

**TOWN OF COALHURST
ENGINEERING AND
DEVELOPMENT STANDARDS
2016 EDITION**



Prepared for:
THE TOWN OF COALHURST

Prepared by:
Stantec Consulting Ltd.

November 7, 2016

Sign-off Sheet

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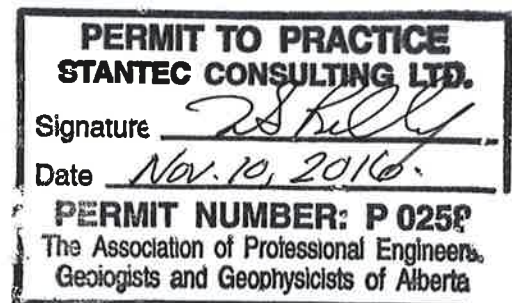
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1.0 GENERAL

1.1 PURPOSE

The purpose of this document is to aid in the standardization of the design and construction of municipal services for residential, commercial, and industrial developments in the Town of Coalhurst (Referred as "Town" hereafter).

This document is intended as a guide for developers, builders, and the public in the development process for subdivision, developments by severance and for individual site developments. The intent of standards is not to simply dictate what would be a desirable design but to provide the design basis, which can be used to evaluate the cost effective or innovative designs considering environmental impacts.

These Standards and Procedures apply for the preparation and submission of engineering drawings for municipal services in both rural and urban residential, commercial, and industrial developments and shall include:

- Water distribution systems and lot service connections;
- Sanitary sewage systems and lot service connections;
- Storm collection systems, lot grading and lot service connections;
- Facilities including storm water management facilities;
- Roadways, sidewalks, curb and gutter and lane improvements;
- Shallow (franchised) utilities (i.e. gas, power, lighting, telephone, and cable television);
- Park and Open Spaces.

1.2 DESIGN PRINCIPLES

The intent of providing overall design principle is to ensure that all the municipal services provided in lands being developed meet minimum acceptable standards. Also, these standards establish the benchmark for the municipal services which can further be efficiently operated and maintained by the Town for the end users of new development. These design principles were established keeping in view of the following aspects:

- 1) **Safety:** Public safety is the highest priority. Designers must consider protection of health and property as a high priority. This should include not only the town's citizens but also the town staff required to operate and maintain the facilities.

- 2) **Functionality:** The design must be functional, reliable and provides a certain level of service as set forth by the Town.
- 3) **Environmental Consideration:** The designers should always acknowledge the regional environmental conditions and should include energy conservation in design.
- 4) **Life Cycle Costs:** The design should consider the cost, ease and frequency of maintenance and then following up with the quality construction are the main factors needed to achieve reasonable life cycle costs.

1.3 REFERENCE STANDARDS

This document and the standards within are to be used in conjunction with good engineering practice and the latest edition of the following standards, regulations, design manuals and guidelines of:

- Transportation Association of Canada (TAC) Standards and Guidelines;
- Alberta Transportation and Utilities (AT&U)
- Alberta Environmental Protection Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems
- Environmental Reference Manual for Review of Subdivisions in Alberta
- Environmental Protection and Enhancement Act and Water Act
- Safety Codes Act of Alberta
- "Alberta Private Sewage Treatment and Disposal Regulations", by Alberta Labour.

Any proposed development will be subject to the requirements as set forth by the planning and development and should follow the Town of Coalhurst Land Use Bylaw.

1.4 APPROVALS

Depending on the location and nature of the development, the Proponent may be required to obtain approvals from various other regulatory agencies in addition to or prior to obtaining approval from the Municipality.

It is the responsibility of the Proponent to provide the Municipality with suitable written documentation of approval from the regulatory agencies.

1.5 ENGINEERING DESIGN

The Proponent shall retain a professional engineer licensed in the Province of Alberta for the design of all services, preparation of plans and specifications and the supervision and inspection of all construction works.

The developer's engineer and/or planner must consider the overall servicing and development of adjacent lands in the watershed, which may be affected, by the development. Where applicable, such considerations and recommendations concerning existing and/or proposed sanitary sewage treatment plants, water treatment plants, pumping stations, sewage collection systems, water distribution systems, storm water management and traffic impact may be required.

The layout of roads and sizing of water and sewage mains should also consider the future of abutting lands.

Where the nature of the development is more complex or varies from the standards, it will be required that the Proponent's engineer submit proposed preliminary design criteria to the Municipality for review. In any case the minimum requirements of the applicable statutes, by-laws, government ministries and regulatory agencies must be satisfied.

1.6 SHALLOW UTILITIES

The Proponent shall coordinate the installation of utilities including cable TV, electricity, telephone, and natural gas.

These utilities shall be installed within the road right-of-way in accordance with the utility locations within a utility easement. After installation, the Contractor shall ensure that they backfill it to the back of the walk. All the backfill material shall be compacted to a minimum of 95% standard proctor density at optimum moisture content in accordance to City of Lethbridge specification for backfill in R/W.

2.0 ROADS

2.1 GENERAL

The classification and designation of roads and walks shall be undertaken during the subdivision design stages, commencing with the Outline Plan, in order that roads and walks, utility, and right-of-way requirements can be coordinated, established, and approved in the design stages of subdivision development.

Roads are classified in a functional hierarchy. The road classifications are local, collector, and arterial; These road standards are supplemented by the standard cross sections and design elements of the Transportation Association of Canada (TAC) and the Alberta Transportation and Utilities (ATU) documents as noted below.

- Manual of Uniform Traffic Control Devices for Canada Roads, TAC
- Geometric Design Guide for Canadian Roads, TAC.

2.2 DESIGN GUIDELINES

The following design guidelines are to be used for the typical applications as noted in Table 2.2.1.

Where these classifications, applications and design guidelines are inappropriate the shall submit to the Municipality a set of design criteria for review and approval prior to design.

Table 2.2.1 Road classifications and geometric guidelines

	Roadway Classification						
	Urban			Rural		Industrial	
	Local	Collector	Arterial	Local	Collector	Local	Collector
Application / Typical Use							
Design Speed (Km/h)	50	60	60-90	60	80	50	60
Posted Speed (Km/h)	50	50	50-80	50	70	50	50
Allowable Gradient (%)							
Minimum	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Maximum	6	6	6	6	6	6	6
Maximum Super-elevation (m/m)	Crowned	0.04	0.06	0.08	0.08	Crowned	0.04
Minimum Stop Sight Distance (m)	65	85	85	85	140	65	85
Minimum Pavement/Surface Width (m)	9.5	12.5	8	8	9	9.5	12.5
Number of Lanes	1 to 2	2	2 to 6	1 to 2	2	1 to 2	2 to 4
Minimum Right of Way Width (m)	18.5	25	45	30	30	18.5	20
Minimum Cross fall (%)	2	2	2	2	2	2	2

Reference: "Geometric Design Guide for Canadian Road" by the Transportation Association of Canada

2.3 PAVEMENT STRUCTURE

A geotechnical investigation and independent pavement design is required for all developments and shall be based on a 20-year design life for in situ conditions and projected traffic volume. In general, the road structure will include a minimum of 150mm of subgrade prep, a granular base of 300mm in thickness and with the minimum pavement thickness as specified in Table 2.3.1.

Table 2.3.1 Minimum Asphalt Pavement Structure

Road Classification		Asphalt Thickness (mm)	City of Lethbridge Asphalt Mix Type	Granular Base Course	Sub-Base
Urban					
	Local	90	Type III	250	
	Collector	60 60	Type I Type II	100	150
	Arterial/Heavy Truck Traffic	60 100	Type I Type II	100	350
Industrial		60 100	Type I Type II	100	250
Lane		80	Type III	200	
Rural					
	Local	90	Type III	250	
	Collector	60 60	Type I Type II	100	150
	Arterial	60 100	Type I Type II	100	350

Reference: City of Lethbridge Design Standards 2016 Edition

- On rural roads where asphalt surfacing is not required, the road shall be surfaced with a minimum of 65 mm of Granular Base Course material but granular base course must be 75mm minus material granular material.
- Where suitable native materials exist for subgrade construction, the sub-base material may be excluded upon recommendation of the geotechnical engineer.
- Pending the results of the geotechnical investigation, additional pavement structure strengths and/or materials testing may be required in areas with poor subgrade materials. This would include areas with heavy industrial applications. Where road use is mixed (i.e. commercial and residential) the pavement structure shall meet the higher load criteria.
- Roadways in all urban subdivision developments shall be surfaced with asphaltic concrete pavement (hot mix asphalt).
- Good roadway industry construction practices and techniques shall be employed. The pavement shall be placed in two (2) separate lifts. The first lift shall be designed to withstand the expected loads due to construction activity in the first two (2) years

and must be placed prior to a Construction Completion Certificate being issued by the Town. The second lift shall be placed after a two (2) year period and prior to a Final Acceptance Certificate being issued by the Town.

2.4 CUL-DE-SAC

- In residential subdivisions, all dead-end roads shall be provided with a cul-de-sac or turnaround consistent with the requirements outlined in the Standard Drawings and the Transportation Association of Canada manual. The maximum length of dead end roads that service residential lots shall be 150 m, as measured from the centerline of the intersecting street to the centre of the bulb. Cul-de-sac bulbs in residential areas shall have a minimum radius of 13 m from the centre to the face of curb. Bulb road surfaces shall be crossfall sloped for drainage, at a minimum grade of 1.0% and a maximum grade of 3.0% outward from the centre of the bulb. The bulb shall have a minimum gutter grade of 0.8%.
- All roadways should be crowned on a minimum 2% slope.

2.5 SIDEWALKS

- Sidewalks are required on at least one side for urban local roads.
- Sidewalks are required on both sides for urban collector and arterial roads.
- Sidewalks shall be a minimum of 1.5 m wide.
- Sidewalks and curbs shall be depressed at street intersections to permit easy passage of wheel chairs.
- A minimum of 100mm of gravel shall be provided under all sidewalks where medium to high plastic soils are present. The Town's public works division will on a case by case basis consider not having gravel if a detailed geotechnical report indicates;
 - i. soils are not medium to high plastic, and
 - ii. not having high swelling properties, and
 - iii. the report must indicate no long term performance issues without gravel for each location.

2.6 LANES

- Residential lanes must be paved and have minimum width of 3.5 m, with centerline swale and 2.5% cross-fall. Commercial/industrial lanes must be paved and be a minimum of 6.0 m wide or the width of the right-of-way;
- Where lane traffic is expected to be high, such as for certain commercial developments, a wider surface width and right-of-way may be required, as determined by the Town;

- Road structure shall be as per geotechnical investigation;
- "Dead-end" lanes must be terminated with a means to turn around;
- Maximum lane grade shall be 6.0%; and Minimum lane grade shall be 1.0%.
- Lane approaches should be properly reinforced with 10M rebar. For details refer to Figure 1 in Appendix A.

2.7 DRAINAGE

- Urban cross-section roads shall have a minimum longitudinal gutter grade of 0.5%.
- Rural cross-section roads may have a minimum longitudinal grade of 0.0%, provided adequate cross fall is provided.
- The minimum allowable culvert size allowed under any municipal road shall be 600 mm.
- The minimum allowable culvert size for driveway accesses shall be 450 mm.
- Ditch bottom shall be a minimum of 0.300 m below the top of subgrade.
- Ditches shall have a minimum grade of 0.3%.

2.8 INTERSECTIONS

The design of intersections shall conform to the following:

- The minimum angle of intersection between two roadways shall be 75°;
- Intersections for local roadways shall be spaced a minimum of 60.0 m apart, as measured from road centerline to road centerline;
- Curb returns shall have a radius of 10.0 m minimum, with a radius of 12.0 m preferred in residential areas and in industrial areas a radius of 15.0 m minimum, with a preferred radius of 20.0 m;
- Gutter grades shall be a minimum of 0.8% around curb returns; and
- Roadways connecting at an intersection shall have a maximum grade 2.0% for 30.0 m approaching the intersection.

2.9 STREET SIGNS

- They shall apply to the Municipality for street name(s) approval.
- Street name signs are to be in an approved location at each street intersection and shall have double nameplates lettered on each side and centre mounted on galvanized steel posts.

2.10 MATERIAL

Materials used in roadway construction shall be from sources approved by Town's Public Works Division. Manufactured goods shall meet the standard manufacturer's specifications and the approved roadway specifications. Under no circumstances shall defective, rejected or substandard materials be used in the construction of roadways.

2.10.1 Subgrade

- Organic soils, tree stumps and other deleterious materials are not acceptable as subgrade materials.

2.10.2 Granular Sub-Base and Base Course for Asphaltic Concrete Pavement Surfaces

- Granular sub-base and base course shall be crushed stone or gravel consisting of hard, durable, angular particles free from clay lumps, cementation, organic material, frozen material, and other deleterious materials.

2.10.3 Asphalt

- The asphalt surface shall not be laid prior to the base course meeting the required testing.
- Asphalt materials, mixing, spreading, and rolling shall conform to good practice. A tack coat shall be applied to all horizontal and vertical surfaces prior to paving. The required densities shall be as follows in Table 2.10.1:

Table 2.10.1 Minimum Density for Different Paving Types

Minimum Density	Type of Paving
98%	New paving and all stages in staged paving
97%	Lane paving
97%	Rehabilitation overlay more than 40 mm thick
97%	Rehabilitation overlay less than 40 mm thick
96%	Paved walkway and Access roads

2.10.4 Sidewalks/Curb & Gutter/Driveways

- Ready mix concrete shall be produced, mixed and delivered in accordance with the latest edition of CAN/CSAA23.1.
- All cement for Cast-in Place concrete to be Type 50, Sulphate Resistant, CSA certified.
- Air content shall be 5.5-8 %.
- Concrete shall have a compressive strength of 32 Mpa at 28 days.
- Maximum aggregate size shall be 25 mm.
- Reinforcing bars, tie bars to CSA G30.12M, grade 300, billet steel, deforming bars, uncoated.
- Reinforcing mesh, cold drawn steel wire to CSA G30.3M, uncoated.

2.11 CONSTRUCTION

2.11.1 Subgrade

- Finished subgrade shall have a minimum cross fall of 3%.
- Prior to placing fill the exposed subgrade surface shall be scarified to a minimum depth of 0.3 m, re-laid and compacted in 0.15m lifts to 98% of Standard Proctor Density at optimum moisture content in accordance ASTM D698 (Method C or D).

2.11.2 Granular Sub-Base and Base Course for Asphaltic Concrete Pavement Surfaces

- Finished granular sub-base and base course shall have a minimum cross fall of 2%.
- Granular sub-base and base course shall be placed in lifts not exceeding 0.150 m and shall be compacted to 98% of Standard Proctor Density at optimum moisture content in accordance ASTM D698 (Method C or D).

2.11.3 Asphaltic Concrete Pavement (ACP)

- Compaction on Type I and II Asphaltic concrete shall be a minimum of 97% based on 75 blow Marshall.
- Compaction on Type III Asphaltic concrete shall be a minimum of 98% based on 50 blow Marshall.
- The finished ACP surface shall have a cross fall of 2%.

2.11.4 Sidewalks/Curb & Gutter/Driveways

- Concrete shall be bedded on a minimum of 100 mm of granular base compacted to a density of 98% of Standard Proctor Density.

2.11.5 Access Road

A 4.5 m (minimum) wide paved access road is to be provided into all the public facilities i.e. storm or sewer pump stations, water reservoir or treatment plants, park maintenance room, etc. with extensions as appropriate to provide maintenance and emergency vehicle access to the site.

2.12 QUALITY CONTROL

All Quality Control testing will be the responsibility of the Developer/Contractors. The Municipality reserves the right to select a testing firm on its own to conduct visual inspections and testing, compile its own data during or after the construction period. This does not relieve the Developer of their responsibility to conduct their own Quality Control testing program. Should the tests indicate failure the cost of the tests shall be borne by the Developer and taken from the security held by the Municipality.

2.12.1 Subgrade

- Density tests shall be taken separately and randomly on all lifts placed.
- Reports shall indicate the dates when fill was placed and testing was done, along with the horizontal and vertical location of tests.
- There shall be at least one soil density and moisture test for each 125 metres of road.
- Prior to placement of Granular Sub-Base and Base Course the subgrade shall be proof rolled under the supervision of the developer's Engineer.
- Test shall be distributed across the road section with a minimum of 25% of the tests conducted at or near the road shoulder.

Test reports shall be certified by the engineer and submitted to the Municipality within 5 days of completing the subgrade completion.

2.12.2 Granular Sub-Base and Base Course

- Density tests and moisture tests shall be taken on all lifts placed; locations shall be randomly selected.
- Reports shall indicate the dates when fill was placed and testing was done, along

with the horizontal and vertical location of tests.

- There shall be at least one soil density and moisture test for each 75 metres of road.
- One complete aggregate gradation analysis report for every 1000 tonnes of each material required or one complete analysis for each production day when the production rate is less than 1000 tonnes. Include percentage of crushed coarse aggregate particles in granular base reports.

Aggregate gradation analysis and physical properties analysis shall be certified by the developer's engineer and submitted to the Municipality 1 week prior to commencing work.

Density and moisture tests shall be submitted to the Municipality 1 week prior to asphalt concrete pavement construction.

2.12.3 Asphaltic Concrete Pavement

- A minimum of 3 cores shall be taken from the finished road surface; locations shall be randomly selected.
- A minimum of 1 core per 250 tonnes placed.
- The average density value determined by the coring procedure shall be used to determine acceptance.
- One complete aggregate gradation analysis report for every 1000 tonnes of each material required or one complete analysis for each production day when the production rate is less than 1000 tonnes. Include percentage of crushed coarse aggregate particles in granular base reports.

Asphalt cement properties, aggregate gradation analysis and physical properties analysis shall be certified by the developer's engineer and submitted to the Municipality 1 week prior to commencing work.

3.0 SANITARY SEWAGE DISPOSAL

3.1 GENERAL

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater, and Storm Drainage Facilities.
- City of Lethbridge Standards and Specifications for Water, Sewer, and Roadworks.
- Alberta Private Sewage Treatment and Disposal Regulations, Alberta Labour latest revision.

3.2 COLLECTION SYSTEM DESIGN GUIDELINES

Design of sanitary sewage collection systems for disposal to a sewage treatment plant, lagoons, and communal septic fields shall be in accordance with "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems", Alberta Environmental Protection.

3.2.1 Sewer Mains

- The minimum size of sanitary sewers shall be 200 mm.
- The minimum allowable pipe gradient shall produce a velocity no less than 0.75 m/s when under peak flow.
- The maximum allowable pipe gradient shall produce a velocity no more than 5.5 m/s when under peak flow.
- In curved sewers the minimum slope shall be increased by 50%.
- Gravity pipe sizes shall be determined using the Manning's equation.
- The roughness coefficient used in the Manning's equation shall be 0.013.
- The minimum depth of cover to top of pipe is 2.5 m.
- Where the minimum depth of cover is less than 2.5 the sewer main shall be insulated.
- Trenchless watercourse, rail, and highway crossings are to consist of an oversized steel encasement pipe with Polyethylene carrier pipe.

3.2.2 Manholes

- Manholes shall be located at all changes in direction or gradient.
- The maximum allowable distance between manholes is 120 metres for 375 mm

diameter sewers and smaller; and 150 m for 450 mm to 750 mm diameter sewers, on straight sections.

- The minimum size manhole allowed is 1200 mm.
- When larger pipes exit manholes than those entering the elevation of the obverts of the pipes shall match.
- City of Lethbridge most current Standards and Specifications for "Watertight Manhole Inserts" shall be used for manholes located within trapped lows or for manholes located in surface drainage route.
- Drop manholes are required where a difference in elevation between the incoming pipe invert and the exiting pipe invert exceeds 600 mm.
- All joints in manholes are to be watertight with flexible butyl resin sealant or approved equal.

3.2.3 Service Connections

- Private Service Connections shall have a minimum diameter of 100 mm.
- Private Service Connections less than one half the diameter of the sewer main may be tapped directly into the main without a manhole by means of PVC Saddle.
- Minimum gradient of a service connection shall be 2%.
- Minimum depth of cover at property line shall be 2.2 metres below finished grade.
- Install sewer cleanout where horizontal deflection is greater than 45°.
- Refer to the Alberta Plumbing Code for Requirements on Private Property.

3.2.4 Sanitary Sewage Flow

As per City of Lethbridge Design Standards Latest Revision.

3.3 MATERIALS

3.3.1 Sewer Mains

- All pipe and fittings must be "Smooth Wall" Poly vinyl chloride (PVC) DR35 and meet the latest revision of ASTM F679, ASTM 2412, ASTM3034 and CAN/CSA B182.2.
- All the Forcemains must be PVC OR HDPE and must conform to AWWA C900 OR C906 respectively.
- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.
- Pipe Bedding to be as per pipe manufacturer specifications.

3.3.2 Manholes

- All cement for Cast in Place or Precast concrete to be Type 50 Sulphate resistant, Portland Cement, CSA certified as meeting CAN/CSA-A5.
- All concrete for Cast in Place or Precast manholes shall meet CAN/CSA-A23.1.
- Concrete shall produce a minimum compressive strength of 20 MPa at 28 days.
- All mortar to use aggregate meeting the latest revision of CSA A82.56 and cement meeting CSA-A8, Type 50.
- Manhole frames and covers shall weigh a minim of 160 kg per set and be heavy-duty municipal type for road service. The cover shall be cast without perforations and be complete with two 25 mm square lifting holes.

3.3.3 Service Connections

- All pipe and fittings 100 mm and 150 mm in diameter must be PVC DR28 and meet the latest revision of ASTM F679, ASTM 2412, ASTM3034 and CAN/CSA B182.2.
- For Service connections larger than 150 mm diameter pipe shall be "Smooth Wall" polyvinyl Chloride.
- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.

3.4 CONSTRUCTION

3.4.1 Sewer Main

- Sewer mains shall be installed in accordance with City of Lethbridge Standard Drawings Latest Revision.

3.4.2 Manholes

- Manholes shall be bedded on a minimum of 150 mm granular bedding compacted to 95% Standard Proctor Density.
- All manholes shall be benched to provide a smooth U-shaped channel. Side height of channel to be 0.75 times the full diameter of the sewer. Slope adjacent floor at 1 in 10. For pipes smaller than 300 mm use standard fitting, braking out upper half of fitting upon completion of manhole.
- Manholes shall be left 5mm below finished grade.
- All joints in manholes are to be watertight with flexible butyl resin sealant or approved equal.

3.4.3 Service Connections

- All service connections shall be bedded in sand compacted to a minimum 95% Standard Proctor Density.
- Service connections to the sewer main shall be by approved PVC saddles connection.
- Minimum saddle connection size should be 100mm and to be 400m apart minimum.
- Do not extend service connection into interior of sewer main.

3.5 QUALITY CONTROL/TESTING

- All sewer mains, manholes and lot service lines are required to pass an exfiltration test. The test shall be performed for a period of 2 hours under a hydrostatic head of 1000 mm, above the crown of the lowest pipe or the maximum elevation of groundwater, whichever is greater. The maximum allowable leakage shall be 0.175 L per hour per mm of diameter per 100 metres of pipe.
- All sewers shall be inspected by CCTV after backfilling of the trench to top of Subgrade.
- The 's engineer shall submit certification of successful exfiltration testing along with a copy of the sewer video/report to the Public Works Superintendent.

3.6 ONSITE SEWAGE DISPOSAL DESIGN GUIDELINES

If a proposed subdivision is not being served by a municipal wastewater system the Municipality requires the Proponent to provide an assessment of characteristics of the land that is to be subdivided, including susceptibility to slumping or subsidence, depth to water table and soil suitability for onsite sewage disposal.

All assessments shall be conducted in accordance with the "Environmental Reference Manual for Review of Subdivisions in Alberta" as published by Alberta Environmental Protection.

The design of individual septic field disposal systems shall be completed in accordance with "Alberta Private Sewage Treatment and Disposal Regulations", Alberta Labour, latest revision.

4.0 STORM WATER MANAGEMENT

4.1 GENERAL

This section includes storm drainage engineering design criteria. The dual drainage system concept (minor and major systems) should be followed in developments with an urban street cross-section.

- The minor system (underground pipes, roof leaders, gutters, lot drainage, curb, and gutter) provides a basic level of service by conveying flows during minor storm events (1:5 year).
- The major system (lot drainage, roads and gutters, storage facilities) convey runoff from the rainfall events more than the minor system capacity and shall be design to safely handle a 1 in 100-year storm event without causing flooding of private property.

For developments with rural road cross-section both the minor and major drainage systems consist of ditches, swales, culverts, and storage facilities.

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater, and Storm Drainage Facilities.
- Stormwater management guideline for Province of Alberta, Alberta Environmental Protection.
- City of Lethbridge Standards and Specifications for Water, Sewer, and Roadworks.
- Environmental Reference Manual for Review of Subdivisions in Alberta, Alberta Environmental Protection.

The Municipality reserves the right to require the Proponent of a development to submit a storm water management study that:

- Identifies the impact of the proposed development on the watershed
- Demonstrates how runoff from land above the proposed development will be conveyed through the development.
- Demonstrates how runoff from development and lands above the development will be conveyed to the receiving body.

- Identifies measures proposed which will ensure that existing downstream drainage systems and receiving bodies will be capable of conveying and receiving post development runoff.
- Provides details of storm water detention facilities.
- Provides details of water quality enhancement facilities.

4.2 MINOR SYSTEM GUIDELINES

Storm Sewers shall be designed as a separate system from the sanitary sewer system. No cross connections shall be permitted.

4.2.1 Storm Sewer Flows

- The Rational Method shall be used in the design of the minor storm sewer system for drainage areas less than 50 ha.
- The Municipality reserves the right to request that computer modeling is carried out to provide the appropriate analysis.
- The maximum inlet time (time of concentration) at the upper end of the system is 10 minutes.

4.2.2 Pipe System and Gutters

- The minimum size storm sewer shall be 300 mm
- The storm sewer system shall be designed so that no surcharging occurs during the 1 to 5 storm event.
- The minimum grades on gutters and paved surface shall be 0.6%.
- Minimum grades of lanes shall be 1.5% for a minimum distance of 5 m from the back of concrete along the lane. The minimum grade of lanes shall be 1% at other locations.
- The surface of asphalt in the lane shall be at least 12 mm higher than concrete where the asphalt meets the back of concrete.

4.2.3 Catch-Basins

- Catch basin leads shall have a minimum size of 250 mm.
- The maximum length of a catch basin lead shall be 30 metres.
- The minimum grade on a catch basin lead shall be 1%.
- All leads shall be connected to a main line manhole or a catch basin manhole.
- Catch basins shall not be in the expected wheel path of vehicles, driveways,

wheelchair ramps or in the entryways.

- Catch basins in lanes are discouraged. Wherever possible lanes shall drain to a street.

4.2.4 Weeping Tile/Foundation Drains

- The bottom of every exterior foundation wall shall be drained as per the Building and Plumbing Codes.
- Foundation drains cannot be connected to the Wastewater Collection system.

4.3 MAJOR SYSTEM GUIDELINES

The Town is open for any measures or technical design solutions, that can improve stormwater quality, reduces peak flows and run-off volumes. The following items are suggested for consideration in a new development:

- New developments shall have a continuous route for overland flow from the point of precipitation to a suitable outlet. Continuity of overland flow routes between adjacent developments shall be maintained. The overland flow route will handle runoff from storms that exceed the one in 5-year event.
- The Major System, storm ponds and overland flow within new developments, shall safely handle a one in 100-year event without causing flooding of private property or erosion damage. Ponding and overland flow shall be confined to public property and right of ways and be limited to no more than 300 mm deep as measured at the gutter of the streets for the 1 in 100-year event. Once collected, Stormwater shall remain on public property.
- Peak post development flow rates shall not exceed pre-development flows resulting from the one in 5-year event. Where downstream constraints exist, post development flow rates may be restricted to less than the one in 5-year predevelopment flow. The allowable release rate shall be maintained for all design storms up to and including the one in 100-year event.
- Grass swales and runways should be incorporated into pond inlets and green strip conveyance paths. Flow spreaders to encourage sheet flows across grassed areas are highly desirable. Flows across vegetation have been shown to be effective in improving stormwater quality and in reducing volumes.

The developers and designers are encouraged to contact and follow the regulations set by provincial and federal regulation in addition to the City of Lethbridge Design Standards for Storm Management.

5.0 WATER SUPPLY AND DISTRIBUTION

5.1 GENERAL

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater, and Storm Drainage Facilities.
- Environmental Reference Manual for Review of Subdivisions in Alberta, Alberta Environmental Protection.
- Plumbing and Drainage Act of Alberta.
- "Water Supply for Public Fire Protection, A Guide to Recommended Practice", Fire Underwriter Survey.

5.2 DESIGN GUIDELINES

5.2.1 Water Supply

- The water system shall have adequate capacity to supply the peak hourly demand or the maximum day demand plus fire flows, whichever is greater
- Fire flow requirements shall be in accordance with those recommended by the Fire Underwriters Survey.
- Where the water supply source does not have adequate capacity to meet the peak demands and fire flow requirements, storage is required for peak demands and fire flows.
- The system shall be designed for operation pressures between 350 kPa and 550 kPa under average day flow conditions. Pressure between 550kPa and 670kPa will only be allowed when individual PRV's are required on all services.
- The minimum system pressure under any flow condition is 140 kPa.

5.2.2 Water Distribution

Mains

- The minimum size water main shall be 200 mm except in cul-de-sacs which do not require hydrants for fire protection.
- Shall be installed to a minimum depth of cover of 2.5 m to the top of uninsulated pipe. Maximum depth of cover to top of pipe shall be 2.9 m.

- Dead end water mains shall be avoided.
- Where Dead ends are unavoidable flushing points shall be included in the design.
- No dead end water main may service more than 35 single family residences main.
- There shall be a minimum clearance of 150 mm between the outside diameters of a water main crossing over a sanitary sewer main.
- Thrust blocks are required for all bends, tees, plugs and wyes.

Hydrants/ Valves/ Fittings

- Hydrants shall be located within the road right of way and 1.0 m from the property line.
- Valves and valve boxes are required on all hydrant leads.
- Hydrants shall be located on lot lines and curb return ends.
- Spacing of hydrants shall be as per the Fire Underwriters Survey.
- All metallic fittings, valves and hydrants shall be cathodically protected.
- Valves shall be the same size as the main.
- Valves shall be located on the projection of the property lines.
- Valves shall be spaced such that no more than three valves are required to shut down the system. Such a system may not contain more than 30 single family residences and no more than two fire hydrant is taken out of service by a water main shutdown.
- Valves are required at both ends of a utility right of way or easement.
- Valves are required at both ends of a major utility crossing (i.e. highway or railway crossing).
- Valves are required at either end of a steel encasement pipe used for trenchless crossings.

5.2.3 Service Connections

- The minimum service size shall be 20 mm.
- Each lot will be connected to the distribution main through one service connection. For a Multifamily lot service connection within property National Plumbing Code to be followed.
- All water services shall be installed to provide a minimum depth of 2.2 m to top of pipe at property line.
- Water services may be laid in the same trench as the sanitary service with a 0.3 m separation.

- Water service connections shall be spaced a minimum of 1.0 meter apart along the distribution main.
- The curb stop shall be 300mm from the property line on the Town's side and greater than 3.0 m from any structure foundation.
- All water services, from property line to main, are to be shown on the construction and as-built drawings.

5.3 MATERIAL

Mains

- For pipe sizes 100 mm to 300 mm in diameter, all pipe and joints shall be to the latest revision AWWA C900 and CSA 3-B137.3.
- For pipe sizes 350 mm to 900 mm in diameter, all pipe and joints shall be to the latest revision AWWA C905 and CSA 3-B137.3.
- All PVC pipe to be cast iron outside diameter, bell end complete with 1 MPa elastomeric gasket push on joint.

Resilient Seat Gate Valves

- Valves sized 150 mm to 300 mm diameter shall be resilient wedge gate valves conforming to latest revision AWWA C509, complete with fully rubber encapsulated solid wedge, non-rising stem, suitable for direct bury.
- Valves to open left (counter clockwise).
- Valve body to be constructed of cast iron, in accordance with ASTM A126, Class "B". All nuts, bolts, and washers to be stainless steel.
- Interior and exterior of valve to be epoxy coated, as per latest revision AWWA C550
- Bronze valve stem to be operated by a 50 x 50 mm square operating nut. The valve stem (stuffing box) shall contain double "O" ring seal
- Valve ends to be push on "Tyton Joint" conforming to latest revision AWWA C1110
- Approved products: Crane McAvity Resilient Seat
- An Alignment disc is required on all valves to align the stem.

Hydrants

- Hydrants to be dry barrel, compression type conforming to latest revision AWWA C502.
- Hydrants to close with pressure.
- Hydrant Valve opening to be 133 mm.



- Valve seat and valve body to be of bronze construction.
- Pumper and hose nozzles shall be located a minimum of 460 mm above the ground flange.
- Hydrants shall be equipped with one pumper nozzle (150 mm nominal diameter) and two hose nozzles (65 mm nominal diameter).
- Hose nozzles shall be at 90° to pumper nozzle.
- Nozzle threads to conform to the Alberta Mutual Aid Standard.
- Hydrants shall open counter clockwise.
- Operating nut shall be five sided (22 mm on a side).
- Approved products: McAvity M-67.

PVC Fittings

- PVC fittings are acceptable for main sizes 300 mm and smaller, PVC fittings to the latest revision AWWA C907 and CSA 3-B137.2. Bell ends complete with 1 MPa elastomeric gasket push on joint.

Curb Stops

- Curb Stops to be Teflon coated brass ball valve construction, body to be red brass to latest revision ASTM B62-85, compression type inlet and outlet fittings, without drain. Valves to be full port.
- Corporation stops and curb stops products shall be Ford or Mueller.

Sacrificial Anode

Anode lead wires shall be a minimum of 4 m in length and shall consist of #12/7 stranded copper wire with type RWU-90 insulation. Magnesium anodes are to be supplied with a blue lead wire and shall conform to ASTM B843 B 843 Grade M1C (latest edition). Zinc anodes are to be supplied with a white lead wire and shall conform to ASTM. B418 Type II (latest edition). The lead wire shall be connected to the core with silver solder or an approved equal. The connection shall be insulated by filling the recess and any voids in the lead wire core connection with an electrical potting compound.

5.4 QUALITY CONTROL/TESTING

- Density and moisture tests shall be taken on all trench backfill; locations shall be randomly selected.

- Reports shall indicate the dates when fill was placed and testing was done along with the horizontal and vertical location of tests.
- There shall be at least one soil density and moisture test for each 100 metres of trench.
- All new water mains shall be hydrostatically tested for leakage in accordance with the latest edition of AWWA C600. Hydrostatic testing shall be completed after service installation. The developer's engineer shall certify that the hydrostatic testing was successfully completed.
- Copies of bacteriological and chlorine testing results shall be provided to the Municipality along with certification from the developer's engineer that disinfection was properly done.

5.5 INDIVIDUAL SYSTEMS

For the purposes of these guidelines and standards an individual system is considered a system that has less than 15 service connections and less than 3 km of water distribution system.

Reference should be made to Alberta Regulation 122/93, Potable Water Regulation for a complete definition and requirements.

Where groundwater is the proposed supply source the developer shall have a groundwater supply evaluation report prepared by hydrogeologist or professional engineer competent in the groundwater field.

The groundwater supply evaluation shall be undertaken in accordance with the "Interim Guidelines for the Evaluation of Groundwater Supply for Unserved Residential Subdivision Using Privately Owned Domestic Water Wells".

Aquifer Testing shall be undertaken in accordance with "Interim Guidelines for the Evaluation of Groundwater Supply for Unserved Residential Subdivision Using Privately Owned Domestic Water Wells".

Wells which serve 3 or more lots are required to be licensed by Alberta Environmental Protection.

6.0 STREET LIGHTING

6.1 GENERAL

All urban subdivisions shall be provided with street lights. Rural subdivisions may or may not require street lighting.

Street lighting shall be arranged by the developer to a standard of lighting comparable to existing standards set forth in City of Lethbridge Design Standards, latest revision.

The developer's engineer shall review lighting requirements with the Municipality prior to final design.

6.2 DESIGN

Street lights shall be in accordance with the Standard Specifications set forth in City of Lethbridge Standards.

The posts shall be spaced with a spacing of 40 to 55 metres (130 to 180 feet) with posts located opposite the lot lines perpendicular to the street. The first light poles should be installed a maximum of 10 metres (33 feet) from the curb of the intersecting streets.

All lighting systems shall meet the requirements of the Transportation Association of Canada and Fortis.

6.3 INSTALLATION

Installation may be mounted or direct burial type. The developer may be required to provide details, specifications of the proposed lighting system and materials including engineer's shop drawings of concrete bases and/or pole embedment. Where direct buried poles are approved for use, the Municipality may require concrete embedment or other means satisfactory to the Municipality to ensure that poles are securely installed. Underground wiring for street lighting shall be used. Standards may vary based on the nature of the development and class of road.

Proposed lighting layout, specifications, and details are subject to approval of the Municipality. For developments abutting collector or arterial roads, special lighting requirements and/or a photometric report may be required.

7.0 LOT GRADING AND DRAINAGE

Lot grading shall be based on the overall drainage system and shall be in conjunction with the local Storm Management Plan of the development.

- The minimum Finished Grade Elevation at the building(s), for all lots adjacent to trapped low is to be a minimum of 300mm above the 1:100-year ponding elevation for the trapped low.
- The interior lot grading design must provide the following minimum slopes:
 - A 10% slope for the first 2.0 m away from the foundation. If the distance between the foundation and edge of lot is less than 2.0 m, the finish grade elevation must be a minimum of 150 mm above the edge of lot elevation.
 - After the first 2.0 m, the remainder of the lot is to slope at 2% to the edge of lot.
 - A 2% slope along sod (grassed) swales located on the common property line between lots.
 - A 0.6% slope along asphalt and concrete swales located on the common property lines between lots.
- Downspouts shall not be connected to the building foundation drain system or the sanitary sewer by any means.
- Sump pumps and downspouts must discharge to a splash pad or an impervious surface that is graded to convey the discharge a minimum of 2 m horizontally away from the building and adjacent properties.
- Driveways shall be graded at 2% down towards the street on urban cross-sections for the first 2.0 m behind the curb towards the property. Reverse driveways are not permitted unless the runoff can be directed away from the structure and off the property in a controlled way.
- Driveways shall be graded at 2% down away from the edge of the driving surface for the first 5 metres from the edge of the driving surface on rural cross-sections.
- The maximum allowable driveway grade is 12%.

8.0 PARKS AND OPEN SPACE

Development of parks and open space is required and will be subject to development agreement negotiations. In general, the Town requires the parks and open space development to follow the City of Lethbridge Design Standards.

9.0 SANITARY AND STORM SEWER LIFT STATION

Refer to Appendix B for detailed design and construction standards and procedures for Sanitary and Storm Sewer Lift Station.

10.0 SUBMISSION OF PLANS, REPORTS AND STUDIES

10.1 SUBMISSION PROCEDURE

All submissions of plans, specifications, documents, reports, studies, design criteria proposals, etc. shall be made to the Public Works Superintendent of the Municipality in sufficient quantities as may be required for distribution by the Public Works Superintendent to such persons as the Building Official, Municipality's Planner, Municipality's Consulting Engineer, etc.

10.2 PLAN REQUIREMENT

Unless otherwise approved by the Municipality, the Developer shall supply the Town with as-built in hard copy and digital format prior to Substantial Completion Inspection. All drawings are to be signed and sealed by a professional engineer. General plan layout shall be in accordance with standard engineering practice. All elevations on grading plans, site plans, servicing plans, and profiles, etc. shall relate to Geodetic Survey of Canada Datum.

10.3 DRAWINGS TO BE SUBMITTED

In general, the following drawings are required for subdivision developments. Some of the following may also be required for individual site plan control developments.

- A key plan, showing the general location of the development to be serviced.
- One or more general servicing plans, showing all services to be constructed, including storm sewers, sanitary sewers, the water distribution system, roads, street lighting systems.
- A lot grading plan, to a scale of 1:500 and including sufficient areas of adjacent land where applicable to illustrate total drainage patterns.
- Plan and profile drawings for each street to be constructed, reconstructed, widened, etc. and for each service easement to a scale of 1:500 horizontally and 1:50 vertically.
- A storm drainage area plan to a scale of not less than 1:2,000 and including all interior and exterior tributary areas which contribute to storm sewer and/or storm water management design. Storm sewer design charts shall be included on the storm drainage plan.

- A sanitary drainage area plan, to a scale of not less than 1: 2,000 and including all interior and exterior tributary areas. Sanitary sewer design charts shall be included on the sanitary drainage plan.
- Such other drawings showing notes, details, typical sections, etc. as may be necessary for the proper construction of the works, such as:
 - typical road cross-section
 - typical lot grading section
 - typical channel or swale details
 - geotechnical report information
 - legend
 - storm sewer outfall structures/erosion protection
 - materials
 - trench details

One or more of the above drawings which are to become part of the construction drawing package, shall include sufficient legal survey monumentation, dimensions, etc. to enable the contractor and/or engineer to locate and / or layout the road right-of-way, easements, and / or lot corners, as may be required.

10.4 RECORD DRAWINGS

Record drawings are to be submitted to the Municipality to show the services and works as they were constructed. The developer shall provide the Municipality with three (3) complete set of all the drawings as hard copy along with one CD applicable to the project. Record drawings shall include water service locations with ties, and chainages of private connections measured from the nearest downstream manhole. Record drawings shall be stamped/sealed by the Developer 's engineer.

10.5 CONSTRUCTION COMPLETION CERTIFICATE

The Developer shall submit to the Town, two (2) copies of the Construction Completion Certificate attached with as-built plans attached, duly signed by the Developer's engineer. The Town shall cause an inspection to be made within thirty (30) days from date of receipt of the Certificate. The Developer will be notified of the results of the inspection as soon as possible thereafter. If the inspection shows to the satisfaction of the Town's Representative and the improvements are completed, in accordance with the approved plans and application specifications, the Town's Representative shall sign the Construction Completion Certificate. If, however, defects or deficiencies in the utility or improvements are apparent, the Certificate will be returned to the Developer

unsigned with a report of the defects and deficiencies. Upon correction of the defects and deficiencies, the Developer shall submit two (2) new copies of the Construction Completion Certificate.

The Developer shall understand that the improvements shall be considered "complete", when the improvement has been developed to level shown on the approved plans. If the Developer is not advised of any deficiencies within thirty (30) days of receipt of the Certificate by the Town's Representative, the Developer shall deem the utility of improvements to be completed.

After the issuance of the Construction Completion Certificate, the Developer shall be responsible for all repairs and replacements to any utilities and/or improvements that may become necessary from any cause whatever, up to the end of the warranty/ Maintenance periods specified in the said Construction Completion Certificate.

10.6 FINAL ACCEPTANCE CERTIFICATE

One (1) month prior to the expiration date of the warranty period of the improvements, the Developer and Town designate shall inspect each improvement and the Developer shall correct all defects and deficiencies, due to damage and other causes. Subsequent to the correction of the said defects and deficiencies, the Developer shall submit to the Town two (2) copies of the Final Acceptance Certificate, duly signed and sealed by Developer's Engineer.

Within thirty (30) days of receipt of the Final Acceptance Certificate, weather permitting, the Town's representative shall inspect the improvement and approve the Final Acceptance Certificate, if the work is completed to his satisfaction. If defects and deficiencies are noted during the inspection, the Final Acceptance Certificate will be returned as soon as possible to the Developer, unsigned, with a report of the defect and deficiencies listed. Upon correction of the defects and deficiencies, the Developer shall submit two (2) new copies of the Final Acceptance Certificate.

10.7 MAINTENANCE /WARRANTY PERIOD

The maintenance period shall begin from the date specified on the Construction Completion Certificate. The term "Maintenance", as used in this document, does not include operation of the works or rectification of problems arising out of systems operation, failures of public utilities, general wear and tear on operational

equipment, tools, structures, and appurtenances of failures resulting from work performed by others.

All utilities, appurtenances, and improvements whether surface or underground must be complete, free of defects, with approved as-built plans and reports in place and with a subsisting Construction Completion Certificate for the improvements for the development area to qualify for an FAC (Final Acceptance Certificate). Table 9.7.1 shows the maintenance period for the corresponding type of improvements following issuance of a construction completion certificate has expired;

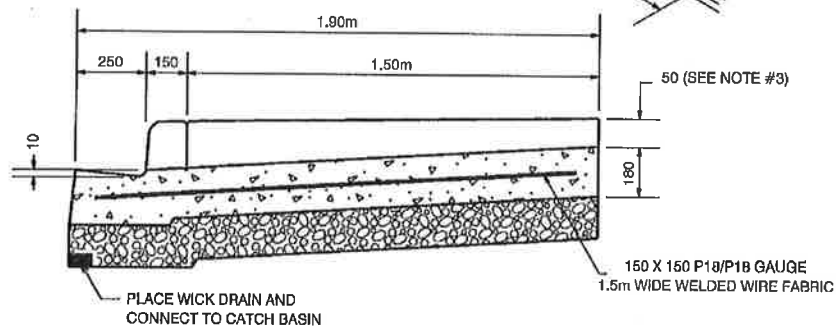
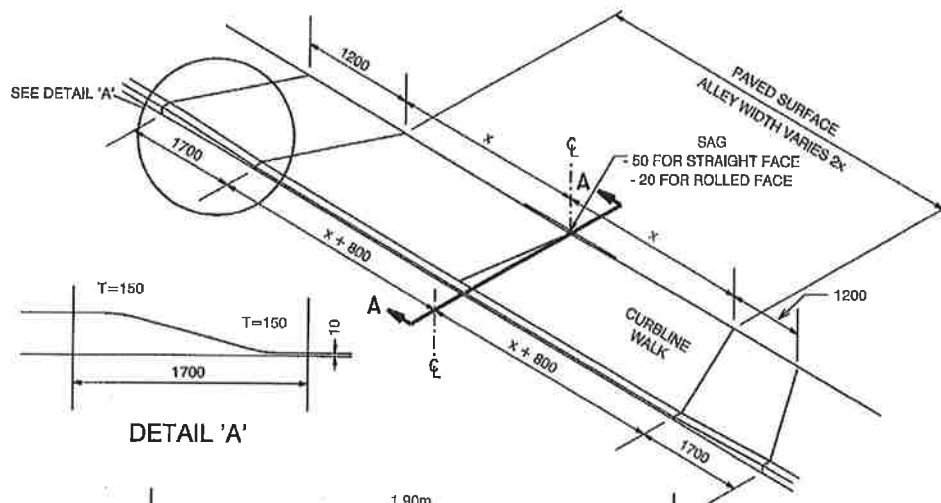
Table 10.7.1 Maintenance Period for different type of development

Type of improvement		Maintenance period
1.	Rough Grading	One (1) year
2.	Underground Utilities (Deep) Sanitary Sewerage System Water Distribution System Sanitary and Water Service Connections Storm drainage System Overland or surface drainage Conveyances, Storm Water Management facilities, Outfalls	One (1) year
3.	Shallow Utilities	One (1) year
4.	Surface improvements Sidewalks, curb, and Gutters Roads Paving -Base Lift Traffic Control	Two (2) year
5.	Street Lighting	One (1) year
6.	Open Space and Trial development Landscaping, Parks, Irrigation, Fencing, trails, and walkaway	One (1) year

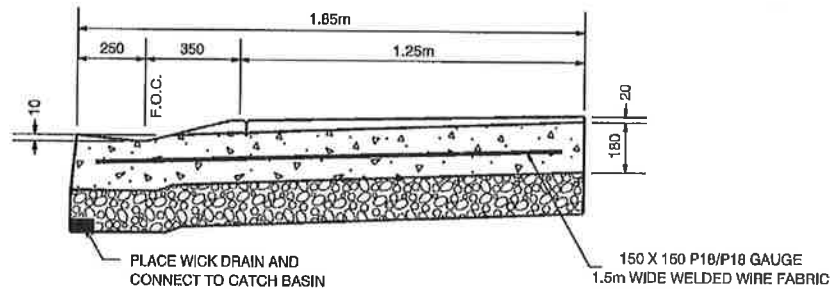
Upon expiration of the maintenance period, an inspection will be conducted; all deficiencies shall be corrected and maintenance work completed prior to acceptance of the Work by the Town.

Appendix A

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SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTES:

1. MAXIMUM SLOPE 8% UNLESS OTHERWISE APPROVED BY ENGINEER.
2. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER.
3. BACK OF CROSSING DROP FOR EXISTING 200mm CURBFACE IS 50mm.
4. ALTERNATIVE REINFORCING 10M REBAR ON A 300 mm GRID WITH 75 mm COVER FROM BOTTOM AND EDGE OF SLAB.

ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

ORIGINAL SHEET - ANSI A

November, 2016
112947965



Suite #290, 220 - 4th Street South
Lethbridge, Alberta Canada T1J 4J7
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Client/Project

TOWN OF COALHURST
STANDARDS AND SPECIFICATIONS

Figure No.

1.0

Title

LANE CROSSING DETAIL

Appendix B

SCHEDULE 'C'

**TOWN OF COALHURST
SANITARY AND STORM SEWER
LIFT STATION
DESIGN AND CONSTRUCTION
STANDARDS AND PROCEDURES**

January 2007

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SANITARY AND STORM SEWER LIFT STATION DESIGN AND CONSTRUCTION STANDARDS AND PROCEDURES

1.0 AUTHORITY

All lift stations that will become the property of The Town of Coalhurst Public Works Department are required to meet the standards and follow the procedures identified in this document. Any deviations from these standards and procedures may only be authorized by the Town (or authorized delegate) and will be provided in writing. The Town (or authorized delegate) is the Design and Construction Authority in all cases.

2.0 REGULATORY STANDARDS

All applicable regulatory standards shall be met for design and construction. This includes but is not limited to federal requirements; Alberta Environment requirements for waste water systems; applicable federal, provincial and municipal building and safety codes; and municipal bylaws.

3.0 DESIGN STANDARDS

Throughout this document, the term Lift Station shall be deemed to include all force main(s) serving the Lift Station.

The Lift Station components will be designed and constructed to achieve the following functional life:

<i>Component</i>	<i>Functional Life (Years)</i>
Wet Well (& Dry Well) ^(Note 1)	40 Years
Generator Structure ^(Note 2)	40 Years
Pumps	20 Years
Motors	20 Years
Diesel Generator	20 Years
Heating/Ventilation	15 Years
Force Main(s)	50 Years

The Lift Station will be designed for a phasing (if appropriate) from start-up to ultimate load, as follows:

<i>Component</i>	<i>Design Target</i>
Wet Well	Ultimate (Note 3)
Generator Structure	Ultimate
Diesel Generator	Ultimate
Force Mains	Ultimate
Pumps & Motors	Phased with piping for Ultimate
Ventilation	Ultimate

- Note 1** Any station with an ultimate submersible pump motor size of greater than 75 HP shall be a wet well/dry well structure. (See Annex C)
- Note 2** Any Lift Station sited in any 1:100 year flood plain, must have the generator structure and components designed to provide for quick disconnection of power and controls and be able to be moved entirely by crane within 1 hour.
- Note 3** Depending on the phasing schedule and significance in size from early phases to ultimate, the Public Works Department will provide specific direction on phasing the wet well on a case by case basis.

4.0 DESIGN AND CONSTRUCTION MANAGEMENT

The Town Administration will determine if the Public Works Department, as the facility owner, will design the facility in-house or engage a consultant for the design and construction of the station, or whether it will permit the Developer to undertake either or both of these aspects following the completion and approval process in this document. The design team qualifications and the Proposed Consultant Team Application Form that is required to be completed by the Consultant and Developer is found in Annex A. In considering a request from the Developer to undertake Design and/or Construction management, the Town will consider the complexity of the lift station based on initial and ultimate flows, the size of the Lift Station, the number of Developers in the ultimate catchment area, the Developers proposed design team qualifications and experience in Alberta Lift Station design and construction, the project schedule and other relevant factors. See Annex B for General Parameters for Developer Design Considered versus Mandatory Town Design. The decision of the Town is final. Regardless of the approach taken, the Developer will pay all costs of Design and Construction Management including Public Works Department costs.

5.0 GENERAL PROCESS

All lift stations shall follow the following process for design and construction:

- a. Preliminary Design Phase
- b. Detailed Design Phase
- c. Construction Tender Phase
- d. Construction Phase
- e. Post Construction Warranty and Acceptance Phase

The number of design meetings and detailed project schedule will be established at the start-up meeting and will depend on the complexity of the station and Developer's schedule.

6.0 PRELIMINARY DESIGN PHASE

This phase identifies all parameters relevant to the specific lift station. The impact of each parameter is to be assessed against the design standard and decisions made by the Public Works Department on the station before detailed design is completed. This phase begins with a start-up meeting with the Developer, engineer and the Public Works Department (Management, Operations and Engineering staff) to review the process, standards, schedule, process costs and development particulars. This phase ends with the Public Works Department formally accepting in writing a Preliminary Design Report prepared by the Developer which records all design and construction details of the station to reflect the Public Works Department standards. In addition to the start-up meeting, this phase will typically include progress meetings at the 40%, 80% and 98% complete stage of the Preliminary Design Report. Depending on the complexity of the station, the Public Works Department may require more or less meetings. The Preliminary Design Report shall be a professionally written report prepared and stamped by a Professional Engineer legally registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta who is professionally competent in lift station design and did personally complete the pre-design work. The report shall address all topics and shall be written following the outline and specifications contained in Annex C of this document. Where a topic is not applicable, the report shall report it as Not Applicable.

7.0 DETAILED DESIGN PHASE

This phase involves the preparation of the detailed drawings and specifications of the station incorporating all decisions recorded and accepted in the Preliminary Design Report. The Specifications shall be in National Master Specification Format and the Drawings shall follow Public Works Department standards. This phase begins with a written authorization from the Public Works Department that the Preliminary Design Report is

accepted and Detailed Design may commence. This phase ends with the Public Works Department formally accepting in writing the drawings and specifications. This phase will typically include progress meetings at the 40%, 80% and 98% complete stage of the Detailed Design. Depending on the complexity of the station, the Public Works Department may require more or less meetings. The Detailed Design Specifications and Drawings shall be professionally prepared and stamped by the Professional Engineers legally registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta who did personally complete design work and who were listed in the Consultant Team Application Form. Prior to formally accepting in writing the detailed design, the Public Works Department will issue a conditional acceptance letter pending complete approval of the station from Alberta Environment. Following receipt of this conditional letter, the Developer will submit a request to Alberta Environment (cc: Public Works Department) for authorization to construct and amend the Town's Approval as well as any other regulatory approvals as may be required. Following written approval by Alberta Environment and any other regulatory agency, the Town will issue written acceptance of the Detailed Design Plan. This acceptance will be subject to any change the Town Engineer may require to be implemented during the subsequent phases (tender, construction and warranty/acceptance).

8.0 CONSTRUCTION TENDER PHASE

Town Administration will specify what information and involvement the Public Works Department will require in the construction tender phase.

9.0 CONSTRUCTION PHASE

The Public Works Department will specify the details of the following requirements:

- a. The minimum amount of on site inspection the design engineer must provide and the critical stages of construction that the engineer must be present to verify proper construction, along with the written reporting requirements from the engineer;
- b. The stages during construction that the Town's construction inspector must be present;
- c. The specific points during construction that the Town's construction inspector must sign off before construction may proceed beyond those points;
- d. The frequency of written progress reports the Town requires from the engineer;
- e. The frequency of progress meetings,

- f. The involvement in commissioning,
- g. Any other requirements the Town may identify.

10.0 POST CONSTRUCTION AND WARRANTY PHASE

The Developer must provide the following:

- a. Reimburse the Public Works Department for the cost of preparation of a Control Philosophy Manual prepared by the Public Works Department.
- b. Reimburse the Public Works Department for all costs for PLC programming prepared by the Department.
- c. An Operations and Maintenance Manual as specified in Annex D.

11.0 FINANCIAL

The Developer will be required to fund the design and construction costs.

12.0 DEVELOPER'S USE OF LIFT STATION

The Town will issue a letter to the Developer authorizing use of the Lift Station once all outstanding financial and technical issues have been completed to the Town's satisfaction. This includes the completion of all deficiencies and clearances on liens, WCB claims, legal and any other final clearances as may be required.

ANNEX A - DESIGN TEAM QUALIFICATIONS

1.0 TEAM MEMBER QUALIFICATIONS & EXPERIENCE LIST

The design team must include qualified and experienced personnel meeting the following standards:

Team Member	Minimum Qualification	Minimum Experience * in Lift Station design of similar size of proposed project
Team Leader	APEGGA – PEng	1. Team Leader for minimum of 3 Lift Stations 2. Stamping mechanical engineer for a minimum of 2 Lift Stations
Mechanical (Pumps/Motors/Forcemains)	APEGGA – PEng	Stamping mechanical engineer for minimum of 4 Lift Stations
Structural	APEGGA – PEng	Stamping structural engineer for minimum of 4 Lift Stations
Electrical (Power Supply/Domestic /Motor Supply)	APEGGA – PEng or ASET	Stamping electrical engineer (or design technologist) for minimum of 4 Lift Stations
Heating/Ventilation	APEGGA – PEng or ASET	Stamping engineer (or design technologist) for minimum of 4 Lift Stations
Other Civil	APEGGA – PEng or ASET	Stamping engineer (or design technologist) for minimum of 4 Lift Stations
Construction Inspector	ASET	Construction technologist for minimum of 4 Lift Stations

Footnote * - All experience must be demonstrated to be within the past 5 years.

The Consultant Team being proposed for a the Lift Station design project must identify the name, APEGGA/ASET membership number, resume highlighting the minimum experience requirements and client references to verify performance for each of the minimum required lift stations.

The proponent shall complete the Consultant Team Form.

**2.0 PROPOSED CONSULTANT TEAM APPLICATION FORM
FOR TOWN OF COALHURST LIFT STATION DESIGN**

Name: _____
Address: _____

Phone: () Fax: ()

APEGGA Permit Number: _____

Lift Station Name: _____

Developer: _____

Attach Proposed Project Schedule for Lift Station and entire Subdivision.

1. Team Leader Name: _____

APEGGA Number: _____

Lift Stations as Team Leader (Name of Lift Station, Client, Reference and
Phone, Dates, Capacity, Construction Cost)

1. _____

2. _____

3. _____

Lift Stations as Stamping Engineer (Name of Lift Station, Client, Reference
and Phone, Dates, Capacity,
Construction Cost)

1. _____

2. _____

Attach complete resume

2. Mechanical Leader Name: _____

APEGGA Number: _____

Lift Stations as Mechanical Leader (Name of Lift Station, Client, Reference
and Phone, Dates, Capacity,
Construction Cost)

1. _____

2. _____

3. _____

4. _____

Attach complete resume

3. Structure Leader Name: _____

APEGGA Number: _____

Lift Stations as Structural Leader (Name of Lift Station, Client, Reference and
Phone, Dates, Capacity, Construction Cost)

1. _____

2. _____

3. _____

4. _____

Attach complete resume

4. Electrical Leader Name:

APEGGA or ASET Number:

Lift Stations as Electrical Leader

**(Name of Lift Station, Client, Reference
and Phone, Dates, Capacity,
Construction Cost)**

1.

2.

3.

4.

Attach complete resume

5. Heating/Ventilation Leader Name:

APEGGA or ASET Number:

Lift Stations as Ventilation Leader

**(Name of Lift Station, Client, Reference
and Phone, Dates, Capacity,
Construction Cost)**

1.

2.

3.

4.

Attach complete resume

6. Other Civil Leader Name: _____

APEGGA or ASET Number: _____

Lift Stations as Other Civil Leader

(Name of Lift Station, Client, Reference
and Phone, Dates, Capacity,
Construction Cost)

1. _____

2. _____

3. _____

4. _____

Attach complete resume

7. Construction Inspector Name: _____

ASET Number: _____

Lift Stations as Construction
Leader

(Name of Lift Station, Client, Reference and
Phone, Dates, Capacity, Construction Cost)

1. _____

2. _____

3. _____

4. _____

Attach complete resume

8. Other Technical Team Members: (Name, Professional Qualifications, Role in this Project, Experience)

1. _____

2. _____

3. _____

4. _____

Attach complete resumes

INDIVIDUAL CERTIFICATION

I certify that the information provided on my qualifications and experience is true and correct and I certify that my name and signature will appear on drawings and the specifications for which my name is identified.

Team Leader:

Mechanical Leader:

Structural:

Electrical:

Heating/Ventilation:

Civil:

Construction Inspector:

Others (Specify):

FIRM CERTIFICATION

I certify that the information provided in this application is true and correct and that the named individuals will be assigned to this project as indicated. I understand that if an individual is unable to complete his/her assigned component beyond my firm's control by reason of resignation, illness or death, I will notify the Town, Public Works Department within 24 hours of my discovery. I understand that the Town may decide to permit a new team member, provided the new member meets all qualifications and experience credentials, which I will provide to the Town for review and acceptance. I understand that failure to provide a qualified and experienced replacement for the Town's acceptance will be grounds for the Town to cease any further progress approvals in this project.

I am an authorized officer for the Consultant Firm.

Signed: _____ Date: _____
Name: _____
Title: _____

DEVELOPER CERTIFICATION

I certify I have read this entire form and that I understand my financial, project schedule and other risks by proposing the above consulting firm. I have carefully read the Firm Certification paragraph above. I am an authorized officer for the Developer.

Signed: _____ Date: _____
Name: _____
Title: _____

GENERAL PARAMETERS FOR DEVELOPER DESIGN CONSIDERED VERSUS MANDATORY TOWN DESIGN - ANNEX B

**ANNEX B - GENERAL PARAMETERS FOR DEVELOPER DESIGN
CONSIDERED VERSUS MANDATORY TOWN DESIGN**

<i>Column A</i>	<i>Column B</i>
<i>Design by Qualified Developer Consultant Team Considered</i>	<i>Mandatory Design by Town</i>
<ul style="list-style-type: none">• Ultimate individual submersible pump motor size of less than 75 HP• Wet Well structure only• No phasing of Wet Well structure from initial flows to ultimate flows• No more than 1 development in ultimate flow catchment area	<ul style="list-style-type: none">• Ultimate individual submersible pump motor size of greater than 75 HP• Wet Well/Dry Well structures• Wet Well expansion by phasing

If all parameters in Column A apply, the Town will consider an application by a Developer to use a qualified consultant.

If any of the parameters in Column B apply, the Town will not consider an application by a Developer to use a Developer consultant and will complete and manage Lift Station design and construction.

If there is more than one development in the ultimate flow catchment area, the Town will consider an application from a Developer to use a qualified consultant provided all issues relating to the multiple development scenario are resolved to the Town's satisfaction.

ANNEX C - PRELIMINARY DESIGN REPORT

INTRODUCTORY PAGES

The introductory pages must include the following pages:

1. The Preliminary Design Report Cover must identify the Lift Station name, development name, Developer, consultant and date.
2. A signed transmittal letter must be included.
3. A Table of Contents containing all of the following sections must be included:

Table of Contents	
Transmittal Letter.....	i
Table of Contents/List of tables and Figures.....	ii
1.0 Objectives	
2.0 Background	
3.0 Sewage Flow Projections	
4.0 Projected Pumping Requirements	
5.0 Mechanical Equipment Selection	
6.0 Electrical Equipment Selection	
7.0 Lift Station Control Philosophy	
8.0 Architectural and Structural	
9.0 Ventilation	
10.0 Permits and Approvals	
11.0 Costs	
12.0 Implementation Schedule	
References	
Appendix A - Development Area Phasing Strategy and Flow Projections	
Appendix B - Equipment Specifications	
List of Tables and Figures	
Table 1	
Table 2	
etc	

1.0 OBJECTIVES

The following objectives shall be addressed in the report:

1. Review background information provided by the Town, Developer and other relevant agencies.
2. Establish the estimated start-up and ultimate design flows to the lift station and the growth rate from start-up to ultimate.
3. Review Alberta Environment requirements for the proposed lift station.

4. Calculate pumping capacity requirements and head requirements for start-up and ultimate conditions.
5. Calculate and identify proposed pump upgrading requirements from start-up to ultimate identifying flow values for change-over events and these flows approximate population stages.
6. Calculate the number and sizes of force mains required for the life cycle of the lift station from start-up to ultimate.
7. Prepare a conceptual design of the wet well or wet well and dry well structure.
8. Determine the electrical and mechanical equipment requirements.
9. Prepare the conceptual design of the layout for the lift station stand-by generator and control building.
10. Prepare the conceptual control philosophy of the facility including all local alarm points and SCADA telemetry information.
11. Prepare the conceptual architectural scheme for the structure and site.
12. Compile the list of all required permits and approvals including who will obtain and issue each one.
13. Prepare a summary of cost estimates.
14. Provide a project schedule from the start-up meeting with the Public Works Department to the completion of construction, commissioning and acceptance.

2.0 BACKGROUND

This section shall include all of the following as a minimum:

1. Development location plan.
2. Lift station location plan.
3. Total lift station catchment area for the development.
4. Total additional catchment area physically possible by topography including any other catchment areas with the potential to feed into this lift station system. Identify all landowners in the entire catchment area.
5. Land Use Bylaw Zoning for all catchment areas identified in 3 and 4 above.
6. Lift station forcemain alignment and discharge location.
7. The summary from a geotechnical report for the station site with the geotechnical report attached as an Annex.

3.0 SANITARY AND STORM SEWAGE FLOW PROJECTIONS

This section shall include all of the following as a minimum:

1. Identify the source of population and/or flow projections.
2. Identify growth stages including size in hectares, population and anticipated year of each.

3. Identify assumptions used to estimate the required capacities for the facility to include populations at start-up, each phase and ultimate; average daily flow rate in lpcd; density/Ha; peaking factor (show Harmon Equation calculations); infiltration assumptions.
4. Show a Table as follows:

Table # Projected Flows to the "name" Lift Station			
Period	Estimated Population	Flows	
		Average Flows (ML/Day and Usgpm)	Peak Flows (ML/Day and Usgpm)
Start-up			
Phase x			
Phase y			
Ultimate			

4.0 PROJECTED PUMPING REQUIREMENTS

This section shall include all of the following as a minimum:

1. The following statement must appear as the first paragraph "Alberta Environment Standards and Guidelines for Municipal Wastewater requires that all sewage pumping stations be capable of handling peak flows at all times. Sewage pumping stations must incorporate standby capacity such that when the largest pump is out of service the station is capable of handling the peak flow rate."
2. This section must discuss the evaluation of multiple force main options to meet lift station requirements from start-up to ultimate.
3. This section must identify pumping criteria for each force main in service through various growth stages and summarize it in tabular form as follows: (the selection criteria must ensure that a self-cleansing velocity of minimum 0.6 meters/second is maintained in the forcemains to avoid solids deposition with this statement made in the report):

Pump Criteria		
Minimum flow (litres/second)	Total Dynamic Head (m)	Force main in service
		mm
		mm
		mm

4. This section must include the following statement:

Wet Well Capacity:

- This station wet well was sized based on the volume of sewage required to minimize pump-starting frequency which is a function of the relationship between the station discharge rate and the station inflow rate.
 - The worst case occurs when inflow is half of the outflow because that would cause the pump to start more often than any other situation.
 - The size has also considered the possibility of switching to large pumps in the future.
 - The maximum sewage storage capacity was calculated to be _____ cubic meters (include calculations).
 - This was based on the worst-case scenario of [describe] and a cycle time of [#] starts per hour not including the emergency stand-by pump.
 - The pump manufacturer must verify in writing (include letter) that [#] starts per hour is an acceptable maximum design criteria given the motor horsepower required
5. This section must include the system curves for all proposed force mains on one graph.

5.0 MECHANICAL EQUIPMENT SELECTION

This section shall include all of the following paragraphs as a minimum:

1. Pumps. (pump manufacturer (Approved Manufacturers for submersible pumps include Flygt, ABS and Pumpex; Approved Manufacturers for centrifugal pumps include Cornell, and Fairbanks-Morse. These pumps must include flushless seals.)), and the following information for any future change outs due to growth: model, impeller size, suction size, discharge size, motor full speed RPM, motor rating HP, hydraulic efficiency for system curve in section 4.0, total weight).
2. This section must include a Figure of pump curves plotted with system curves from start-up to ultimate with the various force main service plan.
3. This section must include a Table showing the population served by each pump/force main combination.
4. This section must include a discussion on VFDs with line reactors (must be Alan Bradley VFDs).
5. Check valves (Valmatic or APCO swing or Flygt HDL ball) downstream of pumps on discharge piping.
6. Pump isolation valves shall be Valmatic or Dezurik plug valves between the check valve and the header.

7. Header shall be externally epoxy coated and connect all pumps in parallel and shall include a lateral for any future pumps required for ultimate flows.
8. This section must include a discussion on the need for an Air Release Valve.
9. This section must identify proposed location and type of force main isolation valves.
10. This section must include a discussion on the need for a mixer to prevent the accumulation of settled solids.
11. A magnetic flow meter shall be installed on the discharge header with a signal to the control panel and capable of displaying flow in litres per minute and total flow in cubic meters. The meter may be installed in a separate vault outside of the discharge header well if required to minimize the well size.
12. This section must include a discussion on possible emergency overflow capability.
13. This section must include a discussion on the proposed well type. The Town will decide what type of system will be required based on ultimate flow. A general guide for well type is found in the following table:

<i>Circular Fibre Glass Wet Well Only System</i>	<i>Rectangular Reinforced or Prefabricated Concrete Wet Well Only System</i>	<i>Rectangular Reinforced Concrete Wet Well/Dry Well System</i>
Maximum submerged motor size of 75 HP.	Maximum submerged motor size of 75 HP.	Must use dry well pumps.
Maximum two submerged pumps for ultimate flows including standby.	Maximum three submerged pumps for ultimate flows including standby.	Must include wet well suction pipe and valves, and discharge header piping and valves for all future pumps.
Tank must be protected from buoyancy.	Tank must be protected from buoyancy.	

14. This section must include a plan and an elevation view drawing showing the station dimensions, equipment, piping, appurtenances, access, hoists, elevations, ventilation, control elevation points, etc.
15. This section must include a drawing showing the force mains from the lift station to the discharge manhole.

6.0 ELECTRICAL EQUIPMENT SELECTION

This section shall include a discussion of all of the following equipment meeting the specified standards:

1. An Emergency Generator system shall be sized to power the ultimate load for pumps operating at peak load plus miscellaneous loads such as lighting, receptacles and controls; diesel fuelled motor; removable through a louver or door in the generator structure; radiator cooling coupled directly to the engine; inlet and outlet louvers and dampers will be installed to ensure adequate cooling over the engine as well as combustion air; a hospital rated muffler may be required with the generator to minimize air pollution depending on the proximity of the station to other property.
2. Diesel fuel tank shall be an aboveground double-walled tank located in the generator building and sized to operate the station for 8 continuous hours with spill containment and alarms sized to hold 125% of the fuel tank volume. Fuel Tank to be located under the generator.
3. Generator control panel.
4. Main disconnect (Allan Bradley or Cutler Hammer).
5. Automatic transfer switch (Allan Bradley or Cutler Hammer).
6. Meter service box (Allan Bradley or Cutler Hammer).
7. VFD's.
8. Control panel c/w PLC (Allan Bradley) and DTAM.
9. Milltronics level controller.
10. Uninterruptible power supply (UPS).
11. Transformer and circuit panel board.
12. Ventilation equipment and control panel.
13. Supplemental exhaust fan c/w inlet louver and damper.
14. Explosion proof lighting in wet well.
15. Other lighting.
16. Receptacles.
17. Sensors, devices, modems and all necessary equipment to connect to the Town's SCADA System.
18. This section shall include a plan view drawing of the generator/control building.

7.0 LIFT STATION CONTROL PHILOSOPHY

This section shall include all of the following as a minimum:

1. A drawing showing the elevations for level transmitter and level switches.
2. The effective volume between pump on and pump off must be set to meet Alberta Environment regulations which require pumping at least every 30 minutes at the average initial flow.
3. The station must typically operate in Automatic mode controlled by the PLC located in the control building.
4. The pumps must be capable of operating in either Manual or Automatic mode though a Hand-Off Automatic (HOA) selector switch for each motor.
5. There must be a low level and a low low level switch located in the wet well to shut down the pumps in either mode. Specify elevations.
6. Specify lead pump on and off elevations.
7. Specify lag pump on and off elevations.
8. Specify High level Alarm and High High Level Alarm elevations.
9. Specify maximum and minimum pump RPM speed.
10. In the Automatic mode the level transmitter will provide information to the PLC/VFD to control the speed of the pumps using a 4 to 20 mA signal.
11. The section must include discussion on the minimum pump speeds required to maintain self-cleansing velocities in the force mains. Provide a table showing the minimum flows required for self-cleansing velocities in liters/second for each force main combination.
12. All PLC programming shall be completed by the Public Works Department with all costs billed to the Developer.

13. The following table lists the alarm points and the equipment that trigger the alarm point:

Alarm Condition	Equipment Source	Control Panel	SCADA System
Pump Failure for each pump	Safety devices	✓	✓
High High Alarm Level (xxx m)	Level Switch	✓	✓
High Alarm Level (xxx m)	Level Transmitter	✓	✓
Low Alarm Level (xxx m)	Level Transmitter	✓	✓
Low Low Alarm Level (xxx m)	Level Switch	✓	✓
Utility Power Failure	Automatic Transfer Switch	✓	✓
Generator Failure	Generator control panel	✓	✓
UPS Failure	UPS	✓	
Dry Well High Level (xxx m)	Level Switch in dry well	✓	✓
Fuel Tank Leaking	Sensor in secondary fuel containment area	✓	✓
Fuel Tank Low Level (1/2 full)	Level switch in fuel tank	✓	✓
Intrusion	Contacts on door way	✓	✓
Fire	Smoke and heat detectors	✓	✓
Low building temperature	Thermostats (main floor, dry well)	✓	✓
Wet well ventilation failure	Wet well blower	✓	✓
Dry well ventilation failure	Dry well blower/heater	✓	✓
Level transmitter failure	Level transmitter	✓	✓

8.0 ARCHITECTURAL AND STRUCTURAL

This section shall include all of the following as a minimum:

1. Aboveground structures architectural features to blend the facility appropriately into the surrounding neighborhood to include a description of the exterior finish, roof line and finish, doors, louvers, ventilation protrusions, etc.
2. Landscaping features shall be proposed to include paved driveway and parking for service vehicles, turf and irrigation, fencing.
3. The structural features of wells shall include a description of hatches; lifting rails and cranes; aluminum stairwells, rails and grating; ladders, etc.
4. The building structure shall be insulated concrete block for interior and exterior walls on a reinforced concrete foundation with standard steel doors and frames with panic hardware and locksets.
5. A color architectural elevation drawing shall be included showing all four sides of the above ground structure and landscaping features.

9.0 VENTILATION

This section shall include all of the following as a minimum:

1. Separate wet well and dry well ventilation systems.
2. Wet well and Dry well ventilation shall be continuous at 6 changes/hour with a blower/heater.
3. The volume and required flow (cfm) shall be calculated and shown.
4. The Public Works Department will determine whether the generator/control building will require electric or natural gas unit heaters.

10.0 PERMITS AND APPROVALS

The following table shall be completed with any additional approvals included as required:

Approval Authority	Contact Person	Nature of Approval	Obtained By	Approval/Permit Requirement
Public Works Department	Town Engineer	Acceptance of Preliminary Design Report	Developer	Upon completion of report
Public Works Department	Town Engineer	Preliminary acceptance of Detailed Design	Developer	Upon completion of detailed design
Alberta Environment	Lethbridge Office	Permit to construct and License amendment	Developer	Upon completion of detailed design
Public Works Department	Town Engineer	Final acceptance of Detailed Design	Developer	Upon receipt of AENV approvals
Public Works Department	Town Engineer	Construction acceptance	Developer	Upon completion of construction, commissioning and submission of operation manual and O&M Manual
Public Works Department	Development Officer	Development permit	Developer	As required by Planning Department

11.0 COSTS

This section shall include a breakdown of estimated costs as follows:

1. Engineering design and construction supervision.
2. Site.
3. Structure (including architectural).
4. Mechanical and electrical.
5. Forcemain(s).
6. Site utilities.

12.0 IMPLEMENTATION SCHEDULE

This section shall include the following dates:

1. Start Preliminary Design Phase.
2. End Preliminary Design Phase.
3. Start Detailed Design Phase.
4. End Detailed Design Phase.
5. Start Construction Phase.
6. End Construction Phase.
7. Commissioning week.
8. Estimated Start Warranty Period.
9. Estimated End Warranty Period.

ANNEX D – OPERATION AND MAINTENANCE MANUAL

This section shall include copies of all manufacturer's brochures and specifications specific to the type and model installed for the following equipment:

1. pumps.
2. motors.
3. valves.
4. meters.
5. level measurement.
6. lights, heaters, blowers and ventilation equipment.
7. generator.
8. VFD's.
9. PLC.
10. UPS.
11. Cathodic Protection.
12. electrical devices.

1.0 MANUAL

An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified.

2.0 GENERAL

1. Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
2. Submit one complete Operation and Maintenance Manual to Town three (3) weeks prior to application for Substantial Performance of the project. Submit a total of three (3) copies of the Manual after approval by the Town. The final Manuals must be submitted prior to releasing of holdback monies.
3. All instructions in this Manual shall be, as much as possible, in non-technical terms to guide the Owner in the proper operation and maintenance of this facility.
4. In addition to information called for in the specification, include the following:
 - a. Title sheet, labeled "Operation and Maintenance Instructions" and containing the project name and date.
 - b. Table of Contents.

OPERATION AND MAINTENANCE MANUAL - ANNEX D

- c. Names of the General Contractor, subcontractors, suppliers and manufacturers. In addition, supply the names of the local service representatives and phone numbers and addresses at which they can be contacted.
- d. Reviewed shop drawings of all equipment.
- e. Information shall include but not be limited to:
 - i pumps, motors, pump curves, pump shafts, bearings
 - ii check valves, knife gate valves, plug valves
 - iii level sensors, level switches
 - iv pressure switches and transducers
 - v flow meters
 - vi control equipment and PLC's
 - vii building system and hardware
 - viii heating and ventilating equipment
 - ix motor control centre
 - x variable frequency drives
 - xi generation equipment including fuel tank and control panel
 - xii automatic transfer switch
 - xiii uninterruptible power supply
 - xiv lifting beam and hoist equipment
- f. Full description of each facility, controls, electrical and mechanical systems and operation.
- g. Full description of preventative maintenance requirements for each piece of equipment, on a daily, weekly, monthly, quarterly and yearly basis. Prepare a separate listing of all preventative maintenance required for all equipment. One listing for each: daily, weekly, monthly, quarterly, and yearly. Place listing at the beginning of the Operations and Maintenance Manual.
- h. List of warranties.
- i. Copies of approvals and certificates.
- j. A detailed description of the control philosophy of each facility and an explanation of each alarm point, its' meaning and suggestions to rectify the problem.
- k. If information relative to equipment covers several models of the equipment, stipulate at the beginning of each equipment section the specific model supplied to the project.

3.0 BINDERS AND MATERIALS

1. Provide a binder for the "Name" Lift Station.
2. Material: label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets. Organize data into same numerical order as contract specifications.
3. Type lists and notes.

4. Drawings, diagrams and manufacturers literature must be legible.
5. Binders: Atlas expansion binder, complete with heavy weight tanotex cloth covering with gold imprinting. Binders available from Atlas Book Binary (1961) Ltd. 452-9130.

Cover to read as follows:

Operation and Maintenance
Manual

Town of Coalhurst

("Name" Lift Station)

Tender No. XXXX-XXX
Year

Prime Consultant:
General Contractor:
Mechanical Contractor:
Electrical Contractor:

6. Identify contents of each binder on spline.

Spline to read as follows:

Operation and Maintenance
Manual

Town of Coalhurst

("Name" Lift Station)

Tender No. XXXX-XXX
Year