

VILLAGE OF TELKWA
SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW NO. 380, 1996

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VILLAGE OF TELKWA

BYLAW NO. 380, 1996

A bylaw to establish subdivision and development servicing requirements.

The Council of the Corporation of the Village of Telkwa, in open meeting assembled, enacts as follows:

SECTION 1: TITLE

- 1.1 This bylaw may be cited for all purposes as the "Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996."

SECTION 2: INTERPRETATION

- 2.1 In this Bylaw:

"Applicant" means a person applying for the approval of a subdivision whether as the owner of the property proposed to be subdivided or as agent for the owner;

"Approval" means the Approving Officer affixing his/her signature to the subdivision plan pursuant to the Land Title Act;

"Approving Officer" means the person appointed by Council to exercise the jurisdiction conferred on him/her by the Land Title Act;

"Community Drainage System" means a system of works owned, operated and maintained by the Municipality, designed and constructed to control the collection, conveyance and disposal of surface and other water;

"Community Sewer System" means a system of sewer works which is owned, operated, and maintained by the municipality;

"Community Water System" means a system of waterworks which is owned, operated and maintained by the municipality;

"Council" means the Council of the Corporation of the Village of Telkwa;

"Cul-de-sac" means a highway with only one point of intersection with another highway and which terminates in a vehicle turning area, referred to as the **"Terminus;"**

"Design and Construction Manual" means the current Village of Telkwa standards and specifications for design and construction of subdivision services. This Manual comprises Schedule "F" of this Bylaw;

"Developer" means the owner of land proposed to be subdivided or his/her representative;

"Development" means affecting a change in the use of land and in the nature of the use of land, including but not limited to the subdivision of land, and the building or placement of structures on land;

"Frontage" means that length of a parcel boundary which immediately abuts a highway other than a lane or a walkway;

"Highway" means a public street, road, walkway, bridge, lane, thoroughfare and any other public way but does not include a private right-of-way on private property;

"Lane" means a highway more than three metres, but not greater than ten metres, in width, intended to provide secondary access to parcels of land. A lane is not a partial highway;

"Lot" means the smallest unit into which land is subdivided as shown on the records of the Land Title Office;

"Lot Line" means the legally defined limits of any lot;

"Lot Line, Front" means the boundary line of the lot and the street on which the lot abuts. In the case of a corner lot where two lot lines abut streets, the lot line of the shortest length shall be the front lot line. In the case of a through lot, the lot line abutting two parallel or approximately parallel streets shall both be considered as front lot lines;

"Lot Line, Side" means a lot line marking the boundary between two lots, or between a lot and a lane, or between a lot and the public street in the case of a corner lot, of which one or both ends intersect a front lot line;

"Lot Depth" means the shortest horizontal distance between the front and rear lot lines;

"Lot Width" means the mean horizontal distance between side lot lines measured at right angles to the lot depth;

"Owner" means a person registered in the Land Title Office as owner of land, whether entitled to it in his own right or in a representative capacity or otherwise, and includes the registered holder of the last registered Agreement for Sale and Purchase;

"Panhandle Parcel" means any parcel which is serviced and gains highway frontage through the use of a narrow strip of land which is an integral part of the parcel (hereinafter called the **"Access Strip"**);

"Parcel" means any lot, block or other area in which land is held or subdivided but does not include a highway or portion thereof;

"Professional Engineer" means a person who is registered or duly licensed as such to practice within the Province of British Columbia, under the provisions of the Engineering Professional Act, R.S.B.C.;

"Right-of-Way" includes land or any interest in land acquired for the purpose of:

- a) public rights of passage with or without vehicles; or
- b) constructing, maintaining, or operating any railway;
- c) erecting and maintaining any pole-line;
- d) laying, placing and maintaining drains, ditches, pipes, transmission lines, or wires for the conveyance, transmission, or transportation of water, electric power, communication, or for the disposal of sewage;
- e) the operation and maintenance of vehicular traffic and as registered as public right-of-way.

"Roadway" means the portion of the highway that is improved, designed or ordinarily used for vehicular traffic;

"Subdivider" means the person applying for subdivision approval and includes the owner of land, developer or any person contracting with the subdivider, owner or developer regarding such subdivision or the development thereof;

"Subdivision" means the division of land or redivision of land into two or more parcels, whether by plan, abbreviated description or metes and bounds description;

"Village" means the Corporation of the Village of Telkwa, its Council, or a specific section of Telkwa as the context may require;

"Village Engineer" means the person or persons designated from time to time by the Village Council to fulfil the duties assigned by this bylaw;

"Watercourse" means a natural depression with well defined banks and a bed of 0.6 metres or more below the surrounding land serving to give direction to a current of water on the average at least six months of the year, or having a drainage area of two square kilometres or more;

"Zone" means a land use designation created by the Zoning Bylaw of the Village of Telkwa and all amendments thereto.

SECTION 3: CONDITIONS OF SUBDIVISION

3.1 Subdivision of land in the Village of Telkwa shall be in compliance with the provisions of this bylaw.

3.2 Area, Shape and Dimensions of Lots

- a) No lot shall be created by subdivision in any zone that has an area in square metres or hectares less than those set out for the zone in which it is located as required in the Village of Telkwa Zoning Bylaw No. 363, 1995 as amended or replaced from time to time.
- b) Where a parcel created by subdivision fronts on a highway, the minimum frontage shall be 1/10 of the perimeter of the lot.
- c) Notwithstanding subsection 3.3 (b), a person proposing to subdivide land may be exempted from the prescribed minimum frontage by a resolution of Council.

3.3 No subdivision will be approved which:

- a) is not suited to the configuration of the land being subdivided; or
- b) is not suited to the use to which it is intended; or
- c) will make impracticable the future subdivision of the land within the proposed subdivision or of any adjacent land.

SECTION 4: PROVISION OF SERVICES IN SUBDIVISIONS

4.1 Highways

All highways created by a subdivision plan, including widening of existing highways, shall:

- a) comply with the dimension, location, alignment and gradient requirements set out in Schedule "B" of this Bylaw; and
- b) be cleared, graded and surfaced in accordance with the standards set out in Schedule "B" of this Bylaw.

4.2 Street Lighting

In subdivisions where a street lighting system is required, street lighting shall be installed and constructed in accordance with the standards set out in Schedule "B" of this Bylaw.

4.3 Water System

Each parcel created by a subdivision shall be supplied with a complete water distribution system connected to the community water system, and all system components shall be installed in accordance with the standards set out in Schedule "C" of this Bylaw.

4.4 Sewer System

Each parcel created by a subdivision shall be supplied with a complete sewer collection system connected to the community sewer system, and all system components shall be installed in accordance with the standards set out in Schedule "D" of this bylaw.

4.5 Drainage System

Each parcel created by a subdivision shall be provided with a drainage collection system constructed in accordance with the standards set out in Schedule "E" of this bylaw.

4.6 Power, Cablevision and Telephone

All subdivisions and developments are to be serviced with electrical power, cablevision and telephone services.

4.7 Overhead Wiring and Natural Gas

- a) In all subdivisions and developments where overhead wiring is required, each shall be located, constructed and otherwise meet the standards found in Schedule "F".
- b) Natural gas services may, at the owner's option, be provided for some subdivisions; and, where such natural gas services are to be provided, they shall be located, constructed and otherwise meet the standards found in Schedule "F".

4.8 Underground Wiring

Underground wiring may be considered at the discretion of the Approving Officer for some subdivisions; and, where such underground wiring is required, each shall be located, constructed and otherwise meet the standards found in Schedule "F".

4.9 Subdivisions Where Servicing Requirements May Be Waived

Notwithstanding Subsection 1, the servicing requirements of this Bylaw may be waived by the Council where the parcel being created is to be used solely for unattended equipment necessary for the operation of:

- a) a community water system;
- b) a community sewer system;
- c) a community gas distribution system;
- d) a radio or television receiving or broadcasting antenna;
- e) a telecommunication relay station;
- f) an air navigational aid;
- g) an automatic telephone exchange;
- h) an electrical substation or power generating station;
- i) parks and playgrounds; or
- j) any other similar public service facility or utility.

4.10 Cost of Services

- a) Unless otherwise provided in this Bylaw, all works and services required in this Bylaw shall be constructed and installed at the expense of the owner of the land being subdivided.
- b) The Village may require that the owner of land that is subdivided or developed provide excess or extended services to provide access to or serve land other than the land being subdivided or developed pursuant to the provisions of Section 990 of the Municipal Act.

4.11 Security Agreement for Subdivision Approval Before Completion of Works and Services

All works and services required to be constructed and installed at the expense of the owner of the land being subdivided shall be constructed and installed in accordance with the provisions of this Bylaw before the Approving Officer approves the subdivision, unless the owner of the land;

- a) deposits with the Village a security in the form and amount prescribed in Schedule "H" of this bylaw; and
- b) enters into an agreement with the Village as provided for in Schedule ""H" of this Bylaw to construct and install the required woks and services by the date specified in the agreement or forfeit to the Village the amount secured.

SECTION 5: SERVICING REQUIREMENTS FOR SUBDIVISIONS UNDER THE CONDOMINIUM ACT OR FOR DEVELOPMENT WITH NO SUBDIVISION

As a condition of the issuance of a building permit on the site being developed, the Village of Telkwa may require that the owner of the land being developed shall provide works and services which are directly attributable to the development in accordance with a site servicing plan prepared by the owner and approved by the Village Engineer.

This section does not constitute a part of the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996; but is provided for information purposes and to indicate the servicing requirements for proposed developments of this type (i.e. subdivision under the Condominium Act or for development not involving subdivision).

5.1 Access Roads and Parking

- a) For developments where on-site parking and/or on-site loading facilities are to be provided, the development shall be provided with vehicle access from a highway or highways in accordance with the site servicing plan.

For a development site fronting on a Controlled Access Highway designated pursuant to the Highway Act, the proposed method of providing access to the site shall also be subject to approval by the Ministry of Transportation and Highways.

- b) All access roads, on-site parking areas and on-site loading areas shall be surfaced with crushed granular materials.

5.2 Site Drainage

The development shall be provided with site drainage collection and disposal facilities in accordance with the standards of this bylaw. The drainage component of the site servicing plan shall illustrate the following:

- a) site grading - showing existing and post-development contours;
- b) method of on-site collection;
- c) methods of disposal subject to approval by the Village of Telkwa and, if appropriate, Ministries having jurisdiction such as Highways and Environment may be by:
 - connection to municipal storm sewer system, or
 - discharge to surface drainage course, or
 - discharge to natural water course, or
 - on-site disposal to dry-wells,

SECTION 6: SERVICING REQUIREMENTS FOR HIGHWAYS ABUTTING A SITE BEING SUBDIVIDED OR DEVELOPED

As a condition of the approval of a subdivision or the issuance of a building permit, the Village of Telkwa may require that the owner of the land being developed, provide all works and services directly attributable to the development which are or would be located on that portion of a highway immediately adjacent to the site being subdivided or developed, up to the center line of the highway, including;

- a) Highway Improvements - clearing, grading, and surfacing in accordance with the standards set out in Schedule "B" of this bylaw;
- b) Water System Improvements - construction of water distribution system components in accordance with the standards set out in Schedule "C" of this bylaw;
- c) Drainage System Improvements - provision of drainage facilities as required in Schedule "E" of this bylaw.

The required works and service on a highway immediately adjacent the site being subdivided or developed shall not include specific works or services that are included in calculations used to determine the amount of a development cost charge, unless the owner agrees to provide the works or services, in which case the calculation of the development cost charge will be subject to Section 983(8) of the Municipal Act.

Section 6 does not constitute a part of the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996; but is provided for information purposes and to indicate the servicing requirements for development of this type (i.e. subdivisions under the Condominium Act or for development not involving subdivision).

SECTION 7: ADMINISTRATION AND ENFORCEMENT

7.1 Application Fee

An applicant for subdivision approval shall submit with the application a fee of THIRTY DOLLARS (\$30.00) for the first lot created by the proposed subdivision and FIFTEEN DOLLARS (\$15.00) for each additional lot.

7.2 Authorization to Enter on Lands Being Subdivided

The Approving Officer or the Village Engineer, being officers of the Village of Telkwa, are authorized to enter, at all reasonable times, upon the lands for which application to subdivide has been made, in order to ascertain whether the provisions of this Bylaw are being obeyed.

7.3 Penalty

Any person who violates any of the provisions of this Bylaw shall, on summary conviction, be liable to a penalty not exceeding ONE THOUSAND DOLLARS (\$1,000.00), plus the cost of prosecution.

7.4 Severability

If any section, subsection, sentence, clause or phrase of this Bylaw is for any reason deemed to be invalid by the decision of any court of competent jurisdiction, the invalid portion shall be severed and the decision that it is invalid shall not affect the validity of the remainder of this Bylaw.

7.5 Schedules Form Part of Bylaw

Schedules "A" through "H" are attached to and form part of this Bylaw.

SECTION 8: ENACTMENT

8.1 Repeal of Previous Bylaw

"Village of Telkwa Subdivision and Development Servicing Bylaw No. 256, 1987" and all amendments thereto are hereby repealed.

8.2 Effective Date

This Bylaw shall take effect upon registration by the Inspector of Municipalities.

READ FOR A FIRST TIME this _____ day of _____, 1996.

READ FOR A SECOND TIME this _____ day of _____, 1996.

READ FOR A THIRD TIME this _____ day of _____, 1996.

ADOPTED this _____ day of _____, 1996.

Greg Fortune
Mayor

Arlene deGelder
Clerk-Treasurer

Certified a true and correct copy of "Village of
Telkwa Subdivision and Development Servicing
Bylaw No. 380, 1996."

Arlene deGelder
Clerk-Treasurer

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
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SCHEDULE "A"

HIGHWAYS

Schedule "A" consists of standards for the dimensions, locations, alignment, and gradient of highways and standards for the design, construction and installation of works relating to roadways, boulevards and street lighting.

1. Highway Classifications

For the purpose of establishing standards, highways are classified into the following categories as described more fully in Schedule "F", Section 2:

- a) arterial streets;
- b) collector streets;
- c) industrial streets;
- d) local streets;
- e) cul-de-sacs, consisting of two parts - the entrance and the terminus;
- f) lanes;
- g) walkways.

2. Highway Standards

Different Highway standards will be required for different classes of highways. The required standards for right-of-way width, road width, road lane widths, road surfacing and shoulders are set out in Table 1 (see next page).

TABLE 1: HIGHWAY WIDTH STANDARDS

HIGHWAY CLASSIFICATION	RIGHT-OF-WAY WIDTH	PAVED ROAD SURFACE WIDTH	GRAVEL ROAD SURFACE WIDTH
Arterial	27.0 metres *	14.0 metres roadway 3.0 metre shoulders	12.0 metres
Collector	20.0 metres	9.5 metres roadway 3.0 metre shoulders	9.5 metres
Local	20.0 metres	8.5 metres roadway 1.5 metre shoulders	9.5 metres
Cul-de-sac: a) Entrance b) Terminus	16.0 metres 15.0 m radius	11.0 metres roadway	9.5 metres 11.5 m radius
Industrial	20.0 metres	9.5 metres roadway 3.0 metre shoulders	9.5 metres
Lane	6.0 metres	7.5 metres roadway	6.0 metres
Walkway	3.0 metres	1.5 metres paved	1.5 metres

* It is recognized that under the Municipal Act, a local government cannot require the dedication of a highway right-of-way greater than 20 metres in width without compensation. Where a proposed subdivision necessitates the provision of an arterial road to be built to a generally accepted engineering standard of 27 metres right-of-way, the Village will enter into an agreement with the developer to ensure that an adequate roadway width is provided that complies with the requirements of the Municipal Act.

3. Intersections

Standards for Intersections are as follows:

- a) Intersection Spacing - no intersection shall be less than 40 metres from any other intersection or likely future intersection. Measurement shall be made along the centerline of the intersected highway and between centerlines of intersecting streets.

- b) The intersection approach angle shall be as near as possible to 90 degrees, with a minimum permissible angle of 70 degrees and a maximum of 110 degrees.
- c) Intersections with more than four legs are not permitted.
- d) Intersections shall not be located in or near sharp horizontal curves or near the crest of any vertical curve.
- e) At all intersections, corner cut-offs shall be provided on corner lots. Such corner cut-offs shall be 4.5 metres x 4.5 metres in dimension in residential areas, and 6.0 metres x 6.0 metres in industrial and commercial areas.

4. Roadway Design Criteria

Minimum and maximum grades for roadways, design speeds, minimum radii of curvature, and vertical curves shall be in accordance with the provisions of Schedule "F".

5. Clearing

All street right-of-way and lanes shall be cleared their full width, grubbed and all refuse completely disposed of, unless by prior arrangement with the Village Engineer desirable natural cover has been allowed to remain. Notwithstanding the foregoing, the Village Engineer may require that certain areas or trees are not to be cleared.

Topsoil shall be removed and stored on site for later replacement on boulevards and where surplus is available on lots.

Individual leaning or dangerous trees or snags outside the clearing area shall be removed.

Burning shall be carried out in accordance with local and provincial regulations.

6. Grading

Topsoil shall be removed for the full width of the right-of-way and the road, lane and boulevard areas shall be graded to the approved profiles and cross-sections. The completed subgrade profile shall be constructed to tolerance of 30 mm and all soft, spongy or unstable areas which may exist or develop shall be excavated to a firm base and backfilled to grade with compacted selected material. All utility trenches within the subgrade section shall be properly compacted as provided for in Schedule "F" for the full depth, so that settlement of the road surface will be minimized. Embankment and cut slopes shall be neatly trimmed as required in Schedule "F".

7. Select Granular Sub-Base

Select granular sub-base material shall be placed on dry, firm sub-grade, and compacted in uniform layers not exceeding 150 mm in uncompacted thickness, to a minimum 100% Standard

Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 15 mm, free from ruts, waves and undulations.

8. Crushed Granular Base

Crushed granular base course material shall be placed on dry, firm sub-base, and compacted in uniform layers to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 12 mm, free from ruts, waves and undulations.

9. Boulevards

Boulevard areas lying between the curb and property line of the road right-of-way shall be graded to drain to the curb and fill sections shall be compacted. The topsoil shall be raked free of roots and other debris.

10. Hot-Mix Asphaltic Concrete

Priming and paving shall be carried out only on dry, smooth, compacted base course. Granular base courses and asphaltic concrete base courses shall be kept clean and uncontaminated until covered. Priming shall include granular and asphaltic base courses, edges of buildings, structures, gutters and pavement and shall not be carried out when the ambient temperature is less than 10 degrees Celsius.

Hot-mix asphaltic concrete shall be produced in a batch plant capable of drying and heating the mineral aggregate, heating the asphalt cement and accurately proportioning all materials to produce an asphaltic concrete possessing the required characteristics and within designated tolerances in accordance with ASTM D-99.

Hauling of asphaltic concrete shall be done in a manner such that the hot-mix is delivered to the site at the specified temperature and that no damage to surfaces of roadway occurs.

Hot-mix asphaltic concrete shall be placed, spread and compacted to produce a true profile and cross-section of the specified thickness and density and with a uniform textured surface free from roller marks. Minimum final densities shall be:

Prior to October 1	- 97% of laboratory design density
After October 1	- 98% of laboratory design density

Test results indicating conformance with the approved detailed design drawings and specifications shall be submitted.

11. Lanes and Pedestrian Walkways

a) Where service lanes for vehicular traffic are provided in commercially zoned subdivisions, the requirements of subgrade preparation and surfacing of lanes shall be as

for street surfacing.

- b) Lanes shall be provided where:
 - i. they form an extension of any existing system of lanes;
or
 - ii. they are necessary to provide secondary access in order that reasonable traffic flow can be assured on the main highway unless terrain and natural features render vehicular access impractical.
- c) Where pedestrian walkways are provided in the subdivision, they shall be designed and constructed to standards set out in Schedule "F".

12. Asphaltic Concrete Pavement and Related Works

- a) All asphaltic concrete pavement for roads and lanes shall be manufactured and laid according to the standards set out in Schedule "F" and only after all the registered services are installed.
- b) Before commencement of the works, the applicant shall prepare a construction schedule satisfactory to the Approving Officer, based upon completing the various phases or parts of the work. During installation and construction, the Applicant's Engineer shall certify that each phase or part is complete and meets all standards and requirements.

The Applicant shall not proceed to a subsequent construction phase prior to the inspection of the preceding phase by the Approving Officer. If the Approving Officer is not given proper notice and has not had ample opportunity to carry out the proper inspections, he/she may take whatever steps he/she deems necessary including exposing or removal of the works.

- c) Where restoration work is necessitated by reason of construction through a built-up or established area, work shall proceed in such a manner that testing, manhole construction, house service connections, restoration of private easements, boulevards, roads, and general site clean-up are completed no later than thirty (30) days after completion of the works. If the restoration is not completed within this time, the Village reserves the right to enter upon the property, carry out or complete the restoration and charge the cost of such work to the Applicant.

13. Street Lighting

- a) If required, Street lighting shall be provided by street lights mounted on overhead power poles. The Applicant shall be responsible for arranging for the street lights, obtaining all

electrical permit required and paying for all fees in connection with the installation.

- b) The street lighting system shall be laid out in accordance with good engineering design and in accordance with the Illuminating Engineering Society (IES) (ANSI RP-8) "National Standard Practice for Roadway Lighting". The minimum lighting level shall conform to Schedule "F".

14. Private Utility Work

- a) The Applicant shall be responsible for meeting all the requirements of the utility companies and government agencies concerned in the installation of power, and telephone and gas distribution systems. The Applicant shall obtain permits which may be required to carry out the system installation.
- b) Installation of all underground utilities are to be complete before street improvements are constructed.

15. Boulevards

Unless otherwise approved, boulevards shall be graded to drain to the ditch with slopes constructed to standards set out in Schedule "F".

16. Curb and Gutter

If required by the Approving Officer, curb and gutter shall conform to specifications set out in Schedule "F". Rolled mountable curbs may be permitted for local streets, in residential areas. All other streets shall have non-mountable curb and gutter.

17. Concrete Sidewalks

Concrete sidewalks, if required, shall conform to specifications set out in Schedule "F".

18. Street Signs

The Applicant shall deposit with the Village funds equal to the cost of providing and installing street name signs. Signs will be installed by the Village when all works are completed by the Applicant.

19. Street Names

Street names shall be assigned to new streets by the Council.

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
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SCHEDULE "C"

WATER DISTRIBUTION SYSTEM

Schedule "C" consists of standards for the design, construction and installation of works relating to water distribution systems.

1. Installation of Watermains

All materials, including pipe fittings, shall be installed to applicable A.W.W.A. Standards for the installation of the particular type or class of material being used and to any additional requirements as set out by the materials manufacturer. All watermains shall be installed to a minimum depth of 1.8 metres clear cover from the crown of the pipe to the finished grade of the street directly above the pipe. All pipe shall be bedded, backfilled and compacted in accordance with Schedule "F".

The minimum allowable main size shall be 150 millimetres nominal diameter, except in short cul-de-sacs, where there is no chance of future extension and where no fire hydrants are required, the mains may be 100 millimetres in diameter.

The maximum desirable length of any permanent non-interconnected watermain shall be 183 metres and must have a blow-off valve at the dead end of the main. All mains exceeding 183 metres, unless it is a temporary situation, shall be looped unless otherwise accepted. Dead-end mains shall not be promoted.

Watermains shall generally be located in the road right of way. When watermains must cross private property, a registered utility right-of-way, minimum 6.0 metres wide, shall be provided.

The Owner shall obtain a Final Certificate for proposed waterworks improvements from the health Branch, a copy of which shall be provided to the Village prior to installation of the works.

2. Materials

All materials to be incorporated in the water distribution system shall conform to the specifications set out in Schedule "F".

3. Connection to Existing System

Connection of a new system to existing municipal mains, or the turning on of water into new mains shall be carried out by the Village. Application for connection must be made to the

Approving Officer, providing adequate advance notice for the execution of such works.

4. Testing and Disinfection

- a) Each section of water distribution piping installed by the applicant must be tested for pressure and leakage as outlined in Schedule "F".
- b) The Applicant shall advise the Approving Officer 24 hours in advance of the leakage test being applied, which test shall be scheduled for normal Village working hours, and the Approving Officer may elect to witness the test. All test data and leakage calculations shall be submitted to the Approving Officer.
- c) Disinfection and flushing of the water distribution system shall be carried out by the applicant in accordance with the procedure set out in Schedule "F" prior to the system being placed in service.

5. Fire Hydrants

Fire hydrants shall conform to the specifications set out in Schedule "F".

6. Water Service Connections

- a) All materials to be incorporated in the water services shall conform to Schedule "F" and the regulations of the B.C. Plumbing Code.
- b) Each single family dwelling, and each dwelling unit of a semi-detached duplex, or row house project, where each unit is on an individual parcel, shall have an individual 19 millimetre (3/4 inch) diameter copper water service connection.
- c) Service connections shall be installed to the property line.

7. Trench

Water service connections shall be installed in accordance with B.C. Plumbing Code and Schedule "F". The pipe subgrade shall be carefully prepared, graded and compacted prior to installation of the service pipe.

8. Parks and Boulevards

Water service connections to the size and locations as determined by the Approving Officer shall be provided by the Applicant for land designated for park, green strip or median boulevard use within the subdivision.

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
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SCHEDULE "D"

SANITARY SEWER SYSTEM

Schedule "D" consists of standard for the design, construction, and installation of works relating to sanitary sewer systems.

Sanitary sewer systems shall be designed and installed in accordance with the requirements of the Ministry of Environment, Waste Management Branch, "Guidelines for Assessing Sewage Collection Facilities", and the requirements noted in this Schedule.

1. Installation of Manholes, Pumping Stations, and Force Mains

All materials shall be installed to applicable A.W.W.A. Standards for the installation of the particular type or class of material being used and to any additional requirements as set out by the materials manufacturer. All gravity sewer mains shall be installed to a minimum depth of _____ metres clear cover from the crown of the pipe to the finished grade of the street directly above the pipe. All low-pressure sewer mains shall be installed to a minimum depth of _____ metres clear cover from the crown of the pipe to the finished grade of the street directly above the pipe. If the pipe is installed with only _____ or less clear cover, then the pipe must be insulated.

All pipe shall be installed, bedded, backfilled and compacted in accordance with Schedule "F".

The minimum allowable gravity sewer main size shall be _____ millimetres in diameter and the minimum allowable low-pressure sewer main size shall be _____ millimetres in diameter.

2. Materials

All materials to be incorporated in the sanitary sewer system shall conform to the specifications set out in Schedule "F".

3. Connection to Existing System

Connection of a new system to existing municipal mains or sewer works shall be carried out by the Village. Application for connection must be made to the Approving Officer, providing adequate advance notice for the execution of such works.

4. Flushing and Testing

a) Each section of sanitary sewer piping installed by the applicant must be tested for

pressure and leakage as outlined in Schedule "F".

- b) The Applicant shall advise the Approving Officer 24 hours in advance of the testing, which test shall be scheduled for normal Village working hours, and the Approving Officer may elect to witness the test. All test data and leakage calculations shall be submitted to the Approving Officer.
- c) All flushing and testing of the sanitary sewer system shall be carried out in accordance with the procedure set out in Schedule "F" prior to the system being placed in service.

5. Parks and Boulevards

Sanitary sewer connections to the size and locations as determined by the Approving Officer shall be provided by the Applicant for land designated for park, green strip or median boulevard use within the subdivision.

6. Individual On-Site Disposal Systems

Where a parcel is not required to be served by a community sewer system, such parcel shall be served by individual on-site sewage disposal.

An area, suitable for construction of on-site sewage disposal facilities and certified by the Medical Health Officer, shall be located on each parcel, and not smaller than the following as determined by the percolation rate of the soil in that area:

Percolation Rate (min/2.5 cm)	Min. Size of Area of Soil (square metres)
less than 13	300
13 or more, but less than 25	450
25 or more, but less than 30	600

The longest acceptable percolation rate is 30 minutes/2.5 c.m.

There shall be a minimum of 120 cm of natural porous topsoil above the ground water table or any impervious layer in such area of soil and a representative number of test holes shall be dug in that area to a minimum depth of 120 cm to demonstrate this.

The area of soil required for sewage disposal shall be capable of meeting the siting and setback requirements for absorption fields in the Sewage Disposal Regulations, B.C. Reg. 411/85.

Percolation tests are subject to the certification of the Medical Health Officer, B.C. Ministry of Health, who will make a recommendation to the Approving Officer.

Percolation tests to test the area of soil are to be undertaken as follows:

- a) Percolation test holes shall be dug at points and elevations selected as typical in the area of proposed disposal field;
- b) One of these test holes shall be dug at each end of the area of the disposal field. Further holes may be required depending on the nature of the ground and the result of the first test and the size of the proposed field;
- c) Test holes shall be 300 mm square and excavated to the depth of the proposed absorption trench;
- d) To make the percolation test more accurate, any smeared solid should be removed from the walls of the test hole;
- e) If the soil contains considerable amounts of silt and/or clay, the test hole shall be presoaked before proceeding with the test. to do this, keep the hole as fully filled with water as possible for four (4) hours. Proceed with the test immediately after presoaking.
- f) To undertake the test, fill the test hole with water. When the water level is thirteen (13) centimetres or less from the bottom of the hole, refill the hole to the top. No recording of time need be done for these two fillings.
- g) When the water level after the second filling (step (f) is thirteen (13) centimetres or less from the bottom of the hole, add enough water to bring the depth of water to fifteen (15) centimetres or more;
- h) Observe the water level until it drops to the fifteen (15) centimetre depth. At precisely fifteen (15) centimetres commence timing. When the water level reaches precisely twelve and one-half (12.5) centimetres depth, stop timing.
- i) repeat procedures (g) and (h) until the last 2 rates of fall do not vary more than 2 minutes per 2.5 cm;
- j) The time in minutes for the water level to drop 2.5 centimetres is the percolation rate for that hole and is recorded in minutes per 2.5 centimetres. The percolation rate of the absorption field is the average of the slowest rates of the percolation tests made for that field;
- k) Cover the holes, flag their location and repeat the test in other locations. record the results and submit to the local authorities.

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW NO. 380, 1996

SCHEDULE "E"

STORM DRAINAGE

1. Drainage Plan

For each new subdivision, a drainage plan shall be prepared and approved by the Approving Officer. The drainage plan shall be presented on a contour map at a scale of not less than 1:2500 with contour intervals of not more than 2 metres. the drainage plan will show how storm drainage will be handled within the subdivision, including:

- a) proposed method of handling surface drainage, including discharge points to natural drainage courses; and
- b) provisions of drainage right-of-way where necessary;

2. Natural Drainage Courses

No natural drainage course shall be altered or diverted unless in accordance with a drainage plan pursuant to subsection (1) approved by the Approving Officer.

3. Storm Drainage System Materials, Construction and Installation

Where storm drainage systems are provided, the materials, installation, construction and testing of all pipe, fittings, manholes, outfall or drainage drywells, and appurtenant structures shall conform with the requirements set out in Schedule "F" - Design and Construction Manual.

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW NO. 380, 1996

SCHEDULE "F"

DESIGN AND CONSTRUCTION MANUAL

The Design and Construction Manual consists of design standards and standard engineering drawings for the design, construction and installation of works required in this Bylaw. The contents of the Manual comprises the following:

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SECTION 1 - GENERAL REQUIREMENTS

100. ENGINEERING DRAWINGS

100.1 Design Drawing Preparation

- a. All applications for approval under the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996 shall be accompanied by engineering drawings as specified in this Schedule. The drawings shall be submitted to the Approving Officer and shall be prepared at no cost to the Village.
- b. All required engineering drawings shall be prepared under the direction of, dated, sealed and signed by a Professional Engineer.
- c. Where works or services are provided, located or constructed as a condition of subdivision approval under this bylaw, as-built engineering drawings of those works and services shall accompany the application for subdivision approval as evidence of the completion of those works and services unless an arrangement pursuant to Section 911 of the Municipal Act exists. Such drawings shall be prepared and provided at no cost to the Village.

100.2 Design Drawing Approval

Three paper copies of the engineering drawings shall be submitted to the Village Engineer for approval before the Owner starts construction of subdivision services.

100.3 General and Legal Information

- a. Drawings to be completed in ink on standard A-1 size sheets.
- b. In general, plan and profile drawings shall be to the scale:

Horizontal	-	1:500
Vertical	-	1:50

with the profile below and the plan above on the drawing.

- c. North arrow to face the top or left side.
- d. The Village's Subdivision reference number shall be shown on the title block.

- e. Consecutive drawings to be joined by matchlines.
- f. Legal dimensions to be shown on lot lines.
- g. Lot and registered plan numbers to be shown.
- h. Right of Way and easement numbers to be shown.
- i. All elevations shall be referenced to geodetic datum.

100.4 Water Service Information

- a. On plan, show all watermains, hydrants, valves, caps, reducers, standpipes pressure reducing stations and all other appurtenances.
- b. Show offsets of mains from property line, pipe sizes, material, and class.
- c. On plan indicate fitting sizes and joint types.
- d. On profile show pipe sizes, material and classes.
- e. On plan show water services from main to property line.
- f. Location of water services to lot corner to be dimensioned.

100.5 Sanitary Sewer and Storm Drainage Information

- a. On plan show all pipes, manholes, catch basins, drainage drywells, clean-outs, leads, inlets and outfall, pipe sizes, material, class of pipe and offset from property line.
- b. On profile show manholes, pipe and sizes, length, material classes and grades between manholes and pipe invert elevations. Invert elevations of inlets and outfall must be shown.
- c. On plan and profile, designate manholes DMH-# for storm sewer manholes and SMH-# for sanitary sewer manholes.
- d. On plan show sewer services from main to property line.
- e. Location of water services to lot corner to be dimensioned.

100.6 Roadwork Information

- a. On plan, show all centerline horizontal curve data, roadway edges and ditches, offsets from property line to roadway edges and centerline.
- b. On profile show road centerline profile including vertical curve data and grades.

100.7 Staging

- a. Where a subdivision is to be constructed in stages, show subdivision development staging and the order in which each portion of the project will be developed on plan and profile. Prepare and submit a report outlining proposed staging.

100.8 Soils

- a. On a separate plan, show location of test holes, test hole logs, porosity of soils, the depth to ground water and bedrock, areas of soil instability, and any other information deemed necessary of the Village Engineer.

110.0 CONSTRUCTION PROCEDURES

110.1 Construction Schedule

Before starting construction of subdivision services, the Developer shall provide the Village Engineer with a construction schedule in writing setting out the sequence and timing of construction activities, including those set out in the Design and Construction Manual where approval by the Village Engineer is required.

If there are delays or variances from the construction schedule, the Developer shall inform the Village Engineer of these variances. The Developer shall provide the Village Engineer with the names and addresses and telephone numbers of the On-site Representative(s), the Contractor, and the Contractor's Superintendent.

110.2 Authorization of Village Engineer to Enter on Lands

During construction, the Village Engineer is authorized to enter upon the lands where services are being constructed to view the construction of services.

110.3 Inspection of Works

The construction of required works and services shall be inspected by a Professional Engineer or his designated representative at the expense of the Developer of the land being subdivided.

110.4 Trench Cuts Across Existing Roads

Where utility mains and services have to cross existing paved roadways, the pavement shall be precut with a cutting wheel or jack hammer. Upon completion of the utility

installation, the trench shall be backfilled and compacted, and a roadway structure similar to the existing roadway placed and compacted. The road shall be patched with hot mix asphalt.

110.5 As-builts of Existing Underground Services

The existing underground services shown on Village of Telkwa drawings are not guaranteed to be accurate or complete. It shall be the responsibility of the Developer to find and locate in the field all existing services such as water, sewer, drains and culverts, hydro, telephone and natural gas, prior to construction, and to preserve and protect them from damage during construction.

No claim for damages by the Developer will be entertained by the Village for the cost of locating existing utilities, adjusting design lines and grades or relaying pipe to avoid conflict.

110.6 Connections to Existing Municipal Utilities

All connections to existing municipal utilities shall be undertaken by the Village. The Developer shall design the connections and submit it to the Village for approval. The Village will supply all materials, equipment and labour required to complete the connection. The Developer shall pay all connection costs and coordinate timing of the connection with the Village, as well as advise affected consumers of a utility system disruption.

110.7 Public Access and Safety

During construction of the work, all streets shall be kept open for public travel, unless prior arrangements have been made by the Developer and the Village.

Barricades, warning lights, traffic signs and all traffic control devices shall be provided and used by the Developer to standards set out by the Village Engineer.

At no time shall access be cut off completely from any houses or buildings, however private driveways may be cut off temporarily for periods up to twenty-four (24) hours. Before cutting off access to any houses or buildings, the Developer shall give at least eight (8) hours notice to the owner of the property.

the Developer shall effectively warn and protect the public from any danger as a result of the work being done.

No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, or in such a manner that it creates a hazard for the public. At the end of each days' work and at other times when work is suspended, the Developer shall remove all equipment and other obstructions from that portion of roadway open for use

by traffic.

The Developer shall ensure that fire hydrants, valve boxes, manhole covers, meter boxes, fire or police call boxes, and all other utility controls are accessible at all times.

The Developer shall provide temporary pedestrian bridges across the trench at all street intersections and at access points to houses and buildings unless alternative convenient pedestrian access is available.

110.8 Maintenance and Restoration of Existing Drainage

All existing drainage facilities disturbed by the Developer in carrying out the work shall be promptly restored to their original condition as the work advances. On completion of the work, drainage facilities shall have at least the same flow capacity as before and left in a stable condition to the satisfaction of the Village Engineer.

110.9 Construction Completion Certificate

Upon completion of construction and submission of as-built drawings to the Village, the Professional Engineer representing the Developer shall provide the Village with a Construction Completion Certificate on a standard form provided by the Village of Telkwa, stating that the works as constructed conform to the plans and specifications set out in the approved design drawings.

110.10 Acceptance of Construction Completion Certificate by the Village

Upon receipt from the Developer's Engineer of the Construction Completion Certificate, the Village Engineer shall inspect the works and services. Upon determining that all deficiencies have been rectified and that the subdivision conforms to the plans and specifications set out in the approved design drawings, the Village shall accept the Construction Completion Certificate. Only the standard certificate form provided in this manual shall be used. Property pins and survey monuments destroyed or damaged by construction operations shall be replaced prior to accepting the Construction Completion Certificate.

110.11 Maintenance Bond

Upon acceptance of the Construction Completion Certificate by the Village, the Developer shall provide the Village with a maintenance bond or letter of credit acceptable to the Village in the amount of 10% of the total construction value as determined by the Professional Engineer representing the Developer and approved by the Village Engineer. The term of the maintenance bond shall be from the date of acceptance of the Construction Completion Certificate to the date of issuance by the Village of the Final Acceptance Certificate, but in no case shall the term be less than twelve months.

110.12 Final Acceptance Application

No less than 12 months after the date of acceptance of the Construction Completion Certificate by the Village, the Developer shall apply to the Village for Final Acceptance on a standard form provided by the Village of Telkwa.

110.13 Final Acceptance by the Village

Upon receipt from the Developer's application for Final Acceptance, the Village Engineer shall inspect the works and services and upon determining that all deficiencies have been rectified to conform to the plans and specifications set out in the approved design drawings, the Village shall issue the Final Acceptance Certificate as provided for in on the standard Final Acceptance Application form.

120. "AS-BUILT" DRAWINGS AND SERVICE REPORTS

Upon completion of the works, one (1) set of reproducible and tow (2) sets of paper as-built drawings shall be submitted to the Village. The drawings shall conform to the Village standards and shall include all required inverts, locations, offsets and material types and classes comprising the works. In addition, the drawings shall include:

- a) All service connections shall be accurately shown on the "as-built" drawings indicating horizontal distance from service location to property corner and an invert elevation at property line. All changes made during construction shall be made on the "as-built" drawings.
- b) "As-Built" or "As Constructed" must be clearly marked on the full sized transparency drawings and the drawings shall be dated and sealed by a Professional Engineer.
- c) Service reports for each serviced lot shall be submitted along with the "as-built drawings." The reports, to be completed on standard Village forms shall include the following information:

Sewer:

- invert of main at connection;
- invert of service at connection;
- invert of service at property line;
- size and type of service pipe;
- size and type of main;
- type of saddle;
- location of service from lot corner;
- location of main from property line.

Water:

- invert of main at connection;
- top of curb stop at property line;
- size and type of service;
- size and type of main;
- type of service saddle;
- location of service from lot corner;
- location of main from property line.

SECTION 2 - ROAD DESIGN

200. ROAD CLASSIFICATION

The road classification definitions have been included here for ease in use of the Village Design Manual.

- a) Arterial Street - means a highway usually providing a continuous route for through traffic, with land access a secondary consideration.
- b) Collector Street - means a highway performing a dual function of land access and distribution of traffic between local and arterial streets.
- c) Industrial Street - means a highway in an area zoned for industrial uses, which is especially designed to carry truck traffic, and having the same function as a Collector Street.
- d) Local Street - means a highway providing land access with little or no provision for through traffic. Direct access is allowed to all abutting properties.
- e) Cul-de-sac - means a highway that provides no through traffic with only one point of intersection with another highway and which terminates in a vehicle turning area, referred to as the "terminus". Cul-de-sacs shall be no longer than 150 metres to the center of the bulb.
- f) Lane - means a highway not exceeding seven metres in width which provides a secondary means of land access.
- g) Walkway - means a pedestrian path which does not generally lie adjacent and parallel to a highway or other roadway.

205. ROAD CUT AND FILL SLOPES

Unless otherwise approved by the Village Engineer, cut and fill slopes shall conform to the following:

- 1 vertical to 3 horizontal for slopes up to 1 metre height;
- 1 vertical to 2 horizontal for slopes 1.0 to 2.0 metre height;
- 1 vertical to 0.25 horizontal for rock cuts.

The Village Engineer may request a geotechnical report be submitted for slopes over 2 metres in height which will substantiate the recommended design slope.

210. DESIGN SPEED

Roadways shall be designed to R.T.A.C. Geometric Design Standards unless otherwise specified. Design speeds for roads shall be:

Arterial	70 km/h
Collector	60 km/h
Local	50 km/h

215. CROSS SECTION

- a) All roads shall be designed with a minimum 2% to a maximum 4% crown. Under certain adverse topographical conditions, offset crowns may be permitted on collector and local roads. The location of the offset crown shall be approximately 2.5 metres from the high edge of pavement.
- b) Lanes shall be designed with an inverted 2% crown.

220. HORIZONTAL ALIGNMENT

- a) Table 1 provides the minimum required center line radius for the various roadway classifications:

TABLE 1

ROADWAY CLASSIFICATION	MINIMUM CENTERLINE HORIZONTAL RADIUS (metres)			
	NORMAL CROWN	SUPERELEVATION (M/M)		
		0.02	0.04	0.06
Arterial	250	225	200	180
Collector	120	110	100	----
Local	65	----	----	----

- b) Simple curves are required on all road classifications.
- c) Superelevation shall not exceed the maximums shown in Table 1.

225. SHOULDER RETURNS

Table 2 details required shoulder return radii for the various road classifications. When two intersecting roads have two different road classifications, the higher classification shall govern.

TABLE 2

ROAD CLASSIFICATION	SHOULDER RETURN RADII	MAXIMUM GRADE
ARTERIAL	9 m	8%
INDUSTRIAL	9 m	10%
COLLECTOR	8 m	8%
LOCAL	7 m	10% uphill 8% downhill 6% uphill 6% downhill
CUL-DE-SAC:		
Entrance	7 m	
Terminus	12 m	
LANES	-----	10%

230. VERTICAL ALIGNMENT

230.1 Road Grades

- a) Minimum road grades shall not be less than 0.5%.
- b) Maximum grades shall not exceed those shown in Table 2 unless it can be justified to the Village Engineer that short sections exceeding the maximums will improve intersection design.
- c) Curb return grades shall be minimum 1.0%.

230.2 Vertical Curves

Vertical curves are to be designed to provide safe stopping sight distances. Vertical curve lengths are calculated by the following equation:

$$L = KA$$

where L = length of vertical curve

K = a constant related to lines of geometry of a parabolic curve
 A = algebraic difference in grades in percent

Table 3 below specifies minimum K values to be used for vertical curve design:

TABLE 3
 MINIMUM K VALUES (in metres)

ROADWAY CLASSIFICATION	CREST CURVE		SAG CURVE
	MINIMUM	DESIRABLE	
ARTERIAL	15	25	15
COLLECTOR	10	15	8
LOCAL	8	10	6

In order to provide proper drainage, a maximum K value of 80 metres for crest curves, and 40 metres for sag curves shall not be exceeded.

235. INTERSECTION DESIGN

- a) Unless otherwise indicated, intersection design standards shall conform to the latest edition of R.T.A.C. Geometric Design Standards.
- b) Intersection grades shall not exceed 75% of the allowable maximum grade of the intersecting street.
- c) Minimum K values of vertical curves at intersections shall not exceed those shown in Table 4 below:

TABLE 4

INTERSECTING STREET	MINIMUM K VALUES (in metres)	
	CREST	SAG CURVE
Collector	7	6
Local	4	4

- d) Grades of major roads through intersections shall not exceed 75% of the maximum allowable grade for the following distances from the edge of the

intersecting road.

Arterial	60 metres
Collector	30 metres
Local	15 metres

- e) Intersection approach angles shall be as near as possible to 90 degrees, with a minimum permissible angle of 70 degrees and a maximum angle of 110 degrees.

240. ROAD STRUCTURE DESIGN REQUIREMENTS FOR URBAN AND RURAL ROADS

- a) The Village Engineer, in areas where poor soil conditions exist, may request the Developer to provide a road structure design by a Geotechnical Engineer.
- b) Table 5 outlines the minimum road structure when the applicant is not requested to submit a road structure design. For gravel surfaced roads, only the sub-base and base are required. For paved roads, all three layers are required.

TABLE 5

ROAD CLASSIFICATION	SUB-BASE THICKNESS	BASE THICKNESS	ASPHALT THICKNESS
Arterial	450 mm	75 mm	100 mm (1-50 mm lifts of 19 mm aggregate & 1-40 mm lift of 13 mm aggregate).
Collector	400 mm	75 mm	75 mm (2 lifts)
Local	300 mm	75 mm	50 mm
Cul-de-Sac	300 mm	75 mm	50 mm
Industrial	400 mm	75 mm	75 mm (2 lifts)
Lane	300 mm	75 mm	50 mm

- c) Pavement structure requirements shall be confirmed by the Developer's Engineer following completion of a geotechnical investigation.

245. EARTH WORKS COMPACTION

Embankments shall be compacted to at least 95% of standard maximum dry density when tested in accordance with the Standard Proctor method, ASTM Standard D698.

250. MATERIALS

250.1 The Village Engineer shall have the right to reject any material delivered to the site which has no prior approval. All sampling and testing shall be done in accordance with ASTM or CSA Standards.

250.2 Road Sub-Base

The material for the road sub-base course shall be 75 mm minus pit run gravel composed of inert durable materials, free from soft disintegratable particles.

250.3 When tested in accordance with ASTM Standards C-136 and C-117, the material shall meet the gradation requirements and shall be uniformly graded as follows:

<u>Sieve Size</u>	<u>Percent Passing (by weight)</u>
75 mm (3")	100%
25 mm (1")	50% - 85%
No. 4	30% - 60%
No. 200	0% - 8% (wet sieving conforming to ASTM C-117)

250.4 The road subbase material shall also meet the following criteria:

- Los Angeles Abrasion test undertaken in accordance with ASTM D-131 shall not exceed 50%;
- The liquid limit undertaken in accordance with ASTM D-423 shall not exceed 25;
- The plasticity index undertaken in accordance with ASTM D-424 shall not exceed 6;
- The amount passing the No. 4 sieve shall not exceed 30%.

250.5 Road Base for Paved Roads, and Road Surface for Gravel Roads

a) Granular base course material shall be uniformly graded 25 mm crushed gravel of which not less than 60% of the material retained on the No. 4 sieve is fractured rock. Base course material shall have the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
25.000 mm	100%
19.000 mm	85% - 100%
9.500 mm	60% - 85%
4.750 mm	40% - 70%
1.180 mm	20% - 50%
0.300 mm	10% - 30%

0.075 mm

5% - 15%

b) Granular base course material shall also meet the following criteria:

- Los Angeles Abrasion test undertaken in accordance with ASTM D-131 shall not exceed 50%;
- The liquid limit undertaken in accordance with ASTM D-423 shall not exceed 25;
- The plasticity index undertaken in accordance with ASTM D-424 shall not exceed 6;

250.6 Granular sub-base and base course materials shall be laid and compacted to 100% of maximum dry density (ASTM D-698 Method A).

250.7 Shoulders

The material for finishing road shoulders shall be as specified in clause 250.5. Shoulder material shall be watered and compacted to 100% of maximum dry density (ASTM D-698 Method A).

255. ASPHALTIC HOT-MIX CONCRETE

255.1 Asphalt Cement

Asphalt cement shall be 120 - 150 penetration grade conforming to ASTM Standard D946 for asphalt cement used in Pavement Construction. The asphalt cement shall be uniform in character, free of water and shall not foam when heated to 177 degrees celsius.

255.2 Aggregate

All aggregate particles shall be clean, tough, durable, moderately sharp and free from coatings of clay, silt, loam and other deleterious material. Combined aggregates shall be free of clay or silt balls or any other aggregations of fine material. All Aggregates shall meet the following testing requirements:

- Los Angeles Abrasion test undertaken in accordance with ASTM D-131 shall not exceed 50%;
- The liquid limit undertaken in accordance with ASTM D-423 shall not exceed 25;
- The plasticity index undertaken in accordance with ASTM D-424 shall not exceed 6;

a) Coarse Aggregate

Coarse aggregate shall be all material retained on a No. 4 sieve and shall conform to the soundness and abrasive requirements in ASTM Designation D692-54.

b) Fine Aggregate

Fine aggregate shall be all material passing the No. 4 and shall conform to ASTM Designation D1073-54.

c) Mineral Filler

The mineral filler shall conform to ASTM Designation D242 and shall have the following gradation:

No. 4 sieve	100% passing
No. 100 sieve	90% - 100% passing
No. 200 sieve	70% - 100% passing

d) Gradation

The mixing aggregates shall meet the following gradation limitations by wet sieve analysis:

Percent Passing (by weight)
Asphaltic Hot-Mix Maximum Aggregate Size

<u>Sieve Size</u>	<u>10mm</u>	<u>13mm</u>	<u>19mm</u>
19mm (3/4")			100%
12.5 mm (1/2")		100%	80% - 100%
9.5 mm (3/8")	100%	80% - 100%	70% - 90%
No. 4	85% - 100%	55% - 75%	50% - 70%
No. 8	80% - 95%	35% - 50%	35% - 50%
No. 30	55% - 80%	18% - 29%	18% - 29%
No. 50	30% - 60%	13% - 23%	12% - 23%
No. 100	10% - 35%	8% - 16%	8% - 16%
No. 200	4% - 14%	4% - 10%	4% - 10%

255.3 Asphalt Primer

Asphalt Primer shall be MC-0, or as specified by the Asphalt Institute.

260. ASPHALT MIX DESIGN

The mix design shall meet the following specifications:

<u>Characteristic</u>	<u>Requirement</u>
Asphalt cement viscosity grade	AC8

Asphalt cement content (by total wt. of mix)	4.5% - 7.0%
Compaction blows per end of specimen	75
Stability @ 68 degrees celsius	545 Kg
Flow	2 mm - 4.6 mm
% voids total mix	3 - 5
Mixing temperature	143 degrees celsius - 157 degrees celsius
Asphalt Cement temperature	135 degrees celsius - 149 degrees celsius
Aggregate temperature	141 degrees celsius - 163 degrees celsius

265. ASPHALTIC CONCRETE SURFACING

Asphaltic concrete shall not be placed prior to approval of the base coarse, tack coat or prime coat by the Village Engineer. The hot mix temperature shall be between 135 degrees celsius and 177 degrees celsius in the truck at the site.

270. COMPACTION OF THE MIX

Compaction of the asphalt shall be to at least 98% of the density obtained with Marshal specimens prepared from samples of the mix being used. Specimens shall be prepared in accordance with ASTM designation D-1559.

275. COLD-MIX ASPHALTIC CONCRETE

Cold-mix asphaltic concrete shall not be permitted, unless approved by the Village Engineer.

280. TESTING

The Developer, at no cost to the Village, shall provide from an independent laboratory, the following materials testing information:

- sieve analysis results on subbase, base and asphalt gravels;
- Proctor density curves on subgrade, subbase and base materials;
- one (1) set of successful field density results for every 500 square metres of roadway constructed;
- asphalt mix design and test results for the following:
 - asphalt content, gradation, density, marshal stability of flow on 1 test per 1000 tonne;
 - core samples tested for asphalt content, gradation, thickness, density, stability, flow, VMA, air voids. 1 core/500 square metres;
 - viscosity curves will be required on each load of asphalt cement hauled to the asphalt plant.

SECTION 3 - CURB AND GUTTER

300. GENERAL

- a) Curb, gutter and sidewalks may be required by the Village.
- b) If curb, gutter and sidewalks are required by the Approving Officer, then they shall be constructed in accordance with this standard and a piped storm drainage system will be provided.
- c) Wheel chair ramps shall be provided at intersections and where requested by the Village Engineer.

310. CURB TYPE

Non-mountable concrete curbs are required for all arterial and collector streets.
Mountable concrete curbs are required in all other areas.

320. CURB RETURN

Curb return radii shall conform to pavement return radii in Table 2, Section 2 - Road Design.

330. CONCRETE

Concrete shall conform to CSA-A23 and the mix design shall include the following:

- a) Minimum compressive strength - 25 MPa at 28 days.
- b) Maximum aggregate size - 19mm for hand formed and 9.5 for extruded.
- c) Slump - Maximum 80 mm, minimum 20 mm.
- d) Air entrainment - 5% to 7%.
- e) Other additions may be used only if prior approval is obtained from the Village Engineer.

340. BASE PREPARATION

- a) All topsoil, organic soils, frozen materials, roots or other deleterious materials shall be removed to a minimum depth of 0.3 metres below the bottom of the sidewalk and replaced with granular material. All fill material shall be compacted to 100% maximum dry density (ASTM D-698, Method A).

- b) Granular sub-base and base course materials shall conform to Road Base Specifications.
- c) On the prepared sub-grade, a minimum of 150 mm of 75 mm minus pit-run and 50 mm of crushed gravel shall be placed and compacted to a minimum of 0.3 metres beyond the edge of the curb or sidewalk.

350. CONSTRUCTION JOINTS

Construction joints shall be installed at sidewalk crossings, around manholes and catchbasins along the surface of existing structures where the sidewalk butts up to the surface and at 12 metre intervals. The material used shall be vituminous fibre, conforming to ASTM-D 545 and shall be installed throughout the entire depth of the sidewalk. The construction joint shall be exposed with a 6mm radius edger.

360. CONTRACTION JOINTS

Contraction joints shall be constructed every 1.8 metres by means of an approved marking tool which has a minimum width of 32 mm and a minimum depth of 25 mm. The edges of the tool shall be rounded off with a 6mm radius. Contraction joints shall be the full width of and perpendicular to the longitudinal axis of the sidewalk, curb and gutter, invert crossing or median section.

370. FINISHING

- a) When the concrete has partially set up the surface of the concrete shall be worked with wood and steel trowels. Under no circumstances shall water be sprinkled onto the surface of the concrete in order to provide a more workable surface.
- b) After steel trowelling the surface to a smooth, even finish the sidewalk shall be broomed transversely; curbs, gutters, invert crossings and medians shall be left with a smooth trowel finish. No mortar coat or water shall be used. After brooming, the edges shall be rounded with an edger, having a minimum width of 32 mm and a minimum depth of 13mm. Invert crossings shall be surface jointed after brooming as shown.

380. CURING AND PROTECTION

Freshly deposited concrete shall be protected from premature drying and extreme temperatures. It shall be maintained with minimal moisture loss at a relatively consistent temperature for a period of time necessary for hydration of the cement and proper curing of the concrete.

Curing and protection of concrete shall conform to Section 21 of CSA Standard CAN3-A23.1-M77.

390. PEDESTRIAN WALKWAYS AND FENCING

- a) Where pedestrian walkways are required for access to parks, school sites, commercial areas or connection to residential streets, the walkways shall be cleared to their full right-of-way width.
- b) All organic and frost susceptible materials shall be removed from the full right-of-way and the right-of-way graded to provide proper drainage and access to the connecting streets.
- c) A minimum of 100 mm of 19 mm minus crushed granular gravel and 50 mm of asphaltic concrete shall then be placed for the full length and width of the walkway right-of-way. All materials used in sub-grade construction and surfacing shall conform to the specifications as outlined for roadways.
- d) Walkways shall be fenced for their full length on both sides and the height may vary according to individual situations and the height requirements of the Village Zoning Bylaw. Fence material shall be 9 guage 50 mm mesh, galvanized chain link type with 50 mm diameter galvanized posts, in accordance to CSA standards.
- e) Walkway grades shall not be flatter than 1.0% or steeper than 15%. Stairs shall be constructed where walkway grades are steeper than 15%. Detailed drawings for stairways shall be submitted to the Village Engineer for approval.

SECTION 4 - WATER MAINS

400. GENERAL

These standards shall apply to all waterworks installations constructed by, for, or in the Village of Telkwa. All standards not specifically covered in these Standards shall be in accordance with the appropriate AWWA Standards or as directed by the Village Engineer.

405. DESIGN DEMANDS AND PRESSURES

- a) The distribution system shall be sized to supply the greater of the peak hourly demand or the maximum daily demand plus fire flow.
- b) The water system shall be designed for the following demands:
 - i. average day demand of 570 litres (125 gallons) per capita per day;
 - ii. maximum day demand of 1590 (350 gallons) per capita per day;
 - iii. peak hourly demand of 2730 litres (600 gallons) per capita per day;
- c) The water system shall be designed to meet the following pressures:
 - i. the maximum allowable static pressure in the watermains shall be 1035 kPa (150 psi). This shall be the static pressure measured with the reservoir full;
 - ii. the minimum allowable static pressure shall be 210 kPa (30 psi) measured or calculated at the main floor of the highest existing or proposed house. The reservoir water level shall be assumed to be at the mid-point for this calculation.
 - iii. where the maximum static pressure exceeds 590 kPa (85 psi) the developer shall provide pressure reducing valves on the watermains. Individual pressure reducing valves on each service may be accepted by the Village Engineer.

410. MINIMUM PIPE SIZE

Water supply mains in residential areas in all subdivisions shall be a minimum of 150 mm diameter, except in low density cul-de-sacs where a fire hydrant is not required and future waterline extension is not conceivable; the minimum size may be 100 mm diameter. In high density or commercial areas the minimum water main size shall be 200 mm diameter.

415. MATERIALS

All materials and equipment utilized shall conform to these Standards and to the latest edition of the pertinent AWWA Standard Specifications for materials and equipment. All material shall be new non-corrosive and of the best quality available. Alternative materials shall be covered by the latest AWWA specifications. All material must be approved by the Provincial Ministry of Health for use in public water supply systems.

415.1 Pipe

Pipe sizes 100 mm and larger shall be ductile iron (Ductile), or polyvinyl chloride (P.V.C.).

a) Ductile Iron Pipe

Ductile Iron pipe shall conform to AWWA Standard C151/A21.51-81 with particular requirements.

Class: The pipe wall thickness shall be designed for each application in accordance with AWWA C150/A21.50-81.

Pipe Joints: Pipe joints shall be a rubber gasket type conforming to AWWA C110/A21.10-82 such as Bell-tite, Tyton or approved equivalent.

Cathodic protection may be required at the discretion of the Village Engineer where soils information or previous experience suggests soils are corrosive to metallic materials.

b) Polyvinyl Chloride (P.V.C.)

Polyvinyl Chloride pipe shall conform to AWWA Standard C900-81 with the following particular requirements:

Class: All pipe shall be class 150 or higher.

415.2 Main Line Valves

Line valves 150 mm and larger shall be Terminal City or equivalent gate valves conforming to AWWA Standard C500-80. Valves shall be iron-body, bronze-mounted, solid wedge or double-disc gate, non-rising stem with flanged or hubbed ends to suit. Flanges shall have Class 125 standard drilling. Valve stems shall be fitted with a standard AWWA nut and shall turn clockwise to close.

All valves shall have the manufacturer's name and catalogue number moulded as an integral part of the valve body.

On distribution mains through the subdivision, valves shall be installed to isolate sections of main no greater than 200 m (650 feet) in length. The number of valves required at intersections shall be one less than the number of legs on the fitting.

415.3 Fittings

Fittings such as bends, tees, crosses, adaptors, end caps, etc., shall be flanged or hubbed to suit. fittings shall be cast iron fittings meeting AWWA Specification C110, ductile iron fittings meeting AWWA specification C153, or PVC fittings for use with Class 150 PVC pressure pipe conforming to AWWA Standard C900.

415.4 Fire Hydrants

All hydrants shall be Terminal City C71P hydrants or equivalent and shall be equipped with two 64 mm nominal I.D., conforming to the B.C. Standard hose thread and one 146 mm (5.75") O.D. pumper port with 4 threads per 25.4 mm (inch). Hydrants shall be painted yellow to conform to current Village colour standards for fire protection facilities. Colour must match exactly.

415.5 Valve Boxes

Valve boxes shall be telescopic Robar No. 37-72, Nelson or equivalent.

415.6 Service Connections

Service connection pipe up to and including 50 mm diameter shall be Type K soft copper tube conforming to ASTM specification B88 or Series 160 polybutylene tubing conforming to AWWA Specification C902. Services shall be continuous with no joints.

All fittings shall have compression type connections.

Corporation cocks shall be Mueller standard brass.

Curb Stops shall be stop and drain type Mueller brass or equivalent with an inverted key and adjustable service box.

Service saddles shall be of the double strap type with bronze body and stainless steel straps. Direct tapping of watermains is not allowed.

All bushings, reducers, unions and nipples shall be standard brass.

415.7 Coupling Clamps

Upon approval from the Village Engineer, joining of two plain end pipes may be made by use of Robar Series 306 stainless steel clamps or equivalent.

415.8 Air Release

Provisions for air release shall be provided at all critical high points of the water system. Should air release through fire hydrants and services not be sufficient or non-existent on the designed system, air and vacuum release valves shall be installed.

Air and vacuum release valves shall be installed in a reinforced concrete chamber, designed to withstand H₂O loading. the chamber shall be vented, insulated, have an access ladder and be drained to a rock pit.

415.9 Pressure Reducing Valves

Individual pressure reducing valves installed on house or building services shall be WATTS No. U5 or equal.

Mainline pressure reducing valve stations shall comprise:

- 2 pilot activated PRV's installed in parallel c/w strainers, isolating valves and pressure gauges with the smaller valve providing normal domestic flows, and the larger responding only to fire flows;
- the complete PRV assembly to be installed in a buried reinforced concrete chamber , manufactured to accommodate H₂O loading, providing minimum 2 metres head room, insulated, heated, drainage to a storm sewer or other approved location, aluminium access ladder, and lockable Bilco type access hatch.

420. PIPE BEDDING MATERIAL

- a) Pipe bedding shall be undertaken in strict accordance with the manufacturer's bedding requirements for the type of pipe utilized. Sand bedding, where required, shall be clean well graded sand with a maximum aggregate size of 6mm (1/4") with not more than 5% by weight passing the No. 200 sieve.
- b) Bedding material shall be provided in accordance with the standard drawings attached hereto.

425. SERVICE CONNECTIONS

- a) Service connections are defined as the installation from the connection at the main up to and including curb stop and service box marked "WATER".
- b) Service connections shall be installed in accordance with the Standard Drawings.
- c) The minimum depth of bury for services from finished ground elevation to the top of the pipe shall be 2.4 metres, provided that the Approving Officer at his sole

discretion may, upon receipt of such application supported by adequate technical evidence from the Developer, issue a Development Variance Permit for a 1.8 m bury.

- d) The size of service connections will be determined by the Village Engineer based on available pressure and estimated demand. The standard house service connection shall be 19 mm diameter unless the length of service line dictates a larger service line is required.

430. HORIZONTAL REACTION BLOCKS

Horizontal reaction blocks shall be placed between undisturbed soil and all fittings whose deflection is greater than 10 degrees. Reaction blocks for each type and size of fitting shall be sized to conform to the bearing areas specified on the standard details. Reaction block concrete shall not be placed over the joints between the fitting and the pipe.

435. VERTICAL REACTION BLOCKS

Vertical reaction blocks shall be placed above or below vertical fitting deflections of greater than 5 degrees (grade change of 9%).

The quantity of concrete required for each reaction block is calculated from the following formula:

$$\text{concrete required in cubic metres} = \frac{2 \times 1000 \text{ HA Sin } 1/2 \text{ D} \times 1.5}{2405}$$

where:

H = Calculated head at the fitting in metres plus 70 metres for surge allowance;

A = Cross-sectional area of the main in square metres;

D = Deflection angle of the fitting.

440. PIPE ANCHORS

- a) Pipe anchors shall be placed around water mains, laid at grades of 20% and steeper, and shall be constructed in accordance with the standard details.
- b) All pipe anchors shall be constructed with 20 MPa concrete and shall project a minimum of 200 mm into undisturbed soil at the bottom and sides of the trenches.

445. EROSION PROTECTION

Trench backfill or steep side slopes shall be placed in a manner to eliminate erosion due

to surface runoff. Design drawings shall identify the means to be used for erosion protection.

450. WATERMAIN DISINFECTION AND FLUSHING

- a) Providing the inside of the pipe installed is clean, the water system may be chlorinated in accordance with the AWWA Standard C601-81, Section 7, hypochlorite tablets (with 3 - 3/4 grams of available chlorine per tablet). The number of tablets required for various sizes of pipe shall conform to the following table:

Length of Pipe Section in Metres	Diameter of Pipe (mm)					
	50	100	150	200	250	300
4.0 m	1	1	2	2	3	5
5.5 m	1	1	2	3	5	6
6.0 m	1	1	2	3	5	7
9.0 m	1	2	3	5	7	10
12.0 m	1	2	4	5	9	14

- b) The tablets shall be attached to the top of the main by using a non-toxic waterproof glue.
- c) If in the Village Engineer's opinion the mains were constructed without due cleanliness or should the mains have to be re-chlorinated because of ineffective chlorination with tablets, chlorination shall be undertaken by the continuous feed method (AWWA Standard 601-81) until satisfactory tests have been proved.
- d) After 24 hour chlorination retention time, all mains, services and appurtenances shall be completely flushed of sand, silt, dirt, chlorinated water and other foreign material. The Developer shall insure that flushed water does not create a hazard or nuisance to the public, nor to public and private property. Where practical watermains shall be flushed into storm sewers or where no storm sewers or reasonable drainage areas exist, the Developer shall flush mains into a tanker truck and dispose of it away from the site. The Developer shall take full responsibility for damage to persons or property caused by his flushing operations.
- e) After the main has been satisfactorily flushed the Developer shall collect water samples from sections of the system as prescribed by the local Health Inspector.

the samples shall be submitted to the ministry of Health for testing with test results reported directly to the Village Engineer by the Ministry of Health.

455. WATERMAIN TESTING

- a) All water mains shall be pressure tested with water to AWWA Standards at a minimum of 1030 KPa or 1.5 times the working pressure of the main, whichever is greater, for a minimum duration of 1 hour. The system shall be tested in sections which shall be defined as the length of watermain between two consecutive mainline valves including services, hydrants, fittings, and all other appurtenances. the working pressure of the test section shall be the normal working pressure of the line at the lowest elevation within the section. Leakage pressure tests may be conducted on more than one section at a time; however, the allowable leakage for the total test length may not exceed the allowable leakage of the shortest test section.
- b) The Village Engineer shall calculate the test pressure and shall determine the leakage rate.
- c) The allowable leakage shall be determined by the following formula:

$$L = \frac{ND \times P^{0.5}}{130,400}$$

where: L = allowable leakage in litres per hour
N = number of joints in test section
D = inside diameter of pipe in millimetres
P = test pressure in kilopascals

Examples of allowable leakage in litres per hour per 50 couplings:

<u>Pipe Diameter in mm</u>	<u>Test Pressure = 1030 KPa</u>
100	1.23
150	1.85
200	2.46
250	3.08
300	3.69
350	4.31
400	4.92
450	5.54
500	6.15
600	7.38

- d) All leaks shall be repaired, and all air pockets removed from the watermain test section; the test shall continue until the leakage is less than the allowable leakage

calculated by the Village Engineer.

460. MAIN OFFSETS FROM CENTER LINE AND DEPTH OF BURY

- a) Water distribution mains shall be offset 5.0 metres from the property line.
- b) The minimum depth of bury from finished ground elevation to the top of the pipe shall be 1.8 metres.
- c) The minimum vertical clearance between a watermain and any crossing sanitary sewer where the watermain is over the sewermain, shall be 450 mm unless the watermain is adequately encased with concrete encasement. The minimum vertical clearance between a watermain and any crossing sanitary sewer where the watermain is under the sewermain, shall be 1.0 metre unless the watermain is adequately encased with concrete encasement. The minimum vertical clearance to piping other than sanitary sewer shall be 300 mm unless the watermain is adequately encased in concrete.

The minimum horizontal clearance between a watermain and any parallel sewer shall be 3.0 m unless the watermain is concrete encased or installed in a carrier pipe.

SECTION 5 - DRAINAGE

500. GENERAL

These standards shall apply to and govern drainage systems installed in the Village.

510. DESIGN STANDARDS FOR STORM DRAINAGE

510.1 Design Flow

- a) The design flow at any point in a storm water collection system shall be calculated by the Rational Formula:

$$Q = \frac{C \times I \times A}{360}$$

where: Q = Design Flow in cubic metres/second

C = Run-off Coefficient

I = Rainfall Intensity in millimetres/hour

A = Area drained in hectares (ha)

- b) Drainage systems shall be designed for rainfall intensities which are expected to return on the average once every thirty years (return period - 30 years). The rainfall intensity shall be derived from the intensity curves included in the Standard Drawings.

510.2 Time of Concentration

The time of concentration shall be the estimated time required for rain falling on the farthest point in the drainage area to reach a point in the drainage system under design. the minimum inlet time for rain to reach drainage system shall be assumed to be 10 minutes in residential subdivisions and commercial areas.

510.3 Run-Off Coefficient

- a) Run-off coefficients for drainage system design shall be assumed to be not less than the values given in the following tabulation:

<u>Description of Area</u>	<u>Run-Off Coefficient</u>
Commercial - downtown	0.80
Residential - single family	0.35
Residential - multi-family	0.60
Apartment Areas	0.70

Parks and Playgrounds	0.25
Unimproved Areas including hillsides	0.30

- b) The derivation of run-off coefficients to be used for drainage system design shall include consideration of relative areas of roofs and pavement.
- c) Ground slope and soil permeability shall also be considered, however, the run-off coefficients shall in no case be less than the values outlined in these standards.

510.4 Overland Flow

Where a piped drainage system is provided, in no case shall the overland flow distance for stormwater within the subdivision exceed 150 metres. All ditches shall be constructed either on roadways or on land whose title is conveyed to the Village. Ditches carrying upstream drainage through proposed lots will not be permitted.

510.5 Outfalls

Outfalls shall be located and designed such that the outfalled storm water will not cause or present the potential of erosion of Crown, private, or municipal property. Energy dissipation measures shall be implemented if deemed necessary by the Village Engineer

510.6 Culverts

Minimum 300 mm diameter 1.6 mm gauge CMP culverts conforming to CSP1 Specification No. 501 may be used for driveway and roadway crossings. Cement/sand bag end structures in accordance with the standard detail drawings shall be installed on the ends of each culvert.

510.7 Downstream Effects Improvements

The developer shall be responsible for improving the existing drainage system downstream of his development to handle any increased flow from his development.

510.8 Ditches

Ditches shall be in accordance with the standard drawings and shall be designed to prevent erosion.

520. CULVERTS

- a) Culverts shall be installed at the grades and alignments shown on the approved drawings. Culvert pipe shall be placed on undisturbed ground with additional excavation depth for sand bedding where existing materials are not suitable for pipe bedding. Pit run gravel shall be used for fill in areas where excavation is

required to encounter stable undisturbed soils. Culverts shall be bedded with sand bedding from 150 mm below the pipe to 300 mm above the pipe compacted to 95% maximum dry density (ASTM D-698, Method A).

- b) A flexible joint shall be provided in the culvert pipe at a point not more than 1 metre from the face of the inlet headwall.

SECTION 6 - SANITARY SEWER

600. GENERAL

Sanitary sewer systems shall be designed and installed in accordance with the requirements of the Ministry of Environment, Waste Management Branch, "Guidelines for Assessing Sewage Collection Facilities", and the requirements noted in this Schedule.

605. DEPTH OF BURY

The minimum depth of bury from finished ground elevation to the top of pipe for mains shall be 2.5 metres.

610. MINIMUM VELOCITY AND GRADE

Minimum velocity for sanitary sewer mains flowing full or half full shall be 0.75 m/s. Minimum grades for various sizes of pipe are:

100 mm	1.25%	375 mm	0.15%
150 mm	0.60%	400 mm	0.14%
200 mm	0.40%	450 mm	0.12%
250 mm	0.28%	525 mm	0.10%
300 mm	0.22%	600 mm	0.08%

615. DESIGN STANDARDS FOR SANITARY SEWER

615.1 Design Flow

- a) The design flow for sanitary sewer in the Village shall be calculated on the basis of Section 610 above and the following criteria:

Average Daily Flow	365 litres/capita/day
Infiltration Allowance	5620 litres/hectare/day

- b) The ratio of Peak Flow divided by the average daily flow shall be known as the Peak Factor. The Peak Factor shall be calculated by using the Harmon Formula as follows:

$$\text{Peak Factor} = 1 + \frac{14}{4 + P^{0.5}}$$

Where P is the service population in thousands.

Design populations used in calculating average daily flows shall be computed in

accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

615.2 Pipe Sizes

- a) Minimum pipe diameters shall be:

Mains - 200 mm
Service Connections - 100 mm
- b) Where sanitary sewer main extension in low density residential areas is not conceivable, the final 300 metres of main may be 150 mm diameter.
- c) The pipes shall be designed using the Manning Formula with roughness coefficient $n = 0.13$, to flow full (or less than full) at the design flow with a velocity not less than 0.75 metres per second.

Mannings' Formula to determine capacity of gravity sanitary sewer mains:

$$Q = \frac{A R^{0.667} S^{0.5}}{N}$$

Where: Q = Design Flow in m^3/sec

A = Cross Sectional Area in m^2

R = Hydraulic Radius in m

S = Slope of hydraulic grade line in m/m

N = Roughness coefficient

(0.013 for A.C or Concrete Pipe

(0.011 for P.V.C. Pipe

615.3 Depth of Mains

Mains shall be designed to connect all possible basements on the assumption that the service pipe leaves the building at the closest point to the sewer at a pipe crown elevation 0.45 metres below the basement floor level and runs at a slope of not less than 2.0% to connect to the crown of the sanitary sewer main.

The depth of the sewer must be sufficient to provide 'gravity flow' service connections to both sides of the roadway and must allow for future extension(s) to properly service all of the upstream tributary lands for ultimate development.

615.4 Sanitary Sewer Manholes

- a) Manholes shall be installed at:

- all changes in grade

- all changes in direction
 - all changes in pipe sizes
 - all intersecting sewers
 - all terminal sections
 - downstream end of curvilinear sewers
- b) Manholes shall be placed where future extensions are anticipated and shall be spaced no greater than 150 m apart.
- c) Pipe intersections in manholes shall utilize smooth hand formed concrete channels to maintain uniform flows.
- d) Standard manholes shall be 1050 mm inside diameter.
- e) The maximum drop between pipe inverts shall be 200 mm. Where drops greater than 200 mm occur, exterior drop structures shall be installed.

The invert of the downstream pipe shall not be higher than that of the upstream pipe. However, both pipes may be placed at the same elevation.

- f) Manholes deeper than 4.25 m shall be provided with safety platforms in accordance with the Worker's Compensation Board requirements.

615.5 Anchoring

- a) Sanitary sewer mains installed at grades steeper than 20% shall be anchored in accordance with the standard detail drawings.
- b) 20 MPa Concrete shall be used for anchor construction.

620. MAIN OFFSETS FROM CENTER LINE

Sanitary sewer mains shall be installed on the opposite side of the road from the watermain at an offset distance specified on standard drawing R-8 for each road classification.

625. SANITARY SEWER SERVICE CONNECTIONS

In addition to the municipal requirements, service connections shall be subject to the requirements of the BC and National Plumbing Code.

- a) 100 mm diameter sewer services (or larger if required), shall be installed to the property line in accordance with the Standard Drawings. The service shall be installed, wherever possible, in a common trench with the water service. The sewer service shall be offset 0.5 metres to the left of the water service when facing

the lot and be located at the center of the lot unless topographical constraints prohibit. Deviation from the required location for the sewer service may be permitted in instances where topographic features dictate a more desirable location of the service connection.

- b) Service connections shall be made with an approved branch wye or saddle and be installed in a straight line and at uniform grade from the terminus at property line to the 45E long radius bend at the main.
- c) The minimum grade of 100 mm diameter service connection from the main to the property line shall be 2.0%. Where this grade cannot be met, a 150 mm diameter service connection at a minimum grade of 1.0% may be installed.
- d) The terminus of service connections shall be not more than one 300 mm short of the property line. The ends of all service connections shall be sealed with watertight plugs or caps and marked with 50 mm x 100 mm stakes placed vertically with one end in the bottom of the trench and in contact with the watertight plug or cap and the other end protruding at least 0.6 meters above ground level. The depth of service pipe invert below the top of the marker stake shall be marked on the stake.
- e) When the sewer main is 3.6 metres or more in depth, service risers may be installed at the main when service depth is not critical.

630. MATERIALS

630.1 The following types of pipe will be acceptable for sanitary sewer mains and services:

i. Concrete Pipe

Concrete storm sewer pipe shall be Class III or better conforming to ASTM Standard C786 for Reinforced Concrete Culvert. Rubber o-ring gaskets for concrete sewer pipe shall conform to ASTM C-361 and ASTM C-443.

ii. Polyvinyl Chloride (PVC) Pipe

For 150 mm to 300 mm sizes, the pipe and fittings shall conform to ASTM D3034-73, and shall have a minimum SDR of 35. For diameters greater than 300 mm, Perma-Loc 70 ribbed gravity sewer pipe conforming to ASTM F794-83. 100 mm and 150 mm sanitary sewer services shall have a minimum SDR of 28.

630.2 Precast Manhole Sections

i. Precast concrete manhole sections shall be 1050 mm inside diameter with 115 mm wall thickness, reinforced concrete pipe of at least Class II in accordance with ASTM Standard C76 with tongue and groove joints. Manhole sections shall have 19mm

galvanized steel steps cast in the concrete as shown on the drawings.

ii. Joints shall be made water tight by grouting or the use of water proofing agents.

iii. Cover slabs for manholes shall be reinforced to withstand H20 highway loading conditions.

630.3 Cast Iron Manhole Frames and Covers

Covers and frames shall be cast iron of an approved pattern to withstand H20 loading. The clear opening of the frame shall be 500 cm in diameter. The cover shall have a weight of 66 Kg. the frame shall be of the round base pattern having a weight of 84 Kg. Bearing faces of the cover to frame shall be machined for a non-rocking fit. Covers shall have 2 only 22 mm diameter lifting holes with bolt plug assembly as shown on the drawings. Frames shall have 3 only 22 mm diameter levelling holes. Covers and frames shall be Dobney Foundry Pattern C20, or approved equal. The working "SANITARY SEWER" shall be embossed on each cover.

630.4 Concrete

Poured in place concrete shall have 28 day strength of 20 MPa.

635. INFILTRATION AIR AND EXFILTRATION TESTS

635.1 Infiltration Test

Where the surface level of existing groundwater in the backfilled trench is one metre or more above the top of the pipe throughout the entire test section, an infiltration test shall be used to determine leakage into the pipe.

Copies of the test results shall be submitted to the Village Engineer on the Village's Standard test forms.

635.2 Air Test

Where the groundwater surface level is less than one metre above the top of the pipe at the lowest point in the test section, or where groundwater at the time of testing is not apparent, a low pressure air test shall be carried out. Air pressure tests shall be the maximum time allowed for the pressure within a sewermain section to drop from 20.7 kPa to 17.2 kPa. The maximum time-air pressure loss for various diameters of pipe are as follows:

<u>Pipe Diameter</u>	<u>Maximum Time for Air Pressure to Drop from 20.7 kPa to 17.2 kPa</u>
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100 mm	2 minutes, 32 seconds
150 mm	3 minutes, 50 seconds
200 mm	5 minutes, 6 seconds
250 mm	6 minutes, 22 seconds
300 mm	7 minutes, 39 seconds
350 mm	8 minutes, 56 seconds

Copies of the test results shall be submitted to the Village Engineer on the Village's Standard test forms.

635.3 Exfiltration Test

Where the groundwater level is below the pipe invert throughout the test section, an exfiltration test shall be used. The test section shall be sealed at its lower extremity by means of a watertight plug. the test section shall be filled with water such that a minimum hydrostatic head of 600 mm is placed on the pipe at its upper extremity. the head of water on the pipe shall be taken as the distance from the top of the pipe to water surface at the point of measurement. The test pressure shall be maintained above the 600 mm minimum head for a period of not less than one hour.

The rate of exfiltration shall be calculated from the amount of water which must be added to maintain the original water level at the upper end.

The maximum allowable infiltration/exfiltration rate shall be 9.3 litres/mm of pipe diameter/24 hours/kilometre of sewermain. Rates for various pipe sizes are as follows:

<u>Pipe Diameter</u>	<u>Maximum Allowable Infiltration/Exfiltration Rate in Litres Per Hour Per Meter of Main</u>
100 mm	.0387
150 mm	.0581
200 mm	.0775
250 mm	.0968
300 mm	.1162
350 mm	.1356

Copies of the test results shall be submitted to the Village Engineer on the Village's Standard test forms.

635.4 Manholes shall be tested with water to prove they are completely water tight.

635.5 If leakage is detected, the leak or leaks shall be found and repaired by approved measures. The testing shall be repeated on these sections until leakage is within acceptable limits.

640. CLEANING AND FLUSHING

All sewer mains, manholes, and services installed shall be flushed of all deposits of silt, sand, gravel, debris and other objectionable materials. All sewer mains shall be flushed clean and a suitably sized plug passed through each test section to ensure no obstructions exist. The Village shall witness all flushing operations. Mains other than those laid on curves shall be straight, and have clear visibility between manholes.

645. VIDEO INSPECTIONS

The Village Engineer may require a video inspection report be submitted where conventional testing indicates the section may not conform to specifications or for sections which can not be adequately tested by conventional means.

650. FORCEMAINS

650.1 Pipe

Pipe sizes 100 mm and larger shall be polyvinyl chloride (PVC) or Ductile Iron (D.I.).

a) Polyvinyl Chloride (P.V.C.)

Polyvinyl Chloride class and series pipe shall conform to AWWA C900 or ASTM D2241.

b) Ductile Iron Pipe (D.I.)

Ductile Iron Pipe shall conform to AWWA C151.

Cathodic protection may be required at the discretion of the District Engineer where soils information or previous experience suggests soils are corrosive to metallic materials.

650.2 Fittings

Cast iron fittings shall conform to watermain specifications.

650.3 Pipe Bedding Material

Pipe bedding material and installation shall be in accordance with the watermain specification.

650.4 Reaction Blocks

Reaction blocks shall be placed in accordance with the watermain specifications.

650.5 Pipe Anchors

Pipe anchors shall be placed in accordance with the watermain specifications.

650.6 Testing

Forcemains shall be tested to AWWA standard at 1.5 times the working pressure for a duration of 1 hour. The allowable leakage shall be calculated by the AWWA formula noted in the watermain specifications.

Copies of the test results shall be submitted to the Village Engineer on the Village's Standard test forms.

650.7 Pumping Stations

If at all possible, the use of sanitary pump stations is to be discouraged. Any proposed use of pump stations must receive prior approval from the Municipality. any sanitary pump station must be located within a right-of-way outside of the road dedication.

The size, capacity, and type of these stations will be dependent upon the development and catchment area involved. All pumping station and force main design and installation shall be as accepted for the specific installation.

SECTION 7 - POWER AND STREET LIGHTING

700. GENERAL

- a) The developer shall be responsible for meeting all the requirements of the utility companies and government agencies concerned with the installation of electric power services. Design drawings prepared by the utility companies shall be submitted together with all other required plans for the subdivision.
- b) Street lighting shall be provided on all streets within the subdivision, perimeter roads, and pedestrian pathways through parks or in instances where total separation between vehicular and pedestrian traffic has been provided. Installation of street lights on overhead electrical power poles will be permitted.

710. LIAISON WITH POWER COMPANIES

Where overhead power is to be provided, it is the responsibility of the developer to conduct liaison with the Power Authority prior to the submission of the subdivision drawings to the Village Engineer to ensure that pole locations will not conflict with other utilities. Further, the developer shall provide written evidence from the Power Authority that complete street lighting services can be provided from power poles. Written confirmation of serviceability from power poles shall be submitted complete with design drawings for the subdivision roads and services.

715. RESIDENTIAL STREET LIGHT LUMINARIES

Residential luminaries shall be 100 watt, 120/240 volt H.P.S. Powerlite c/w Sylvania LU100/D lamp LXBC22275-100 complete with photoelectric controller.

720. ARTERIAL ROAD STREET LUMINARIES

Arterial and commercial street luminaries shall be 150 watt 120/240 volt H.P.S. Powerlite LXBC2227S-150 c/w Sylvania LU150/55D lamp, complete with photoelectric controller.

725. RECOMMENDED AVERAGE HORIZONTAL ILLUMINATION (from IES Roadway Lighting Practice)

AREA CLASSIFICATION

Roadway and Walkway Classification	Commercial		Residential	
	Foot Candle	Lux	Foot Candle	Lux
Arterial	2.0	22	1.0	11
Collector	1.2	13	0.6	6
Local	0.9	10	0.4	4
Lanes	0.6	6	0.4	4
Pedestrian Walkways/ Sidewalks	0.9	10	0.2	2
Pedestrian Ways	---	---	0.5	5

The levels recommended represent average illumination on the roadway, when the light source is at its lowest output and when the luminary is in its dirtiest condition.

Recommended Uniformity Ratio

3.1 Average to minimum (lowest footcandle value at any point on the roadway) except:

6.1 Average to minimum is acceptable for residential areas.

SECTION 8 - STANDARD DETAIL DRAWINGS

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW NO. 380, 1996

SCHEDULE "G"

GENERAL SERVICE INSTALLATION REQUIREMENTS

1. DUST CONTROL

During construction of works and services within the subdivision, the Applicant shall be responsible for providing for and maintaining dust control at all times wherever:

- a) the operation of any equipment causes dust that becomes a nuisance to property owners and residents in the area;
- b) bare soil conditions are created in performing work.

2. CLEAN UP

- a) During construction of works and services within the subdivision, the Applicant shall be responsible for ensuring that the construction area shall be maintained free of accumulation of excess of waste material and debris.
- b) The disposal of waste materials and rubbish by burning or burial on the site will not be permitted.
- c) During and after construction of works and services, the Applicant shall be responsible for ensuring that all access streets into the subdivision are maintained free of accumulation of excess waste material and debris. The Village reserves the right to carry out the maintenance of such access streets and charge the cost of such work to the Applicant, if the Applicant fails to restore the street(s) to normal levels within a week of being notified in writing by the Village.

VILLAGE OF TELKWA SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW NO. 380, 1996

SCHEDULE "H"

PERFORMANCE AGREEMENT

Schedule "H" consists of a form for an agreement between the Village of Telkwa and the owner of the land. The agreement is to be used where the owner has requested approval of the subdivision plan before complete construction and installation of the works required in the Subdivision and Development Servicing Bylaw and is agreeable to entering into a bonding agreement pursuant to Section 991 of the Municipal Act.

Under Section 3 of the Performance Agreement, the security to be provided to the Village by the owner shall be in the amount of 100% of the total construction value of works required under this Bylaw as determined by the Professional Engineer representing the owner and approved by the Village Engineer. The construction cost estimate shall be submitted to the Village Engineer prior to final subdivision approval being granted by the Village.

The Performance Agreement will also include as attachments the following:

Attachment 1 - Plan of Subdivision and Development prepared by the owner and approved by the Approving Officer.

Attachment 2 - Letter of Credit.

PERFORMANCE AGREEMENT

**FOR THE SUBDIVISION AND DEVELOPMENT OF LAND
IN THE VILLAGE OF TELKWA**

THIS AGREEMENT MADE this _____ day of _____, _____.

BETWEEN:

THE CORPORATION OF THE VILLAGE OF TELKWA, a Municipality duly incorporated under the laws of the Province of British Columbia, P.O. Box 220, in the Village of Telkwa, in the Province of British Columbia

(hereinafter called the "Village")

OF THE FIRST PART

AND:

(hereinafter called the "Owner")

OF THE SECOND PART

WHEREAS the Owner desires to subdivide certain lands within the Village and, more particularly known and described as:

(hereinafter called "the Lands")

AND WHEREAS the Owner is required to construct certain highways and other works and services within the Lands and to subdivide the Lands according to a plan of subdivision (hereinafter called the "Development"), a copy of which is hereunto annexed as Attachment 1 of this Agreement;

AND WHEREAS the Owner has requested approval of the Development prior to the construction and installation of the required works and services and is agreeable to entering into

this bonding agreement pursuant to Section 991 of the Municipal Act and to deposit the Bond herein specified;

NOW THIS AGREEMENT WITNESSETH that in consideration of the premises and in consideration of the Agreement by the Village to permit the Development, and in consideration of the approval of the subdivision plan prior to completion of the construction of the works, the Village and the Owner herein covenant and agree as follows:

1. In this agreement unless the context otherwise requires:
"**Complete** or **Completion**" or any variation of these words when used with respect to the Development shall mean completion to the satisfaction of the Village Engineer when so certified by him in writing.

"**Contract**" means this Agreement;

"**Development**" means the work and services to be performed and constructed by the Owner as required by the Subdivision Servicing and Development Bylaw of the Village.

2. The Owner shall complete the Development herein specified to the satisfaction of the Village Engineer by the _____ day of _____, _____.
3. As security for the due and proper performance of all of the covenants and agreements in this Contract contained and the Development contemplated, the Owner has deposited with the Village:
 - a) Cash or a certified cheque in the amount of \$_____ as a Bond within the meaning of Section 991, subsection (a) of the Municipal Act (hereinafter called the "Bond") , OR
 - b) An irrevocable Letter of Credit in the form attached as Attachment 2 in this Agreement, a copy of which is attached hereto, (hereinafter called the "Bond") to be valid for a period of twelve (12) months from the date hereof, PROVIDED HOWEVER, that the Village shall be at liberty to make demand on the said Letter of Credit at any time after the date hereof with the Owner being entitled to renew this Agreement as hereinafter provided if such Letter of Credit shall not have been demanded upon in the manner hereinafter provided and provided also that the amount of such Bond may be reduced at any time with approval of the Village in writing over the hand of the Approving Officer of the Village. Application for renewal of this Agreement shall be made in writing by the owner a minimum of five (5) weeks in advance of expiry of the existing Agreement. The period of such renewal shall be as agreed between the Owner and the Approving Officer, but shall not exceed twelve (12) months. Renewal of the Agreement is contingent upon the extension of the irrevocable Letter of Credit for the period of the renewal of the Agreement.

NOTE: Clause (a) or (b) should be deleted if not applicable.

4. The Owner agrees that if the Development is not completed pursuant to Paragraph 2 hereof, the Village may complete it, in which event the Owner shall forfeit the amount secured by the Bond to cover the cost of such completion, and the Village shall return to the Owner such balance of the Bond as shall not be required for completion, less any administration fees or costs required. If there is insufficient money on deposit with the Village by reason of the Bond, then the Owner will pay such deficiency to the Village immediately upon receipt of the Village's account for completion. It is understood that the Village may do such work either by itself or by contractors employed by the Village. If the Development is completed as herein provided, then the Bond shall be returned to the Owner.
5. It is understood and agreed that the intent of this Agreement is that the Owner shall complete the development, and grant all necessary easements as shown in the plans and specifications attached and as approved by the Village Engineer on the _____ day of _____, _____. Construction procedures, including ensuring that all works and services are fully operative and conform to Village standards, as well as certification of construction completion, shall be in accordance with the provisions of the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996, Schedule "F", Section 1 - General Requirements.
6. The Owner covenants and agrees to comply with the provisions of all Municipal Bylaws throughout the construction of the Development. In the event that any material or debris should be left upon any road after the construction of the Development, the Owner covenants and agrees that the Village may forthwith remove such material or debris at the expense of the Owner, the cost of such removal to be determined by the Approving Officer. In the event that any invoice of the Village, for the removal of such material or debris, shall remain unpaid after thirty (30) days of receipt of the same by the Owner, the Village is authorized to deduct the amount of such invoice from the Bond referred to in paragraph 3 hereof.
7. The Owner shall, at all times in connection with the Development, keep and employ a competent general superintendent with the authority to act on behalf of the Owner and capable of speaking, reading and writing the English language and any explanations, orders, instructions, directions and requests given by the Village to such superintendent shall be held to have been given to the Owner.
8. The Owner covenants and agrees to provide a Maintenance Bond to the Village as required in the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996, Schedule "F", Section 1 - General Requirement.
9. The Owner shall submit to the Village final as-built drawings as required in the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996, Schedule "F", Section 1 - General Requirements.

10. With respect to property taxes on the property herein described:
 - a) The Owner agrees to pay all arrears of taxes outstanding against the property herein described before the formal approval of any subdivision plans.
 - b) The Owner further undertakes to pay all current taxes levied or to be levied on the Lands on the basis and in accordance with the assessment and collector's roll entries.
11. The Owner covenants to save harmless and effectually indemnify the Village against:
 - a) All actions and proceedings costs, damages, expenses, claims and demands whatsoever and by whomever brought by reason of the Development.
 - b) All expenses and costs which may be incurred by reason of this Agreement resulting in damage to any property owned in whole or in part by the Village or which the Village, by duty or custom, is obliged directly or indirectly, in any way or to any degree, to construct, repair or maintain.
 - c) All expenses and costs which may be incurred by reason of liens or non-payment of labour or materials, Workers' Compensation assessment, unemployment insurance, Federal or Provincial Tax.
12. The Village hereby covenants and agrees with the Owner to permit the Owner to perform all the said works herein upon the terms and conditions herein contained.
13. The Village covenants and agrees that upon satisfactory completion by the Owner of all the covenants and conditions of this Agreement, to provide the Owner with a Final Acceptance Certificate in accordance with the provisions of the Village of Telkwa Subdivision and Development Servicing Bylaw No. 380, 1996, Schedule "F", Section 1 - General Requirements.