supply and placement of hot-mix asphalt (HMA) and warm-mix asphalt (WMA) concrete paving. This section must be referred to and interpreted simultaneously with all other sections pertinent to the works described herein.

Add section 1.0.2 as follows: ‡

.2 WMA represents technologies which allow a reduction in the temperature at which asphalt mixtures are produced and placed. WMA technologies include those in which an additive is mixed with the asphalt cement or added to the mixture during production, and to plant foaming processes.

### 2.2 Mix Design

Delete sections 2.2.1 and 2.2.2 and replace with the following: ‡

.1 Submit job formula to Director of Capital Works and Infrastructure for review and approval. The mix design shall identify HMA or WMA. In addition to the regular information provided in the mix design the mix design for Warm Mix Asphalt shall include the following:

- .1 WMA technology and/or WMA additives information.
- .2 WMA technology manufacture's established recommendations for usage.
- .3 WMA technology manufacturer's established target rate for water and additives, the acceptable variation for production, and documentation showing the impact of excessive production variation.
- .4 Temperature range for mixing.
- .5 Temperature range for compacting.
- .6 Asphalt binder performance grade test data over the range of WMA additive percentages proposed for use.

.2 Mix may contain up to 15% recycled asphalt cement replacement without changing binder grade. Design of mix to include RAP from proposed source blended with virgin aggregate.

Add sections 2.2.3.3.5 and 2.2.3.3.6 as follows: ‡

.5 Percentage of RAP used shall be stated in the mix design report.

.6 Minimum Tensile Strength Ratio (TSR): 80 for mix design with RAP content.

Add section 2.2.4 as follows: ‡

.4 Modification of asphalt cement either using additives or by foaming shall be in accordance with the approved mix design of the WMA.

### 3.1 Plant and Mixing Requirements

Add section 3.1.1.9.4 as follows: ‡

.4 Use minimum 0.3% of anti-stripping agent, if Tensile Strength Ration (TSR) is less than 80%.

Delete section 3.1.4 and replace with the following: ‡

.4 Mixing tolerances including variations resulting from adding RAP:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass):

| | | |
|---|---|---|
| .1 | 4.75mm sieve and larger | 5.5 |
| .2 | 2.36mm sieve | 4.5 |
| .3 | 0.600mm sieve | 3.5 |
| .4 | 0.150mm sieve | 2.5 |
| .5 | 0.075mm sieve | 1.5 |

.2 Permissible variation of asphalt cement from job mix, 0.3%

.3 Permissible variation of mix temperature at discharge from plant, 5°C.

### 3.4 Transportation of Mix

Delete section 3.4.5 and replace with the following: ‡

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within specified range under the approved mix design.

## SS 32 12 17 Superpave Hot-Mix Asphalt Concrete Paving ‡

### 1.0 General

Delete section 1.0.1 and replace with the following:

.1 Section 32 12 17 refers to those portions of the work that are unique to the supply and placement of Superpave hot-mix asphalt (HMA) and Superpave warm-mix asphalt (WMA) concrete paving. This section must be referenced to, and interpreted simultaneously with, all other sections pertinent to the works described herein. Requirements applicable to Superpave HMA in sub-sections 2.0 Products and 3.0 Execution also apply to Superpave WMA.

Add section 1.0.6 as follows:

.6 WMA represents technologies which allow a reduction in the temperature at which asphalt mixtures are produced and placed. WMA technologies include those in which an additive is mixed with the asphalt cement or added to the mixture during production, and to plant foaming processes.

### 1.4 Submission of HMA Mix Design(s)

Delete section 1.4.1.2 and replace with the following:

.2 Information on the design aggregate structure including the source(s) of aggregate, type of aggregates, RAP, required quality characteristics and gradation;

### 2.2 Mix Design

Delete section 2.2.2 and replace with the following:

.2 Submit Superpave HMA mix design(s), to Director of Capital Works and Infrastructure for review and approval, in accordance with 1.4 of this section. The mix design shall identify HMA or WMA with the respective mixing and compaction temperatures.

Add sections 2.2.3, 2.2.4, and 2.2.5 as follows:

.3 Where RAP will be incorporated in the mix, the mix design, shall include RAP content as per Section 1.2 References.

.4 Use minimum 0.3% of anti-stripping agent, if Tensile Strength Ratio (TSR) is less than 80%.

.5 Modification of asphalt cement for WMA either by using additives or by foaming shall be in accordance with the approved mix design of the WMA technology.

### 3.4 Transportation of Mix

Delete section 3.4.5 and replace with the following:

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within specific range under the approved mix design.

### 3.6 Compaction

Delete section 3.6.1 and replace with the following:

.1 Roll asphalt continuously to average density of 93% of the Superpave Maximum Theoretical Density (MTD) with no individual test less than 91% of MTD.

## SS 32 13 13 Portland Cement Concrete Paving

### 2.1 Materials

Delete section 2.1.4 and replace with the following:

.4 Concrete mixes and materials: to section 03 30 53 – Cast-in-place Concrete meeting CSA A32.1 Exposure Class C2.

## SS 32 13 16.1 Roller Compacted Concrete Paving

### 2.1 Materials

Delete section 2.1.3 and replace with the following:

.3 Portland Cement: to CSA A3000.

Delete section 2.1.4 and replace with the following:

.4 Fly Ash: to CSA A3000

## SS 32 17 23 Painted Pavement Markings

### 2.1 Materials

Delete reference title for section 2.1.6 and replace with the following title: ‡

.6 Pavement Markings:

Delete section 2.1.6.7‡

Add section 2.1.7 as follows:‡

.7 Thermoplastic material:

.1 Material composition shall be at the discretion of the manufacturer subject to the approval of the Director of Capital Works and Infrastructure. Each formulation shall be identified by a code number

.2 No retained water when tested by ASTM D-570

.3 Specific gravity of the supplied product shall be within 3% of that specified for the selected formulation.

.4 Material shall not deteriorate upon contact with de-icing chemicals, gasoline, diesel fuel or grease dropped by traffic.

.5 Material shall not break down, deteriorate, scorch or discolour, if held within the application temperature range specified by the manufacturer for a period of four hours and it must be able to be reheated from room temperature to the application temperature four (4) times without showing any of these detrimental effects.

.6 When applied at the temperature recommended by the manufacturer and at a film thickness of 2 to 4mm, the material shall set solid and show no tracking under traffic after elapsed times as follows:

.1 Two (2) minutes at an air temperature of 10°C, relative humidity less than 75%, and road surface temperature from 10° C.

.2 Five (5) minutes at an air temperature of 32° C, relative humidity less than 75%, and road surface temperature from 35°C.

.3 The drying time under conditions intermediate between the two air temperatures shall be interpolated using a straight line model.

.7 The quantity, type, and gradation of the component reflecting glass spheres premixed in the thermoplastic material shall be at the discretion of the manufacturer, but shall provide retro-reflection levels specified below.

### 3.3 Application

Delete section 3.3.3.3 and replace with the following: ‡

.3 Thermoplastic material shall be heated in the melter to a temperature of 382 ºF

## SS 32 31 13 Chain Link Fences and Gates

Add sections 3.3, 3.4 and 3.5 as follows: ‡

.3 Installation of Gates

.1 Install gates in locations as shown on Contract Drawings.

.2 Level contours between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Determine position of centre gate rest for double gate. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.

.4 Install gate stops where specified.

.4 Touch up

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

.5 Cleaning

.1 Clean and trim areas disturbed by operations. Dispose of surplus material as specified in Contract Document.

## SS 32 92 19 Hydraulic Seeding

### 3.3 Equipment

Delete section 3.3.1 and replace with the following: ‡

.1 All hydraulic seeding/mulching equipment adjustment to reflect Rates of Application determined for the project.

### 3.5 Application for Hydraulic Seeding

Delete section 3.5.4 and replace with the following: ‡

.4 If required, add legume seed to grass mixture at time of seeding. Inoculate legume seed with standard product humus culture before mixing with grass seed. Protect inoculated seed from exposure to sunlight for periods of over one-half hour. Use seed within eight hours from inoculation; otherwise, seed to be reinoculated.

## SS 32 92 20 Seeding

### 3.3 Application for Mechanical Dry Seeding

Delete section 3.3.5 and replace with the following: ‡

.5 Apply mulch with seed; or apply mulch immediately after seeding. Do not seed areas which cannot be mulched the same day.

## SS 33 01 30.1 CCTV Inspection of Pipelines

### 1.3 Submission of Certification

Delete section 1.3.1 and replace with the following: ‡

.1 Submit copy of the CCTV operator's current NASSCO certification certificate to the Director of Capital Works and Infrastructure at least one week prior to the start of the CCTV inspection operations.

### 3.7 Photographs and/or Digital Images

Delete section 3.7.2.5 and replace with the following: ‡

.5 CSA condition defect code.

### 3.12 Coding Accuracy

Delete section 3.12.4 and replace with the following: ‡

.4 An operator failing to meet the accuracy requirements on two occasions will not be permitted to code on the remainder of the project until they have successfully passed the NASSCO Level of Qualification for CSA Operators.

## SS 33 11 01 Waterworks

Delete section 2.2.4.13 and replace with the following: ‡

.13 Joint Restraint Devices: General Requirements:

- .1 Ductile iron castings to ASTM A536.
- .2 Anti-corrosion coating of ductile iron castings to AWWA C219, AWWA C210, C213 or C550.
- .3 Bolts and nuts high strength low alloy steel to AWWA C111 or as specified in Contract Documents, stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836 for heavy hex nuts. Rolled threads, fit and dimensions to AWWA C111.
- .4 Tie rods to 2.2.4.10 of this Section.
- .5 Restrainers for ductile iron pipe shall be mechanical joint fittings or push-on joint fittings with tie rod.
- .6 Restrainers for PVC pipe shall be mechanical joint fittings or push-on joint fittings with tie rod lugs.
- .7 Restrained harnesses or integral restraint systems manufactured as part of the pipe joint.
- .8 All joint restraint systems for PVC pipe to be approved by the specific PVC pipe manufacturer, and that they do not derate the pipe manufacturer's recommended working pressures.
- .9 Restrainers for PVCO pipe shall be mechanical joint fittings or push-on joint fittings with tie rod lugs.

.10 All joint restraint systems for PVCO pipe to be approved by the specific PVCO pipe manufacturer, and that they do not derate the pipe manufacturer's recommended working pressures.

Add section 2.2.7 as follows: ‡

.7 Oriented Polyvinyl Chloride (PVCO) Pressure Pipe:

.1 Pipe:

.1 Pipe to be manufactured to specifications for pipe size ranges as follows:

.1 Pipes 100 to 600mm dia. - AWWA C909

.2 Pipes to be certified by Canadian Standards Association for pipe size ranges 100 mm to 600 mm dia. - CSA B137.3.1

.2 Cast iron pipe equivalent outside diameter.

.3 To be compatible with specified mechanical joint and push-on joint fittings and valves without use of special adapters.

.2 Joints: Push-on integrally thickened bell and spigot type to AWWA C909 Clause 4.3.3.2 (a) with single elastomeric gasket to ASTM F477.

## 2.4 Valve and Large Meter Chambers

Delete section 2.4.7 and replace with the following:

.7 Mortar: aggregate to CAN/CSA-A82.56, masonry cement to CSA A3000

## 3.12 Hydrants

Delete Clause 3.12.6 and replace with the following:

.6 For hydrants not in service, place a burlap sack or canvas bag over the hydrant and secure in place. Remove when water main is accepted by the Director of Capital Works and Infrastructure.

## 3.17 General Procedure Flushing, Testing, and Disinfection

Delete section 3.17.2 and replace with the following:

.2 Perform all tests in presence of Director of Capital Works and Infrastructure and Owner between 08:00 and 17:00 h, Monday to Friday unless otherwise authorized. Notify Director of Capital Works and Infrastructure 72 h in advance of proposed test.

## 3.19 Testing Procedures

Delete 3.19.2 and replace with the following:

.2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1034 kPa

applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Minimum duration of test period to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3 – Table 9.

Add new section 3.19.7 as follows:

.7 Fire Hydrants to be included in all watermain testing.

### 3.20 Disinfection, General

Add new section 3.20.3 as follows:

.3 All water mains to be flushed, disinfected, and bacteriological tested in accordance with AWWA C651. Bacteriological testing to include total coliforms, fecal coliforms, and heterotrophic plate count (HPC). Bacteriological samples to be collected by the Owner. Bacteriological samples can only be collected Monday to Thursday.

## SS 33 30 01 Sanitary Sewers

### 2.1 Concrete Pipe

Delete section 2.1.3.4 and replace with the following: ‡

.4 Lift insert opening not required to be grouted provided it does not extend beyond the depth of the engineered design.

## SS 33 34 01 Sewage Forcemains

### 3.15 Pressure Testing Procedure

Delete section 3.15.2 and replace with the following: ‡

.2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Each section of pipe to be filled and allowed to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Pipeline to be submitted to a test of 1.5 x working pressure applied at highest elevation in each section. At no time shall test pressure exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24 hour period. Minimum duration of test period to be 2 hours.

## SS 33 44 01 Manholes & Catchbasins

### 1.4 Material Certification

Delete section 1.4.1 and replace with the following: ‡

.1 Products manufactured to ASTM Standards shall be marked with the applicable specification number. Compliance test results shall be provided at the request of the Director of Capital Works and Infrastructure.

## 2.1 Materials

Add section 2.1.7.3 as follows: ‡

.3 Any frame and cover assembly creating a point load on the concrete riser rings will not be permitted.

.12 Catchbasin lids manufactured to ASTM C478M.

Delete section 2.1.13 and replace with the following:

.1 Refer to City of Quesnel Approved Products List

Delete section 2.1.15.2 and replace with the following:

.2 Cement: to CSA A3000

Delete section 2.1.17 ‡

## 3.1 Excavation and Backfill

Add section 3.1.2 as follows: ‡

.2 For manholes, when base gravels are complete, excavate for grade rings and manhole frame assembly. Do not disturb the compacted road base beyond the excavation requirement.

## 3.3 Manhole Installation

Delete section 3.3.12.2 and replace with the following: ‡

.2 Allowable products are precast concrete risers, and cast-in-place form system. Individual riser height shall be 50 mm, 75 mm, or 100 mm.

Delete section 3.3.12.5 and replace with the following: ‡

.5 Proper layer of grout between the spacers, covering the entire surface of the rings, should be utilized.

Add section 3.3.17 as follows: ‡

.17 Ensure frames conform to design contour of pavement or existing surface. Use of shim and mortar will only be permitted outside of road pavement. One of the following means shall be used to set final grade for frame and cover within road pavement:

.1 Tapered pre-cast concrete, HDPE, or metal adjustment riser rings when use with conventional manhole frame and cover under Standard Detail Drawing S1; or

.2 Integrated height adjustable manhole frame and cover assembly. Any assembly creating a point load on the riser rings will not be permitted.

.3 After grade rings and manhole frame assembly has been installed and adjusted the remaining excavation must be filled to the top of road base or bottom lift of asphalt surface with 30mpa 10mm aggregate concrete or 19mm base gravel compacted to specification. Ensure specified asphalt thickness can be achieved.

Reference Section 33 49 23‡ Storm Drainage Water Retention Structures

Add Standard Specification 33 49 23

## 1.0 General

.1 Section 33 49 23 refers to those portions of the work that are unique to the supply and installation of underground storm water infiltration / detention systems. Related appurtenances are included in other sections. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 All details of storm sewer facilities not specifically covered in this section to comply with CSA, ASTM and CGSB standards and/or manuals of practice as specified in Contract Documents.

## 1.1 Related Work

| | | |
|---|---|---|
| .1 | Temporary Facilities Section | 01 53 01 |
| .2 | Aggregates and Granular Materials Section | 31 05 17 |
| .3 | Excavating, Trenching and Backfilling Section | 31 23 01 |
| .4 | CCTV Inspection of Pipelines Section | 33 01 30.1 |
| .5 | Cleaning of Sewers Section 33 01 30.2 | |
| .6 | Pipe Culverts Section | 33 42 13 |
| .7 | Manholes and Catchbasins Section | 33 44 01 |

## 1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 –Reference Specifications – Site Infrastructure.

## 1.3 Samples

.1 Samples may be required.

## 1.4 Material Certification

.1 Aggregate surrounding infiltration systems shall have a minimum void ratio of 40%.

.2 At least 14 days prior to commencing work, submit to Director of Capital Works and Infrastructure the material manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.

.3 Project specific shop drawings of the system components hall be sealed by a Professional Engineer registered in the Province of British Columbia. Shop drawing shall show general

layout of the system and its structural design parameters such as assumed allowable bearing capacity and loadings.

## 1.5 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions to Director of Capital Works and Infrastructure for approval and adhere to approved schedule.

## 2.0 PRODUCTS

.1 Pipe culverts used for infiltration and detention purposes shall be referred to Section 33 42 13 – Pipe Culverts.

.2 All products shall withstand H-20 loading.

## 2.1 Concrete Box Culvert

.1 Concrete Box Culvert: to ASTM C1433-08

.2 End caps/walls: to ASTM C1433-08

.3 Box culverts to be manufactured in accordance to depth of fill tables specified in ASTM C1443-08 to suit site conditions.

.4 Box culvert lay lengths: Up to 2.44m, or as specified on Contract Drawings.

.5 Geotextile fabric to be used at joints.

.6 All concrete box culvert system shall incorporate at least one manhole access point to allow for inspection and maintenance.

.7 Manholes access tees and/or flow control structures including bases and lids: manufactured to CSA A257.4 and/or ASTM C478.

## 2.2 Polypropylene Arched Chamber, Corrugated Wall

.1 Raw materials and processes used in the manufacture of storm water chambers shall meet the requirements of ASTM F 2418 and CSA B184.

## 2.3 Polyethylene Arched Chamber, Corrugated Wall

.1 Raw materials and processes used in the manufacture of storm water chambers shall meet the requirements of CSA B184.

## 2.4 Corrugated Steel Pipe System, Corrugated Wall

.1 Corrugated steel pipe to Section 33 42 13. Pipe material to be Galvanized Steel, Aluminized Type 2 Steel or Polymer Laminated Steel to CSA G401.

.2 Couplers shall be Hugger Band type couplers complete with o-ring gaskets to Section 33 40 01.

.3 Integral CSP manholes shall be detailed as per shop drawings. Pre-cast concrete manhole tops shall be designed such that the top bears on the surrounding backfill so that all live load is transmitted to the backfill zone adjacent to the CSP manhole riser.

.4 Steel plate bulkheads shall be fabricated from steel plate with continuously welded reinforcing steel members. Bulkheads shall be factory coated with 2 coats of zinc-rich paint as per CSA G401. Bulkheads shall be attached to the CSP pipe barrel with a continuous fillet weld.

## 2.5 Polymeric Cubic Structure

.1 Cubic structure materials to be polypropylene copolymer (CPP) to ASTM D4101 and supporting columns to be poly vinyl chloride (PVC) to ASTM D1784.

.2 Module interactions: adjacent modules must be capable of transferring the applied side and vertical loads to adjacent modules through an assembly of modules.

## 2.6 Geotextile and Liner

.1 Geotextile fabric used for separating bedding and surrounding aggregate from native soils and backfill shall be AASHTO M288 Class 2 non-woven geotextile.

.2 Impermeable liner used in detention system for separating bedding and surrounding aggregate from native soils and backfill shall be minimum 30 mil thick PVC or LLDPE liner.

## 2.7 Granular Chamber Bedding and Surround Material

.1 As shown on Contract Drawings.

.2 Refer to Section 31 05 17 - Aggregates and Granular Materials for material specifications.

.3 Approved Bedding and Surround Materials: 19mm or 40mm clear crushed gravels with a minimum porosity of 40% after installation.

## 2.8 Backfill Material

.1 As shown on Contract Drawings.

.2 Refer to Section 31 05 17 - Aggregates and Granular Materials for material specifications.

# 3.0 EXECUTION

## 3.1 General

.1 System bedding details, including granular surround and material specifications to be as shown on Contract Drawings, including Standard Detail Drawing G4.

.2 The component supplier's representative shall be available to provide project start-up assistance and provide technical support. Should site conditions deviate from the sealed shop drawings during construction, the Director of Capital Works and Infrastructure shall be notified.

## 3.2 Preparation

.1 Carefully inspect materials for defects before installing. Remove defective materials from site. Clean system components of debris and water before installation.

## 3.3 Excavation

.1 Excavate in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

.2 System alignment and depth as shown on Contract Drawings.

## 3.4 Granular Bedding

.1 Fill over-excavation below design elevation of bottom of specified bedding with approved bedding and surround materials placed and compacted to 95% Modified Proctor Density. Drain rock may be used for backfill of over-excavation only with Director of Capital Works and Infrastructure's approval.

.2 Shape bed true to grade to provide continuous, uniform bearing surface for the system.

.3 Geotextile fabric shall be laid in accordance to the approved shop drawings.

.4 For detention systems using an impermeable liner, a subsequent manufacturer approved impermeable liner and geotextile fabric shall be placed on top of the initial fabric layer and secured per the manufacturer’s recommendations.

.5 Place granular bedding material in 150mm lifts across width of the excavation and compact to 95% Modified Proctor Density in compliance with ASTM D1557.

## 3.5 System Installation

.1 Handle system components in accordance with manufacturer's recommendations.

.2 Lay and join system components in accordance to the manufacturer's instructions and specifications except as noted otherwise herein. Pipe culvert systems shall be installed in general compliance with Section 33 42 13 - Pipe Culverts.

.3 Lay system components on prepared bed, true to line and grade. Ensure section is in contact with shaped bed throughout its full length.

.4 Keep jointing materials and installed sections free of dirt, water and other foreign materials. Whenever work is stopped, install removable bulkhead at open end to prevent entry of water and foreign materials.

.5 Cut system component, as recommended by the manufacturer, without damaging unit.

## 3.6 Surround Materials

.1 After assembling the system and the Director of Capital Works and Infrastructure has inspected work in place, place surrounding material in uniform layers not exceeding 150 mm compacted thickness simultaneously on both sides. Material can be placed directly over the assembled sections and allowed to build up equally on each side of the system, as long as care is taken to ensure assembled sections remain true to line and grade.

.2 Compact each layer from bedding to underside of backfill to minimum 95% Modified Proctor Density.

## 3.7 Backfill

.1 Place and compact backfill material in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

.2 Backfill requirements, including type of material and compaction requirements, as shown on Contract Drawings, including Standard Detail Drawing G4.

## 3.8 Inspection

.1 Where specified, install inspection chamber at specified location, set plumb and to specified elevation as shown on Standard Detail Drawing S7 or Drawing S10 as applicable. If inspection chamber located in driveway, lane or paved surface install cover or lid as shown on Standard Detail Drawing S9 or Drawing S10 as applicable.

## 3.9 Flushing

.1 Flush completed system per Section 33 01 30.2 Cleaning of Sewers. Before flushing and testing, ensure infiltration / detention system is completely finished and make arrangements with Director of Capital Works and Infrastructure for scheduling of testing.

.2 Water may be supplied from Municipal fire hydrants upon application for a Hydrant Use Permit.

.3 Obtain municipal approval prior to discharging flushing water to municipal sewers or drainage ditches.

.4 Comply with General Conditions, Clause 20.4, Environmental Laws, in regard to discharge of flushing water.

.5 Provide Director of Capital Works and Infrastructure with all required approvals prior to discharging flushing water.

.6 Remove foreign material from assembled system and related appurtenances by flushing with water. System to be flushed at water velocities as high as can be obtained from available water sources. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

## 3.10 Testing

.1 Following installation of a system and prior to substantial completion, the completed installation shall be visibly inspected to ascertain the requirement for cleaning.

.2 Visual inspection shall consist of either physical manual inspection or CCTV camera which shall be submitted to the Director of Capital Works and Infrastructure for review.

.3 System shall be cleaned, if by Director of Capital Works and Infrastructure's determination, it is apparent that accumulated solids or siltation exceed acceptable limits which may impede the proper operation of the system design.

.4 Cleaning shall be done in accordance with manufacturer's recommended approved practices, owner's requirement and Director of Capital Works and Infrastructure's approval.

.5 After cleaning has been completed, a re-inspection may be required to insure effective removal of materials present.

.6 An operating manual, complete with recommended maintenance schedule shall be provided to the Owner and/or Director of Capital Works and Infrastructure with submission of design proposal.

## 3.11 Installation Standard

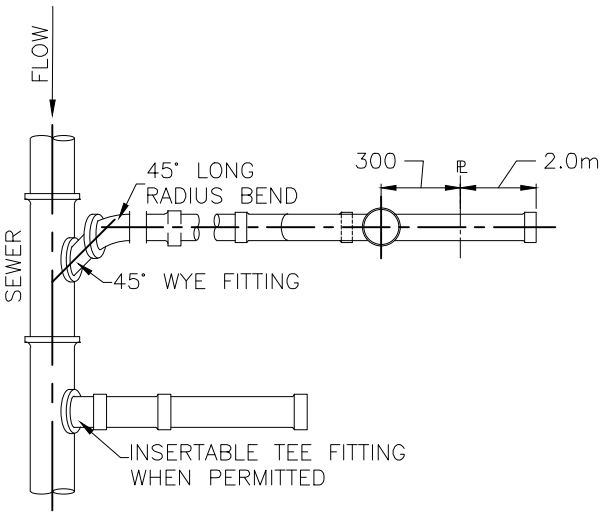
.1 Repair all deficiencies and visible leaks.

.2 Repair procedures and materials subject to approval of Director of Capital Works and Infrastructure.

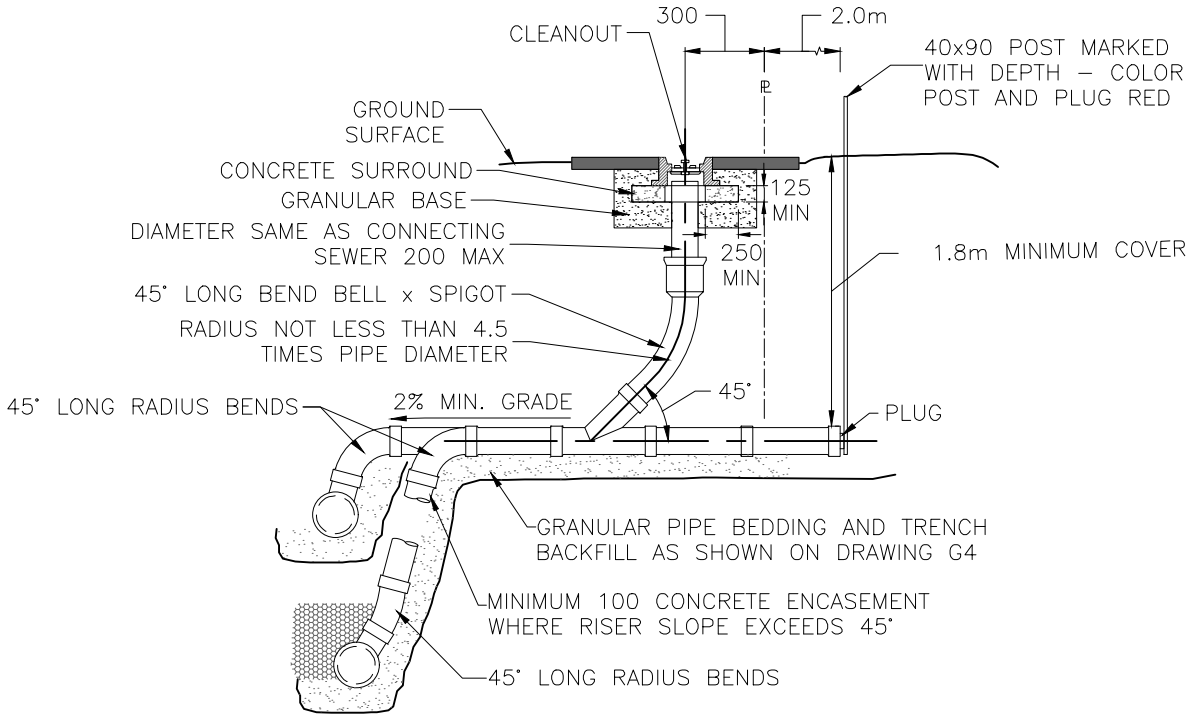
.3 Director of Capital Works and Infrastructure reserves right to require Contractor to replace defective installations at Contractor's sole cost.

.4 Test procedures, including video inspection, to be repeated and repairs made until satisfactory results are obtained.

# PART D SUPPLEMENTARY DETAIL DRAWINGS



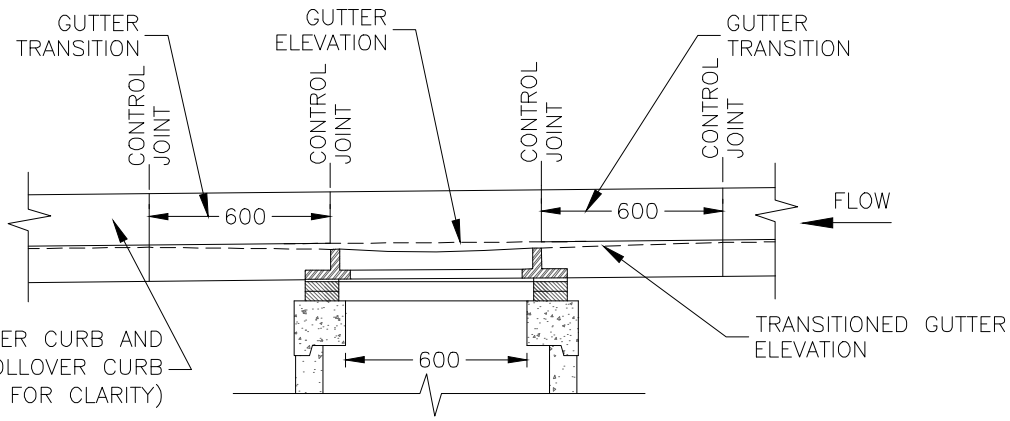

PLAN



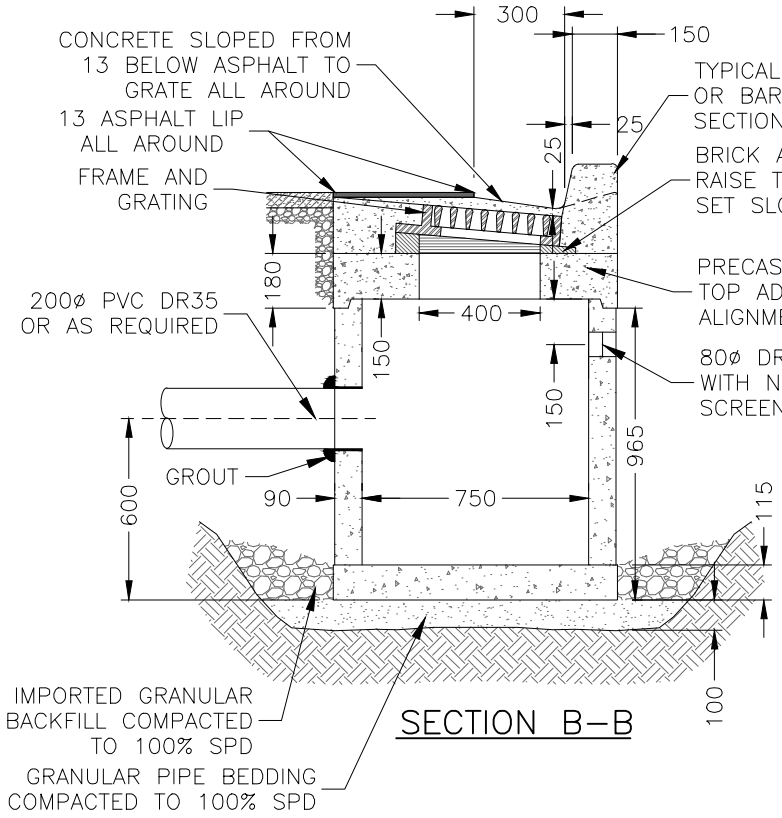

ELEVATION

NOTES:
1. CONNECTIONS TO BE 100 OR AS SPECIFIED IN DESIGN
2. LOCATION OF SERVICE AND MARKER AS SHOWN IN DESIGN

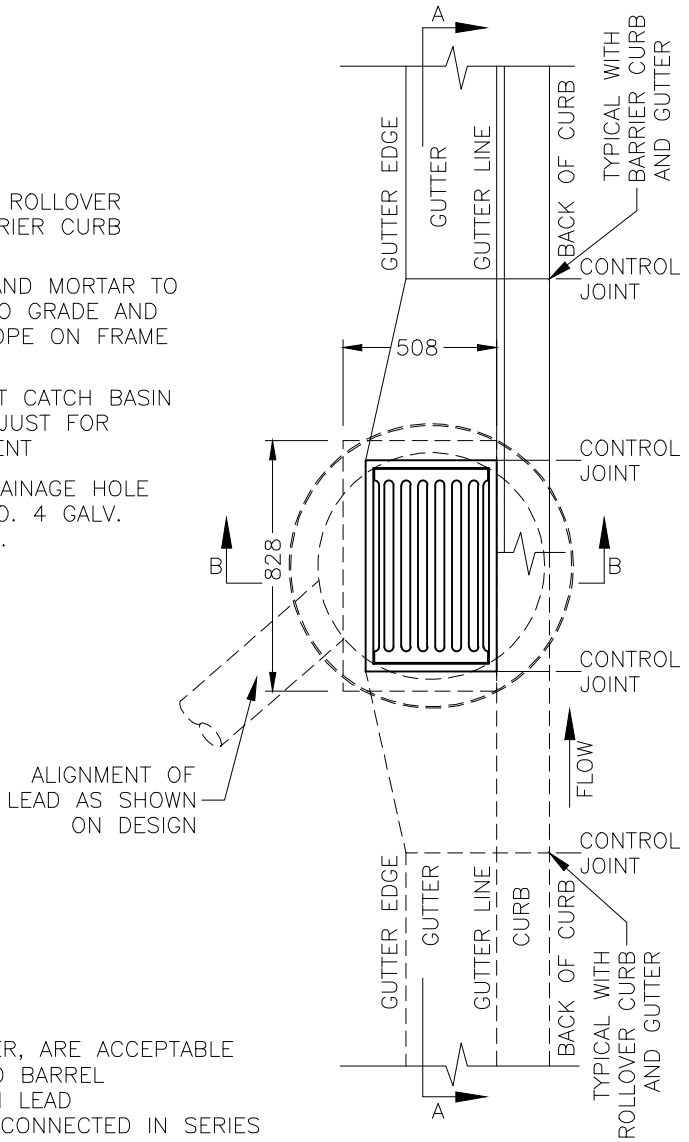
| | | | |
|---|---|---|---|
| CITY OF Quesnel | SCALE: NOT TO SCALE | TITLE: SANITARY SEWER SERVICE CONNECTION | |
| | DATE DRAWN: 2020-07-10 | | |
| | APPROVED BY: | SECTION: | REVISION No. / DWG.No. SS7 |




SECTION A–A




SECTION B–B




GUTTER TRANSITION

NOTES:

1. PRECAST UNITS c/w BASE, APPROVED BY APPROVING OFFICER, ARE ACCEPTABLE
2. CATCH BASIN LEADS TO EXTEND NO MORE THAN 20mm INTO BARREL
3. 200ø PVC DR35 OR AS REQUIRED FOR SINGLE CATCH BASIN LEAD
4. 250ø PVC DR35 OR AS REQUIRED FOR TWO CATCH BASINS CONNECTED IN SERIES

CITY OF Quesnel

| | | |
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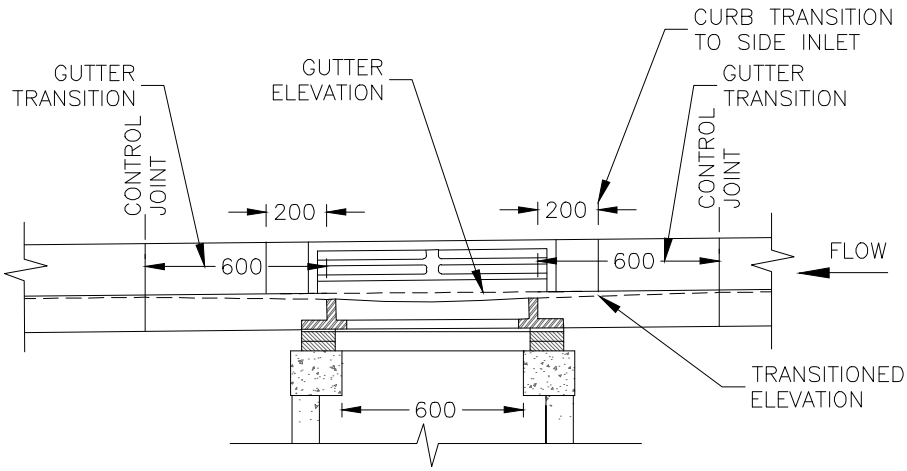
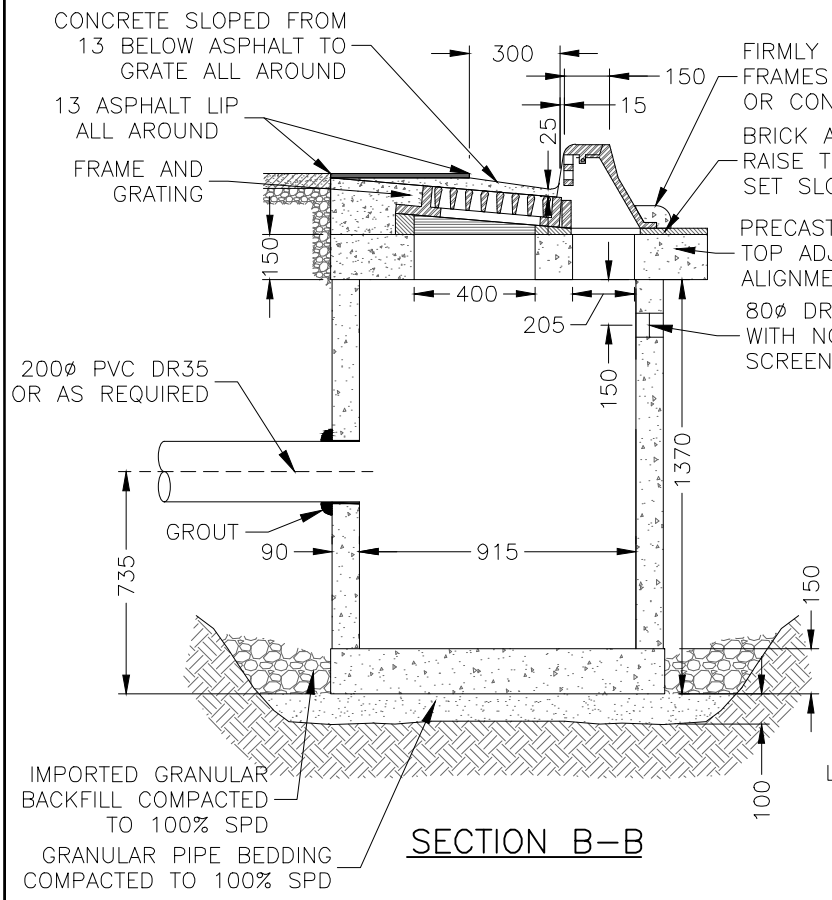
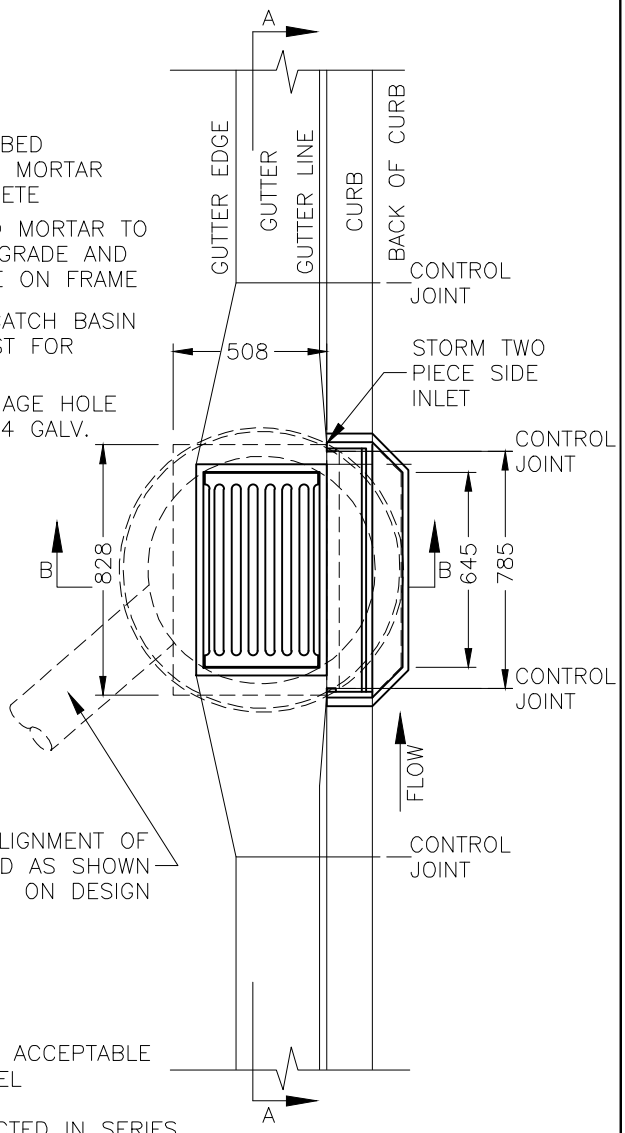
| SCALE: NOT TO SCALE | TITLE: TOP INLET CATCH BASIN | |
| DATE DRAWN: 2020–07–10 | | |
| APPROVED BY: | SECTION: | REVISION No. / DWG.No. SS11A |




SECTION A–A




SECTION B–B



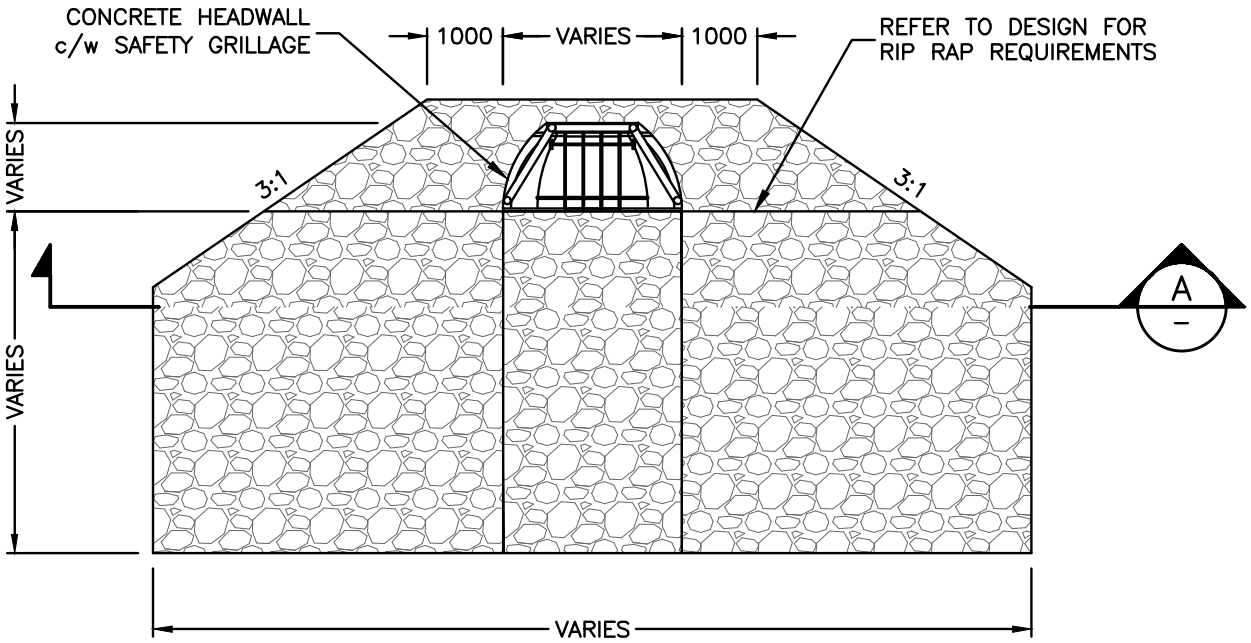

GUTTER TRANSITION

NOTES:

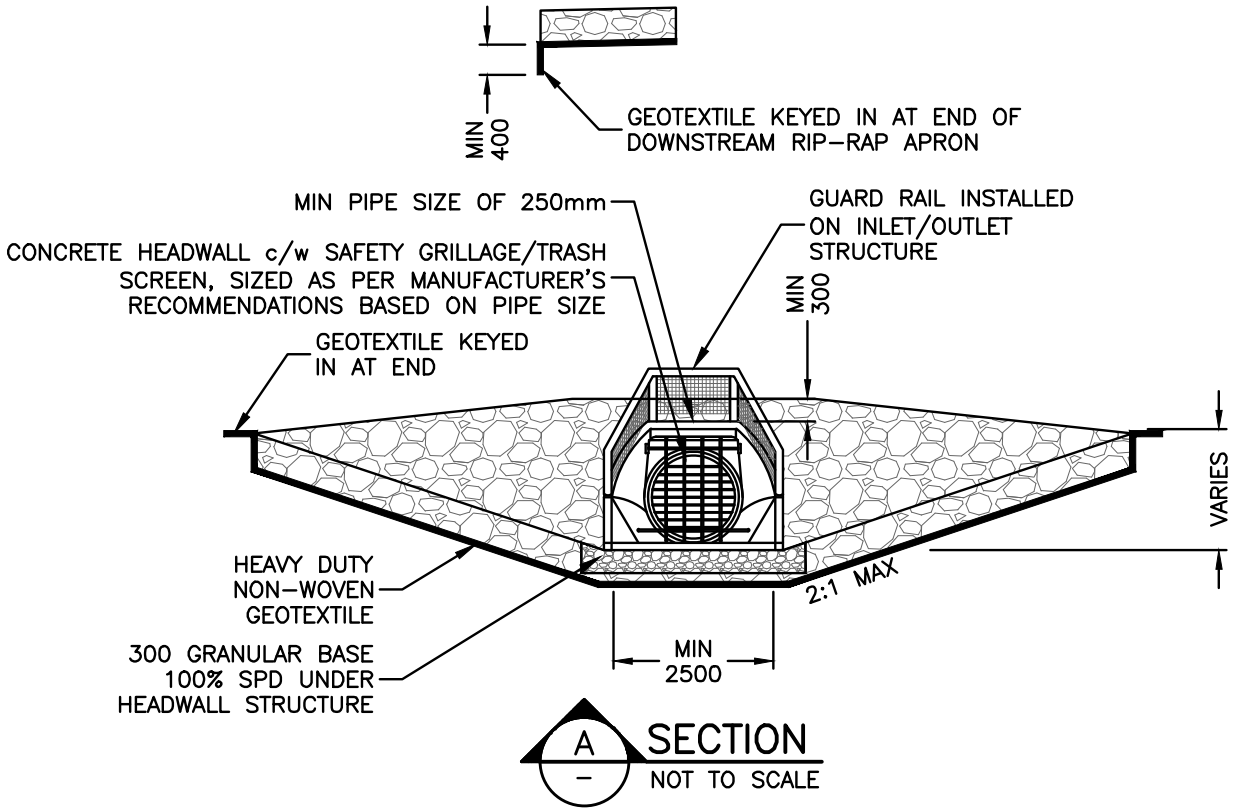
1. PRECAST UNITS c/w BASE, APPROVED BY APPROVING OFFICER, ARE ACCEPTABLE
2. CATCH BASIN LEADS TO EXTEND NO MORE THAN 20mm INTO BARREL
3. 200ø PVC DR35 OR AS REQUIRED FOR SINGLE CATCH BASIN LEAD
4. 250ø PVC DR35 OR AS REQUIRED FOR TWO CATCH BASINS CONNECTED IN SERIES

CITY OF Quesnel

| | |
|---|---|
| SCALE: NOT TO SCALE | TITLE: TOP AND SIDE INLET CATCH BASIN |
| DATE DRAWN: 2020–07–10 | |
| APPROVED BY: | SECTION: / REVISION No. / DWG.No. SS11B |




PLAN

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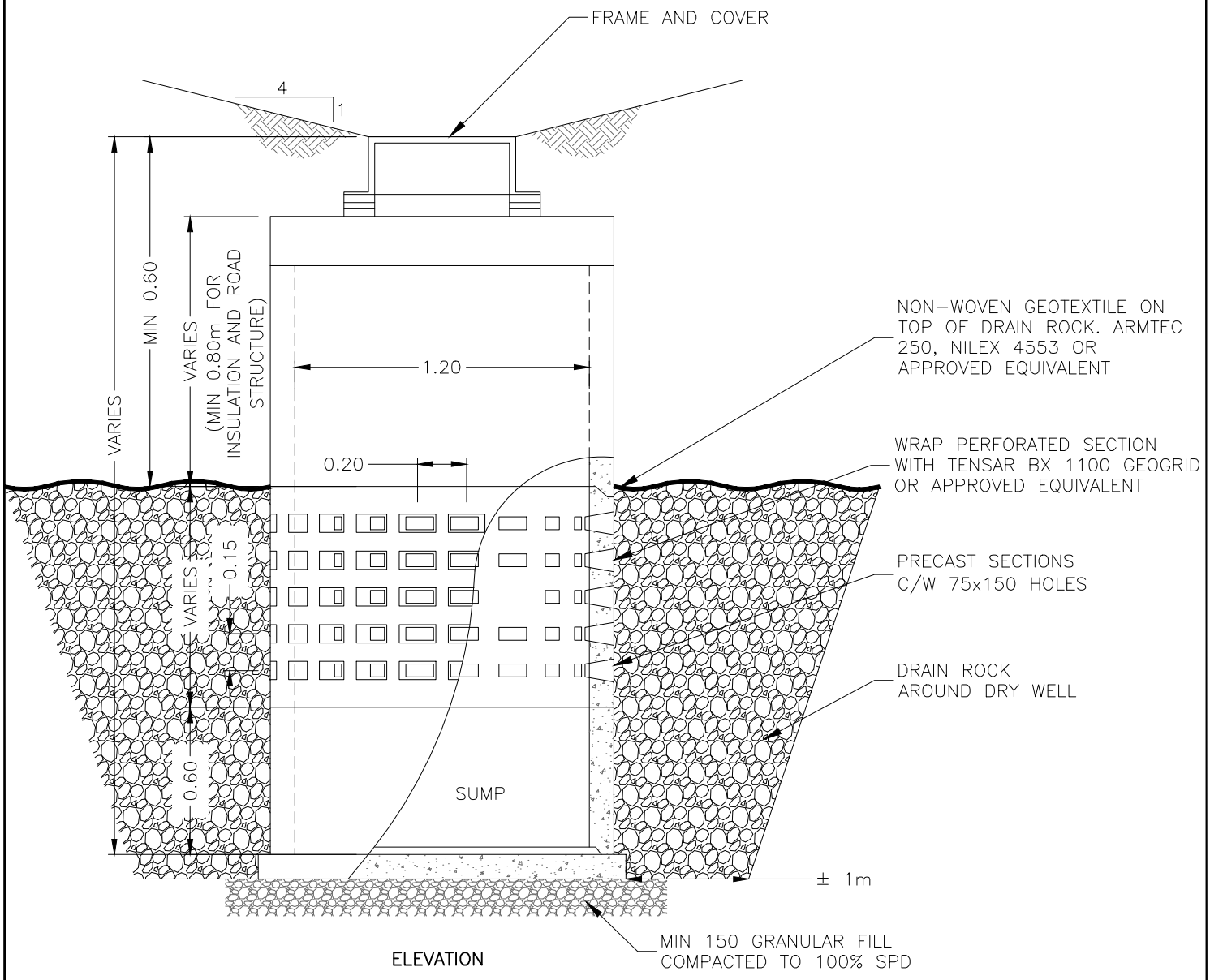
| DATE DRAWN: 2020-07-10 | | | |
| APPROVED BY: | SECTION: | REVISION No. | DWG.No. SS14 |




ELEVATION

NOTES:

1. PERFORATED SECTION OF DRY WELL TO BE WRAPPED IN TENSAR BX 1100 GEOGRID.
2. COVER CLAYS/SILTS EXPOSED IN SIDES OF EXCAVATION AT DEPTH OF MANHOLE PERFORATIONS WITH NON-WOVEN GEOTEXTILE. GEOTEXTILE WITH PUNCTURE STRENGTH OF 1.20 kN, APPARENT OPENING SIZE 0.15-0.25mm.
3. EXCAVATE TO A FREE DRAINING GRANULAR LEVEL.
4. VOLUME OF DRAIN ROCK AROUND DRY WELL WILL BE DEPENDANT ON EXPECTED INFLOW VOLUMES AND RATES AS WELL AS EXPECTED, LONG-TERM NATIVE SOIL PERCOLATION RATES AS DETERMINED BY THE PROFESSIONAL ENGINEER

CITY OF Quesnel

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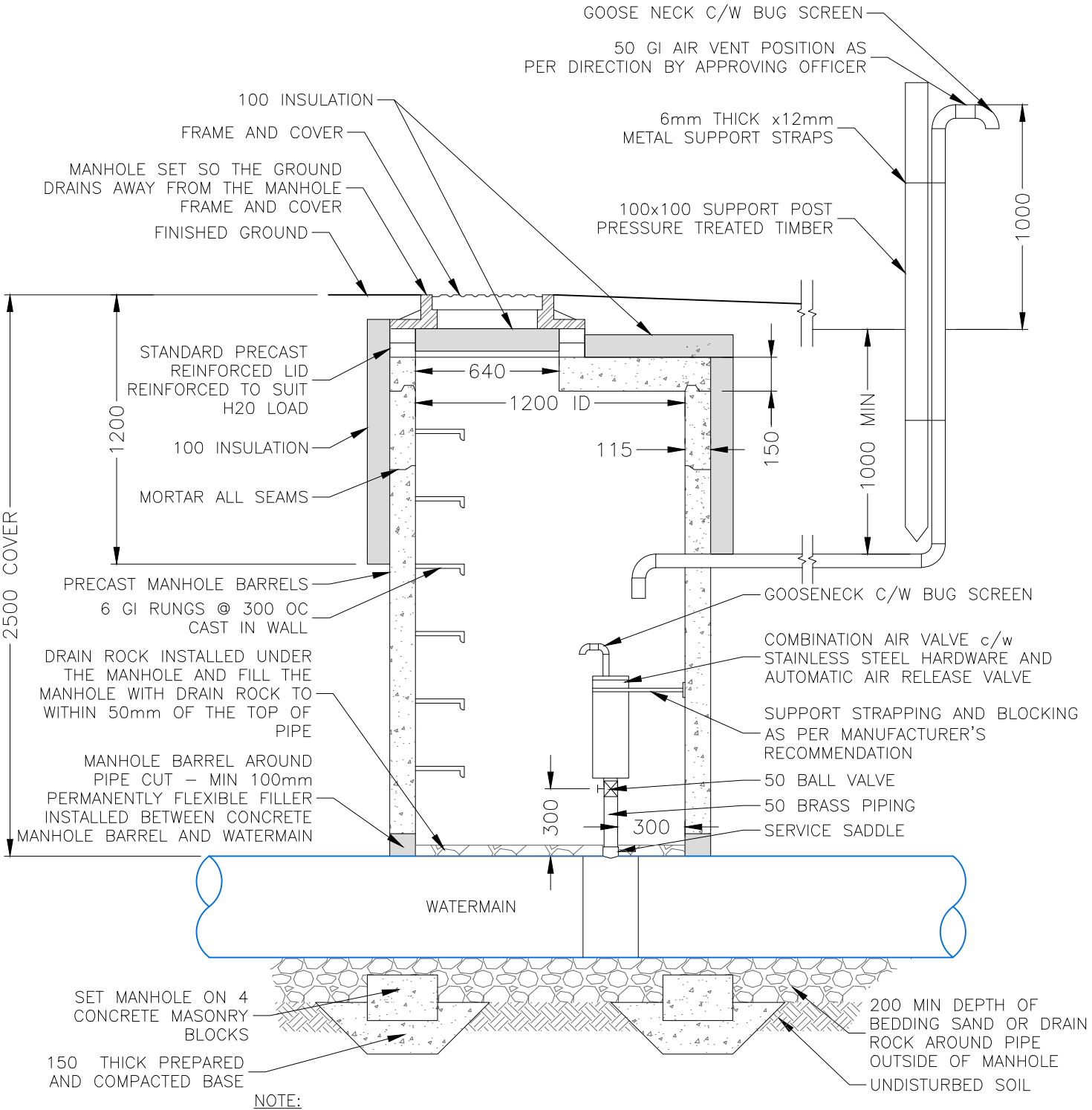
|---|---|---|---|
| SCALE: NOT TO SCALE | TITLE: DRY WELL | | |
| DATE DRAWN: 2020-07-10 | | | |
| APPROVED BY: | SECTION: | REVISION No. | DWG.No. SS16 |




NOTE:

1. 100 HI60 RIGID INSULATION. INSULATION CUT INTO APPROPRIATELY SIZED STRIPS WITH BEVELED EDGES TO PROVIDE CONTINUOUS COVERAGE WITHOUT GAPS. INSULATION ADHERED TO PRECAST CONCRETE USING AN APPROPRIATE CONSTRUCTION ADHESIVE.
2. WATER MAIN BURIED WITH DRAIN ROCK TO WITHIN 50mm OF THE TOP OF PIPE.
3. 100mm OF PERMANENTLY FLEXIBLE FILLER INSTALLED BETWEEN THE WATER MAIN AND THE MANHOLE TO SEAL OPENING AND TO PROVIDE FLEXIBILITY FOR POTENTIAL SETTLEMENT.

CITY OF Quesnel

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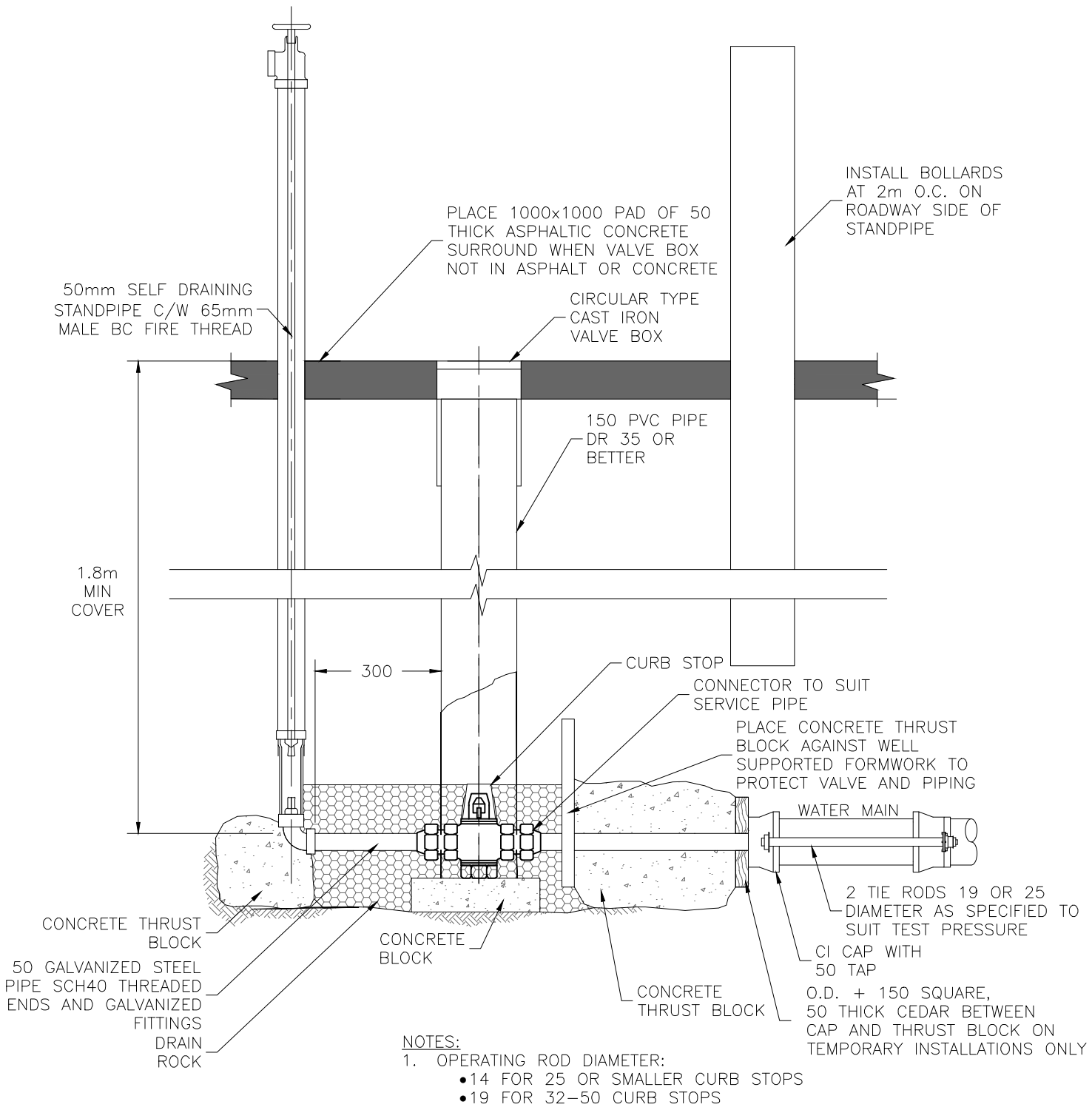
| SCALE: NOT TO SCALE | TITLE: WATERMAIN COMBINATION AIR–VACUUM VALVE |
| DATE DRAWN: 2020–07–10 | |
| APPROVED BY: | SECTION: / REVISION No. / DWG.No. SW6 |




NOTES:

1. OPERATING ROD DIAMETER:
   - 14 FOR 25 OR SMALLER CURB STOPS
   - 19 FOR 32–50 CURB STOPS

CITY OF Quesnel

| | | | |
|---|---|---|---|
| SCALE: NOT TO SCALE | TITLE: BLOWOFF FOR WATERMAIN | | |
| DATE DRAWN: 2020–07–10 | | | |
| APPROVED BY: | SECTION: | REVISION No. | DWG.No. SW8 |

# PART E APPROVED PRODUCTS LIST

## *Section B1 – List of Approved Materials*

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| **1. Waterworks** | | | | | |
| 1.1 Pipe | 1.1.1 | Polyvinyl Chloride Pipe (PVC) | Ipex<br>Napco | AWWA C900 DR25, 18 and 14; CSA B137.3 | C900 Sizes 100 – 300 mm<br>C905 Sizes 350 – 1200 mm<br>CSA B137.3 100 – 1200 mm |
| 1.2 Fittings | 1.2.1 | Cast Iron Fittings | Terminal City | Exterior Coating to ANSI/AWWA C151/A21.5.1<br>Hot Coal Tar Enamel to AWWA C203<br>ASTM C110-82 | Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.2.2 | Ductile Iron Fittings | Terminal City | ANSI/AWWA C151/A21.53<br>Exterior Coating to ANSI/AWWA C151/A21.5.1<br>Hot Coal Tar Enamel to AWWA C203<br>Cement Mortar Lined to ANSI/AWWA C104/A21.4<br>ASTM A337 | Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.2.3 | PVC Extruded Fittings | Ipex Inc.<br>Napco | AWWA C907 (100-900 mm)<br>CSA B137.2 and B137.3 | Long Body 5° Bends<br>Long Radium Bends |
| 1.3 Couplings | 1.3.1 | Couplings | Robar<br>Smith-Blair<br>Ipex Certified<br>Hymax | ANSI/AWWA C219 Bolted, Sleeve-Type Couplings for Plain-end Pipe. | Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.3.2 | Adapter Flanges | Uni-Flange<br>Terminal City | ANSI B16.1 125lb<br>ANSI D16.5 150lb | Epoxy coated<br>Type 304 SS Bolts<br>Flanges and all bolts to be wrapped in petrolatum tape |
| 1.4 Restraining Devices | | | Uni-Flange<br>Ford | ASTM A536 | Series 1300 – 1390 for PVC Pipe<br>Series 1300, 1390, 1400 and 1450 for DI Pipe<br>Epoxy coated<br>Type 304 SS Bolts<br>All bolts to be wrapped in Denso tape |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| 1.5 Tapping Sleeves | 1.5.1 | | Robar Industries Ltd.<br>Terminal City | AWWA C223-19 | Wrap in Denso tape<br>Stainless Steel or Mild Steel (Epoxy Coated) |
| 1.6 Fire Hydrants & 50 mm Standpipes | 1.6.1 | | Terminal City<br>Canada Valve<br>Clow Canada | AWWA C502 | Painted Red (Hydrant)<br>Compression Type Confirm depth of bury with design<br>Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| 1.7 Repair Clamps | 1.7.1 | | Robar Industries Ltd.<br>Mueller<br>Canada Pipe<br>Clow Canada<br>Ford | Stainless Steel "Two Piece Type" | Sizes 100 – 600 mm |
| 1.8 Valves | 1.8.1 | Mainline Gate Valves | Mueller | Electrostatically Applied Fusion Bonded Epoxy Coated | Resilient Seat<br>Sizes 100 – 350 mm<br>Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.8.2 | Butterfly Valves | Mueller<br>Rotork | AWWA C504 – Class 150B | Electrostatically Applied Fusion Bonded Epoxy Coated<br>Resilient Seat<br>Sizes 400 – 900 mm<br>Direct Bury<br>Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.8.3 | Valve Boxes | Terminal City | Hot Coal Tar Enamel to AWWA C203<br>Exterior coating to ANSI/AWWA C151/A21.5.1 | Terminal City MR Type<br>North American Manufactured |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| | 1.8.4 | Check Valves | Apco<br>Mueller | ANSI/AWWA C508 Swing-Check Valves for Waterworks Service. 2 in. (50mm) Through 24 in. (600mm) NPS.<br>ANSI/AWWA C510 Double Check Valve Backflow-Prevention Assembly. | Sizes 100 – 400 mm<br>AWWA C504 Flanges<br>Corrosion protection in accordance to recommendations from Owners Geotechnical Engineer |
| | 1.8.5 | Air Release, Air/Vacuum and Combination Air Valves | Apco (DeZurick)<br>Val-Matic<br>Pratt | AWWA C512 (2070 kPa) | |
| 1.9 Water Service | 1.9.1 | Water Service Pipe<br>19 – 50 mm | Ipex<br>Napco | AWWA C901<br>ANSI H23.1<br>ASTM F1281<br>ASTM B88<br>CSA B137.1<br>WWT-799 | Municipal Polyethylene<br>Type K Soft Copper |
| | 1.9.2 | Taped Coupling | Ipex<br>Robar | AWWA C907<br>CSA B137.2 AND B137.3 | IP Thread |
| | 1.9.3 | Water Service Saddles | Robar | AWWA C 800-14 | Double Strap Stainless Steel<br>IP Thread<br>Brass<br>Epoxy Coated<br>Robar product 2706<br>CD2 or SC2 |
| | 1.9.4 | Corporation Stops | Ford | AWWA C 800-14 | Sizes 19 – 50 mm<br>IP Thread and Compression |
| | 1.9.5 | Curb Stop<br>Residential (Stop & Drain)<br>Irrigation (Stop & Drain) | Ford | AWWA C 800-14 | Sizes 10 – 50 mm<br>Full Flow, Full Port<br>IP x IP |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| | 1.9.6 | Service Box | Trojan<br>Mueller | AWWA C 800-14 | 2.75 m Bury<br>1.5 m Internal Stainless Steel Rod<br>Epoxy Coated Boot<br>12 pound zinc anode<br>Trojan Product SSB1<br>Mueller product A726<br>Mueller Product A728 |
| **2. Sewer** | | | | | |
| 2.1 Storm Pipe | 2.1.1 | Concrete Pipe | Ocean Construction | ASTM C14,<br>ASTM C76<br>ASTM C655 | 600 mm and Larger<br>Type 50 Cement |
| | 2.1.2 | Polyvinyl Chloride Pipe | Ipex<br>Napco | ASTM D2412<br>NQ3624-060 | DR28 100 – 150 mm<br>DR35 150 – 900 mm |
| | 2.1.3 | Ultra-Rib | Ipex<br>Napco | ASTM F794<br>CSA B182.4 | 300 mm and Larger |
| | 2.1.4 | Perma-Loc Class 5 | Ipex<br>Rehau Industries Ltd. | CSA B182.4 | 600 mm and Larger |
| | 2.1.5 | Corrugated High Density Polyethylene Pipe | ADS Hancor<br>Big O Boss 2000<br>Big O Boss 1000<br>(Culverts Only) | ASTM D3350,<br>ASTM D1248<br>ASTM F405<br>ASTM F667<br>CSA B182.6 – M92 | Bell and Spigot with Gaskets<br>Screw on Coupler |
| | 2.1.6 | Corrugated Steel Pipe<br>Spir-L-Ok | Armtec Inc.<br>Atlantic Industries | CSA G401 | 2.0 mm Gauge<br>Minimum 400 mm<br>Galvanized Coated<br>Minimum 2.0mm thickness<br>Coating as per Canadian Durability Guideline for CSP – CSPI |
| 2.2 Vaults | 2.2.1 | Pre-Cast Reinforced Concrete | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | Precast Concrete<br>Minimum 960 Opening<br>H20/CS-600 Loading<br>Type 50 Cement |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| 2.3 Catchbasins | 2.3.1 | Barrels | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | Pre-Cast Concrete<br>Type 50 Cement<br>1500 Deep<br>H20/CS-600 Loading<br>750 mm and 900 mm Diameter |
| | 2.3.2 | Complete Bases and Lids | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | Pre-Cast Concrete<br>360 maximum 640 mm Opening<br>H20/CS-600 Loading<br>Type 50 Cement |
| | 2.3.3 | Lawn Basin | Le-Ron Plastics<br>Ocean<br>Leko | For PVC<br>CSA B137.2 and B137.3<br>For Concrete CAN/CSA - A231.2<br>ASTM C478 | 70A06 with B33 Grate<br>B22A grate<br>Type 50 Cement |
| | 2.3.4 | Frame and Grate | Terminal City | ASTM 1143-19 | Type 1 and Type 2 Style B39B, B18 and B19<br>TF-33<br>Grate to indicate that stormwater drains to fish habitat or stream |
| 2.4 Headwalls | 2.4.1 | Pre-Cast Concrete<br>HDPE | Grosso<br>Leko<br>Armtec | CAN/CSA -A231.2<br>ASTM C478 | Pre-Cast Concrete<br>Type 50 Cement |
| 2.5 Storm and Sanitary Manholes | 2.5.1 | Barrels-Storm | Grosso<br>Leko | ASTM C478 | Pre-Cast Concrete<br>Minimum 1050 mm<br>H20/CS-600 Loading<br>Type 50 Cement |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| | | Barrels-Sanitary | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | PVC<br>1200 mm diameter |
| | 2.5.2 | Concrete Lid-Storm | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | Pre-Cast Concrete<br>Minimum 1050 mm<br>H20/CS-600 Loading<br>Type 50 Cement |
| | 2.5.3 | Pre-Cast Bases-Storm | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | GU Liners<br>Type 50 Cement |
| | | Pre-Cast Bases-Sanitary | Grosso<br>Leko | CAN/CSA -A231.2<br>ASTM C478 | PVC lined<br>Type 50 Cement |
| | 2.5.4 | Frame and Cover | Terminal City | ASTM 1143-19 | C18 Frame and Cover<br>C18D Frame and Cover<br>H20/CS-600 Loading<br>TF-39 |
| 2.6 Sanitary Sewer Pipe | 2.6.1 | Concrete Pipe | Ocean | ASTM C14, C76 or C655 | 750 mm or Larger<br>Bell and Spigot with Gaskets<br>Type 50 Cement |
| | 2.6.2 | PVC Pipes | Ipex<br>Napco | ASTM D2412<br>CSA B182.2<br>NQ3624-060 | DR28 100 – 150 mm<br>DR35 150 – 900 mm |
| | 2.6.3 | High Density Polyethylene Pipe (HDPE) | Phillips<br>Sclair<br>Drisco | AWWA C906 | DR32.5 to DR11 |
| 2.7 Sanitary and Storm Sewer Services | 2.7.1 | Service Wyes | Ipex<br>Napco | ASTM D3034<br>ASTM F1336<br>CSA B182.2 | DR28 Bell and Spigot<br>All new mainline construction |
| | 2.7.2 | Saddles | Ipex<br>Le-Ron Plastics Inc.<br>Robar | ASTM D3034<br>ASTM F1336<br>CSA B182.2 | Double Strap Wye<br>Only on existing mains |

| Reference | | Item Description | Approved Product/Supplier | Standard | Comments/Restrictions |
|---|---|---|---|---|---|
| | 2.7.2 | Saddles | Ipex<br>Le-Ron Plastics Inc.<br>Robar | ASTM D3034<br>ASTM F1336<br>CSA B182.2 | Double Strap Wye<br>Only on existing mains |
| | 2.7.3 | Inspection Chamber | Le-Ron Plastics Inc.<br>Ipex<br>Napco | CSA B137.2 and B137.3 | 100 mm and 150 mm<br>70A4WOP or 70A6WOP Chamber<br>73A08HSL Locking Collar<br>71ALID086L Locking Lid<br>Red – Sanitary<br>Green – Storm |
| 2.8 Forcemains | 2.8.1 | PVC Pipe & Fittings | Ipex<br>Napco<br>Rehau Industries Ltd. | AWWA C907<br>ASTM D1784<br>CSA B137.2 AND B137.3 | DR25 and DR18<br>C900 Sizes 100 – 300 mm<br>C905 Sizes 350 – 1200 mm |
| | 2.8.2 | High Density Polyethylene (HDPE) Pipe and Fittings | Philips | AWWA C906 | DR11 to DR32.5 |
| | 2.8.3 | Series PVC Pipes & Fittings | Ipex<br>Napco | AWWA C900<br>CSA B137.2 and B137.3 | Series 100 to Series 160 |
| | 2.8.4 | Lift Station Pumps | Flygt | | |
| | 2.8.5 | Valves | Mueller | AWWA C505 | Resilient Seat<br>Sizes 100 – 350 mm |
| | 2.8.6 | Services | See 1.9 Water Services | | |
| **3. Electrical** | | | | | |
| 3.1 Luminaires | 3.1.1 | Post Top Luminaire | Streetworks MPW Woodbridge | | |
| | 3.1.2 | LED Luminaire | Phillips Lumic | | |
| | 3.1.3 | LED Cobra Head 16, 32 and 48 LED Luminaire | Phillips StreetView | | |
| 3.2 Poles and Anchors | 3.2.1 | Poles and Anchors | West Coast Engineering Group Ltd. | 9010-08-WCE-SD-22-8 | |