

SCHEDULE D

REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND INSTALLATION OF WATER SYSTEMS

Schedule D - Regulations, Standards and Specifications for the Design and Installation of Water Systems

This is **Schedule D** of the Corporation of the Village of Valemount Subdivision and Development Servicing Bylaw No. 919, 2026.

Corporate Officer

SCHEDULE D – REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND INSTALLATION OF WATER SYSTEMS

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SCHEDULE D

REGULATIONS, STANDARDS, AND SPECIFICATIONS FOR THE DESIGN AND INSTALLATION OF WATER SYSTEMS

GENERAL

Water Distribution System to be Constructed by Owner

Where the provisions of Schedule A of this Bylaw require the construction of a water distribution system, the Owner shall provide a water distribution system and storage facilities including watermains, valves, hydrants, service connections, pump stations, reservoirs and pressure reducing stations consistent with the regulations, standards and specifications set out in this Schedule. All standards not specifically described in this schedule shall be in accordance with appropriate AWWA standards or as directed by the Approving Officer. The Owner shall submit an approved Water Works Construction Permit from the Northern Health Authority to the Approving Officer prior to construction.

All water distribution system modifications require approval of the Northern Health Authority prior to construction.

Approval of Engineering Drawings Required prior to Construction

Sealed engineering drawings completed by a Professional Engineer showing detailed design of the necessary works shall be submitted to the Approving Officer for approval. No construction shall commence until the engineering drawings have been approved by the Approving Officer. Drawing submission requirements shall be according to Schedule H.

Where a water system is not yet available, rights-of-way may be required to be provided by the Owner to allow for the eventual installation of this facility. Such rights-of-way shall be registered in favour of the Corporation of the Village of Valemount at the Owner's expense.

DESIGN CRITERIA

Capacity of System and Sizing of Watermains

Water distribution systems shall be designed to deliver water in adequate quantities at adequate pressures for both domestic use under peak consumption conditions and fire flows. Mains shall be sized to carry the peak hourly flow rate or the maximum daily flow rate plus the fire flow rate, whichever is the greater.

Mains shall be sized using the Hazen-William formula with "C" equal to 120. Maximum flow velocity during peak hourly demand shall not exceed 2.0 m per second. For fire flow, plus the maximum day rate, the flow velocity shall not exceed 3.0 m per second.

Domestic Demand Criteria

For residential areas, the daily domestic demand criteria for purposes of designing water distribution systems shall be assumed to be:

- Average day: 945 litres/day/capita.
- Maximum Day: 2,750 litres/day/capita; and
- Peak Hour/Maximum day Consumption Ratio: 1.5.

For other than residential areas, the demand criteria shall be selected to suit the circumstances subject to the Approval by the Approving Officer.

Fire Flow Requirements

Water distribution systems shall also be designed to ensure that fire flows as required by the current edition of “Water Supply for Public Fire Protection - A Guide to Recommended Practice” published by Fire Underwriters Survey are available for required durations. Fire flows shall not be less than 3,600 litres per minute. The amount and duration of design fire flows shall be provided to the Approving Officer for approval prior to final design of the water distribution system.

Design Pressures

Water pressure under system conditions:

Constraint	Limit (kPa)	Pump Condition
Maximum allowable pressure during static conditions	850	On
Minimum pressure at peak hour	300	Off
Minimum system pressure during MDD + fire	150	Off

These are the minimum and maximum allowable pressures at any point in the system.

The minimum pressure shall be measured or calculated at the main floor elevation of the highest proposed house and an allowance made for pressure loss in the service line to the house wall.

Minimum residual pressure at any hydrant shall not be less than 150 kPa under maximum day domestic consumption plus fire conditions. Reservoir level shall be assumed at mid-point for calculation of minimum pressures and full for calculation of maximum static pressures.

Water systems components shall be designed to not exceed manufacturer pressure ratings.

Minimum Pipe Size

The minimum pipe size for all watermains shall be 200 mm diameter, however the pipe size shall be capable of providing present and future domestic, and fire flows.

Location and Grade of Watermains

Watermains shall be located in the road right-of-way and as approved by the Approving Officer. Separation from other utilities such as sanitary sewers, storm sewers and other non-potable mains shall be in accordance with the requirements from the Northern Health Authority. On side-hill streets, the main shall, where possible, be located on the cut side of the centre line of the street.

Watermains shall be normally designed to follow a straight alignment between intersections, at grades parallel to the road centreline.

Vertical and horizontal curves may be formed using pipe joint deflection as follows:

- Minimum radius in accordance with manufacturer's specifications;
- Maximum joint deflection shall be half manufacturer's specifications;
- Constant radius throughout curve;
- Only one horizontal defined curve is permitted between any two fittings;
- The centre line alignment installed on a curve shall run parallel to the curb or street centre line; and
- Minimum one pipe length between two consecutive 5-degree bends.

Sufficient data is to be provided on design drawings for setting out of horizontal curves and detailing as-built construction record information.

Watermains shall be designed with a rising grade wherever possible to minimize high points in the main. Where a high point is unavoidable, either a blow off, service or air release valve shall be installed at that point. A minimum slope of 0.1% shall be used for watermains unless otherwise approved by the Approving Officer.

Where the watermain network lacks watermain looping, installation of supplementary mains of a minimum of 200 mm diameter to existing mains may be required at the discretion of the Approving Officer and may necessitate the provision of rights-of-way in favour of the Corporation of the Village of Valemount.

No electric or telephone duct or other utility line shall be installed in the same trench with watermains.

Where it is necessary for the watermain to cross other underground services, the crossing shall be made at an angle greater than 20 degrees and the vertical clearance between services at the crossing point shall be not less than 200 mm except for sanitary sewers where the clearance shall be at least 450 mm between the exterior walls of the pipes. Crossings shall also meet Northern Health Authority requirements.

The drawings shall indicate whether the watermain passes over or under other underground services which it is crossing.

Spacing of Fire Hydrants

Fire hydrants shall be located in accordance with the Fire Underwriters Survey Water Supply for Public Fire Protection in Canada, as follows:

- Not more than 180 m apart for single family residential areas;
- Not more than 90 m apart for multi-family and non-residential buildings;
- Where building locations have been determined and multiple hydrants are required, three hydrants shall be provided within 150 m of the principal entrance of the building and all hydrants required to deliver the total fire flow are to be located within 300 m as determined by the Village Fire Department. Maximum design flow from each hydrant is 75 L/s;
- As determined by the Village Fire Department, but in general at road intersections and at property corners. Consideration shall be given to the anticipated direction in which the fire truck will approach the hydrant;
- A hydrant shall not be located within 3 m of a utility pole, pad mounted transformer or light standard, within 1.5 m horizontally of underground service pipes or open ditches, or within 1 m of the curb line or back of sidewalk; and
- Existing 150 mm diameter watermains may be fitted with new fire hydrants if the hydrant will deliver fire flow for the land uses covered by the hydrant and the maximum velocities are not exceeded, at the sole discretion of the Approving Officer.

Line Valves

Line valves in residential areas shall be located at a maximum spacing of 200 m in a continuous line and shall generally be located so that no more than 1 hydrant or 20 service connections will be without adequate pressure in the event of any one water break. In commercial and industrial areas, line valves shall have a maximum spacing of 120 m and be located so that no more than one hydrant will be out of service during water system repairs.

Each tee shall have two line valves; each cross shall have three line valves. Each line valve shall be the same diameter as the pipe on each downstream branch of the tee or cross. At the discretion of the Approving Officer, line valves may be required on all branches of a wye or tee.

A line valve may be required on a new pipeline near each point of connection to existing mains.

Blow Offs

Permanent blow offs shall be installed at all permanent dead-ends and an adapter will be required for connecting a standard 63 mm fire hose for flushing the main, as shown on the Supplementary Detail Drawing SW-8. Either above ground or below ground blow offs may

be used depending on the suitability of the location of the blow off. Location and type shall be approved by the Approving Officer.

Temporary blow offs (usually a corporation stop) may be installed to facilitate chlorination and flushing of any part of the system. After flushing, the temporary blow off shall be removed as directed by the Approving Officer.

Air Relief Valves

Air valves should be installed at the summits of all mains 200 mm diameter and larger except as follows:

- Where the difference in elevation between the summit and valley is less than 600 mm;
- Where it can be shown that air pockets will be carried by typical flows;
- Where active service connections are suitably located to dissipate entrapped air; and
- Where fire hydrants or blow offs are provided.

Air valves shall be vented to an appropriate above-grade location to eliminate any potential for cross contamination in a flooded or contaminated chamber.

Fittings and Appurtenances

Fittings and appurtenances with other than standard hub ends shall be so indicated on plan.

Where practical, all fittings shall be located in respect to each other so that flanges or standard pipe lengths can be used to connect them.

The centre-to-centre dimension between fittings near each other shall be shown on the final engineering drawing.

Service Connections

The diameter of water services shall be determined by the Design Engineer and is subject to approval of the Approving Officer, and in no case shall the diameter be less than 19 mm.

A water service shall be installed where required to provide a connection to each lot created by the subdivision and to any other existing or possible future lot which can be serviced from mains installed by or for the subdivision.

In general, 20 mm to 50 mm diameter service connections may be tapped into mains 150 mm diameter and greater with double strap service saddles.

No tappings shall be made at an angle of greater than 30 degrees above the horizontal centreline plane of the pipe.

Spacing of services shall meet pipe manufacturer's spacing specifications.

The curb stop at the end of each service pipe shall be located 0.3 m in front of the street/property boundary line, and 3.0 metres from the parcel line. Where such location will conflict with other services, the location may be revised with the approval of the Approving Officer.

All residential, commercial, industrial and institutional buildings must be metered. Strata and mobile home developments require a meter pit at the property line to house the meter. Water meter make and model, including installation requirements, must be confirmed with the Approving Officer.

Connection of a new service connection to an existing watermain shall be undertaken by the Owner and witnessed by the Village, who will supply and install all materials to construct the service connection. The cost of the service connection will be charged to the Owner by the Village. A minimum of 5 business days' notice shall be provided to the Village. The pipe coupon shall be given to the Village. The Village of Valemount has a Watermain tie-in request form that shall be submitted to the Approving Officer for approval prior to any tie-in.

Depth of Cover

The depth of the watermain shall be sufficient to provide all services with a minimum cover of 2.5 m to the top of the service anywhere within the right-of-way. In no instance shall the minimum cover over the crown of the main be less than 2.5 m.

Cathodic Protection

A corrosive soils investigation is to be provided with the design submission. It is to be prepared by a Professional Engineer (on behalf of the Design Engineer) currently working in the corrosion abatement field to confirm the suitability of the soils for the proposed works. The Corrosion Engineer is to submit a signed and sealed report which addresses the life expectancy of the various metallic components of the work. This report shall include projected time to perforation of unprotected components based on soil corrosivity and shall recommend protective measures to achieve a minimum life expectancy of 50 years.

The corrosive soils investigation shall include but not be limited to determining the following:

- Chlorine content (ppm);
- Sulphate content (ppm);
- Electrical resistivity (ohm-cm);
- Electrical conductivity (ms/cm);
- Moisture content (%);
- Soil pH; and
- Soil classification (% sand, silt, clay).

Samples are to be taken at maximum 200 m intervals along the length of the proposed works with a minimum of two samples taken.

Where corrosive soils are identified, the methods of protection of metallic components shall be sacrificial anodes. Water trunk main components shall be protected with anodes connected to approved test stations. Copper water services (if used) shall be provided with test leads.

The Professional Engineer is to inspect the installation of the cathodic protection components and provide certification of the same. The Corrosion Engineer's final report shall summarize testing of all components including all relevant field testing data. This data shall contain locations of each test site and structure to soil potentials noting applicable testing methods.

All corrosion abatement components are to be functioning to the satisfaction of the Corrosion Engineer and Approving Officer prior to acceptance of the works and prior to paving.

Tie-ins to Existing Watermains

Connection of a new pipe to an existing watermain shall be undertaken by the Owner and witnessed by the Village. The cost of the connection will be charged to the Owner by the Village. A minimum of 5 business days' notice shall be provided to the Village. The pipe coupon shall be given to the Village. The Village of Valemount has a watermain tie-in request form that shall be submitted to the Approving Officer for approval prior to any tie-in.

Reservoirs

Design criteria and specific requirements for reservoirs shall be obtained from the Approving Officer prior to undertaking design. Access and safety features of the facility shall be in accordance with current WorkSafeBC and other regulatory agencies.

The Design Engineer shall ensure that the location chosen for the reservoir is appropriate for current and future needs. The location shall also provide safe and easy access as well as parking for Village operations personnel.

In general, reservoir capacity shall be not less than:

Total Storage Requirement = A + B + C, where:

A = Fire Storage (in accordance with FUS)

B = Equalization Storage (25% of maximum day demand);

C = Emergency Storage (25% of A + B).

Reservoir design, at minimum, shall incorporate the following features:

- sufficient geotechnical data to prove the site suitable for reservoir construction;
- structures to be below ground and covered, unless specifically approved otherwise;
- material - reinforced concrete;
- 2 cells, each containing one-half of total required volume and capable of being drained and filled independently;

- lockable access opening in roof for cleaning and maintenance - minimum dimension 1 m x 1 m to be located between overflow pipe and wall;
- ventilation pipes or openings;
- slope floor to sump;
- sub-drain under floor to collect and drain any leakage (connect to overflow pipe in a manhole);
- interior wall ladder from roof access to floor (no exterior ladder required);
- inlet, outlet pipe to be perforated and designed to disperse water throughout the reservoir;
- overflow drain to be provided and sized to transmit the maximum pump discharge. The overflow drain shall be connected to an acceptable point of discharge;
- access roads;
- coordination and integration with Village SCADA System; and
- designed by a qualified structural Professional Engineer, licensed to practice in British Columbia

Before commencement of construction, the Design Engineer shall prepare and submit a sealed design report, complete with all sealed drawings, calculations, schematic diagrams of vital components, including, power, telecommunications, water supply tie-ins, drains, overflows, landscaping treatments, and any other information as deemed necessary by the Approving Officer for the evaluation of the proposed infrastructure.

Before acceptance of the completed reservoir, the Design Engineer shall provide digital and 3 bound copies of an Operation and Maintenance manual to the Village.

All submission requirements are outlined in Schedule H.

Pump Stations

Design criteria and specific requirements for pump stations shall be obtained from the Approving Officer prior to undertaking design. Access and safety features of the facility shall be in accordance with current WorksafeBC and other regulatory agencies.

The Design Engineer shall ensure that the location chosen for the pump station is appropriate for current and future needs. The location shall also provide safe and easy access as well as parking for Village operations personnel.

In general, pump stations shall be designed to meet maximum daily demands with the largest pump out of service with balanced storage online. If equalization storage is not online, pump station capacity must meet peak hour demand with the largest pump out of service.

Pump station design, at minimum, shall incorporate the following features:

- reinforced concrete, blockwork or brick construction, aesthetically pleasing;

- lockable access doorways sized so that the largest single piece of equipment may be safely removed and replaced. Lifting hooks or rails with pulley blocks as required;
- pumps to start and stop individually. Start and stop to be based on water levels in control reservoir. Automatic alternation of pump sequence;
- power failure protection with manual reset;
- high water override start plus alarm;
- high pressure (discharge) override start;
- low pressure (discharge) override start plus alarm;
- low pressure/no flow (suction) override start;
- alarms to be audible and visible;
- control valves to minimize starting and stopping surges;
- duplicate control cables (without splices) between pump stations and reservoirs;
- power factor correction as required by Power Authority;
- hour meters and amp meters on each pump;
- recording flow meter;
- recording suction and discharge pressure gauges;
- automatic heating, ventilating and dehumidifying systems;
- in-station lighting;
- drainage;
- coordination and integration with Village SCADA System;
- electrical phase loss protection;
- electrical drawing schematics for control panels; and
- access road.

Before commencement of construction, the Design Engineer shall prepare and submit a sealed design report, complete with all sealed drawings, calculations, schematic diagrams of vital components in the pump station, including, power, telecommunications, water supply tie-ins, drains, landscaping treatments, and any other information as deemed necessary by the Approving Officer for the evaluation of the proposed infrastructure.

Before acceptance of the completed pump station, the Design Engineer shall provide digital and 3 bound copies of an Operation and Maintenance manual to the Village.

All submission requirements are outlined in Schedule H.

Pressure Reducing Stations

Design criteria and specific requirements for pressure reducing stations shall be obtained from the Approving Officer prior to undertaking design. Access and safety features of the facility shall be in accordance with current WorksafeBC and other regulatory agencies.

The Design Engineer shall ensure that the location chosen for the pressure reducing station is appropriate for current and future needs. The location shall also provide safe and easy access as well as parking for Village operations personnel.

In general, each pressure reducing station shall have a separate pressure reducing valve and appurtenances for maximum daily demand and a separate pressure reducing valve and appurtenances for fire flows.

Pressure reducing station design, at minimum and as required by the Approving Officer, shall incorporate the following features:

- access road to facility;
- to be situated in a non-confined space enclosure;
- fluorescent lighting, heating, venting and one electrical outlet;
- pressure reducing valves with downstream surge control;
- wye strainers;
- isolating gate valves;
- Double block and bleed system if it is a below grade, confined space chamber;
- Victaulic couplings;
- pressure gauges;
- one 20 mm hose bib connection;
- pipe stands;
- ceiling and wall of facility to be painted with two coats of latex white paint; and
- coordination and integration with Village SCADA System

The station shall be designed without confined space access requirements, unless otherwise approved by the Approving Officer.

Before commencement of construction, the Design Engineer shall prepare and submit a sealed design report, complete with all sealed drawings, calculations, schematic diagrams of vital components in the pressure reducing station, including, power, telecommunications, water supply tie-ins, drains, overflows, landscaping treatments, and any other information as deemed necessary by the Approving Officer for the evaluation of the proposed infrastructure.

Before acceptance of the completed pressure reducing station, the Design Engineer shall provide digital and 3 bound copies of an Operation and Maintenance manual to the Village.

All submission requirements are outlined in Schedule H.

Access

An all-weather vehicular access shall be provided to all reservoirs and pump stations. The access roads shall conform to Access Road Standards provided in **Table B.1**.

MATERIALS

Execution - Master Municipal Construction Documents (MMCD)

The Village of Valemount is using the MMCD Specifications for the installation of watermain. The specifications shall apply with the amendments outlined in:

- Appendix B – Supplementary Specifications
- Appendix C – Supplementary Detail Drawings
- Appendix D – Approved Products List

RECORD DRAWINGS

Prior to final acceptance, the Owner shall deposit with the Village, in AutoCAD and PDF format, one set of original record drawings showing all the information requested by this schedule and conforming to the criteria set out in **Schedule H**.