



C I T Y O F
FORT SASKATCHEWAN
A L B E R T A

Engineering and Servicing Standards

NOVEMBER 2013

LIST OF REVISIONS AND APPROVAL

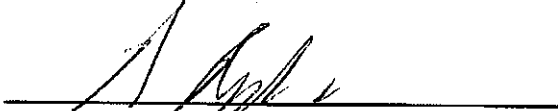
REVISION	DESCRIPTION
FEBRUARY 2013	Complete Issue of Engineering and Servicing Standards Excluding Schedule A
JUNE 2013	Revised per COFS UDI Technical Committee comments from April 15, 2013 meeting.
NOVEMBER 2013	Issued for approval.
AUGUST 2019	Schedule C, Section 6 Landscaping. Entire section has been updated.


COFS UDI REPRESENTATIVE

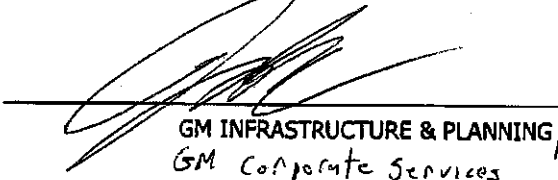
SEPT 3, 2019
DATE


DIRECTOR FLEET, FACILITIES & ENGINEERING

Sept 4, 2019
DATE


DIRECTOR PUBLIC WORKS

Sept 5/19.
DATE


GM INFRASTRUCTURE & PLANNING/Acting.
GM Corporate Services

Sept 6/19
DATE

JUNE 2013 REVISION LIST

- 3.17 Eliminated requirement for submission of Asbuilt Drawings in order to achieve construction completion.
- 3.19 Updated to include requirement of Asbuilt Drawings in order to achieve final acceptance.

Schedule B

- 3.2.b Updated to 2 decimal places.
- 3.2.d Updated to hectares to 2 decimal places.
- 4.1 Added clarification that sections 4.2 through 4.5 are recommendations, not requirements.
- 5.1 Requirements revised to include City logo, Type of drawings, Stage and Year.
- 5.11 Changed requirement for plan/profile drawings to not necessitate multiple drawings for different services

Schedule C

- 1.4.2 Revised the vertical separation of a watermain over a sewer main to 0.3m from 0.5m to match spec in 2.20
- 2.9 Inserted wording to allow for 150mm watermains in cul-de-sacs
- 2.15 Addition of requirement for 120m spacing for hydrants in multi-family residential and school zones
- 2.18 Returned curb stop distance from right-of-way to 150mm from 300mm
- 2.18 Inserted the section of materials from the old document and re-categorized the new standards into the old format
- 2.23 Removed text of constant maximum allowable leakage that was in contradiction with formula provided
- W-06 Corrected CC location to 150mm inside easement (300mm shown previously)
- W-10 Detail added for single service connection
- W-11 Detail added for dual service connection
- 3.13 Changed sanitary service depth back to 2.6m from 2.8m so that standards are met in 3.18.2
- 3.18.3 Changed grade back to 2.0% to allow for contractor error
- 3.18.4 Inserted information on the requirement of sanitary service risers
- 3.18.4 Inserted information of material specifications on service connections.
- S-05 Corrected color issues
- S-08 Corrected color issues
- 4.6.1 Inserted table from old standard for more comprehensive calculation of runoff coefficient
- 4.6.4 Removed section on use of airport method. Changed inlet time to 15 minutes because the 10 minute factor of safety was unnecessarily conservative
- 4.9.1 Removed note on waiting for Land Use Bylaw city council approval
- 4.10 Added specification for required slope on grass swales
- 4.11 Changed the wording of "detention facility" to stormwater management pond.
- 4.11 Inserted additional specification for the lowest building opening
- 4.25 Removed requirement for "Storm Sewer" to be stamped on manhole covers
- 4.28 Inserted text on acceptable material for catch basin leads from old standards
- 4.28 Added differentiation between local road and arterial road manhole separation requirements
- 4.28 Inserted requirement for sump depths in catchbasins
- 4.28 Removed requirement for catchbasins at intersections. Could result in redundant catch basins. Assume common sense is to be used. Catch basins should not be used at a high intersection.
- 4.28 Changed depth of cover to depth of cover to invert to reach grade requirements of leads
- 4.28 Removed capacity for ponding depth chart because of incomplete information and lack of resources to complete it.
- 4.29 Inserted text from old standard that clarifies requirement for foundation drain service risers

- 4.30 Changed wording on maximum flow depth to reflect old standards
- 4.35.3 Added specification for use of Manning's equation
- 5.0 Reverted to 2005 standard for required drawings.
- 5.9 Returned curve radii to original 225m
- 5.10 Returned maximum gradient on local and collector roads to 6%
- 5.11 Removed specification for maximum length of public lanes
- 5.15.2 Corrected wording from public lane to local road
- 5.15.3 Removed specification for specifically monolithic walk because of conflict with statement requiring all separate sidewalk
- 5.20.3 Reverted local roadway accesses to 1.5m from property line
- 5.20.8 Added Cul-de-sac requirements
- 6.2 Revised to eliminate requirement of paper submission for record drawings.

NOVEMBER 2013 REVISION LIST

Schedule B

- 3.17.d Clarified to state service invert elevations required.
- 5.4 Added note to include ASCM information on grading plan.

Schedule C

- 1.4.2 Updated minimum clearance for watermain to 0.5m below and 0.3m above sewer. Eliminated requirement for pipe wrapping for installs meeting minimum clearance guidelines.
- 2.16 Corrected to magnesium anodes.
- 2.19 Revised backfilling in landscaped areas to min 95% SPD.
- 2.22 Corrected to 1035 kPa (150 psi) minimum test pressure.
- W-04 Corrected to magnesium anodes.
- 3.12 Revised section on curved sewers.
- 3.18.4 Corrected to 4.0m depth for sanitary service risers.
- 3.18.4 Service connections in manholes corrected to state "no more than 2 service connections into manhole".
- 4.6.1 Eliminated redundant table.
- 4.20 Added more information on curved sewers.
- 4.29 Corrected depth of cover for service and service riser.

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SCHEDULES:

SCHEDULE A	Subdivision and Development Requirements (*NOT INCLUDED IN NOV 2013*)
SCHEDULE B	Engineering Drawing Standards
SCHEDULE C	Engineering Design Standards

1.0 DEFINITIONS

Unless the context requires otherwise:

"Act" means *Municipal Government Act*, *Land Titles Act*, and any other *Act* named herein and found in the Statutes of Alberta, as amended, both before and after the date of this document.

"Alley" means a narrow highway intended chiefly to give access to the rear of buildings and parcels of land.

"Applicant" means a person applying for the approval of a subdivision, pursuant to the provision of the *Municipal Government Act*, as amended, or a person applying for development other than subdivision, whether as the Owner of the property proposed to be subdivided or developed or as agent for the Owner or his contractor.

"Approval, Preliminary Layout" means written notification of a review of information presented to the Subdivision Authority previous to submission of a subdivision plan for final approval.

"Arterial Roadway" means a highway with the primary function of carrying all types of through traffic from one area to another and a secondary function of providing access to adjacent parcels of land.

"Boulevard" means that portion of a highway between the curb lines or the lateral boundary lines of a roadway and the adjoining property or between curbs on median strips or islands, but does not include curbs, sidewalks, ditches or driveways.

"City" means the City of Fort Saskatchewan or the area within the municipal boundaries thereof as the context may require.

"City Engineer" means the Engineer, or his designate, as appointed by the Chief Administrative Officer of the City of Fort Saskatchewan.

"Collector Roadway" means a highway with equal priority functions of distributing traffic between arterials and lower classifications of roads such as other collectors and local roads and providing access to adjacent parcels of land.

"Community Sewer System" means a sanitary sewer or a system of sewage disposal works which is owned, operated and maintained by the Municipality.

"Community Water System" means a waterworks system, which is owned, operated and maintained by the Municipality.

"Construction Completion Certificate" means the certificate issued by the City of Fort Saskatchewan certifying the completion of the municipal improvements, or a portion thereof, once the municipal improvements have been constructed and installed by the Owner/Applicant to the satisfaction of the Municipality without defects or deficiencies.

"Council" means the Council of the City of Fort Saskatchewan.

"Cul-de-sac" means a local street that is connected to the remainder of the road network at only one point and that terminates in a vehicle-turning area.

"Design Engineer" means the Professional Engineer engaged by the Owner/Applicant to design and prepare drawings for construction of works in a subdivision or development, or his authorized representative.

"Development" shall be interpreted as defined in the *Municipal Government Act*, as amended.

"District" means an area created by the current City of Fort Saskatchewan Land Use Bylaw, as amended, or as replaced from time to time both before and after the effective date of this document.

"Drainage System" means a system of works designed and constructed to control the flow of storm water and/or ground water.

"Final Acceptance Certificate" means a written acceptance issued by the City of Fort Saskatchewan for the municipal improvement, or a portion thereof, upon the completion of any repairs for defects or deficiencies, and the expiration of the Maintenance period.

"Frontage" means the length of a lot boundary which immediately adjoins a highway other than a lane or a walkway.

"Highway" means any thoroughfare, street, road, trail, avenue, parkway, driveway, viaduct, lane, alley, square, bridge, causeway, trestleway or other place or any part of any of them, whether publicly or privately owned, that the public is ordinarily entitled or permitted to use for the passage or parking of vehicles and includes

- (i) a sidewalk, including a boulevard adjacent to the sidewalk,
- (ii) if a ditch lies adjacent to and parallel with the roadway, the ditch, and
- (iii) if a highway right of way is contained between fences or between a fence and one side of the roadway, all the land between the fences, or all the land between the fence and the edge of the roadway, as the case may be,

but does not include a place declared by regulation not to be a highway.

"Industrial Roadway" means a local street that provides access to adjacent parcels districted for industrial use.

"Land Use Bylaw" means the current Land Use Bylaw of the City of Fort Saskatchewan as amended.

"Local Roadway" means a highway with the primary function of providing direct access to adjacent parcels of land and generally connects to other local roads and collector roads.

"Lot" means a quarter section; a part of a parcel where the boundaries of the part are separately described in a certificate of title other than by reference to a legal subdivision; or in part of a parcel where the boundaries of the part are described in a certificate of title by reference to a Plan of Subdivision.

"Lot Depth" means the average horizontal distance between the front and rear lot lines.

"Lot Line, Front" means the property line of a lot abutting a public roadway other than a lane. In the case of a corner lot, the front lot line is the shorter of the property lines abutting a public roadway, other than a lane.

"Lot Line, Rear" means either the property line of a lot which is furthest from and opposite the front lot line, or where there is no such property line, the point of intersection of any property lines other than a front lot line which is farthest from and opposite the front lot line.

"Lot Line, Side" means the property line of a lot other than front lot line or rear lot line.

"Lot Width" means the horizontal distance between side lot lines of the site measured at a distance from the front lot line equal to the minimum required front yard.

"Medical Officer of Health" means the Medical Officer of Health appointed under the *Public Health Act*, as amended.

"Municipality" means the City of Fort Saskatchewan or the area within the municipal boundaries thereof as the context may require.

"Owner" shall be interpreted as defined in the *Municipal Government Act*, as amended.

"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 the aggregate of the one or more areas of land described in a Certificate of Title or described in a Certificate of Title by reference to a plan filed or registered in a Land Titles Office.

"Pathway" means a path which follows routes independent of motor vehicle roadways, sidewalks and bike lanes, intended for use by pedestrians and other non-motorized modes of travel.

"Potable Water" means water which is approved for drinking purposes by the Medical Officer of Health.

"Professional Engineer" means a person who is registered or duly licensed as such with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA).

"Proven Supply" means that a supply of potable water is available and proven with respect to volume, delivery and continuity of supply from an on-site groundwater system, a source requiring a water license from Alberta Environment or a community water system.

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

"Service Level" means the standard of municipal services required for development of subdivisions under the provisions of this document.

"Site" means any combination of lots or titled areas for which application is made for a Development Permit.

"Statutory Plan" means a planning document as described in Part 17, Division 4 of the *Municipal Government Act*, as amended, including Intermunicipal Development Plans, Municipal Development Plans, Area Structure Plans, or Area Redevelopment Plans.

"Street" means a highway except a lane, trail or walkway.

"Subdivision" means the division of land into two or more parcels by plan or apt descriptive words.

"Subdivision Authority" means any person duly authorized by the Municipal Council to act as Subdivision Authority Officer pursuant to the provisions of the *Municipal Government Act*, as amended.

"Top of Slope, Embankment or Escarpment" means the natural defined top edge of a slope, embankment or escarpment; or, where a gradual steepening exists, the point at which the slope exceeds 30% grade.

"Watercourse" means any natural or man-made drainage course or source of water, whether usually containing water or not, and includes any lake, river, creek, spring, ravine, swamp, gulch, or source of groundwater, whether enclosed in a conduit or not.

2.0 SUBDIVISION AND DEVELOPMENT REQUIREMENTS AND REGULATIONS

2.1 Purpose Statement

No person shall subdivide or develop land in the City of Fort Saskatchewan except in compliance with the provisions of this document, the Land Use Bylaw, any applicable statutory plan, or the requirements of the *Municipal Government Act*, as amended. Compliance with the above documents or regulations does not remove obligations to conform with other municipal, provincial, or federal legislation, policies, or bylaws, or any caveats, covenants, or easements that may be attached to a site.

2.2 General Requirements for Design of Subdivisions

No subdivision of land shall be approved which:

- a) is not suited to the configuration of land being subdivided;
- b) is not suited to the use to which it is intended;
- c) is not in conformance with the Land Use Bylaw;
- d) is not in conformance with any statutory plan adopted by the City of Fort Saskatchewan;
or
- e) will make impracticable the future subdivision of the land within the proposed subdivision or of any adjacent land.

2.3 Area, Shape and Dimensions of Lots

- a) No subdivision shall be created in any district so that any lot created by the subdivision has an area in square metres or hectares or a width in metres less than those set out for the district in which it is located as set out in the current City of Fort Saskatchewan Land Use Bylaw, as amended.
- b) The side lines of parcels to be created by the subdivision shall be as close as practicable at right angles or radial to street lines and the Subdivision Authority shall ensure that the parcels to be created are logical in shape and dimension for the use intended.

- c) No panhandle parcels will be permitted as part of any decision of a tentative plan of subdivision by the Subdivision Authority.
- d) The location of all public utility lots, utility rights-of-ways, municipal reserve and environmental reserve parcels proposed under a tentative plan of subdivision shall be to the satisfaction of the Subdivision Authority.

3.0 PROVISION OF SERVICES IN SUBDIVISIONS AND DEVELOPMENTS

3.1 Level of Service

Unless otherwise approved by the Subdivision Authority, all subdivisions and developments shall be provided with municipal water and sewer servicing.

3.2 Expense of Service to be Borne by the Owner/Applicant

The following expenses are to be borne solely by the Owner/Applicant:

- a) All reasonable and justifiable charges or accounts rendered to the City of Fort Saskatchewan by Consulting Engineers that may be engaged by the City of Fort Saskatchewan from the time plans are submitted until final acceptance of all municipal improvements.
- b) All reasonable and justifiable legal charges or accounts rendered to the City of Fort Saskatchewan by solicitors from the time of application for subdivision until final acceptance of all municipal improvements.
- c) Cost of additional work performed or of work repaired or redone by reason of orders and direction by the City's Engineer under the terms of the Development Agreement.
- d) Cost of providing the security and insurance required to be provided by the Owner/Applicant under the terms of the Development Agreement.
- e) Cost of preparation of an easement or utility right-of-way document(s) to be provided by the Owner/Applicant including cost of registration of the same.
- f) Cost of land title registrations of the Development Agreement.

3.3 Indemnity and Insurance

The Owner/Applicant shall indemnify and save harmless the City of Fort Saskatchewan from any and all losses, costs, damages, actions, causes of action, suits, claims and demands, resulting from anything done or omitted to be done by the Developer in pursuance or purported pursuance of this Agreement.

The Owner/Applicant must provide and maintain, at the Owner/Applicant's expense, at all times until the Certificate of Final Acceptance is issued, Comprehensive General Liability Insurance coverage, covering premises and operations liability, contingency liability with respect to the operations of contractors and sub-contractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units.

The limits of liability must be not less than \$5,000,000 for each occurrence for bodily injury, death and damage to property. Each policy must provide that it can not be cancelled, lapsed, or materially altered without a minimum thirty (30) days notice in writing to the City by registered

mail, must name the City and its officials and employees as an additional insured, and must contain a cross-liability clause.

The insurance coverage required to be provided by the Owner/Applicant may be embodied in a blanket insurance policy obtained by the Owner/Applicant. The Owner/Applicant must deliver a copy of each insurance policy to the City prior to the commencement of Construction of the Works and Services. If the Owner/Applicant fails to obtain and maintain the said insurance or deliver the said policy or policies to the City, the City may but will not be obliged to obtain and maintain such insurance at the expense of the Owner/Applicant.

3.4 Traffic Impact Assessment

Depending on the nature of the development, the surrounding neighbourhood and the adjacent transportation system, the City of Fort Saskatchewan may require that the Owner/Applicant submit a Traffic Impact Assessment completed by a qualified professional engineer(s).

The cost for the preparation and submission of the Traffic Impact Assessment will be entirely borne by the Owner/Applicant.

3.5 Offsite Utilities Impact Analysis

Depending on the nature of the development, the surrounding neighbourhood and the adjacent offsite utilities systems, the City of Fort Saskatchewan may require that the Owner/Applicant submit an Offsite Utilities Impact Analysis, completed by a qualified professional engineer(s). The Offsite Utilities Impact Analysis will discuss the impacts of the proposed development on the City's water, sanitary and storm sewer systems.

The cost for the preparation and submission of the Offsite Utilities Impact Analysis will be entirely borne by the Owner/Applicant.

3.6 Excess or Extended Capacity

Pursuant to Section 651(1) of the *Municipal Government Act*, as amended, the City may require that the Owner/Applicant provide excess or extended services to provide access to or service land other than the land being subdivided or developed.

3.7 Cost of Excess or Extended Capacity

The cost of providing excess capacity shall be derived by the following formula:

Cost of excess capacity = cost of installing system with excess capacity minus cost of installing system to service the proposed subdivision only or the minimum permitted for the size of line in the City servicing standards, as amended, whichever is greater.

The determination of the cost of excess capacity shall be based on estimates prepared by a professional engineer representing the Owner/Applicant of the land being subdivided, agreed to by the City Engineer.

3.8 Payment of Cost of Excess Capacity

Where the City requires the provision of excess capacity under Section 3.6, the cost of the excess capacity will be paid for by the Owner/Applicant of the land being subdivided.

3.9 Cost Recovery by an Owner/Applicant

Where the Owner/Applicant of land being subdivided pays for the cost of providing excess capacity under Section 3.8, the City may impose a charge under Section 3.10 and shall pay to that land owner all the charges collected during the period beginning after the works or services were completed and ending on a date to be agreed upon by the land owner and the City and failing agreement, to be determined pursuant to the International Commercial Arbitration Act, but no charges are payable beyond ten (10) years from the date service is completed and a Final Acceptance Certificate is issued.

3.10 Endeavour to Assist for Excess Capacity

The City may, as a condition of an Owner/Applicant connecting to works and services where excess capacity has been provided under 3.8, impose a charge and the charge shall be calculated as a proportion of the cost of providing excess capacity as determined under Section 3.7. The proportion of costs to be imposed on an Owner/Applicant shall be derived on the basis of the capacity of the system to be utilized by the Owner/Applicant in relation to the total excess capacity provided.

In calculating the charge to be imposed on the Owner/Applicant who wishes to connect, there shall be included in the total cost of providing excess capacity, interest calculated annually at the current Bank of Canada prime rate plus two percent (2%) payable for the period commencing when the work or service providing the excess capacity was completed, up to the date that the connection is made.

3.11 Off-Site Services

The Owner/Applicant shall be required to contribute towards the cost of upgrading or upsizing of off-site roads and utilities.

3.12 Right-of-Way Agreement

Pursuant to Sections 648, 651 and 655 of the *Municipal Government Act*, as amended, where the provisions of this document require an Owner/Applicant to grant a utility or drainage right-of-way to the City of Fort Saskatchewan, the Owner/Applicant shall be required to enter into a development agreement and shall pay all associated costs.

3.13 Subdivision Endorsement Prior to Completion of Works and Services

Endorsement of a subdivision must be granted prior to the construction and installation of any and all works and services as prescribed in Schedules A to D hereto at the expense of the Owner/Applicant to serve said subdivision.

Construction and installation of the required works and services may begin prior to endorsement of the plan of subdivision where:

- a) the Owner/Applicant provides a Letter of Credit to the City of Fort Saskatchewan in an amount representing Fifty Percent (50%) of the cost of installing and paying for all the works and services required as estimated by the Owner/Applicant's Engineer and approved by the City's Engineer, and
- b) the Owner/Applicant has submitted Detailed Engineering Design Drawings and after approval of the plans and specifications by the City, as outlined in Section 8.1 of Schedule A.

3.14 Site Preparation

- a) The Owner/Applicant shall erect fencing and provide other measures satisfactory to the City to ensure the stripping and grading does not encroach into Environmental Reserve land where applicable.
- b) The Owner/Applicant, at no expense to the City, shall erect "Private Property" and "No Trespassing" signs on the perimeter of the lands, stating the Owner/Applicant's name and the telephone number of a representative.
- c) The Owner/Applicant shall submit to the City for approval, proposed access routes identifying streets for site preparation and general construction.
- d) The Owner/Applicant shall be responsible for controlling restricted and noxious weeds and excessive vegetative growth within the Development Area.
- e) No grading, filling or excavation is permitted within existing utility and road rights-of-way, under any overhead utility lines, or over any underground utilities, unless prior written authorization has been obtained from the utility agencies concerned.
- f) If, during stripping and grading operations or any other construction within the Development Area, the Owner/Applicant or any of their agents or contractors becomes aware of any contamination, the person discovering such contamination shall forthwith report the contamination to Alberta Environmental Protection, the Capital Health Authority and the City of Fort Saskatchewan.
- g) In the event the Owner/Applicant encroaches into the adjacent land during the stripping and grading operations, the Owner/Applicant, at its sole expense, shall rehabilitate the adjacent lands to the satisfaction of the land owners immediately after completion of the stripping and rough grading of the adjacent lands.
- h) The Owner/Applicant, at its sole expense, and to the satisfaction of the City's Engineer, shall rehabilitate in a timely manner any offsite areas or operations, storm water runoff, soil erosion, soil instability, sedimentation, dust or other problems which may arise from the stripping and grading, and shall employ the use of gravel pads to curb dirt, mud or other debris from being tracked out onto any streets located within and adjacent to the Development Area and reduce or stop activity when the site has excessive dust emissions.

3.15 Dust Control

During construction of works and services, the Owner/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 land owners and residents in the area; or
- b) bare soil conditions are created in performing work.

Should the Owner/Applicant not implement dust control procedures as required or as directed by the City's Engineer, the City will undertake the dust control procedures and charge back the Owner/Applicant to recover all costs incurred including such things as engineering and administration costs, wages, equipment costs, etc.

3.16 Clean-Up

During construction of works and services within the subdivision or development, the Owner/Applicant shall be responsible for ensuring that the construction area shall be maintained free of accumulation of excess waste material and debris.

The disposal of waste materials and rubbish by burning or burial on the site will not be permitted. The disposal of volatile wastes such as mineral spirits, oil, gasoline or paint thinner into storm or sanitary sewer drains will not be permitted.

During and after construction of works and services, the Applicant shall be responsible for ensuring that all access streets into the subdivision or development are maintained free of accumulation of excess waste material and debris. The City reserves the right to carry out the maintenance of such access streets and charge the cost of such work to the Owner/Applicant, if the Owner/Applicant fails to restore the street(s) to normal levels within forty-eight (48) hours of being notified in writing by the City.

3.17 Construction Completion

Upon 100% completion of the works, the Design Engineer must schedule a field inspection with the City Engineer. Upon verification by the City Engineer that 100% Construction Completion of all Works and Services has been achieved, the Owner/Applicant must provide the City with:

- a) a confirmation of Professional Assurance;
- b) confirmation in writing from an Alberta Land Surveyor (A.L.S.) that all survey pins have been installed on the Parcel;
- c) all copies of required manuals, videos, testing reports and results in the form specified in Schedule A; and
- d) sanitary, storm and water service connection invert elevations.

Upon receipt of the above, the City will issue the Construction Completion Certificate.

3.18 Maintenance

Where the Owner/Applicant of land is required to construct and install works and services in accordance with the provisions of this Document, the Owner/Applicant shall be responsible to:

- a) provide the City with a Letter of Credit for up to two (2) years to the value of 10% of the constructed works plus 200% of the value of Deficiencies as security against unsatisfactory operation and maintenance of the works and services during the maintenance periods specified in the Development Agreement. Identified deficiencies must be addressed in a timeline considered reasonable by the City; and
- b) pay the City the inspection fees as specified in the Development Agreement.

With reasonable notice, the City may cash the Letter of Credit provided under Section 3.18 a) to address deficiencies that have not been appropriately remedied by the Owner/Applicant.

3.19 Certificate of Final Acceptance

Upon the expiration of all Maintenance Periods, submission and City approval of asbuilt drawings, receipt from the Owner/Applicant of a Statutory Declaration and verification by the City Engineer that all information, documents, agreements, covenants, and fees required from the Owner/Applicant and Design Engineer pursuant to this Document have been provided to the City, the City will:

- a) provide the Owner/Applicant with a Final Acceptance Certificate of all Works and Services; and
- b) release to the Owner/Applicant the balance of the Letter of Credit.

3.20 Business License

All contractors or other businesses undertaking works related to the requirements of this document must possess a valid business license from the City.

4.0 ADMINISTRATION AND ENFORCEMENT

4.1 Application Fee

An Application for Subdivision Approval will not be accepted by the City of Fort Saskatchewan unless the appropriate fee, as identified by Schedule A of the current Fees and Charges Bylaw as amended, has been provided.

4.2 Inspection Fees

The Development Agreement sets out inspection fees for constructing utilities and roads required for the new subdivision.

4.3 Authorization to Enter Lands Being Subdivided

Officers of the City of Fort Saskatchewan, or their designates, 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 Document are being met.

4.4 Violation

Every person who:

- a) violates any of the provisions of this Document;
- b) causes or permits any act or thing to be done in contravention or violation of any of the provisions of this Document;
- c) neglects or omits to do anything required under this Document;
- d) carries out, causes or permits to be carried out any development in a manner prohibited by or contrary to any of the provisions of this Document;
- e) fails to comply with an order, direction or notice given under this Document; or

- f) prevents or obstructs or attempts to prevent or obstruct the authorized entry of an officer on a property under Section 4.3;

shall be deemed to be guilty upon summary conviction of an offence under this Document.

4.5 Offence

Each day's continuance of an offence under Section 4.4 constitutes a new and distinct offence.

4.6 Penalty

Any person who violates any of the provisions of this Document shall, on summary conviction, be liable to a penalty not exceeding \$10,000 plus the cost of prosecution for each offence.

4.7 Completion

Should any person fail to construct or install any works or services required under this Document, the Municipality, its agents or servants may construct or install the works and services at the expense of the person in default, and the expense thereof, with interest at the Bank of Canada prime rate plus two percent (2%) per annum with costs, may be recovered in like manner as municipal taxes as provided under the provisions of Section 553 of the *Municipal Government Act*, as amended, and may in addition to any other remedy available to the City, be collected in the same manner and with the like remedies as ordinary taxes upon Land and improvements are collected under the said Act, as amended.

4.8 Severability

If any section, subsection, sentence, clause or phrase of this Document 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 Document.

4.9 Schedules Form Part of Document

Schedules A through C are attached to and form part of this Document.



C I T Y O F
FORT SASKATCHEWAN
A L B E R T A

Engineering and Servicing Standards

SCHEDULE B

ENGINEERING DRAWING STANDARDS

NOVEMBER 2013

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1.0 GENERAL REQUIREMENTS

This Document outlines the minimum standards and requirements for design and As-Built Drawing submissions for engineering work(s).

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

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

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

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

Elevations shall be referred to geodetic datum. Horizontal coordinates shall be referenced to 3TM grid coordinate system NAD83.

2.0 ABBREVIATIONS

3TM	3-degree Transverse Mercator
NAD83	1983 North American Datum
FOC	Face of Curb
GUT	Gutter Line
EC	End of Curve
BC	Beginning of Curve
PI	Point of Intersection

3.0 DRAFTING STANDARDS

3.1. Sheet Layout

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

- a) sheet size to be ANSI D 558.8 mm x 863.6 mm (22" x 34");
- b) a north arrow shall be placed close to the top right side of each plan view on the sheet. Where feasible, the north arrow shall point to the top of the page;
- c) a title block which describes the contents of the drawing (eg. Key plan, road, etc) and shall clearly indicate the location of the works by road name(s) and/or legal description; and
- d) drawing scale, date, revision history block, and a detailed legend shall also be included on each sheet layout.

3.2. Dimensions and Units

The following conventions must be used:

- a) dimensions and units must be shown in metric. No imperial units are permitted;
- b) all distances, elevations, and coordinates shall be given in meters to accuracy of 2 decimal places;
- c) grades shall be given as a percentage to accuracy of 2 decimal places;
- d) areas shall be in hectares to accuracy of 2 decimal places;
- e) all pipe sizes shall be given in millimeters as per ASTM specifications using: 1" = 25mm; and
- f) existing imperial dimensions, except for pipe sizes, are to be soft converted using the factors:

1 inch = 25.4 millimeters
1 foot = 0.3048 meters.

3.3. Lettering

The following conventions must be used:

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

3.4. Scales

The following scales shall be normally used:

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

4.0 DRAWING STANDARDS (DIGITAL)

4.1. General Requirements

The Owner/Applicant will be required to submit to the City of Fort Saskatchewan a complete set of electronic drawings of the Subdivision or Development in AutoCAD DWG format compatible with the current version of AutoCAD upon completion of the proposed works.

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

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

Sections 4.2 through 4.5 outline recommended drafting standards, however these are not required.

4.2. Layer Names and Colours

The City of Fort Saskatchewan uses the following convention for naming AutoCAD layers:

<category>-<object>-<type>

Where the available 'categories' are defined below and 'objects' could be lines, mains, manholes, valves, walls, fences, and text; and 'type' describes the type of object.

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

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

Some common layer examples are:

SAN-MAIN-200mm
ROAD-EDGE-ASPHALT
SURV-POINT-CONTROL

Required layer names may be prefixed as shown below to signify either existing, proposed, or future works.

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

4.3. Special Layers

Exceptions to the layer naming convention described are listed below:

Layer Category	Category Description	Colour Pen #
_MVIEW	Viewports	0
_IMAGE	Externally Referenced Images	0
_TITLE	Title Block Data (text and line work)	180, 182 & 184

4.4. Line Weight Conventions

Colours 180, 182, and 184 are generally used for Title blocks and miscellaneous text and notes.

180	0.60	black
182	0.30	black
184	0.20	black

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

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

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

10, 20, 150...	0.60	black
12, 22, 152...	0.40	black
14, 24, 154...	0.35	black
16, 26, 156...	0.30	black
18, 28, 158...	0.20	black

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

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

	W	WATER MAIN
	S	SANITARY SEWER
	FM	SANITARY FORCE MAIN
	D	STORM SEWER
	G	GAS
	T	TELEPHONE
	TV	CABLE
	G/H	OVERHEAD UTILITY
	U/G	UNDERGROUND UTILITY
		PAVEMENT EDGE
		GRAVEL EDGE
		BOTTOM OF SLOPE
		TOP OF SLOPE
	X	FENCE
		SWALE
		DITCH
		VEGETATION BDRY
		BUILDING

All plans should include the property lines, lot-block numbers, street names and construction limits. Drawings and/or drawing elements may be combined at the discretion of the Engineer. Distinction shall be made between existing, proposed, and future features.

In addition to any other requirements presented in this document, the cover sheet shall show the following information:

- Note: The standards defined in Sections 3.1 c), 3.1 d), and 3.3 do NOT apply to the cover sheet.

5.2. Index Plan

This Plan will indicate which portion of the development that relates to a particular plan/profile sheet. A complete list of the drawing set(s) is to be included.

5.3. Legal Plan

This Plan shall indicate parcel, ROW, easement, and PUL dimensions; relevant control stations and benchmarks.

5.4. Contour and Lot Grading Plan

This Plan shall indicate the following:

- a) The existing contours and elevations at a maximum of 0.5metre intervals, all existing topographical features such as trees, buildings, utilities, etc., and the date and method of survey
- b) Proposed finished lot corner elevations and lot grades
- c) Proposed finished elevation of the building
- d) Proposed swale locations
- e) Directions of surface drainage flow
- f) Ponding areas
- g) Include note listing all ASCM's used for elevation control

5.5. Road, Sidewalk & Walkway Plan

This Plan shall indicate the following:

- a) All locations, dimensions, and alignments of roads, lanes, ditches, walkways, curb ramps, temporary access connections, signs, and other proposed topographical features
- b) BC and EC locations and radii of curvature
- c) Date and author of geotechnical report specifying pavement structure

5.6. Sanitary, Storm & Watermain Overall Plan

This plan shall indicate the following for all mains and related components/ appurtenances:

- a) The location, alignment, and offsets
- b) Network type
- c) Size
- d) Material
- e) Direction of flow

5.7. Basin Plan

This plan shall indicate the following:

- a) Contributing storm and sanitary sewer catchment boundaries and areas in hectares
- b) Direction of flow and discharge point through each catchment
- c) Fire hydrant service radii in meters
- d) Calculations for design flows, flow restrictors, pipe/channel capacities, and storage requirements and capacities
- e) Date and author of report or outline plan used as a reference

5.8. Key Plan(s)

In addition to any other requirements presented in this document, Key Plans shall show the following information:

- a) Lot numbers, plan numbers, and road names of the subject Development and adjoining properties.
- b) Cross reference of the drawings by outlining the area contained in each drawing and referencing that drawing by drawing number.
- c) General construction notes.

5.9. Building Envelope Plan (if applicable)

In addition to any other requirements presented in this document, Building Envelope Plan shall show the following information:

- a) Overall plan of current phase.
- b) Lot numbers.
- c) Roads, curbs, gutters and sidewalks.
- d) Rights of way and easements.
- e) Offset lines from all property boundaries indicating required building setbacks.
- f) 10 meter by 10 meter square on each parcel indicating the required minimum building envelope.
- g) Notes that indicate the required setbacks from all property boundaries pursuant to the Zoning Bylaw.

5.10. Composite Plan(s) (as required)

In addition to any other requirements presented in this document, Composite Plans shall show the following information:

- a) All existing and proposed utilities, roads, walkways, and sidewalks.
- b) All rights of way and easements including widths.
- c) Control monuments with identification number.
- d) All legal information, including bearings, dimensions, lot numbers, block numbers, legal plan numbers, and street names. All lots must be numbered.
- e) Show legal lot line dimensions.
- f) All roadway dimensions including width of right of way, FOC to FOC (GUT to GUT) and FOC (GUT) to edge of right of way.
- g) Area of each parcel.

5.11. Plan / Profile Drawings - General

In addition to any other requirements of this document, Plan/Profile drawings shall conform to the following:

- a) Both plan and profile stationing must be tied to a property line or road boundary.
- b) The profile shall be shown at true centerline length and projected below the plan in as close a horizontal relationship as possible.
- c) The top half of a Plan/Profile sheet shall show the plan view and shall show the legal layout with legal descriptions of all properties, the location of all curbs, sidewalks, underground utilities such as water, sanitary and storm sewer, manholes, catch basins, culverts, valves, hydrants, shallow utilities such as gas, power, street lights, telephone, cable and all survey monuments, but not limited to the above.
- d) Drawings shall also show existing dwellings, fences, trees, hedges, unusual ground features, existing roads and driveways including the type such as asphalt, concrete or gravel.
- e) Plan/Profile drawings for various services are to be combined on one plan.

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

Road **Plan** views shall show the following information:

- a) Width of road, width of shoulders, and the offset of curb (FOC/GUT) from property line.
- b) Chainages of the BC and EC of horizontal curves shall be shown together with the delta angle, centerline radius, tangent length, and centerline arc length. Curb radii are not required if the centerline radius and road width are shown, except on curb returns at intersections and at the end of cul-de-sacs.
- c) Quarter point gutter elevations for cul-de-sac.

- d) Catchbasin rim elevations.

Road **Profile** views shall show the following information:

- a) Design gutter and/or centerline grade (%).
- b) Vertical curve chainage and elevations of BC, EC and PI; the external value, e; the length of vertical curve; the chainage and elevation of the low spot of sag curves; and, K value of vertical curvature (crest on sag).
- c) Existing ground elevation along the centerline of proposed roadway and/or the edge of existing asphalt.

5.13. Water Plan/Profile Drawings (may be combined with Sanitary Sewer and Storm Mains)

Water **Plan** views shall show the following information:

- a) Offset of pipelines from property lines;
- b) Length and size of pipe;
- c) Offset of connections from property lines;
- d) Locations of manholes, hydrants, valves, services, end-of-main, or other appurtenances referenced to nearest property line;
- e) Information on any curves or pipe deflections;
- f) Easements (existing and/or required); and
- g) Location and connection details for all valves and fittings.

Water **Profile** views shall show the following information:

- a) Surface profiles (existing and design, if applicable) over proposed main.
- b) Length, size, grade, type, and material of pipe.
- c) Profiles of invert and crown of pipes.
- d) Location, type and invert elevation of all crossing utilities.
- e) Stationing of all valves, fittings and appurtenances.
- f) Anchor block locations.

5.14. Storm Drains and Sanitary Sewer Plan/Profile Drawings

Storm & Sanitary **Plan** views shall show the following information:

- a) The drawings shall show the structural details of all manholes and chambers, etc. not covered by standard drawings. Where the sanitary sewers and storm drains or other utilities are to be installed in a common trench, a typical cross-section showing vertical and horizontal distances between pipes and classes of pipe and bedding shall be shown.
- b) Offset of pipelines from property lines.
- c) The size of pipe.
- d) Offset of connections from property lines (if applicable).
- e) The locations of manholes, clean-outs and services relating to property lines.
- f) Information on any curves or pipe deflections.
- g) Easements (existing and/or required).
- h) Future curb & gutter lines (if applicable).
- i) Manhole identification numbers.
- j) Inverts of service connections at property line (if applicable).
- k) For storm drainage, features such as ditches, culverts, streams, channels, etc.

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

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

5.15. Grading Plan(s)

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

- a) Pre-Development contour lines. The topographic information shall extend a minimum 30.0m outside the Development site.
- b) Proposed contours, slopes, grades, and spot elevations.
- c) The minor (5 year return) storm sewer system with the flows noted per section and the accumulated flows from all upstream sections. Provision must be made for upstream Development potential where applicable.
- d) The major (100 year return) system. The Consulting Engineer shall note wherever the major system is not in the pipe or the roadway, showing the routing and flows for the 100 year return storm.
- e) All swales proposed to affect the submitted Storm Water Management Plan.
- f) How the Development proposal will affect adjacent lands, attempts should be made to "meet" existing elevations along the Development boundary.
- g) A legend noting all items proposed in the Storm Water Management Plan. Applicable "General Notes" should also be included.

Lot Grading Plans will show the following information

- a) All existing corner lot elevations (uncircled).
- b) All proposed corner lot elevations (circled).
- c) The proposed building envelope with the minimum basement elevation (mbe) noted.
- d) The slope of the lot (directional arrow), noting a minimum 1% grade on the lots.

5.16. Landscape Plan(s)

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

- a) Extent of proposed landscape works and services.
- b) Existing and proposed property information, including lot lines, easements, legal descriptions, addresses and dimensions.
- c) Existing and proposed contours, slopes, grades and spot elevations for landscaped areas (if not already shown on grading plan).
- d) Existing and proposed buildings, structures, roads, curbs, sidewalks, walls, fences, signs, site features and other appurtenances.
- e) Existing vegetation proposed to be removed, relocated or retained.

- f) Areas of proposed preservation, naturalization, restoration, lawn and landscaping, including soil types, depths and amendments.
- g) Proposed plant species name (botanical and common), size and planting condition.
- h) Existing and proposed irrigation system.
- i) Construction details and specifications as required.

5.17. Storm Water Management Plan (SWMP)

In addition to any other requirements presented in this document, Storm Water Management plans shall show the following information:

- a) Site and surrounding area (400 m minimum outside Development) showing roads and major features. A small location plan of the watershed is also to be included.
- b) Contours of existing ground (0.5 m intervals where slope <10%, 1.0 m >10%) for the site and surrounding area mentioned above.
- c) Major flood routing (1:100 year); show as arrows and indicate if in pipe or on surface show an "open" arrow for surface routes and the same arrow "shaded" for routes in pipes).
- d) Detention pond details, if applicable.
- e) Area, in hectares, of Development and the total area of drainage basin.
- f) Directional arrows of flow within the site and on surrounding areas.
- g) Sub-catchment boundaries, coefficients and areas.
- h) Pipe system including size, grade, and minor and major flows (a table may be utilized).
- i) The subject Development is to be highlighted.

5.18. Erosion and Sediment Control Plan(s)

The Erosion and Sediment Control Plan is to detail methods and procedures that will be used to prevent or minimize soil displacement and transport of sediment from the Development site. This is to include methods to prevent or minimize soil transport onto adjacent properties or onto existing roads adjacent to the site (i.e. tracking from vehicles). Preventative methods of soil displacement on the site are to be detailed. In addition to any other requirements presented in this document, the drawing shall show the following:

- a) Existing contours of the site at an interval sufficient to determine drainage patterns.
- b) Final contours if the existing contours are significantly changed.
- c) Final drainage patterns/boundaries.
- d) Existing vegetation such as significant trees, shrubs, grass, and unique vegetation.
- e) Limits of clearing and grading.

- f) Erosion and sediment control measures (temporary and permanent) including locations, names and details, in accordance with "Land Development Guidelines for the Protection of Aquatic Habitat".
- g) Storm Drainage systems including drain inlets, outlets, pipes, and other permanent drainage facilities (swales, waterways, etc.).

The plan must have a narrative section describing the land, the disturbing activity and details of the methods used for controlling erosion and sedimentation. Include a description of the procedures for construction and maintenance of the control measures and note the persons involved in maintenance and provide a maintenance schedule that is to be followed. Where the land area to be subdivided is less than 10 hectares, this plan may be combined with the Stormwater Management Plan.

5.19. Street Lighting Plan(s)

A plan view of the street lighting shall be provided. There shall be General Notes included on the Plan noting reference(s) to the Municipal Standards and Specifications and the appropriate design criteria.

5.20. Street Sign, Paint Marking, and Traffic Control Device Plans

A drawing identifying signs, markings, and required control devices. Detailed drawings may be required for traffic control devices.

5.21. Traffic Management Plan(s)

Detail routes for construction traffic and traffic controls for traffic on existing roads affected by construction.

5.22. Road Cross Section Plan(s)

Shall be scaled at 1:100 horizontal and 1:50 vertical and shall note the existing ground elevation, the proposed elevations of the road centerline, the curb and gutter (or road edge) and property lines. Cross-sections are required at 20.0 m intervals.

5.23. Construction Details

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

5.24. Electrical, Gas, and Communication Utilities

Per appropriate authority (Individual utilities may provide separate drawings).

6.0 DRAWING SUBMISSIONS

6.1. Design Submissions

Submit to the City of Fort Saskatchewan 2 sets of full size paper prints accompanied with electronic drawings in DWF format compatible with the current version of Design Review Software for all design drawings.

6.2. Record Drawings

Record Drawings must be submitted for review after the completion of the Works and Services, and must be approved prior to issuance of an FAC.

The Owner/Applicant shall submit to the City of Fort Saskatchewan a complete set of electronic drawings of the Subdivision or Development in AutoCAD DWG format compatible with the current version of AutoCAD in addition to a Digital Hard copy in PDF format in accordance with Sections 5.3 and 5.4 of this document.

6.3. Electronic Drawings

The Owner/Applicant shall submit to the City of Fort Saskatchewan a complete set of electronic drawings of the Subdivision or Development in AutoCAD DWG format compatible with the current version of AutoCAD.

The electronic drawing shall be prepared in accordance with all requirements and conventions herein.

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

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

6.4. Digital Hard Copies

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

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

Drawing sets submitted as a digital hard copy shall be electronically sealed by the Owner/Applicant's Engineer.

6.5. Device/Document Settings for Plotting Adobe Portable Document Format

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

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

- a) Paper size to be ANSI D 558.8 x 863.6 mm.
- b) Layout to be "landscape".
- c) Graphic print quality to be no less than "600 dpi".



C I T Y O F
FORT SASKATCHEWAN
A L B E R T A

Engineering and Servicing Standards

SCHEDULE C

ENGINEERING DESIGN STANDARDS

NOVEMBER 2013

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1.0 GENERAL DESIGN CONSIDERATIONS

This Infrastructure Design Standards Manual was prepared to provide a standardized set of guidelines to be adopted by The City of Fort Saskatchewan for those involved with design and construction of municipal infrastructure. Users of this manual shall note the following:

Alternative criteria relating to such things as field conditions, climate, development standards and development density have been included in this manual where practical.

Design criteria variations may be adopted from time to time in the form of Supplementary Design Guidelines which will supersede the guidelines contained in this manual.

The contents of this manual are intended to complement the City of Fort Saskatchewan Specifications and Standard Detailed Drawings.

This manual is not intended to be a substitute for sound engineering knowledge and experience. It is the designer's responsibility to exercise professional judgment on technical matters in the best interests of the Owner/Applicant and the public. Standards contained herein are provided to assist in making these judgments, but shall not be used as a substitute. The standards do not, and cannot, cover all particular cases.

1.1 Sustainability and Asset Management

Development of appropriate design standards for municipal infrastructure involves consideration of the principles of sustainability and asset management. These principles include the following:

- enhancement of quality of life
- environmental protection
- financial economies
- preventative maintenance
- life-cycle costs

A balanced approach to design of municipal infrastructure requires careful consideration of all of the above principles.

1.2 Independent Utilities

Independent utilities are those not normally supplied by municipal or regional authorities and are not included in these standards. Independent utilities include Fortis Alberta Inc., Axia Netmedia Corporation, ATCO Gas, TELUS, Shaw Cable systems G.P., Prestige Telecom and Bell Canada.

Design of municipal infrastructure must include consideration of the above utilities. Design of these utilities is normally carried out by the utility owner and coordinated by the municipal designer and/or the City of Fort Saskatchewan. All layouts and installations shall be subject to the approval of the City of Fort Saskatchewan.

In new urban developments, all wiring is generally to be underground. See Schedule B Level of Service Standards for all other developments.

Easements shall be registered on each individual lot prior to the sale of any lot in the development area.

1.3 Utility Rights-of-Way

Utility right-of-way (ROW) locations shall be selected to avoid environmentally sensitive areas such as watercourses, wetlands and wildlife migration corridors and forested areas.

Where location of a municipal utility in a statutory right-of-way is approved by the City of Fort Saskatchewan, the minimum right-of-way widths are as follows:

- a) Single Service Main – ROW width to be equal to twice the depth from surface to the crown of the pipe (6.0 m minimum width)
- b) Two Service Mains – ROW width to be equal to twice the depth from surface to the crown of the deeper pipe plus a separation allowance (9.0m minimum width)
- c) When the service is within a road allowance, and the distance from the property line to the centre of the service is less than one half of the width indicated above for a single service, the difference shall be provided as right-of-way on the adjacent property.

In all cases, the width of right-of-way shall be sufficient to permit an open excavation with side slopes in accordance with the WCB regulations, without impacting on or endangering adjacent structures.

Where required, sanitary and storm trunk sewer mains shall have rights-of-way wide enough for future widening and/or twinning. The width of the right-of-way shall be the required separation between pipe centerlines plus two (2) times the depth to the crown of the deeper sewer.

The designer shall provide cross sections indicating the minimum safe distances to adjacent building footings based on a safe angle of repose from the limits of the excavation.

Where a utility is located within a right-of-way, and valves, manholes or other appurtenances which require maintenance are located within the right-of-way; provide road access from a public road. The maintenance access must be sufficiently wide and structurally adequate to support the maintenance vehicles for which the access is intended.

For independent utilities, the Owner/Applicant shall provide either registered rights-of-way or registered easements in the name of the City for the purpose of accommodating the utility services. Rights-of-way shall be sufficient width and satisfactory to the utility companies.

1.4 Utility Separation

Requirements for separation of sanitary or storm sewers from water mains are as follows, unless otherwise indicated by the local public health authority.

1.4.1 Horizontal Separation

At least 3.0 m horizontal separation shall be maintained between a water main and either a sanitary sewer or storm sewer (center line to center line).

In special circumstances separation less than 3.0 m may be permitted provided that:

- a) The sewer main and water main are installed in separate trenches and the water main invert is at least 0.5 m above the crown of the sanitary sewer or storm sewer and the joints are wrapped with heat shrink wrap (or similar) or packed with compound and wrapped with petrolatum tape in accordance with the latest version of AWWA Standards C217, and C214 or C209; or
- b) The pipes are installed in the same trench with the water main located at one side on a bench of undisturbed soil at least 0.5 m above the crown of the sanitary sewer or the storm sewer and the joints of the water main are wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

1.4.2 Vertical Separation

Where a sanitary sewer or storm sewer crosses a water main, the water main shall be installed with a minimum clearance of 0.3m above the sewer or 0.5m below the sewer.

Where it is not possible to obtain the vertical separation indicated above, and subject to City of Fort Saskatchewan approval, the following details may be used:

- a) The joints of the water main, over a length extending 3.0 m either side of the sewer main, are to be wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.
- b) The sewer shall be constructed of pressure pipe such as high density polyethylene (HDPE) or PVC with fused joints and pressure tested to assure it is watertight.

1.5 **Trenchless Technologies**

Installation or rehabilitation of pipelines by trenchless methods is frequently mandatory or desirable. Circumstances favouring trenchless installation include:

- installation or rehabilitation in heavily built-up areas
- stream crossings
- railway crossings
- highway crossings.

Available technologies include the following:

- slip-lining
- cured-in-place pipe (CIPP)
- pipe bursting
- horizontal directional drilling (HDD)
- microtunnelling
- pipe jacking.

2.0 WATER DISTRIBUTION

This section outlines the design criteria that apply to the water distribution system. These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Designs shall be prepared under the direction of a qualified professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA). The design shall be approved by the City Engineers.

2.1 Water Distribution General Principles and Objectives

A water distribution system includes all piping, fixtures, and pumping/storage facilities required to safely deliver potable water from a treatment facility to residential, commercial and industrial users for the purposes of consumption and fire suppression. Systems must be designed to ensure:

- water is disinfected and suitable for consumption
- sufficient and reliable volume and supply
- infrastructure is sized to meet projected future demand
- water is delivered at sufficient pressure under key demand conditions and
- sufficient protection against corrosion, freezing, and other forms of damage/deterioration.

The design shall consider long term service area, land use, available capacity, and potential connection points. As the City wishes to promote an orderly process of development, temporary servicing schemes and the construction of infrastructure through undeveloped areas (leapfrog development) are discouraged.

2.2 Metering

See City of Fort Saskatchewan Bylaw 1648 – Waterworks, Sewers and Plumbing Bylaw

2.3 Water Demand

Residential, commercial, industrial and institutional demands shall be determined using specific data related to the development or zoning. In the absence of such data, use the following residential per capita demands and the following equivalent population factors. The equivalents apply to the average daily demand (ADD).

average daily demand (ADD)	360 litres per capita per day (L/c/d)
maximum day demand (MDD)	2 x ADD L/c/d
peak hour demand (PHD)	3 x ADD L/c/d

Land Use	Equivalent Population/Hectare (gross)
Low Density Residential	50 people/ha
Medium Density Residential	90 people/ha
High Density Residential	150 people/ha
Commercial/Institutional	48 people/ha
Industrial	48 people/ha

2.4 Fire Flow

Fire flow requirements shall be in accordance with the most current edition of the Fire Underwriters Survey (FUS) Guidelines. Generally, these are:

Developments	Minimum Fire Flow
Single Family Residential	100 L/s
Multi Family Residential	133 L/s
Industrial and Institutional	183 L/s
Apartment and Commercial	233 L/s

2.5 Design Flows for Water Mains

Total design flows (Q_{design}) are to be the greater of the following:

$Q_{\text{design}} = \text{MDD} + \text{F}$ Maximum Day Demand for the population or equivalent population plus the Fire Flow, or
 $Q_{\text{design}} = \text{PHD}$ Peak Hour Demand for the population or equivalent population

2.6 Pressure

Maximum allowable pressure in System	515 kPa (80 psi)
Minimum residual pressure at Peak Hour Demand (PHD)	280 kPa (40 psi)
Minimum residual pressure in system during design Fire Flow and Maximum Day Demand (MDD+F)	140 kPa (20 psi)

Pressures in the above table are measured at ground elevation.

2.7 Roughness Coefficient

PVC pipe shall be used and the value of "C" in the Hazen-Williams formula shall be 120 for sizes less than 400mm and 130 for sizes larger than 400mm.

2.8 Water Storage

Minimum Water Storage = 2x Average Day Demand + Fire Flow

2.9 Minimum Pipe Diameter

The minimum size of distribution mains shall be:

- 200mm for residential
- 250mm for industrial/commercial
- 150mm allowance for cul-de-sacs

The minimum size of water service connections shall be:

- 25mm for residential
- 150mm for industrial/commercial

Oversizing may be required by the City Engineer to accommodate for future development.

2.10 Pipe Material

Pipes and fittings shall be Polyvinyl Chloride (PVC) Class DR 18 in accordance with AWWA Standard C900 for pipes 300mm or smaller, and AWWA Standard C905 for pipes large than 300mm.

Joint lubricants must be certified for potable water use in accordance with National Sanitation Foundation standards.

Disinfection, flushing and bacteriological testing shall be carried out in accordance with AWWA standards and practices.

2.11 Dead Ends

A dead end watermain is allowed when:

- Less than 120m in length
- Serves less than 25 single family homes
- Serves only 1 multifamily or commercial site
- Serves no more than 2 hydrants

2.12 Depth of Cover

Water mains shall be installed to provide a minimum depth of cover of 2.75m from finished design grade to the top of pipe. Soil type and groundwater levels shall be considered and depth increased if necessary.

Insulation may be used in cases where minimum depths cannot be achieved, subject to approval of City Engineer.

2.13 Grade

Grade shall be straight lines between defined deflection points. Elevations shall be recorded.

Grading shall be designed to minimize the number of high points. Where possible, high points are to correspond to hydrant locations.

If the pipe slope equals or exceeds 20%, appropriate joint restraint and pipe anchorage is required.

2.14 Valves

Valves shall be located:

- At the projection of property lines
- Preferred at intersections; Mid-block locations are subject to the approval of the City Engineer

- Three (3) valves at cross intersections
- Two (2) valves at tee intersections
- Not more than three valves required to isolate line (four if cross intersection involved)
- Not more than two hydrants are taken out of service during shutdown
- Not more than 25 single family units, 1 multi-family site, or 1 commercial site are taken out of service during shutdown

Mueller brand gate valves are preferred. Alternatives are subject to approval of City Engineer. Gate valves shall conform to AWWA Standard C515 and shall include the following supplementary requirements:

- Iron body
- Stainless steel type 304 trim (nuts and bolts)
- 51mm square operating nut
- Type 304 stainless steel stem
- "O" ring stem seal
- Open by turning counter clockwise
- Non-rising stem
- Double disc or solid wedge type
- Resilient seated
- External epoxy coated

Valve boxes are to be Norwood Foundry or equivalent and include:

- Type A (sliding) or Type B (screw) both acceptable
- Cast iron valve box complete with cast iron lid
- Sufficient length to provide for adjustments of 300mm up or down
- Internal operating rod installed a maximum of 600mm from the ground surface

2.15 Hydrants

Fire hydrants shall be installed in all areas (including private developments) and in locations convenient for the Fire Department. Hydrants are to be installed and located as follows:

- Maximum allowable spacing between hydrants of 150 m for residential zones
- Maximum allowable spacing between hydrants of 120 m for multi-family residential and school zones
- Maximum allowable spacing between hydrants of 90 m for commercial, institutional and industrial zones
- Hydrants shall be installed at the projection of property lines except at intersections, where they shall be installed at the beginning of curb returns
- Hydrants leads are 150mm diameter and shall be a maximum length of 7.5m from the main. Longer leads will require a larger diameter
- A gate valve is required on each hydrant lead
- Hydrant flange to be no less than 50mm and no more than 150mm above final grade

In areas with rural roadway cross-sections, hydrants shall be located on special "pads" extending perpendicular to roadway centre lines and a minimum of 3.0 m from the edge of the proposed road surface and be accessible from the roadway. The elevation of the "pads" shall be no more than 0.3 m below the crown of the road at that point.

Hydrants are to be Canada Valve Century. Hydrants shall conform to AWWA C502 and include the following supplementary requirements:

- Four section breakaway flange
- Stainless steel type 304 trim (nuts and bolts)

- Compression type shutoff
- Two 63mm hose nozzles with Alberta Mutual Aid Thread
- Steamer port fitted with a 125mm Storz Fitting
- 3 sided operating nut
- All hydrants shall be painted Chrome Yellow, top of hydrant painted silver
- All hydrants shall be self draining unless groundwater conditions dictate otherwise

2.16 Cathodic Protection

Cathodic protection to be applied to all iron fittings, based upon recommendation by the Engineer.

As minimum, cathodic protection shall be provided for:

1. Valves
 - Install one 4.1 kg packaged magnesium anode
 - Attached anode to valve body via thermit weld process
 - Install one #10 or 12 AWG test lead to valve body and route to surface
2. Hydrant
 - Install one 4.1 kg packaged magnesium anode
 - Install two #10 or 12 AWG test leads using thermit weld process and route to surface
 - Install cathodic test station adjacent to hydrant and terminate all three leads therein.
3. Watermain – Cast / Ductile
 - Install one – 9.1 kg magnesium anode
 - Install two # #10 AWG test leads using thermit weld process
 - Install cathodic test station (flush mount) above line at street level and terminate leads therein
 - If watermain "broken, install 2 #8 AWG bond cables across repair joint using thermit weld process to attach leads to both sides
4. Services
 - Install one 4.1 kg magnesium anode
 - Attach anode directly to valve or saddle using solder (on copper) or thermit weld (on steel)

A record of the installation and the test results; including soil resistivity values, anode and the line potential and anode current, should also be submitted along with a drawing or site sketch. Cathodic protection to be applied to all iron fittings.

Refer to Drawing W-4 Typical Anode Installation.

2.17 Thrust Restraint

Concrete thrust blocking and/or adequate joint restraining devices complete with corrosion protection must be provided at bends, tees, wyes, reducers, plugs, caps, valves, hydrants and blow-offs.

Refer to Drawing W-5 Horizontal Thrust Block and W-9 Vertical Bend Pipe Support.

2.18 Service Connections

2.18.1 Watermains – Materials

1. Pipe for the watermain shall conform to Polyvinyl Chloride (PVC) Class 1035 (150) DR 18 A.W.W.A. pressure pipe
2. Rubber rings for the couplings shall conform to A.S.T.M. D1869, latest revision thereof; control lubrication of pipe joints to prevent taste and odour concerns
3. Cast iron fittings shall be in accordance with A.W.W.A. Specification C110, latest revision thereof and shall be cathodically protected, with test station; cast iron tees, elbows and crosses will only be allowed if the fitting is not readily available in moulded PVC
4. Services of size 50mm or less shall be Type K Copper tubing conforming to AWWA Standard C800.
5. Services of sizes 100mm or greater shall be Polyvinyl Chloride (PVC) Class DR 18 in accordance with AWWA Standard C900.
6. Corporation stop to be provided at the mains. Service saddles are to be used at all main connections. Curb stop to be located 150mm inside easement boundary.

Fittings are to be as follows unless otherwise approved by City Engineer:

- Corporation stops to be Mueller A-220
- Curb stops to be Mueller Oriseal H15204, non draining type
- Service boxes to be epoxy coated cast iron extension type with type 304 stainless steel operating rod, manganese bronze clevis and brass cotterpin for connection to the curb stop

2.18.2 Watermains – Location

Every legal lot and each residential, commercial or industrial unit shall be provided with a separate service connection as per Drawing W-6 Water Service Connection. Note that each service will receive one water meter.

For residential services, minimum size for service connections should be 25mm, with 30 meter maximum length from the water main to the house.

For industrial, commercial and other major users, the service connections should be sized based on the required hydraulic conditions and design flows with minimum size of 150mm. Sizing calculations should be provided and approved by the City Engineer.

No pipe sizes between 50 mm diameter and 100 mm diameter will be allowed.

All service lines shall be installed to provide a minimum depth of cover of 2.75m at property line.

CC operating rod to be installed at a length where the top of the operating rod is 600mm (+/- 150mm) below the approved final grade at the CC location.

Cathodic protection to be provided per Section 2.17.

2.19 Trenching, Bedding and Backfilling

All trenching and backfilling shall be completed in strict accordance with Occupational Health and Safety Guidelines.

If unsuitable soil conditions are encountered, proper measures for dealing with the conditions shall be identified either on the design drawings or as a report to the City Engineer prior to the construction.

Class "B" pipe bedding shall be utilized in suitable soil conditions. Washed rock shall be used if water table is above the pipe zone. Bedding sand shall have a minimum depth of 100 mm below the pipe and provide a minimum cover of 300 mm above the pipe.

The minimum trench width measured at the pipe springline shall be equal to the pipe outside diameter plus 450 mm.

Excavated material shall be stockpiled at a safe distance from the edge of the trench.

Native backfill under existing or proposed roads, alleys, sidewalks and trails shall be compacted to 98% standard proctor density.

Native backfill in all other areas shall be compacted to 95% standard proctor density.

Refer to:

- Drawing W-7 Typical Trench Section
- Drawing W-8 Typical Pipe Support

2.20 Alignment

Water mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawings T-3 through to T-13.

On straight roads, water mains shall have straight alignments with uniform offsets between intersections. Curved alignments must be parallel to property lines. Design joint deflections shall be limited to half the maximum deflection specified by the pipe manufacturer. Locations of short lengths, or field cut pipes, must be recorded during construction.

Water mains shall have a minimum horizontal clearance of 3.0m o/c from any sewer line, 1.5m from any catch basin and 2.0m from any gas, power or communication line or as required by the utility company whichever is greater.

Water mains shall have a minimum vertical clearance of 0.5m below any sewer lines and 0.3m above any sewer lines.

2.21 Cleaning and Preliminary Flushing

Before flushing and testing, ensure waterworks system is completely finished except tie-ins to existing water mains and services and make arrangements with the City Engineer for scheduling of testing and disinfection of mains.

If required, isolation of existing water system will be performed by the City. Do not operate any valves without the City Engineer's authorization.

Remove foreign material from the pipe and related appurtenances by flushing with water. Main is to be flushed at water velocities as high as can be obtained from available water sources.

Minimum velocity is to be 1.0 m/s and in accordance with AWWA C651. Flushing water is to be discharged to storm sewer, water courses or ditches that have sufficient capacity to carry flow.

Flushing should continue at least until flow from most distant point has reached the discharge location and until the discharged water is clean and clear.

2.22 Testing Procedure

Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing.

The maximum length of distribution main test sections shall be 450 m. The maximum length of transmission main sections shall be 800 m.

Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling shall be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1035 kPa (150 psi) or 1.5 times the normal operating pressure (based upon the elevation of the lowest point in the main and corrected to elevation of the test gauge), whichever is greater. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Minimum duration of test period is two hours. The pressure shall be maintained within 20 kPa of the specified test pressure throughout the test. Maximum test pressures should not exceed those specified in CSA B137.3 – Table 9.

Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605. Compare against the allowable leakage calculated as follows:

PVC Pipe	$L = NDP^{1/2}/128,225$	Where:	L = allowable leakage, L/hr
Ductile Iron Pipe	$L = NDP^{1/2}/32,046$		N = total number of joints
			D = nominal pipe diameter, mm
			P = test pressure, kPa

Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirements is achieved.

2.23 General Disinfection, Flushing and Bacteriological Procedures

After Engineer has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances.

Disinfect, flush, and bacteriological test shall be in accordance with AWWA C651 and the following:

Disinfection and Flushing procedures shall be witnessed by the Engineer and a representative of the City of Fort Saskatchewan. Notify the Engineer and City representative at least 24 hours before the proposed date when disinfection will commence.

Do not use granular hypochlorite for disinfection of PVC pipe with solvent welded joints, due to explosive reaction potential.

Retain water containing not less than 25 mg/L free chlorine in water system for a period of at least 24 hours, in accordance with AWWA C651, Continuous Feed Method.

After completion of chlorination, flush chlorinated water from system, hydrants and services until chlorine concentration in remaining water is less than 0.3 mg/L. Water with a chlorine

concentration greater than 1 mg/L shall not be discharged to a recognized water course without the approval of the Alberta Environment.

At a point not more than 3m downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not have less than 25 mg/L free chlorine. To assure that this concentration is provided, measure the chlorine concentration at regular intervals as specified in AWWA C651.

Amount of chlorine required to produce 25 mg/L concentration in 30 m of pipe of various sizes is:

Pipe Size (mm)	100% Chlorine (kg)	1% Chlorine Solution (Litres)
100	0.006	0.61
150	0.014	1.36
200	0.024	2.46
250	0.039	3.86
300	0.054	5.45
400	0.098	9.85

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of water samples taken at least 24 hours apart, shall be collected from the new main. Samples shall be taken at a minimum interval of 370m, plus one set from the end of the line and at least one set from each branch. Samples shall be tested at the Contractor's expense for total and fecal coliforms and background bacteria by a laboratory approved by the Engineer. Sampling and analysis shall be done in accordance with *Standard Methods for the Examination of Water and Wastewater*. The presence of total or fecal coliform bacteria and/or background bacteria greater than 200 CFU per 100 ml shall constitute a failed test.

Following successful bacteriological testing, the results of the bacteriological tests shall be delivered or faxed to the City of Fort Saskatchewan, stating that the water is free from contamination. Once satisfactory water quality and bacteriological test results have been confirmed, the City will notify the Contractor to proceed. Contractor shall remove test and bleed out apparatus and shall backfill and complete any work required to commission the waterworks systems. Final connections to existing mains and services shall be swab disinfected with 1% - 5% chlorine in accordance with AWWA C651, Section 4.6. Disinfection and final connections shall be witnessed by the Engineer and a representative of the City of Fort Saskatchewan.

Contractor shall submit a written plan for approval by the City Engineer 72 hours in advance of performing the work.

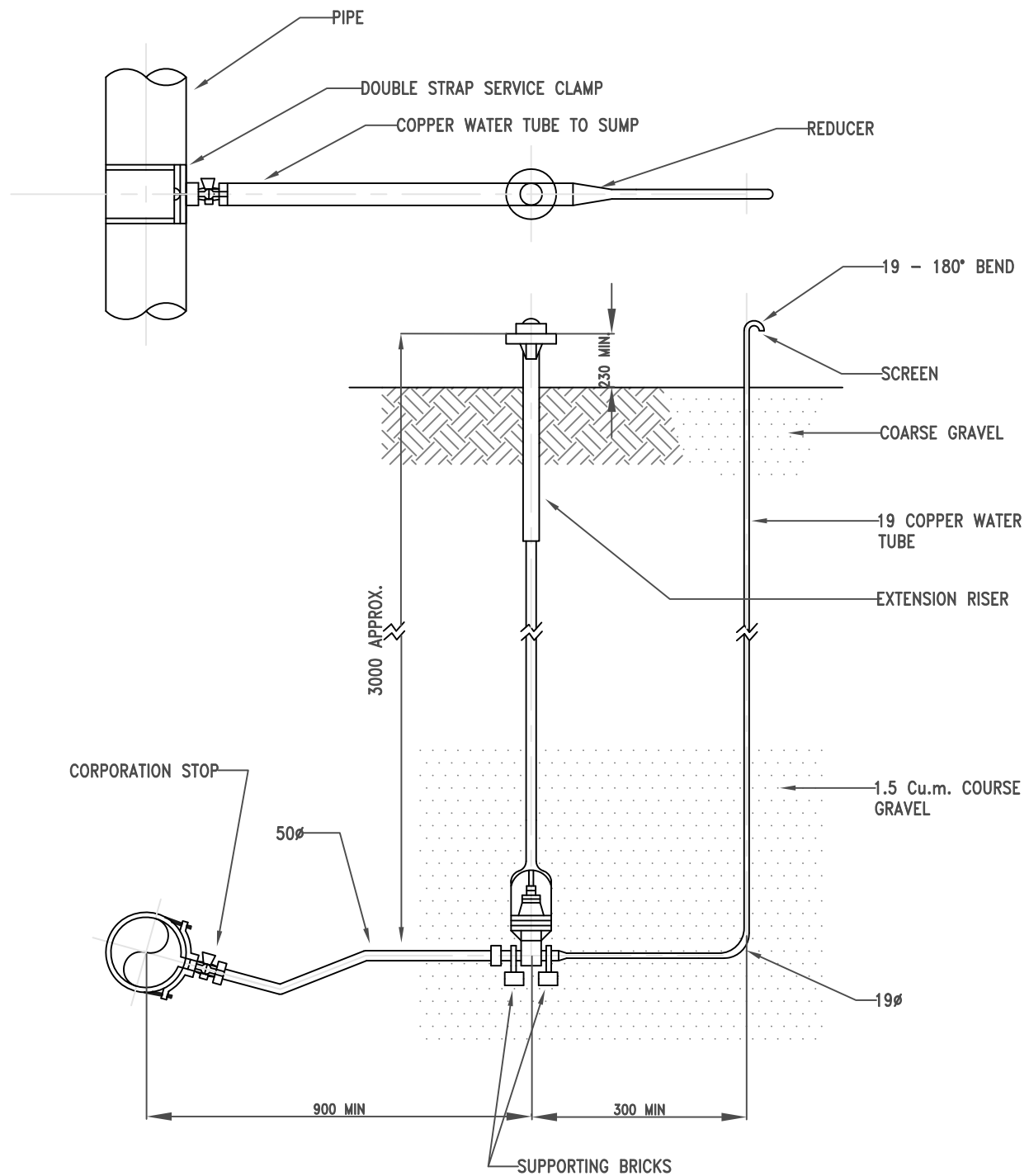
All testing, disinfection, flushing, and water sampling shall be witnessed by the City Engineer.

Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least five days after placing concrete or two days if high early strength concrete is used.

2.24 List of Standard Drawings

- W-1 Supply Line Blow Off
- W-2 Valve and Casing
- W-3 Hydrant Connection
- W-4 Typical Anode Installation

W-5	Horizontal Thrust Block
W-6	Water Service Connection
W-7	Typical Trench Section
W-8	Typical Pipe Support
W-9	Vertical Bend Pipe Support
W-10	Single Service Connection
W-11	Dual Service Connection



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

SUPPLY LINE BLOW OFF

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

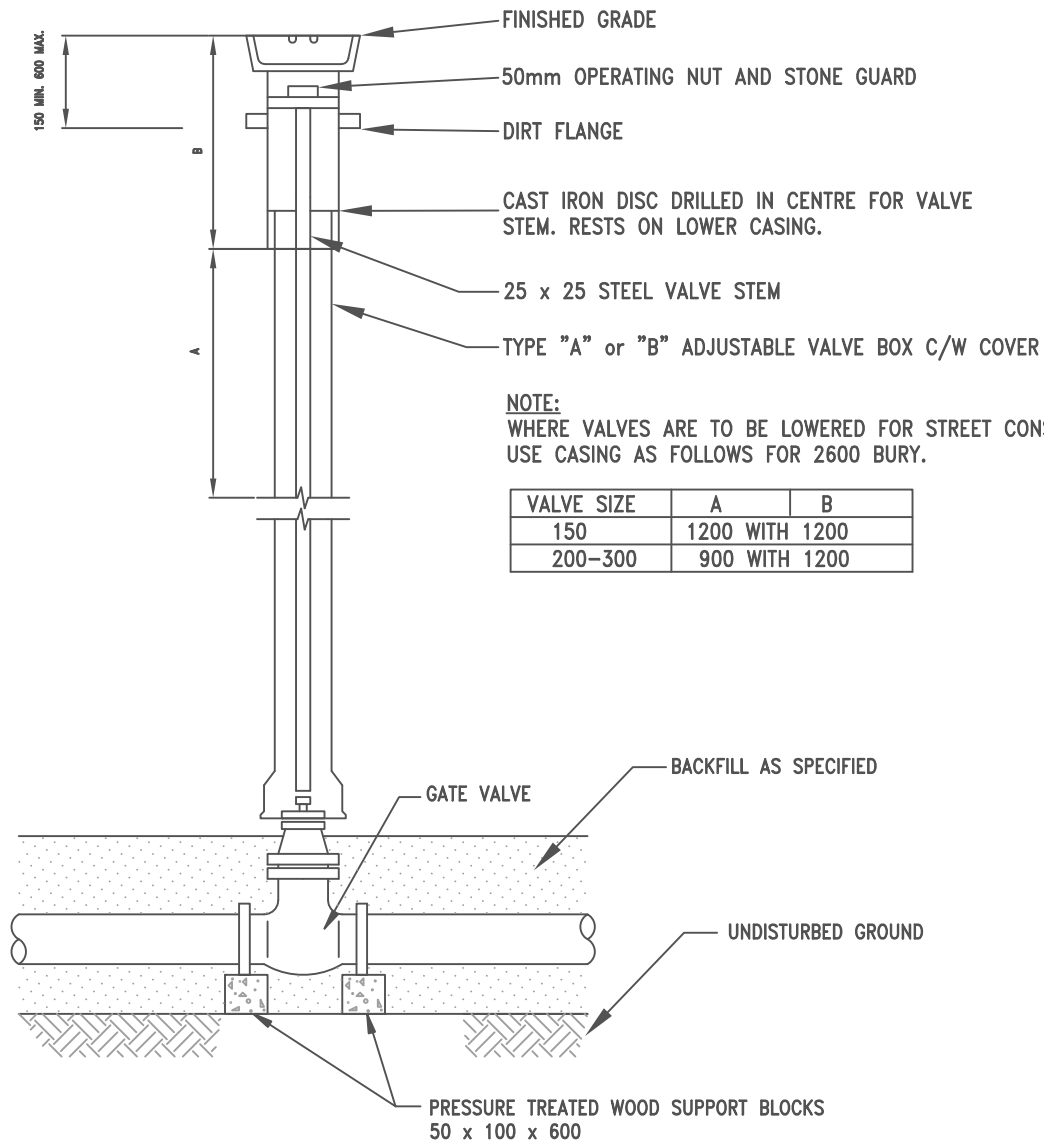
NOT TO SCALE

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DWG. NO.

W-1



NOTE:

WHERE VALVES ARE TO BE LOWERED FOR STREET CONSTRUCTION, USE CASING AS FOLLOWS FOR 2600 BURY.

VALVE SIZE	A	B
150	1200 WITH 1200	
200-300	900 WITH 1200	

NOTES:

1. VALVE BOX TOPS TO BE SET FLUSH WITH SURFACE.
2. VALVE BOXES SHALL BE BITUMINOUS COATED TO PREVENT CORROSION.
3. TYPE "A" or "B" VALVE BOX MAY BE USED
4. VALVE TO BE EPOXY COATED WITH STAINLESS STEEL NUTS AND BOLTS.
5. VALVE TO BE RESILIENT SEATED WEDGE TYPE.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

VALVE & CASING DETAIL



CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

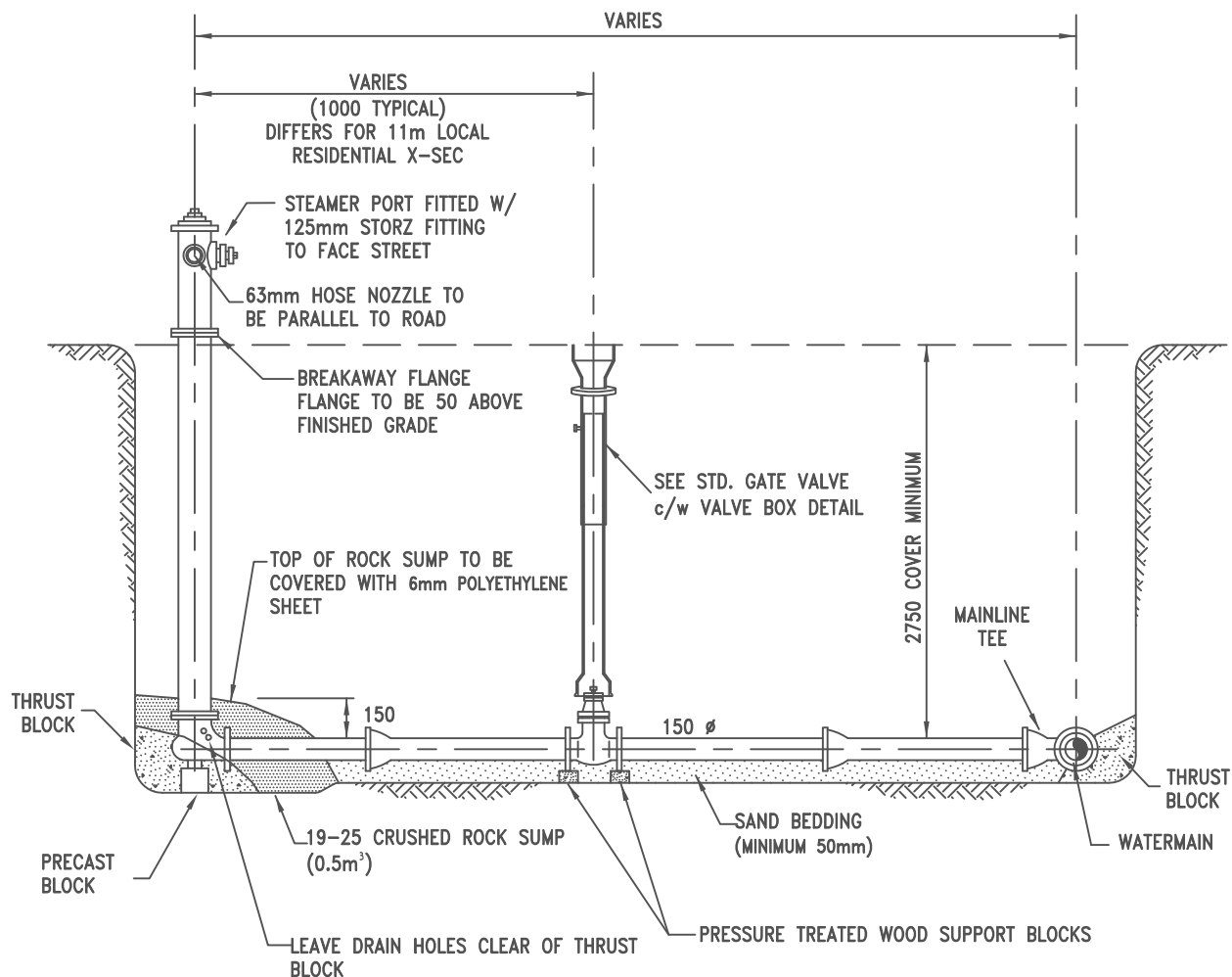
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NOT TO SCALE

DRAWN: MP

W-2

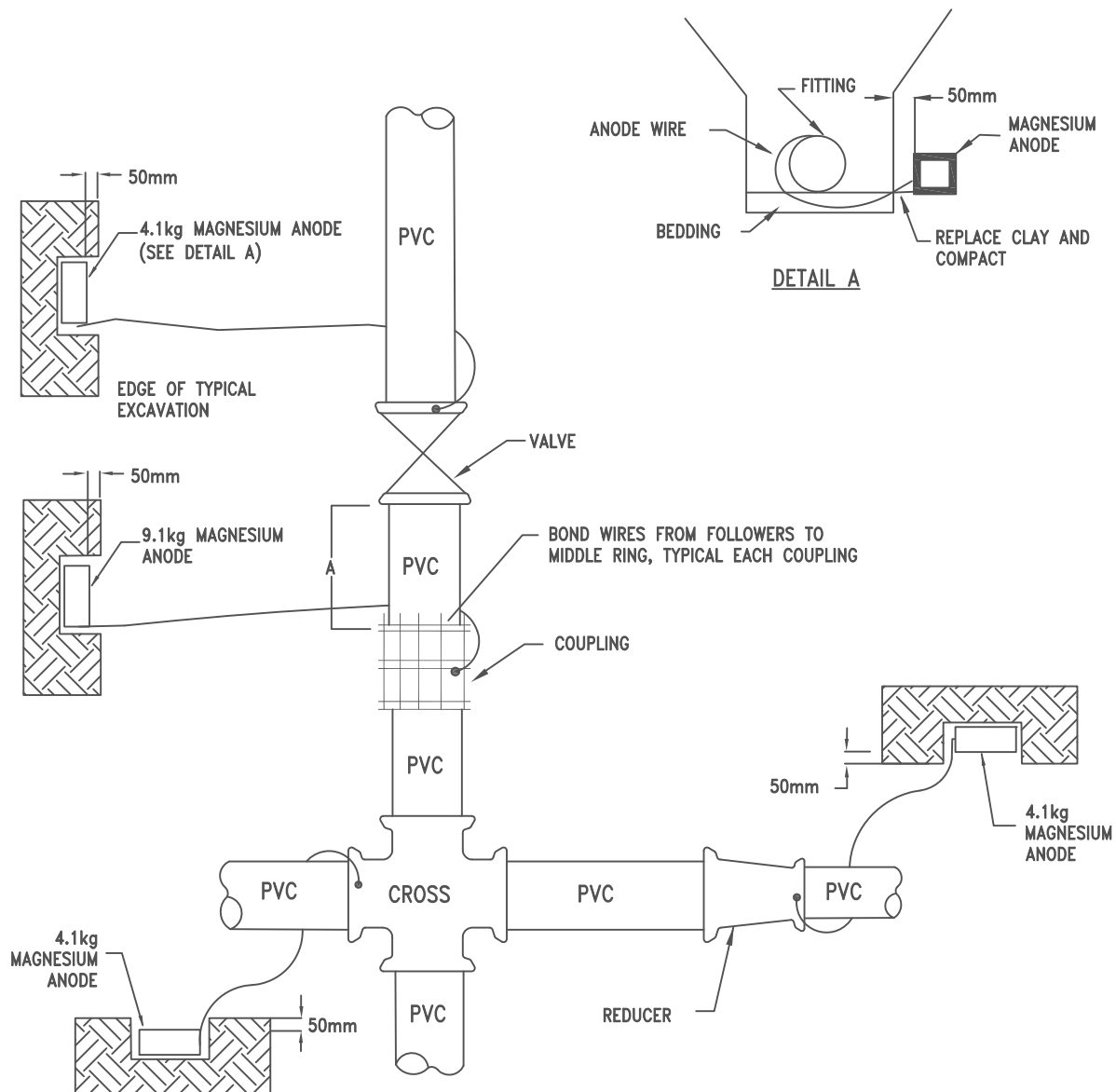


NOTES:

1. HYDRANT TO BE CATHODICALLY PROTECTED WITH A 5.5KG (12.1LB) ZINC ANODE; VALVE WITH A 2.3KG (5LB) ZINC ANODE.
2. HYDRANT TO BE CHROME YELLOW WITH TOPS AND CAPS COLORED IN ACCORDANCE WITH NFPA GUIDELINES.
3. ALL NUTS AND BOLTS TO BE STAINLESS STEEL.
4. HYDRANT MUST NOT RESTRICT SIDEWALK.
5. OPERATOR NUT TO BE 1-1.25 INCH 3 SIDED.
6. HYDRANT SHOULD BE LOCATED SO STEAMER PORT FACES THE ROAD OR MOST ACCESSIBLE SPOT FOR A FIRE TRUCK TO CONNECT.
7. ALL HOSE CONNECTIONS TO BE 63mm THREADED CONNECTIONS TO ALBERTA MUTUAL AID THREAD SPECIFICATIONS.
8. STEAMER PORT TO BE FITTED WITH 125mm STORZ FITTING
9. HYDRANTS TO BE CANADA VALVE CENTURY

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

HYDRANT CONNECTION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	W-3
NOT TO SCALE	DRAWN: MP	

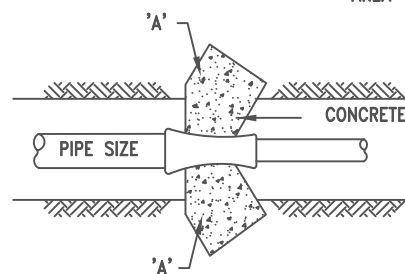
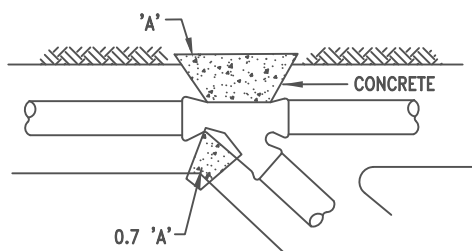
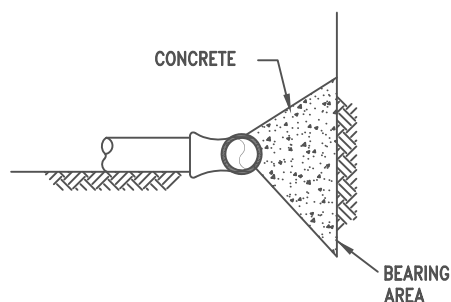
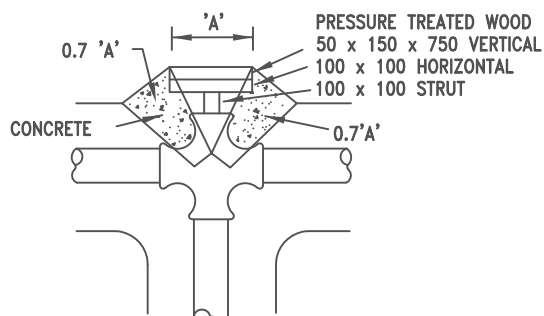
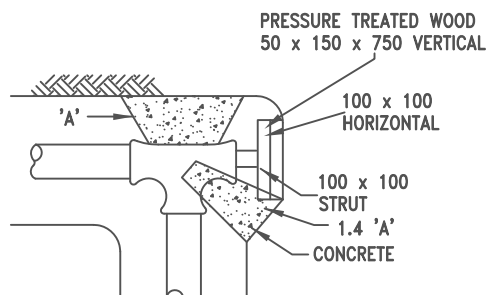
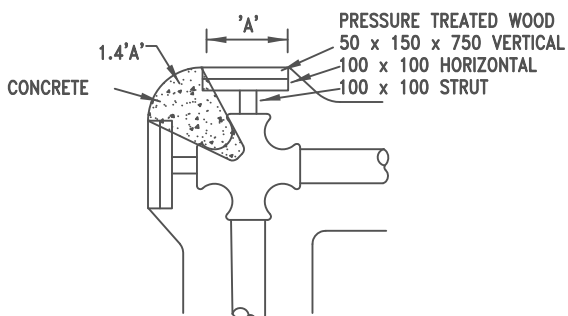
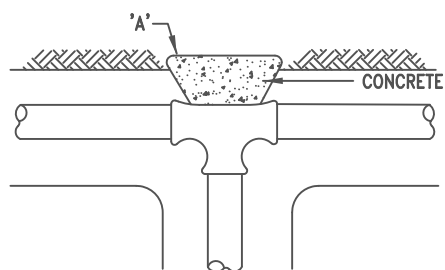
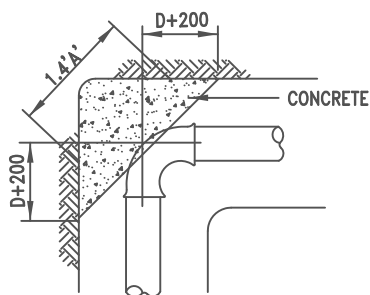


NOTES:

1. MINIMUM DISTANCE FROM ANODE TO PIPE FITTING, VALVE, OR HYDRANT IS 150mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. ALL MAGNESIUM ANODES ON HYDRANTS ARE 4.1kg
4. MAGNESIUM ANODES TO BE EMBEDDED INTO TRENCH WALL TO BE PROVIDED FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
5. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

TYPICAL ANODE INSTALLATION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: NOV 2013	W-4
NOT TO SCALE	DRAWN: MP	



FOR CALCULATION OF BASIC THRUST BLOCK BEARING AREA 'A'

PIPE SIZE	150	200	250	300	350	400	450
'A' (m ²)	0.40	0.68	1.06	1.54	2.08	2.72	3.44

THRUST BLOCK DESIGN IS BASED ON:

1. 1050kPa MAX. SYSTEM PRESSURE OR 700kPa OPERATING PRESSURE PLUS A SURGE ALLOWANCE OF 345kPa (2fps SURGE ALLOWANCE AT 25psi/fps)
2. THRUST BLOCK DESIGN ASSUMES A MIN. VERTICAL SOIL BEARING OF 100kPa.
3. THRUST BLOCK BEARING AREA BASED ON PVC PIPE (AWWA C900 AND C905 DR18).
4. CONCRETE 20MPa TYPE 50 CEMENT.

BEND DEFLECTION

90°	1.4A
45°	0.7A
22 1/2°	0.35A
11 1/4°	0.18A

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

HORIZONTAL THRUST BLOCK



CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

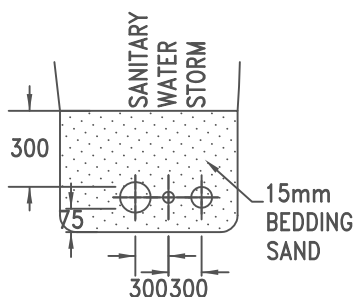
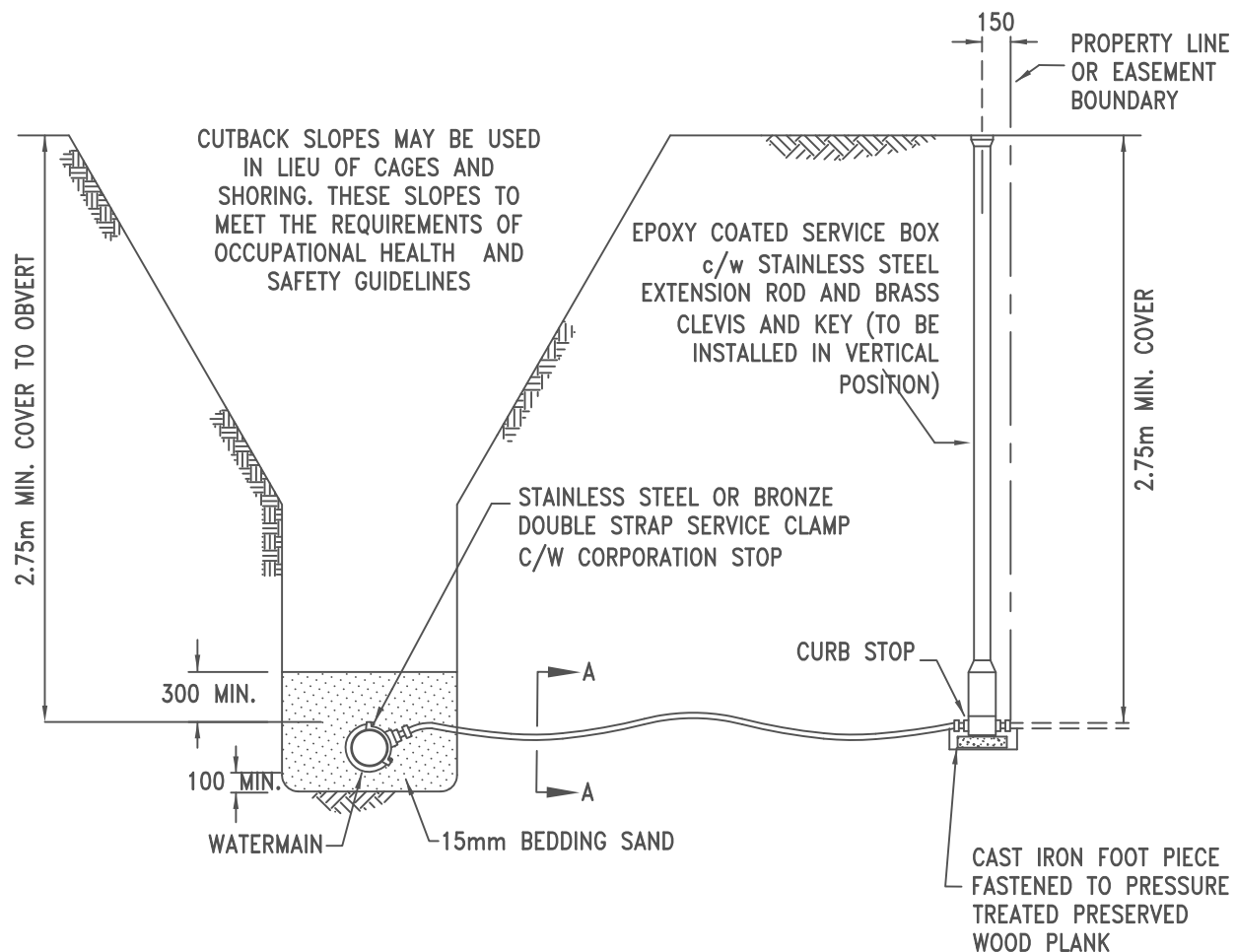
REVISION NUMBER: A

DATE: FEB 2013

NOT TO SCALE

DRAWN: MP

W-5



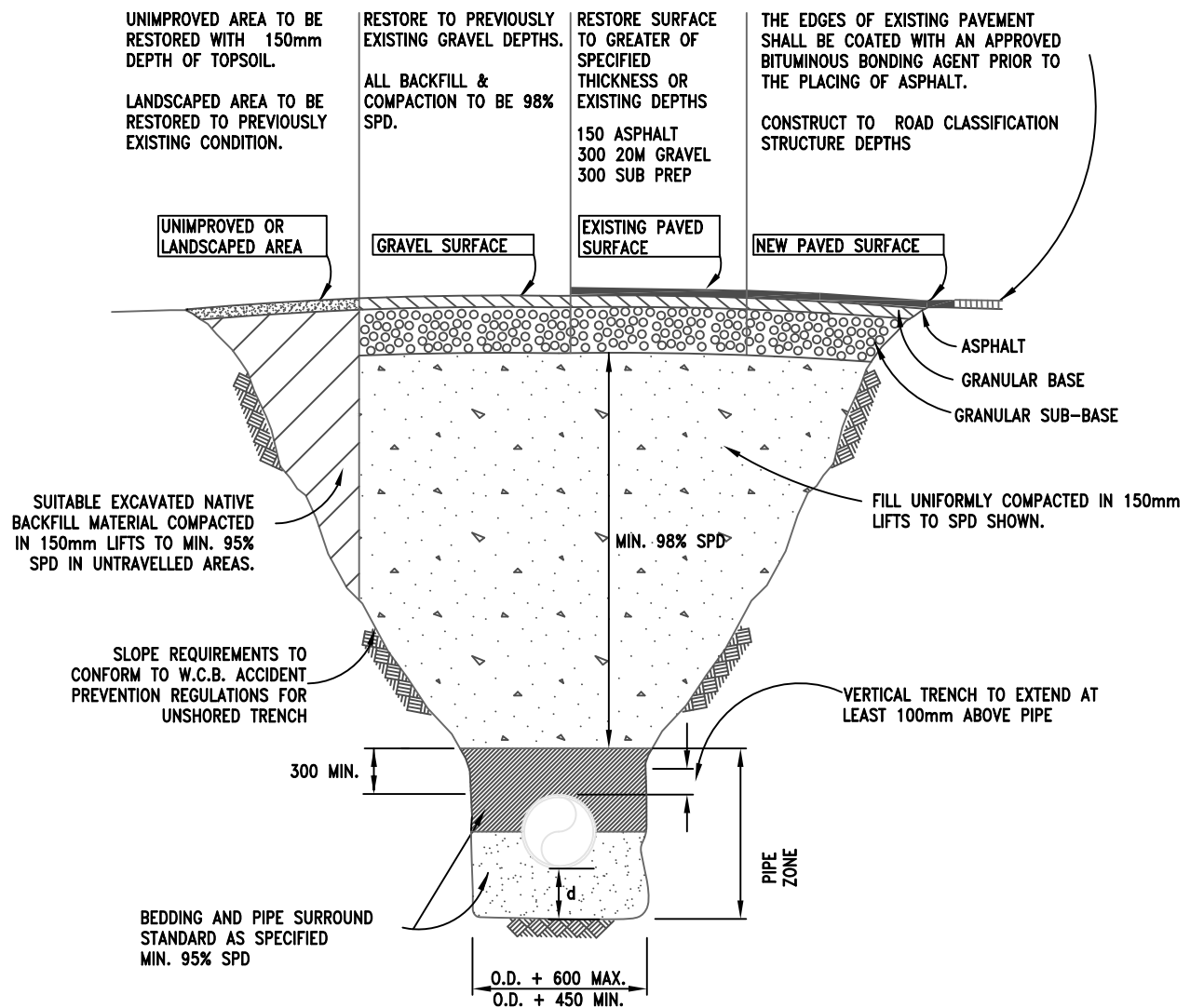
SECTION A
(FACING PROPERTY)

NOTES:

1. WATER SERVICE TO BE TAPPED AT THE 2 TO 3 O'CLOCK POSITION.
2. WATER SERVICE:
UP TO 50mm TO BE TYPE K COPPER.
3. WATER SERVICE UP TO 50mm TO BE SNAKED IN THE TRENCH.
4. WATER SERVICE IS TO INCLUDE A HORIZONTAL GOOSENECK AT THE CORPORATION STOP.
5. CORPORATION STOP AND CURB STOP TO BE CATHODICALLY PROTECTED WITH 2.3kg (5lb) ZINC ANODES.
6. ALL FITTINGS TO BE PACKER NUT TYPE, NOT GRIPPER NUT.
7. WHEN A GAS EASEMENT OCCURS ADJACENT TO THE P/L THE WATER SERVICE SHALL BE STUBBED 300mm BEYOND EASEMENT LIMITS.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

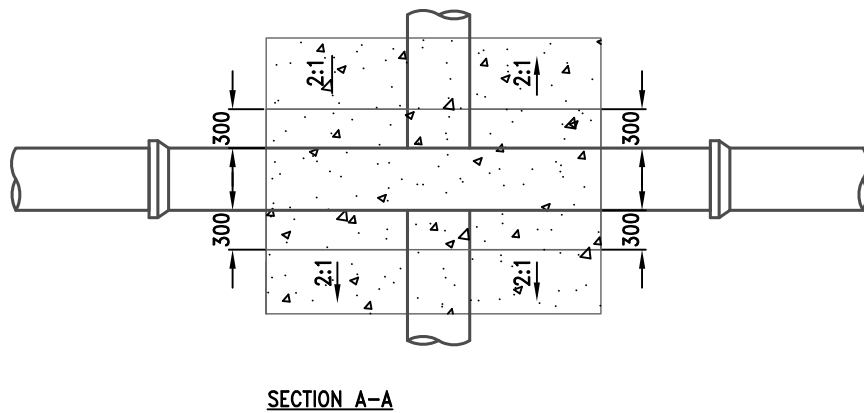
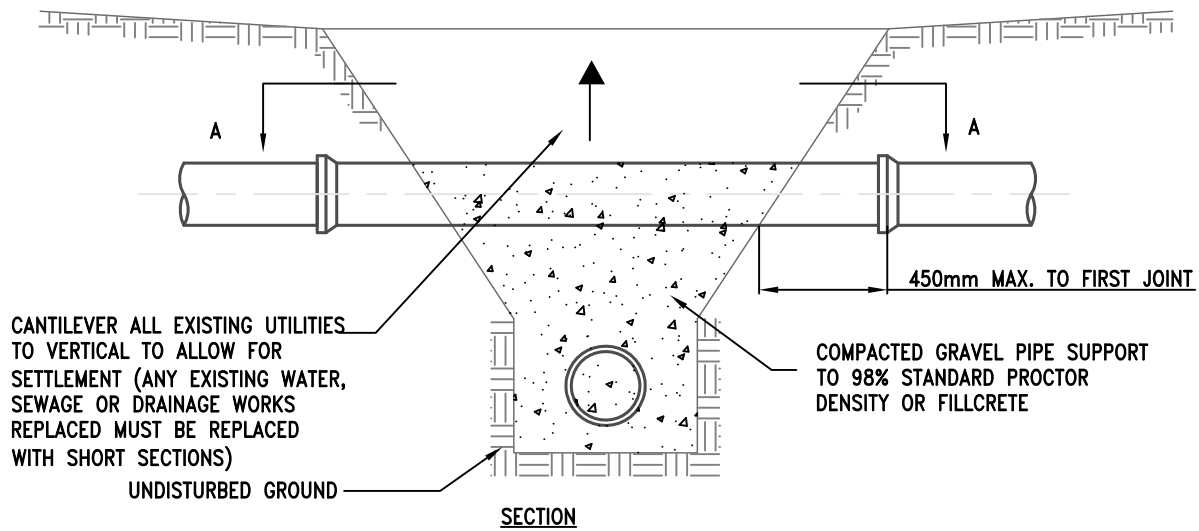
WATER SERVICE CONNECTION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	W-6
NOT TO SCALE	DRAWN: MP	



d = 100mm MIN. DEPTH OF BEDDING BELOW PIPE

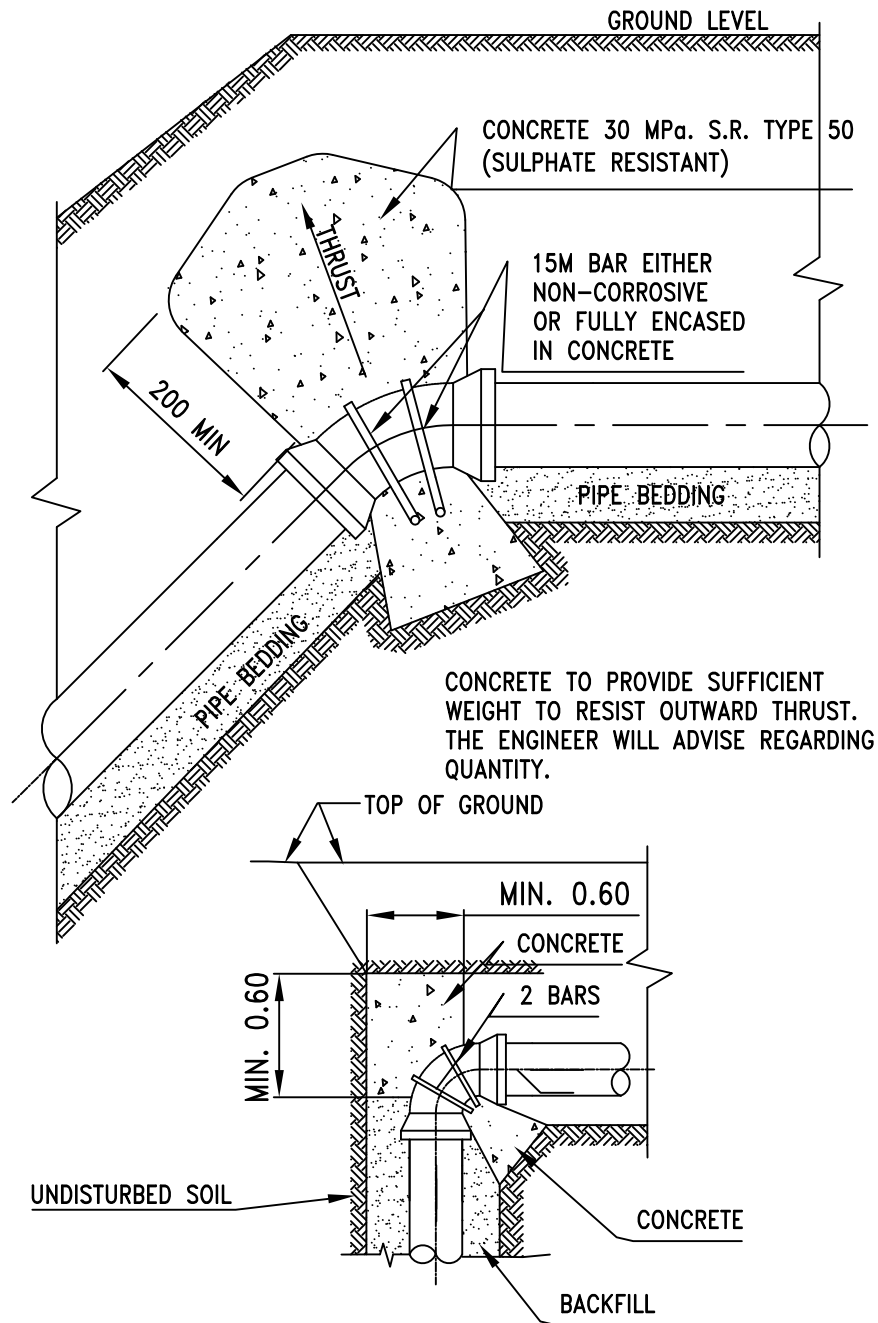
ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

TYPICAL TRENCH SECTION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	W-7
NOT TO SCALE	DRAWN: MP	



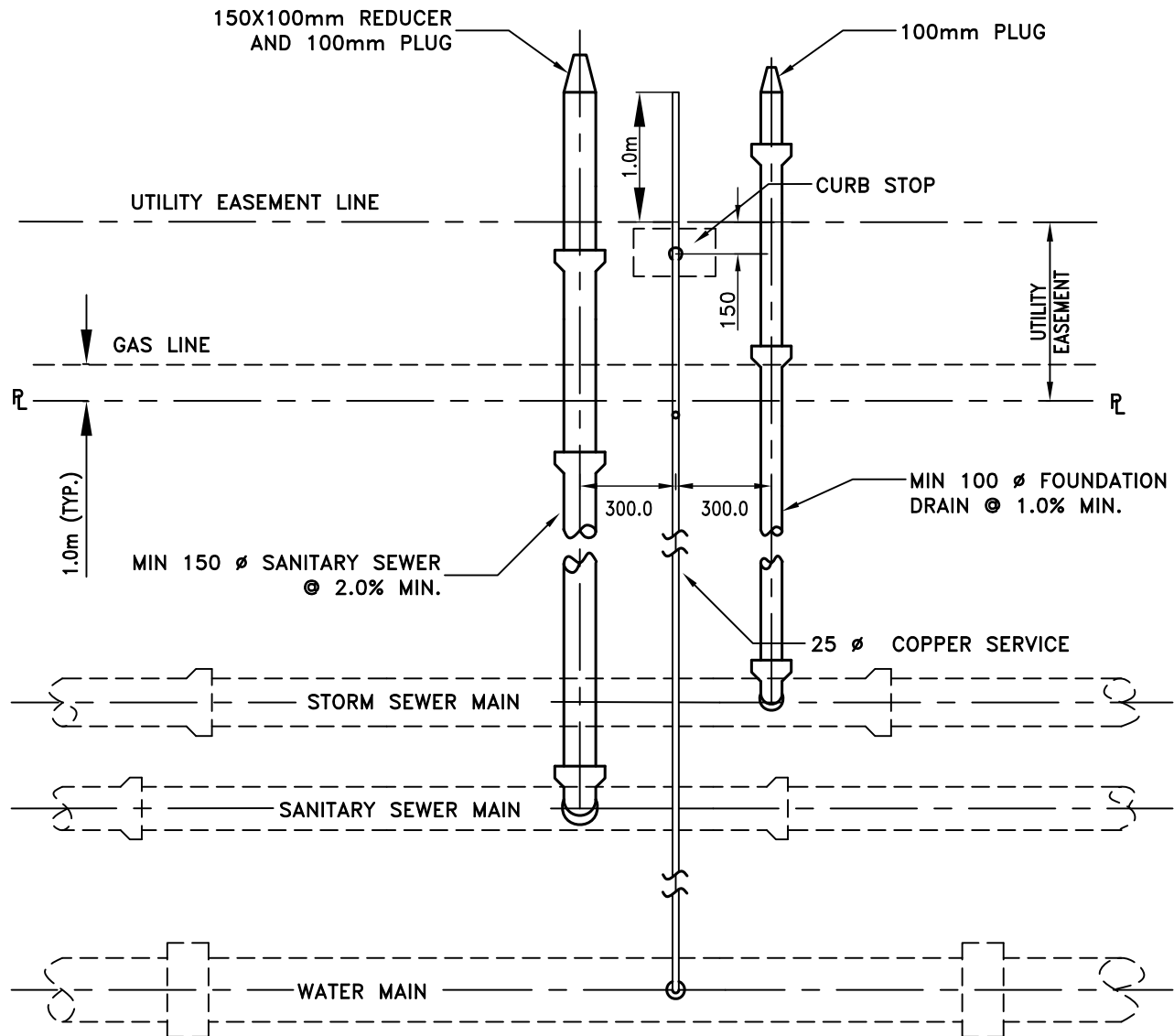
ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

TYPICAL PIPE SUPPORT		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	W-8
NOT TO SCALE	DRAWN: MP	



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

VERTICAL BEND PIPE SUPPORT		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	W-9
NOT TO SCALE	DRAWN: MP	



SINGLE SERVICE CONNECTION



CITY OF
FORT SASKATCHEWAN

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

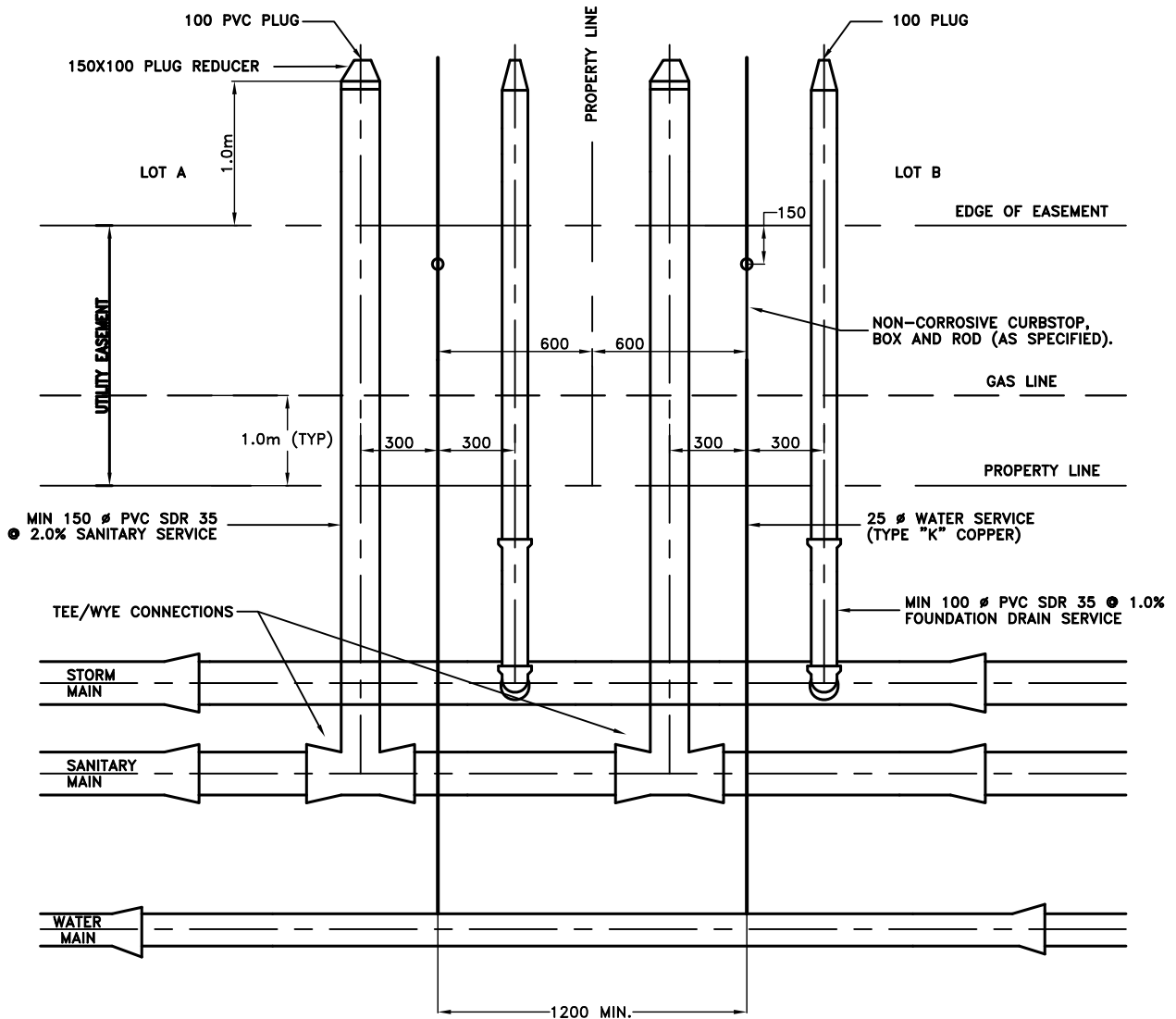
REVISION NUMBER: A

DATE: JUNE 2013

NOT TO SCALE

DRAWN: VB

W-10



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

DUAL SERVICE FOR SINGLE FAMILY LOTS



CITY OF
FORT SASKATCHEWAN

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

REVISION NUMBER: A

DATE: JUNE 2013

NOT TO SCALE

DRAWN: VB

W-II

3.0 SANITARY COLLECTION

This section outlines the methodology and design criteria that apply to the design of the sanitary sewage conveyance system. These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Sanitary sewer system designs shall be prepared under the direction of a qualified professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA). The design shall be approved by the City Engineers.

3.1 Sanitary Collection General Principles and Objectives

Sanitary sewers are intended to convey wastewater only. This includes standard domestic plumbing fixtures, floor drains, approved industrial and commercial wastes and unavoidable infiltration. Sanitary sewer systems are intended to exclude stormwater, roof drains, foundation drains and groundwater.

All residential, commercial and industrial development within Fort Saskatchewan city limits shall be provided with sanitary sewer service.

Sanitary sewers collect and convey wastewater to treatment facilities for treatment. To accomplish this, new systems must be designed and constructed with reliable conveyance capacity and minimal potential for rainfall and groundwater inflows, such that system backup is limited to cases of unforeseeable blockage. To achieve this objective, new system extensions will be sized to flow at less than full and with reasonable allowances for extraneous inflows. It is recognized that these criteria provide a safety factor compared to previously constructed systems, which will flow full at the design flow rate.

To protect the functional integrity of the sanitary sewer system, extraneous inflows must be prevented or controlled to match the design criteria and performance expectations.

A prime consideration in the selection of alternatives for the sanitary servicing of new development areas must be minimization of the long-term cost to the public. Economic analysis must include evaluation and comparison of operations and maintenance costs as well as capital cost. Extension of sanitary servicing by means of gravity sewer systems to the maximum extent possible is preferred and the utilization of pumping systems will be permitted only when insurmountable constraints cannot be resolved otherwise.

The City wishes to promote an orderly process of development with the objective of achieving permanent sanitary sewer system extensions in the most cost-effective manner. Hence,

- the proliferation of temporary servicing schemes in lieu of permanent system extensions is discouraged; and
- extensions of systems and developments will be discouraged when they involve the construction of downstream connections through undeveloped areas (leapfrogging) solely for the purpose of advancing service extensions to upstream areas.

3.2 Design Flow

The sanitary sewer system shall be of sufficient capacity to convey the peak dry weather flows plus infiltration and inflow (including future contributing areas).

Average Dry Weather Flows for:

- Residential Contributions: Minimum average contribution of 360 liters per capita per day (l/c/d)
- Commercial, Industrial and Institutional: Minimum average contribution of 0.2 liters per second per hectare (l/s/ha).

Average dry weather flows (ADWF) shall be based on specific data related to the development or zoning. In the absence of such data or local regulations, use the above per capita flow rates and the following equivalent population factors:

Land Use	Equivalent Population/Hectare (gross)
Low Density Residential	50 people/ha
Medium Density Residential	90 people/ha
High Density Residential	150 people/ha

Average Annual Daily Water Demands for Commercial and Institutional Facilities may be used as an estimate of ADWF, subject to City of Fort Saskatchewan approval.

The Owner/Applicant should account for higher average flows if high water use facilities are being planned within the development e.g. food processing plant, large hotel, hospital, etc.

3.3 Peaking Factors

The peaking factor is the ratio of peak dry weather flow (PDWF) to the average dry weather flow (ADWF).

Residential	Peaking factor shall be the larger of 1.5 or $PF = 2.6P^{-0.1}$ where P = population in thousands
Commercial/Industrial/ Institutional	$PF = 10Q_{Avg}^{-0.45}$. Min = 2.5, Max = 25.

3.4 Extraneous Flow Allowance

Design flow shall include allowance for inflow and infiltration.

A general allowance of 0.28 litres per second per hectare shall be applied to all residential areas to account for wet weather inflow to manholes not located in street sags and for infiltration into pipes and manholes.

A general allowance of 0.05 litres per second per hectare shall be applied to all commercial, industrial and institutional areas to account for wet weather inflow to manholes not located in street sags and for infiltration into pipes and manholes.

A separate allowance of 0.4 litres per second per manhole shall be applied for inflows at manholes located within roadway sags or other low areas that may be flooded during major storm events. An effort should be made during the design stage to locate sanitary manholes away from sag locations. For planning purposes and downstream system design, the Owner/Applicant shall make a conservative estimate of the number of sag manholes that may be located in the future contributing area. For new construction, all sanitary manholes in sag locations are to be waterproofed.

Connection of foundation drains (weeping tile) to sanitary sewers is not permitted.

3.5 Total Design Flow for Sanitary Sewers

The total design flow for the sanitary sewer is the sum of the peak dry weather flow and all extraneous flows.

$$Q = ADWF \cdot PF + AWWF \quad \text{Where:}$$

Q = design flow in m^3/s
 $ADWF$ = Average Dry Weather Flows
 PF = Peaking Factor
 $AWWF$ = Average Wet Weather Flows

3.6 Sizing of Sanitary Sewers

3.6.1 Gravity Sewers

All sanitary sewers shall be sized using Manning's equation.

$$Q = \frac{AR^{0.667}S^{0.5}}{n} \quad \text{Where:}$$

Q = design flow in m^3/s
 A = cross sectional area in m^2
 R = hydraulic radius (area/wetted perimeter) in m
 S = slope of hydraulic grade line in m/m
 n = roughness coefficient = 0.013 for all pipe

Sanitary sewers are to be designed to carry the design flow at flow depth of 80% of the sewer diameter, which results in a flow rate approximately 86% of the sewer's full flow capacity.

$$\frac{\text{required flow}}{\text{sewer capacity}} = \frac{\text{estimated total design peak flow rate}}{0.86}$$

3.6.2 Sewage Force Mains

Use Hazen-Williams formula:

$$Q = \frac{CD^{2.63}S^{0.54}}{278780} \quad \text{Where:}$$

Q = rate of flow in l/s
 D = internal pipe diameter in mm
 S = slope of hydraulic grade line in m/m
 C = friction coefficient = 120 for all pipe

A "system-head" curve shall be provided for each force main. Supplementary information to be provided with the curves will include, but not limited to, population estimates, areas served, plan and profile of line, friction coefficients and line head losses.

3.7 Minimum Flow Velocities

Minimum full flow design velocities:

- gravity sewers at 0.6 m/s
- force mains at 0.75 m/s

3.8 Maximum Flow Velocities

Maximum full flow design velocities for gravity sewers and force mains at 3.0 m/s.

3.9 Alignment

Wherever practical, straight alignments are preferred. Except as indicated for curved sewers, horizontal and vertical alignments shall be straight lines between manholes for gravity sewers, and between defined deflection points for force mains. Elevations are to be recorded.

Force main line and grade requirements are as indicated for water mains. Air release valves are required at high points.

3.10 Minimum Pipe Diameter

Residential	200 mm
Commercial/Industrial/Institutional	250 mm
Service Connections	150 mm
Sewage Force Mains	150 mm

Pipe and fittings material shall be PVC pipe – CSA B182.2 SDR35 (maximum 600 mm diameter). Material selection for larger pipes shall be submitted for approvals to the City of Fort Saskatchewan.

Installation is to comply with manufacturers recommendations.

3.11 Minimum Sanitary Pipe Grades

Minimum grades of gravity sewers are as required to obtain the minimum velocity of 0.60 m/s except for the upstream section of a residential sewer serving a design population of 25 or less in which case the minimum grade is 1%, unless otherwise approved by the City of Fort Saskatchewan.

Minimum slopes permitted for various sewer sizes are as follows:

Sewer Size	Minimum Slope
200 mm	0.40%
250 mm	0.28%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm or larger	0.10%

Force main grades are as indicated in Section 2.13 Grade.

3.12 Curved Sewers

Where straight sewers are not possible or practical, horizontal curves may be permitted using pipe joint deflections as follows:

- A radius equal to or greater than 90m or the manufacturers minimum recommended radius, whichever is larger
- constant radius throughout curve

- continuous curves between manholes

Curves shall run parallel to the curb or street center line, following the road alignment and within the road right-of-way.

Minimum slopes permitted for sewers on a curve shall be 50% greater than the minimum grade required for straight runs of sewers.

3.13 Depth

Sewers shall be of sufficient depth to:

- permit gravity service connections to building basements
- prevent freezing
- clear other underground utilities
- prevent damage from surface loading
- minimum depth of cover 2.8 m to top of pipe measured from finished design grade
- Clearance from sewers is as indicated in Section 1.4 of Schedule D

In cases where design grade does not comply with the minimum depth of cover, pipes must be insulated to provide frost and mechanical protection. Final design is subject to approval by the City Engineer.

Refer to:

- Drawing W-7 Typical Trench Section
- Drawing S-1 Trench Bedding Types

3.14 Manholes

3.14.1 Design Features

Manholes shall be a minimum 1200 mm inside diameter in the main portion of the structure. Manholes shall be 1500 mm diameter or larger when connecting sewers are 600 mm or larger.

Refer to:

- Drawing S-2 1200mm Manhole for Piping up to 600mm
- Drawing S-3 1200mm Perched Manhole
- Drawing S-4 T-Riser Manhole

The maximum change in the direction of flow in any sanitary sewer manhole shall be 90°.

The maximum drop allowed across a manhole is 0.6m. If the design of the sewer system is such that the difference in elevation between the manhole inlet and outlet exceeds 0.6m, a manhole drop structure will be required as per Drawing S-5 Manhole Drop Structure.

Aluminum safety platforms shall be required in all manholes with a depth greater than 6.0m. Safety platforms to be installed at 3.0m increments.

Manholes shall be installed with ladder rungs as per Drawing S-6 Ladder Rungs.

PVC mains shall be connected to manholes using either a manhole adaptor or an approved pre-benched manhole base. Refer to Drawing S-7 1200mm Manhole Benching.

F-80 manhole covers to be used in most situations. F-90 manhole covers shall be used in sag locations.

3.14.2 Required Locations

Manholes are required at the following locations:

- every change of pipe size
- every change in grade
- every change in direction, except as indicated in the Curved Sewers section
- upstream and downstream ends of curved sewers
- every pipe intersection except for 150mm and smaller service connections
- upstream end of every sewer main
- every future pipe intersection
- 120 m maximum spacing for pipe size up to 600 mm diameter
- 150 m maximum spacing for pipe size from 675 mm to 1200 mm diameter.

3.14.3 Hydraulic Details

Crown elevations of inlet sewers shall not be lower than crown elevation of outlet sewer.

Minimum drop in invert elevations across manhole is:

Straight run	Continue slope of upstream or downstream sewer, whichever is greater
Deflections up to 45°	25 mm drop
Deflections 45° to 90°	50 mm drop

Hydraulic losses are to be calculated for manholes with significant change of grade or alignment. For high velocity flows or large pipes (> 600 mm diameter) detailed analysis is required. For low velocities and smaller pipes, use the following formula:

$$H_L = k \frac{V^2}{2g}$$

Where:

- H_L = head loss (m)
- V = outlet flow velocity (m/s)
- g = gravitational acceleration (9.81 m/s²)
- k = head loss coefficient (1.0 for channeled 90° bends and tees, to 1.5 without channelized benching)

Force main discharges shall be directed into the receiving manhole outflow pipe. Manhole benching shall be extended a minimum 200 mm above the force main crown. If a manhole drop cannot be avoided, an inside drop pipe is required.

3.15 **Testing of Sewers**

In areas where the ground water table rises up to the sewer pipe invert or higher, each section of sewer mains and service connections shall be tested for water tightness by an infiltration test. In all other situations, an exfiltration test may be required after review of the camera inspection report.

Maximum allowable leakage for an exfiltration test of a sewer pipe while subjected to a minimum 0.6 m hydrostatic head of water is 40 l/d/mm of diameter/km.

Tests shall be undertaken on each section of sewer main and the results recorded and shall be performed in the presence of the City's engineer.

3.16 Camera

All sections of sewer shall be inspected with closed circuit television camera (CCTV) equipment. An inspection report, photos and DVD (or other digital copy) shall be submitted to the City for their approval and records. CCTV shall be carried out at the Construction Completion Certificate (CCC) and within 60 days of the Final Acceptance Certificate (FAC).

3.17 Pipe Locations and Corridors

Sewers shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawings T-3 through to T-13.

Clearance from water mains is as indicated in Section 1.4, Schedule D.

3.18 Service Connections

Every legal lot and each residential unit shall be provided with a separate service connection as per Drawing S-8 Sanitary Service Connection.

Unless otherwise approved by the City of Fort Saskatchewan, connections are to serve all plumbing by gravity. Drawings to provide service invert at property line.

3.18.1 Size

Pipe size is to accommodate peak design flow. Minimum pipe size is 150 mm diameter.

3.18.2 Location and Depth

Connections to large lots are to be located at the lower portion of each lot. For residential developments, locate connections in accordance with detail drawings.

Depth requirements are as indicated in Section 3.13 Depth herein.

3.18.3 Grade

Minimum grade from property line to sewer main is

150 mm diameter pipe	2.00 %
Larger Sizes	Grade based on minimum velocity of 0.75 m/s

3.18.4 Connections

Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles. The service connection centerline must not be below the sewer main centerline.

Service connections may be permitted into manholes if:

- the connection is not oriented against the flow in the main
- manhole hydraulic requirements are met
- no more than 2 service connections into manhole

Control inspection manholes are required on all industrial and commercial connections.

Connections exceeding 30 m in length shall be treated as mains and must have a cleanout.

All sanitary sewer service lines must extend 300 mm beyond the easement or 2.0 m from the property line on the private side. Service connections made directly to manholes should extend into the manhole by 100 mm.

Where services are required to connect to mains in excess of 4.0 m in depth, risers shall be installed and properly plugged. The risers shall be firmly supported and anchored to the trench wall in all cases.

1. Pipe and Joints
Sewer pipe shall be Polyvinyl Chloride (PVC) pipe shall be SDR 35 service pipe conforming to ASTM Specification D3034.
2. Fittings
Sewer fittings shall conform to the pipe material being used and shall be in accordance with the corresponding manufacturer's recommended standards and specifications.
3. Plugs
The ends of the pipe at the edge of the easement shall be sealed with plastic plugs fitted to the bell end of the pipe and braced. Blue painted marker posts shall be placed from the invert of the pipe and extend 600 mm from the design (or final) ground surface to identify the location of all plugged ends.

3.19 Sanitary Lift Stations

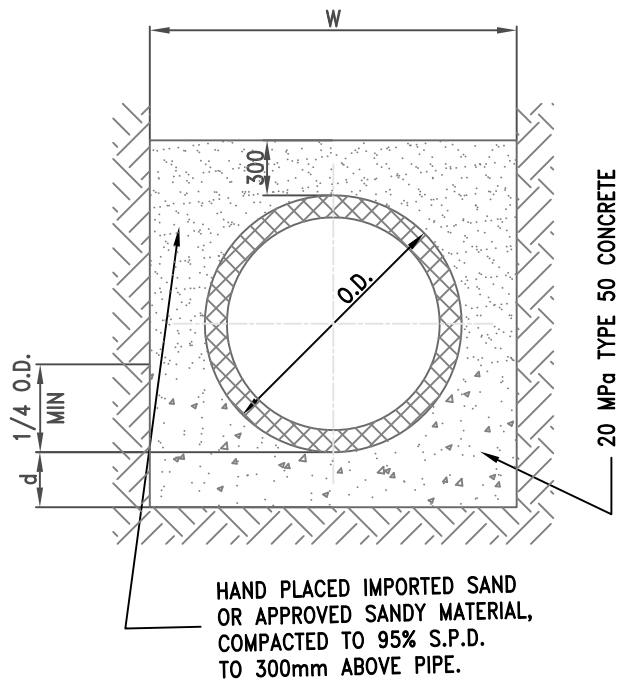
The extension of sanitary servicing by use of sanitary lift stations shall be avoided where possible. Sanitary pump stations shall only be considered where physical constraints dictate. Sanitary servicing concepts in which a pump station is required shall be justified through the Area Structure Plan requirements for new development areas and be supported by the Sanitary Master Plan. Any use of pump stations must be proposed by a professional engineer and submitted to the City Engineer for approval. Preliminary design must be approved before detailed design proceeds. Check with City Engineer for requirements.

3.20 List of Standard Drawings

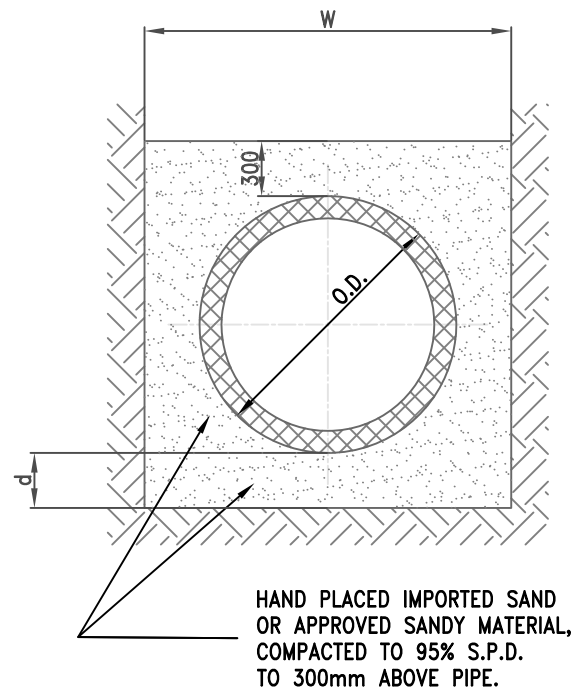
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|-----|---------------------------------------|
| S-1 | Trench Bedding Types |
| S-2 | 1200mm Manhole for Piping up to 600mm |
| S-3 | 1200mm Perched Manhole |
| S-4 | T-Riser Manhole |
| S-5 | Manhole Drop Structure |
| S-6 | Ladder Rungs |
| S-7 | 1200mm Manhole Benching |
| S-8 | Sanitary Service Connection |

See water section detail W-7 for Typical Trench Section
See water section detail W-10 for Single Service Connection
See water section detail W-11 for Dual Service Connection

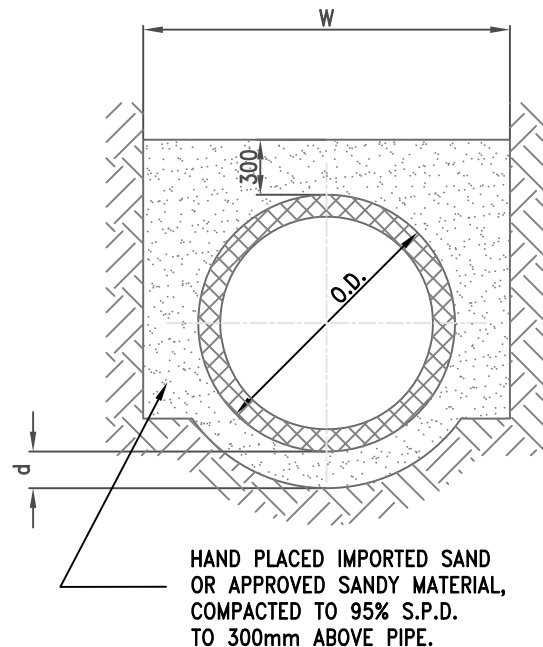
CLASS 'A' BEDDING



CLASS 'B' BEDDING



CLASS 'B' BEDDING
ALTERNATE - 375mm & UNDER I.D.



NOTES:

W = TRENCH WIDTH = 600mm MIN
O.D. = OUTSIDE PIPE DIAMETER
I.D. = INSIDE PIPE DIAMETER
d = DEPTH OF BEDDING BELOW PIPE

I.D. = 675mm AND SMALLER:

W = 600mm MIN

d = 100mm MIN

I.D. = 750mm AND LARGER:

W = O.D. + 750mm MIN

d = 150mm MIN

1. THESE BEDDING TYPES APPLY ONLY WHERE SOLID, SUITABLE SOIL CONDITIONS EXIST. IN AREAS WITH UNSUITABLE SOIL CONDITIONS, SPECIAL BEDDING AND PIPE FOUNDATION DESIGNS ARE REQUIRED.

TRENCH BEDDING TYPES



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

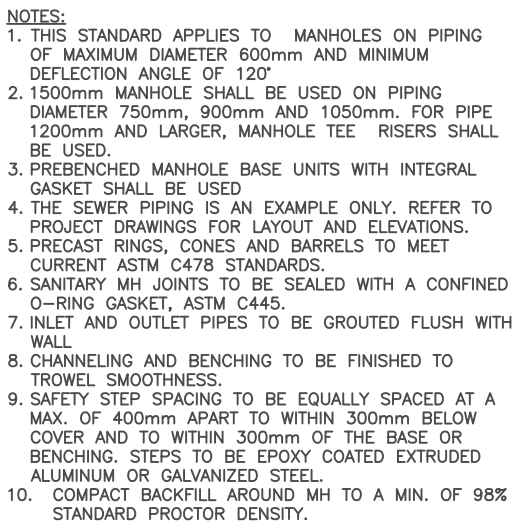
REVISION NUMBER: A

DATE: FEB 2013

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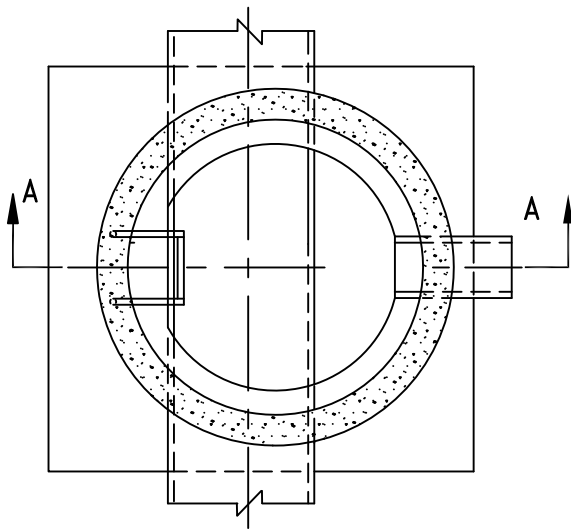
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S-1



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

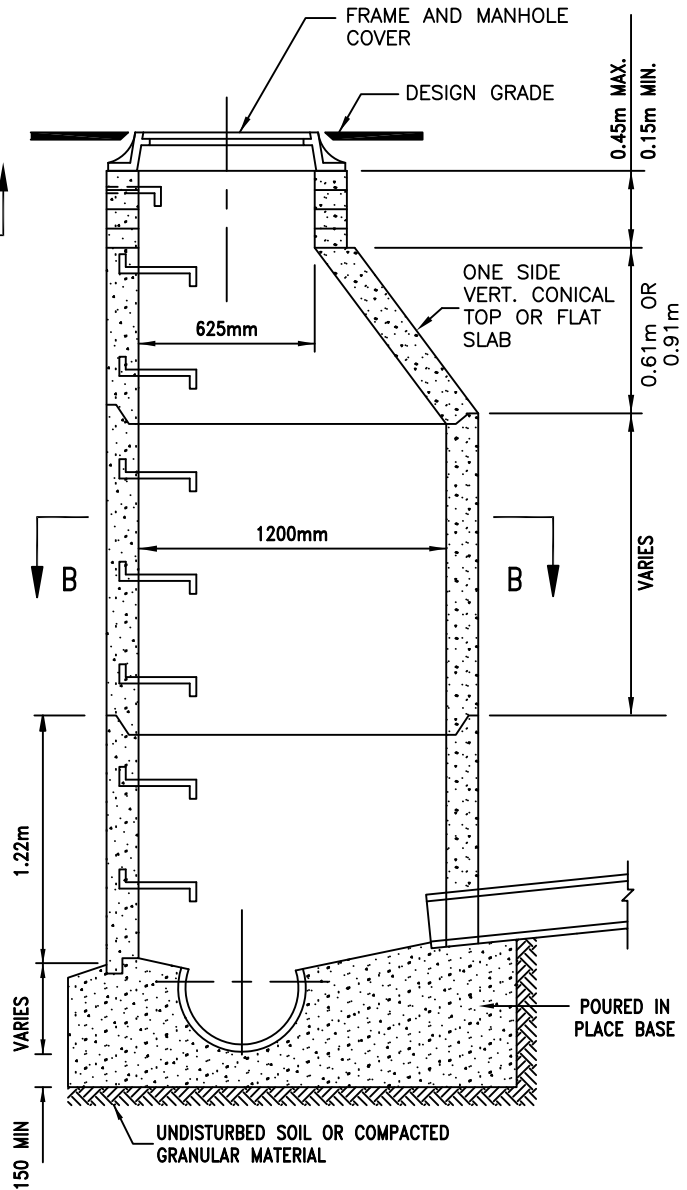
1200mm MANHOLE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-2
NOT TO SCALE	DRAWN: MP	



SECTION B - B

NOTES:

1. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
2. SANITARY MH JOINTS TO BE SEALED WITH A CONFINED O-RING GASKET, ASTM C445.
3. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR.
4. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
5. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
6. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 400mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 300mm OF THE BASE OR BENCHING. STEPS TO BE EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
7. COMPACT BACKFILL AROUND MH TO A MIN. OF 98% STANDARD PROCTOR DENSITY.

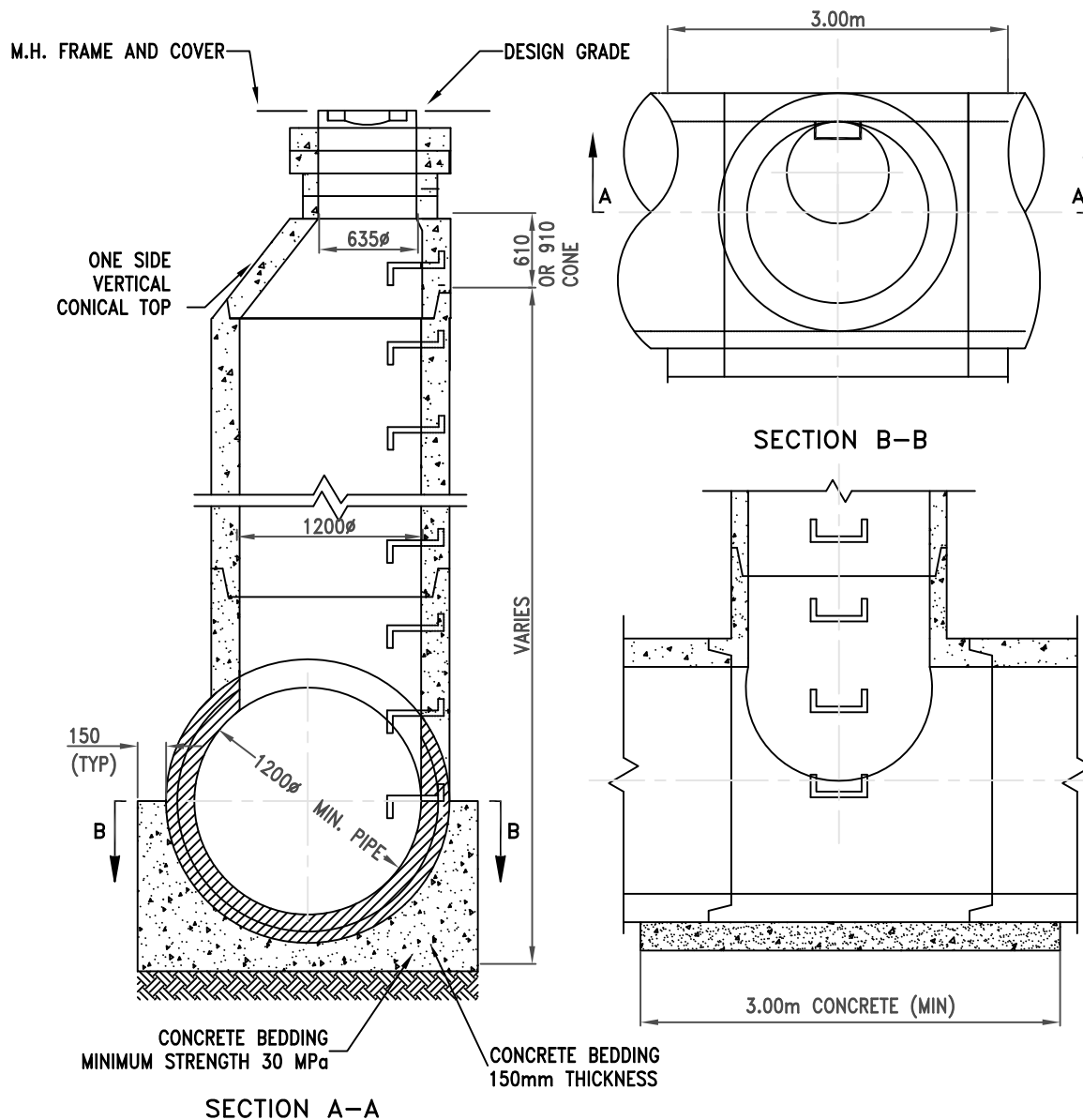


SECTION A - A

F-39 FRAME AND COVER IN LANDSCAPED AREAS.
F-80 FRAME AND COVER IN HARD SURFACED AREAS.
F-90 GASKETED FRAME AND COVER AT SAGS.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

1200mm PERCHED MANHOLE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-3
NOT TO SCALE	DRAWN: MP	



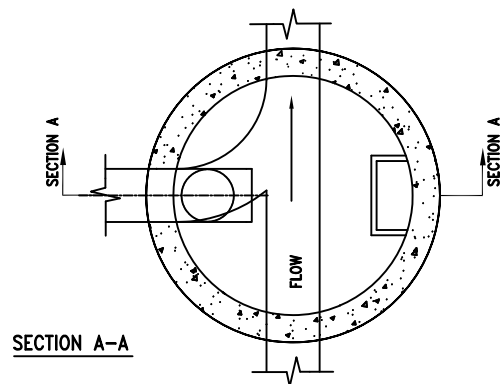
NOTES:

1. THIS TYPE OF MANHOLE IS TO BE BUILT ONLY ON MAINS OF 1200mm DIAMETER OR LARGER
2. ALUMINUM BARRELS TO MEET ASTM C-478.
3. ALUMINUM SAFETY STEPS 400mm O.C. MAXIMUM TO FULL HEIGHT OF MANHOLE.

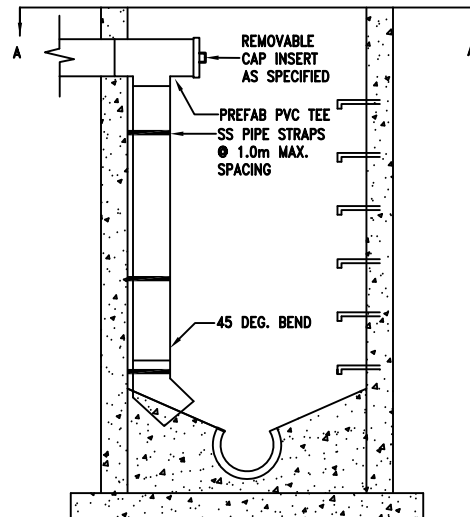
F-39 FRAME AND COVER IN LANDSCAPED AREAS.
F-80 FRAME AND COVER IN HARD SURFACED AREAS.
F-90 GASKETED FRAME AND COVER AT SAGS.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

T-RISER MANHOLE		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-4
NOT TO SCALE	DRAWN: MP	

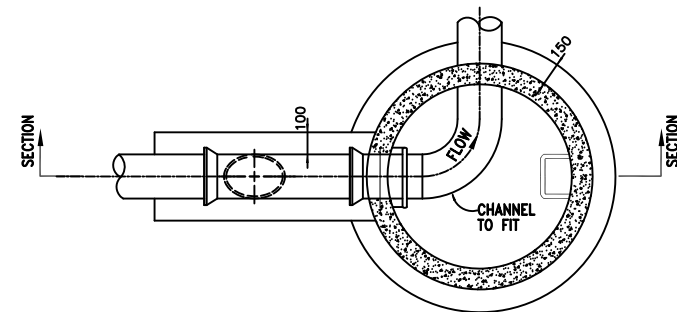


SECTION A-A

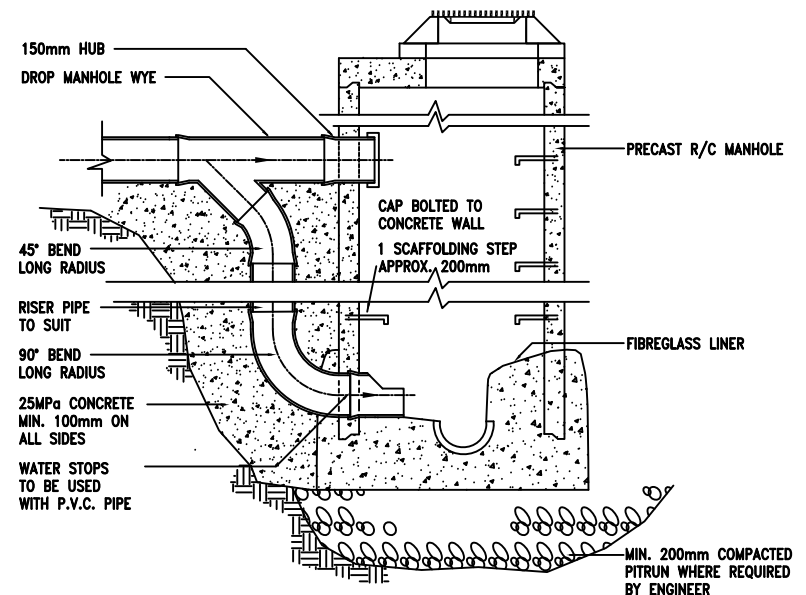


NOTES

1. MAXIMUM INLET SEWER OF 300mm DIA.
2. DROP PIPE SIZE TO EQUAL INLET PIPE SIZE.
3. ALL JOINTS SHALL BE WATERTIGHT.
4. POSITION 45° BEND IN LINE WITH DIRECTION OF FLOW AND SECURE WITH BENCHING OR STAINLESS STEEL BRACKET.



PLAN



SECTION

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

MANHOLE DROP STRUCTURE

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

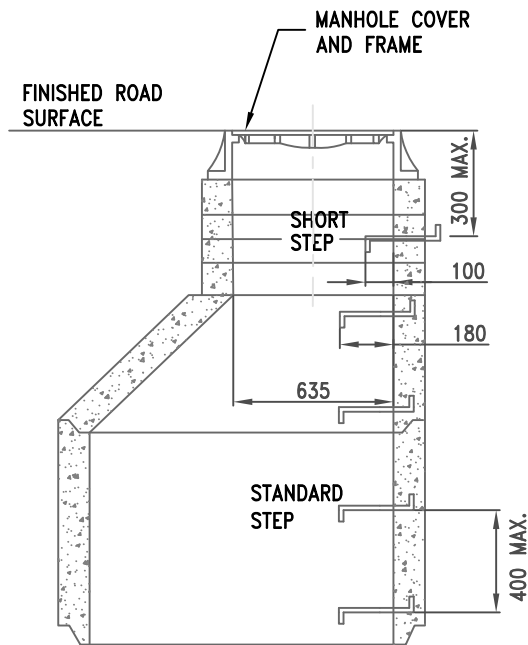
DATE: FEB 2013

DRAWN: MP

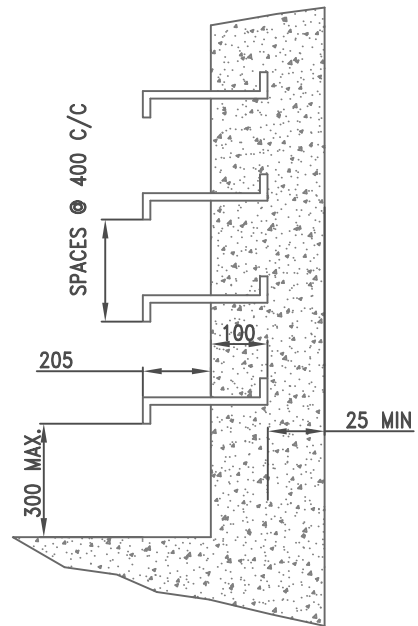


DWG. NO.

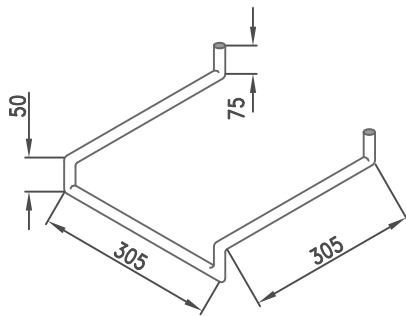
S-5



TYPICAL MANHOLE SECTION
N.T.S.



LADDER RUNGS
N.T.S.

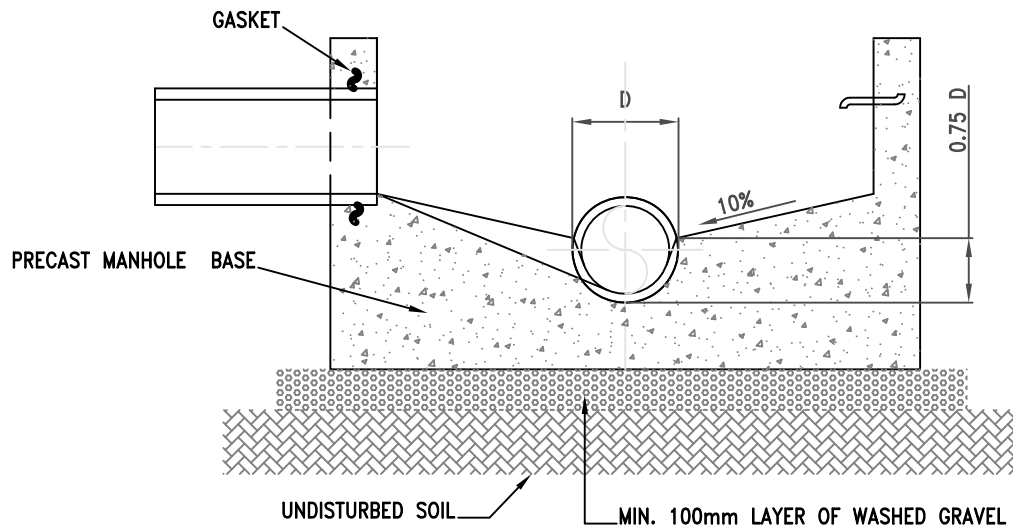


20mm ALUMINUM FORGED MANHOLE STEPS
OR AS PER MANUFACTURER SPECIFICATION

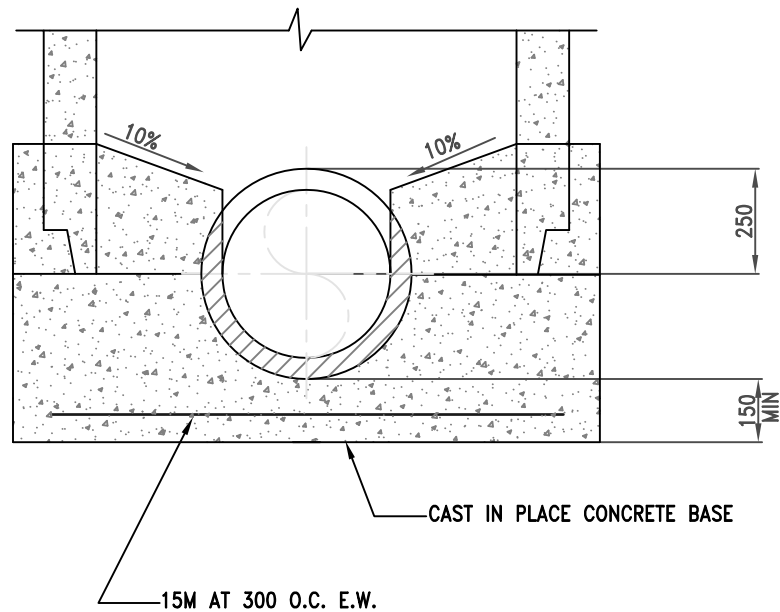
MANHOLE RUNG DETAIL
N.T.S.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

LADDER RUNGS		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-6
NOT TO SCALE	DRAWN: MP	



BENCHING DETAIL 1



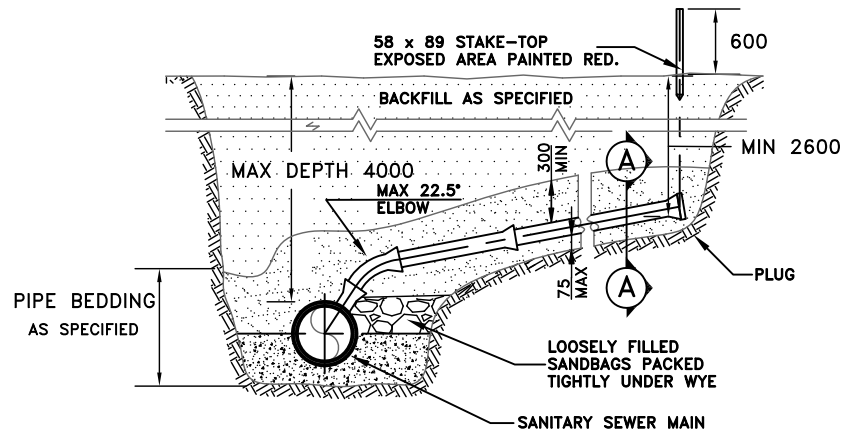
BENCHING DETAIL 2

NOTES:

1. ALL POURED CONCRETE SHALL CONFORM TO C.S.A SPEC. A.23-1 AND SHALL HAVE A COMPRESSIVE STRENGTH OF 30 MPa AT 28 DAYS.
2. ALL REINFORCING STEEL TO BE GRADE 400 DEFORMED BARS CONFORMING TO C.S.A. SPEC. G30.18.
3. REINFORCE AS DETAILED OR AS ORDERED BY THE CITY.

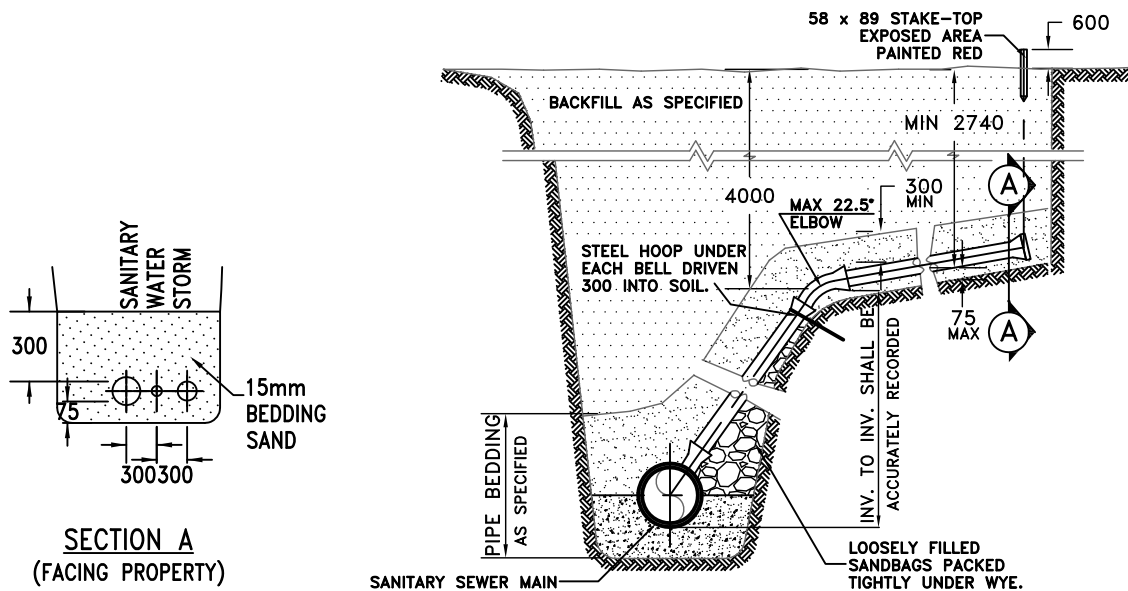
ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

1200mm MANHOLE BENCHING		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-7
NOT TO SCALE	DRAWN: MP	



WITHOUT RISER

REFER TO SPECIFICATION
FOR WYE OR SERVICE SADDLE.



WITH RISER

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

SANITARY SERVICE CONNECTION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	S-8
NOT TO SCALE	DRAWN: MP	

4.0 STORM DRAINAGE

This section outlines the methodology and design criteria that apply to the design of the storm drainage conveyance system. These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Drainage designs shall be prepared under the direction of a qualified professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

The following standards are intended to cover only minimum requirements. Drainage designs must conform to federal and provincial statutes and guidelines.

4.1 Stormwater Management General Principles and Objectives

Stormwater management is a comprehensive approach to planning, design, implementation and operation of stormwater drainage systems. The purpose of the stormwater management approach is to develop effective drainage systems that balance the objectives of maximizing drainage efficiency and minimizing adverse environmental impacts.

Stormwater management involves the planning and design necessary to mitigate the hydrological impacts of land development or land use changes. Adverse hydrological impacts include increased stormwater peak flows, erosion, sedimentation, flooding, reduced surface infiltration, reduced minimum groundwater levels and stream base flows, water quality deterioration and degradation of aquatic and wildlife habitats. Mitigation measures should be implemented to minimize these adverse impacts on the watershed by incorporating tools to mimic natural (pre-development) hydrology conditions.

These methods include but are not limited to the following:

- appropriate Land Use Planning
- increase permeable surface by incorporating green roofs, permeable paving and etc.
- lot grading and Landscaping to mimic the predevelopment conditions
- appropriate sizing and routing of the drainage conveyance system
- incorporating storage facilities and Best Management Practices (BMPs)
- water quality control
- sediment control
- erosion protection

Stormwater Management Plan requires approval from Alberta Environment, both under the Environmental Protection and Enhancement Act (EPEA) and the Water Act. It is the responsibility of the Owner/Applicant to get approval from Alberta Environment prior to construction.

4.2 Dual Drainage Concept

Stormwater management plan shall include planning and design for both minor and major systems.

4.2.1 The Minor System

The minor system consists of those drainage works that convey flows from minor storm events and efficiently from a catchment, providing convenience drainage. The components of the minor system include:

- roof leaders
- foundation drains

- lot drainage
- gutters
- catchbasins, inlets and leads
- underground pipes
- manholes, junctions and outfalls
- storage facilities
- outfall channels
- erosion protection and energy dissipaters and
- receiving water bodies

The division of facilities into minor and major system components is not precise. Some components carry and store flows during both major and minor events. These components are listed as part of both systems as they must be considered in the design of each.

4.2.2 The Major System

The major system consists of those components that convey and store flows during major and less frequent storm events. Failure to plan and adequately size these components can result in potentially serious flooding of properties during major storm events and create hazards to life as major runoff flows and ponds.

The components of the major system include:

- roof leads
- lot drainage
- roads and gutters
- swales
- storage facilities
- outfall channels
- outfalls
- underground pipes (large size pipes, tunnels), and
- receiving water bodies

4.3 **Level of Service**

The objective of urban drainage systems is to provide a high degree of drainage service without causing unacceptable downstream impacts at a reasonable cost. To achieve this, the 4-h Chicago distribution hyetographs should be used for analysis of major and minor conveyance systems by computer simulation. The **1 in 5 year storm event** shall be used for the minor system and the **1 in 100 year storm event** shall be used for the major system. When the design of stormwater management facilities is involved, the 24-h Huff distribution design hyetograph should be used with the **1 in 100 year storm event**.

4.4 **Stormwater Management Plan**

Unless otherwise indicated a Stormwater Management Plan is required for all developments larger than 3.0 ha, except those in rural or agricultural areas where lots are larger than 0.4 ha. The Stormwater Management Plan shall be in accordance with federal and provincial guidelines and shall conform to the Watershed and/or Master Drainage Plan.

In the absence of such plans, the following approach shall be considered and discussed with the City Engineer:

- define design objectives and required information
- assessment of receiving waterbodies
- identify quality and environmental concerns
- selection of the appropriate type(s) of Best Management Practices (BMPs) and location

The Stormwater Management Plan shall ensure that the adverse environmental and hydrological impacts of the development are minimized and shall:

- identify pre development drainage basins
- provide details indicating how the proposed development relates to its adjacent neighbouring land
- identify and quantify upstream drainage entering the proposed development pre development
- identify pre development flows and pre development point of discharge
- identify all existing flow channels and major flow paths
- identify the existing environmentally significant areas and resources within the proposed development including environmental classifications and/or fish presence information, if available
- identify the receiving waterbody(s) and its characteristics
- identify the impact of the proposed development on the watershed
- provide a conceptual lot grading plan that minimize changes to existing topography
- quantify post development flows (minor and major)
- provide conceptual sizing and layout of the minor and major conveyance system
- identify the type, size and location of stormwater management facility(s)
- identify the required land size to accommodate the proposed stormwater management facility(s)
- provide details of water quality enhancement measures, such as proposed source control and/or quality treatment facilities, and other BMPs
- provide details of hydraulic and hydrologic analyses
- provide hydraulic grade line (HGL) elevations for both major and minor storm events for the proposed stormwater management facility(s)
- provide proposed minimum building elevations (MBE) and the relation to the 100 year HGL in the major flow paths
- provide the conceptual sizing and location of the point of discharge and/or outfall
- provide the erosion control mitigation measures
- provide construction sedimentation control plan
- provide any other proposed mitigation measures, if appropriate
- provide preliminary cost estimate
- identify all licensing and federal and provincial approval requirements

4.5 Runoff Analysis

Storm drainage design shall be carried out using one or both of the following methods. Calculations are to be included and submitted with the design package.

Rainfall-Runoff Simulation Method: applicable to design of complex minor drainage systems, all stormwater management facility calculations and major drainage systems. The computer program proposed for use is subject to approval by the City of Fort Saskatchewan. Acceptable computer models shall include but not limited to SWMM, PCSWMM, and OTTHYMO.

Rational Method: applicable to preliminary design and to detailed design of minor drainage systems in urban areas where no storage facility is required. Use of the Rational Method should

be limited to areas less than 65 ha. This method is not applicable if stormwater management facilities are proposed.

4.6 Rational Method

The Rational Method is used to quantify peak flows and quantify design flows to size the conveyance system:

$$Q = CIA/360 \quad \text{Where:} \quad \begin{array}{l} Q = \text{peak flow in m}^3/\text{s} \\ C = \text{runoff coefficient} \\ I = \text{intensity of rainfall in mm per hour for a time equal to} \\ \text{the time of concentration} \\ A = \text{area of catchment in hectares (ha)} \end{array}$$

Rational Method design calculations are to be tabulated and submitted.

4.6.1 Runoff Coefficients

The following runoff coefficients are to be used in the Rational Formula. These coefficients are for general application only. Design values are subject to verification by the designer and approval by the City Engineer.

Land Use	Percent Impervious	Runoff Coefficient (C)
		5 and 10 Year Storm Events
Residential – Large/Medium Lot Single Detached (RS1, RS2, RSE; Lots > 0.49 ha)	20%	0.35
Residential – Small Lot Single Detached (RS3, RS4)	40%	0.50
Residential – Low/Medium Density Multi-Family (RMC, RML, RMM)	65%	0.60
Residential – High Density Multi-Family (RMH, RMHC)	78%	0.70
Commercial (C1, C2, C3, C4)	90%	0.80
Light Industrial (IL)	80%	0.70
Medium/Heavy Industrial (IM, IH)	90%	0.80
Institutional (PS)	80%	0.75
Parks/Grasslands (PR)	20%	0.20
Cultivated Fields	30%	0.30
Woodlands/Agricultural	5%	0.10

For zonings not shown in this table, the runoff coefficient "C" and the percentage of imperviousness "Imp%" shall be estimated by the designer. This includes IR (Industrial Reserve) and IB (Industrial Buffer) UR (Urban Reserve).

When the Rational Method is used for land with multi-use and different surface types, the weighted average of the pervious and impervious area runoff coefficient shall be estimated using the following equation:

$$C = \frac{C_p A_p + C_i A_i}{A_p + A_i} \quad \text{Where:} \quad \begin{array}{l} C = \text{runoff coefficient} \\ C_p = \text{pervious surface} = 0.10 \\ A_p = \text{pervious area (ha)} \end{array}$$

C_i = impervious surface = 0.95
 A_i = impervious area (ha)

For use of the Rational Method to determine peak runoff due to storms with return periods greater than a 1 in 5 year and 1 in 10 year events, the runoff coefficient shall increased accordingly. The relevant modifiers to be used for various design events factors up to a maximum of $C=0.95$ are:

Design Return Period	Runoff Coefficient Modification
Greater than 1 in 5 year up to and including 1 in 25 year	multiply by 1.1
Greater than 1 in 25 year up to and including 1 in 50 year	multiply by 1.2
Greater than 1 in 50 year up to and including 1 in 100 year	multiply by 1.25

4.6.2 Rainfall Intensity Duration Frequency (IDF) Data

The rainfall intensity for the Rational Method shall be determined using the Edmonton Municipal Airport IDF data with storm duration equal to the Time of Concentration (T_c) calculated as indicated in Section 4.6.3 Time of Concentration. Edmonton Municipal Airport IDF parameters listed below, are to be used to determine the rainfall intensity incorporating the below formula:

I (mm/hr) = $a \cdot (t+c)^b$ Where: t = storm duration in minutes and a , b and c are based on the following values

Edmonton Municipal Airport IDF Parameters	Return Frequency					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
a	221.36	335.26	410.76	506.20	577.02	647.33
b	-0.647	-0.654	-0.656	-0.659	-0.660	-0.661
c (min)	1.571	1.542	1.533	1.526	1.523	1.520

*Based on AES data at Edmonton Municipal Airport, Edmonton, AB for period 1914 to 1995.

4.6.3 Time of Concentration

The time of concentration (T_c) is the time required for runoff to flow from the furthest point within the contributing catchment area under consideration to the design location. Determination of T_c requires estimation of two components, the "inlet time" (T_i) and "travel time" (T_t);
 $T_c = T_i + T_t$.

4.6.4 Inlet or Overland Flow Time (T_i)

The inlet time is the time for flow from the extreme limits of the catchment to reach the first point of inflow into the defined conveyance system. It is dependent upon the imperviousness and the size of the catchment.

Typical inlet times for urban areas should not exceed 15 minutes.

4.6.5 Travel Time (T_t)

The travel time is the time required for flow to travel within the conveyance system from the point of inflow to the design location.

In piped systems, travel time shall be determined based on the full flow pipe velocity in each pipe upstream of the design location.

$$T_t = L/60V \quad \text{Where:} \quad \begin{array}{l} T_t = \text{travel time in (minutes)} \\ L = \text{pipe length in (m)} \\ V = \text{average velocity in (m/s)} \end{array}$$

4.7 **Simulation Method**

Stormwater systems servicing areas greater than 50 ha and all stormwater systems with storage facilities shall be sized using computer modeling and simulation techniques. List of acceptable computer program are stated in section 4.6 Runoff Analysis.

4.7.1 Model Selection

Selection of computer programs requires review of the historical application of each program in watersheds similar to those under consideration. City approval of computer program selection shall be obtained before design is commenced.

The OTTHYMO or SWMM models are recommended to be used in the design of dual (major and minor) drainage systems. Other suitable programs may be used as approved by the City of Fort Saskatchewan.

4.7.2 Modeling Procedures

Using the proposed catchment areas, runoff hydrographs shall be calculated and used to size the conveyance system and storage facilities. Post development hydrographs are to be determined at key points of the trunk sewer and major systems for the 5 and 100 year design storm events and for sizing of the stormwater management facilities.

Whenever possible, modeling results shall be calibrated using observed rainfall and flow data from the design watershed or a similar watershed. Sensitivity of the model predictions to variations of key parameters shall be tested and the findings used to develop realistic and conservative models.

4.7.3 Suggested Model Parameters

The value of runoff parameters used in the computer model, such as infiltration rates, evaporation rates, impervious and pervious roughness factors, and sufficient background information on the selection of these values shall be provided by the Owner/Applicant in the design brief.

4.7.4 Design Storm Events and Rainfall Data

The 4-hour Chicago distribution hyetographs should be used for analysis of major and minor conveyance systems by computer simulation. When the design of a stormwater management facility is involved, the 24-hour Huff distribution design hyetographs should be used.

For larger areas and urban areas with multiple detention facilities, the design storm with durations of, 12 and 24 hours should be considered for simulation. A different range of storm durations may be appropriate, subject to City approval. This will identify the critical storm event to be used in designing the system component. Note that the storm durations that generate the critical peak flow may be different from the durations that generate the critical storage volume. Systems with a number of interconnected ponds or with restricted outlet flow capacity may require analysis for sequential storm events or modeling with a continuous rainfall record.

Detailed designs shall include maximum hydraulic gradelines (HGLs) of the minor and major systems plotted on profiles of the minor system components and compared with minimum building elevations (MBE) to demonstrate flood protection.

4.7.5 Submission of Modeling Results

Modeling results are to be submitted to the City in a report containing the following information as a minimum:

- plans showing catchment and sub-catchment boundaries, slopes, soil conditions, land uses and storage facilities;
- name and version of modeling program(s)
- parameters and simulation assumptions
- design storm details
- pre development and post development flow calculations
- hydraulic grade lines in the conveyance systems and storage facilities during minor and major storm events

4.8 **Discharge Rates and Quality**

Drainage systems shall be designed to control post-development runoff so that it does not exceed the 1 in 100 year peak flow in pre development conditions.

Runoff quality treatment shall be considered for flows up to 50% of the two year post-development peak flow or the five year pre-development peak flow, whichever is greater. Quality treatment facilities include, but are not limited to, oil/grit separators for service stations, silt traps, detention storage facilities, grassed swales and constructed wetlands. Designs are to comply with the requirements of the City, regional, provincial and federal statutes and guidelines as noted above.

Treatment facilities shall include provisions for maintenance equipment access.

4.9 **Site and Lot Grading**

4.9.1 General Grading Requirements

Grading is to comply with the Alberta Building Code and the following:

- Grade lots to drain to a municipal minor or major drainage system, natural drainage path or roadway at a minimum 2% grade. Lower grades require approval from City Engineer.
- Grade areas around buildings to direct the runoff away from foundations
- Where lots are lower than the adjacent roadways, direct road runoff away from buildings and driveways and into a municipal drainage system

Cross lot drainage is permitted in the following situations:

- The rear 6m of a lot may drain onto the adjacent property to the rear if the adjacent property to the rear has a minimum back to front lot grade of 2% and the rear 6m portion is graded at 2-3%.
- A blanket easement or covenant is placed on the property titles affected noting the allowance of cross lot drainage.
- Approval is granted by City Engineer.

The relative surface elevations must allow for the slope of the ground adjacent to the building to be at a minimum of 10% for a distance of 2.0 m or to the property line whichever the smaller, on all sides of the house, with the slope directing drainage away from the building and then for reasonable slopes in the order of 2.0% from all points within the property to the property boundary at which the drainage may escape. Refer to Drawing ST-1 Typical Lot Grading.

Public Reserves and lands shall be graded to drain toward developed streets, lanes and/or the storm sewer drainage system.

In cases where the backyard slopes towards the building, provisions are required to keep the runoff at least 3.0 m away from the rear of the building with the possibility of draining the surface water along the lot lines into the storm sewer drainage system.

Lots shall be pre-graded to the designed grade or to a maximum of 300 mm below design grade.

Lot Grading plans submitted by the Owner/Applicant shall indicate the following information:

- existing contours and proposed corner grades showing drainage
- minimum ground elevation at the building
- invert of sanitary sewer service
- location of water, sanitary sewer and storm sewer connections
- direction of drainage showing lot grading away from buildings and on to public roadway only
- actual and proposed elevation of the top of the sidewalk at the corner of the property
- the proposed and existing grades for the Public lands (reserves, buffers and boulevards)

4.9.2 Lot Grading Program

All lot grading in the City of Fort Saskatchewan requires lot grading approval. The process is as follows:

- Developer and their Engineering Consultant submit subdivision grading plan to City Engineer for Approval.
- Home builder submits plot plan for individual lot to City of Fort Saskatchewan prepared by legal surveyor. City Engineer will review grading to ensure it matches approved subdivision grading plan.
- Home builder submits rough grade certificate for individual lot to City of Fort Saskatchewan (prepared by legal surveyor or professional engineer). City Engineer will review rough grading certificate and return to homebuilder indicating approval or deficiencies exist. If deficiencies exist, home builder is to correct within 60days and submit new rough grade certificate for review by City Engineer.
- Once rough grade has been approved, the homeowner has one year to complete the final landscaping and initiate final grade approval.
- Home owner submits final grade certificate for individual lot to City of Fort Saskatchewan (prepared by legal surveyor or professional engineer). City Engineer will review final grading certificate and return to homeowner indicating approval or deficiencies exist. If

deficiencies exist, homeowner is to correct within 60days and submit new final grade certificate for review by City Engineer.

- Homeowner will receive a copy of the Lot Grading Certificate once final grade is approved.

4.10 Swales

Drainage swales on municipal or private property shall be constructed prior to any development of subdivision lots. Complete swale construction shall be a prerequisite to the issuance of the construction completion certificate.

Drainage swales located on private property shall be built in an easement in favor of the City. A minimum of 200 mm should be provided between the edge of swale and the property line.

The minimum design slope for concrete swales on private property or on public property is 0.60%.

On approval by the City, grass swales with a minimum slope of 2% may be acceptable.

Concrete swales to be constructed in accordance with Drawing ST-2 Concrete Drainage Swale. Earthen swales shall be protected from erosion by grass cover, appropriate ground cover or geotextile fabric.

4.11 Lowest Allowable Footing

The lowest basement footing of any building on a lot adjacent to a stormwater management pond shall be a minimum of 300mm and 500mm for lowest building opening above the 1:100 year high water level.

4.12 Piped System

In special circumstances, or to accommodate lower building elevations, the minor drainage system may be enlarged or supplemented to accommodate major flows. System details shall be included in the Stormwater Management Plan. Design considerations include:

- provision of adequate inlets to accommodate major flows
- the requirement for surface overflow routes at potential surface ponding locations
- design in accordance with minor drainage system guidelines

4.13 Storm Sewer Mains

Storm sewer pipes shall be sized to convey the design flow so that when flowing full, the hydraulic gradeline is at the pipe obvert.

Pipe material shall be:

Concrete Pipe	CSA A257.2, sulfate resistant
PVC Pipe	CSA B182.2 SDR 35
PVC Pipe (Ultra-Rib)	CSA B 182.4

**Concrete pipe should only be used for situations where trench depth and loading is a concern.

4.14 Storm Pipe Inlet

Stormwater pipe inlets and outfalls shall be constructed such that ground erosion is minimized. To meet this requirement, head walls, end walls, nursery sod, rip rap blanket, gabions or other approved structures may be required in constructing the inlets and outfalls.

4.15 Minimum Pipe Diameter

Storm Sewers	300 mm
Catchbasin Leads	300 mm
Culvert	600 mm
Foundation Drain Main	200 mm
Foundation Drain Service	100 mm

4.16 Ditch Inlets

Ditch inlets to storm sewers shall include bar screens.

4.17 Alignment

Except as indicated for Curved Sewers, horizontal and vertical alignments are to be straight lines between manholes. Elevations are to be recorded.

4.18 Locations and Corridors

Sewers shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawings T-3 through to T-13.

Clearance from water mains is as indicated in Section 1.4, Schedule D.

4.19 Minimum and Maximum Grade

The slope of the storm sewers should be designed so that the minimum pipe velocity is 0.6 m/s when flowing full. Suggested minimum design slopes are indicated below. For catchbasin leads and service connections, minimum grades are as indicated in the following sections. Where steep grades result in velocities exceeding 3 m/s, appropriate measures shall be designed and implemented to prevent pipe bedding erosion and movement.

Sewer Diameter	Minimum Design Slope
200 mm (FD)	0.40%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm	0.10%
600 mm and larger	0.10%

4.20 Curved Sewers

Where straight sewers are not possible or practical, horizontal curves may be permitted using pipe joint deflections as follows:

- minimum radius = 60 m
- constant radius throughout curve

- joint deflection not to exceed 75% of maximum recommended by pipe manufacturer
- minimum design velocity = 0.9 m/s
- continuous curves between manholes

Curves shall run parallel to the curb or street center line, following the road alignment and within the road right-of-way.

Minimum slopes permitted for various curved sewer sizes are as follows:

Sewer Size	Minimum Slope
200 mm	0.40%
250 mm	0.31%
300 mm	0.25%
375 mm	0.18%
450 mm	0.15%
525 mm	0.13%
600 mm or larger	0.10%

4.21 Pipe Depth

Storm mains shall be installed to provide a minimum depth of cover of 1.5m.

In residential areas, storm mains shall be at a depth to provide the minimum depth of cover over foundation drain services. Where minimum cover cannot be met due to the existing storm system, other frost protection measures are to be reviewed with the City Engineer.

4.22 Trench and Bedding

Reference Drawing W-7 Typical Trench Section and Drawing S-1 Trench Bedding Types.

4.23 Pipe Joints

Use watertight joints except where storm sewers are part of a subsurface collection/disposal system.

4.24 Groundwater Infiltration

In low areas where groundwater concentration may cause surface ponding, reduced soil stability, or cause submergence of other utilities, screened and filtered manhole inlets or perforated and filtered sections of storm sewer pipe should be provided.

4.25 Manhole Design Features

Manholes shall be precast concrete and shall conform to the latest version of ASTM C478. All concrete shall be sulfate resistant.

Storm Sewer Pipes $\leq$ 600 mm	1200 mm Manhole
Storm Sewer Pipes $>$ 600 mm and $\leq$ 1050 mm	1500 mm Manhole
Storm Sewer Pipes $>$ 1050 mm	Requires specific design

Reference standard details for installation guidance with respect to various manhole types:

- Drawing S-2 1200mm Manhole for Piping up to 600 mm

- Drawing S-3 1200mm Perched Manhole
- Drawing S-4 T-Riser Manhole
- Drawing ST-3 1200mm Catchbasin Manhole

Manholes shall be installed with ladder rungs as per Drawing S-6 Ladder Rungs. Aluminum safety platform shall be required in all manholes with a depth of 6.0 m (vertical distance from rim to invert) or greater.

Frames and covers shall be of cast iron and capable of withstanding H-20 loading. F-80 manhole covers shall be used in most situations. F-39 covers shall be used in landscaped areas.

All joints shall be designed and constructed to be water tight using a bitumastic watertight sealant.

PVC mains shall be connected to manholes using either a manhole adaptor or an approved pre-benched manhole base as per Drawing S-7 1200mm Manhole Benching.

The maximum change in the direction of flow in any storm sewer manhole shall be 90°.

The maximum drop allowed across a manhole is 0.6 m. If the design of the sewer system is such that the difference in elevation between the manhole inlet and outlet exceeds 0.6 m, a manhole drop structure as shown on the standard detail drawings will be required.

When greater than one internal drop structure required in a manhole, the manhole shall be a minimum of 1800 mm diameter.

4.26 Manhole Locations

Manholes are required at the following locations:

- every change of pipe size
- every change in grade, except as indicated in the Curved Sewers section
- every change in direction, except as indicated in the Curved Sewers section
- downstream end of curved sewers
- upstream end of every sewer main
- every pipe intersection
- every cb location
- 150 m maximum spacing

4.27 Manhole Hydraulic Details

Crown elevations of inlet sewers not lower than crown elevation of outlet sewer.

Minimum drop of invert elevations across manholes

Straight Run	30 mm drop
Deflections	60 mm drop

Drop manhole and ramp structures shall be avoided where possible by steepening inlet sewers. Where necessary, provide drop structures as follows:

Invert Difference	Structure
Up to 0.25 m	Inside Ramp
0.25 to 0.90 m	Outside Ramp
Greater Than 0.90 m	Outside Drop

Inside drop may be used if approved by the City of Fort Saskatchewan as per Drawing S-5 Manhole Drop Structure.

Hydraulic losses are to be calculated for manholes with significant change of grade or alignment. For high velocity flows or large pipes (> 600 mm diameter) detailed analysis is required. For low velocities and smaller pipes, use the following formula:

$$H_L = k \frac{V^2}{2g}$$

Where:

- H_L = head loss (m)
- V = outlet flow velocity (m/s)
- g = gravitational acceleration (9.81 m/s²)
- k = head loss coefficient (1.0 for channeled 90° bends and tees, to 1.5 without channelized benching)

4.28 Catchbasins

Catchbasins shall be of sufficient number, have sufficient inlet capacities and adequate catchbasin leads to receive and convey the calculated stormwater flow. Minimum size for catchbasin leads is 300 mm diameter.

Catchbasin and catchbasin manhole sump to be 500 mm deep.

Catchbasin leads shall be non-reinforced concrete pipe ASTM C14 Class 3 or approved PVC pipe.

The maximum surface runoff flow length along the curb and gutter is 120m for collector/arterial roadways. 150m will be permitted for local roads.

Minimum grade of catchbasin leads is 1.0%. Maximum length of leads to be 30 m.

All catchbasin bodies shall be a minimum 900 mm diameter precast concrete sections conforming to the latest version of ASTM C478, and constructed so as to provide a sump to trap rocks and gravel. All concrete is to be sulfate resistant.

Catchbasin	Type of Inlet
F-38	Grated for lane
F-51	Combination for rectangular curb grate or curb opening
K-7 or DK-7	Grated for rolled curb and gutter

The capacity of a single catchbasin can be calculated using the orifice formula:

$$Q = kCA\sqrt{2gh}$$

Where:

- Q = inlet capacity (l/s)
- k = clogging factor
- C = orifice coefficient (0.006)
- A = open area (cm²)
- g = gravitational acceleration (9.81 m/s²)
- h = depth of ponding (cm)

The inlet capacities for the catchbasins in a sump condition are given below. Due to the geometry of these inlets, flow through each individual opening of each grate or curb may act as flow through an orifice or flow across a weir depending on the assumed depth of ponding. Capacity of each inlet is based on the combined capacity of each opening calculated separately.

In order to intercept the clogging factor for the catchbasin inlets, the inlet capacity reduction factors shown below are to be applied to the theoretical inlet capacities presented above. The reduction factors are used to compensate for effects which decrease the capacity of the inlet such as debris plugging, pavement overlaying and variations in design assumptions. The reduction factors to be applied to inlets in sump conditions are:

Inlet Type	% of Theoretical Capacity
Curb Opening	80%
Grated	50%
Combination	65%

For Open Area, measured in cm²:

Inlet Type	Grate	Curb	Total	Neck Section Detail
F-38	1,043 cm ²		1,043 cm ²	Drawing ST-14
F-51	1,845 cm ²	1,161 cm ²	3,006 cm ²	Drawing ST-13
K-7				

Catchbasins are required at regular intervals along roadways and at low points.

Lawn basins are required on boulevards and private properties where necessary to prevent ponding or flooding of sidewalks, boulevards, driveways, buildings and yards.

Catchbasin spacing is to provide sufficient inlet capacity to collect the entire minor flow or major flow, if required, into the pipe system.

Other spacing requirements include:

- prevent overflow to driveways, boulevards, sidewalks and private property
- avoid interference with crosswalks
- catchbasin leads to discharge into storm manholes where possible

Catchbasin leads shall be installed to provide a minimum depth of cover of 1.5m to invert unless otherwise approved.

All catchbasin leads shall discharge directly into storm sewer manholes.

4.29 Service Connections

Each residential unit shall have a foundation drain service connection.

Foundation service is to be 100mm diameter. The minimum depth of cover for foundation drain services shall be 2.0m at the property line.

Storm sewer service connections for the connection of onsite storm drainage systems and/or roof drains are to be provided to properties zoned or proposed to be zoned for commercial, institutional, industrial and multiple residential land uses. When required service locations are known, storm service connections should be installed concurrently with the general area servicing. Otherwise, installation of connections may be deferred until the specific property development is proposed.

Foundation drain service connections to be installed in accordance with Drawing ST-6 Foundation Drain Service Connection and ST-7 Foundation Drain Service House Connection Detail.

Where services are required to connect to mains in excess of 4.00 m in depth, risers shall be installed and properly plugged. The risers shall be firmly supported and anchored to the trench wall in all cases.

Roof drains are to discharge to splash pads on landscaped areas.

4.30 Surface Flow Routing and Paths

All surface flows shall have specially designed routes that are preserved and protected by right-of-ways and are accessible for maintenance. Design criteria includes:

- maximum flow depth on local roadways allowed to be 50mm above the crown, which with a 150mm parabolic crown is 200mm of depth
- where a roadway is used as a major flow path, the road grades are to be designed to accommodate and control the flow at intersections
- flooding is not permitted on private property except in flow channels in municipal rights-of-way
- overflow routes are required at all sags and low points in roadways and other surface flow routes
- major flood routes are required at down-slope cul-de-sacs.

4.31 Surface Flow Capacity

Flow capacity of road surfaces and swales can be calculated using the Manning formula. Typical values of the Manning Roughness Coefficient "n" are:

- 0.018 for paved roadway
- 0.03 for grassed boulevards and swales
- 0.04 to 0.10 for irregular or treed channels
- 0.013 for Concrete Swale

Design detail shall include consideration of flow velocities and the potential requirement for erosion control measures.

4.32 Road Ditches

The design criteria for road ditches are:

- a Manning's n of 0.025 shall be used for computing flows in grassed ditches
- road ditches shall be designed to handle the peak runoff of 1:100 year (Chicago Distribution) storm. The peak 1:100 year water level must be contained within the road ditch. No flooding of the road surface or adjacent property should occur during the 1:100 year storm.
- the minimum road ditch slope shall be 0.75% - the City may approve an exemption from these criteria if suitable justification is provided by the Owner/Applicant
- for slopes equal or greater 2%, ditch check dams shall be provided as shown in Drawing ST-8 Ditch Check Dam to protect the ditch against erosion
- ditch side slopes shall not be steeper than 3:1
- the maximum 1:100 year flow velocity within a grassed road ditch shall be 1.0 m/s - for higher flow velocities, erosion control must be provided in the ditch

4.33 Culverts and Bridges

Culverts located in natural watercourses or road crossings shall be designed to convey the major flow or greater.

Aquatic habitat protection requirements must be considered for culverts in natural channels. Approvals are required under the Alberta Water Act and the federal Fisheries Act.

Culvert design is to be in accordance with the procedures outlined in an applicable design manual including but not limited to:

- American Concrete Pipe Association – Concrete Pipe Design Manual
- Corrugated Steel Pipe Institute – Handbook of Steel Drainage and Highway Construction Products

Inlet and outlet structures are required for all major system culverts. Design considerations are to include inlet control and outlet control conditions, energy dissipation and erosion control.

Culverts and channels under bridges for arterial and collector roads are to be designed to convey the 1 in 200 year peak flow.

Culverts are to be installed in accordance with Drawing ST-9 Culvert and Drawing ST-10 Culvert Backfill with appropriately sized rip rap at either end as shown on Drawing ST-11 Culvert End Rip Rap.

4.34 Watercourses

Watercourses and flood plains are to be preserved and/or designed to sustain habitat for aquatic and other wildlife as well as to convey storm runoff.

Designers must consider the federal, provincial and municipal laws, regulations and guidelines noted above and must obtain comments and approvals from the appropriate agencies.

4.35 Stormwater Management Facilities

4.35.1 Parking Lot Storage

Ponding is allowed in parking lots to store runoff. Ponding is to be located in remote areas of the parking lot, or in grass medians. Maximum ponding depth shall not exceed 150 mm.

Detailed lot grading design is required to ensure proper drainage, pedestrian safety and convenience, and major flow paths for storms exceeding the design frequency.

4.35.2 Underground Storage

Underground storage facilities include tanks and oversized pipes with outlet controls and may be on-line or off-line. Cross sections and inlet and outlet locations shall be designed to minimize maintenance requirements.

Traffic loads and groundwater pressure should be considered in the structural design of these facilities. Maintenance access provisions are required.

4.35.3 Dry Detention Ponds

Dry detention ponds are storage areas designed to temporarily detain excess runoff and limit the peak outflow rate to the maximum allowable discharge rate. Designs that propose containment of runoff due to events more frequent than 1 in 2 years are to include special provisions to facilitate clean up i.e. provide base structure to allow for maintenance equipment. Dry ponds may accommodate recreational uses.

The dry pond shall have a minimum side slope of 5:1. In the event of a major storm event, the high water level in the dry pond shall have a free board of 500 mm below the minimum basement elevation, when walkouts are provided. Design schematic is shown in Drawing ST-12 Dry Pond.

Pipe sizing shall be determined by utilizing the Manning's Formula, using "n" value of 0.013.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

Inlet and outlet structures associated with dry ponds shall have grates provided over their openings to restrict access. A maximum clear bar spacing of 150 mm shall be used for gratings.

4.35.4 Wet Detention Ponds

The purpose of wet ponds is to temporarily store stormwater runoff in order to promote the settlement of runoff pollutants and to attenuate peak flows to reduce potential downstream impacts, flooding and erosion.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

When a choice is necessary between using one large pond as an alternative to two or more smaller facilities, one of which would have an area of less than 2 ha at normal water level, then one pond is to be used. This is to discourage proliferation of large numbers of small ponds and higher maintenance costs.

The minimum depth from normal water level to pond bottom shall be 2.0 m. Inlets and outlets are to be fully submerged, with the crown of the pipe at least 1.0 m below normal water level. Inlet and outlet pipe inverts are to be a minimum 100 mm above the lake bottom. The pond shall have a minimum side slope of 5:1 from the pond bottom to the normal water level and 7:1 above that level. Design schematic shown in Drawing ST-13 Wet Pond.

The inlet and outlet shall be distanced as far as possible from each other to avoid hydraulic short-circuiting.

Where no emergency outflow is provided, a free board of 500 mm above the high water level and below the minimum basement elevation shall be provided.

4.35.5 Constructed Wetlands

Constructed stormwater wetlands are human-made systems, designed, constructed and operated to emulate natural wetlands or many of their biological processes. They are generally shallow impoundments, planted with emergent rooted vegetation or colonized naturally by volunteer plant species. They may be designed to provide detention storage as well as treatment to improve stormwater quality

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

When a choice is necessary between using one large pond as an alternative to two or more smaller facilities, one of which would have an area of less than 2 ha at normal water level, then one pond is to be used. This is to discourage proliferation of large numbers of small ponds and higher maintenance costs.

A variety of water depths, 0.1 m to 0.6 m with an average permanent water depth of 0.3 m, are required to encourage emergent vegetation. Deep water areas, i.e. greater than 2 m, are to be limited to less than 25% of wetland surface. Water level fluctuation in excess of 1 m above NWL should be infrequent to prevent killing of the vegetation. Typical wetland schematic shown in Drawing ST-14 Constructed Wetland.

The minimum length to width ratio should provide an effective flow path length at low flow that is three times the relative wetland width in order to increase the residence time. Incoming water should be well distributed throughout the land and be conveyed as sheet flow to optimize treatment.

A forebay is required at each major inlet, to trap suspended solids before stormwater enters the constructed wetland. Inlets and outlets should be located to avoid hydraulic short-circuiting and maximize the flow path. The maximum depth in the inlet and outlet areas is restricted to 3.0 m. Inlets and outlets are to be fully submerged, with the crown of the pipe at least 1.0 m below normal water level. Inlet and outlet pipe inverts are to be a minimum 100 mm above the bottom.

Slopes shall be 5H:1V or flatter to support larger areas of wetland vegetation. Side slopes around the accessible deep areas in sediment forebay and permanent pool areas shall be a maximum of 7H:1V.

Where no emergency outflow is provided, a free board of 500 mm above the high water level and below the minimum basement elevation shall be provided.

4.35.6 Water Quality

Stormwater management facilities can be an effective treatment for sediment control. The minimum design requirement for total suspended solids removal is 85% of particle size 75µm or greater, as recommended by Alberta Environment, April 2001.

4.35.7 Outlet Controls

Outlet controls for storage facilities may be designed using the standard Orifice and Weir equations:

Orifice Equation:

$$Q = CA(2gh)^{0.5}$$

Where:

- Q = release rate (m³/s)
- C = orifice coefficient (0.62 for sharp or square edge)
- A = area of orifice (m²)
- g = gravitational acceleration (9.81 m/s²)
- h = net head on orifice (m)

Weir Equation:

$$Q = CLH^{1.5}$$

Where:

- Q = release rate (m³/s)
- C = weir coefficient
- L = effective length of weir crest (m)
- H = net head on weir crest (m)

Large storage facilities are to include provisions for discharges at rates greater than the design release rate. Rapid drawdown of the water level may be necessary for emergency purposes or to restore the available storage to accommodate subsequent storm events.

Provisions to accommodate higher discharges will involve oversizing the fixed openings and sewers connected to the control structure. Adjustable mechanisms such as slide gates or removable orifice plates can be used to regulate design release rates. The extent of the oversizing will depend on the capacity of the downstream drainage system.

Design of inlet and outlet structures is to include consideration of energy dissipation and erosion control. Safety grates are required over all inlet and outlet openings 500 mm or larger. Locks for access hatches are required.

Grated outlet structures are to be designed with a hydraulic capacity of at least twice the required capacity to allow for possible plugging. Further, the arrangement of the structures and

the location to the grating shall be such that the velocity of the flow passing through the grating will not exceed 1.0 m/s.

4.35.8 Biofiltration Swales

These facilities are intended to provide biofiltration and sediment removal and may be designed to provide detention storage as well as treatment to improve stormwater quality.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents. A typical schematic is shown in Drawing ST-15 Bio-Swale.

Biofiltration swales must be designed by a qualified professional and must take into consideration site suitability and growth environment for vegetation.

4.35.9 Mechanical Treatment Units and Oil and Grit Separators

It is the responsibility of the Owner/Applicant to meet established quality guidelines. If site discharge does not satisfy the criteria outlined by Alberta Environment (reference section 3.0), the Owner/Applicant may pursue the implementation of mechanical treatment units and/or oil and grit separators. Design details to be provided by supplier of proprietary system or by designer of equivalent and should be stamped by a Professional Engineer.

The City also reserves the right to request additional treatment if stormwater discharge is deemed unacceptable.

4.35.10 Erosion and Sediment Control

Erosion and sediment control measures are required for land development activities such as clearing, grading, road construction, excavation and stockpiling of excavation and backfill materials.

Design details to be in accordance with current technologies as outlined in Surface Water Quality Guidelines for Alberta and related documents.

4.35.11 Drainage Pump Stations

Drainage pump station guidelines are not included in this manual.

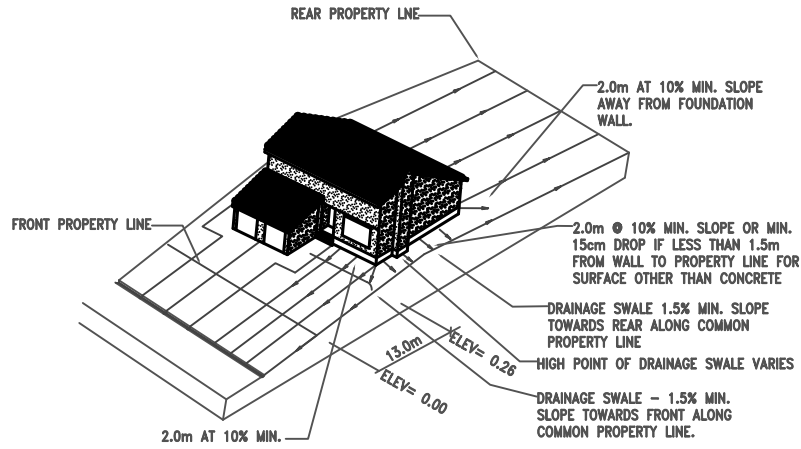
Where drainage pumping is required, the designer must review the design concept and proposed guidelines with the City Engineer, submit a pre-design report and obtain approval before proceeding with the design.

4.36 **List of Standard Drawings**

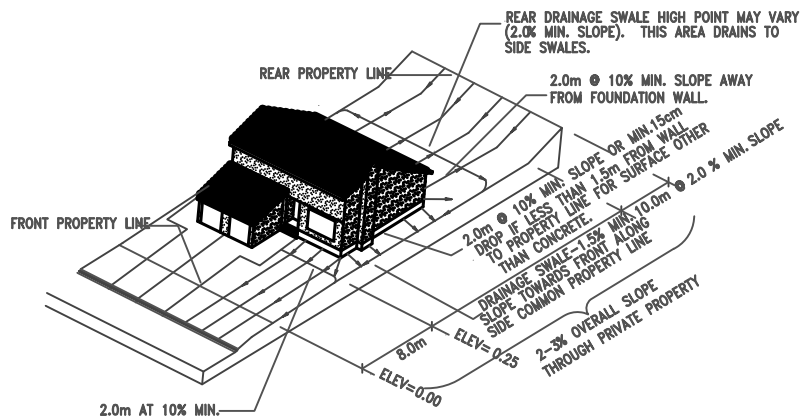
ST-1	Typical Lot Grading
ST-2	Concrete Drainage Swale
ST-3	1200mm Catchbasin Manhole
ST-4	900mm Catchbasin with Type F-51 Grating and Frame
ST-5	900mm Catchbasin with Type K-7 Grating and Frame
ST-6	Foundation Drain Service Connection
ST-7	Foundation Drain Service House Connection Detail
ST-8	Ditch Check Dam

- ST-9 Culvert
- ST-10 Culvert Backfill
- ST-11 Culvert End Rip Rap
- ST-12 Dry Pond
- ST-13 Wet Pond
- ST-14 Constructed Wetland
- ST-15 Bio-Swale

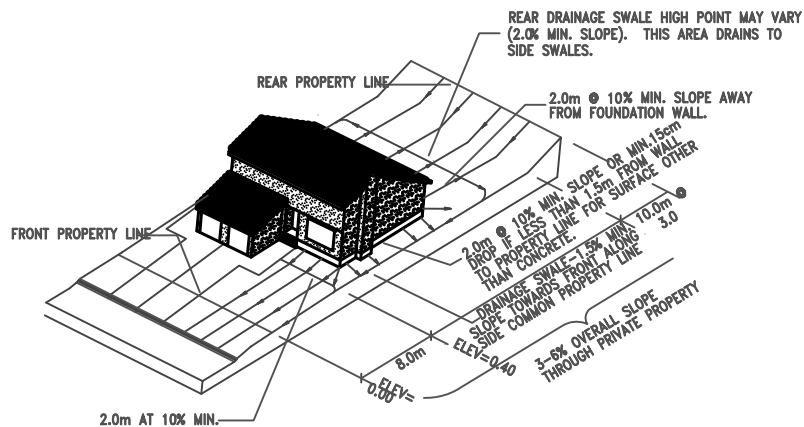
See water section detail W-7 for Typical Trench Section
See water section detail W-10 for Single Service Connection
See water section detail W-11 for Dual Service Connection
See sanitary section detail S-1 for Trench Bedding Types
See sanitary section detail S-2 for 1200mm Manhole for Piping up to 600mm
See sanitary section detail S-3 for 1200mm Perched Manhole
See sanitary section detail S-4 for T-Riser Manhole
See sanitary section detail S-5 for Interior/Exterior Manhole Drop Structure
See sanitary section detail S-6 for Ladder Rungs
See sanitary section detail S-7 for 1200mm Manhole Benching



1.5% OVERALL SLOPE - LOT TYPE D
SPLIT SURFACE DRAINAGE



2-3% OVERALL SLOPE - LOT TYPE A
REAR TO FRONT SURFACE DRAINAGE



3-6% OVERALL SLOPE - LOT TYPE B
REAR TO FRONT SURFACE DRAINAGE

TYPICAL LOT GRADING



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

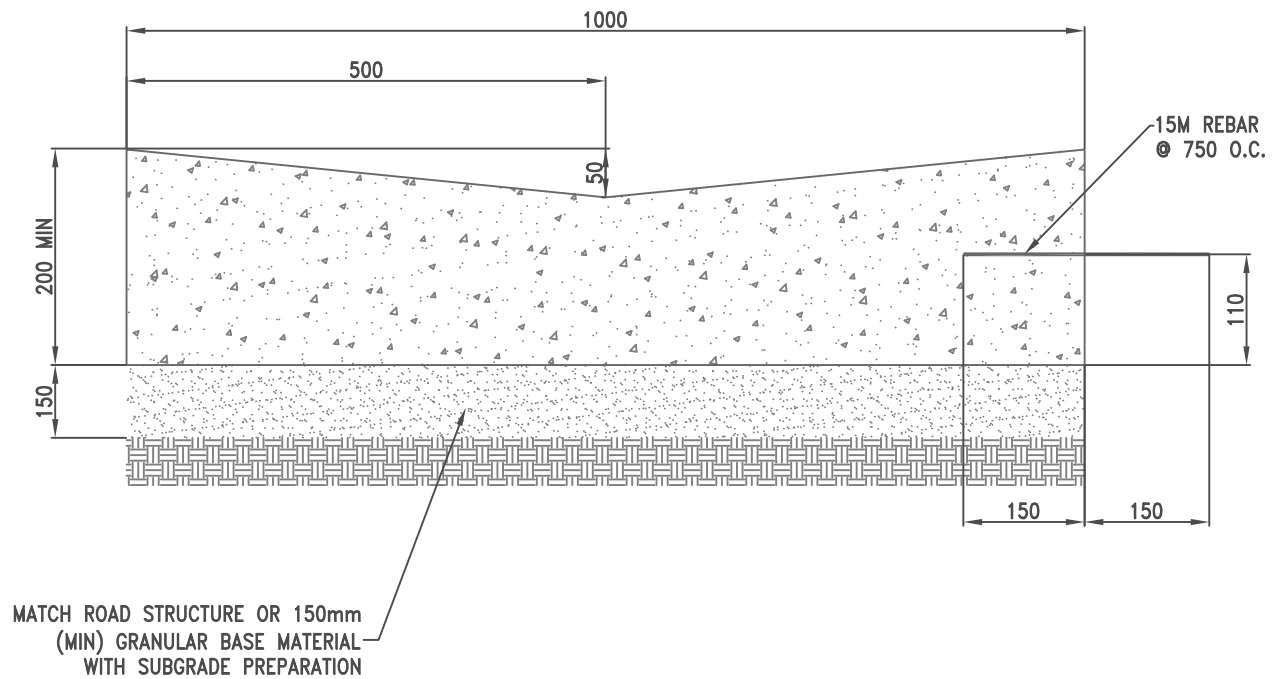
REVISION NUMBER: A

DATE: FEB 2013

NOT TO SCALE

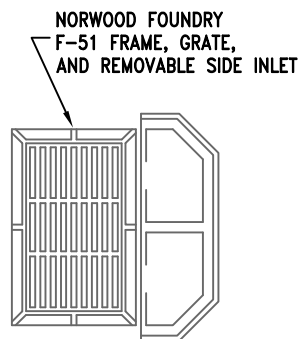
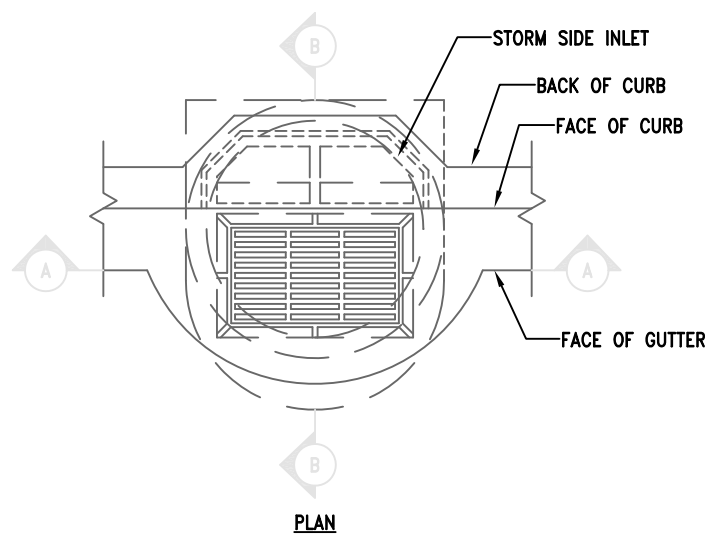
DRAWN: MP

ST-1

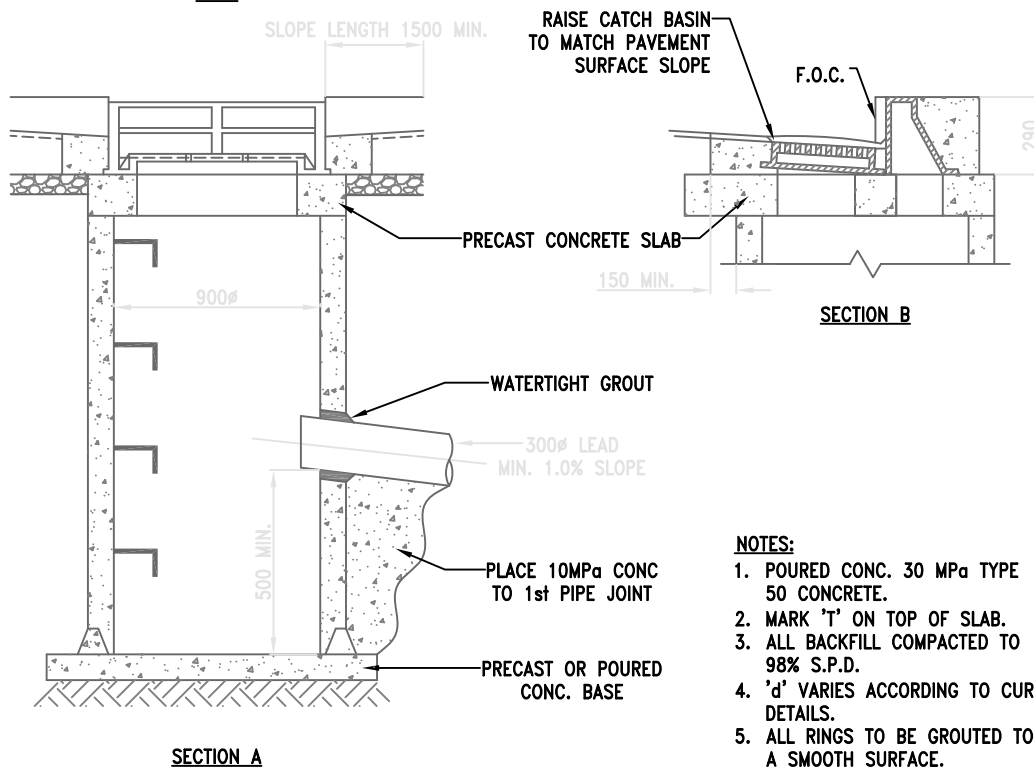


ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CONCRETE DRAINAGE SWALE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-2
NOT TO SCALE	DRAWN: MP	

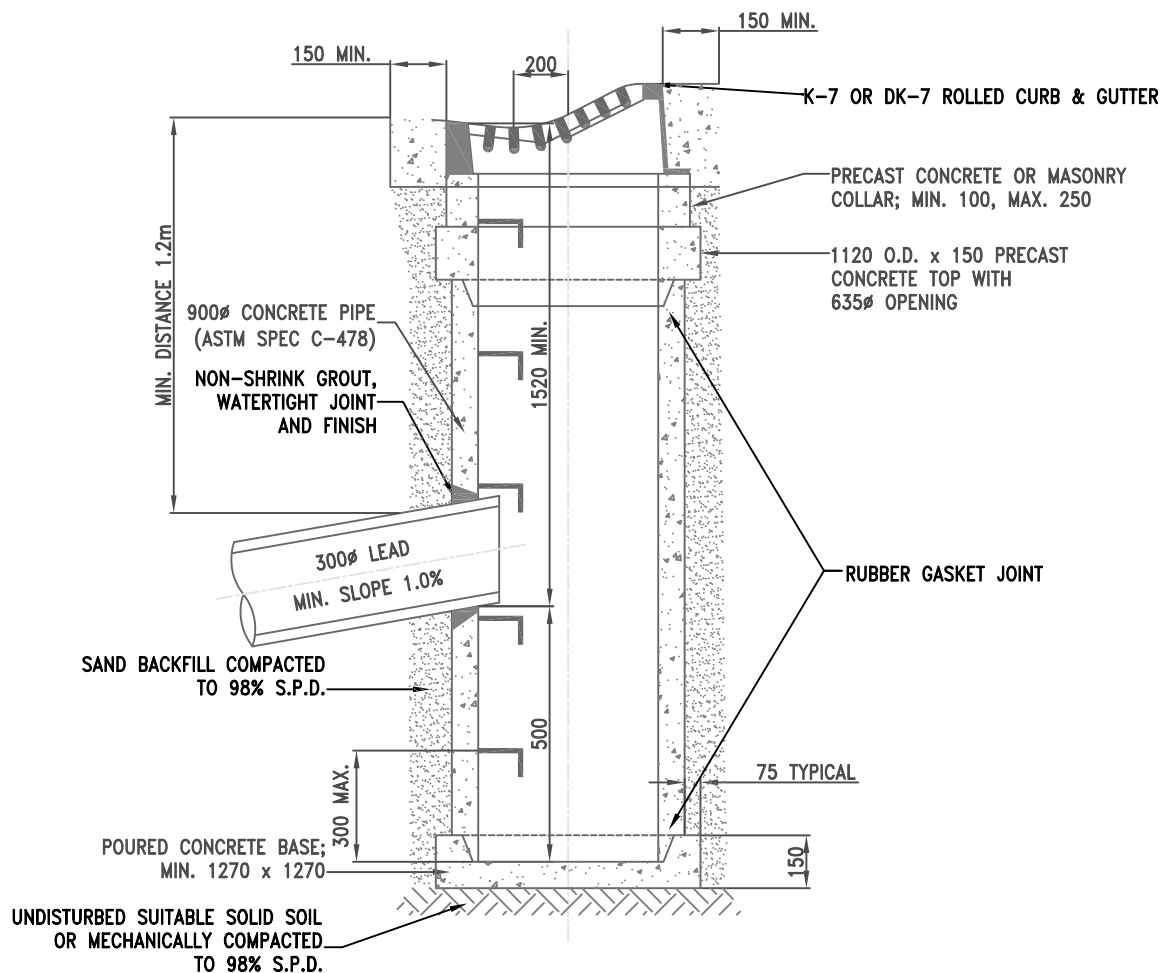


PRECAST TOP



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

900mm CATCHBASIN WITH TYPE F-51 GRATING AND FRAME		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-4
NOT TO SCALE	DRAWN: MP	



NOTES:

1. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. FIRST STEP TO BE 150 MAX. BELOW FRAME, LAST STEP TO BE 300 MAX. ABOVE BENCHING.
2. PRECAST CONCRETE COMPONENTS TO MEET CURRENT A.S.T.M. C478 STANDARDS
3. CAST IN PLACE CONCRETE TO BE 25 MPa AT 28 DAYS.
4. ALL JOINTS TO BE SET WITH RUBBER GASKET WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR FULL CIRCUMFERENCE. THIS INCLUDES JOINTS BETWEEN GRADE RINGS, GRADE RINGS AND FRAMES, AND BETWEEN GRADE RINGS AND SLAB TOPS.
5. PRECAST CONCRETE BASE THICKNESS AND REINFORCEMENT MUST BE DESIGNED FOR THE SPECIFIC CATCHBASIN DEPTH AND SOIL CONDITIONS.
6. JOINTS BETWEEN GRADE RINGS, GRADE RINGS AND CONES, AND BETWEEN RINGS AND FRAMES MUST BE WATERTIGHT. RAM NECK MATERIAL FINISHED WITH NON-SHRINK GROUT MAY BE USED IF WATERTIGHT JOINTS CAN BE ACHIEVED.
7. WICK DRAINS TO CONNECT TO CATCH BASIN SUCH THAT JOINTS ARE WATERTIGHT.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

900mm CATCHBASIN WITH TYPE K-7 GRATING AND FRAME

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

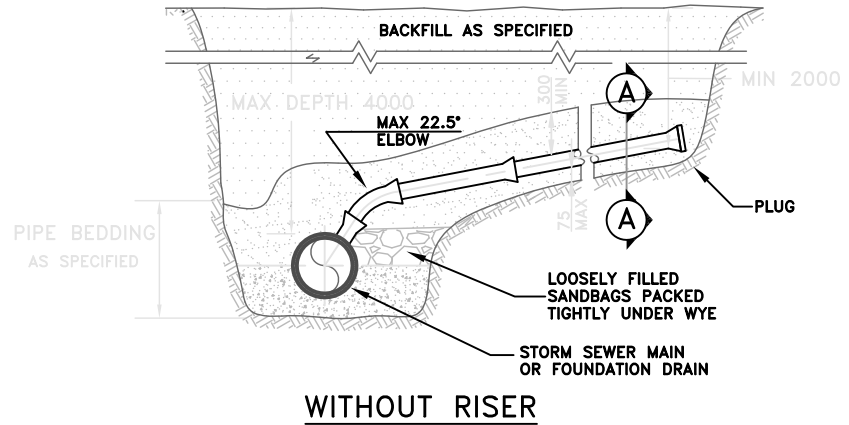
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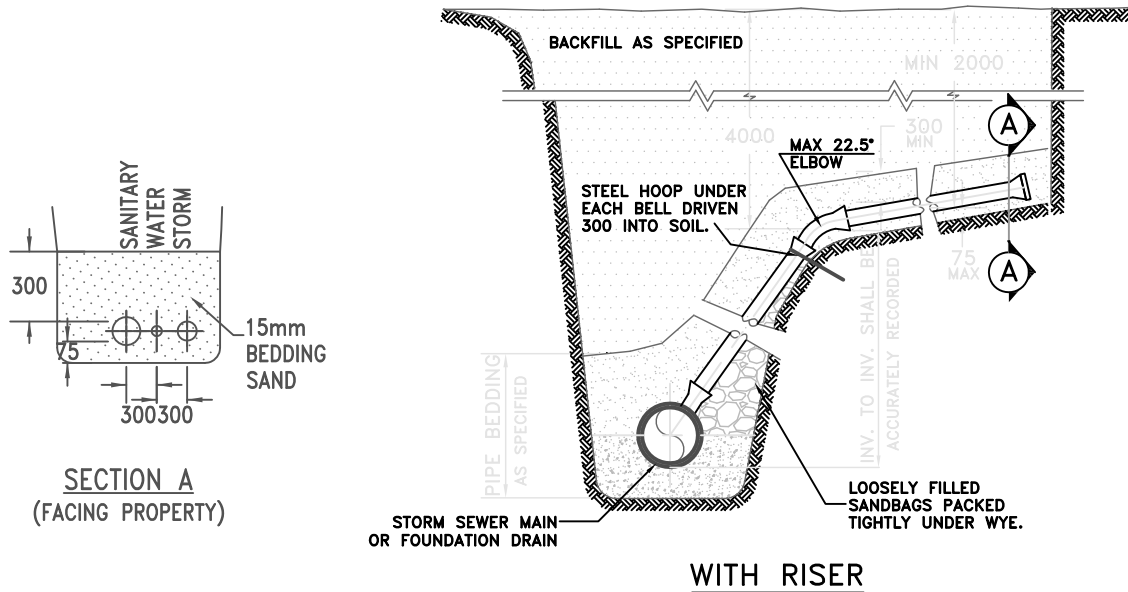


DWG. NO.

ST-5

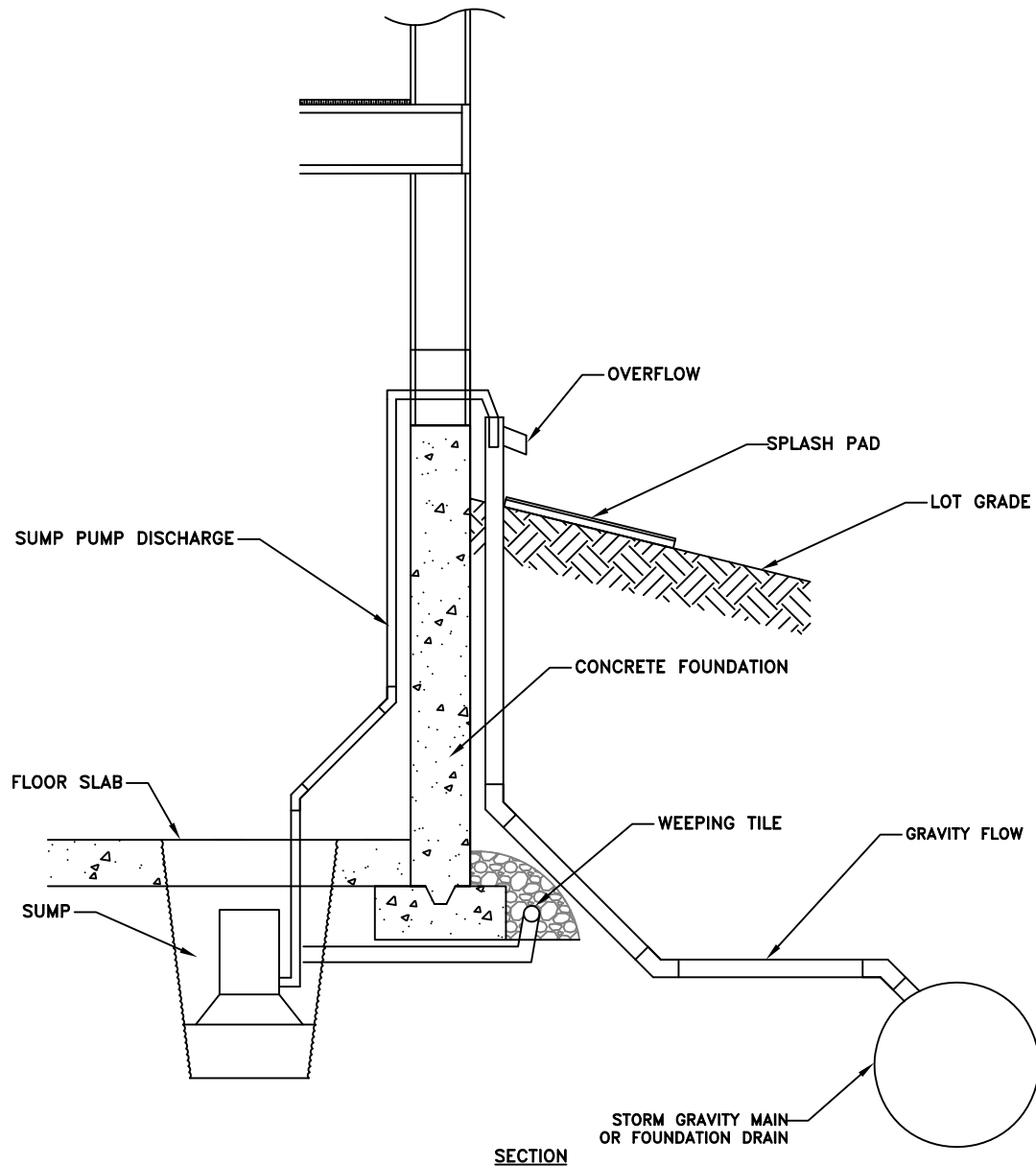


REFER TO SPECIFICATION
FOR WYE OR SERVICE SADDLE.



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

FOUNDATION DRAIN SERVICE CONNECTION		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-6
NOT TO SCALE	DRAWN: MP	

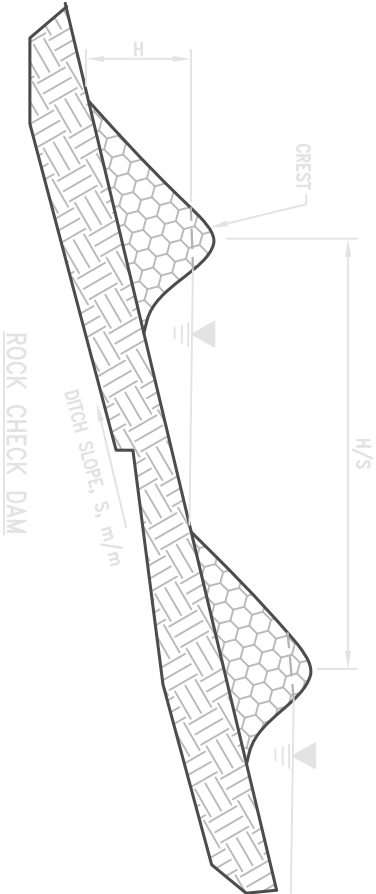


NOTES:

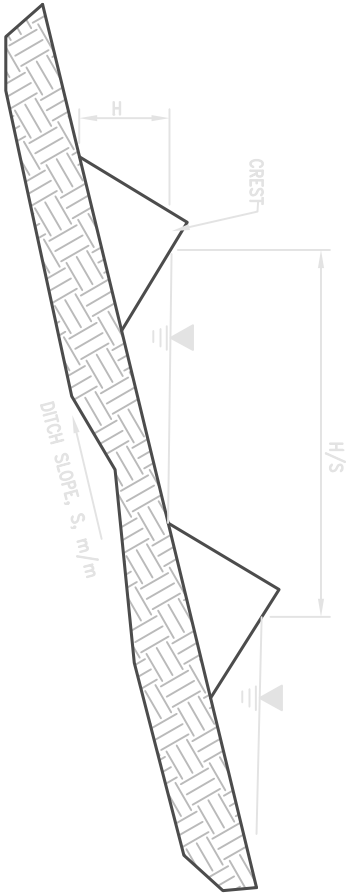
1. RECOMMEND HIGH WATER ALARM IN SUMP IN EVENT OF PUMP FAILURE.
2. WEEPING TILE DRAINS INTO SUMP NOT DIRECTLY INTO SEWER.
3. ALL PIPE DIAMETERS AS PER DESIGN STANDARD.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

FOUNDATION DRAIN SERVICE HOUSE CONNECTION DETAIL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-7
NOT TO SCALE	DRAWN: MP	



ROCK CHECK DAM

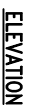


MANUFACTURED CHECK DAM
(SYNTHETIC PERMEABLE AND
TRIANGULAR FOAM CHECK DAM)

GENERAL NOTES:
THIS FIGURE DEPICTS THE TYPICAL SPACING FOR CHECK DAMS. SPACE CHECK DAMS IN ACCORDANCE WITH THIS FIGURE, UNLESS INDICATED OTHERWISE IN THE DESIGN STANDARDS.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

DITCH CHECK DAM		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-8
NOT TO SCALE	DRAWN: MP	



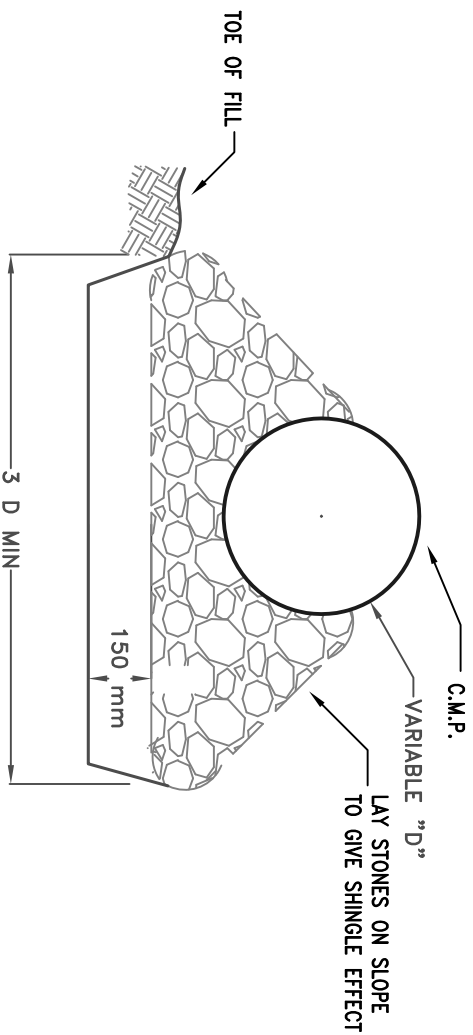
CULVERT

DWG. NO.

CHD

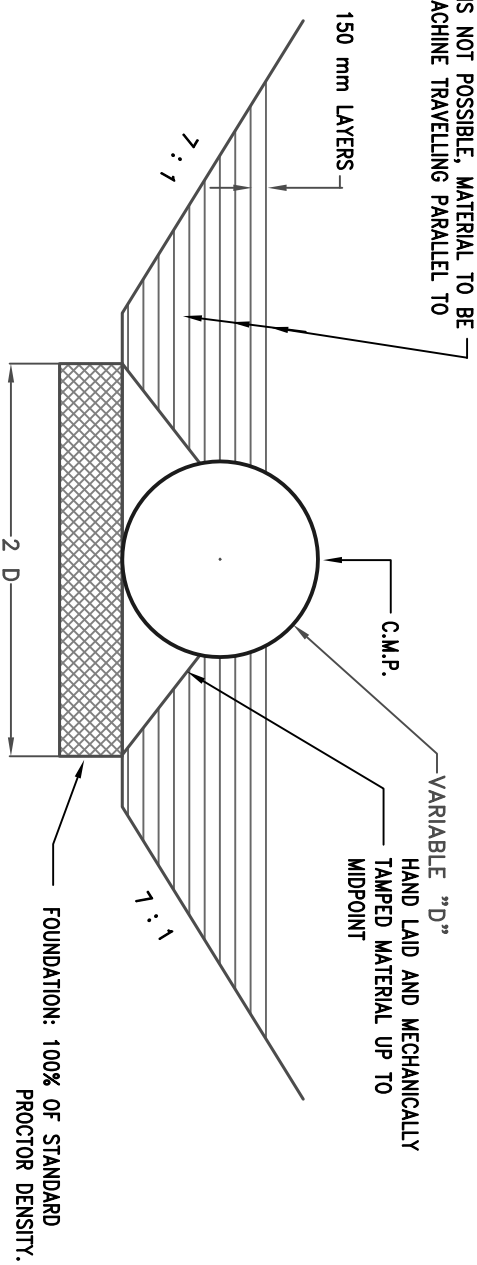
DRAWN: MP

ST-9



OUTLET VIEW

BRING UP FILL IN 150 mm LAYERS BOTH SIDES SIMULTANEOUSLY. IN AREAS WHERE MACHINE COMPACTION IS NOT POSSIBLE, MATERIAL TO BE SPREAD BY MACHINE TRAVELLING PARALLEL TO STRUCTURE



BACK FILL DETAILS

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CULVERT BACKFILL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

NOT TO SCALE

DRAWN: MP



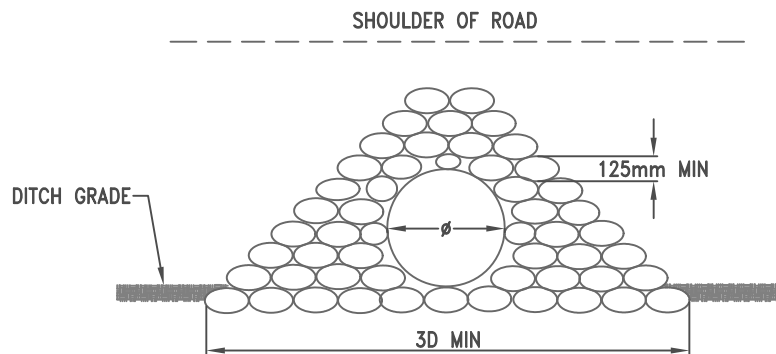
FORT SASKATCHEWAN

DWG. NO.

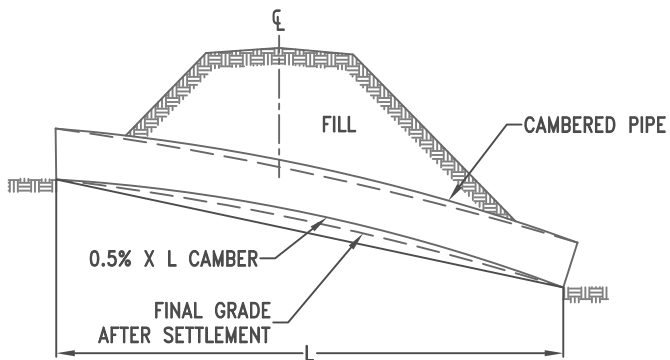
ST-10

PROCEDURE:

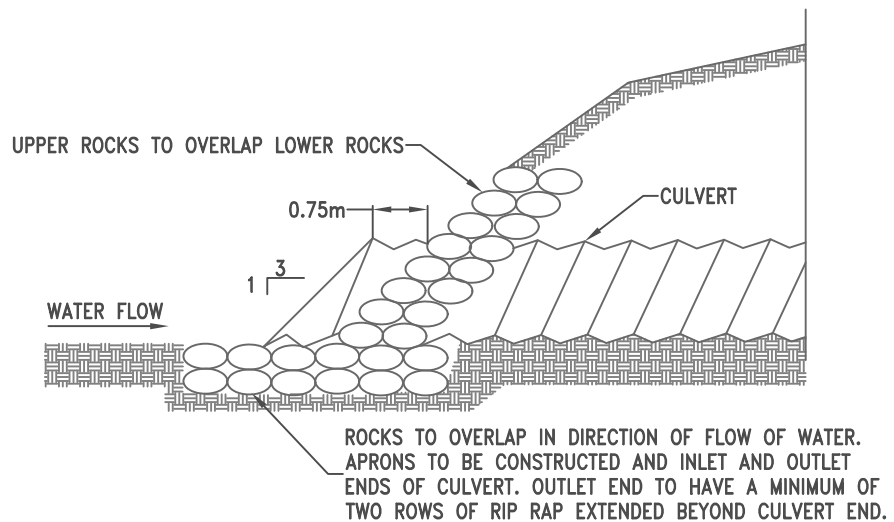
PLACE ROCKS INTO POSITION BY RAMMING AND PACKING AGAINST EACH OTHER TO FORM A CLOSELY MOULDED AND UNIFORM LAYER AVERAGING NOT LESS THAN 125mm IN THICKNESS. PLACE ROCKS IN STAGGERED PATTERN SUCH THAT ANY ROCK (EXCEPT AT THE BOTTOM) WILL REST ON TWO OR MORE OTHER ROCKS.



INLET AND OUTLET ELEVATION



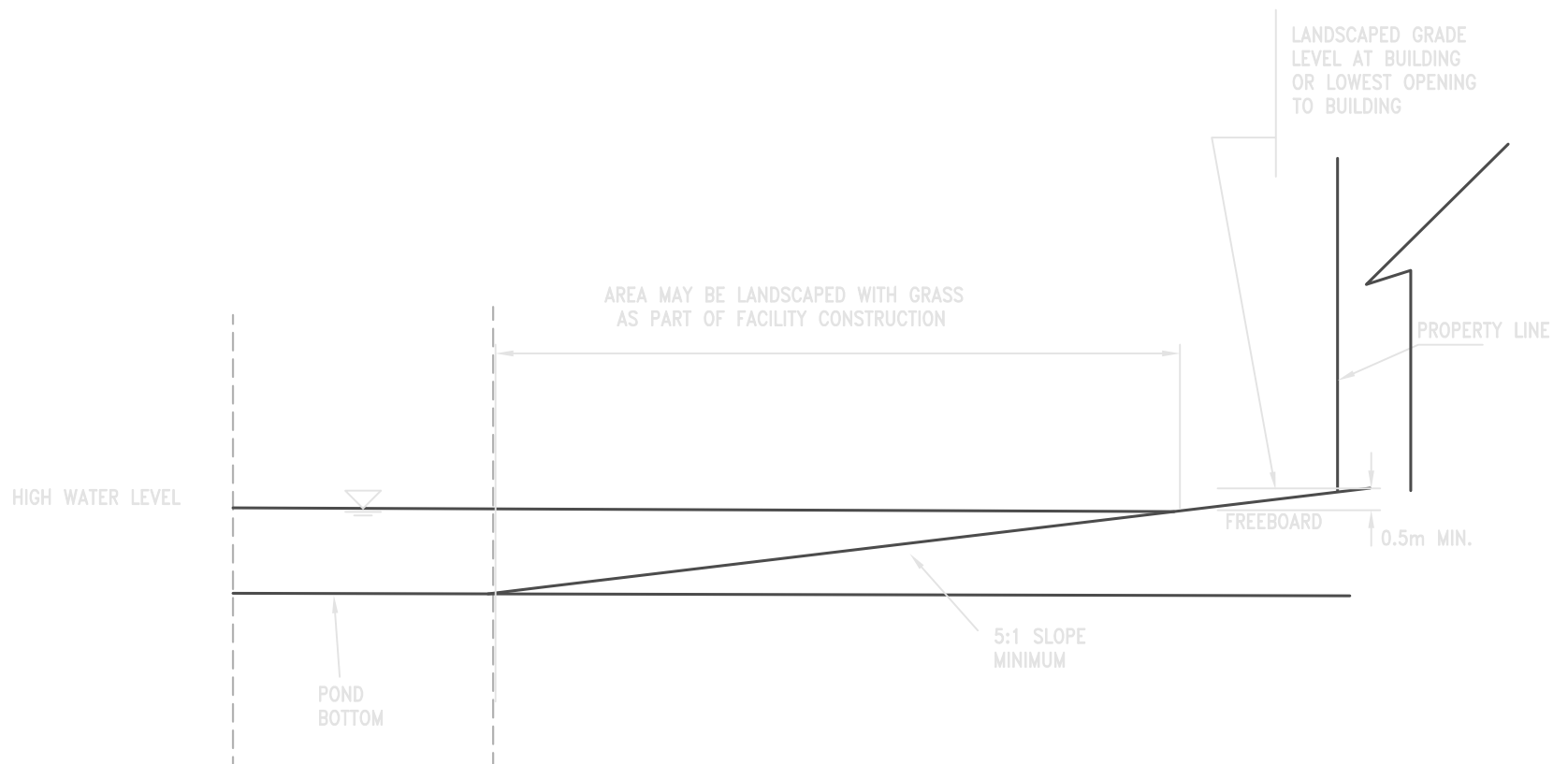
PROFILE



SIDE ELEVATION

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CULVERT END RIP RAP		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-11
NOT TO SCALE	DRAWN: MP	

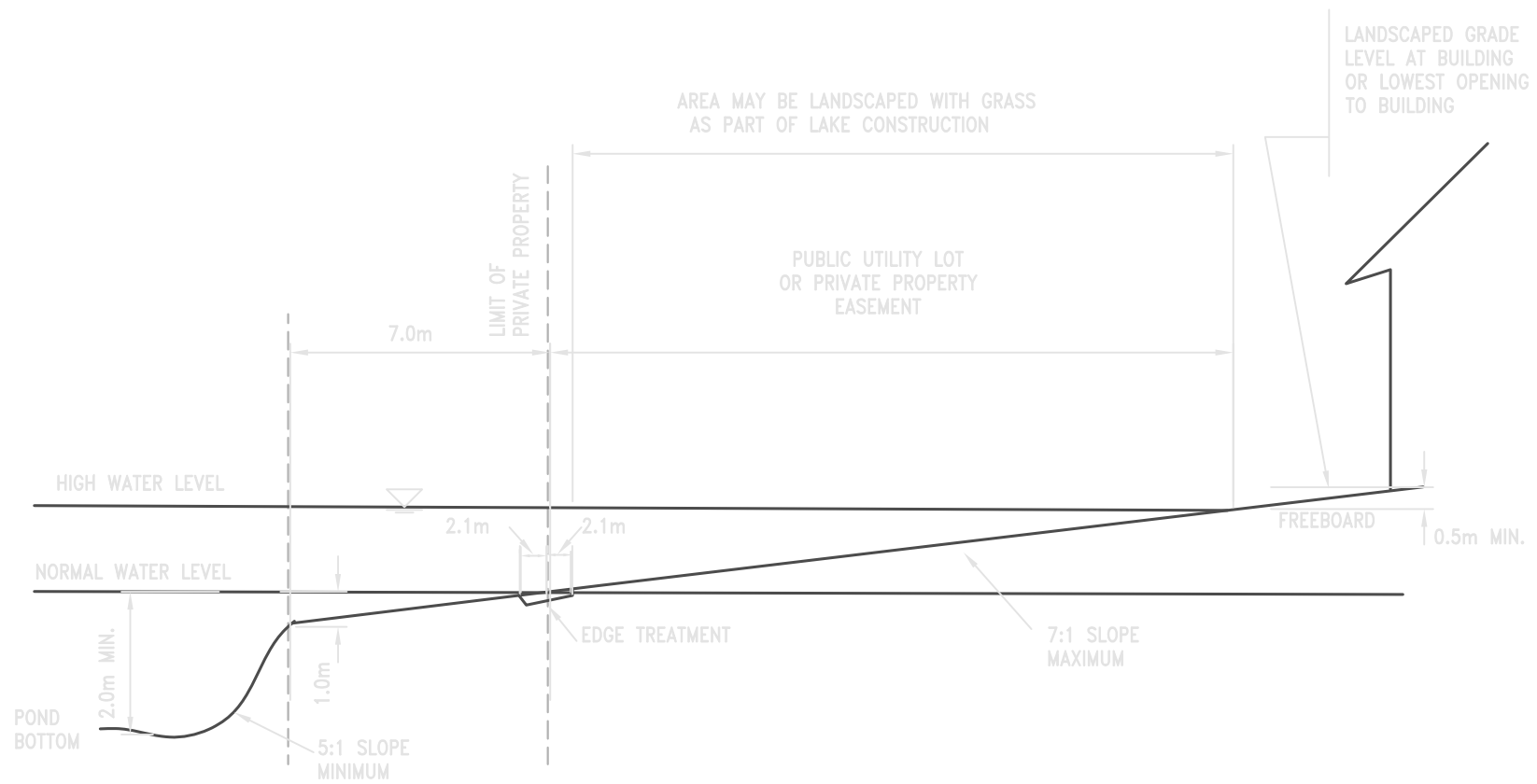


NOTES:
 FREEBOARD REQUIREMENTS ARE TO BE DETERMINED AS PART OF THE
 STORAGE FACILITY DESIGN, AND MAY VARY IN CONSIDERATION OF
 THE FACILITY DESIGN BASIS.

ALL DIMENSIONS IN MILLIMETERS
 UNLESS OTHERWISE NOTED

DRY POND		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-12
NOT TO SCALE	DRAWN: MP	

DWG. NO.

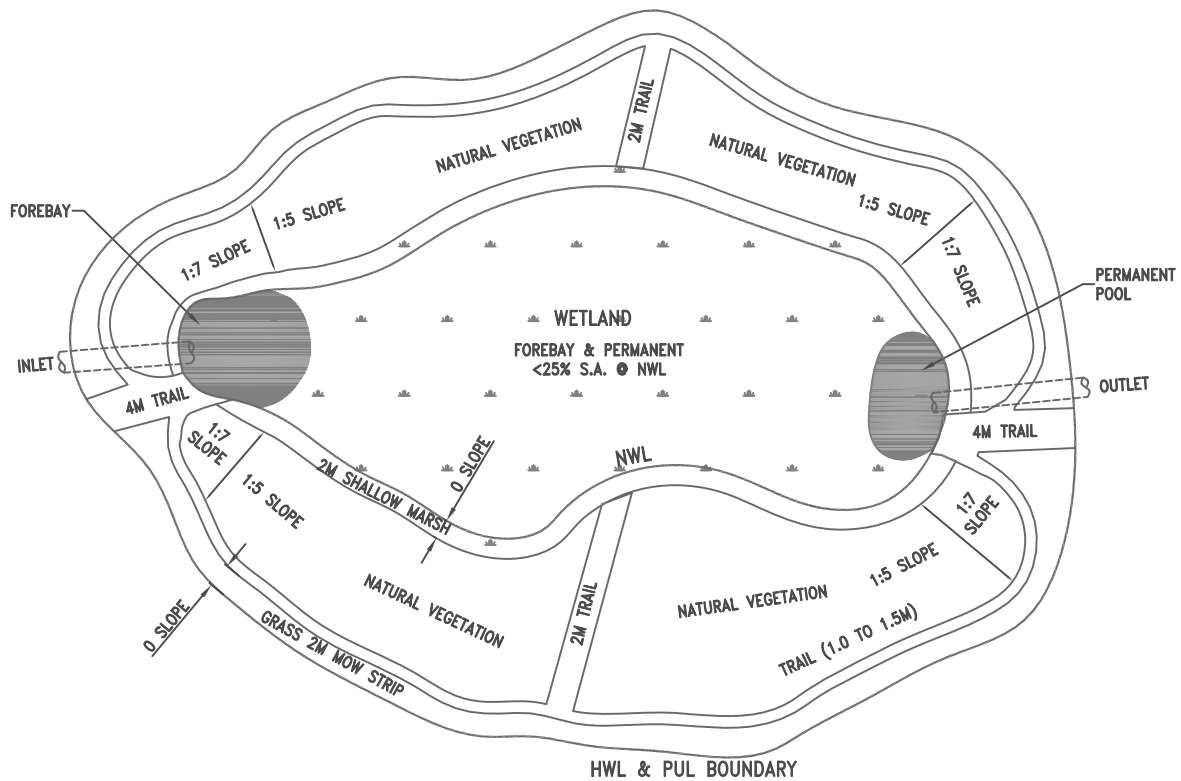


NOTES:

FREEBOARD REQUIREMENTS ARE TO BE DETERMINED AS PART OF THE STORAGE FACILITY DESIGN, AND MAY VARY IN CONSIDERATION OF THE FACILITY DESIGN BASIS.

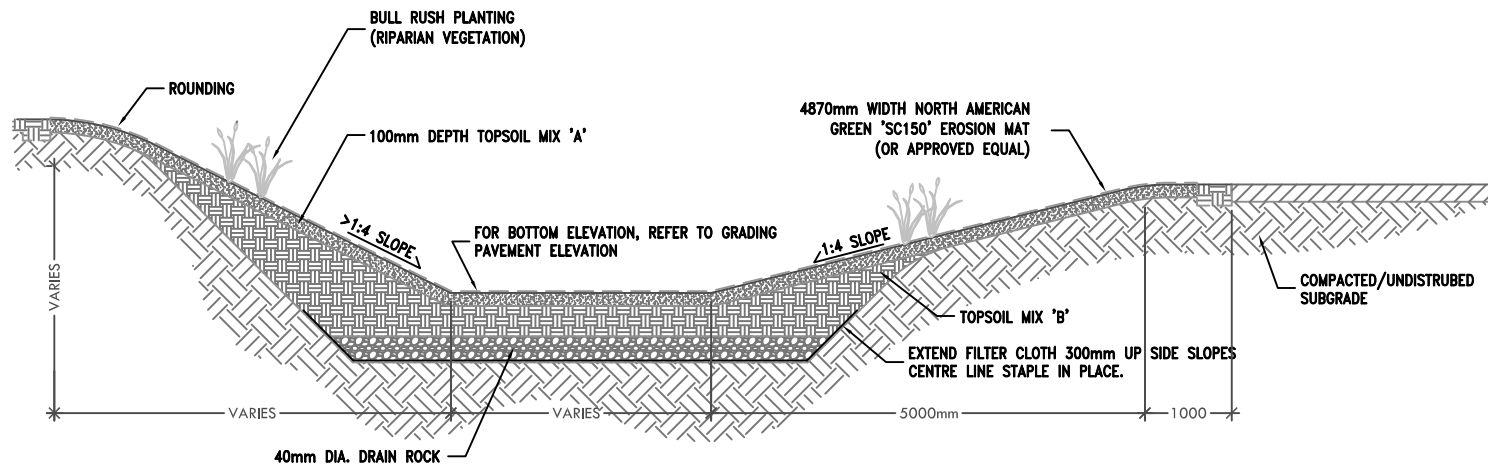
ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

WET POND		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-13
NOT TO SCALE	DRAWN: MP	



ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

CONSTRUCTED WETLAND		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-14
NOT TO SCALE	DRAWN: MP	



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

BIO-SWALE		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	ST-15
NOT TO SCALE	DRAWN: MP	

5.0 TRANSPORTATION

This section outlines the methodology and design criteria that apply to the design of transportation related systems. These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Transportation system designs shall be prepared under the direction of a qualified professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

5.1 Transportation Design General Principles and Objectives

It is the designer's responsibility to exercise professional judgment on technical matters in the best interests of the City and the public. Standards contained herein are provided to assist in making these judgments, but shall not be used as a substitute; these standards do not cover all specific project related cases.

These standards are based on general site conditions, prevailing and predicted vehicle dimensions and performance, driver behaviour and performance, and current technologies. Designers are advised to use the latest edition or updates of these standards.

The following standard and guideline publications were referred to for the preparation of these transportation design standards and the most current versions should be used for reference:

- Geometric Design Guide for Canadian Roads, Transportation Association of Canada (TAC), 1999
- Urban Supplement to the Geometric Design Guide for Canadian Roads, TAC, 1995
- Pavement Design and Management Guide, TAC
- Manual of Uniform Traffic Control Devices for Canada (MUTCD), TAC, 2008
- Canadian Guide to Neighbourhood Traffic Calming, TAC, 1998
- Design vehicle dimensions for use in geometric design, TAC, 1999
- Metric Curve Tables, TAC, 1999
- A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2001
- City of Fort Saskatchewan and Regional bylaws
- Alberta Municipal Government Act
- Alberta Motor Vehicle Act
- Alberta Transportation Manual of Standard Signs and Pavement Markings

The City of Fort Saskatchewan does not rely exclusively on any one of the above-noted references. The City shall approve the final design based on a combination of the references above and the design standards contained herein. The standards contained in this section are required minimum standards; wherever possible, higher standards should be used. In cases of discrepancies between these standards and the above noted references, these standards will govern; however, the City of Fort Saskatchewan is the final approving authority.

5.2 Definitions

Acceleration Lane: An auxiliary lane to enable a vehicle to increase speed and merge with through traffic.

Access Management: The application of roadway design and traffic operations to the location and design of access from the roadway adjacent to the land uses.

Arterial Roadway: A roadway primarily for through traffic.

Auxiliary Lane: A lane in addition to, and placed adjacent to, a through lane intended for a specific maneuver such as turning, merging, diverging, weaving and for slow vehicles.

Average Annual Daily Traffic (AADT): The total volume of traffic passing a point or segment of a roadway, in both directions for one year, divided by the number of days in the year.

Boulevard: The strip of land paralleling the roadway between the curb and the sidewalk, often planted with trees, grass, and shrubbery.

Channelization: The separation and direction of traffic movements and pedestrians into defined paths at an at-grade intersection through the use of geometric features, pavement markings and traffic control devices.

Collector Roadway: A roadway on which traffic movement and access have similar importance, and provides for traffic movements between arterial and local roadways.

Cross-Slope: The average grade between the edges of a cross-section element.

Crosswalk: Any part of a roadway specifically intended for pedestrian crossing, which may be so indicated by signs, lines, markings or other devices.

Cul-de-sac: A roadway opened at one end only.

Curb: A structure with a vertical or sloping face along the edge of a lane or shoulder which strengthens or protects the edge and clearly defines the edge.

Curb Drop: The transition length required to decrease the curb height to accommodate a driveway or sidewalk ramp.

Curb Return: The curved section of curb used at intersections or driveways to join tangent sections of curb.

Deceleration Lane: An auxiliary lane to enable a vehicle exiting from a roadway to reduce speed after it has left the through traffic lanes.

Design Speed: A speed selected for the purpose of design which correlates to the maximum safe speed, when conditions are favourable, that the geometric features of the roadway has been designed.

Expressway: A divided arterial roadway for through traffic with full or partial control of access and with some interchanges.

Freeway: A roadway limited to through traffic, with access only through interchanges.

Gradient: The rate of rise or fall with respect to the horizontal distance.

Horizontal Alignment: The configuration of a roadway as seen in plan view.

Island: A defined area between traffic lanes for control of vehicle movements or for pedestrian refuge.

Lane: A part of the travelled way intended for the movement of a single line of vehicles.

Longitudinal Barrier: A barrier adjacent to the roadway whose primary function is to safely redirect an errant vehicle that may be leaving the normal travel path.

Median: A reserve area, including shoulders, between lanes carrying traffic in opposite directions.

Median Barrier: A longitudinal barrier used to prevent an errant vehicle from crossing the median into hazard.

Outer Separation: The area between the edge of the travel lanes of a roadway and the edge of the travel lanes of an adjacent, parallel roadway.

Public Lane (Alley): A narrow minor street, usually without sidewalks, located at the rear of lots for vehicle access to garages or other parking spaces and which also serves as a utility right of way.

Right of Way: The area of land acquired for or devoted to the provision of a roadway.

Roadside: The area adjoining the outer edge of the roadway to the right of way limits.

Roadside Barrier: A longitudinal barrier used to shield roadside obstacles or non-traversable terrain features. It may occasionally be used to protect pedestrians from vehicle traffic.

Sidewalk or Walkway: A travel way intended for pedestrian use, following an alignment generally parallel to that of the adjacent roadway.

Superelevation: The gradient measured at right angles to the centre line across the roadway from the inside to the outside edge of a curve.

Throat Length: The provision of sufficient unobstructed on-site driveway length to prevent stopped vehicles from blocking the path of entering vehicles or vehicles travelling along the circulation roadways on site.

Through Lane: A lane intended for through traffic movement.

Traffic Calming: The combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users.

Trail: A joint-use travel way intended for both pedestrian and cyclist use, following an alignment generally parallel to that of the adjacent roadway.

Vertical Alignment: The configuration of a roadway as seen in longitudinal section.

Warrant: A criterion that identifies a potential need for a transportation measure, such as traffic light, physical barrier, extra lane, street lighting or other requirement.

5.3 Transportation Impact Assessment (TIA)

5.3.1 Purpose

The Transportation Impact Assessment (TIA) is intended to adequately assess the impacts of any development proposal on the existing and planned transportation system, including pedestrian and bicycle mobility, transit service, and vehicle traffic.

5.3.2 Study Requirements

A TIA is required for any proposed site plan or subdivision plan which would be expected to generate 100 or more vehicle trips during the peak hour of the traffic generator or the peak hour of adjacent streets, or over 750 trips in an average day.

Under special circumstances, at the City's discretion or for developments which are projected to either impede general traffic flow, add potential traffic safety concerns, or significantly alter the number of pedestrians, cyclist or transit users, a TIA studies may still be required even if the vehicle trips generated do not meet the threshold indicated

A TIA may also be required, at the discretion of the City if:

- high traffic volumes on surrounding roadways affect movement to and from the proposed development.
- there is a lack of existing left turn lanes on the adjacent roadway at the proposed access drive.
- there is inadequate sight distance at access points.
- there is close proximity of the proposed access points to other existing drives or intersections.
- a development includes a drive-through operation.

5.3.3 Coordination with the City

Consultants and Engineers preparing TIAs shall discuss proposed development projects with the City Engineer to identify special circumstances. Issues to be discussed include, without limitation, definition of the study area, relevant subarea plans, level of service objectives, maximum design volume objectives, methods for projecting build-out volumes, background traffic conditions, trip generation rates, directional distribution of traffic, modal share, and trip assignment. These terms of reference for the TIA shall be approved by the City prior to study preparation.

5.3.4 TIA Guideline

The following is a guideline outlining the basic contents of a TIA. For additional information on traffic impact assessment refer to the *ITE Transportation Impact Analysis for Site Development* and *the Alberta Transportation Traffic Impact Assessment Guidelines*. The content, structure and focus may be adjusted in coordination with the City on a case by case basis for the lifetime of these designs standards and unless the City specifies otherwise, the long term horizon year will be 2041.

1. BACKGROUND

- Description of proposed development;
- Description of study area, and study intersections;
- Location of proposed access points;
- Identification of peak hours and whether weekends will be used in the impact analysis; and
- Identification of study horizon years typically includes existing/opening day, and a short and long term horizon year.

2. BASE TRAFFIC CONDITIONS:
 - Description of existing roadway network and intersections adjacent to site and at access points;
 - Traffic volume counts during peak-impact hours; and
 - Description of existing transit, pedestrian and cycling infrastructure in the vicinity of the site.
3. SITE TRAFFIC GENERATION:
 - Development of trip generation rates used and the source of these rates;
 - Traffic generated during peak impact hours; and
 - Discuss potential generation of transit, pedestrian and cyclist trips, if applicable.
4. SITE TRAFFIC DISTRIBUTION:
 - Method used to distribute traffic;
 - Figure(s) or table(s) showing estimated traffic movements by direction; and
 - Methods used for traffic assignment and assumptions for assignment of traffic to network.
5. NON-SITE TRAFFIC PROJECTIONS:
 - Determine forecast traffic volumes for proposed study horizon years (include data to substantiate how the forecasted traffic volumes were determined);
 - Identification of other proposed development in the study area whose future generated traffic volumes should be added to the forecasted traffic volumes; and
 - Assemble off-site traffic volumes to include background growth and any applicable area development to determine the future horizon traffic volumes.
6. TRAFFIC ASSIGNMENTS:
 - Assignment of peak-period traffic to intersections and access points;
 - Figures for existing peak impact hours traffic, site traffic and total traffic volumes;
 - Complete intersection and corridor performance analysis for peak impact hour; and
 - Identify roadway classification.
7. REVIEW OF SITE PLAN:
 - Internal reservoir at access points;
 - General or detailed parking layout (whichever applies);
 - Pedestrian and cyclist accessibility strategy through the proposed development;
 - If applicable, loading dock locations and access, including design vehicle, with design vehicle turning template; and
 - Identify recommended improvements to the site plan.
8. DISCUSSION OF FUTURE TRAFFIC CONDITIONS AND MITIGATION MEASURES:
 - Identify recommended improvements to the study area roadway network including access point(s), intersection(s) and corridor(s);
 - Discuss mitigation measures for every significant impact identified;
 - Discuss implications for other developments in area; and
 - Discuss mobility of future pedestrian and cyclists in direct area and opportunities for improvement.

5.4 Complete Streets

Complete streets are defined as streets that provide safe, accessible and convenient access for all transportation modes including pedestrians, bicyclists, motorists and transit users – of all ages and ability levels.

The Owner/Applicant shall make all reasonable provisions for the accommodation of bicycles, pedestrians and transit users in the planning, design, and construction of new roadways, major reconstruction or maintenance projects, except where pedestrians, bicyclists and/or transit services are prohibited by law from using a given facility or where unsafe or impractical.

5.5 Roadway Classification

A roadway classification system establishes a hierarchy of roadways that provides for the gradation in function from access to mobility. The characteristics of roadway classifications described in these standards are generally in accordance with the TAC design classification system. Factors such as land use, service function, intersection spacing, traffic volume, traffic flow characteristics, running speed, vehicle type and connection to other roadways; are considered for the roadway classification. The design guidelines presented in this section correspond to the following roadway classification; designs for Expressways and Freeways shall be based on TAC and/or the governing authority (i.e. Alberta Transportation) whichever is more stringent:

- **Public Lane (Alley):** A narrow minor street, usually without sidewalks, located at the rear of lots for vehicle access to garages or other parking spaces and which also serves as a utility right of way.
- **Local Roadway:** A roadway with the primary function of providing land access to residential, industrial or commercial land uses. Movement is incidental and primarily to connect to/from collector roadways.
- **Collector Roadway:** A roadway on which traffic movement and property access (residential, commercial or industrial) have similar importance. Sub-groups of minor and major collectors provide for varying degrees of access control, pedestrian/cycling treatments and intersection spacing/treatments applicable to various mobility conditions. Collector roadways may be required to accommodate transit buses. Collector roadways provides for movements between local and arterial roadways.
- **Arterial Roadway:** A roadway primarily intended to provide high levels of service for through traffic. Rigid access control and sound access design are essential to preserve its function and ensure safety. Also, sub-groups of minor and major arterials provide for varying degrees of access control, pedestrian/cycling treatments and intersection spacing/treatments applicable to various mobility conditions. Major arterials roadways typically link major development areas including central business district (CBD), large industrial areas, and large shopping districts. Minor arterials typically interconnect residential, shopping, employment and recreational activity areas.
- **Expressway:** A divided roadway intended for uninterrupted through traffic flow except for widely spaced signalized intersections. Full or partial control of property access should be strictly applied. Grade separation may be required at key intersections. Refer to the Geometric Design Guide for Canadian Roads, TAC.

- Freeway: Refer to the Geometric Design Guide for Canadian Roads, TAC.

5.6 Roadway Rights-of-Way and Carriageway Widths

Rights-of-way shall be of adequate width to accommodate the carriageway, sidewalks, bikeways, boulevards, underground utilities, street lighting, etc. in an acceptable manner. Easements will be as required. Right-of-way and carriageway may be amended by mutual agreement. The minimum requirements are:

Roadway Class	Right-of-Way (m)	Carriageway (m)	Typical Cross Section Details Drawing No.
Public Lane (Alley)			
• Residential	6.0	5.8	T-1
• Commercial/Industrial	9.0	7.0	T-2
Local			
• Residential	18.0	9.0 or 11.0	T-3, T-4, T-5
• Commercial/Industrial	21.5	10.5	T-6
Minor Collector			
• Residential	24.0	11.5	T-7
• Commercial/Industrial	23.0	12.0	T-8
Major Collector			
• Residential	24.0	13.5	T-9
• Commercial/Industrial	23.0	13.0	T-10
Arterial			
• Minor Undivided	33.0	15.8	T-11
• Standard Divided	33.0	16.8	T-12
• Major Divided	44.0	16.8	T-13

5.7 Minimum Requirements

All City roadways shall be designed in conformance with the most current edition of the Geometric Design Guide for Canadian Roads by TAC. The design standards outlined in this section are minimum design standards for the City, and all roadway design shall meet or exceed these standards. Under special circumstances, the Public Works & Engineering General Manager may approve standards to be applied to roadway design that may exceed the minimum standards in this section based on functional; however, designers still need to ensure safe and efficient operation of the roadway at all times.

5.8 Design Speed & Design Vehicle

Selection of the most appropriate design speed should be made on the basis of the intended service function and needs of expected users. All users including motorists, pedestrians, cyclists, and transit riders, should be taken into consideration while selecting the design speed for a given roadway. The selected design speed shall be logical with respect to the character of terrain, anticipated operating speed, adjacent land use and roadway classification system. Differences in design speed from one segment to another should not be more than 20 km/h. The following minimum design speeds, must be provided for both vertical and horizontal alignment, unless otherwise approved by the Engineering Manager:

Roadway Class	Posted Speed
Public Lane (Alley)	30 kph
Local	50 kph
Collector	50 kph
Arterial	50 or 70 kph

Selection of Design Vehicle is completed by examining vehicle classifications (i.e. passenger car, single unit vehicles, emergency vehicles, bus, tractor-trailer unit etc.), vehicle characteristics (i.e. size, length, turning radii of vehicle) and local roadway conditions (i.e. local, collector, arterial roadways). Generally, emergency vehicles are considered as design vehicle for local residential roadways. For residential collectors, single unit trucks or buses should be considered as design vehicle. Industrial collectors should use tractor-trailer truck combination such as WB-19 for design vehicles. For arterial roadways and roadways within commercial areas, the minimum turning paths of tractor-trailer truck (WB-19) should be considered as the design vehicle. Refer to Chapter 1.2 of the Geometric Design Guide for Canadian Roads, TAC for specific characteristics of vehicles operating in Canada.

5.9 Horizontal Alignment

Roadway curvatures shall meet the minimum specifications shown below. For additional horizontal alignment parameters refer to the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

Horizontal Design Criteria	Local Roadway	Collector Roadway	Arterial Roadway
Design Speed	50 / 60 kph	60 kph	70 kph
Minimum Curve Radii (m)	80 / 90	90 - 120	225
Superelevation ¹	No	optional	Yes
Minimum Curve Length (m)	60	60	See TAC (section 2.1.2.2)

¹ For superelevation rates, refer to TAC Geometric Design Guide for Canadian Roads (1999):

- For design speed 60 kph – 80 kph, use Table 2.1.2.9 (emax = 0.06 m/m)
- For design speed 90 kph or higher, use Table 2.1.2.6 or Table 2.1.2.7.

5.10 Vertical Alignment

Roadway vertical alignments shall meet the specifications shown below. For additional vertical design parameters refer to the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

Vertical Design Criteria	Local Roadway	Collector Roadway	Arterial Roadway
Design Speed	50/60 kph	60 kph	50 - 70 kph
Minimum Gradient	0.60%	0.60%	0.60%
Maximum Gradient	6%	6%	5%
Crest Curve, min. K (m)	10 / 20	20	10 - 35
Sag Curve, min. K (m)	20 / 10	20 / 10	20 - 25 /
Headlight Control ¹ / Comfort Control			10 - 15

¹ Note: See TAC for explanation of Headlight Control versus Comfort Control

5.11 Public Lane (Alley)

Alleys should be centred on the alley right-of-way wherever possible. A 3.0 m fillet shall be constructed at the intersection corners of all alley intersections.

The vertical alignment of alleys adjacent and parallel to collector or arterial roadways shall be designed in conjunction with the grades on the adjacent roadways. The minimum longitudinal grade for alleys is 0.7%.

5.12 Cross Section Elements

The urban cross section normally consists of the travel lanes, curb and gutter or shoulder (semi urban or rural), storage lanes (i.e. left turn, right turn), parking lanes, separators (i.e. medians, outer separators) and provisions for pedestrians and cyclists (i.e. walkways, trails, bicycle paths / lanes). The minimum requirements for cross section elements for different roadway classifications are described in the following sections.

5.12.1 Travel Lane Width

Travel lane widths shall be in accordance to the most current edition of the Geometric Design Guide for Canadian Roads, TAC. Recommended travel lane widths for each roadway class are shown below, and are measured from the lip of gutter (pavement edge). In retrofit situations, TAC also contemplates reduction of these values under sound engineering judgement in regards to safety, traffic operation, speed and capacity¹.

Roadway Class	Travel Lane Width (m)
Public Lane (Alley) - Residential - Commercial/Industrial	2.0 – 4.0 3.5
Local - Residential - Commercial/Industrial	3.0 – 3.7 3.5 - 3.7
Minor Collector - Residential - Commercial/Industrial	3.5 – 3.7 (4.3-4.5) ² 3.7
Major Collector - Residential - Collector/Industrial	3.5 – 3.7 3.7
Arterial - Minor (Undivided) - Standard (Divided) - Major (Divided)	3.5 – 3.7

²Note: Widths accommodate shared use travel lanes.

¹ Cross Section Elements (Chapter 2.2) – TAC Geometric Design Guide for Canadian Roads (1999)

5.13 Cross Slope Requirements

The cross slope for roadways in urban areas is generally 2% towards the outside pavement edges, as shown in the typical cross section figures. Cross slope requirements for various cross section elements are:

Cross Section Elements	Recommended Cross Slope	Minimum Cross Slope
Roadway	2% - 2.5%	2%
Gutter	10% - 12%	10%
Sidewalk / Walkway / Trail	2%	2%
Border & Boulevard (turf)	2% - 4%	2%
Shoulder	2% - 5%	2%

Normally, on super elevated sections, the cross-slope of the shoulder on the low side is normally the same as that of the adjacent travelled lane. However for the high end, the shoulder should either be super elevated to match with the adjacent travelled lane or sloped away from the travelled lane based on the site specific requirements.

In retrofit situations or at critical locations (such as driveways), the cross slope of any cross section element may be altered to meet existing control elevations. Use of sound engineering judgment and adoption of best practices are recommended in dealing with such site specific critical situations. Typical cross sections shall be referred to confirm the direction of the cross slope for each element.

5.14 Curb & Gutter

All City roadways shall be complete with wide base barrier concrete curb and gutter as indicated on the typical roadway cross sections. Refer to the following for requirements, design and specifications for each type of curb and gutter:

- Drawing T-15 Straight Face 150mm Curb with 250mm Gutter
- Drawing T-16 Straight Face 150mm Curb with 500mm Gutter
- Drawing T-17 Roll Face Curb and Gutter
- Drawing T-18 Typical Swale Gutters
- Drawing T-19 Concrete Curb

5.15 Sidewalks, Walkways and Trails

5.15.1 Classification and Design

Classification and design of sidewalks, walkways and trails will be as per:

- Drawing T-20 1.5m Separate Concrete Sidewalk
- Drawing T-21 Roll Face Monolithic Concrete Sidewalk
- Drawing T-22 Straight Face Monolithic Concrete Sidewalk
- Drawing T-23 Asphalt Trail
- Gravel Walkway – Width as required

5.15.2 Requirements

The City requires that all sidewalks within new subdivisions are constructed as separate concrete sidewalks.

Roadway Class	Location
Local Road at Cul-de-sacs < 10 lots/properties 10-18 lots/properties > 18 lots/properties	1.5 m sidewalk on one side (Optional) 1.5 m sidewalk on one side (Required) 1.5 m sidewalk on both side (Required)
Local - Residential/Commercial/Retail - Industrial	1.5 m sidewalk on both sides 1.5 m sidewalk on one side
Collector - Residential/Commercial/Retail - Industrial	1.5 m sidewalk on both sides or 1.5 m sidewalk on one side & 3.0 m Asphalt Multi-use Trail on other side 1.5 m sidewalk on one side
Arterial	1.5 m sidewalk on one side and 3.0 m Asphalt Multi-use Trail on other side

Note: If necessary within a collector or arterial roadway design, use a 2.0m width for monolithic concrete sidewalk type in conjunction with straight face curb and gutter.

5.15.3 Specification

Facility	Adjacent Facility	Type	Material	Width
Sidewalk	Local / Collector / Arterial	Separate	Concrete	1.5 m
Sidewalk/ Gravel Walkway	Emergency Access	Separate / Monolithic	Concrete / Gravel	3.0m
Multi-Use Trail	Collectors / Arterial / SWMF	Separate	Asphalt	3.0 m
Gravel Walkway	Top of Bank / SWMF	N/A	Gravel	1.5 m
Gravel Walkway	TUC	N/A	Gravel	3.0 m

Sidewalks wider than 1.5 m may be required on a case-by-case basis at the discretion of the City Engineer. In cases where utilities are located within the right-of-way, alternate alignments may be required at the discretion of the Engineering Manager to avoid possible conflicts and maintenance concerns with the utilities. A curvilinear alignment may be considered where walkway rights-of-way exceed 10 m in width.

At sidewalk locations directly adjacent to transit stops or transfer points, the Engineering Manager may require wider sidewalk sections to provide for adequate passenger storage areas.

5.15.4 Vertical Alignment

The vertical alignment of sidewalks should generally follow the vertical grades of the associated roadways. Walkways and trails should be integrated with the associated horizontal alignment, drainage and berm construction. Since the sidewalks, walkways and trails are used as self-contained drainage corridors, they should be designed to facilitate positive drainage flow. The normal longitudinal grade of all sidewalks, walkways and trails is recommended at 0.7% and the minimum permitted grade is 0.5%.

Variations from the specifications for the design or construction of improvements shall be submitted to and receive written permission from the Engineer before beginning construction.

The Owner/Applicant shall submit a detailed grading plan with associated walkway profiles for approval by the Engineering Manager in conjunction with the detailed engineering drawings for

all other municipal improvements in the development area. All landscaping plans shall conform to plan standard requirements noted in Section 6.0 LANDSCAPING herein.

5.15.5 Concrete Curb Ramps

Concrete curb ramps, generally located at intersection locations or terminating locations of walkways, sidewalks or trails shall conform to the design and specifications as detailed in:

- Drawing T-24 Typical Concrete Curb Ramps

5.15.6 Utilities

Where sidewalks, walkways and trails cross or are located within an existing major utility or pipeline right-of-way, the Owner/Applicant will be responsible to obtain proper written permission/agreement with the appropriate authority prior to construction. The Owner/Applicant may be asked to produce a copy of a plan approved by the appropriate authority permitting construction of the walkway within the utility or pipeline corridor.

5.16 Medians and Outer Separations

A median is that portion of roadway which physically separates the vehicular travel lanes of traffic in opposing directions. The outer separation is that portion of an arterial roadway which physically separates the outside travel lanes of a roadway from an adjacent service roadway or a collector roadway. Median design widths and auxiliary information related to unique design applications shall conform to the most current edition of the Geometric Design Guide for Canadian Roads, TAC. The following drawings outline the general requirements, design and specifications for proposed concrete and landscaped median applications:

- Drawing T-25 Concrete Slab-On Median
- Drawing T-26 Median – Concrete Infill
- Drawing T-27 Median – Landscaped
- Drawing T-28 Drop Nose Median

Median grassing and outer separations shall be constructed in accordance with Section 6.0 LANDSCAPING herein.

5.17 Streetscaping

Streetscape design elements including wheelchair/pedestrian ramps, landscaping, pedestrian crossings and protection elements, benches and waste receptacles, etc; shall be in accordance with the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

5.18 Lighting

Roadway lighting refers to lighting of roadways, lanes sidewalks, walkways and trails. Lighting is generally required in all urban and suburban areas. In other areas, lighting requirements are in accordance with the warrants as indicated in the more current edition of the Guide for the Design of Roadway Lighting, TAC.

Roadway lighting designs shall be prepared under the direction of a lighting design professional with the appropriate experience and credentials, and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

The lighting design and other utilities must be shown on the construction plan submitted for City approval and conform to the design standards and specifications of Fortis Alberta. Contact the Engineering Manager or Fortis Alberta for further information.

5.19 Intersections

Geometric design of all intersections shall be in accordance with the most current version of the Geometric Design Guide for Canadian Roads, TAC. Intersections should be analyzed considering safety, efficiency and capacity of the roadway network. The designs shall ensure that pedestrian, bicycle, transit and vehicular concerns are addressed. An intersection analysis procedure should be followed and submitted with the overall design of the roadway network.

5.19.1 Intersection Spacing

Intersection spacing is mainly governed by the functional classification of the roadway so that roadways with the highest function will have the least number (greatest spacing) of intersection. The following spacing is recommended in accordance to TAC. Variations to this recommendation require approval of the City Engineer.

Type of Roadway	Minimum Spacing (Unsignalized Intersections)	Minimum Spacing (Signalized Intersections)
Arterial	200 m	300 m
Collector	60 m	120 m
Local	60 m	N/A

5.19.2 Angle of Intersection

All City roadways shall intersect at, or nearly at right angle (90°). A maximum variation (+/- 10° degrees) may be considered under special circumstances (see Chapter 2.3 of the most current edition of the Geometric Design Guide for Canadian Roads, TAC), and requires approval of the City Engineer.

5.19.3 Intersection Sight Distances

Intersection sight distances shall meet minimum recommendations as per the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

5.19.4 Grades and Cross Slopes

Combined vertical and horizontal alignments, including approaching grades and intersection cross slopes shall be design in accordance with the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

5.20 Access Management

The following are basic recommendations for access control key to the functional classification of the roadway. Access management concepts and techniques shall be applied in accordance with the most current edition of the Geometric Design Guide for Canadian Roads, TAC.

5.20.1 Two-Way Access (Full Movement)

A full movement access is the most prevalent type of access requested and may be associated with a median break on divided roadways. Full movement access should be limited along divided arterial roadways which primary function is to provide high level of service for through traffic.

In special cases where access must be provided along arterial roadways, and right in/right out is not sufficient, a left in movement may be allowed while restricting the left out (3/4 movement). The left out movement typically is the most difficult one to make because of conflicting traffic flows. Provision of a full movement access, and associated median break, which reduces the length of an existing left turn bay, should only be considered if it is demonstrated that future intersection operation is not degraded by shortening the existing left turn bay.

5.20.2 Two-Way Directional Access (Right-In/Right-Out)

This type of access is used to prevent cross traffic and left turns into and out of a site along an undivided roadway, or to provide a high standard of site ingress/egress. Typical applications of this access type are high intensity multiple-use commercial sites.

Right-in/right-out accesses are most appropriate on collector and arterial roadways where through traffic is trying to be facilitated. Accesses for high traffic generators are of a particular concern because a full movement access tends to operate much like a roadway intersection.

In the proximity to a major intersection, where left turn bays are present, a right-in/right-out type access should be positioned in advance (upstream) of the bay taper for the left turn storage area. This allows drivers exiting a reasonable opportunity to cross through lanes to reach the left turn lane. (See Figure U.K.5 in the Urban Supplement, TAC, 1995).

5.20.3 Access Location

The table below shows the recommended minimum clearances and spacing of driveways or public lanes along a roadway with operating speed of 50 kph, as per the Geometric Design Guide for Canadian Roads, TAC (current edition should be referenced). Higher spacing standards may be required for higher speeds as warranted by traffic conditions. Minimum spacing from roadways shall be measured from the back of curb of the cross road to the nearest (leading) back of curb of the access throat. Minimum spacing between accesses shall be measured at the property line (between throat edges).

Reference Location (measured to edge of access)	Minimum Spacing (m)			
	Single Family Residential	Other Residential	Commercial	Industrial
Local Roadways				
• From property line	1.5	3.0	4.5	9.0
• From street corner (traffic signals at cross road)	15	15	15	15
• From street corner (stop control at cross road)	15	15	15	15
• Between accesses ¹	7	10	12	21
Collector Roadways				
• From property line	Permitted only when no other access is available.	3.0	4.5	9.0
• From street corner (traffic signals at cross road)		55	55	55
• From street corner (stop control at cross road)		25	25	25
• Between accesses ¹		10	12	21
Arterial (divided)				
• From property line	Permitted only when no other access is available.	5.0	5.0	6.0
• From street corner (traffic signals at cross road)		70 ²	70 ²	70 ²
• From street corner (stop control at cross road)		25	25	25
• Between accesses ³		20-25	29	32

Notes:

For 'Reference Location' diagram, refer to Figures 3.2.8.2 and 3.2.9.3 of Geometric Design Guide for Canadian Roads, TAC and Figure U.K.2.6 of the Urban Supplement to the Geometric Design Guide for Canadian Roads, TAC (current editions should be referenced).

¹ Greater spacing often results as a result of maximum recommended driveways based on property frontage.

² Minimum spacing dependant on roadway classification and characteristic; consideration also needs to be taken in regards to the potential impact to left turn storage length and bay taper. Refer to most current edition of Geometric Design Guide for Canadian Roads, TAC.

³ Spacing shown is along divided Arterial; high traffic turning volumes may warrant greater spacing between driveways along arterial roadways

It is to be noted that the minimum distance from the intersecting roadway to an access is more critical on an undivided roadway due to effects of left turning traffic into the site.

5.20.4 Curb Crossing Format

There are two types of curb crossing formats; curb returns and curb drops. The choice of when to use each is dependent upon the roadway classification and the land use type to be served. Curb returns should be used on arterial roadways and with high traffic generating developments (greater than 100 vph at the peak hour) on collector roadways. Curb drops are appropriate for local, local collector and low traffic generating developments on collector roadways.

Single family residential accesses are to be of the curb drop format, perpendicular to the adjacent curb line and installed as per Drawing T-32 Residential Crossing Separate Sidewalk and Drawing T-33 Residential Crossing Monolithic Sidewalk.

Curb drops for public lanes and commercial crossings are to be perpendicular to the adjacent curb line. As well, curb return crossings for two-way accesses to arterials and high traffic generating development accesses to collectors should also be constructed perpendicular to the adjacent curb line. Refer to Drawing T-34 Commercial, Industrial or Arterial Crossing Separate Sidewalk and Drawings T-35 Commercial, Industrial or Arterial Crossing Monolithic Sidewalk for further details and design information.

5.20.5 Access Width

Driveway access width shall be in accordance with most current edition of the Geometric Design Guide for Canadian Roads, TAC or the Urban Supplement to the Geometric Design Standards for Canadian Roads Manual, TAC. Typical driveway width dimensions are:

Access Type	Residential (m)	Multi-family / Commercial (m)	Industrial (m)
One-way	3.0 - 4.5	5.0 – 7.5	5.0 – 9.0
Two-way	3.0 - 7.5	7.5 ¹ - 12.0 ²	10.0 - 15.0 ³

Notes:

- ¹ Two-way access for passenger vehicles;
- ² Two-way access for delivery vehicles (cube vans); and,
- ³ Two-way access for large trucks and semi-trucks.

5.20.6 Acceleration and Deceleration Lanes

Deceleration and acceleration lanes or auxiliary lanes may be required along major roadways for development access to and from the site to safely accommodate turning traffic and to minimize disruption to through traffic flows on the main roadway. Warrant for installation of auxiliary lanes will be at the discretion of the City's Public Works & Engineering department. Basic warrants for an auxiliary lane are:

- Along arterial roadways
- If existing or projected traffic volume along main roadway is 30,000 vehicles per day or 600 vehicles per hour per lane

Design for such access is to be in accordance with the most current edition of the Geometric Design Guide for Canadian Roads, TAC. Refer also to the Urban Supplement to the Geometric Design Standards for Canadian Roads Manual, TAC, Section U.D.9.

5.20.7 Access Throat Length

Adequate driveway storage capacity or throat length for both inbound and outbound vehicles to facilitate safe, unobstructed, and efficient traffic circulation and movements from the adjacent roadway and within the development shall be provided, except for single-family or duplex residential driveways on local streets. The clear throat length is measure from the end of the driveway curb return radii to the point of first conflict on-site. The storage length is dependent on a number of factors including land use, development size, roadway classification, etc. Refer to the most current edition of the Geometric Design Guide for Canadian Roads, TAC for general guidelines for recommended throat length. For higher traffic generating developments a detailed traffic analysis should be completed to determine the appropriate throat length.

5.20.8 Emergency Access

Primary Access Required: The primary access is considered to be the principal access to a site used by occupants of a development on a daily basis. Primary access to all industrial, commercial, and residential developments shall provide adequate emergency vehicle access. Adequate emergency access is a minimum 6.0 m wide unobstructed fire apparatus access roadway with an unobstructed vertical clearance of 5.0 m, and meets all applicable standards as set forth in the NFPA 1141: Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas, Alberta Fire Code (2006) and The Alberta Building Code (2006).

Emergency Access Route or Secondary Access Street Requirements: When adequate emergency access is not available from a public street (primary access route), an applicant for construction approval shall construct an emergency access route or a secondary access street in accordance to the Alberta Fire Code (2006) and the NFPA 1141: Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas.

General cul-de-sac's requirements are as follows:

- a. The normal maximum length of a cul-de-sac is 120m from the street curb line to the start of the bulb. Cul-de-sac in excess of 120m and less than 170m will require an additional hydrant. Watermain looping will be required if the cul-de-sac of more than 120m. Where cul-de-sac in excess of 170m are proposed, provision must be made for a 6.0m wide Public Utility Lot (PUL) for emergency vehicle access and water service looping. Emergency vehicle access PUL's shall be developed to a standard acceptable to the City Engineer.
- b. Cul-de-sacs with steep grades are to be avoided. If cul-de-sacs cannot be graded to drain towards the intersection then an outlet for the overland flow must be provided by way of a PUL.
- c. The minimum radius of cul-de-sac bulbs is 11m to face of curb.
- d. Cul-de-sac road surface is to be crowned except the bulb portion which may be crossfall.

Parking Restriction on Emergency Access Routes: Curb side parking shall be restricted on emergency access routes (public or private roadways) to provide adequate unobstructed fire apparatus access as follows:

Roadway Carriageway Width¹ (m)	Parking Restrictions
6.0	No parking of any kind. No-parking signs shall be posted on both sides of the access route
7.5	Parking will be permitted on one side of the access route. No-parking signs shall be posted on one side
9.0	Parking shall be permitted on both sides of the access route
One-way access route	One-way access routes are to be a minimum of 6 m wide with no parking. No-parking signs shall be posted on both sides of the access road.

Note: ¹ Roadway carriageway width measurement does not include the curb and gutter.

Sidewalks and Walkways Designated for Emergency Access: Where a walkway is designated as an emergency access route by the City, the following requirements apply:

- the walkway shall be centred on the right-of-way (straight alignment) and constructed with 120 mm of Portland cement concrete. The walkway width shall be a minimum of 3.5 m to allow access by emergency vehicles
- if planting is proposed for the right-of-way a minimum 4.0 m clearance must be provided to allow access by emergency vehicles
- t-bollards must be placed at each end of the walkway access, as shown within the Landscaping Section drawings. The posts shall prevent non-emergency vehicle access while allowing access for maintenance equipment
- standard curbs at the approaches to the sidewalks or walkways are adequate; drop curbs are not required
- sidewalk and walkway lighting standards and other furniture must be located so that they would, in the opinion of the Engineer, not obstruct emergency vehicle access
- the normal gradient for emergency access walkways shall be 0.7% and the minimum gradient shall be 0.5%

5.21 Transit Requirements

The City of Fort Saskatchewan does not currently have Transit services; however, all development applications shall consider and comment on the accommodation and effect of Edmonton Transit or future transit services and facilities where applicable. The Owner/Applicant shall confirm with the City on any transit supportive development characteristics or technical requirements applicable to the proposed development including but not limited to:

- transit supportive strategies (land use/zoning regulations, target densities, etc)
- on-site parking relaxation
- recommended walking distance to existing or planned nearby facilities
- adjacent bus routes (existing or planned)
- potential incorporation/relocation of bus stops (i.e. spacing, location)
- bus stop dimension/design including (shelter, concrete pad, signage, benches, etc)
- bus turnaround requirements
- pedestrian/bicycle amenities and directness of bikeways/pathways
-

If and when the City implements Transit services, design of Transit facilities shall follow the most current edition of the City of Edmonton Transit Design Standards.

5.22 Traffic Control

The design and application of traffic control devices including signage, pavement markings and traffic signals shall be in accordance with the most current edition of the Manual of Uniform Traffic Control Devices for Canada (MUTCD), TAC, and the Alberta Traffic Safety Act, as appropriate.

If signage and pavement markings are required for the proposed development, the Owner/Applicant will be responsible for providing the design and ensuring they are completed by an Engineer with appropriate credentials. The Owner/Applicant shall submit the detailed signage and pavement markings plans for approval by the Engineering Manager in conjunction with the detailed engineering drawings for all other municipal improvements in the development area. The Owner/Applicant is also responsible for the installation of the signage and pavement markings in conjunction with any improvements required to City infrastructure as a result of the development. with the installation of the City services.

The requirements for stop control should be based on MUTCD warrants, and traffic signals should be confirmed using the most current version of the TAC traffic signals warrant guidelines

(Canadian Traffic Signal Warrant Matrix Procedure). Signalization may be required if there are any of the following situations:

- collision concerns
- abnormal left turn volumes
- pedestrian hazards
- insufficient sight distance
- delay problems
- undesirable gaps

In coordination with the City, the Owner/Applicant is responsible for the cost and installation of traffic signals that are a direct result of the traffic generated by the development.

5.23 Traffic Calming

Implementation of traffic Calming measures will be determined on a case-by-case basis. Any proposed traffic calming measures must be identified and approved as part of a Neighbourhood Area Structure Plan or appropriate approval process.

The design of traffic calming measures should consider key factors, including but not limited to:

- weather, particularly winter conditions
- topography
- existing roadway classification and design standards (i.e. traffic volumes, roadway widths, operating speed, etc.)
- drainage
- existing utilities
- on-street parking conditions
- access / driveway locations near intersections
- transit, truck, service and emergency vehicle requirements
- designated cycling routes
- construction and maintenance requirements

The Canadian Institute of Transportation Engineers (CITE) Guide to Neighbourhood Traffic Calming provide guidelines for planning, design and implementation of traffic calming measures on Canadian roadways.

5.24 Pavement Design

The first submission of engineering drawings shall be accompanied by a geotechnical report, complete with borehole logs. The report shall specify the roadway structures required and all assumptions used in the roadway structure design, including California Bearing Ration (CBR) values, design traffic loading and pavement design life. Typically, all the roadways within City limits, regardless of their classification, shall be designed considering 20 years life span unless otherwise directed by the City. In case of staged construction, the life span for a given roadway shall be considered after the final stage of paving.

The mix design shall be provided by a qualified laboratory following the Marshall Method of Mix Design as set out in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2) and submitted to the City for approval.

No changes to the approved mix design shall be made without written approval from the City. The City may seek advice from an independent consultant for the suitability of the mix design for a given roadway.

Paved roadways shall be designed in accordance with the Asphalt Institute method of pavement design using minimum design loadings of 8,165 kg single axle loads for local roadways and 10,886 kg axle loads for collectors. All industrial / commercial roadways shall be designed using a minimum design loading of 10,886 kg single axle loads. Design parameters such as traffic count, percentage of trucks, CBR, etc., are to be provided to the City. The City reserves the right to request the Owner/Applicant to engage a geotechnical engineering agency to carry out CBR tests on the subgrade prior to paving, to confirm adequacy of design.

Staged construction for asphalt work is preferred with the final lift of asphalt placed during the construction season prior to Final Acceptance Certificate (FAC). Refer to the Subdivision and Development Servicing Standards and Construction Specifications for more information.

5.25 Pavement Markings

The Manual of Uniform Traffic Control Devices (MUTCD) provides guidelines for the design and implementation of various pavement markings on roadways. General pavement markings will be as per:

- Drawing T-36 Pavement Marking Types and Width
- Drawing T-37 Intersection Pavement Markings

All pavement markings to be inlaid thermoplastic. In staged construction, painted markings are required upon construction completion, inlaid thermoplastic required upon final acceptance.

5.26 Drainage Design

Stormwater Management and drainage design is integral to the design of all transportation components, and shall conform to City standards. Refer to Section 4.0 STORM DRAINAGE herein for Drainage Design Guidelines.

5.27 Construction Specifications

Construction is to follow the City of Fort Saskatchewan 2005 Transportation Section specifications unless otherwise noted. The specifications are as follows:

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G.1.0. DESIGN STANDARDS

- ~~1. Road classification and designation shall be in accordance with the geometric design standards outlined in the most recent addition of the "Geometric Design Guide for Canadian Roads" Transportation Association of Canada (TAC), 1999 Edition, or revisions thereof.~~
- ~~2. Roads will be designed to the geometric standards noted in Table G-1: Summary of Recommended Design Standards for Urban Streets.~~
- ~~3. General cul-de-sac's requirements are as follows:~~
 - ~~a. The normal maximum length of a cul-de-sac is 120m from the street curb line to the start of the bulb. Cul-de-sac in excess of 120m and less than 170m will require an additional hydrant. Watermain looping will be required if the cul-de-sac of more than 120m. Where cul-de-sac in excess of 170m are proposed, provision must be made for a 6.0m wide Public Utility Lot (PUL) for emergency vehicle access and water service looping. Emergency vehicle access PUL's shall be developed to a standard acceptable to the City Engineer.~~
 - ~~b. Cul-de-sacs with steep grades are to be avoided. If cul-de-sacs cannot be graded to drain towards the intersection then an outlet for the overland flow must be provided by way of a PUL.~~
 - ~~c. The minimum radius of cul-de-sac bulbs is 11m to face of curb.~~
 - ~~d. Cul-de-sac road surface is to be crowned except the bulb portion which may be crossfall.~~
- ~~3. Developers are required to address noise levels for roadways operating at capacity. Noise attenuation structures shall be used where a noise level of 55 dB is measured or calculated at a distance of 5.0 m from the nearest residential dwelling.~~
- ~~4. Developers are responsible for restoration of all survey control markers and legal pins removed or disturbed during construction. Restoration shall include replacing fill over markers that required excavation for access. If frequent access to a buried marker is required, the City Engineer should be advised so that a permanent cover can be installed.~~

G.2.0. CLEARING AND GRUBBING

All work shall be done within the limits of rights-of-way and permanent and working easements, and shall include the complete disposal of all buildings, fences, vegetation and other debris. All work shall be in accordance with existing Provincial and City fire; public safety, and environmental regulations and laws, and be done in accordance with the "approved" drawings and specifications.

G.3.0. EARTHWORK**3.1. TOPSOIL STRIPPING AND STOCKPILING**

Topsoil shall be stripped to its full depth on all road rights-of-way and excavation areas, and stockpiled for use in final grading and/or landscaping.

3.2. COMMON EXCAVATION

All excavation shall occur within the limits of the proposed work to the lines, grades and dimensions as shown on the contract drawings or noted in the contract documents, unless directed otherwise by the Engineer. Surplus or unsuitable material shall be disposed of at a site approved by the Engineer.

3.3. EMBANKMENT CONSTRUCTION

1. Fill material shall be placed in maximum 300 mm (loose) successive uniform layers, each compacted to a minimum of 98% Standard Proctor Density at optimum moisture content unless stated otherwise. Where required, the area receiving fill material will be cleared and grubbed, unsuitable material removed and the area scarified prior to placing fill material. Only material approved by the Engineer shall be used.
2. Testing shall occur at a minimum of one density test for each 2000 m² of compacted lift, or as otherwise approved by the Engineer, using ASTM D1556, ASTM D2167 or ASTM D2922. For comparison, the maximum density is determined according to ASTM D698 Method A. If a test is below the required density the area represented by the test shall be reworked to the depth of the lift, moisture content adjusted if necessary and compacted to the specified density.

3.4. BORROW

Where a sufficient quantity of suitable fill material is not available from excavation on the site, additional fill may be borrowed from other sources. In no case shall City-owned areas be undercut for borrow.

3.5. GRADE TOLERANCE

1. All graded surfaces shall meet a grade tolerance of ± 25 mm from designated grade elevations unless otherwise approved by the Engineer. Crossfalls and ditch bottoms shall be graded to allow for a positive flow of water. High areas shall be trimmed to within the tolerance. Low areas shall be scarified, filled with approved material, compacted to the required density and graded to within tolerance.
2. On finished surfaces, localized high and low points or other obstructions that inhibit drainage, will not be tolerated.

3.6. EQUIPMENT

All proposed routes for hauling equipment other than trucks must be approved by the Engineer prior to commencement of the work. Rubber-tired motor scrapers shall not be used to haul over improved streets. Traffic must be controlled by flagmen and sufficient warning signs to ensure the safety of the public when any travelled roadway is being entered or crossed by hauling equipment to the satisfaction of the City. Road closures and detours must be submitted to and approved by the City a minimum of 48 hours prior to scheduled work. Haul routes must be kept clear and free from dust. Trucks shall be loaded in such a manner that no spillage occurs.

G.4.0. SUBGRADE CONSTRUCTION**4.1. EXCAVATED AREAS**

The areas under future road structure and curb and gutter shall be scarified to a minimum depth of 300 mm below the surface and compacted in 150 mm lifts to a minimum of 100% of Standard Proctor Density. For areas under walks, curb ramps and slabs the surface shall be scarified to a minimum depth of 150 mm and compacted to 97% Standard Proctor Density.

4.2. EMBANKMENT AREAS

The top 300 mm of fill under future road structure and curb and gutter, shall be placed in two 150 mm compacted lifts and compacted to a minimum density of 100% of Standard Proctor Density. For walks, curb ramps and slabs, each of the 150mm lift shall be compacted to 97% Standard Proctor Density.

4.3. GRADE TOLERANCE

The elevation of excavated and embankment areas shall conform to the lines, grades and dimensions required. The finished subgrade surface shall have a maximum variation of 6mm above and 25mm below the designated elevation. High areas shall be trimmed to within the tolerance. Low areas shall be scarified, filled with approved material, compacted to the required density and graded to within tolerance. As an alternative, low areas may be filled with the same material used in the next layer of road structure above the subgrade.

4.4. DENSITY TESTING

Testing shall occur at a minimum of one density test for each 1000 m² of compacted lift, or as otherwise approved by the Engineer, using ASTM D1556, ASTM D2167 or ASTM D2922. For comparison, the maximum density is determined according to ASTM D698 Method A. If a test falls below the required density, two more tests will be taken in the area represented by the failed test and the three test average used as the density for the area. If this average is below the required density the area represented by the tests shall be reworked to the depth of the lift, the moisture content adjusted as necessary, compacted to the specified density and trimmed to grade. Failed sections to be re-tested, at the Contractor's expense.

4.5. DRAINAGE WORKING AREAS

All work shall be carried out so that excavated areas will drain to catch basins, manholes, or to a natural drainage course during construction or by pumping.

NOTE: In certain situations, the use of cement or lime to stabilize the subgrade below the granular base course may be used. Approval must be obtained from the City Engineer prior to construction.

G.5.0. GRANULAR BASE COURSE**5.1. MATERIALS**

Granular materials shall consist of crushed gravel free from vegetation, clay or other extraneous material and meet the following specifications:

1. 20 mm (3/4") Crushed Gravel
 - a. The gravel shall meet the following grading requirements and be uniformly graded between the given limits:

Sieve Size, mm	% Passing by Weight
20.0	100
12.5	60 – 92
5.0	37 – 62
2.0	26 – 44
0.4	12 – 27
0.16	7 – 18
0.08	2 - 10

- b. The Liquid Limit shall not exceed 25 and the Plasticity Index (< 0.4 mm sieve) shall not exceed 6.
 - c. A minimum of sixty percent (60%) by weight of material retained on the 5.0 mm sieve shall have at least two (2) crushed faces. The percent passing the 0.08 mm sieve shall not exceed 2/3 of the fraction passing the 0.4 mm sieve.
2. 63 mm (3") Minus
 - a. The gravel shall be crushed and meet the following grading requirements:

Sieve Size, mm	% Passing by Weight
63.0	100
5.0	25-50
0.08	0 - 10

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- b. At least twenty percent (20%) by weight of material retained on the 5.0 mm sieve shall have at least one fractured face.
- 3. Sand
 - a. The sand shall be free from all organic material and meet the following grading requirements:

Sieve Size, mm	% Passing by Weight
5.0	95
0.08	10 (Max)

- b. The Liquid Limit shall not exceed 25 and the Plasticity Index shall not exceed 6.

5.2. CONSTRUCTION

1. Surface Preparation

The subgrade shall be finished to conform to the required section, grade and density prior to the placement of base course material. Prepared subgrade shall be inspected by the Engineer before placing the granular material.

2. Placement

The granular material shall be placed on prepared subgrade or the preceding course in a uniform manner to ensure the ultimate planned compacted thickness is achieved. Crushed gravel and 63mm minus gravel shall be placed in horizontal layers of not more than 150 mm compacted thickness. The finished granular course shall be free of segregation.

3. Water

If the material requires water to attain the specified density, water shall be added and the material bladed continually until a uniform mixture is obtained. If the gravel contains an excessive amount of moisture, it is to be scarified and aerated until the Optimum Moisture specified is obtained.

4. Compaction

Not less than one hundred percent (100%) of maximum density shall be obtained in compaction tests. Compaction shall be reached by the use of pneumatic tire rollers, vibrating drum packers or other approved types of compaction equipment.

5.3. TESTING AND INSPECTION

1. Densities

A minimum of one density test shall be carried out for each 1,500m² (per layer) of granular base course or at least one test per day of placing operations. Density testing shall conform to ASTM D1556, ASTM D2167 or ASTM D2922. For comparison, the maximum density is determined according to ASTM D698 Method A. If a density test falls below the

required density, two more tests will be taken in the area represented by the failed test and the three test average used as the density for the area. If this average is below the required density the area represented by the test shall be reworked to the depth of the lift, moisture content adjusted as necessary and compacted to the specified density. Failed sections to be re-tested, at the Contractor's expense.

2. Surface Tolerance

The surface shall be such that when tested with a 3 m straight edge, the maximum deviation of the surface from the edge of the straight edge shall nowhere exceed 15 mm.

3. Grade Tolerance

The finished surface shall have a maximum variation of 6 mm above and 15 mm below the designated elevation. High areas shall be trimmed to within the tolerance. Low areas shall be scarified, filled with approved material, mixed, compacted to the required density and graded to within tolerance. As an alternative, low areas may be filled with the same material used in the next layer above.

4. Appearance

The gravel base shall be free of loose or deleterious material. No segregation of rock or fines shall exist in the completed base. Segregation in crushed gravel base shall be repaired by blading and thoroughly mixing the material prior to recompact and grading. Segregated material in 63 mm gravel shall be removed and replaced.

NOTE: The source of the aggregate must be approved by the City Engineer prior to commencing operations.

G.6.0. ASPHALTIC CONCRETE PAVEMENT

6.1. PAVEMENT DESIGN

1. Paved roadways shall be designed in accordance with the Asphalt Institute method of pavement design using minimum design loadings of 8165 kg (18,000 pound) single axle loads for local streets and 10,886 kg (24,000 pound) axle loads for collector streets. All industrial / commercial roads shall be designed using a minimum design loading of 10,886 kg (24,000 pound) single axle loads. The design parameters such as traffic count, percentage of trucks, California Bearing Ratio (CBR), etc., are to be outlined to the City Engineer. The City reserves the right to request the Developer to engage a geotechnical engineering agency to carry out CBR tests on the subgrade prior to paving to confirm adequacy of design.
2. Staged construction for any asphalt work is the preferred method of construction with the final lift of asphalt placed during the construction season prior to FAC.

6.2. MATERIALS

Asphaltic concrete pavements shall consist of aggregate, mineral filler and asphalt cement, and shall be laid and compacted to the specified thickness, conforming to the approved lines, grades and typical cross-sections.

1. Mixes Used:

Asphalt Concrete Surface	ACS	surface course for freeways, arterials and industrial/commercial roadways and base course for collectors.
Asphalt Concrete Base	ACB	base course for freeways, arterials, industrial/commercial roadways and collector roadways.
Asphalt Concrete Residential	ACR	paving local and non-bus route collector roadways.
Asphalt Concrete Overlay	ACO	resurfacing arterial and collector roadways.

Alternative mixes may be considered by the City and shall be approved in writing prior to installation.

2. Aggregates

- a. When tested by means of laboratory sieve, the combined aggregates in the mix shall meet the following gradation:

Sieve Size, mm	% Passing by Weight
----------------	---------------------

	ACR / ACO	ACS	ACB
25.0			100
20.0			80 - 95
12.5	100	85 – 95	
5.0	60 – 80	45 – 65	40 – 60
0.16	7 – 12	7 – 12	9 – 14
0.08	4 – 8	3 – 7	4 - 8

- b. A minimum of 75% of the ACR, ACO and ACS and 70% of the ACB material on the 5.0 mm sieve shall have at least two (2) crushed faces.
- c. Fine aggregates (passing 5.0 mm sieve) shall contain manufactured or crushed fines at a percentage by mass of aggregate as follows:

	ACO	ACS	ACB
Minimum Manufactured Fines, %	75	75	60
Maximum Manufactured Fines, %	85	85	

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3. Asphalt Cement

The asphalt cement shall be uniform in character, shall not foam when heated to 175° C and shall meet the following requirements:

Designation	150/200(A)
Penetration at 25° C, 100 g, 5 sec, dmm.	150
Ductility at 25° C (cm), maximum	100
Solubility in Trichlorethelene (%), minimum	99.5
Flash Point, Cleveland Open Cup, °C minimum	205
Tests on Residue from Thin Film Oven Test: Ratio of Absolute Viscosity of Residue from Thin Film Oven test to Original Absolute Viscosity, Maximum:	4.0

4. Mineral Filler

- Should the grading of the mineral aggregates supplied to the plant not meet the required gradation, mineral filler shall be added in such quantities as will be required to meet the specifications.
- Mineral filler shall consist of Portland cement, fly ash, commercially ground stone dust or other mineral dust approved by the City.
- Mineral filler shall have a zero plasticity index and shall conform to the following gradation requirements:

Sieve Size, mm	% Passing by Weight
0.4	100
0.16	90
0.08	70
0.045	62

6.3. COMPOSITION AND PROPORTIONING

1. Mix Design

- A mix design shall be based on the Marshall Method of Mix Design as set out in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2) and shall conform to the following criteria:

Mix Type	ACS	ACB	ACR	ACO
No. of blows	75	75	50	75
Minimum stability, kN	6.7	6.7	4.5	6.7
Min retained stability, %	75	75	75	75
Flow value, 0.254 mm units	6 – 12	6 – 12	8 – 16	6 - 12
Air voids, % of total mix	4.0±0.2	4.0±0.4	3.0±1.0	4.0±0.4
Voids filled, %	65 – 78	67 – 78	73 – 85	68 - 80
Min film thickness, µm	7.0	6.0	7.0	7.0

- The mix design shall be performed by an accredited testing agency and shall be submitted to the City for approval at least one (1) week

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prior to the commencement of field paving. Changes to the job-mix formula must have written approval from the City prior to use.

- c. A separate and complete mix design shall be required for any change in the nature of the source of the material.

2. Tolerances

- a. Allowable variation in extracted aggregate from the approved job-mix gradation is as follows:

Sieve Size, mm

% Passing by Mass

	Individual Sample	Average of Last 10 Samples
5.0	± 5.0	± 3.0
1.25	± 4.0	± 2.5
0.63	± 3.0	± 2.0
0.315	± 3.0	± 2.0
0.160	± 3.0	± 1.5
0.08	± 1.5	± 1.0

- b. The amount of bituminous material designated for the job shall be within 0.3 percentage points.
- c. The tolerance for air voids in the mix is 4.0 ± 1.0 % for ACS, ACB and ACO mixes, and 3.0 ± 1.0 % for ACR mix.
- e. The mixing temperature of materials shall not vary from those specified by more than 9°C.

3. Asphalt Plant

- a. The latest edition of the Asphalt Plant Manual, Asphalt Institute Manual Series No. 3 (MS-3) should be used as guidance in mix production and material handling.
- b. The asphalt plant must be capable of producing a mix conforming to ASTM D995.
- c. All plant scales must be certified prior to the start of the construction season by Weights and Measures, Canada Consumer and Corporate Affairs.
- d. Asphalt plants must be operated in accordance with Alberta Environment Code of Practice.

6.4. QUALITY ASSURANCE

1. Thickness

The City may request one or more sets of cores taken from asphalt pavement suspected of being deficient in total thickness. Each set will consist of three cores and will represent not more than 1000 m² of asphalt pavement.

2. Density

Asphalt pavement density will be determined based on the ratio of the core density to the density of the Marshall specimen. A minimum frequency of one Marshall density will be taken for each 1000 tonnes of asphalt produced or one day's production, which ever is less. Cores will

be taken in the compacted mat from the same load as the Marshall specimen. Each core represents not more than 1000 m² of mat. If a core density is below the specified requirement, three new cores will be taken from the same area. The average density of the three cores will represent the area.

3. Tests Conducted

The following tests shall be carried out for each 1000 tonnes of asphalt pavement or at least once during each placing shift:

- a. Marshall Stability (ASTM D1559)
- b. Sieve Analysis (ASTM C136 & C117)
- c. Bulk Specific Gravity (ASTM D2726)
- d. Bitumen Content (ASTM D2172)
- e. % Voids in the Mineral Aggregate (VMA) (ASTM D2726)
- f. Air Voids (ASTM D3203)

6.5. CONSTRUCTION METHODS

1. Good Practice

Refer to the latest edition of the Asphalt Paving Manual, Asphalt Institute Manual Series No. 8 (MS-8) for guidance in good paving practice.

2. Staged Asphalt Work

Second (final) lift of asphalt to be placed 2 years after installation of the first lift of asphalt. Contractor is to remedy any problems existing on the first lift of asphalt, prior to placing the second lift.

3. Transport of Mix

- a. The mix shall be transported in vehicles equipped with protective covers and clean, tight, smooth-sided boxes. The inside surface of the box may be lubricated with a light coating of soap or detergent solution. Petroleum derivatives shall not be permitted.
- b. Any accumulation of asphaltic material, which has collected in the box, shall be thoroughly cleaned before loading with hot mix.
- c. Trucks shall have an easily accessible 12 mm hole in the side of the box, at a distance of 300 mm from the bottom, for the purpose of checking temperatures of the mixture.
- d. Trucks shall be maintained perfectly clean of mud or any substance that could contaminate the working area

4. Preparation

- a. The surface to be paved shall be dry and clean of all loose or foreign materials prior to paving.
- b. Tack coat shall be applied to all surfaces intended to contact the hot-mix asphalt. Where tack coat is applied, it shall be thoroughly cured prior to placing the mix.
- c. Where existing pavements are to be overlaid, a levelling course of hot-mix asphalt may be required prior to placing the overlay to bring

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the surface to the desired elevation. Unless otherwise approved by the Engineer, this course shall be laid using a paver and shall meet all of the requirements of this Section. Each filler lift of asphalt shall not exceed 75 mm of compacted thickness.

- d. All surface joints matching to existing asphalt shall be ground to a depth of 50 mm to provide a straight, vertical edge. No feathering of the edge of asphalt will be permitted unless approved by the Engineer.
- e. Catchbasins, manholes, water valves, and other fixtures shall be brought to final grade prior to placing the final lift of hot-mix asphalt.

5. Weather Limitations

Hot-mix asphalt paving will not be permitted during these conditions unless permission is given by the Engineer:

- a. During periods of rain or snow, or when rain or snow is imminent.
- b. When the surface to be paved is wet, icy, snow-covered or frozen.
- c. During excessive winds.
- d. When air temperature is:
 - 7° C or cooler for a mat 40 mm or less thick
 - 4° C or cooler for a mat 40 mm to 50 mm thick
 - 2° C or cooler for a mat greater than 50 mm thick

6. Spreading

- a. Hot-mix asphalt shall be spread at temperatures not lower than 125° C or higher than 150° C as measured in the mat immediately behind the paver.
- b. Unless otherwise permitted by the Engineer, the mix shall be spread by a mechanical self-powered paver, with an automatic leveling device, capable of spreading the mix without segregation or tearing.
- c. The hot-mix asphalt shall be placed in a continuous operation with the paver moving at a uniform speed compatible with the rate of rolling.
- d. The hot-mix asphalt shall be spread uniformly in one or more lifts to depths sufficient to obtain the following compacted thicknesses:

Mix Type	Minimum (mm)	Maximum (mm)
ACS	50	100
ACR	30	75
ACB	65	125
ACO	30	75

- e. Prior to roller compaction, all fat spots, sandy accumulations, high and low spots and any other irregularities shall be removed and replaced with satisfactory material. Before the addition of material to any mat, the surface shall be broken with the tynes of a rake to ensure proper bonding.

- f. The complete pavement shall have a tightly knit structure and be free from segregation. If segregation occurs the paving operation will be suspended until the cause is determined and corrected.
 - g. Edges against which additional pavement is to be placed shall be straight and approximately vertical. A lute or rake shall be used immediately behind the paver, when required, to obtain a true line and vertical face.
- 7. Hand Spreading
 - a. Hot-mix asphalt may be hand spread in small areas where the use of a paver is not practical and where permitted by the Engineer. Hand placement shall be performed carefully to avoid segregation of the coarse and fine aggregates. Broadcasting of material shall not be permitted. During the spreading operation, all material shall be thoroughly loosened and uniformly distributed by lutes or rakes. Material that has formed into lumps and does not break down readily shall be rejected. Following placing and before rolling, the surface shall be checked with straight edges and all irregularities corrected.
 - b. Heat hand tools to keep them free from asphalt. Caution shall be exercised to prevent high heating temperatures that may burn the material. The temperature of the tools shall not be greater than the temperature of the mix being placed.
- 8. Compaction
 - a. Compact the hot-mix asphalt mat using rollers in good working order and operated by competent operators. The number, type and mass of rollers must be sufficient to achieve the required compaction.
 - b. Develop and follow the best rolling pattern to obtain the most uniform compaction across the mat.
 - c. Complete final rolling before the mat temperature reaches 80° C.
 - d. In small areas inaccessible by rollers, approved vibratory plates or hand tampers shall be used to achieve the required compaction.
- 9. Joints
 - a. Transverse Joints

Transverse joints shall be carefully constructed and thoroughly compacted to provide a smooth-riding surface. Joints shall be straight-edged or string-lined to assure smoothness and true alignment and shall be offset at least one metre from joints of adjacent mats. Prior to placing an adjacent mat, transverse joints shall be made straight and vertical and painted with tack coat material.
 - b. Longitudinal Joints
 - Surface longitudinal joints shall not occur in the wheel paths of a travel lane. Mats shall be offset by not more than 150 mm from the center of a line marking. The Engineer may permit a joint to occur in the center of a travel lane.

- Longitudinal joints in successive lifts shall be offset a minimum of 150 mm.
- Compaction of two adjacent mats, forming a longitudinal joint, shall only occur if the temperature of the edge of each mat is above 80°C. If the edge temperature of a mat falls below 80°C prior to placement of the adjacent mat, carefully roll the edge of the first mat, form or cut a clean vertical face to the full depth of the mat, paint the face with tack coat, and then place the second mat.

6.6. QUALITY CONTROL**1. Smoothness Tolerances****a. Surface Variation**

The maximum variation in the asphalt surface under a 3 m straightedge is:

- Longitudinal to the direction of travel: 3 mm
- Transverse to the direction of travel: 6 mm

b. Grade Variation

- The maximum variation in grade from the designated elevations is 6 mm.

c. Texture

- The finished surface texture shall be tight knit and free of visible signs of poor workmanship including, but not limited to, segregation, areas of excess or insufficient asphalt, poorly matched longitudinal and transverse joints, roller marks, cracking, and tearing.
- If the surface and grade tolerances are exceeded, or the texture is not met, grind out and resurface the defective areas as directed by the Engineer.

2. Thickness Tolerances

- a. If the average core thickness is deficient, that area of asphalt pavement will be assessed a pay factor according to the following table and be applied to the price of the quantity of hot-mix asphalt in that mat area.

Thickness Deficiency (%)	Pay Factor (%)
10.0	100
11.0	97.0
12.0	93.7
13.0	90.0
14.0	85.5
15.0	80.5
16.0	75
17.0	68

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18.0	60
19.0	50
19.0 and over	Grind and Resurface

- b. Asphalt pavement with excess thickness may be accepted if surface and grade tolerances and textures are met, but no additional payment is due.

3. Density Tolerances

- a. Each mat of hot-mix placed shall be compacted to the following minimum density (% Marshall density) for the type of paving, or as indicated in Special Provisions.

Minimum Density	Type of Paving
98%	New paving and all staged paving except 2nd stage residential $\leq$ 40 mm thickness
96%	2nd stage residential $\leq$ 40 mm mat thickness
97%	Lane paving
97%	Overlays $>$ 40 mm mat
96%	Overlay $\leq$ 40 mm mat

- b. If the average core density is below specified, the represented area of mat may be accepted subject to the following pay factor being applied to the price of the quantity of hot-mix asphalt in that mat area:

Actual Density	Pay Factor		
%	98% Required	97% Required	96% Required
98.0	100.0		
97.9	99.9		
97.8	99.8		
97.7	99.6		
97.6	99.4		
97.5	99.1		
97.4	98.7		
97.1	97.2		
97.0	96.5	100.00	
96.9	95.8	99.9	
96.8	95.0	99.7	
96.7	94.2	99.4	
96.6	93.3	99.1	
96.5	92.3	98.7	
96.4	91.1	98.2	
96.3	89.8	97.7	
96.2	88.5	97.1	
96.1	87.1	96.3	
96.0	85.5	95.5	100.0
95.9	83.8	94.6	99.7
95.8	82.0	93.6	99.3

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95.7	80.0	92.5	98.9
95.6	77.7	91.3	98.4
95.5	75.4	89.9	97.8
95.4	73.0	88.4	97.1
95.3	70.3	86.7	96.4
95.2	67.2	84.8	95.6
95.1	63.7	82.7	94.6
95.0	60	80.3	93.4
94.9	Under 95.0 Reject	77.6	92.2
94.8		74.3	90.7
94.7		70.6	89.1
94.6		66.0	87.3
94.5		60	85.1
94.4		Under 94.5 Reject	82.6
94.3			79.5
94.2			75.5
94.1			69.7
94.0			60.0
			Under 94.0 Reject

G.7.0 PRIME COATS AND TACK COATS

- "Prime coats" shall be the application of bituminous material to subgrade or previously prepared gravel base course, prior to placing bituminous surfacing material.
- "Tack Coats" shall be the application of bituminous material to a previously constructed paving surface, of any type, and against curb gutter faces, manholes, valves and other appurtenances in the area to be paved, in preparation for placing bituminous surfacing materials.

7.1. PRIME COAT (OVER SUBGRADE OR CEMENT STABILIZED BASE)

The asphalt types may vary from M.C. 30 to M.C. 250; from SS-I to SS-Ih or an emulsified asphalt primer to suit the conditions of the base. The rate of application may vary from 0.50 to 1.50 litres/square metres. The materials' temperature at application shall fall within the following limits:

Medium Curing Asphalt:

M.C. 30 - (50 - 70°C)

M.C. 70 - (75 - 90°C)

M.C. 250 - (100 - 110°C)

Emulsified Asphalt:

S.S. 1 - (24 - 54°C)

S.S. 1h - (24 - 54°C)

Emulsified Asphalt Primer - (15 - 50°C)

7.2. TACK COAT (OVER ASPHALT BASE)

The asphalt for the tack coat may vary from SS-1 to SS-1h; from R.C. 30 to R.C. 250, depending on conditions to suit the base. The rate of application

shall be 0.25 to 0.90 litre/square metre. Temperatures of application shall fall within the following limits:

Rapid Curing Asphalts:

R.C. 30 - (50 - 70°C)

R.C. 70 - (75 - 90°C)

R.C. 250 - (100 - 110°C)

G.8.0. SEAL COATS AND FOG COATS

1. "Seal coats" shall consist of a surface treatment composed of a single application of bituminous material on an existing bituminous surface immediately followed by covering with aggregate.
2. When a seal coat is applied without cover then it shall be referred to as a "Fog Coat". Fog coat shall be a light application of slow-setting asphalt emulsion diluted with water. The emulsion is diluted with an equal or greater amount of water and sprayed at the rate of 0.45 to 0.70 litres/square metre. Fog coating may be used to renew old asphalt surfaces.

8.1. APPLICATION

Seal coats shall be applied during daylight hours when the shade temperature is 10° C or higher. No bituminous material shall be applied when the roadway surface is damp or wet, or when weather conditions are such that the bitumen will become chilled before the cover aggregate can be spread and rolled. Work shall not be started without consent of the Engineer and shall be promptly terminated in the event of unfavourable road or weather conditions.

1. Sweeping

All dust, dirt and foreign matter will be carefully swept from the surface of the pavement for the full width to be seal-coated immediately prior to the application of the binder.

2. Asphaltic Binder

The selected bituminous material shall be uniformly applied on the properly prepared surfaces at a rate specified by the Engineer and within the following ranges:

- a. Fog Coat - 0.23 to 0.70 litres/square meter, with a distributor having special fog nozzles for the purpose of applying a light spray.
- b. Sand Seal - 0.50 to 1.4 litres/square metre.
- c. Chip Seal - 0.90 to 1.8 litres/square metre.

8.2. MATERIALS**1. Bituminous Material**

- a. The liquid asphalt used for seal coating shall be rapid curing or emulsified asphalt; the actual grade and type shall be determined to suit the surface condition and shall be approved by the City.
- b. Temperatures of applications shall fall within the following ranges:

Rapid Curing Asphalt:**Emulsified Asphalt:**

R.C. 30 - (50 - 70°C)	R.S. 1k - (15 - 50°C)
R.C. 70 - (75 - 90°C)	R.S. 2k - (15 - 50°C)
R.C. 250 - (100 - 110°C)	

2. Mineral Aggregate**a. Chip Seal**

- Chip seal aggregate shall be free from soft shale, organic or other deleterious matter and shall have at least one crushed face.
- When tested by means of laboratory sieves, it shall meet the following gradation:

Sieve Size Passing	Cumulative % by Weight
10 mm	100
Retained on Sieve	95 - 100

- The maximum amount of moisture content in the chips shall be 1% for an R.C. asphalt and 3% for an R.S. asphalt.

b. Sand Seal

- When tested by means of laboratory sieves, the following gradation:

Sieve Size Passing	Cumulative % by Weight
5,000	100
400	0 – 15
63	Less than 2

- The maximum amount of moisture content in the sand shall be 2% for an R.C. asphalt and 5% for an R.S. asphalt.

c. Application of Mineral Aggregates

- The application of bituminous material shall not proceed until a supply of aggregate sufficient to cover the entire application is immediately available for covering the bitumen in less than five (5) minutes. The bitumen application shall be promptly covered with specified mineral aggregate at a rate of 5.5 to 11.0 kg/m² for sand, and from 8.0 to 16.0 kg/m² for chips.
- Special care must be taken in the spreading of mineral aggregates in order that the uniformity of cover will be secured. If, in the

opinion of the Engineer, uniform distribution of the aggregate is not being obtained the cover aggregate shall be alternately drag boomed and rolled until it is uniformly bonded over the full width of the application.

- Longitudinal overlap may be from 150 to 250 mm in width, but there shall be no overlap at the end junction of the applications. In order to prevent overlapping at transverse junctions, building paper or metal sheets shall be spread over the treated surface for sufficient distance back from the joint on cover aggregate so that sprayers are operating at full force upon reaching the surface to which application is to be made. The bitumen application shall be stopped or shut-off on paper or metal sheets. Any paper used for covering joints shall be removed and destroyed in a safe and environmentally responsible manner.

d. Rolling

- Immediately after the mineral aggregate has been applied, the road surface shall be rolled sufficiently so that the maximum amount of cover aggregate will be "keyed".
- Rollers of such weight that crush the mineral aggregate shall not be used. The Developer may use steel wheel, pneumatic-tired or vibratory rollers. The minimum number of five (5) complete coverings by the rollers shall be carried out within thirty (30) minutes of the application of the bituminous material. The speed of the rollers shall be such that the suction of the tire shall not lift the aggregate from the sealed surface, or eight (8) kilometres/hour, whichever is less.

e. Traffic

- No traffic shall be permitted on the sealed roadway until after the rolling has been completed and the bituminous material has set to a degree satisfactory to the Engineer. In no case shall traffic be permitted on the sealed roadway until at least twenty-four (24) hours after the application of the bituminous material.

G.9.0. RECYCLED ASPHALT

9.1. COLD MIX RECYCLING

1. Cold-Mix recycling is a process in which reclaimed asphalt pavement materials and/or reclaimed aggregate materials are combined with new asphalt and/or recycling agents to produce a cold-mix base mixture.
2. Cold-mix recycling involves ripping, scarifying, pulverizing or crushing the old pavement which is then either hauled to a central site and upgraded with asphalt cement or emulsified or it is treated in-place. Prior to construction, representative samples should be obtained and the asphalt content, asphalt consistency and aggregate gradation determined. The

materials should then be blended and a minimum design developed. An asphalt surface course is optional.

9.2. HOT MIX RECYCLING

1. Reclaimed asphalt pavement materials and/or aggregate materials are combined with new asphalt and/or recycling agents and/or new aggregate as necessary to produce a hot-mix paving mixture which conforms to the asphaltic concrete pavement standards under this section of the manual.
2. The old pavement may be scarified and the material removed to a crushing plant to be sized, or the material may be sized in-place with rotating drum milling equipment or hammermills and hauled to a central location. The scarified material contains both asphalt and aggregate. The gradation of the aggregate and the consistency of the extracted asphalt should be determined. Amount and type of asphalt and new aggregate to be blended into the reclaimed asphalt pavement is then determined. It may be necessary to use a soft asphalt or recycling agent to enhance the weathered asphalt in the reclaimed asphalt pavement.

G.10.0. CURB AND GUTTER, SIDEWALK AND APRONS

~~10.1. DESCRIPTION~~

- ~~1. This specification covers the manufacture and placement of concrete, reinforced concrete, and related work for the construction of curbs and gutters, sidewalks & aprons placed to conform to the approved lines, grades, and typical cross sections. (See Standard Dwg. & Appendix 1).~~
- ~~2. Curb, gutter, and sidewalk shall be placed as follows:~~
 - ~~a. Local Streets~~

~~Rolled face curb, gutter and separate sidewalk on both sides unless otherwise approved by the City.~~
 - ~~b. Collector Streets~~

~~Rolled face curb and gutter with separate sidewalk on both sides. (Vertical face curb is required in front of industrial, commercial, school, church, park and storm water detention/retention areas).~~
 - ~~c. Arterial Streets~~

~~Vertical face curb and gutter with separate sidewalk on both sides.~~
- ~~3. Curb (Wheelchair) ramps are to be used at all curbed intersections and aligned to allow straight through movement of pedestrians.~~
- ~~4. The minimum radius for curb returns shall be 7.5 meters, for cul-de-sacs 11.0 meters.~~

10.2 MATERIALS

Portland Cement	Portland Cement shall conform to CSA-A3000 and shall be of the following types: <table><tr><td>Normal</td><td>Type 10</td></tr><tr><td>High Early Strength</td><td>Type 30</td></tr><tr><td>Sulfate Resistant</td><td>Type 50</td></tr></table> Type 10 cement shall be used in all concrete mixes unless otherwise specified. Type 50 cement shall be used when recommended by testing of the existing soil conditions. Type 50 cement will not be used during the season between October 15 and May 1. Type 30 cement may be substituted for Type 10 cement.	Normal	Type 10	High Early Strength	Type 30	Sulfate Resistant	Type 50
Normal	Type 10						
High Early Strength	Type 30						
Sulfate Resistant	Type 50						
Aggregates	Concrete aggregates shall conform to clause 5, CSA-A23.1. Maximum aggregate size shall be 20 mm.						
Water	Water used shall conform to clause 4, CSA-A23.1 and be clean and free from injurious amounts of oils, acids, alkalis, organic material, sediment and other deleterious materials.						
Air-Entraining Agent	Air-entraining agents shall conform to ASTM C260.						
Chemical Admixtures	Admixtures shall conform to ASTM C494, including water-reducing agents, retarders and accelerators. Chemical admixtures shall not be used unless approved by the City						
Calcium Chloride	To enhance cold weather protection, calcium chloride conforming to ASTM Specification D98 may be used with the City's approval. The maximum amount permitted will be 2.0% by estimate of weight of cement.						
Fly Ash	Fly ash shall conform to CSA-A23.5, pozzolan type C. Not more than 10% of the specified minimum cement content may be replaced with fly ash. No portion of the specified minimum cement content may be replaced with fly ash during the season between October 15 and May 1.						
Reinforcement	Reinforcement shall conform to the following requirements: Reinforcing Steel – billet steel, Grade 400R, deformed bars to CSA-G30.18, unless indicated otherwise. Tie Bars – billet steel, Grade 300, deformed bars to CSA-G30.18. Steel Dowels – shall be clean, straight, free from flattened or burred ends to CSAG30.18.						

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	Tie Wire – cold-drawn annealed steel to CSA-G30.3. Welded Steel Wire Fabric - wire reinforcement shall conform to CSA-G30.5M.
Curing Compound	Resin based, white pigmented, liquid membrane-forming compound conforming to ASTM C309, type 2, class B.
Preformed Joint Filler	Shall conform to ASTM D1751.
Joint Sealant	Hot-poured elastic type to ASTM D1190.
Granular Base	The granular base shall consist of approved material meeting the gradation for 20mm (3/4") crushed gravel included in Section G5.1.a.

10.3. COMPOSITION AND PROPORTIONING

1. Concrete mix designs shall be preformed by a qualified laboratory. No concrete production shall occur until the applicable mix design has been approved by the Engineer.
2. Concrete production shall be to CSA-A23.1, clause 18 and conforming to the approved mix design.
3. All concrete used on street rights-of-way shall meet the following requirements:
 - a. Compressive Strength
 - The minimum compressive strength required is based on the percentage of air content in the plastic concrete.

Air Content (%)	28-Day Minimum Compressive Strength (MPa)	7-Day Minimum Compressive Strength (MPa)
5.5 – 6.0	30.0	27.0
7.0	28.0	25.0
8 or greater	26.0	23.0

- During the season between October 30 and May 1, concrete placed shall obtain a minimum compressive strength of 27.0 Mpa in 7 days and shall be provided with cold weather protection in accordance with clause 21.2.3 of CSA-A23.1M.
- b. Slump
 - For hand-placed concrete the allowable slump is 60 ± 20 mm. The slump may be reduced for slipformed concrete to 20 ± 10 mm for curb and gutter and 30 ± 10 mm for walk.
 - c. Entrained Air Limits

- The limit minimum air content, by % volume, is 5.5%.
- d. Aggregate Size
 - The maximum aggregate size is 20 mm.
- e. Maximum Water to Cementing Materials Ratio
 - The maximum water to cementing materials ratio (by mass) is 0.45.
- f. Cement Content
 - The minimum Type 10 cement content is 335 kg/m³.

10.4. QUALITY ASSURANCE

1. Slump, air content and compressive strength tests shall be made on the concrete for each 60 m³ placed or at least one test for each day of placing concrete. Slump and air content tests will be taken with every strength test.
2. Sampling and testing shall be performed in accordance with the following:

Slump	CSA-A23.2-1C CSA-A23.2-5C
Air Content	CSA-A23.2-1C CSA-A23.2-4C or CSA-A23.2-7C
Compressive Strength	CSA-A23.2-3C CSA-A23.2-9C

10.5. CONSTRUCTION

1. Subgrade Preparation

The subgrade for curb and gutter, walk, monolithic walk, curb ramps and crossings shall be prepared to the density and grade requirements outlined in Section G4 - Subgrade Construction.
2. Granular Base

A 150 mm granular base course of 20 mm (3/4") aggregate shall be placed under concrete walk, curb ramps, and crossings as detailed on the drawings.
3. Hand Forming

Curbs with a radius less than 40 m shall be constructed with flexible forms, well staked and braced to the established line and grade.

The Engineer will not allow the use of forms that are out of shape, dented, rough or otherwise unsuitable.
4. Slipforming

In areas not accessible to slipform equipment, hand form and place concrete concurrently with the slipforming operation. Where concurrent work is not practical complete this work within 7 days of the slipforming of the adjacent work.

5. Delivery of Concrete

- a. Delivery of concrete to the jobsite shall be according to CSA-A23.1, Clause 18.4. Only rotating drum trucks capable of mixing or agitating the concrete mix shall be used.
- b. Rotate the drum on the jobsite for 3 minutes immediately before discharge.
- c. Retempering with water is not allowed after the initial mixing at the plant unless the following conditions are met:
- d. The slump at the jobsite is less than specified and the addition of water is approved by the Engineer.
- e. The amount of water required to bring the slump to within acceptable limits does not exceed 12 litres/m³.
- f. The drum is rotated a minimum of 30 rotations at mixing speed and a uniform mix is obtained.
- g. Water is added only once on the jobsite.
- h. Retempering with air is allowed only if the following conditions are met:
- i. Retempering is done on site using an approved air-entraining agent, by a quality control technician working for either the concrete supplier or the Contractor.
- j. An air content test is performed on each load of retempered concrete and the results are provided to the Engineer prior to placement.
- k. The concrete shall be completely discharged from the truck prior to the elapse of 1.5 hour, from the time of the start of the initial mixing at the plant.
- l. A delivery ticket with the following information is supplied to the Engineer: batch plant location, supplier's name, ticket and truck numbers, a mechanically punched date and time of the initial mixing at the plant, class and mix design designation, cement type, aggregate size, type and amount of admixtures, if water was added, volume of concrete, site arrival time, discharge time, and any other information requested by the Engineer.

6. Placing Reinforcement

Reinforcement shall be of the type, size, and spacing detailed on the drawings.

a. Separate Walks

- Place 10 M reinforcing steel, parallel to each contraction and surface joint spaced at 300 mm on either side of the joint with a minimum cover of 25 mm unless shown otherwise on the plans.

b. Crossings

- Welded wire fabric shall be placed in all crossings.

c. Curb and Gutter

- A 10 M reinforcing bar shall be placed in the curb section of all curb returns and small radius curves.
- Any concrete base is to be tied to the gutter or curb and gutter by placing 10 mm diameter rods, minimum two (2) meters in length, alternately at maximum 1.5 metre centres with a minimum of two rods per gutter or curb and gutter section.

7. Placing Concrete

- a. Concrete shall be placed only after the prepared base and formwork or string lines have been inspected and approved by the Engineer.
- b. The handling, placing, and consolidation of the concrete shall be according to CSA-A23.1, Clause 19 and supplemented by the following:
- c. Moisten the surface of the base before placing the concrete.
- d. Ensure the formwork and reinforcement is clean and wetted before concrete placement.
- e. Do not place concrete during rain, when rain is imminent or if the weather, in the opinion of the Engineer, is not suitable.
- f. Use 50 mm pencil vibrators or approved vibrating screeds to consolidate concrete.
- g. The interval between placing successive loads shall not exceed 30 minutes. If the discharge interval is greater than 30 minutes a construction joint shall be placed between the loads

8. Finishing

- a. Working the surface during finishing shall be the minimum amount necessary to produce the specified finish with no exposed aggregate or entrapped air. Brush finish shall be done with an approved nylon bristle brush lengthwise along the curb and gutter and transversely across the walk and slabs.
- b. Do not apply water to the surface of the concrete to facilitate finishing.

9. Joints

Contraction, construction, and longitudinal joints shall be constructed where required as shown on the plans or as specified.

Tool all joints to a width of 50 mm and round edges to a 6 mm radius. Joints will have a width of 3 mm to 5 mm.

a. Contraction Joints

- Contraction joints shall be placed (formed or sawn) a maximum every 3 m. Joints in curb and gutter shall be a minimum depth of 50 mm to a maximum of 25% of the gutter depth. In walk and slabs

the minimum depth is 25 mm to a maximum of 25% of the walk or slab thickness.

b. Surface Joints

- A surface or "dummy" joint shall be constructed every 3 m alternating with the contraction joint in sidewalks, to a depth of 10 mm and width of 5 mm. For monolithic curb, gutter and walk structures, a longitudinal joint for the purpose of marking the back of curbs shall be made. This joint shall continue through all driveways and lane crossings.

c. Construction Joints

- A construction joint is required between concrete pours or when matching new concrete to existing. The edges of existing concrete that are not straight and vertical shall be saw cut a minimum of 50 mm deep and removed.
- Transverse construction joints shall have 10 m deformed tie bars placed at 300 mm spacing, extending 300 mm minimum into both sides of the joint. Longitudinal construction joints shall have 10 M deformed tie bars placed at 1 m spacings, extending 300 mm minimum into both sides of the joint.

d. Isolation Joints

- Shall be constructed where specified on the drawings. Isolation joints are to be lined to full depth, with fibreboard material.

10. Protection and Curing

- a. Protect freshly placed concrete from premature drying, temperature extremes, adverse weather and physical disturbance. Refer to CSA-A23.1, Clause 21.
- b. Exposed concrete surfaces shall be sprayed using curing compound applied with a pressurized nozzle. The entire surface shall be covered with a uniform film at a rate of not less than 1 litre per 4 m² of surface area. Sealer is to be applied to surface of the concrete, at a rate not less than 1 litre per 4 m².

11. Backfilling

At all locations the Contractor shall backfill the concrete edges as soon as possible after the placement of the concrete. The backfill shall extend at least 300 mm behind all curb and gutter, sidewalks and slabs. It shall be mechanically tamped in two lifts behind curb and gutter and one beside sidewalks and slabs, to a minimum of 97% Standard Proctor density. Care shall be taken to avoid damaging the concrete.

10.6. COLD WEATHER CONCRETE

1. Concrete Strength - After October 30, all concrete shall attain the specified strength in seven (7) days.
2. Base Condition - No concrete shall be placed on frozen subgrade or base.
3. Concrete Temperature - When the ambient temperature is less than 5° C, concrete delivered to the site shall have a temperature not less than 15° C. For concrete placed when the ambient temperature is expected to fall below 2° C, the Contractor shall completely cover the concrete and forms, maintaining an adequate air cushion between the concrete and cover, using straw, insulation or other approved insulating material. If a temperature of 18° C for 72 hours after placing cannot be maintained using insulation, then concreting shall cease.

10.7. HOT WEATHER CONCRETE

1. Hot weather shall be considered to be an air temperature in the shade of 23°C or above.
2. The concrete temperature at the time of placing in hot weather shall not exceed 30°C. In the event that this limit is exceeded, the concrete operations shall be suspended until the constituent materials of the concrete are cooled.
3. Retarding admixtures shall be approved by the Engineer prior to use in the concrete.

10.8. CURB STAMPING

1. Name Plate
The name of the contractor and year of construction shall be placed in the surface of the sidewalk or curb and gutter by the use of an approved plate at least once in each block constructed.
2. Curb Stop Location
The symbol "CC" is to be stamped into the sidewalk perpendicular to the curb stop location. Where only curb and gutter exist, stamp "CC" on the top or face of curb.

10.9. CATCH BASIN / MANHOLE COVERS

The adjustment of catch basin or manhole frames to meet the curb and gutter or sidewalk grades shall be done by means of extension rings and a bedding of mortar.

10.10. QUALITY CONTROL

1. Concrete Mix
 - a. Deficient Slump
If the measured slump is outside the specified limits, another test will be taken on another portion of the load, or a retest will be done if retempering with water is permitted. If the second test fails, the

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Engineer may reject that load of concrete including the removal of the portion already poured.

b. Deficient Air Content

If the air content of a load is found to be below 5.5%, all concrete from the load, including that already placed, shall be discarded. Concrete with high air content will be accepted if the specified minimum strength is met.

c. Deficient Strength

- The concrete work represented by a test that did not meet the required strength may be accepted subject to the following pay factors. If strength deficiencies continue, changes in the mix design will be required.

Cylinder Strength (% of Specified Strength)	Pay Factor (% of Contract Price)
97.0	100.0
96.0	99.2
95.0	98.2
94.0	96.9
93.0	95.4
92.0	93.6
91.0	91.7
90.0	89.4
89.0	86.7
88.0	83.5
87.0	79.7
86.0	75.5
85.0	70.0

- No payment shall be made for cylinder strengths below 85% of specified strength.

2. Field Work

a. Surface Tolerances

- Walk or Slab:

Max. variation under a 3 m straightedge	6 mm
Max. variation walk crossfall	$\pm 1\%$
Total crossfall	$\geq 1\%$ and $\leq 4\%$

- Gutter Surface and Curb Top:

Max. variation under a 3m straightedge	6 mm
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- Grade of Gutter and Walk:

Max. variation at any surveyed station	6 mm
Max. variation between 2 consecutive surveyed stations	12 mm

- Lip of Gutter Alignment:

Max. deviation	±12 mm in 30 m
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- If tolerances are exceeded the concrete work will be corrected as directed by the Engineer.

b. Thickness Tolerances

The Engineer may request sets of cores from walk and slabs suspected of being deficient in thickness. Each set will consist of 3 cores, the average of these cores will represent not more than 500 m² of walk or slab. If the average thickness is deficient, that area will be assessed a pay factor as follows:

Thickness Deficiency (mm)	Pay Factor (% of Contract Price)
6	100.0
7	97.0
8	93.7
9	90.0
10	85.5
11	80.5
12	75.0
13	68
14	60
15	50
15 and over	Remove and Replace

G.11.0. INTERLOCKING "UNI-STONE" BLOCKS

11.1. MATERIALS

1. Concrete Paving Blocks

Conforming to ASTM Specification C936, "Solid Concrete Interlocking Paving Units", with particular requirements as follows:

a. Cement

- Type 50 Portland cement conforming to CAN3-A5-M77.

b. Aggregates

- Normal density aggregates, conforming to CAN3-A23.1-M77.

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- c. Air-entraining Agent
 - Conforming to CAN3-A23.1-M77.
 - d. Tolerance
 - Manufactured blocks shall be true to shape and shall not differ from manufacturer's standard dimensions by more than ± 2 mm in length and width and ± 3 mm in thickness.
 - e. Shape
 - Type A: Block is dentated and interlocks on all four faces, resists joint spreading in either direction, and can be laid in a herringbone pattern (According to manufacturer's specific shape, subject to City's approval). The City may also specify or accept shapes other than Type A.
 - f. Colour
 - As required; subject to City's approval.
2. Bedding Sand
- Clean, sharp sand free of deleterious soluble salts and other contaminants likely to cause efflorescence, graded as follows:

Sieve Size Passing	Cumulative % by Weight
10,000	100
5,000	95 – 100
2,500	80 – 100
1,250	50.85
630	25 - 60
400	10 – 30
160	5 - 15
63	0 - 10

3. Joint Sand
- Sharp sand free of deleterious soluble salts and other contaminants likely to cause efflorescence and reduced skid resistance, and graded as follows:

Sieve Size Passing	Cumulative % by Weight
2,500	100
1,250	85 – 100
400	25 – 60
160	12 – 30
63	10 – 15

4. Edge Restraint

As shown on plan or as approved by the City. This can be concrete curb, gutter, curb and gutter, walk, existing structure, pressure treated lumber, or other approved method of preventing movement of edge blocks.

5. Other Materials

Weed barrier, insulation, and other materials specified or shown on plan, subject to approval by the City.

11.2. CONSTRUCTION

1. Pavement Structure

Construct the pavement according to the cross-section shown on the plans or drawings. Accordingly, the pavement structure will consist of the prepared subgrade; a granular base/sub-base, and the interlocking concrete blocks laid on a bedding of sand. A weed barrier or insulation material may also be specified. The sidewalk shall be designed so that full bricks are utilized for the width of the sidewalk and the requirement for cut bricks is minimized.

2. Subgrade/Base/Sub-base Preparation

- a. Grade and prepare the subgrade/base/sub-base according to sections G 4.0 and 5.0, extending to the rear face of edge restraints.
- b. The finished surface shall not deviate by more than 15 mm from the bottom edge of a 3 m straightedge laid in any direction, and shall be on a correct grade or not more than 10 mm below grade.
- c. Under no circumstances shall further construction proceed until the subgrade has been inspected and approved by the City.

3. Laying of Paving Blocks

- a. Place paving blocks on the screened sand bed (30 mm thick minimum) to the pattern shown on the plans or as approved by the City. Maintain the laying pattern taking care to leave joints between adjacent units not exceeding 3 mm wide.
- b. Lay full units first in each row commencing from a straight starting edge. Fill edge gaps with edge units, or cut infill pieces using suitable equipment to produce true fitting, even edges without cracks or chips.
- c. Use boards overlaying the laid blocks for foot and other traffic to prevent disturbance of units prior to tamping. Ensure that the sand bed is not disturbed during construction.
- d. Using an approved mechanical flat plate vibrator, tamp the laid blocks to bring the paving surface to correct grade, eliminate lipping between adjoining units, and consolidate the sand bedding. Remove and replace any units structurally damaged during compaction.
- e. Where a structure is to carry heavy loads, use a pneumatic-tired roller, for compaction, as directed and approved by the City.

- f. Proceed with compaction as closely as possible following laying, up to one metre of the laying face. Leave all work to within one metre of the laying face fully compacted at the completion of each day's laying.
 - g. After compaction, prior to terminating work on each day and prior to allowing construction traffic, brush jointing sand across the pavement, and vibrate to completely fill the joints. Sweep off surplus material and leave the pavement surface clean.
4. Finished Pavement Tolerances

Maximum deviation from specified grade	= +10 mm
Maximum deviation under a 3 m straightedge	= 8 mm
Maximum differential level between 2 adjacent units	= 2 mm
 5. Defects - Remove and replace defective and damaged materials and repair defective work at no additional cost to the City.

G.12.0 ASPHALT PATHWAYS

The asphalt and base materials, mixing, spreading, and compaction shall conform to the City of Fort Saskatchewan's Standards and Specifications as outlined under this Section for all of the work required.

G.13.0 BOULEVARD AND MEDIAN GRASSING (REFER SECTION H FOR DETAILS)

G.14.0 TRAFFIC CONTROL DEVICES

- ~~1. A traffic control device is a sign, signal, marking, barrier or other device, placed upon, over or adjacent to a roadway which is intended to regulate, warn, or guide the road user. All such traffic control devices shall be installed in accordance with the latest revision of the "Uniform Traffic Control Devices for Canada" manual distributed by the Roads & Transportation Association of Canada and with the latest revision of the "Alberta Highway Signing Policy Manual".~~
- ~~2. All traffic control devices must be authorized and approved by the City of Fort Saskatchewan prior to placement. No traffic control device, nor its support, shall bear any commercial advertising.~~
- ~~3. It is the intent that these devices be kept serviceable for the safe movement of traffic in both daylight and darkness, year round. As such they must be designed and constructed to be operable and durable given expected environmental conditions.~~

14.1. TRAFFIC SIGNS

Signs inform road users of traffic regulations, warn of roadway characteristics and road hazards, and provide information necessary for route selection. Simplicity in design, care in placement, and a standard of maintenance are essential. Signs are to be used only when necessary and justified. All sign materials shall conform to the Canadian Standards Association (CSA) specifications.

1. Materials

a. Signs

Signs made of treated ferrous and non-ferrous metal and waterproof, resin-bonded plywood are suitable for use in permanent signs (certain other wood-fibre materials, when properly fabricated, are also acceptable). Wooden boards may be used for large signs and for temporary and seasonal signs.

b. Sign Panels

Information signs shall be constructed with high intensity reflective panels. Regulatory and Hazard signs shall be constructed with diamond grade reflective panels.

c. Sign Posts

Where applicable, it is encouraged that all signs be placed on existing supports used for other purposes such as traffic signals or streetlights. If signposts are required, they shall be made of galvanized metal (schedule 40), 60 mm in diameter and 3.65 m in length with a quick-fix breakaway coupling installed 50 mm from ground level. In grassed/residential areas, signs should be installed using schedule 40 pipe, 60 mm in diameter, 3.65 m in length, with 100 mm x100 mm tabs welded 300 mm above bottom of post.

d. Fasteners

Stainless steel fasteners shall be used to attach signs to their supports. Bottom of sign to be a minimum of 2.0 metres from ground surface.

2. Installation and Maintenance

Signs are to be placed with the posts vertical and the signs level. The bottom of the sign should be a minimum of 2.0 meters above the level of the nearest travel lane or existing grades. Signs are to be positioned with best possible road visibility in mind. All signs shall be kept clean, in proper position, and legible - damaged signs are to be repaired or replaced as soon as possible. No vegetation, construction materials, snow, or other items or materials are to be allowed to obscure any sign.

~~14.2. TRAFFIC SIGNALS~~

~~Traffic control signals assign right of way between conflicting streams of traffic with the minimum delay and hazard reasonably obtainable. All traffic control devices are to conform to the "Uniform Traffic Control Devices for Canada" manual distributed by the Roads and Transportation Association of Canada, latest revision thereof.~~

14.3. PAVEMENT MARKINGS

1. Pavement markings are traffic control devices placed on driving surfaces to delineate and clarify traffic and pedestrian movement by regulating, warning, and conveying information to individuals without diverting attention from the roadway.

2. The most frequently used traffic marking materials are traffic marking paint and thermoplastic material.
3. Pavement markings shall conform to the following:
 - a. Colour
Yellow (solid) lines will be used to delineate the separation of opposing traffic flows. White lines will be used to delineate the separation of traffic flows in the same direction. All transverse pavement markings are to be white in colour.
 - b. Pattern
Broken longitudinal lines are to indicate that lane changing is permitted and solid longitudinal lines indicate that lane changing is not permitted. The line to gap ratio for separator lines is to be 3m:6m. Lateral pavement marking may be parallel or "zebra" lines and are to be used to indicate the limits of the drivers' right-of-way concerning stopping, pedestrian crosswalks, no parking areas and the like.

Please see the "Uniform Traffic Control Devices for Canada" manual which details the requirements for pavement markings.

14.4. TEMPORARY SIGNAGE

Temporary signage and devices shall be located as to provide motorist and pedestrians with adequate warning of construction or unusual conditions. A plan showing signage location, spacing and types shall be submitted to the City for approval a minimum of 72 hours prior to disruption. Refer to "Uniform Traffic Control Devices for Canada" manual Section D.

G.15.0 STREET LIGHTING

1. All street lighting layout and location of the buried and/or the overhead lines shall be approved by the City. The location, type and frequency of street lights shall be such as to provide the minimum lighting levels as designated by the franchise utility company and in conformance with the Roads and Transportation Association of Canada guidelines.
2. Wherever possible, streetlight cables shall be installed underground. Cables crossing all roadways or driveways shall be placed in direct-burial-type rigid plastic pipe using one pipe per individual cable unless noted otherwise.
3. Only corrosive resistant street light poles complete with fixtures and concrete pedestals shall be used unless approved otherwise.
4. Street lights shall be so located as to not interfere with proposed driveways, lanes, and motorist's lines of vision and shall be located in line with the extension of common property lines wherever possible.
5. The City may recommend the provision of electrical outlets on light posts.

G.16.0 COMMUNITY MAILBOXES (SUPER MAILBOXES)

Prior to the installation, erection, relocation, or removal of any Community Mailboxes within the City of Fort Saskatchewan, written approval shall be obtained from Canada Post. These boxes shall be placed in the most aesthetic manner possible while addressing concerns of safety and municipal and franchise utility operations. They shall conform to the following criteria for site selection:

16.1. DESIGN CRITERIA

Sighting considerations should address concerns regarding visual intrusion, traffic and pedestrian conflicts, traffic lines of sight, buried services, proximity to intersections, access to abutting, properties and site maintenance. Specific requirements for the Community Mailboxes are:

1. Where there is a sidewalk at a site, the box shall be installed directly behind the walk, facing the roadway. No boxes are to be located between the curb and sidewalk. Where no sidewalk exists, the box shall be installed facing the roadway.
2. A minimum setback of 2.0 m while still within the public right-of-way. Easement must be obtained if insufficient space exists.
3. No island or centre median site locations are permitted.
4. The curb is not to be lowered to accommodate wheelchair or other such access.
5. All locations are to be recorded on the appropriate as-built record drawing(s).
6. The access is to be a minimum of 2.0 m in width and constructed of poured-in-place unreinforced concrete, a reinforced concrete pad, or interlocking brick and shall be as long as required to reach the site. The pad is to be a minimum of 125 mm in depth with a maximum slope of 1:12.

16.2. MATERIALS

All materials are to conform to the standards and specifications contained in Section G of this Manual unless otherwise approved by the City in writing.

16.3. INSTALLATION

1. All installations shall be accomplished as quickly and with the least amount of disruption as possible.
2. Subgrade Preparation - The subgrade shall be finished to conform to the required section, grade and density prior to the placement of the pad.
3. Forming - All forms shall be well staked and braced to the established line and grade.
4. Placing concrete - Concrete shall be placed only after the sub-base and forming have been inspected and approved by the Engineer.
5. Precast Pads - Such pads shall be constructed to the sizes and dimensions shown on the approved drawings and conform to CSA Std. A251. and contain reinforcing steel as noted on the attached "Pre-Cast Foundation - Type A" Figures G.2.16 and G.2.17.

6. Levelling - The boxes shall be installed to the requirements noted on Standard Drawings.
7. A toll free emergency telephone number for Canada Post shall be affixed to the box or otherwise made available on a 24-hour basis.

G.17.0 MISCELLANEOUS**17.1. CULVERTS****1. General**

- a. Culverts shall be placed so that the minimum distance from the finished grade of the roadway to the top of the pipe shall be not less than one-half the diameter of the pipe or a minimum of 1 metre unless approved otherwise.
- b. A trench shall be excavated to the required depth and grade with the bottom shaped to conform to the bottom of the pipe to ensure a firm and uniform bearing over the entire length of the culvert. If the material in the bottom of the excavation is unsuitable, the trench shall be dug below the grade as ordered, and backfilled with approved granular material and thoroughly tamped, or otherwise compacted, to ensure an unyielding foundation.
- c. Where the trench is in solid rock or other hard material, it shall be excavated to a depth of at least 100 mm below the grade established for the bottom of the pipe, and this additional excavation shall be backfilled with suitable material in such manner as to ensure a uniform bearing for the length of the culvert.
- d. Selected backfilling material, properly graded and free of frozen lumps, etc., shall be placed under and around the pipe and thoroughly tamped or otherwise compacted in place. The trench shall be completely filled and the pipe covered to a depth of at least 300 mm with hand placed and properly compacted material before the construction of the embankment over the culvert proceeds.
- e. If a trench is not required, the culvert pipe shall be laid true to line and grade, on a bed that is uniformly firm throughout its entire length, and the backfilling around and over the pipe shall be completed as specified in the preceding paragraph.
- f. When using corrugated pipe, the pipe shall be laid in the trench with the separate sections firmly joined together and with outside laps of circular joints pointing upstream and with longitudinal laps on the side. Corrugated pipe shall be so handled as to prevent damage to the pipe. In no case shall pipe culverts be dragged on the ground.

2. Removing Existing Culverts and Structures

Where it is necessary to remove any existing culvert or structures from the grade or right-of-way, the Developer shall carefully remove and pile or place the materials as directed by the Engineer.

3. Rip-Rap

Embankments, the ends of culverts, and ditch bottoms may be protected by rip-rap as directed when required by the plans or as ordered by the Engineer.

a. Hand Laid Rip-Rap

Hand laid rip-rap shall be sound, durable stones and in no case measure less than 150 mm. The stones shall be placed with their beds at right angles to the slope, with larger stones used in the bottom courses, and the smaller stones at the top. They shall be laid in close contact so as to break joints, and in such manner that the weight of the stone is carried by the earth and not by the adjacent stones. The spaces between the larger stones shall be filled with spalls, securely rammed into place. The finished work shall present an even, right, and reasonably plain surface, varying not more than 75 mm from the required contour.

b. Random Rip-Rap

Random rip-rap, graded so that the smaller stones are uniformly distributed throughout the mass, shall be dumped randomly over the areas until the required depth is attained. The occasional manual handling of rocks or stones shall in no manner be construed to transform the classification of random rip-rap into that of hand laid rip-rap.

c. Sacked Concrete Rip-Rap

- Burlap Sacks

Burlap sacks will be of approximately 40 litre capacity and supplied by the Developer.

- Fabric-formed Concrete

Filter Point fabric (e.g. Fabricform) shall consist of a double layer of fabric woven together in such a manner to provide filter points on 200 mm centres for the relief of hydrostatic uplift pressure. The grout shall consist of a mixture of Portland cement, fine aggregate, and water, so proportioned and mixed as to provide a readily pumpable slurry and shall exhibit a minimum compressive strength of 30 MPa at 28 days. No simple butt joints are to be used; the material is to be field signed and the edges are to be embedded to a depth of at least 0.3 metres along the entire perimeter. No grouting is to occur when the ambient temperature is below 4° C (unless provisions for heating are made) and the fabricform is not to be laid on frozen ground. The fabricform installation shall be supervised directly by a qualified manufacturer's representative.

- Base Preparation

The base shall be formed by excavating, filling, and shaping to the required depth below and parallel to the finished surface of the rip-

rap. The entire base shall be thoroughly compacted to provide a smooth and firm foundation of uniform density.

- **Placement**

Each burlap sack shall be filled to two-thirds (2/3) of its capacity with concrete or soil cement, securely sewn or stapled to form a straight edge closure and immediately placed in its final position on the prepared base. The filled sack shall be kneaded, rammed, and packed into conformance with the prepared base and adjacent sacks already in position to form a closely molded smooth surface of uniform average depth of not less than 125 mm.

All joints between rows shall be staggered and all dirt and debris removed from the top of sacks before succeeding courses are placed. Not more than five (5) courses of sacks shall be placed in any tier before such initial set has taken place in the first course of any such tier. Following placement, the sacked concrete or sacked soil cement shall be kept moist for a period of twenty-four (24) hours by sprinkling, moist earth covering, or other satisfactory means.

17.2. VEHICULAR BARRIERS

1. Vehicular barriers should be constructed at the following locations:

- a. across the end of a lane cul-de-sac which abuts a roadway;
- b. across the end of a walkway which terminates in a lane;
- c. along a lane which parallels an adjacent roadway;
- d. near permanent bodies of water;
- e. at areas showing a large difference in grade separation;
- f. bridge abutments;
- g. retaining walls; or
- h. as a longitudinal divider on narrow medians.

2. While vehicular barriers are designed to reduce the hazard of errant vehicles leaving the highway surface, they themselves must also be considered as hazards. Their purpose is to shield those hazards which cannot be eliminated. Installation is warranted only where the severity of an accident without the barrier is greater than that of a collision with the traffic barrier itself.

3. W-Beam Guardrail

- a. Materials

- Posts and Blocks shall be in accordance with Alberta Transportation Standards and be of the following dimensions:

Posts	200 x 200 x 1,800 mm (minimum) 200 x 150 x 1,800 mm (minimum)
-------	--

G – TRANSPORTATION

Blocks	200 x 200 x 350 mm 200 x 150 x 350 mm
--------	--

- Guardrail and Anchor Block Hardware - Guardrail shall be Amo "Flex-Beam", 2.7 mm thick galvanized steel. Bolts, nuts and washers shall be hot-dipped galvanized medium steel of 50 mm diameter.
- Concrete shall be Type 50 and have a minimum compressive strength of 30 MPa at 28 days.

b. Installation

- Posts shall be set plumb to a height, line and grade adjusted to give the entire guardrail installation a uniform and pleasing appearance in line and grade. The top, bottom and centre of the W-Beam rail shall bear on each block and laps shall be in the direction of the traffic flow. Bolts shall be tightened with exposed threads buried and shall not extend beyond the nuts by more than 13 mm.

17.3. FENCING

Uniform wood fencing and gates shall be constructed in accordance with the Standard Drawings for fencing and shall be constructed adjacent to and at the following locations:

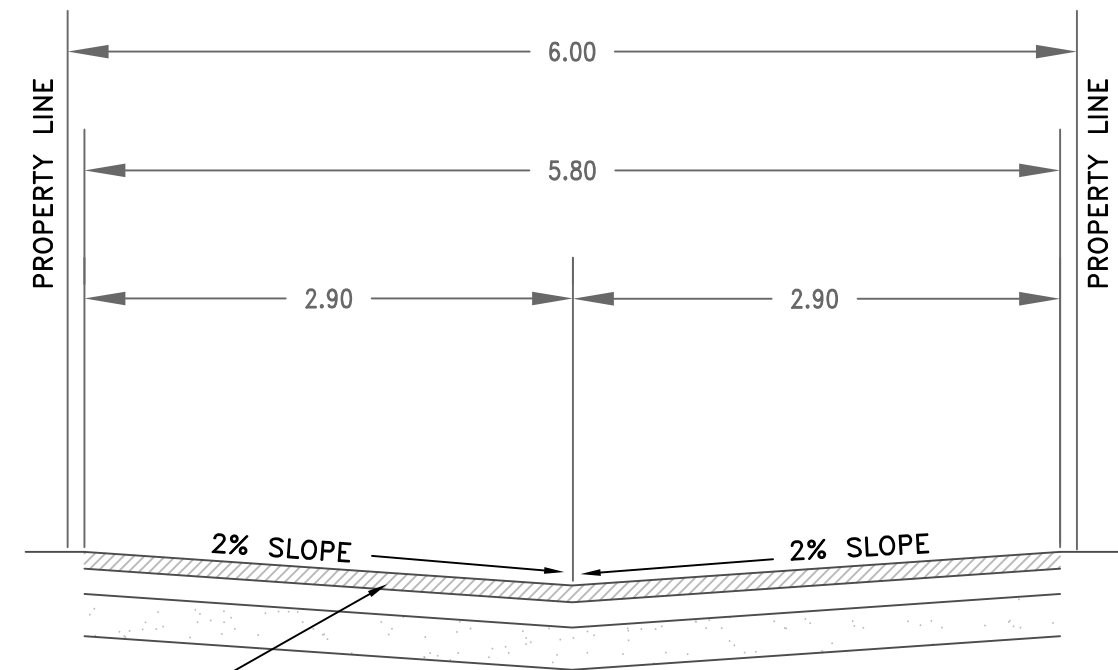
1. arterial roadways;
2. parks and playfields;
3. public walkways and utility lots;
4. school sites;
5. City owned lands;
6. multiple family sites;
7. institutional sites; and
8. other areas as required by the City.

17.4. BACKFILLING UTILITY TRENCHES ON CITY RIGHTS-OF WAY

All ditches, trenches, and cuts on City right-of-ways shall be done with a minimal amount of disturbance. The backfill must be an approved material placed in uniform lifts not exceeding 300 mm (loose depths) to a density of not less than 97% of the Standard Proctor Density. No excavation shall be closed until compaction has been approved by the City.

5.28 List of Standard Drawings

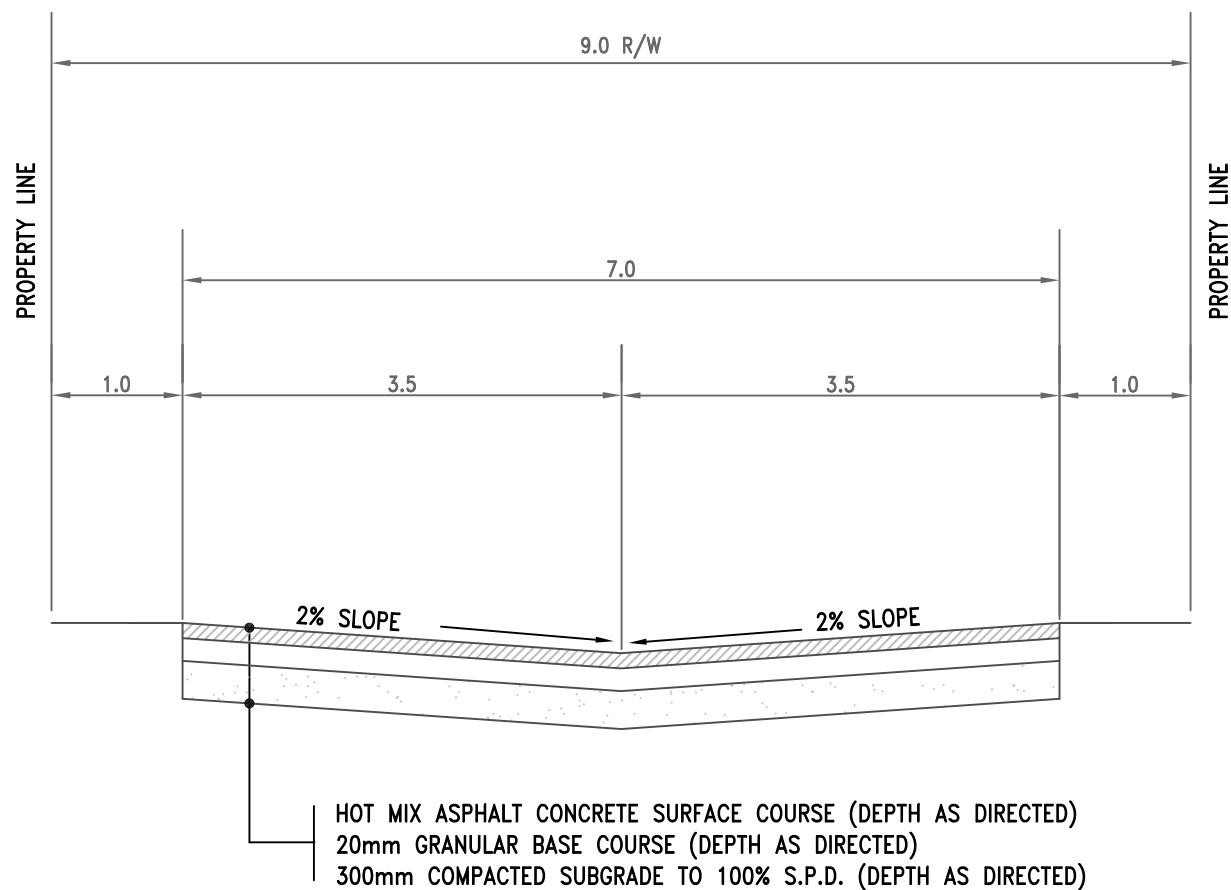
T-1	Alley - Residential
T-2	Alley - Commercial/Industrial
T-3	18m Right of Way – 9m Local Residential
T-4	18m Right of Way – 11m Local Residential (Walk One Side)
T-5	18m Right of Way – 11m Local Residential (Walk Both Sides)
T-6	21.5m Right of Way – 10.5m Local Industrial
T-7	24m Right of Way – 11.5m Minor Collector Residential
T-8	23m Right of Way – 12m Minor Collector Industrial
T-9	24m Right of Way – 13.5m Major Collector Residential
T-10	23m Right of Way – 13m Major Collector Industrial
T-11	33m Right of Way – 15.8m Minor Undivided Arterial
T-12	33m Right of Way – 16.8m Standard Divided Arterial
T-13	44m Right of Way – 16.8m Major Divided Arterial
T-14	Cul-de-Sac
T-15	Straight Face 150mm Curb With 250mm Gutter
T-16	Straight Face 150mm Curb With 500mm Gutter
T-17	Roll Face Curb and Gutter
T-18	Typical Swale Gutters
T-19	Concrete Curb
T-20	1.5m Separate Concrete Sidewalk
T-21	Roll Face Monolithic Concrete Sidewalk
T-22	Straight Face Monolithic Concrete Sidewalk
T-23	Asphalt Trail
T-24	Typical Concrete Curb Ramps
T-25	Concrete Slab-On Median
T-26	Median – Concrete Infill
T-27	Median – Landscaped
T-28	Drop Nose Median
T-29	Residential Access Crossing Separate Sidewalk
T-30	Residential Access Crossing Monolithic Sidewalk
T-31	Commercial/Industrial Crossing Separate Sidewalk
T-32	Commercial/Industrial Crossing Monolithic Sidewalk
T-33	Pavement Marking Types and Width
T-34	Intersection Pavement Markings
T-35	Typical Overlay



HOT MIX ASPHALT CONCRETE SURFACE COURSE (DEPTH AS SPECIFIED)
 20mm GRANULAR BASE COURSE (DEPTH AS SPECIFIED)
 300mm COMPACTED SUBGRADE TO 100% S.P.D.

ALL DIMENSIONS IN METERS
 UNLESS OTHERWISE NOTED.

ALLEY – RESIDENTIAL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-1
NOT TO SCALE	DRAWN: MP	



ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED.

ALLEY — COMMERCIAL/INDUSTRIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

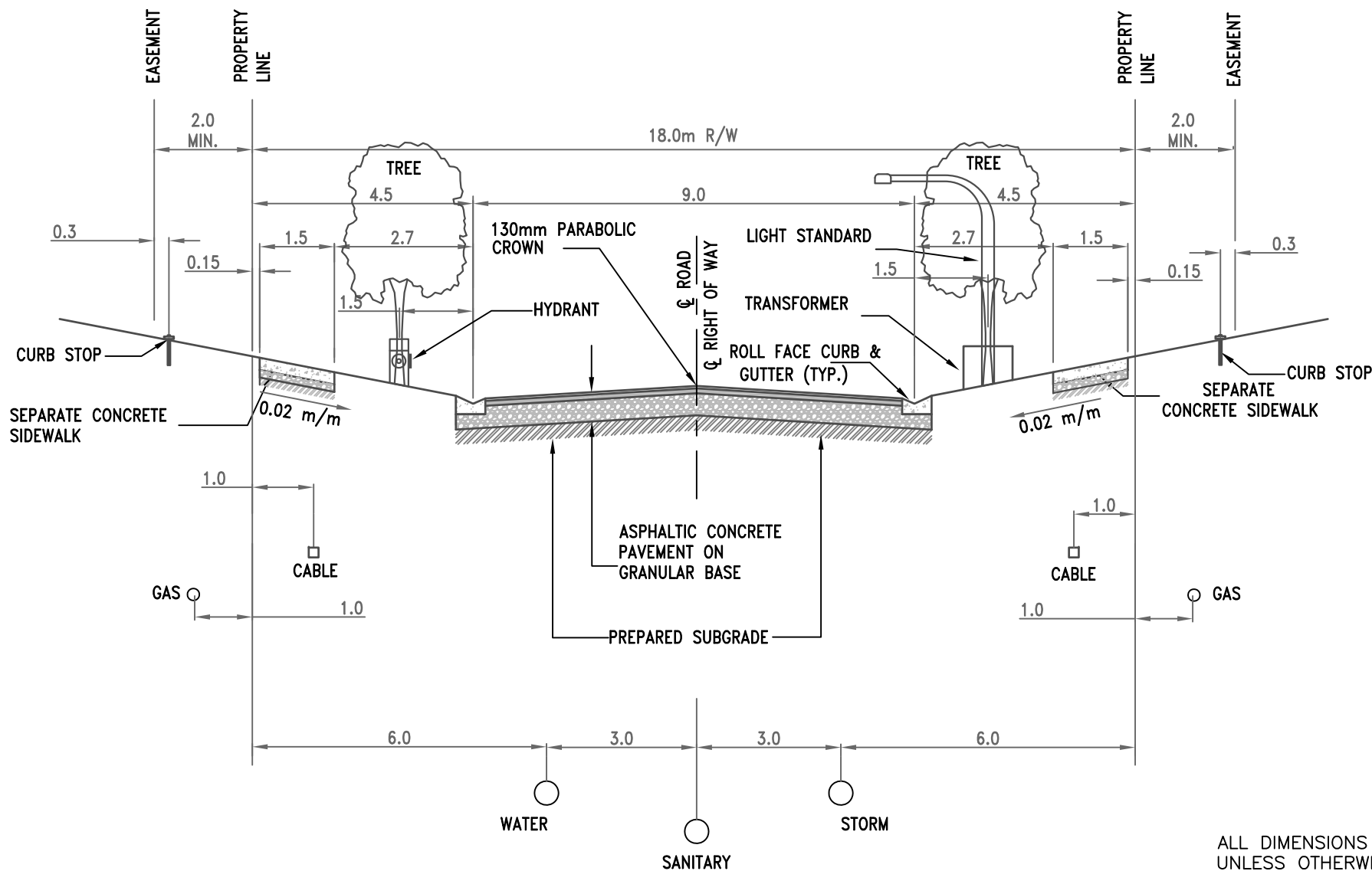
DATE: FEB 2013

DRAWN: MP



DWG. NO.

T-2



ALL DIMENSIONS IN METRES
UNLESS OTHERWISE NOTED

- FOR LOTS GREATER OR EQUAL TO 14 METERS FRONTAGE
- LOTS WITH LESS FRONTAGE CAN USE DETAIL T-4, T-5.
- CONTRACTOR/CONSULTANT TO REVIEW ALL RELATED SPECIFICATIONS AND STANDARDS FOR INFRASTRUCTURES SHOWN IN THIS SECTION.
- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWERPOLES, STREETPOLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

18m RIGHT OF WAY 9m LOCAL RESIDENTIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

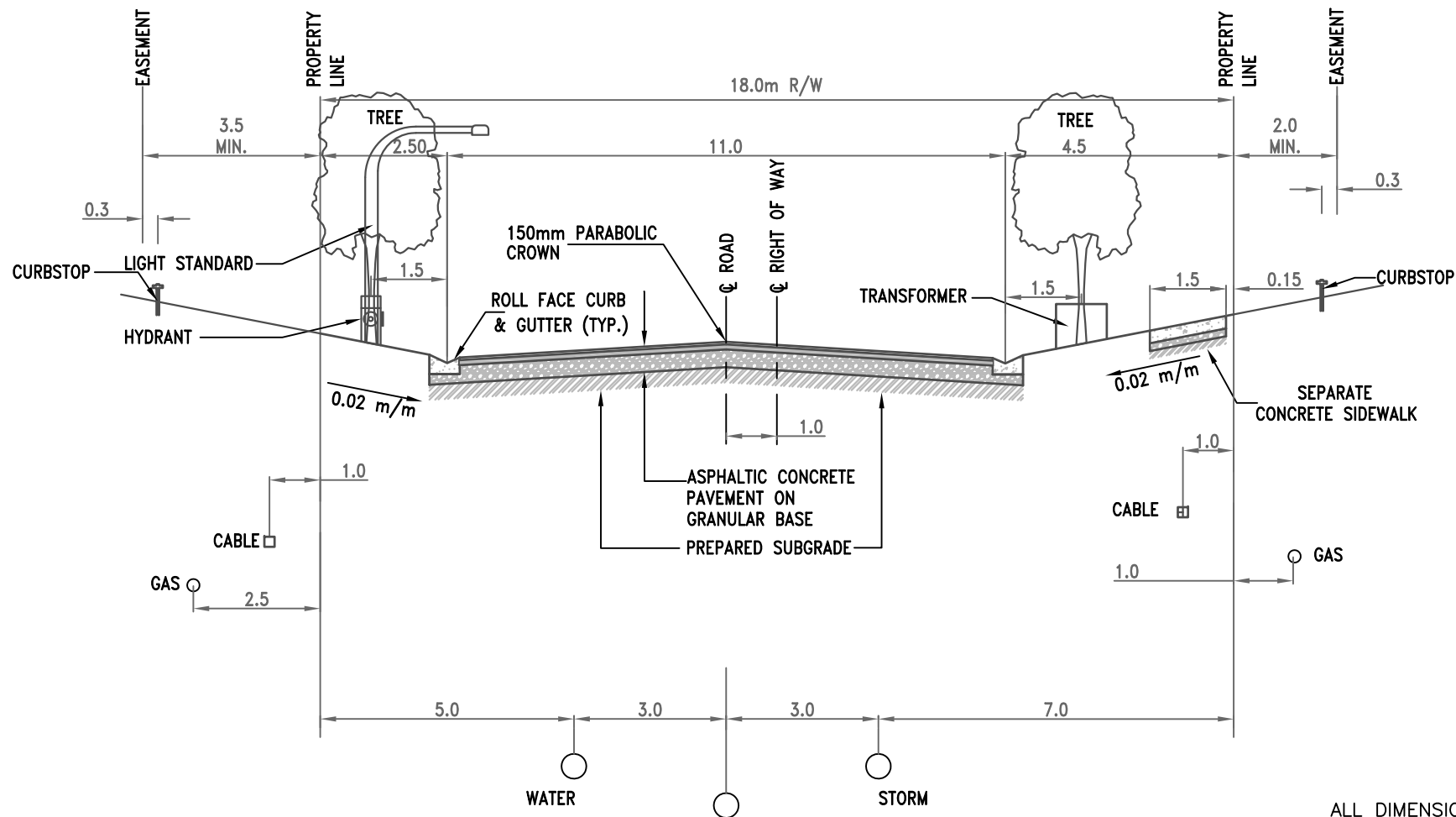
DATE: FEB 2013

DRAWN: MP



DWG. NO.

T-3



ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

- FOR LOTS LESS THAN 14 METERS FRONTAGE.
- LOTS WITH GREATER FRONTAGE CAN USE DETAIL T-3 WITH 9 METER ROAD WIDTH.
- FOR LOTS LESS THAN 14 METERS WITH CONCRETE SIDEWALK REQUIRED ON BOTH SIDES OF ROAD SECTION USE DETAIL T-5.
- CONTRACTOR/CONSULTANT TO REVIEW ALL RELATED SPECIFICATIONS AND STANDARDS FOR INFRASTRUCTURES SHOWN IN THIS SECTION
- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWERPOLES STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

18m RIGHT OF WAY 11m LOCAL RESIDENTIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

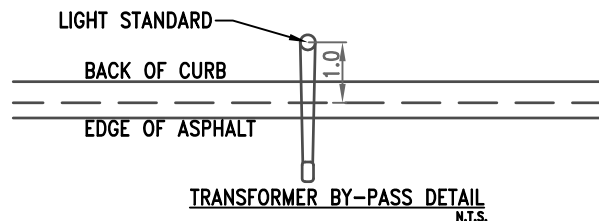
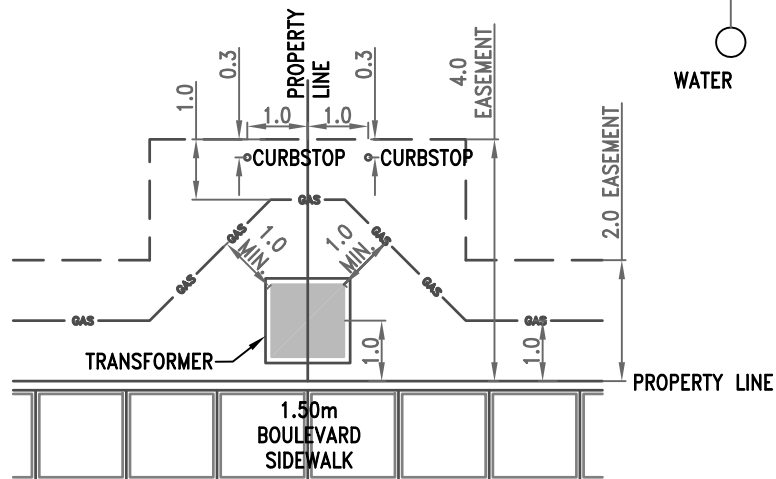
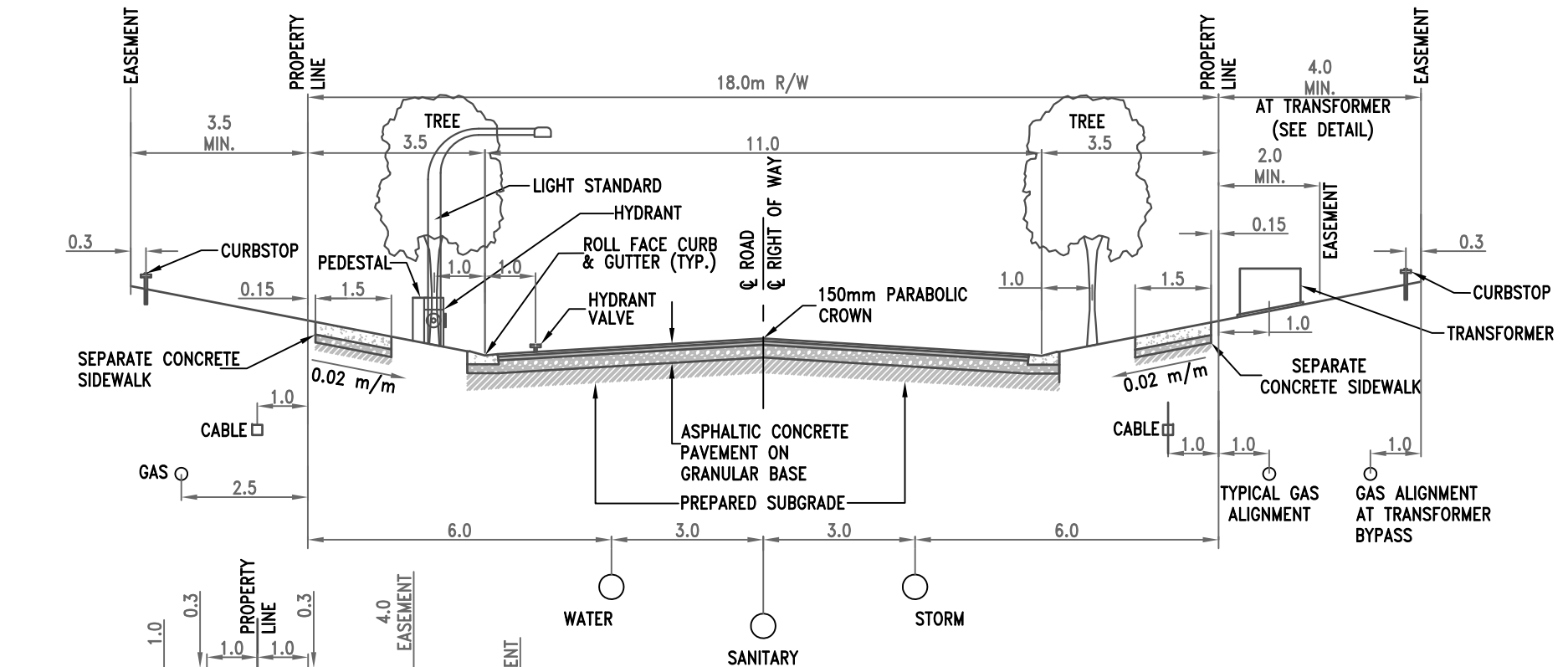
DATE: FEB 2013

DRAWN: MP



DWG. NO.

T-4



- FOR LOTS LESS THAN 14 METERS FRONTAGE
- LOTS WITH GREATER FRONTAGE CAN USE DETAIL T-3 WITH 9 METER ROAD WIDTH
- FOR LOTS LESS THAN 14 METERS WITH CONCRETE SIDEWALK REQUIRED ON ONE SIDE OF ROAD SECTION USE DETAIL T-4 (TRANSFORMER WITH IN BOULEVARD)
- CONTRACTOR/CONSULTANT TO REVIEW ALL RELATED SPECIFICATIONS AND STANDARDS FOR INFRASTRUCTURES SHOW IN THIS SECTION
- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES.

18m RIGHT OF WAY 11m LOCAL RESIDENTIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

DATE: FEB 2013

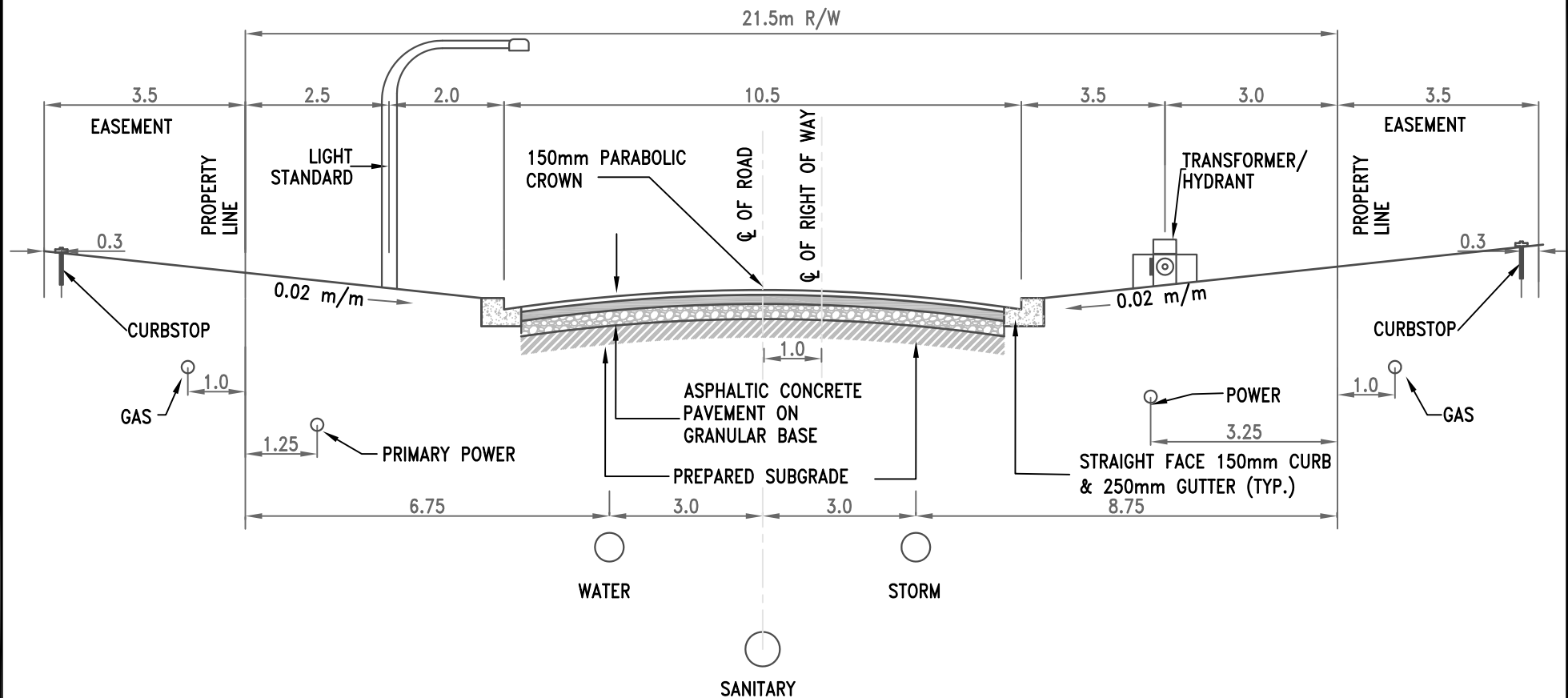
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DWG. NO.

T-5

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

21.5m RIGHT OF WAY
10.5m LOCAL INDUSTRIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

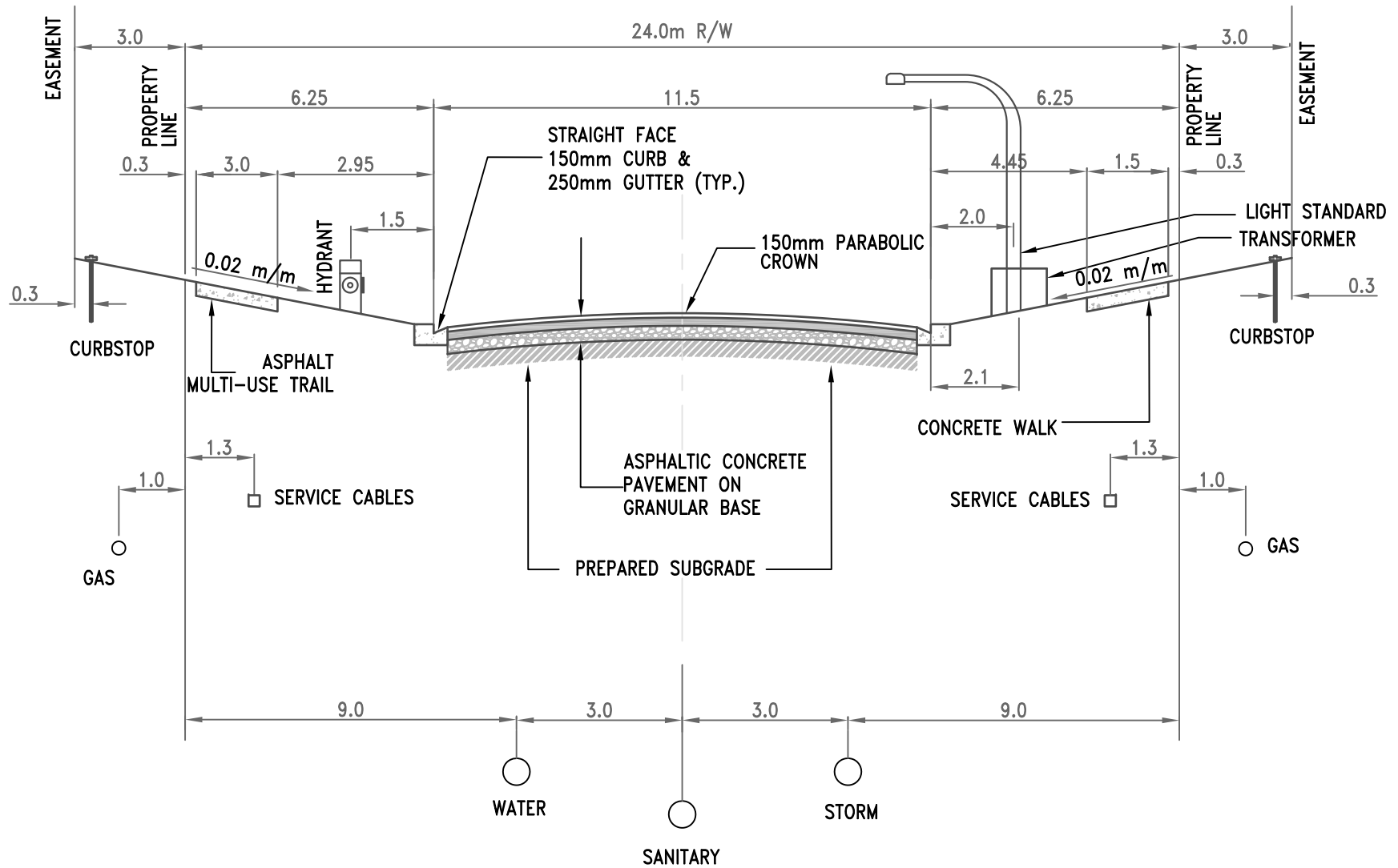
DATE: FEB 2013

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DWG. NO.

T-6



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

**24m RIGHT OF WAY
11.5m COLLECTOR RESIDENTIAL**

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

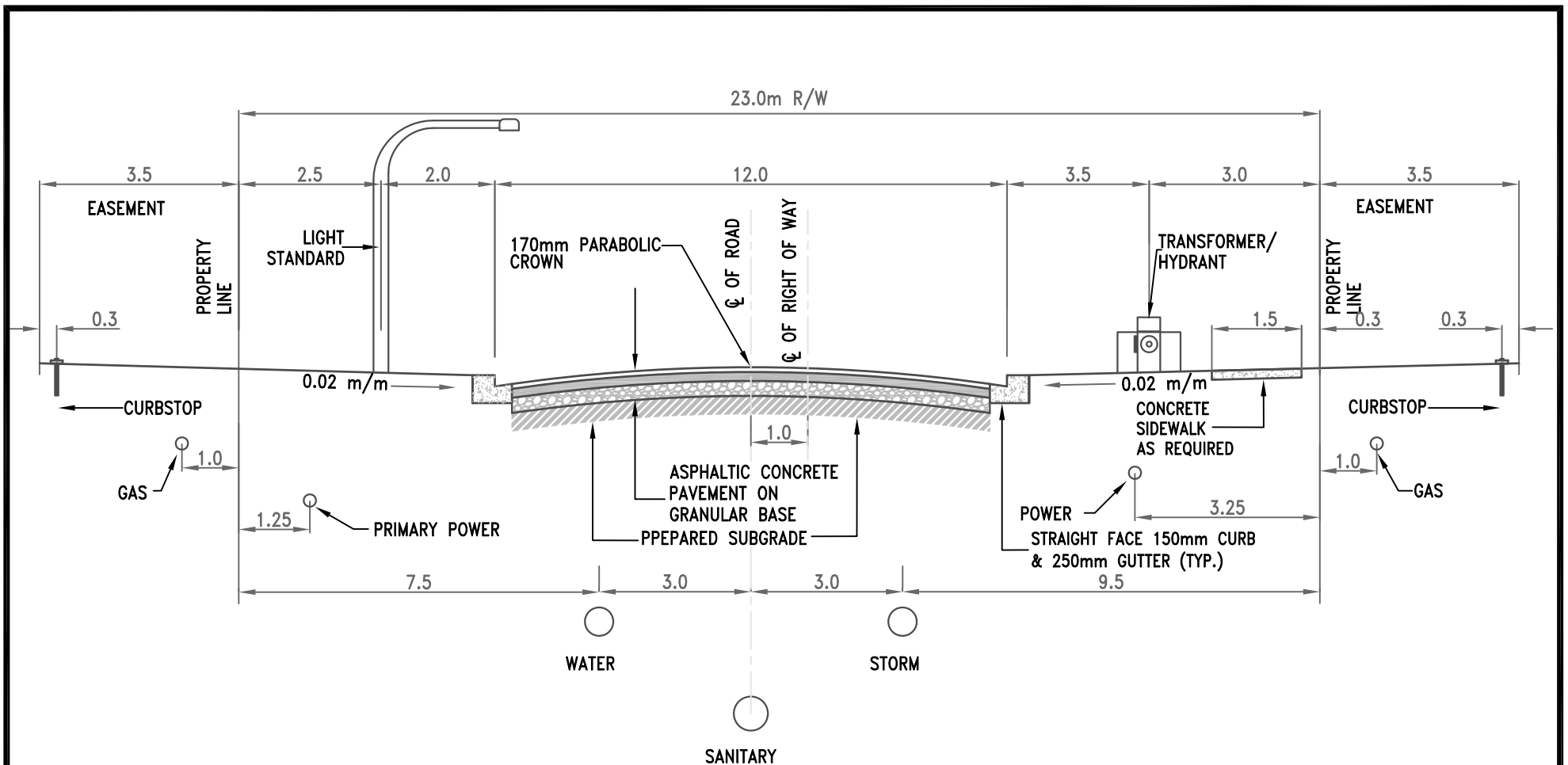
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DWG. NO.

T-7

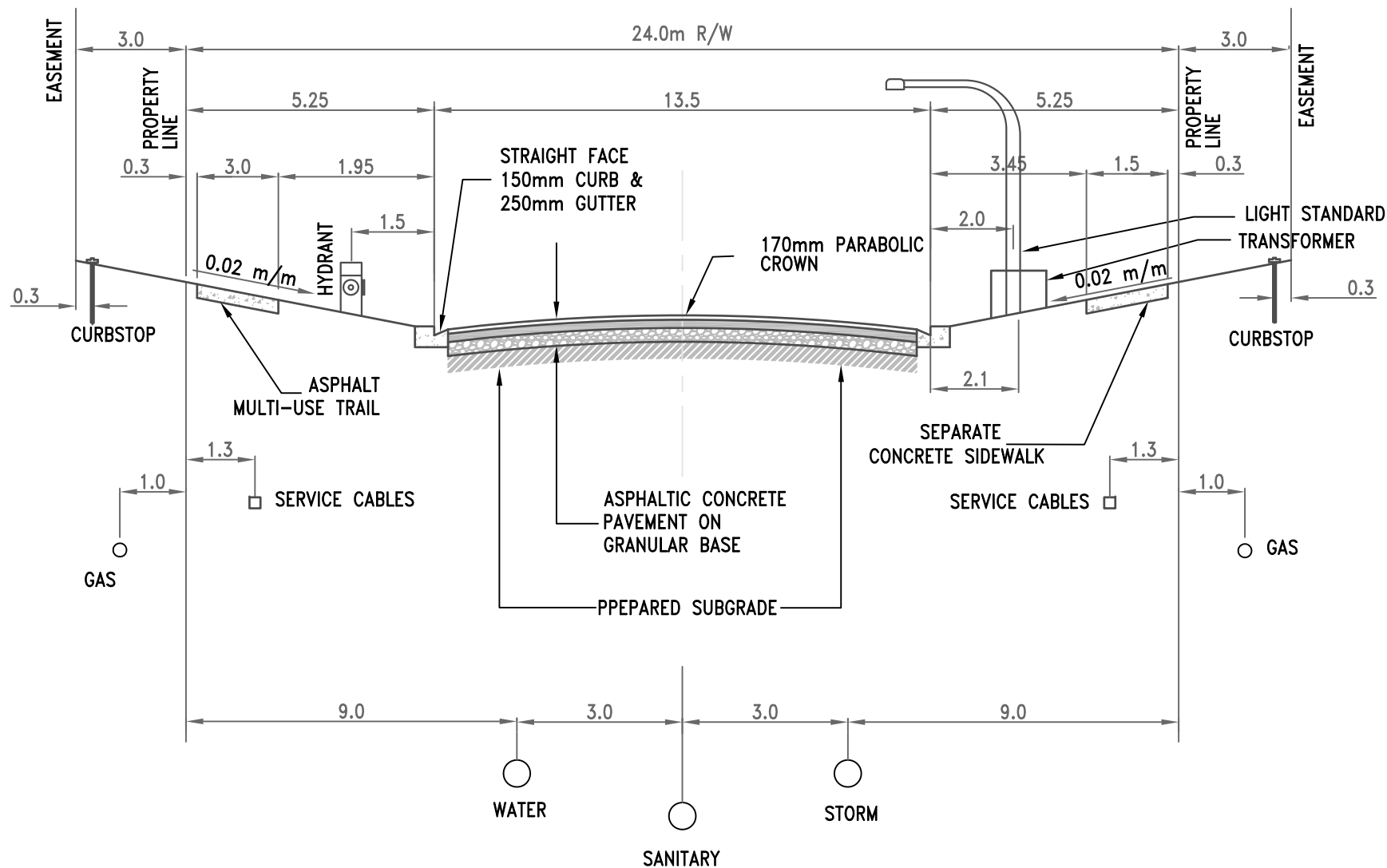


NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES. AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

23m RIGHT OF WAY 12m COLLECTOR INDUSTRIAL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-8
NOT TO SCALE	DRAWN: MP	



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

24m RIGHT OF WAY
13.5m COLLECTOR RESIDENTIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

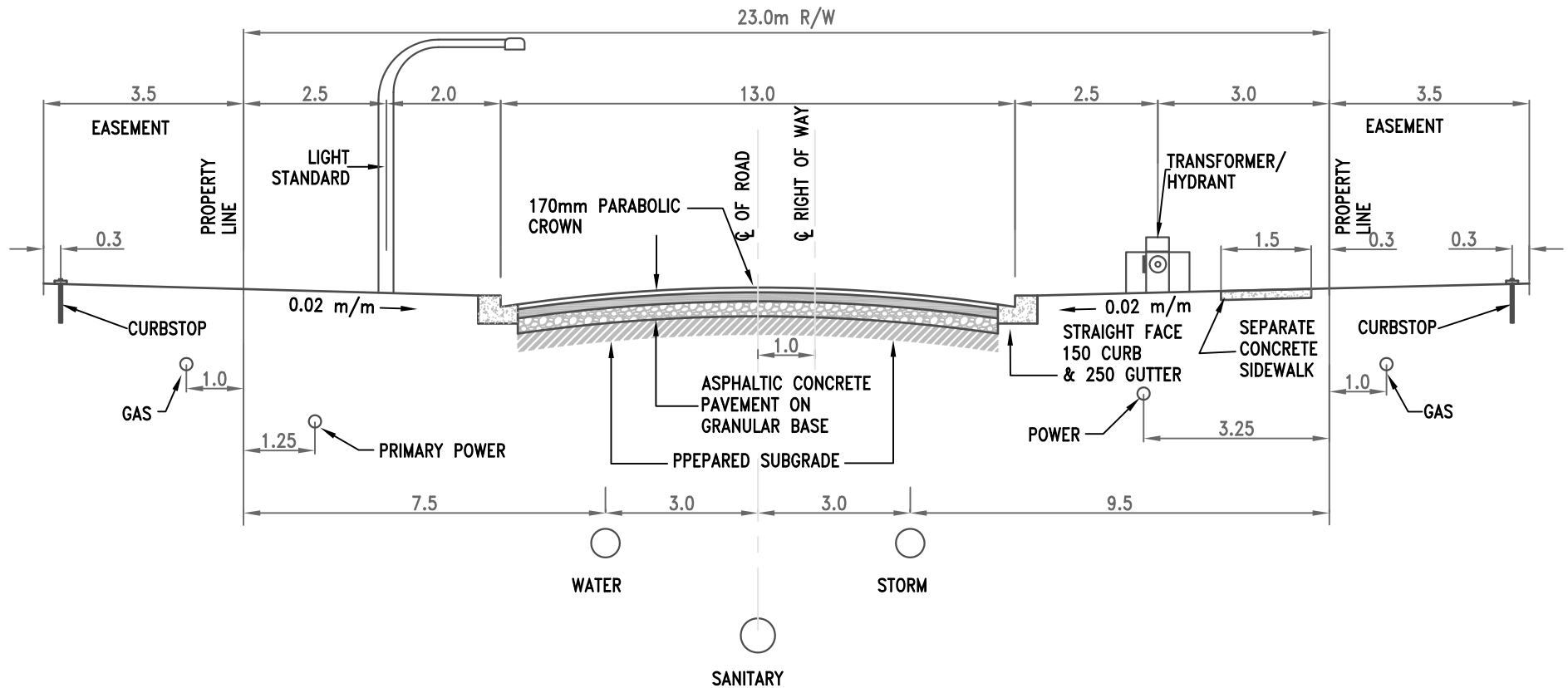
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DWG. NO.

T-9

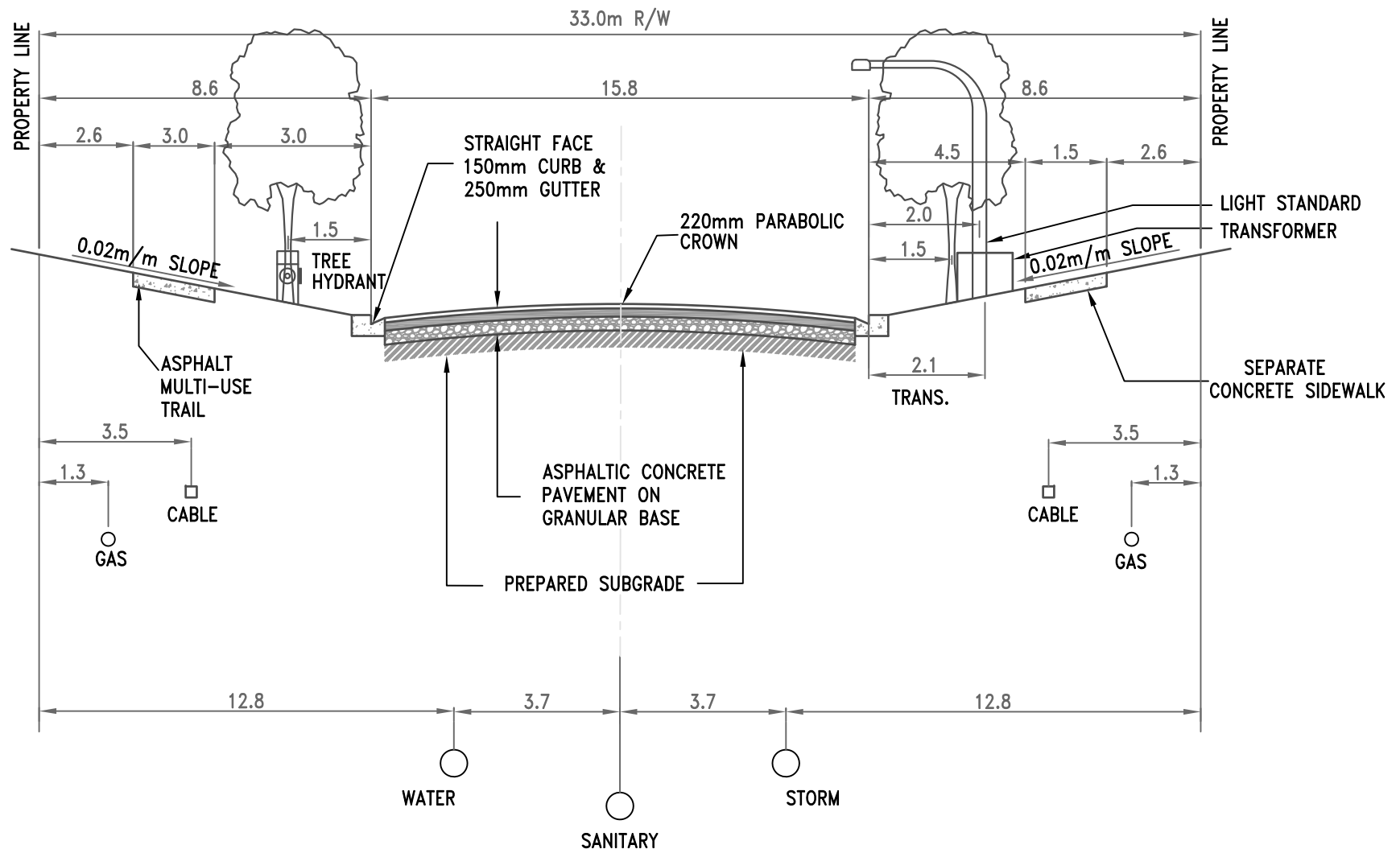


NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES.

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

23m RIGHT OF WAY 13m COLLECTOR INDUSTRIAL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-10
NOT TO SCALE	DRAWN: MP	



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METRES
UNLESS OTHERWISE NOTED

33m RIGHT OF WAY
15.8m MINOR UNDIVIDED ARTERIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

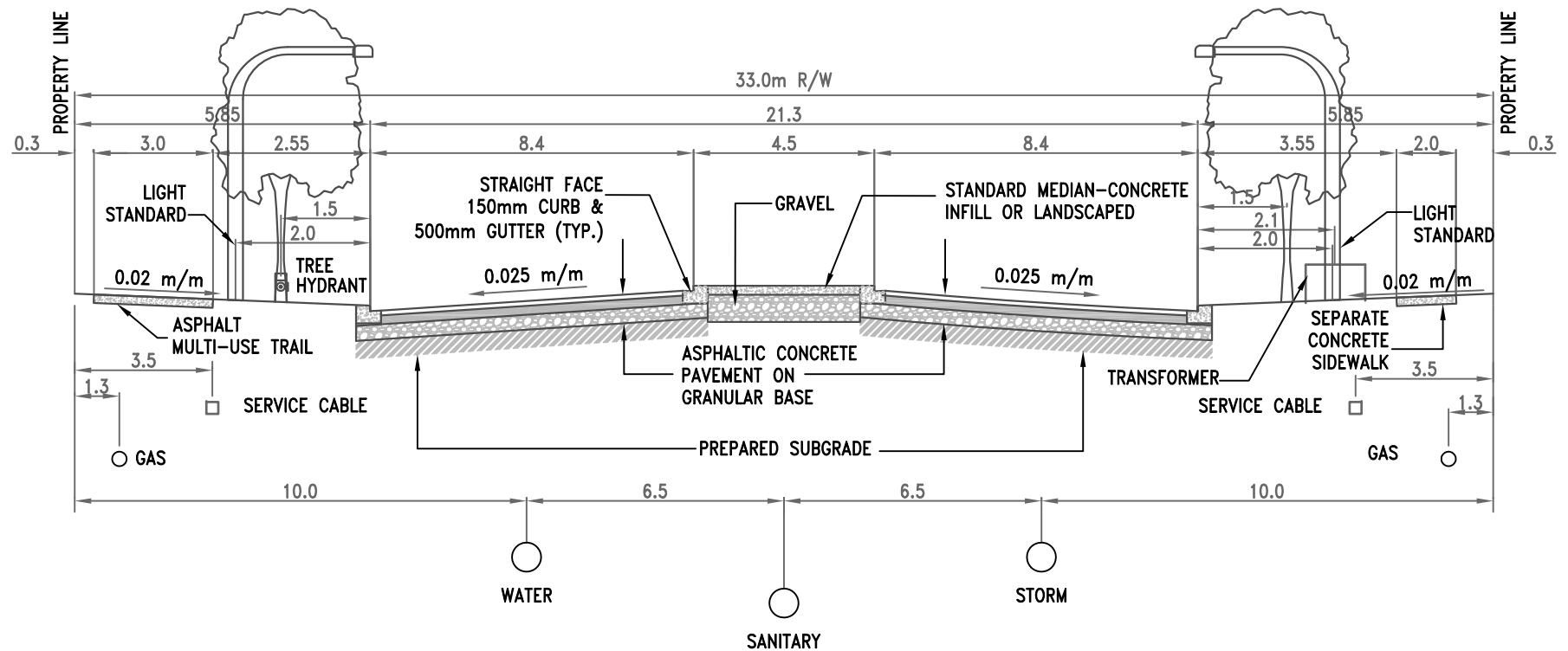
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DWG. NO.

T-11



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FOR HYDRANT AND SERVICES

ALL DIMENSIONS IN METRES
UNLESS OTHERWISE NOTED

33m RIGHT OF WAY
16.8m STANDARD DIVIDED ARTERIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

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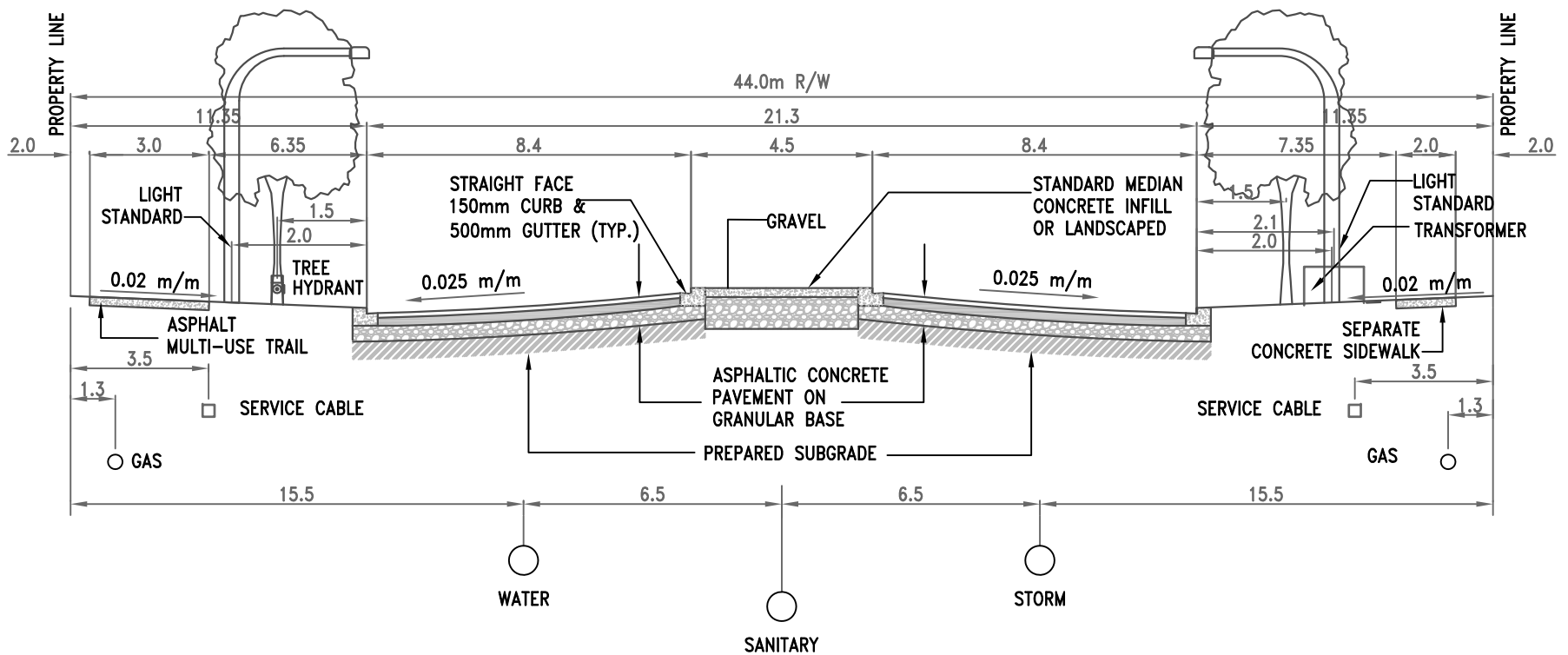
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DWG. NO.

T-12



NOTE:

- REFER TO THE ENGINEERING DESIGN STANDARDS FOR RECOMMENDED TRAVEL LANE AND PARKING WIDTHS.
- POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES, AND ALL OTHER STRUCTURES SHALL MAINTAIN A MIN. OF 3.00M CLEARANCE FROM HYDRANT AND SERVICES

ALL DIMENSIONS IN METRES
UNLESS OTHERWISE NOTED

44m RIGHT OF WAY
16.8m MAJOR DIVIDED ARTERIAL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

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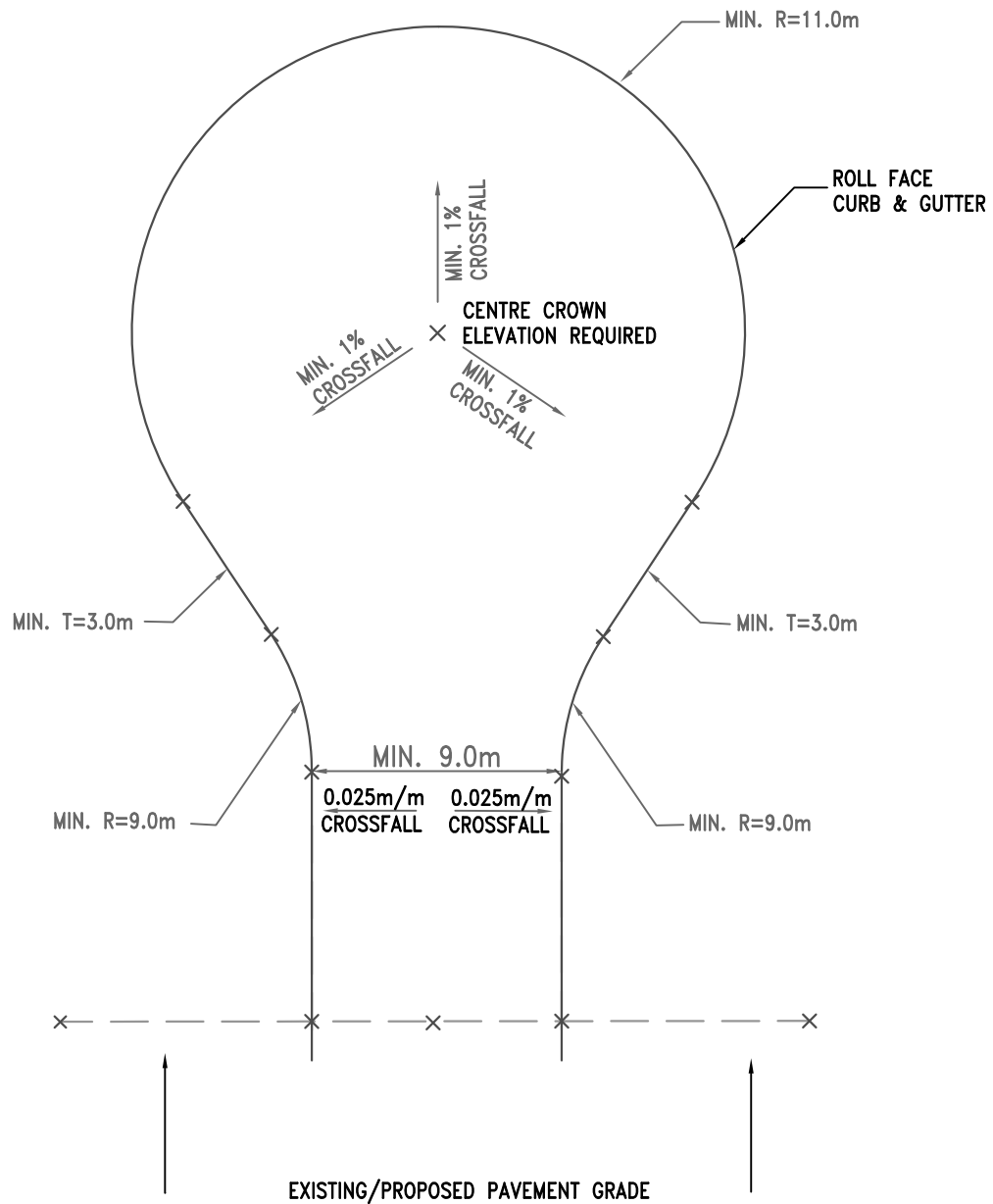
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DWG. NO.

T-13

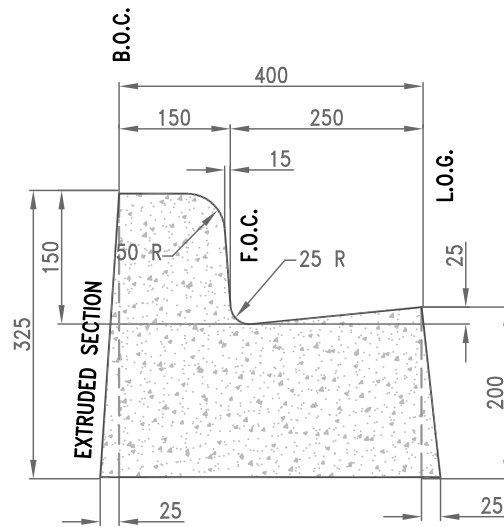


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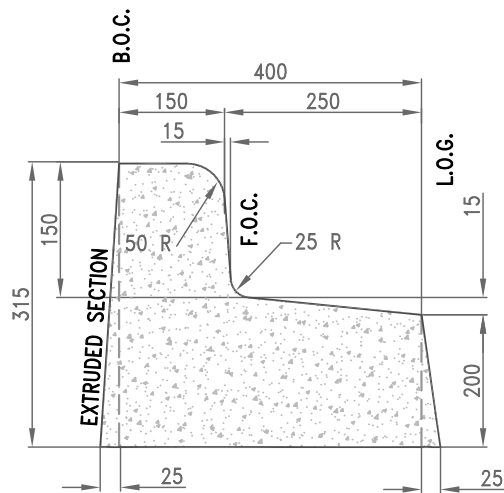
1. ELEVATIONS TO BE PROVIDED FOR 'X' TICK MARKS SHOWN
2. MIN. 0.8% LONGITUDINAL GRADE REQUIRED ALONG CUL-DE-SAC AND CURB RADII
-EXISTING CURBLINE SHOWN FOR LIP OF GUTTER

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

CUL-DE-SAC		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-14
NOT TO SCALE	DRAWN: MP	



150mm CURB & 250mm GUTTER



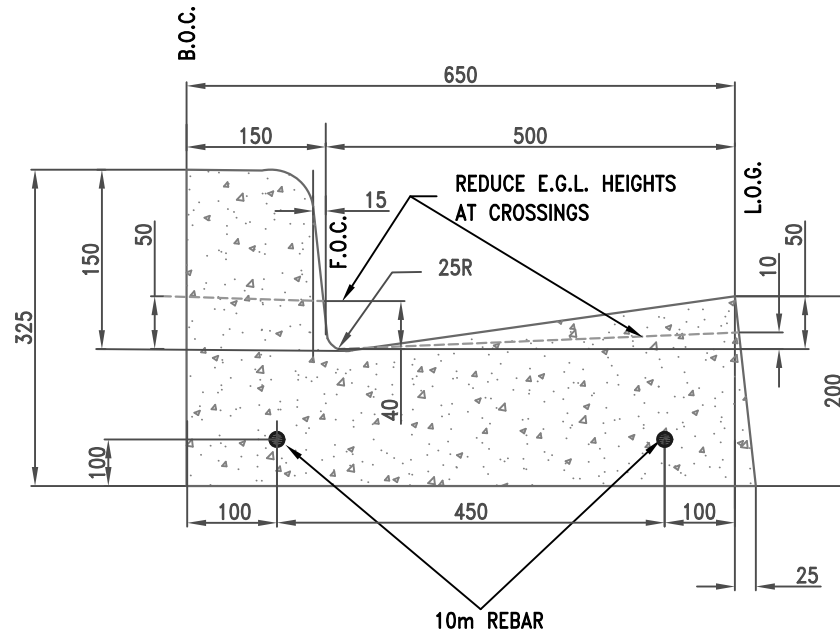
150mm CURB & 250mm REVERSE GUTTER

NOTE:

1. 28 DAYS CONCRETE STRENGTH-30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

STRAIGHT FACE 150mm CURB WITH 250mm GUTTER		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-15
NOT TO SCALE	DRAWN: MP	



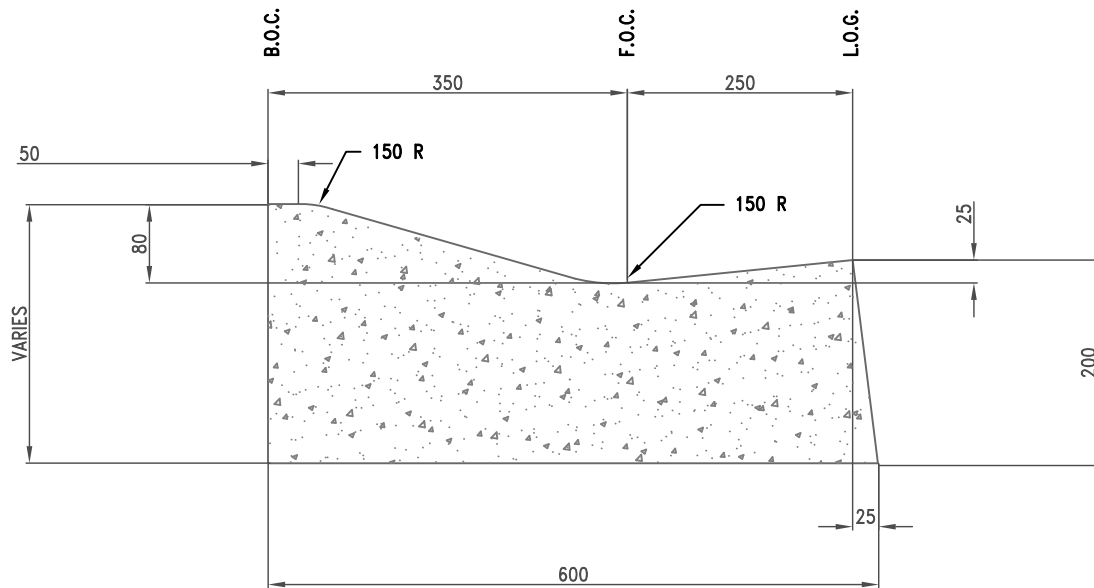
150mm CURB & 500mm GUTTER

NOTES:

1. REINFORCING BARS ARE REQUIRED AT CONSTRUCTION JOINTS AND FUTURE TIE-IN LOCATIONS.
2. REINFORCING BARS SHALL EXTEND INTO CONCRETE A MINIMUM OF 300mm.
3. 28 DAYS CONCRETE STRENGTH – 30 MPa.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

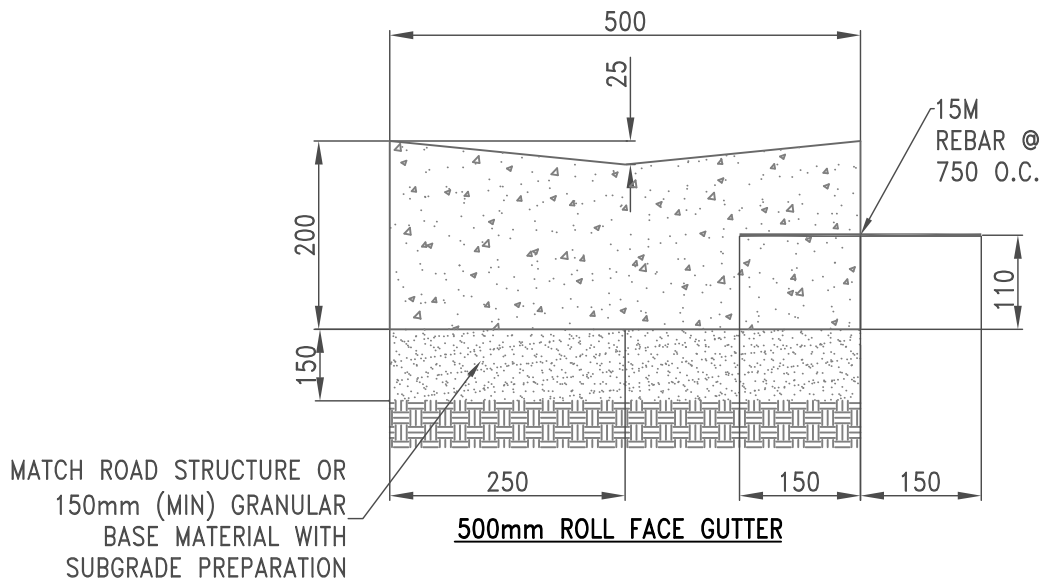
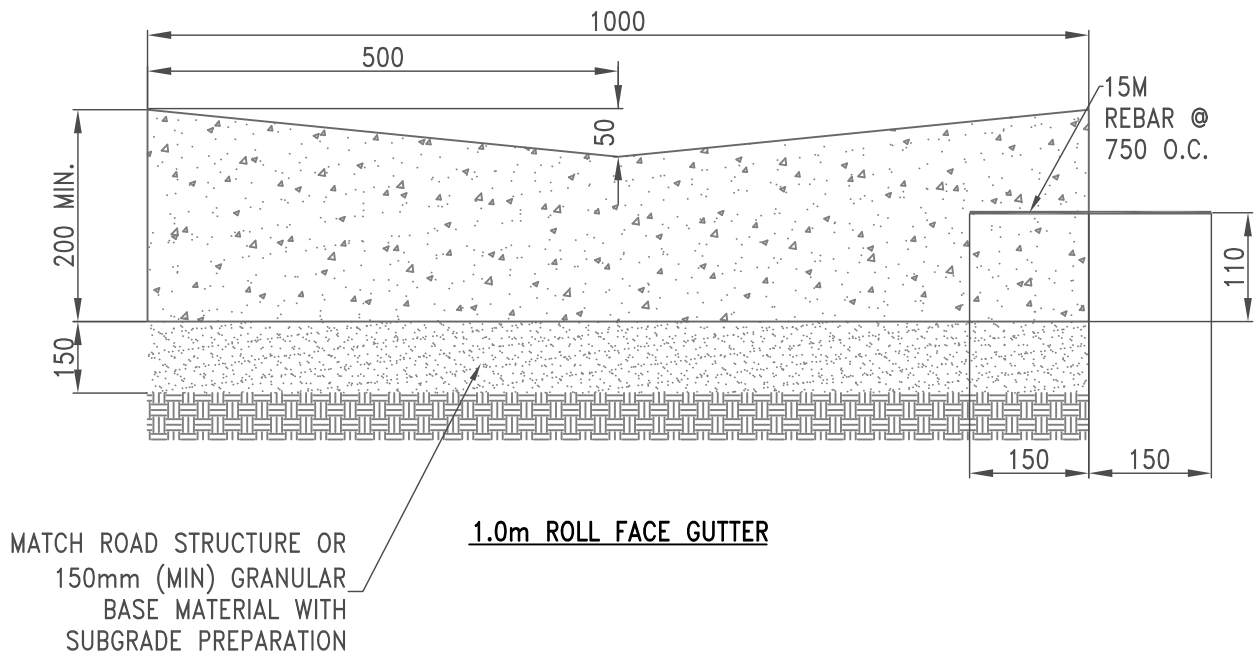
STRAIGHT FACE 150mm CURB WITH 500mm GUTTER		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-16
NOT TO SCALE	DRAWN: MP	



NOTES:
1. 28 DAYS CONCRETE STRENGTH-30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

ROLLED FACE CURB & GUTTER		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-17
NOT TO SCALE	DRAWN: MP	

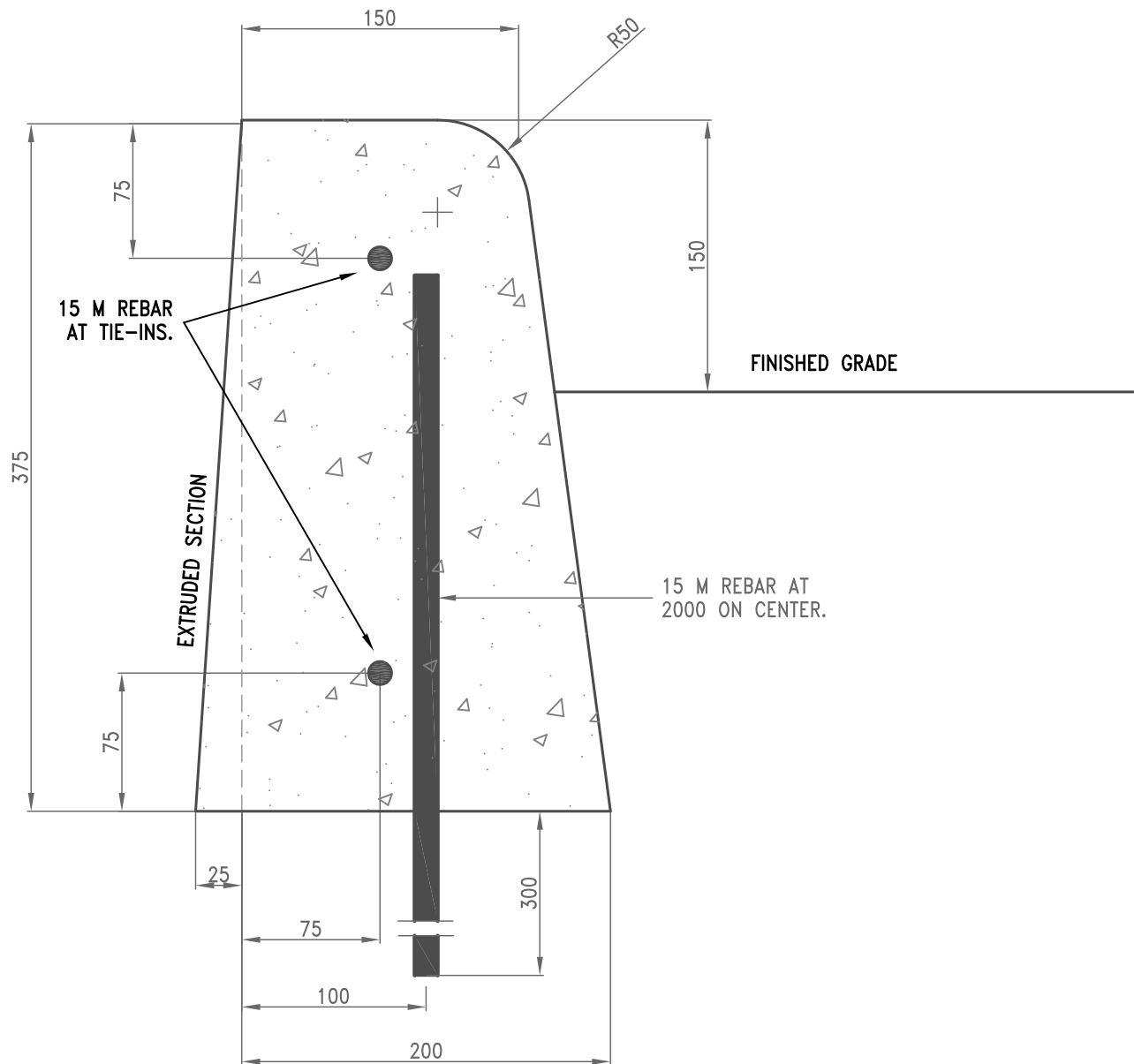


NOTES:

1. 28 DAYS CONCRETE STRENGTH—30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

TYPICAL SWALE GUTTERS		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-18
NOT TO SCALE	DRAWN: MP	

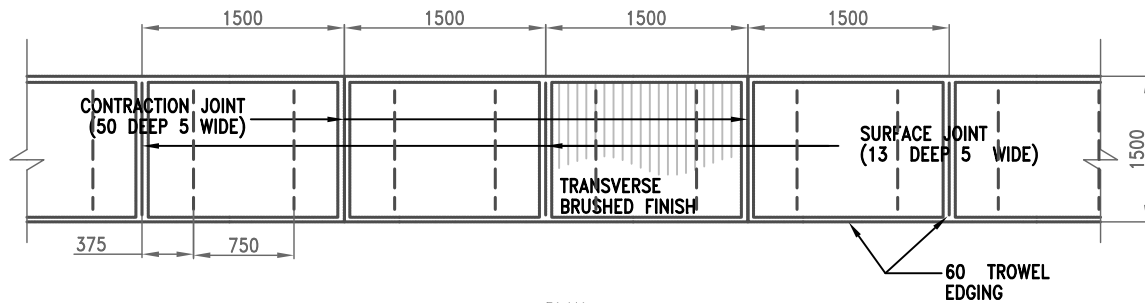


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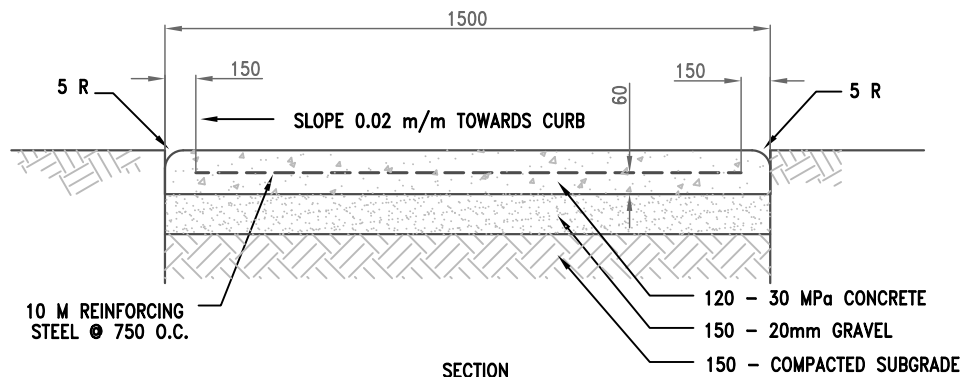
1. 28 DAYS CONCRETE STRENGTH—30MP_a

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

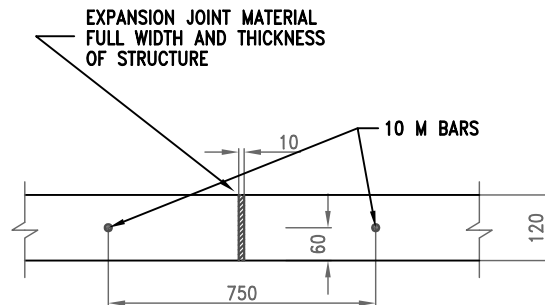
CONCRETE CURB		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-19
NOT TO SCALE	DRAWN: MP	



PLAN



SECTION



EXPANSION JOINT

NOTE:

1. ELEVATION OF FRONT OF SIDEWALK TO BE SET SUCH THAT A MINIMUM SLOPE OF 0.01m/m WITH RECOMMENDED SLOPE OF 0.02m/m TO 0.04m/m IS MAINTAINED ACROSS BOULEVARD BETWEEN FRONT OF WALK AND TOP OF CURB.
2. 28 DAYS CONCRETE STRENGTH-30MPa
3. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB-DRAINAGE SYSTEM.
4. CROSS SLOPE OF SIDEWALK TO BE SET SUCH THAT A MINIMUM SLOPE OF 0.01m/m, AND A RECOMMENDED SLOPE OF 0.02m/m TOWARDS THE CURB IS MAINTAINED.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

1.5m SEPERATE
CONCRETE SIDEWALK



CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

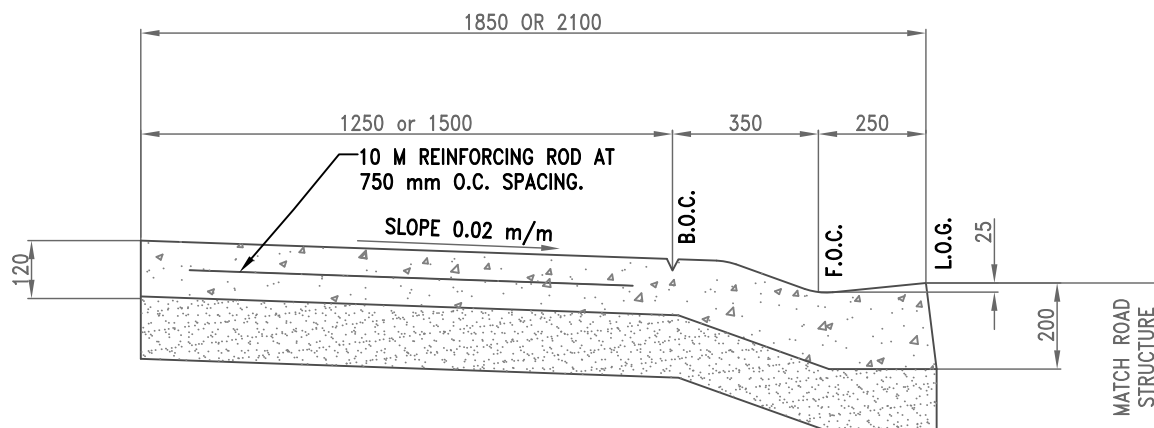
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DATE: FEB 2013

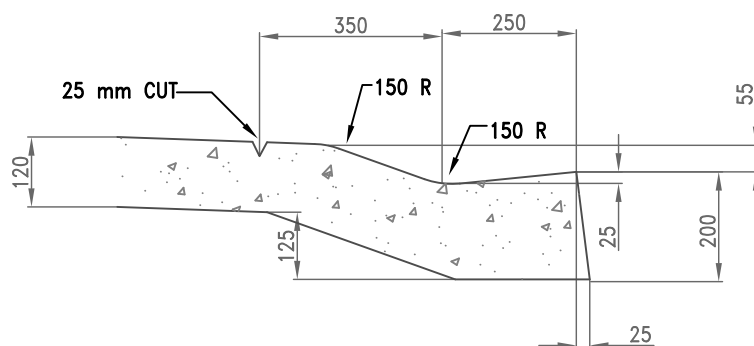
NOT TO SCALE

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T-20



TYPICAL SECTION



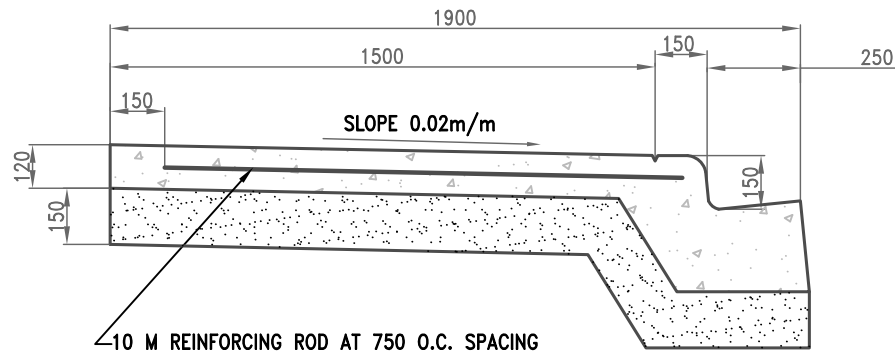
DETAIL

NOTES:

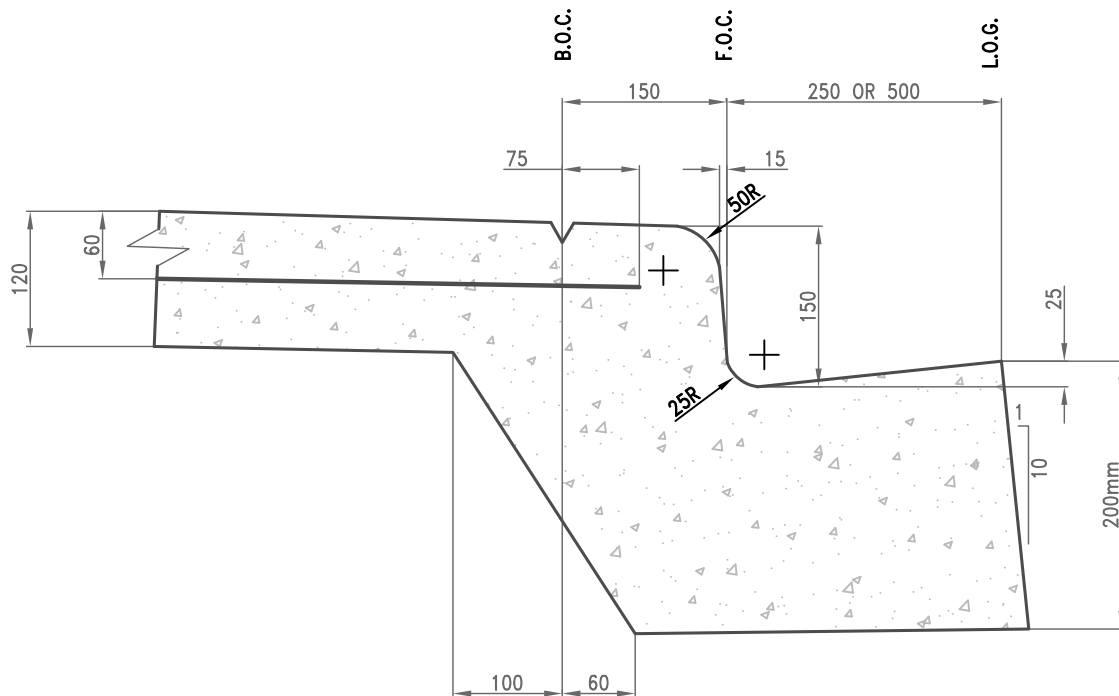
1. USE FOR ROADWAY CLASSIFICATIONS – LOCAL OR COLLECTOR OR AS DIRECTED BY THE ENGINEER
2. STRAIGHT FACE 150mm WITH 250mm GUTTER MAY BE USED IN PLACE OF ROLLED CURB AND GUTTER OR AS PER DIRECTED BY ENGINEER
3. STRAIGHT FACE 150mm CURB WITH 250mm GUTTER MAY BE USED IN PLACE OF ROLL FACE CURB AND GUTTER OR AS DIRECTED BY THE ENGINEER.
4. 150mm THICK 20mm CRUSH GRANULAR MATERIAL COMPACTED TO 100% S.P.D. REQUIRED.
5. 150mm THICK COMPACTED SUBGRADE REQUIRED
6. 28 DAYS CONCRETE STRENGTH–30MPa
7. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB-DRAINAGE SYSTEM.
8. CROSS SLOPE OF SIDEWALK TO BE SET SUCH THAT A MINIMUM SLOPE OF 0.01m/m, AND A RECOMMENDED SLOPE OF 0.02m/m TOWARDS THE CURB IS MAINTAINED

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

ROLL FACE MONOLITHIC CONCRETE SIDEWALK		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-21
NOT TO SCALE	DRAWN: MP	



TYPICAL SECTION



DETAIL

NOTES:

1. USE FOR ROADWAY CLASSIFICATIONS – LOCAL, COLLECTOR, OR AS DIRECTED BY THE ENGINEER.
2. DEPTH OF GUTTER FACE TO MATCH ROAD STRUCTURE.
3. 150mm THICK 20mm CRUSH GRANULAR MATERIAL COMPACTED TO 100% S.P.D. IS REQUIRED.
4. 150mm THICK COMPACTED SUBGRADE IS REQUIRED
5. 28 DAYS CONCRETE STRENGTH–30MPa
6. CROSS SLOPE OF SIDEWALK TO BE SET SUCH THAT A MINIMUM SLOPE OF 0.01m/m AND A RECOMMENDED SLOPE OF 0.02m/m TOWARDS THE CURB IS MAINTAINED
7. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB-DRAINAGE SYSTEM

STRAIGHT FACE MONOLITHIC
CONCRETE SIDEWALK



ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

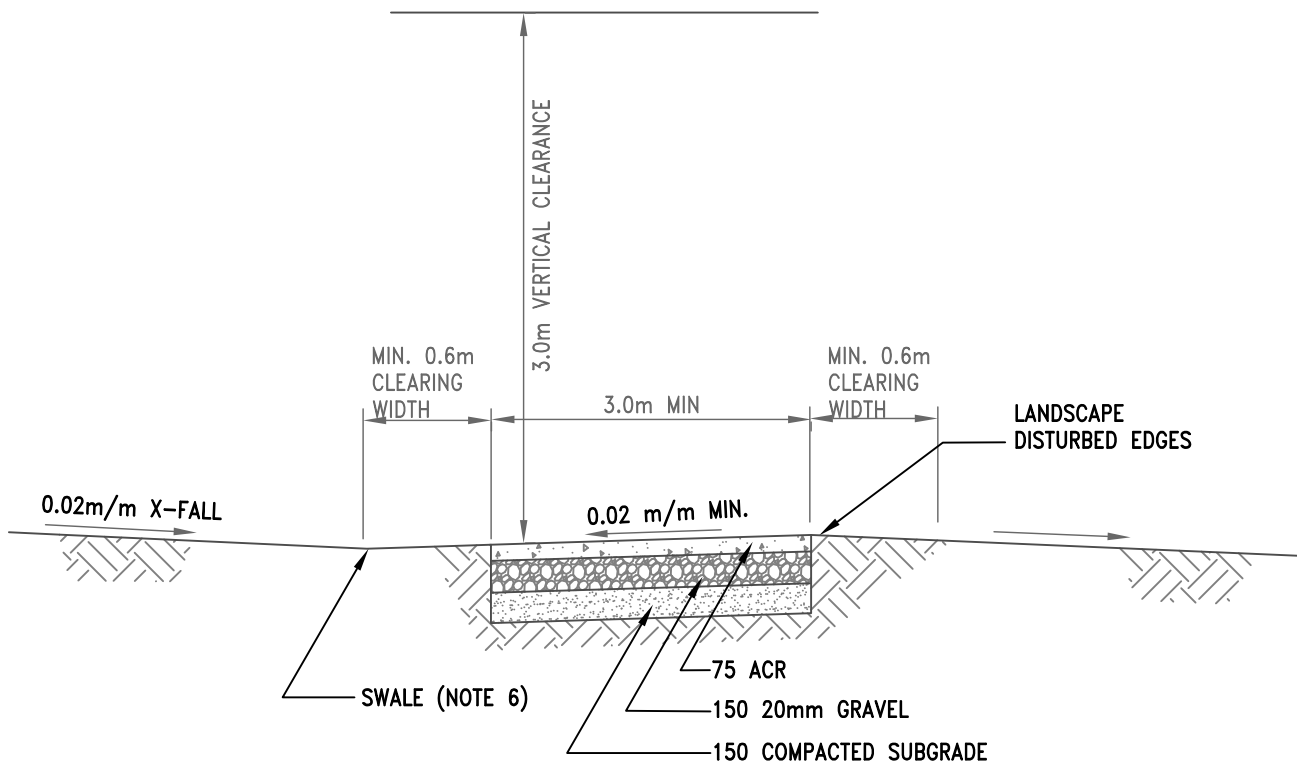
REVISION NUMBER: A

DATE: FEB 2013

NOT TO SCALE

DRAWN: MP

T-22

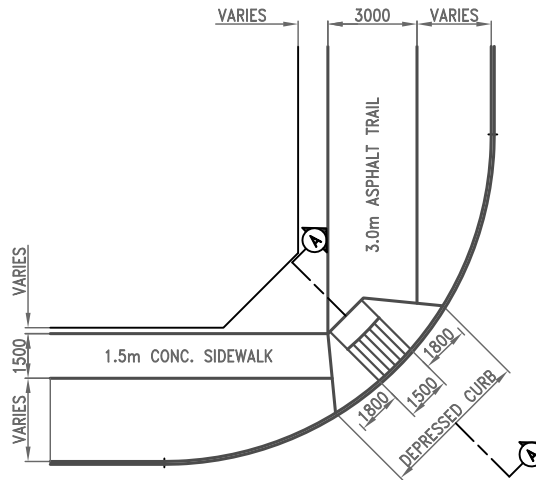


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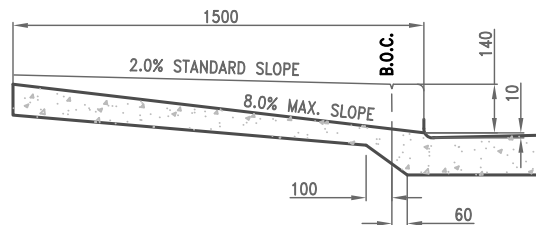
1. GEOTECHNICAL ENGINEER TO PROVIDE TRAIL STRUCTURE
2. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, PAVEMENT STRUCTURE OR SUB-DRAINAGE SYSTEM
3. CROSS SLOPE OF SIDEWALK TO BE SET SUCH THAT A MINIMUM SLOPE OF 0.01m/m, AND A RECOMMENDED SLOPE OF 0.02m/m TOWARDS THE DRAINAGE IS MAINTAINED
4. SHEET FLOW TO BE DIRECTED AWAY FROM TRAIL OR OTHER ACCOMMODATIONS REQUIRED TO TO KEEP SUBGRADE DRY

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

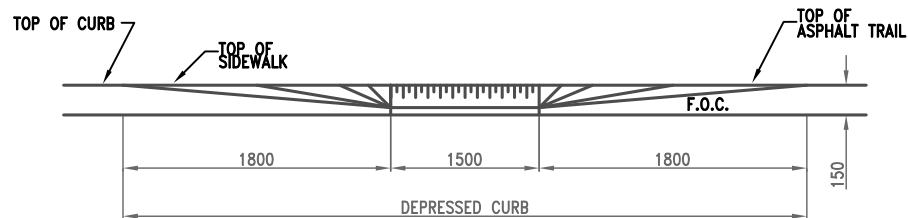
ASPHALT TRAIL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-23
NOT TO SCALE	DRAWN: MP	



PLAN



SECTION A-A



FRONT VIEW

NOTES:

1. TOOLED GROOVES 5mm WIDE X 10mm DEEP, BROOM FINISH. GROOVE SPACING 150mm O.C. ADJACENT TO CURB.
2. WHEN REQUIRED, TRANSITION FROM STRAIGHT FACE CURB TO ROLLED FACE CURB AT CURB RAMP.
3. CURBS AND RAMPS TO BE POURED MONOLITHICALLY.
4. WIDTH OF RAMP MUST EQUAL WIDTH OF WALK (MIN 1.5m. MAX 3.0m) EXCEPT "TYPE A"
5. 28 DAYS CONCRETE STRENGTH-30MPa
6. IF ASPHALT TOPLIFT IS DEFERRED, PLACE ASPHALT RAMP FOR THE WIDTH OF CURB RAMP, AND EXTENDING MINIMUM 1M INTO ROAD.
7. USE REINFORCING BARS OR MESH

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

TYPICAL CONCRETE CURB RAMP

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

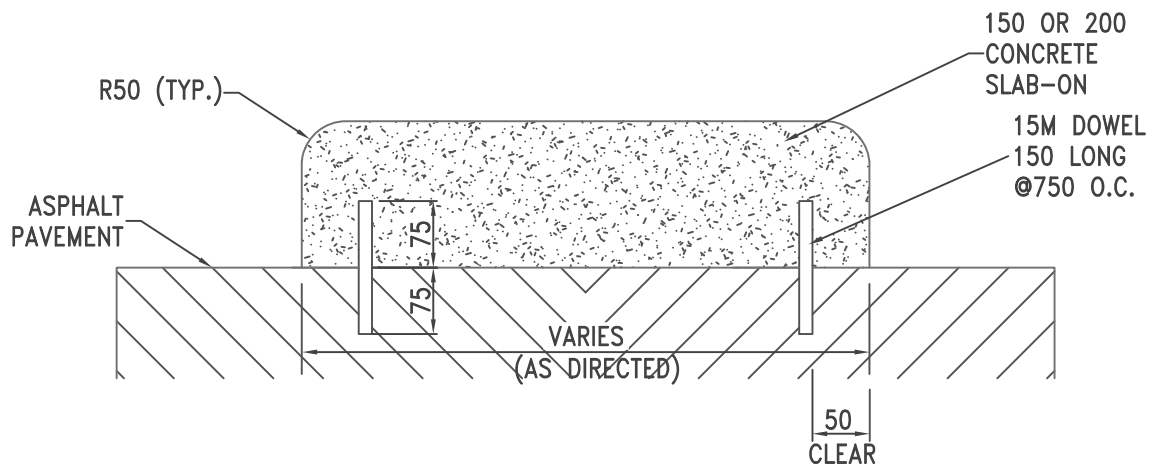
NOT TO SCALE

DRAWN: MP



DWG. NO.

T-24

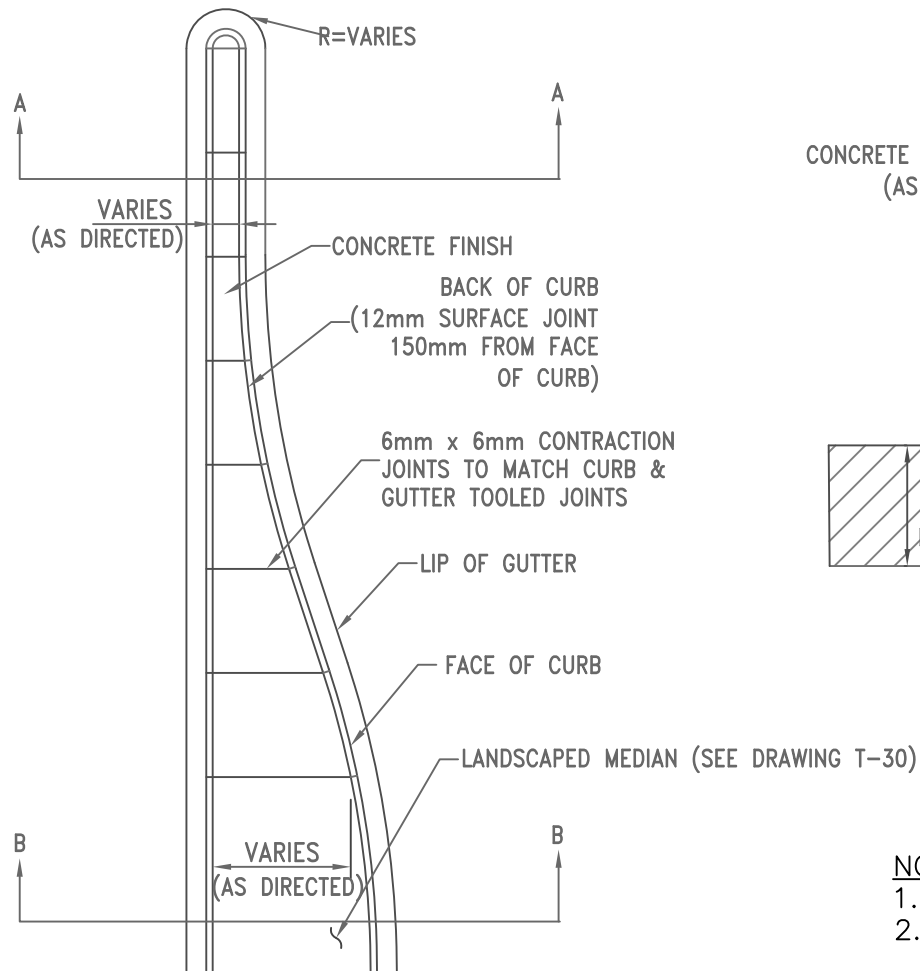


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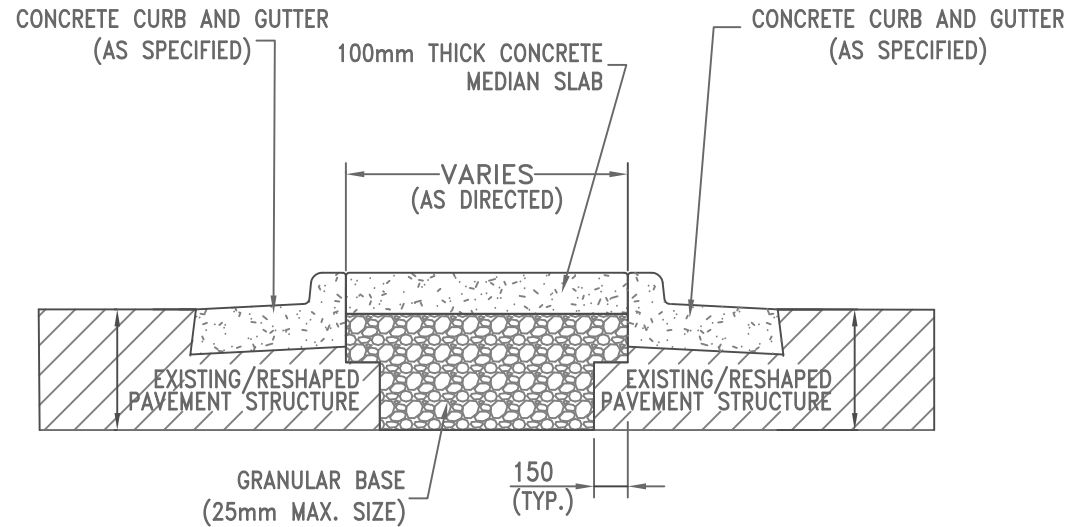
1. 28 DAYS CONCRETE STRENGTH—30MPa

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

CONCRETE SLAB-ON MEDIAN		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-25
NOT TO SCALE	DRAWN: MP	



MEDIAN SECTION



SECTION A-A

NOTE:

1. 28 DAYS CONCRETE STRENGTH—30MPa
2. SEE LANDSCAPED MEDIAN DRAWING T-30 FOR SECTION B-B TYPICAL

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED.

MEDIAN — CONCRETE INFILL

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

NOT TO SCALE

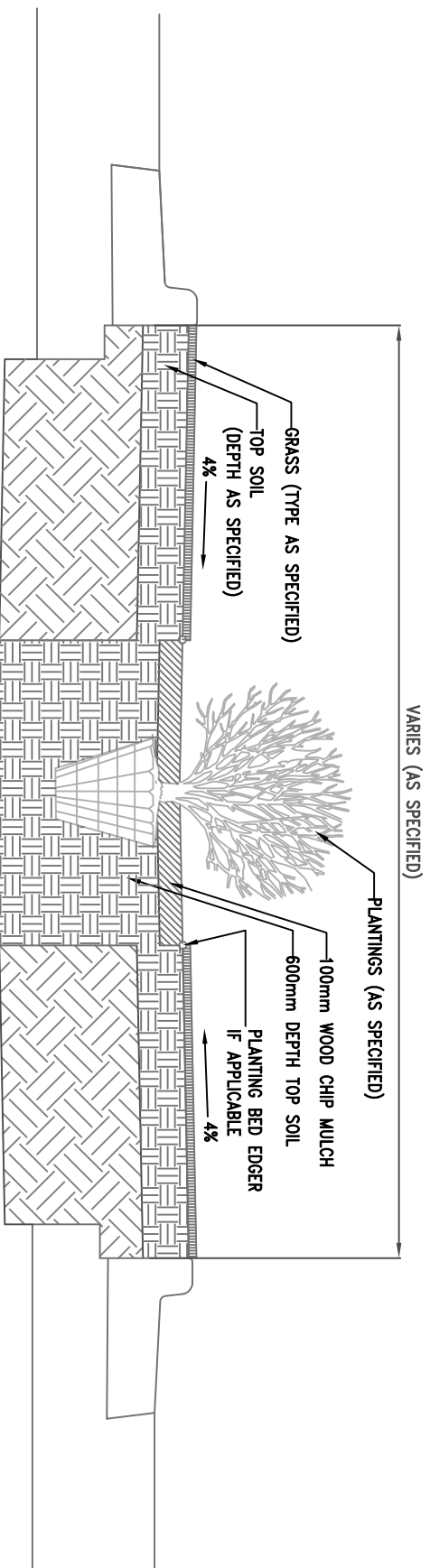
DATE: FEB 2013

DRAWN: MP



DWG. NO.

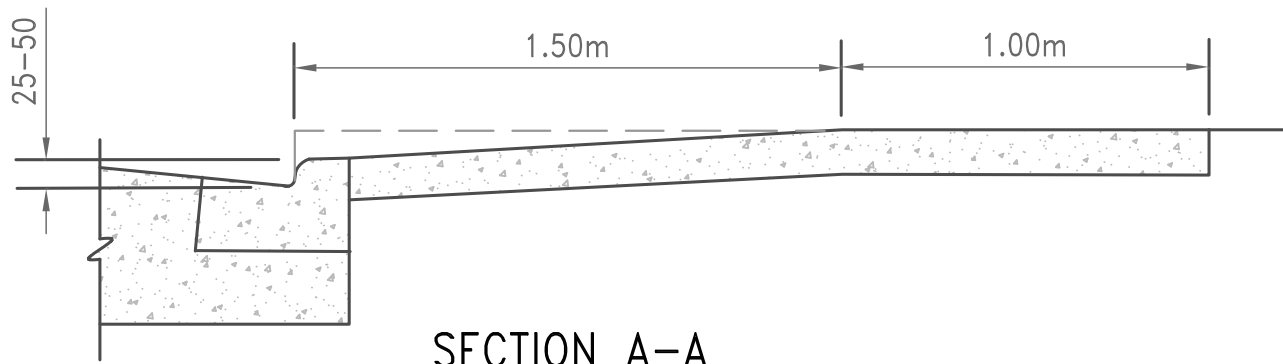
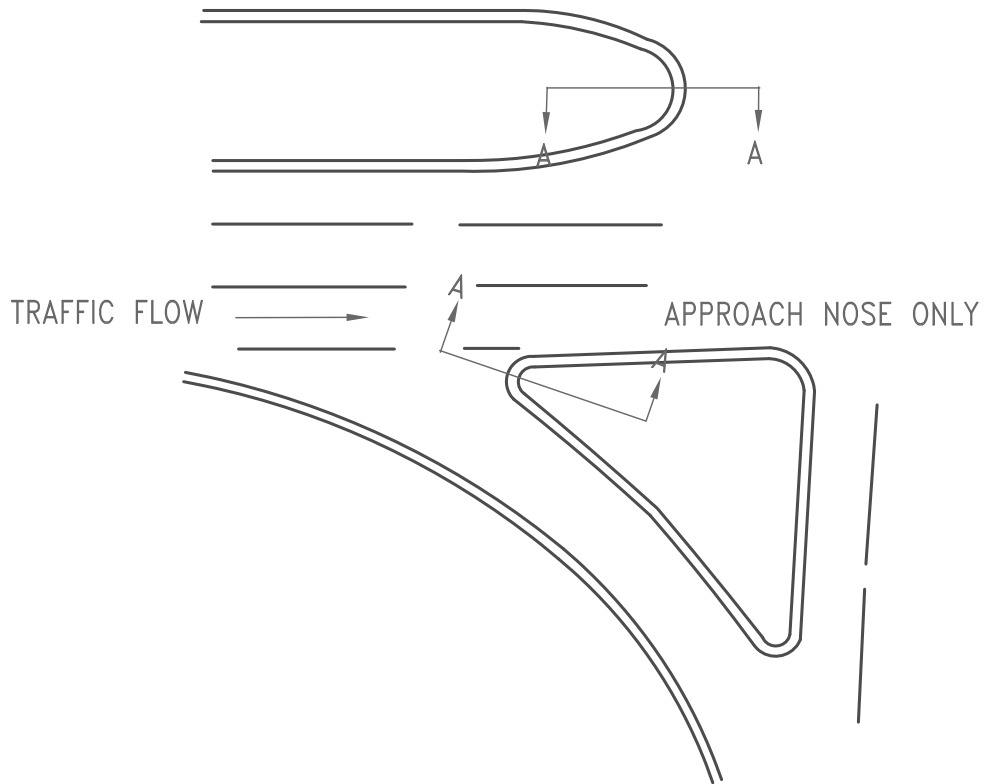
T-26



SECTION B-B

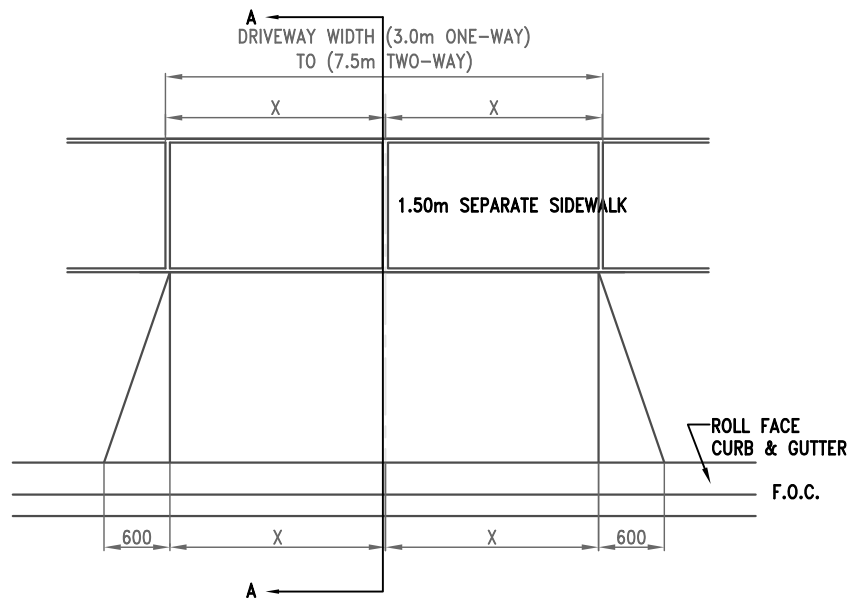
ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED.

MEDIAN – LANDSCAPED		 FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	
NOT TO SCALE	DRAWN: MP	T-27

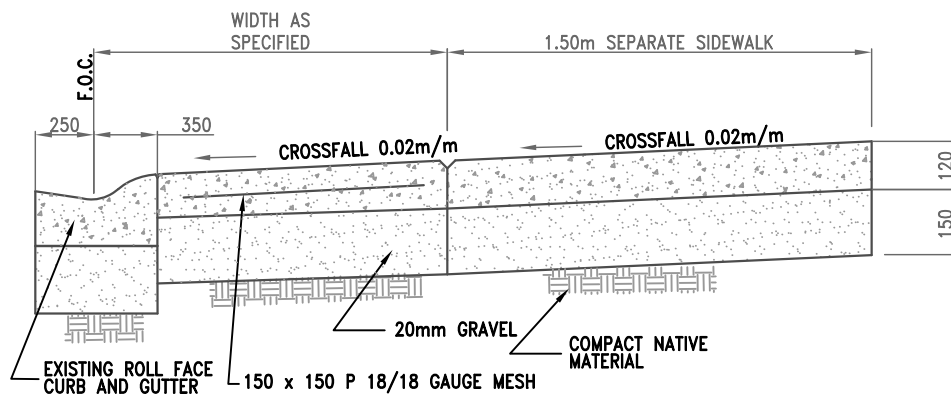


ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

DROP NOSE MEDIAN		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-28
NOT TO SCALE	DRAWN: MP	



PLAN



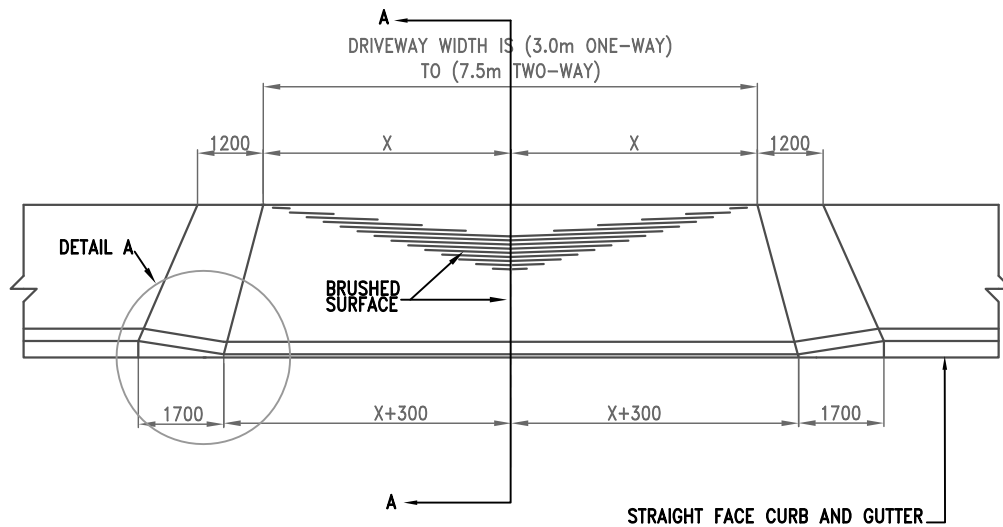
SECTION A-A - ROLL FACE

NOTES:

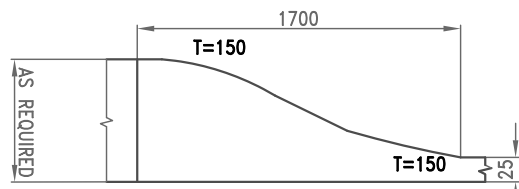
1. WIDTH OF "X" TO BE DETERMINED IN FIELD OR AS DIRECTED BY THE ENGINEER
2. 28 DAYS CONCRETE STRENGTH-30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

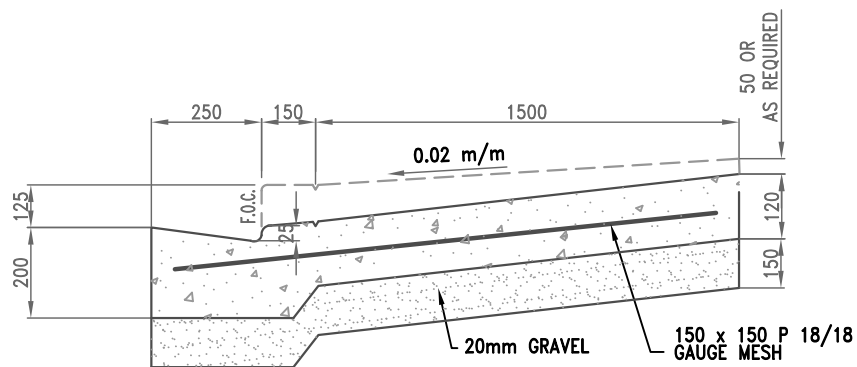
RESIDENTIAL ACCESS CROSSING SEPERATE SIDEWALK		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-29
NOT TO SCALE	DRAWN: MP	



PLAN



DETAIL A - CURB DROP FRONT VIEW



SECTION A-A - STRAIGHT FACE

NOTES:

1. WIDTH OF "X" TO BE DETERMINED IN FIELD OR AS DIRECTED BY THE ENGINEER
2. 28 DAYS CONCRETE STRENGTH-30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

RESIDENTIAL ACCESS CROSSING
MONOLITHIC SIDEWALK

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: A

DATE: FEB 2013

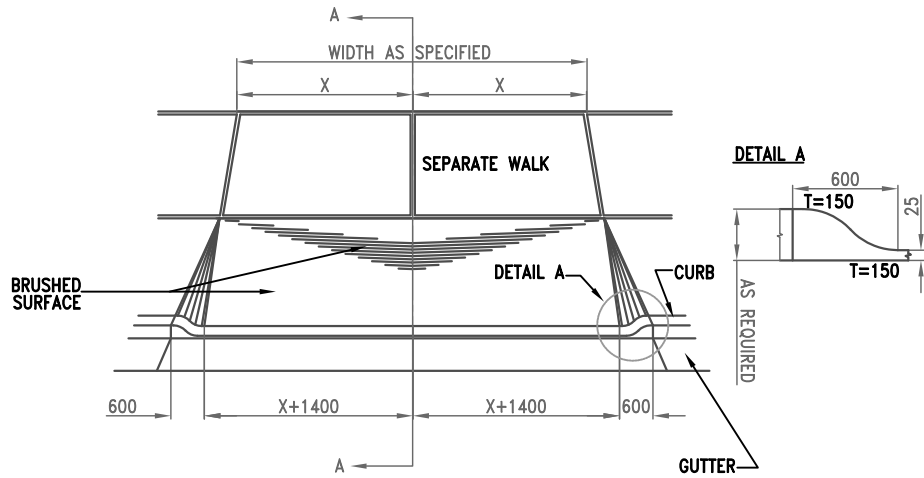
NOT TO SCALE

DRAWN: MP

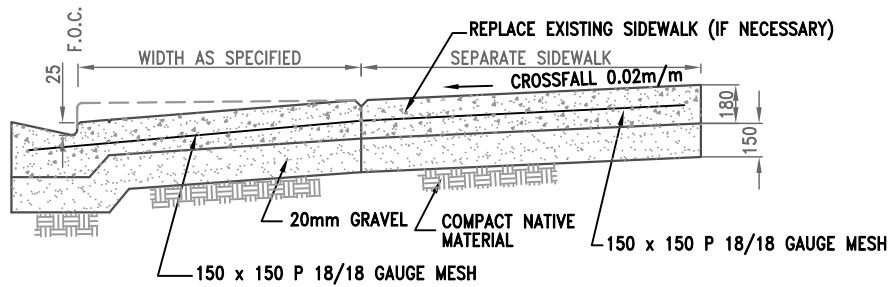


DWG. NO.

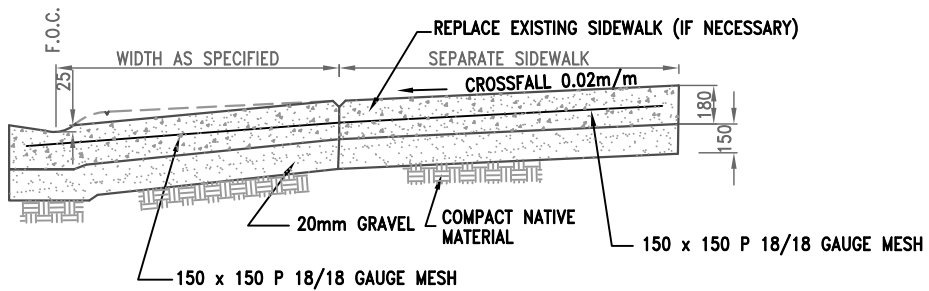
T-30



PLAN



SECTION A-A - STRAIGHT FACE



SECTION A-A - ROLL FACE

NOTES:

1. WIDTH OF "X" TO BE DETERMINED IN FIELD OR AS DIRECTED BY THE ENGINEER
2. 28 DAYS CONCRETE STRENGTH-30MPa

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

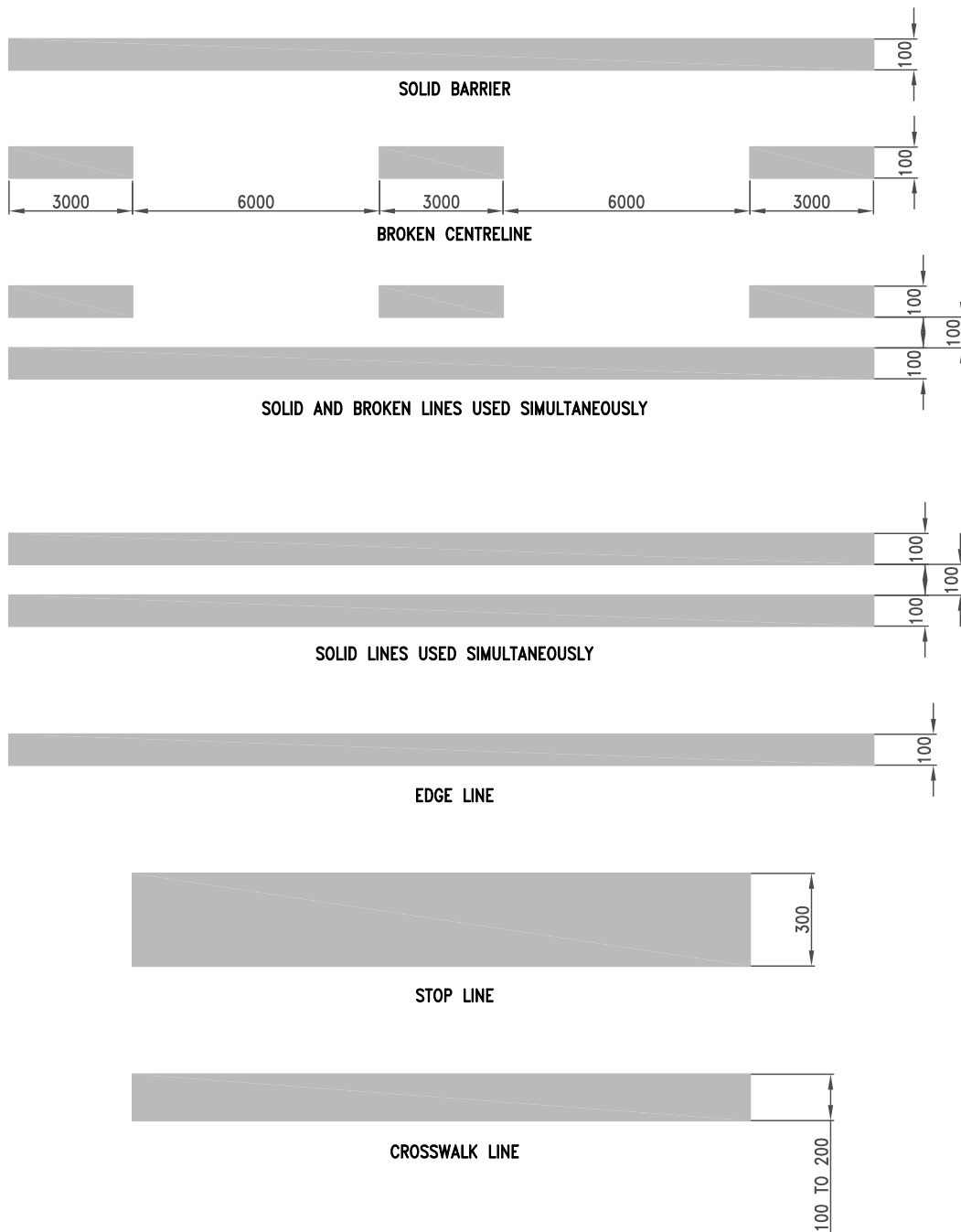
**COMMERCIAL/INDUSTRIAL CROSSING
SEPERATE SIDEWALK**



CITY OF FORT SASKATCHEWAN STANDARD DETAIL	
REVISION NUMBER: A	DATE: FEB 2013
NOT TO SCALE	DRAWN: MP

DWG. NO.

T-31

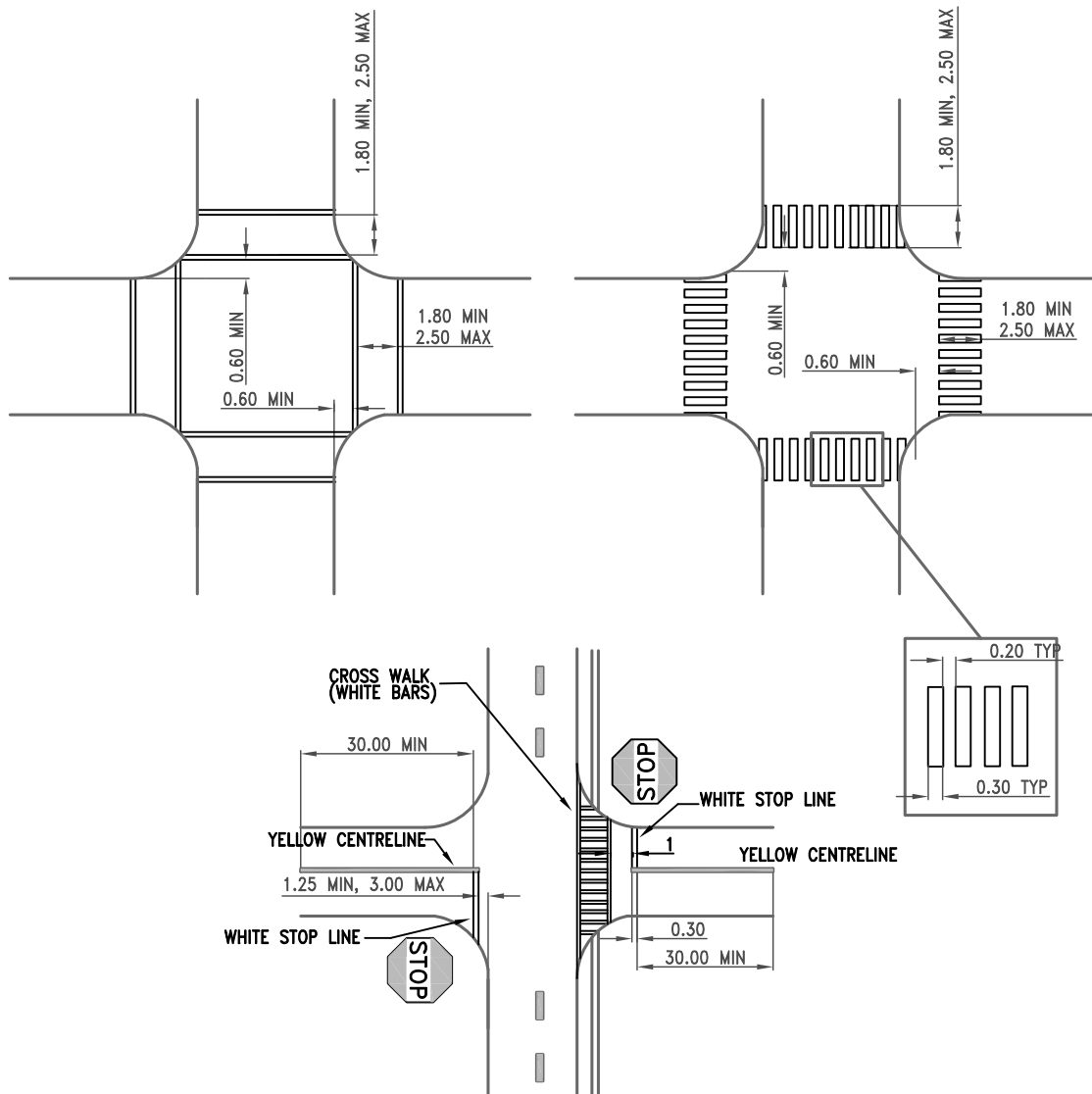


NOTES:

1. THESE TYPICAL DIMENSIONS ARE GENERAL IN NATURE. REFER TO DETAILED ENGINEERING PLANS OR DIRECTION FROM THE ENGINEER FOR PROJECT SPECIFIC APPLICATIONS.
2. REFER TO THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA (MUTCD) TAC, 2008 FOR MORE INFORMATION AND GUIDANCE.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

PAVEMENT MARKING TYPES AND WIDTH		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-33
NOT TO SCALE	DRAWN: MP	



NOTES:

1. THESE TYPICAL DIMENSIONS ARE GENERAL IN NATURE. REFER TO DETAILED ENGINEERING PLANS OR DIRECTION FROM THE ENGINEER FOR PROJECT SPECIFIC APPLICATIONS.
2. REFER TO DWG T-36 AND THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA (MUTCD) TAC, 2008 FOR MORE INFORMATION AND GUIDANCE.

ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

INTERSECTION PAVEMENT MARKINGS



CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

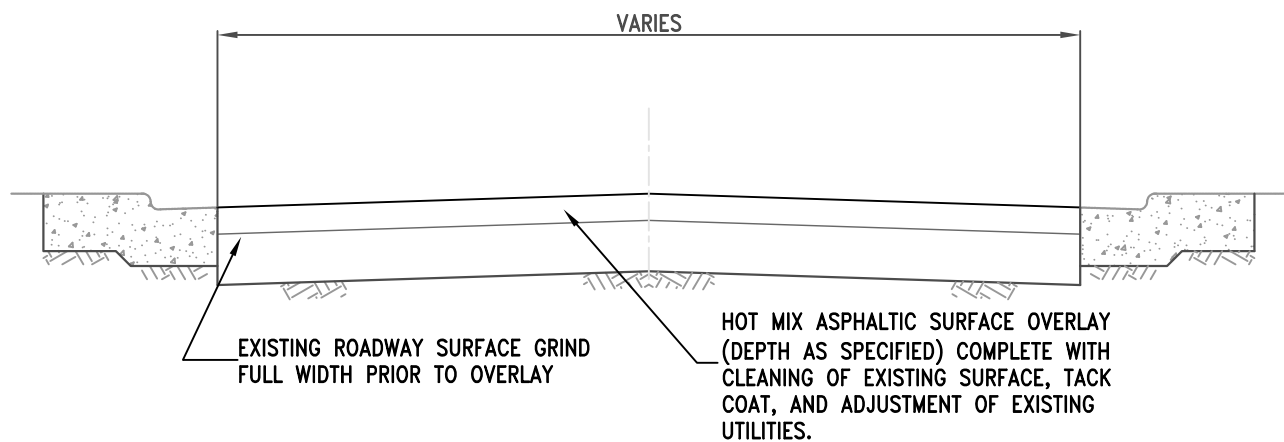
REVISION NUMBER: A

DATE: FEB 2013

NOT TO SCALE

DRAWN: MP

T-34



NOTE:

WHERE CONCRETE SWALES ARE USED, PROVIDE ISOLATION JOINT BETWEEN ASPHALT AND CONCRETE. FILL JOINT WITH ELASTIC COMPOUND.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE NOTED

TYPICAL OVERLAY		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: A	DATE: FEB 2013	T-35
NOT TO SCALE	DRAWN: MP	

6.0 LANDSCAPING

This section outlines design standards and procedures for landscape improvements in the City of Fort Saskatchewan. These standards outline minimum standards for development of the public realm, and the procedures to be followed through the design, construction, maintenance and approval process.

Through these standards, the City of Fort Saskatchewan (the City) aims to provide high-quality public open space and experiences for residents and visitors to our community. Public open spaces, ranging from Formal Landscapes to Natural Areas serve our residents and wildlife with recreational, aesthetic, ecological, health and safety benefits. Through the development of public open space, the City encourages that people maximize their enjoyment of the outdoors while adequately protecting natural and naturalized ecosystems.

Terms that are capitalized within these standards (ie. Formal Landscapes or Developer) are defined in Section 1.2 – Definitions.

6.1 General

The Development Guidelines and Standard Specifications provided in the following section are minimum standards, and are to be used in conjunction with the following documents:

- The City of Fort Saskatchewan Land Use Bylaw;
- Community Sustainability Plan; and
- Fort Saskatchewan Engineering Servicing Standards.

The City reserves the right to supplement these guidelines with regular updates to these standards. Developers, Consultants and Developer Representatives using these standards should consult with City Representatives to ensure any supplemental requirements are adhered to. For example, the City shall, on a regular basis, update permitted and non-permitted tree species within these standards or other using other documents.

It is the City's mandate to promote safe, comfortable, sustainable and easily maintained public open space. We encourage the retention of natural areas where possible, and a balance of formal and naturalized constructed landscapes. The City recognizes the importance of ecological protection and creating landscapes that accommodate human use while respecting ecological integrity.

A Developer is responsible to construct landscape developments in accordance with the minimum landscape development standards indicated to the satisfaction of the City Representative. The City at its discretion, may consider alternatives to or relaxations of the Guidelines and Specifications when the Developer or their agent provides a written submission identifying the reasons for special considerations.

These Guidelines will be reviewed and updated on a regular basis to always remain relevant to the City's development objectives. It is the responsibility of the Developer or the Developer Representative to ensure the latest guidelines are being used.

The Developer is responsible for assigning a qualified individual or consulting firm to act as Developer Representative. The assigned Developer Representative acting on behalf of the Developer must be fully competent and licensed in good standing with its applicable professional organization. During construction, the Developer Representative will be responsible for:

- ensuring Contractors comply with all local, Provincial and Federal requirements related to health and safety, environmental protection and corporate certification as described elsewhere in these standards;
- ensuring all work is completed in accordance with these standards, the development agreement, and the approved drawings;
- ensuring compliance with all required setbacks and monitoring site locations provided by Alberta First Call or other similar utility location agencies;
- arranging for a project startup meeting prior to any construction and any required site meetings that may be required during construction. City representatives shall be invited to attend these meetings;
- approving rough and finished grades for all work, and approving the location of all proposed site features such as trails, trees and shrubs;
- ensuring plant material conforms to all required standards, prior to installation, and receiving validation of the plant material source(s);
- ensuring fences are built in accordance with the survey completed;
- making regular records on the progress of construction, which shall be made available to the City upon request; and
- coordinating all applications and inspections as required.

These Guidelines are organized in the following sections:

- 6.2: Definitions and Acronyms;
- 6.3: Drawing Approval and Preparation;
- 6.4: Site Preparation;
- 6.5: Surface Improvements;
- 6.6: Plant Material;
- 6.7: Site Amenities;
- 6.8: Special Features;
- 6.9: Stormwater Management Facilities;
- 6.10: Construction Completion, Warranty and Maintenance Period Final Acceptance; and
- 6.11: Standard Drawing Details.

6.2 Definitions and Acronyms

CCC – Construction Completion Certificate;

City Representative – the designated individual appointed by the City of Fort Saskatchewan having the authority to review, approve and accept proposed drawings and applications;

Construction Completion – point at which at least 95% of all proposed improvements are in place, and constructed in accordance with the City Specifications, detailed drawings and the development agreement;

Consultant / Developer Representative – the designated party acting on behalf or in coordination with a Developer, providing expertise in a professional field such as engineering, landscape architecture, planning, geomatics, etc.;

Developer – usually the land owner of developing land who intends to, or has executed a development agreement with the City to improve public open space;

Developer’s Representative – an individual or professional consulting firm appointed to act on behalf of a Developer and liaise with the City on an official basis. For certification purposes, the individual or firm must provide evidence of professional competency and maintain in good standing Provincial professional registration with her or his corresponding profession and acting within scope of practice.

FAC – Final Acceptance Certificate

Formal Landscapes – public open space that includes a combination of native and non-native plant species, and requires a higher level of routine maintenance such as regular mowing, irrigation and programming of active recreation;

MR – Municipal Reserve, as defined by the Municipal Government Act of Alberta

Natural Ecosystems / Natural Areas – public open space comprised of naturally occurring ecosystems or those constructed to replicate natural areas of the region, such as native grasslands, native plant areas or constructed wetlands. These areas usually accommodate passive recreation limited to viewing areas and trails, while providing adequate setbacks to protect ecological integrity;

Naturalized Ecosystems – public open space constructed in a manner that replicates natural areas, such as constructed wetlands, native grasslands, and forested areas comprised of species native to the region. Naturalized ecosystems require maintenance practices different than formal landscapes; and

The City – meaning the City of Fort Saskatchewan.

6.3 Drawing Approval and Preparation

6.3.1 Guideline

The Developer must provide complete drawing sets that represent the full extent of development for landscape improvements. Drawings for all open space improvements must be submitted concurrently with engineering drawings, should engineering improvements be part of the project scope. Drawing reviews by the City are for the sole purpose of determining compliance with the standards and other applicable plans. The City’s review and acceptance of any submissions do not relieve the Developer or Developer’s Representative of their responsibility for errors and omissions or their obligation of meeting all requirements of these standards and any other Municipal, Provincial or Federal rules and regulations.

6.3.2 Certification

Drawings for all submissions must be sealed and signed by a Professional Landscape Architect (AALA), Professional Engineer (APEGA), Professional Agrologist (AIA), or Professional Architect (AAA) that is registered and in good standing with their Provincial Association. The signing professional must be competent in all facets of design that are included in the drawing set. Should more than one professional seal be applied to any drawing for interdisciplinary work, the drawing must clearly identify which professional seal covers what aspects.

Any Erosion and Sediment Control (ESC) plans must be certified by any of a Professional Engineer (P.Eng.) or Certified Professional in Erosion and Sediment Control (CPESC), in good standing with their respective professional association.

A current member of the Canadian Playground Safety Institute (CPSI) or Professional Landscape Architect (AALA) must certify drawings and information packages for any playground equipment.

6.3.3 Drawing Submission Requirements

Drawing Compilation

All drawings shall be completed in accordance with the City of Fort Saskatchewan drawings standards.

Drawings Required

Location and Index Plan

All of this information may be included on a single drawing or on separate drawings depending on the size of the project and on individual preference. The location plan should show:

- street names or nearby roads;
- phasing (if applicable) for past and current stages;
- limits of proposed development for the current drawing package, etc.; and
- list of drawings in the package, required only for packages that exceed six pages.

Existing Conditions Plan

Any existing site features including:

- existing topography and overall drainage patterns;
- natural features, such as vegetation, watercourses, pipelines, railways, easements, etc.; and
- the context of surrounding development, including road or trail connections, grades, etc.

Grading Plan

Plans that demonstrates proposed grading to include:

- spot elevations at all property corners within or nearby the site;
- proposed contours at suitable intervals and locations depending on the scale of drawing;
- arrows showing generic pattern of flows as well as percentage slopes; and
- any temporary site access, laydown areas, parking, stockpile locations, equipment storage (during construction) and site boundaries.

Surface Treatment Plan

- Existing and proposed surface materials, including but not limited to hard surfaces, mowed lawn area, naturalized grass areas, gravel surfaces, etc; and

- A table must be included on drawings that indicate the total area of mowed grass, trees and shrubs required and the number provided to reconcile plant requirements, total area of mulched beds, total area of naturalized grass, and total area of any other surface treatment.

Fencing Plan

- types, height and location of various fences;
- location of property lines, and notes stating where fence alignments are proposed compared to property lines;
- locations and widths of gates, if applicable; and
- locations of bollards along PULs, walkways, MR entrances, multiways, etc.

Planting Plan

- all turf, perennial plants, ground covers, shrubs, and trees;
- total measurements (in sq.m.) of shrub beds, flower beds, islands, buffers, PULs, MRs, ERs, SWMFs, parks, etc.;
- total measurements (in sq.m.) of proposed seeded and sodded areas, existing vegetation;
- existing and proposed utilities, including proposed planting setbacks from each of these utilities that conform to minimum setbacks prescribed by each utility owner;
- all existing vegetation to remain, any existing vegetation to be relocated on site, areas of existing ground to remain, etc.;
- plants to be drawn to 2/3 of the mature spread or diameter, as published in the Canadian Standards for Nursery Stock in its latest edition, a publication of the Canadian Nursery Landscape Association (CNLA);
- a plant schedule, with a graphical key that correlates the plant list with all species on that page. Plants must be coded with maximum three letters and must include the total number of plants that are keyed on the overall page. The plant schedule will include the number of each species, the name of each plant in both common and botanical (latin) name, the size of plants (height for coniferous trees, DBH for deciduous trees, height for deciduous shrubs, spread or height for coniferous shrubs and container size for perennials) and any conditions of the proposed plant (such as number of canes, minimum and maximum branching heights, etc.). The Canadian Standards for Nursery Stock in its latest edition must also be referred to in classifying plant sizes, conditions and other attributes noted on the plant schedule;
- areas to be seeded or sodded, and including the proposed seed mix for each area. The legend shall demonstrate what each seeded area hatch type represents. Each seed mix must also include proposed seed rates and type of application;
- mulches for plant beds or other landscaped areas, including mulch type and proposed depth;
- location of any trails, driveways and other hard surfaces; and

- a chart showing the total amount of MR on site, and a calculation demonstrating the rationale for the number of trees and shrubs proposed for each area.

Furniture Plan

- location of proposed site furnishings, such as benches, waste receptacles, picnic tables, pedestrian scaled lighting, signage, etc.
- lighting may be required at the discretion of the City, for multi-use trails. Stubbing must be completed for lighting along trails for multi-use trails, if required.

Irrigation

Irrigation is not a minimum requirement in Fort Saskatchewan for any new development. Special circumstances may lead to a proposed irrigation system for any of the public open spaces proposed in plans. Irrigation plans shall demonstrate:

- types of irrigation application used, such as drip, broadcast, etc. irrigation;
- stubbing of sanitary water and power; this is for irrigation or park washrooms;
- location of each irrigation head and extent of coverage for each unit;
- location and diameter of all water supply lines;
- requirement for tracer wire alongside all water lines and irrigation lines;
- location of all blow-out valves, controller units, junction boxes, control valves, etc; and
- power supply and lines for the irrigation system.

Erosion and Sediment Control

Erosion and sediment control (ESC) plans must include, at minimum and must consult with engineering standards:

- protection measures for all existing natural features, such as watercourses, vegetated areas to remain, etc.;
- inlet protection measures, demonstrating how catch basins and other utilities that lead to SWMFs are protected in advance of turf and other groundcovers being established and protected from erosion and sedimentation;
- temporary erosion control measures used to protect the site from erosion during the course of construction;
- permanent erosion control measures, such as blankets, mulches, etc. that are used to minimize or prevent erosion from taking place on site;
- sediment control measures such as silt fences, sediment socks, straw bales, etc. used to collect sediment once under transport;
- wind protection measures to prevent transport of sediment via the air, particularly addressing stockpiles and areas of soil that will remain bare for extended periods of time; and
- listing of best management practices for ESC planning, such as tracking, equipment washing, contouring, etc.

ESC plans should include a list of estimated units for each proposed ESC measure along with notes describing best management planning strategies such as having ESC products on hand during construction.

Playgrounds

Where playgrounds are proposed, detailed drawings must include, at minimum, the following information:

- layout plan including dimensions shown to the interior of the edging. Include lengths of all straight lines, tangent points and diameters. Dimensions to be interior of edging system;
- grading plan indicating subgrade elevations. Show spot elevations at key locations, and arrows indicating slope direction and percentage. Subgrade to be no less than 1% slope, preferred in a single direction. Grading plan to also include elevations of top and bottom of perimeter edger at regular intervals;
- drainage tile system is required for all playgrounds. Grades along both perforated pipe and solid pipe segments to be shown, demonstrating bottom of pipe elevation. Include grades for daylight points, and up to 5.0m beyond the playground to demonstrate flow of water away from the playground;
- all equipment to be designed in accordance with CSA Standards, and all equipment to meet all local, Provincial and National standards. Notes to include all standards that have been met; and
- include plan view, 3D perspective view and elevations of all proposed equipment, including foundations required for installation. Elevations to show location of subgrade and top of sand fill compared to equipment foundations.

Details

When a detail is available from these standards, drawings must include the standard drawing provided in its entirety, without modification and including the City of Fort Saskatchewan title block for each detail. Should any modification be made to any standard detail it cannot use the City of Fort Saskatchewan title block. Drawings must include any other detail required to depict construction materials, methodology and final product.

Supplemental Information

Along with all submissions for approval, the Developer shall submit documentation to the City indicating that permission has been received from appropriate authorities for crossing of pipelines, railways, highways, or other facilities that require approval.

6.4 Site Preparation

6.4.1 Subgrade Preparation

This section includes the requirements for the preparation of subgrade for landscaped areas.

Guideline

Prepare and provide grading plans for review and approval prior to commencement of work. Design the sub-grade to provide a minimum of 2% a gradient across all landscape areas and away from all structures. Grades for special features may have a lesser grade, however requires prior approval by the City. In no circumstance will turf areas be permitted to have a slope less than 1%.

Provide the City a minimum of 7 days notice prior to arrival on site and advise what work is to be undertaken. Begin operations on site only when grading plans have been approved. Obtain permits as needed and maintain on site for review by inspectors

Off-site drainage onto a reserve parcel and public utility lot/right-of-way is to be limited.

Confirm the sub-grade is not contaminated and is free of all deleterious materials. If contamination or deleterious materials is suspected or found immediately inform the City of Fort Saskatchewan and suspend work pending resolution.

Materials

All materials used are subject to inspection, testing and approval by the City. Use only clean fill materials that are free of all hazardous and deleterious waste, large boulders, roots and other organic materials that may impact proposed development.

Installation

Place fill materials in compacted lifts not exceeding 300mm in depth. Do not place materials in wet, muddy or frozen state. Lifts shall be uniform in thickness throughout the project area as subgrade profiles are constructed.

Compact finished sub-grade and all fill material to a minimum 85% Standard Proctor Density for areas under turf or planting, 98% Standard Procter Density for areas under walks and site amenities.

Scarify sub-grade in areas for topsoil placement to a depth of 75mm in all areas except where considered impractical by The City. Whenever compaction is greater than or equal to 95% standard proctor dry density scarification will be required to a depth of 200mm.

6.5 Surface Improvements

6.5.1 Topsoil Supply and Placement

Guideline

Topsoil shall be placed in all areas that are intended to support plant materials to the depths specified for the intended use.

Imported topsoil may only be used with pre-approval from the City of Fort Saskatchewan.

Native soils must be used on all areas of natural reclamation and in environmental reserves.

Topsoil Material

Topsoil shall be free of subsoil, clay lumps, stones, live plants and other roots, sticks or other extraneous matter. The volume of rock shall not exceed 2%. Screened topsoil is preferred.

Recommended soil composition:

- 35% Sand; 30% Clay; 35% Silt;
- Organic matter 5 - 10 %
- Free of toxic materials
- Electrical conductivity of max. 1.5 ohms per cm²
- pH of 6.0 - 7.5.

The contractor shall submit a sample and an independent laboratory analysis of topsoil from each source to be used seven calendar days in advance of delivery to the site. The laboratory analysis shall include tests for N, P, K, minor element values, soluble salt content, electrical conductivity, pH and physical values (sand, clay and organic material). Test results must be provided to the City Representative prior to topsoil installation. Copies of soil test results from a certified laboratory must demonstrate conformance to these standards. The soil test results must be submitted to the City by email to landscape@fortsask.ca. If necessary, bonemeal, limestone, pesticides, phosphates, sulfates or other amendments shall be added as accepted by the City.

Final topsoil test results and documentation of any amendments made after the time of testing must be provided to the City as part of any application for Construction Completion. The City reserves the right to refuse applications for Construction Completion without adequate testing information made available. The Developer's Representative, at the time of CCC application, must certify that topsoil test results provided are representative of the actual topsoil used on site, and that the tests resulted from samples that were properly collected in accordance with best management practices of the industry. Refer to Part I: Applications, Checklists and Forms for information on the certification required.

If organic material is required to meet the organic material specifications for topsoil, peat moss shall be added in the field and thoroughly mixed with cultivation equipment. The peat moss shall meet the following specifications:

- free of toxic material, live plants, live roots, seeds or other deleterious material
- delivered in a pulverized condition
- approved prior to mixing with the topsoil
- of a pH not less than 4.5 and not greater than 6.0

If necessary, clean sharp sand free of all deleterious materials may be added to meet topsoil specification.

Lime is to be used where the pH of the soil is less than 6.0. The lime shall be ground limestone containing not less than 80% of total carbonates combined. It shall be ground to such fineness that at least 50% will pass a 100-mesh sieve and at least 90% will pass a 20-mesh sieve. Where limestone is specified it shall be stored in such a manner as to stay dry and free flowing.

Recourse and Procedures for Inadequate or Missing Tests

Developers are responsible for ensuring topsoil material used on projects in the City of Fort Saskatchewan meets the criteria set forth in these standards. Compliance must be demonstrated through testing by a certified laboratory. The City, at its discretion, may accept topsoil that does not meet standards, and in this instance will provide confirmation in writing that material outside the specifications may be used, either as-is or with proposed amendments.

Should documentation not be made available at the time of CCC application, the Developer will be responsible for topsoil sample collection from the site, taken at representative volumes to the full minimum depth specified for each area. The City may, at its discretion, take its own samples at any time and conduct independent testing at the expense of the Developer. Reconciliation of any expenses incurred by the City for follow-up testing must be completed prior to issuing a CCC for the subject area.

Should follow-up testing not meet proper specification, the Developer will be responsible for amending topsoil materials in place through rototilling in appropriate amendments or complete removal and replacement of inadequate topsoil. Reseeding may be required depending on the approved amendments.

Topsoil Installation

Prior to placing topsoil, ensure subsoil is prepared appropriately. All weeds, roots, stones larger than 25 mm in diameter and other foreign matter shall be removed from the surface of the subsoil. Immediately before placing topsoil the subsoil shall be loosened to a depth of not less than 50 mm by means of a disc, spike tooth harrow or other means satisfactory to the City and leveled to a firm, even surface. The final grade shall be 50 mm (or as specified) below the adjacent top of curb and/or subgrade and sloped so that no ponding or runoff onto adjacent private property occurs.

All existing utilities shall be adjusted to finished grade elevations and all existing features (curbs, sidewalks, trees, monuments, valves, etc.) shall be protected against any damage.

The topsoil shall be uniformly spread in dry weather on the prepared subsoil over approved subgrade to the minimum compacted depth specified. Topsoil shall not be placed when either the topsoil or subsoil is frozen, excessively wet, extremely dry or otherwise in a condition detrimental to proper grading, compaction or cultivation. The upper 50 mm shall be of a fine texture and free of stones or lumps 6 mm or larger. Allowances for settlement shall be provided where necessary. Manually spread topsoil around trees, plantings and structures to prevent damage. Place topsoil to the following depths:

Application	Min. Depth Required on Sand Subgrade	Min. Depth Required on Clay Subgrade
Seeded Areas, Mowed Grass	300mm	200mm
Seeded Areas, Naturalized (non-mowed) Grass	250mm	150mm
Sodded Areas	200mm	150mm
Shrub Beds	750mm	600mm

If required, lime shall be well worked into the soil before the application of topsoil to obtain a minimum pH value of 6.0.

Ensure that finish grades will be flush with adjacent surfaces, structures and property lines.

After topsoil placement the area shall be thoroughly cultivated, harrowed and floated to a minimum depth of 100 mm. All hard lumps shall be broken down and all stones larger than 25 mm in diameter, roots, stumps and other foreign matter shall be removed and disposed of.

Fertilizer shall be applied at a rate of 10 kg/100 m² with an approved spreader and be well worked into the upper 75 mm of soil. Alternate fertilizer application rates may be proposed based on soil test and fertilizer recommendations from these tests.

Topsoil shall be lightly compacted to 80 – 85% standard Proctor density to prevent disproportional settlement within the project area. Topsoil must be free of any rutting or heavily compacted areas as a result of any activities such as equipment travel over topsoil areas.

Float the surface until smooth and fine grade to eliminate rough or low areas. Final grade for seeded areas shall be flush with adjacent surfaces, for sod shall be 25 mm below finished grade of adjacent work. Maintain all relative grades and drainage conditions as established and approved during sub-grade preparation. Obtain approval of finished topsoil grade and preparation from City before application of seed or sod.

Make good any damage caused by topsoil supply and placement activities to the satisfaction of the City of Fort Saskatchewan. Leave site in a neat and workmanlike condition able to receive landscape components to be installed. Any topsoil tracked onto roads, walks and trails to be cleaned after each work day, unless these areas are within fenced construction areas that are not accessible to the public or being used by City maintenance staff.

6.5.2 Supply and Installation of Grass Seed

Guideline

Areas proposed to be seeded and seed mixes shall be pre-approved for seed application by the City of Fort Saskatchewan. Seed shall not be planted before May 1 or after September 15th, unless given consent in writing by the City Representative.

Seed which fails to germinate for whatever reasons shall be re-cultivated and re-seeded at the Developers expense until germination has taken place and satisfactory growth established.

Materials

Grass seed shall be Canada #1 certified seed meeting the requirements of the "Canadian Seeds Act". The mixture shall comply with federal and provincial seed laws and have a minimum germination of 75% and a minimum purity of 97%. Bags containing the seed mixture shall be

clearly tagged, showing the name of the supplier, the contents, the date bagged and location, and the year of seed production. Seed varieties shall be mixed and application rate set to suit the planting conditions and location. Acceptable seed mixes and application rates are outlined in Table 1. Other mix designs may be used, subject to the written approval of the City.

Water shall be free of any impurities that would inhibit germination or otherwise adversely affect growth.

Fertilizer shall be packed in standard containers, clearly marked with the name of the manufacturer, mass and analysis. Use only standard commercial fertilizer with guaranteed chemical analysis. Fertilizer to be stored in a dry location prior to use.

Seed mixes that are recommended by the Developer's Representative will be assessed by the City to ensure adequate conditions and appropriate species. The City reserves the right to accept or reject any proposed seed mix. Seed mix recommendations must be endorsed by a qualified professional with adequate competencies in seed mix design and applications.

TABLE 1
RECOMMENDED SEED MIXES

GENERAL PARKS AREA MIX			
SUITABILITY	MIXTURE	APPLICATION RATE	
For general use in park areas	Argyle Kentucky Bluegrass	25%	Seed Drill = 100 kg/ha
	Bluechip Kentucky Bluegrass	25%	
	Tomcat Tall Fescue	25%	
	Creeping Red Fescue	15%	Broadcaster = 125 kg/ha
	Perennial Rye Mix	10%	
	Total	100%	
SPORTS FIELD MIX – A			
SUITABILITY	MIXTURE	APPLICATION RATE	
For use on dry land,non-irrigated sports fields	Argyle Kentucky Bluegrass	25%	Seed Drill = 150 kg/ha
	Able 1 Kentucky Bluegrass	25%	
	Nu Density Kentucky Bluegrass	15%	OVER SEEDING RATE
	AC Parkland Crested Wheatgrass	20%	Vertical/spike Overseeder = 100 kg/ha
	Tomcat Tall Fescue	25%	
	Citation Perennial Ryegrass	15%	
	Total	100%	
SPORTS FIELD MIX – B			
SUITABILITY	MIXTURE	APPLICATION RATE	
For use on irrigated sports fields	Award Kentucky Bluegrass	20%	Seed Drill = 150 kg/ha
	Nu Density Kentucky Bluegrass	20%	
	Tsunami Kentucky Bluegrass	20%	OVER SEEDING RATE
	Tomcat Tall Fescue	25%	Vertical/spike Overseeder = 100 kg/ha
	Citation Perennial Ryegrass	15%	
	Total	100%	
STORM WATER POND MIX – A			
SUITABILITY	MIXTURE	APPLICATION RATE	
Wet meadow to withstand 2-3 weeks of flooding	Fowl Bluegrass (Nutracoat)	25%	Seed Drill = 30 kg/ha
	AEC Hillcrest Awned Wheatgrass	20%	Broadcaster = 60 kg/ha
	Nortran Tufted Hairgrass (Nutracoat)	15%	Hydro Seeder = 120 kg/ha
	ARC Sentinel Spiked Trisetum	15%	
	Fults Distans Alkali Grass	15%	
	Beckmann's Sloughgrass	10%	
	Total	100%	

STORM WATER POND MIX – B		
SUITABILITY	MIXTURE	APPLICATION RATE
Dry meadow to withstand 2-3 days of flooding	ARC Mountainview Junegrass 20%	Seed Drill = 30 kg/ha
	Adanac Slender Wheatgrass 20%	Broadcaster = 60 kg/ha
	Elbee Northern Wheatgrass 15%	Hydro Seeder = 120 kg/ha
	Green Needle Grass 15%	
	Sodar Streambank Wheatgrass 10%	
	Nakiska Sheep Fescue 10%	
	Blue Gama (Nutracoat) 10%	
	Total 100%	
HIGHWAY/ROADSIDE MIX		
SUITABILITY	MIXTURE	APPLICATION RATE
Highways and roadsides including ditch sides and bottoms	Slender/Awed Wheatgrass 25%	Seed Drill = 30 kg/ha
	Green Needle Grass 15%	Broadcaster = 60 kg/ha
	Fringed Brome (Nutracoat) 15%	Hydro Seeder = 125 kg/ha
	Northern Wheatgrass 10%	
	Indian Rice Grass 10%	
	Canada Wild Rye 10%	
	Alkali Grass 10%	
	Western Wheatgrass 5%	
	Total 100%	
TEMPORARY COVER MIX - DISTURBED SOILS TYPE A		
SUITABILITY	MIXTURE	APPLICATION RATE
For disturbed soils where development will occur within 1 - 2 years	Annual Ryegrass 25%	Seed Drill = 100 kg/ha
	Perennial Ryegrass 75%	Broadcaster = 125 kg/ha
		Hydro Seeder = 200 kg/ha
	Total 100%	
TEMPORARY COVER MIX - DISTURBED SOILS TYPE B		
SUITABILITY	MIXTURE	APPLICATION RATE
For disturbed soils where development will occur within 4 - 5 years	Annual Ryegrass 25%	Seed Drill = 100 kg/ha
	Perennial Ryegrass 25%	Broadcaster = 125 kg/ha
	Argyle Kentucky Bluegrass 25%	Hydro Seeder = 200 kg/ha
	Turf Type Tall Fescue 25%	
	Total 100%	

Installation

The Developer shall obtain approval of the seedbed from the City Representative before proceeding with any seeding. Once subgrade preparation is complete, the Developer must inform the City Representative that sites are ready for topsoil with three days notice prior to seeding. The City at its own discretion may conduct an interim inspection of subgrade areas. The seedbed shall be free of frost, snow or standing water. Seeding shall not occur if the soil temperature is below 7°C. Seeding shall not be carried out when wind velocities are above 15 km/h. All seed tags from bags used during construction shall be collected and provided to the City at the time of

Construction Completion Inspection. Seed tags must demonstrate that seed mixes are consistent with design drawings, and the number of seed tags collected will demonstrate the quantity of seed used for the site.

For slopes less than 3:1, grass seed shall be sown at a rate (kg/100m²) as per supplier recommended in two passes of a mechanical spreader at 90° to each other. Seed shall be applied by means of an approved mechanical dry seeder "Brillion" or approved equal which can roll and cover the seed with 3 mm to 6 mm of soil. Where the above type of equipment cannot be used, seeding may be done by a cyclone seeder or equivalent dragged with flexible wire mat and rolled with a light turf roller weighing between 90 and 114 kg into the prepared seedbed in two directions in equal amounts.

For slopes greater than 3:1, a hydro-seeder of approved design capable of thoroughly mixing water, grass seed, fertilizer and pulverized wood fiber shall be used at the following rates:

- Grass Seed 24 kg/1000 m²
- Water 468 L/1000 m²
- Mulch 170 kg/1000 m²
- Fertilizer 50 kg/1000 m²

In lieu of using a hydro-seeder, seeding may be done by a mechanical dry seeder as described above, but the seeded slope shall be protected with an approved erosion control blanket installed to manufacturer's specifications to prevent erosion.

Make good any damage caused by seeding activities to the satisfaction of the City. Leave site in a neat and workmanlike condition. Any debris tracked onto roads, walks and trails to be cleaned after each work day, unless these areas are within fenced construction areas that are not accessible to the public or being used by City maintenance staff. Any damage to seeded areas to be addressed promptly.

Seeded areas are to be watered frequently and with a fine spray which will not create any erosion problems.

Approximately six weeks after germination the area shall receive a supplementary application of an organic fertilizer at rates determined by soils tests. If seed fails to germinate within four growing months re-cultivate and reseed until germination takes place.

Application for CCC for developments that include seeded areas cannot be made until which time evidence of germination is in place. Germination at CCC includes minimum 80% coverage of all seeded areas.

Continuously maintain and warranty landscape work as specified for a period of at least two (2) years from the issuance of a Complete Completion Certificate (CCC) and until the issuance of a Final Acceptance Certificate (FAC). At the time of FAC, seeded areas must be fully covered with vigorous growing grass, with no evidence of seed rows. Maintain all seeded areas in accordance with Part H: Construction Completion, Warranty Period and Final Acceptance.

For any development that includes seeded areas, the Developer is responsible for scheduling an interim inspection with the City, approximately one year after CCC. The purpose of this inspection is to ensure full coverage of seed and to ensure weed control has been completed during the first twelve months of growth. The City, at its own discretion, may inspect sites on a routine basis during the warranty period and require the Developer to mitigate for any concerns with

germination, turf coverage and weed control. Refer to Part H: Construction Completion, Warranty Period and Final Acceptance for additional information.

Final inspection of seeded areas will be made prior to the end of the warranty period. At the time of inspection the turf should be mowed and shall be alive and in a healthy satisfactory growing condition, free of weeds. Areas that show root growth failure, deterioration, bare or thin spots or which have been damaged by any means will not be accepted by the City.

Recourse and Procedures for Inadequate Germination or Weed Control

It is understood that sites may not be fully germinated and entirely weed free at the time of CCC. An interim inspection after one full year of growth will identify germination, coverage of turf and weed control. The City maintains discretion to extend the warranty period of any site at the time of any interim inspection or at the time of FAC should inadequate germination, coverage or weed control be observed.

6.5.3 Supply and Installation of Sod

Guideline

Areas proposed for sod and sod type shall be pre-approved for application by the City of Fort Saskatchewan. Sod shall not be planted before May 1 or after September 15th, unless given consent in writing by the Client Representative. Sod which fails to establish for whatever reasons shall be re-planted at the Developers expense until establishment and satisfactory growth has been demonstrated.

Materials

Sod shall be certified No. 1 cultivated turf grass sod of the type as specified on the Plant List, grown and sold in accordance with the classification of the Nursery Sod Growers Association of Alberta and Western Turfgrass Association Standards. At time of sale it shall have a strong, fibrous root system and shall be free from stones and burned or bare spots. Sod shall consist of a uniform mixture of the industry standard mix as per Sod Growers Association of Alberta latest manual, or approved equal. Sod shall be cut by approved methods in accordance with the recommendations of the Sod Growers Association of Alberta and/or the Canadian Nursery Trade Association shall be:

- a minimum of eighteen months old;
- of a quality that satisfies weed tolerance rates as outlined by the Growers Association;
- 20 - 25 mm in uniform thickness;
- cut in strips of uniform width;
- sufficiently moist so that no burning of the edges has occurred; and
- harvested at min. 12 mm soil depth, cut uniform free of any holes and tears.

Water shall be free of any impurities that would inhibit germination or otherwise adversely affect growth.

Topsoil used as joint dressing shall be of best quality and screened.

Fertilizer shall be packed in standard containers, clearly marked with the name of the manufacturer, mass and analysis. Use only standard commercial fertilizer with guaranteed chemical analysis. Fertilizer to be stored in a dry location prior to use.

Installation

The Contractor shall obtain approval from the City Representative before proceeding with any sod installation to ensure proper topsoil placement. Sod shall not be laid before May 1 or after September 30, unless authorized in writing by the City Representative. Sod laying on slopes 3:1 or steeper shall not be done when temperature is above 23°C. Sod shall be laid evenly with staggered joints closely butted together and matched to the existing grades or surrounding areas. All areas shall be rolled with a medium roller (90 to 114 kg) to provide close contact between sod and topsoil and to produce a smooth and even surface. Sod shall be laid at right angles to the slope along the contours of the slope. On slopes of three horizontal to one vertical or steeper, pegs/staples shall be driven full depth on intervals of 1 m. horizontally and vertically.

The sod shall be watered sufficiently to saturate the upper 150 mm of soil immediately after installation. After sod and soil has dried sufficiently to prevent damage, the area shall be again rolled with a medium roller to ensure a good bond between sod and soil and to remove minor depressions and irregularities. Adequate watering shall again be applied immediately following rolling to saturate the upper 150 mm of soil. Watering shall be carried out when required to prevent grass and underlying soil from drying out for a minimum period of 15 days after placement or until the sod is well rooted and established.

The finished turf shall be smooth and even, and there shall be no sudden irregularities in the final grade.

Approximately four weeks after sod is laid, and after the initial cutting, the sod area shall receive an application of organic fertilizer, rates determined by soils tests.

Continuously maintain and warranty landscape work as specified for a period of at least two (2) years from the issuance of a Complete Completion Certificate (CCC) and until the issuance of a Final Acceptance Certificate (FAC). Maintain all sod areas in accordance with Part H: Construction Completion, Warranty Period and Final Acceptance.

Final inspection of sod areas will be made at the end of the warranty period. At the time of inspection the turf should be mowed and shall be alive and in a healthy satisfactory growing condition, free of weeds. Areas that show root growth failure, deterioration, bare or thin spots or which have been damaged by any means will not be accepted by the City. The City will accept topdressing and overseeding of sod for any area less than 1 sq.m. Areas larger than 1 sq.m. must have the dead sod cut and replaced with new sod. Any new sod must be fully established and well knit prior to FAC.

Make good any damage caused by sod activities to the satisfaction of the City. Leave site in a neat and workmanlike condition. Any debris tracked onto roads, walks and trails to be cleaned after each work day. Any damage to sod areas to be addressed promptly.

6.6 Plant Material

6.6.1 Guideline

Plant Source and Hardiness

All plant material shall conform to the horticultural standards of the "Canadian Nursery Trades Association" standards for the Fort Saskatchewan area. Nomenclature (plant names) shall conform to the rules of the international code of nomenclature for cultivated plants. All plants shall be

nursery grown in Alberta, unless approved otherwise, of sound stock, typical of their species or variety.

Plant materials shall be healthy (free from damage, disease and pests, eggs or larvae), well-branched, densely foliated when in leaf with well-developed root systems and of the specified caliper and height. All undersized or girdling root systems will be rejected. Stock shall be free of mechanical damage. Tags shall remain until inspection is complete. Substitutes are not permitted unless pre-approved in writing by the City Representative.

Species of trees, shrubs, and ground covers shall be selected to suit the planting conditions and site locations. Fort Saskatchewan is situated between the Boreal Forest – Dry Mixed wood Natural Region and the Central Parkland Natural Region of the province. For parks, open spaces, and naturalization areas, diversity of species, aesthetics, hardiness, disease resistance, natural occurrence, rate of growth and growth habit, and ratio of trees, shrubs, and perennials shall be considered when selecting varieties. Special consideration shall be given to the suitability of a species (including size, growth habit, hardiness, and maintainability) for boulevard and median plantings.

Prior to installation trees and shrubs may be pre-selected at the nursery. This however does not ensure that trees will be accepted by the City when they arrive on site as damages that occur while in transit may over-ride acceptance at the nursery. The Developer is responsible to ensure all plant materials arrive safely, without damage and in a healthy growing condition.

Plant Material Selection

The City encourages a diversity of trees and shrubs throughout its public realm. Designers are encouraged to specify a range of species, while ensuring species are well suited to the region, actual site soils and other growing conditions presented by each site.

For some species and varieties that are unknown to the City or have yet to be used in Fort Saskatchewan, the City may require clarification or more research by the Applicant to justify the selection and to demonstrate local hardiness and suitability. All proposed plant material must be hardy to minimum Zone 3b, referring to the Plant Hardiness Zone by Municipality charts published by Natural Resources Canada, Government of Canada. All plant material must be certified plants, sourced from an Alberta-based nursery or growing operation. Proof of source may be requested by the City prior to delivery and installation. Any proposed substitutions after drawing approval will require approval by the City.

Tree selection criteria include:

- trees that provide adequate, year-round sightlines maintained for pedestrian and vehicular safety;
- minimum 1.8m branching height for all trees adjacent to roadways and walkways;
- trees with a single and sturdy vertical trunk with a well-balanced crown and fully developed leader, unless uncharacteristic for that species;
- trees with a single and prominent central leader and balanced branching habit. They must be free from disease and insect pests, eggs or larvae, rodent damage, sunscald, frost cracks and other abrasions or scars to the bark;
- plant material that is structurally sound, healthy and vigorous, well branched and densely foliated when in leaf;
- alternating patterns of trees along streetscapes to avoid a monoculture of trees in a particular area; and

- no fruit bearing trees or oak trees to be placed near any sidewalk or trail near streets or boulevards but will be considered in along trails in open spaces.

Non-Permitted and Discretionary Plant Material

The following are non-permitted tree and shrub species that the City will not accept for planting. This list also includes discretionary plants, which may only be used with special consent by the City Representative. The City may, from time to time, amend this list on an annual basis as a result of new research, pests in the area, and other factors. Developers and their Developer Representatives should refer to the City website for any annual updates to this list of non-permitted species.

Non-Permitted Trees / Shrubs	
Any known invasive species, as listed by the Alberta Invasive Plants Council	
Caragana arborescens	Caragana
Elaeagnus angustifolia	Russian Olive
Populus tremuloides erecta	Swedish Aspen
Prunus padus commutate	Mayday
Prunus virginiana 'Shubert'	Shubert Chokecherry
Tamarix spp.	Salt Cedar
Discretionary Trees / Shrubs	
Acer negundo	Manitoba Maple
Acer platinoides	Norway Maple
Berberis vulgaris	Japanese Barberry
Berberis incana	Common Barberry
Cotoneaster acutifolia	Peking Cotoneaster
Cotoneaster integerrimus	Red-Fruited Cotoneaster
Cotoneaster nigra	Dark-Seeded Cotoneaster
Elaeagnus umbellata	Autumn Olive
Fraxinus pennsylvanica	Green Ash
Hippophae rhamnoides	Sea Buckthorn
Lonicera tatarica	Tatarian Honeysuckle
Picea abies	Norway Spruce
Pinus sylvestris	Scotch Pine
Populus alba	White Poplar
Rhamnus cathartica	Common Buckthorn
Rhamnus frangula (Frangula alnus)	Glossy Buckthorn
Sambucus racemose var. pubens	Elderberry
Sorbus aucuparia	European Mountain Ash
Syringa reticulata	Japanese Lilac
Syringa vulgaris	Common Lilac
Ulmus pumila	Siberian Elm
Viburnum opulus	European Highbush Cranberry

6.6.2 Materials

The planting of trees less than 40mm caliper shall only be undertaken on pre-approval in writing from the City of Fort Saskatchewan.

Trees larger than 40mm shall be referenced by caliper. Caliper shall be measured by:

- Deciduous trees with a caliper up to 100mm shall be measured no less than 15cm above the ground
- Deciduous trees with a caliper 100mm and larger shall be measured no less than 30cm above the ground.

Deciduous trees 100mm caliper and larger shall be machine dug as noted in table 2 and 3. Balled and burlapped trees shall be dug with firm natural balls of earth to sufficiently include most of the fibrous roots. Ball sizes shall meet the specifications noted in table 2 and 3.

Container grown trees shall be locally grown in a container for a minimum of two years and shall have a fully developed root system to sufficiently hold its soil together - no plants shall be loose in the container. Soil shall have sufficient moisture.

Table 2 - Deciduous Trees

Caliper (mm)	Root Ball Diameter (mm)	Machine Ball Diameter (mm)
25	600	N/A
50	750	860
75	900	1220
100 - 125	N/A	1520
150 - 250	N/A	2280

Table 3 - Coniferous Trees

Height (m)	Root Ball Diameter (mm)	Machine Ball Diameter (mm)
1.5 - 2.4	900	1220
2.4 - 3.0	1220	1520
3.0 - 3.5	1220	2280

Bare Root Shrubs shall be planted with adequate fibrous roots retained. The minimum size of root balls for shrubs shall be as specified by the Canadian Nursery Trades Association. Container grown shrubs shall be locally grown in containers for a minimum of two years. Container sizes shall be as specified by the Canadian Nursery Trades Association.

Fertilizers shall be 8-24-24 or approved equal delivered as specified in standard size, unopened containers, showing the weight, analysis and manufacturer's name, and will specify as either coniferous or deciduous.

Tree stakes shall be 2.0 - 2.5m in length and of the steel "T" bar type. Tree ties shall be a number ten (#10) gauge galvanized wire inserted into a 200 mm length of 10 mm diameter polyethylene plastic tubing. Tree ties shall be marked with orange flagging.

Water shall be free of any impurities that would inhibit germination or otherwise adversely affect growth.

Any wood type mulch is acceptable except that which is chemically treated or is salvaged from construction lumber, building demolition, or shipping waste. Coarsely ground mulch is preferred; otherwise use an even mixture in a range of sizes from 10mm x 10mm x 5mm to 40mm x 60mm x 35mm. Material should have no more than 5% by volume of soil, sawdust, peat moss, or needles. The best material is pulled out of piles that have composted for a year. No mulch from diseased or infested plant material is allowed unless it can be shown the material presents no risk to tree health.

6.6.3 Installation

The following table includes required spacing between various trees. Spacing is measured at the center of the tree trunk.

Table 4 – Blvd Tree Planting Spacing

Species	Min Blvd Width (m)	Min Spacing (m)	Max Spacing (m)
American Elm	2.0	15.0	20.0
Brandon Elm	2.0	10.0	15.0
Green Ash	2.0	9.0	14.0
Prairie Spire Green Ash	2.0	8.0	14.0
Foothill Green Ash	2.0	8.0	14.0
Patmore Green Ash	2.0	7.0	12.0
Crimson Sentry Maple	2.0	4.0	10.0
Redmond Linden	2.0	6.5	12.0
Bur Oak	2.0	9.5	14.0
Ohio Buckeye	2.0	4.5	10.0
Silver Cloud Maple	2.0	7.0	12.0
Columnar Norway Maple	2.0	2.0	6.0
Japanese Tree Lilac	2.0	4.0	10.0
Red Rocket Maple	2.0	2.0	5.0
Purple Spire Crabapple	2.0	1.4	5.0
Pinacle Birch	2.0	1.6	5.0
Amur Maple	2.0	3.0	8.0
Parkland Pillar Birch	2.0	1.4	5.0
Swedish Columnar Aspen	2.0	3.0	5.0

The following distances are minimum setbacks of trees from various site features. Spacing is measured from the closest edge of any site feature to the center of the tree trunk.

Table 5 – Minimum Setback Distance

Site Feature	Min Setback (m)
Street Corner	7.5
Light Poles	3.5
Stop and Yield Signs	4
Bus Stops	4
Other Signs	2
Driveways and Walkways	2
Fire Hydrants	2
Underground and Overhead Utilities, Pedestals, Transformers, and other Street Furniture	2

The following table outlines the minimum size of trees permitted to be planted. Smaller planting sizes are only permitted with consent in writing by the City Representative. Any trees that do not meet the minimum size specifications as note below may not be included in the total plant count of a site, at the discretion of the City.

Table 6 – Minimum Size Specification

	Size
Deciduous Trees	50mm Caliper at 15cm Above Ground
Coniferous Trees	2.0m in Height

Shrub beds shall be located as indicated on the approved drawings and staked on site so the limits of the bed can be assessed prior to excavation and planting.

Trees are to be planted as follows:

- Tree pits shall be excavated 450 mm (18 inches) greater in diameter than the ball of earth or spread of roots of the tree and deep enough to allow for a 150mm well compacted layer of the planting mixture beneath the ball or roots.
- Trees shall be set straight in the Centre of the pits, the root flare of the plant will be at the surrounding finished grade. Trees shall be faced to give the best appearance or relationship to adjacent structures, walkways or park features.
- Topsoil shall be backfilled in lifts not exceeding 300mm in depth. Each lift of soil shall be compacted to approximately 85% Standard Procter Density. Apply fertilizer as recommended by soil test or as noted on approved drawings.
- The top third of the wire basket must be cut off or folded down. All treated burlap is to be removed. Non-treated burlap can be pulled back and left.
- All plants shall be pruned after planting to the minimum necessary to remove dead or injured branches and to compensate for the loss of roots. Pruning practice shall be completed according to the I.S.A.

- A 75mm high x 1000mm diameter ring of topsoil shall be constructed around each tree with the tree trunk centered in the ring to facilitate watering. This ring will be covered entirely by mulch.
- Each tree shall be well watered at the time of planting. A regular schedule of watering shall continue until maintenance period expires.

Trees are to be staked as follows:

- Deciduous Trees (bare root) shall be supported by a tree stake driven securely into the ground, plumb, on the windward side of the prevailing wind. The tree shall be fastened to the stake with a tree tie. (See Std. Dwg. H2.1)
- Evergreens and Deciduous Trees (Balled and Burlapped and machine planted) shall be supported by two (2) steel bars driven securely into the ground and fastened with a tree tie. Stakes shall be driven outside of the root ball. (See Std. Dwg.)

All newly planted trees are to be protected at the base with a horticulturally approved arbor guard.

Shrub beds to be prepared to a depth of 450mm below finished grade. Installation to include 600mm depth topsoil (clay subgrade) or 750mm depth topsoil (sand subgrade), and 100mm depth wood chip mulch or other specified decorative mulch. Install aluminum edger at min. 400mm depth all around beds as per manufacturer's specifications and flush with finished grade. Edger is not required where beds interface with paved surfaces.

Fertilizer shall be applied evenly over the pit at the following rates when approximately two thirds of the plant pit has been backfilled with soil:

Application	Application Rate
Vines, Groundcover	0.03 Kg/plant
Herbaceous Plants	0.03 Kg/plant
Small Shrubs	0.06 Kg/plant
Small Trees	0.25 Kg/25 mm of caliper
Shade Trees	0.50 Kg/25 mm of caliper
Evergreens	0.03 Kg/300 mm of height

All tree pits and shrub beds shall be mulched to a depth of 100mm. Mulch shall be kept back a minimum of 50mm from the base/trunks of each shrub/tree.

Continuously maintain and warranty all trees and shrubs for a period of at least two (2) years from the issuance of a Complete Completion Certificate (CCC) and until the issuance of a Final Acceptance Certificate (FAC). Maintenance shall include all measures necessary for and incidental to the establishment of all plants in an acceptable, vigorous and healthy growing condition. Maintenance includes the cultivation, edging and weeding of shrub beds and tree pits.

Replacements of dead/unacceptable plants shall be made within 72 hours of notification unless arrangements are otherwise made and agreed to in writing. Refer to Part H: Construction Completion, Warranty Period and Final Acceptance.

Final inspection of trees and shrubs will be made prior to the end of the warranty period. At the time of inspection trees and shrubs shall be alive and in a healthy satisfactory growing condition. Trees that have been recently replaced or are dead, damaged, diseased will not be accepted by the City. All plant material must be in place for no less than 12 months prior to FAC in order to be considered for acceptance.

Subject to approval from the City of Fort Saskatchewan Parks Department, the City will consider a cash in lieu payment for extended warranty or tree replacements when less than 5% of the tree material does not pass final inspection. The fee for the City to take over the warranty of the tree will be \$250 per tree.

Make good any damage caused by planting activities to the satisfaction of the City. Leave site in a neat and workmanlike condition. Any debris tracked onto roads, walks and trails to be cleaned after each work day, unless these areas are within fenced construction areas that are not accessible to the public or being used by City maintenance staff. Any damage done by planting activities to be addressed promptly.

6.6.4 Planting Requirements

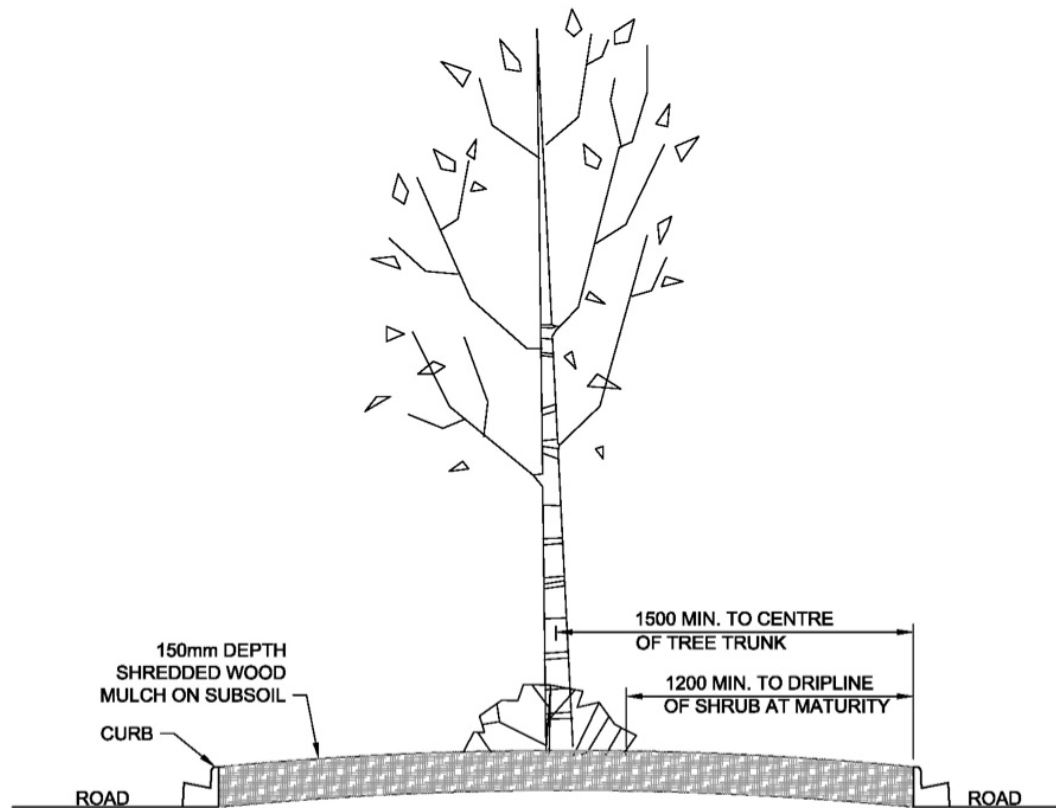
Entrance Feature Areas

Plantings surrounding entrance features may be implemented at the discretion of the City. All designs for special entrance features shall be subject to review by the City as a special consideration. Plant materials will not be part of planting count requirements for any open space. Entrance feature planting shall be low maintenance, and can only consist of trees and shrubs. Shrubs must be massed within planting beds, with deciduous shrubs minimum 500mm ht. and coniferous shrubs minimum 400mm spd. Shrub beds are only permitted at entrance features and roadway island areas, and not within boulevards, PULs or MR's.

Roadway Islands

Roadway islands may be entirely mulched and filled with low lying shrubs that have a maximum mature height of 750mm, however the City's preference is to have islands limited to hard surfacing such as continuous concrete. Islands may not have any plantings within 1.2m of the outside curb of the island, measured to the drip line of the plant material at its maturity. All islands must be filled with adequate topsoil, positively drained from the middle of the island outward to the curb in all directions and covered in min. 100mm depth shredded wood chip mulch. Only deciduous trees that have a minimum branching height of 1.75m may be planted in roadway islands. Trees may not be planted within 1.5m from any curb and can only be planted in islands min. 3.0m dia.

The following diagram demonstrates the minimum setbacks for medians and islands.



MEDIAN AND ISLAND SETBACKS

Medians

Medians that are less than 3.0m wide must be entirely mulched or covered in concrete surfacing, and may not contain any plant material. Medians equal to or greater than 3.0m wide must be and filled with low lying shrubs that have a maximum mature height of 750mm. Medians may not have any plantings within 1.2m of the outside curb of the island, measured to the drip line of the plant material at its maturity. Islands that are 3.0m or greater in width may include portions in sod where plantings are not included. Seeding is not permitted, and all grass areas must be sod. Only deciduous trees that have a minimum branching height of 1.75m may be planted in roadway islands. Trees may not be planted within 1.5m from any curb and can only be planted in medians equal to or greater than 3.0m in width.

The above diagram demonstrates the minimum setbacks for medians and islands.

Municipal Reserve

All MR areas require 75 trees per hectare, measuring the entire land parcel and excluding the area of any proposed buildings or parking lots (ie. in the instance of school sites). Trees may be substituted with shrubs at a rate of five shrubs to one tree. Shrub beds are not permitted in MRs, with exception to beds placed at the entrance of communities or in roadway islands.

6.7 Site Amenities

6.7.1 Trails

Public Open Space may contain either gravel, paved asphalt or concrete trails. The following includes minimum trail widths:

- gravel trails min. 1.5m;
- paved asphalt trails min. 3.0m; and
- concrete trails min. 1.5m.

Trails anticipated to have intensive use or in MR areas that have winter time activities possible, asphalt trails will be required. Gravel trails are only permitted in areas of public open space with only summertime activities. Trail lights may be required at regular intervals along all paved multi-use trails, at the discretion of the City.

6.7.2 Pedestrian Furniture and Signage

Pedestrian furniture must be installed in MR areas, including benches and waste / recycling receptacles. Furniture should be installed in highly visible areas, along trails and on furniture pads. The following lists the standard furniture for all open space development in the City:

- benches – See detail L-10;
- picnic tables – See detail L-11;
- bicycle racks – Model 101 (in-ground mounted) or Model 102 (surface mounted), by Maglin Site Furniture. All components to be powder coated black; and
- waste / recycling receptacles – Model SP-HBIS-N (waste) and Model SP-HBIS-Y (recycling) by Haul-All Equipment Systems.

Furniture shall not be installed until which time all trails have been installed, and surrounding turf has been established to avoid causing premature intensive use of certain areas.

General

Select and locate furniture elements to provide service and comfort to the park user. Locate signs and furnishings on the basis of:

- safety to park user and maintenance crews, consider pedestrians, cyclists, skiers, individuals with roller blades, etc., and maintenance vehicles;
- facilitate routine operational and maintenance programs; and
- minimize clutter in the landscape, select and locate signs of necessity considering safety of park user and key information.

Supply all labor, equipment, materials, products and incidentals necessary to complete signs and furnishings ready for public use. Assemble and finish items ready for installation. Check to ensure all surfaces are smooth to touch, all splinters and burrs removed and marred finishes repaired or refinished. Damaged components shall be repaired or replaced at the direction of the City. When requested, supply extra materials to City's storage facility.

Make no deliveries until site conditions are adequate to receive this work. Protect materials from weather while in transit to site. Adequately protect finished surfaces during handling and shipping.

Do not install furnishings and signs which encourage public use until the site is ready to sustain such use safely and without damage to surrounding areas. Mark proposed location of signs and

furniture items in the field. Prior to continuing with construction, the Owner shall review proposed locations and the Contractor shall have underground utilities marked. Supply and install bollard posts, T-bollards and other barriers as soon as possible. Supply and install safety signs as soon as possible. The Contractor must notify the City as soon as bollards are installed so that City supplied locks can be installed immediately after installation.

All materials and workmanship shall be guaranteed for two years from date of sign and/or furnishing installation.

Materials and Finishes

20 mm Crushed Gravel: locally available sound, hard durable particles free from elongated particles, soft shale, organic or other materials.

For concrete piles, supply "Controlled Concrete" with 28-day strengths as defined by CAN3-A23.1-M90 in accordance with following table:

Concrete Strength (Minimum)	25 MPa
Cement Type	50
Exposure Class	S-3
Air Content	5-7%
Aggregate Size (Maximum)	20 mm
Slump	80 ± 20 mm

For concrete slabs, concrete to meet following requirements:

Concrete Strength (Minimum)	30 MPa
Cement Type	10
Exposure Class	C-2
Air Content	5-7%
Aggregate Size (Maximum)	20 mm
Slump	60 ± 20 mm

Strength	28 day compressive strength per CSA.A23.2
Type	Cement type as defined in CSA.A23.1 clause 3
Exposure	Class of exposure per CSA.A23.1 clause 15 for determination of water cement ratio
Air	Air content % by volume; N = natural air - no air entraining agent
Slump	As determined in accordance with CSA.A23.2-5C

- Add air entraining agent to CAN-A23.1-M90, Section 6;
- Curing Compound: Liquid membrane conforming to CAN3-A23.1-M90;
- Preformed Joint Filler: Asphalt impregnated type to ASTM D1751-73;
- Poured Joint Filler: Asphalt elastic compound to ASTM D1190-74 (1980);
- Welded Wire Fabric: 150 x 150 - MW 11.1 x M2 11.1 welded wire mesh to CSA G30.5M, flat sheets;
- Reinforcing Steel: 10 M bars to CSA G30.12-M77;
- Forms: pre-manufactured and profiled steel forms, wooden or steel forms for curved sections; and
- Form oil: non-staining mineral type.

Wood timbers to meet the following requirements:

- Wood bollard posts and posts for title sign, 250 x 250 square, spruce, pressure preserved CCA-PEG or ACZA, green. CAN/CSA O 80.0-M89, M1-89, M3-89 and CAN/CSA - O 80.1-M89, Preservative Treatment of All Timber Products by Pressure Processes, and CAN/CSA - O 80.5-M89, Preservative Treatment of Posts by Pressure Processes;
- Wood shall be incised;
- Wood members round or sawn greater than 114 mm shall be treated by full cell process;
- All lumber shall be stamped ACA or CCA;
- All lumber shall be dried to a moisture content not exceeding 25%; and
- Cut ends of timbers shall be carefully painted with two (2) coats green CCA or ACA preservative to match preservative used on timbers. Apply to manufacturer's specification.

Lumber for trail signs shall be green CCA or ACA pressure preserved spruce, incised wood to same specification as wood timbers.

Lumber for benches and picnic tables shall be green CCA or ACA pressure preserved, S4S, non-incised pine, same as specification for wood timbers. Knots shall be firm, without gaps and not exceed 1/4 of the lumber face. All lumber surfaces shall be sanded smooth to touch.

Brush on preservative for cut ends to match lumber preservative and to manufacturer's specifications.

All fasteners shall be weatherproof cadmium coated, stainless steel, galvanized, ardox, etc. Fasteners shall be supplied as specified. If changes are required due to supply conditions, discuss and receive approval of Owner prior to substitutions.

Waste containers to be as follows:

- Waste containers shall be Haul-All Equipment Systems - HID-A-BAG I, HID-A-BAG II and HID-A-BAG MINI as required by the site and program or approved equal;
- Waste containers shall be supplied in custom colour in polyester powder coat finish to match item H - 8.2 below; and
- Waste container(s) shall be mounted on a concrete slab, sized so to extend a minimum of 300 mm beyond all edges of the container and to finish level and flush with adjacent walk, trail or other pedestrian surface. Front face of container shall be located a minimum of 900 mm clear to edge of adjacent trail. Clearance to any obstruction at the back of the unit minimum 1200 mm.

All fabricated metal frames and fasteners shall be hot dipped galvanized to 550 g/m² coating. Hot dip galvanizing shall occur after complete assembly and manufacture of each full component. In the fabrication of each metal component for galvanizing, drain holes shall be provided in hollow tube frames as needed to properly drain galvanic bath. Fasteners which are otherwise weatherproof, i.e., cadmium coated, stainless steel, aluminum etc., shall not be galvanized.

Trail signs to meet the following requirements:

- Sign panels shall be 200 x 200 mm, 0.2 cm aluminium panel, with message in reflective plastic sheeting to CGSB 62--GP-3a high intensity "Scotchlite" by 3M. Message element shall be white with dark blue background;
- Sign panels shall be fastened with a minimum of two (2) stainless steel security screws 20 mm length; and
- A maximum of three sign panels shall be installed on any single face of the trail signage.

Title signs to meet the following requirements:

- Title signs shall be considered only for major parks that provide sports and/or recreation facilities of interest to the entire community and visiting teams;
- Signs shall be located so to be clearly visible from arterial and collector streets, but not to interfere with safe transportation sight lines;
- Proposed location of sign shall be staked on site. The City shall review the proposed location. Thereafter, underground utilities shall be marked and location adjusted if necessary;
- City logo shall be provided as a self-adhesive decal. Sign panels for key park facilities shall be to the same specification as trail sign panels. Park facility panels shall be 300 mm x 300 mm and fastened with four (4) stainless steel security screws; and
- The sign manufacturer shall select and warranty materials, finishes and fabrication methods against deterioration, other than normal surface weathering, for a period of five (5) years.

Interpretive signs to meet the following requirements:

- Permanent interpretive signs shall be considered only in areas where continuously new audiences occur. Interpretive signs shall be custom designed to suit the setting and program to which they provide information. Mounting height and angle (if any) shall be determined on the basis of the audience to be served. When preparing sign panels minimize text and maximize graphic information;
- Original art work shall be prepared for the City and supplied to the sign manufacturer. Sign size, story line, panel(s) layout, proposed graphics, text and type styles shall be progressively reviewed by the City and any special interest group(s) or individuals as sign design progresses;
- All graphic materials shall be accurately annotated and credited
- All spelling and grammar shall be proofed by an independent editor.;
- Original art work shall remain the property of the City; and
- The message panels can be of the following systems:
 - Photo Aluminium Sign Panels
 - Porcelain Enamel Panels.

Dog waste bag dispensers are required at the entrance of all parks, located at trail heads or primary access points to a neighbourhood, community or regional park:

- Dispensers to be style SINGLPul, dark green in colour, supplied by Sudden Fun Equipment, Tel. 403.254.0500 or 1.800.490.0501 or approved equal

Execution

All signs, furniture items and buildings shall be staked in the field to illustrate proposed location and finished elevation of slabs. Prior to continuing construction, staking shall be reviewed and approved by the City and Developer's Representative, and underground utilities shall be located and marked.

Dog waste bag dispensers to be mounted to wood signage posts at the entrance of parks no less than 1.0m from the ground.

Prior to commencing construction coordinate access point(s) and route(s) materials storage on-site and site preparation (clearing, grubbing, pruning, topsoil stripping, pavement demolition, cutting and patching) necessary to complete supply and installation.

If not included in a comprehensive construction package, specify site restoration and construction clean-up requirements of supply and installation contract. As a minimum, site will be restored to the condition in which it was received. The Developer shall be responsible for repairing and/or replacing at no cost to the City, all work of others and site development damaged by his activities.

New materials, best of their kind only, shall be utilized in the work. The Developer shall inspect and pre-select materials, removing any substandard and unacceptable materials and/or component assemblies.

The Developer shall hire contractors, subcontractors, workers and suppliers who are experienced and knowledgeable in the work for which they are engaged. The Developer shall be responsible for the actions and safety of its contractors, subcontractors, employees and suppliers.

The work site(s) shall be signed, barricaded and controlled to ensure public safety. The City shall not be responsible for theft, fire or damage to the work until following FAC of the work.

All picnic tables, benches and waste containers shall be installed on concrete, or other hard surfaces. Hard surfaces shall extend for a minimum of 600 mm beyond the extremities of picnic tables and benches and to Section H - 10.7.a. for waste containers. Hard surfaces shall finish flush with surrounding grade.

All signs shall be installed plumb and vertical.

All furnishings shall be installed to fall with surrounding grade. Where slope exceeds 4% (1 in 25) the furniture pad and/or activity area shall be leveled to produce a slope, not less than 1.5% (1 in 66), or greater than 4% (1 in 25).

6.7.3 Wood Screen Fencing & Gates

Description

All uniform wood and metal fencing and gates shall be constructed and installed in accordance with standard detailed drawings H1.1 to H1.10. Uniform wood fencing shall be constructed adjacent to the following:

- expressways and arterial roadways;
- parks and playfields;
- public walkways and utility lots;
- city-owned lands;
- school sites;
- multiple family sites;
- neighborhood commercial sites;
- institutional sites; and
- other areas as required by the City.

All wooden fence material shall be pressure treated cedar or approved alternative and stained or painted (2 coats). The Developer shall be responsible for, and at its own expense, correcting any defect, deficiency or fault in the completed work prior to the end of the specified maintenance period. The work is to comply with the applicable requirements of the Alberta Building Code, latest revision thereof.

Materials

All materials used are subject to inspection and approval by the City. Materials must be protected from weather at all times.

All lumber is to be graded by an agency certified by the Canadian Lumber Standards Administrative Board and marked with a recognized, visible grade stamp.

Dimension Board Lumber Graded in accordance with National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber and to CSA 0141-1970 and meeting the following criteria:

- maximum 19% moisture content at time of installation; and
- lumber to be rough sawn to sizes noted on the drawings.

Nails and Spikes in accordance with Alberta Building Code 1981 and as follows:

- use common spiral nails except where indicated otherwise; and
- use hot tip galvanized finished steel for exposed exterior work.

Bolt, nut, washer, screw and pin type fasteners: hot dip galvanized sheet steel finish to CSA G164-1955 (R1972)

Rail Bracket:

- minimum 1.6 mm sheet, galvanized;
- configuration to suit detail; and
- to be approved by the Owner prior to installation.

Fence Post U-Bracket to be 800 x 152 x 100 mm wide x 6.25 mm thick galvanized sheet steel.

Man Gate Hinges to be No. 311 x 165 mm, quantity - 1 pair, manufactured by Richards- Wilcox Manufacturing company or approved equal.

Bow Handles to be no. 81-#2, (200 mm long) quantity - 2, No. 81-#1 quantity - 1, manufactured by Richards - Wilcox Manufacturing Company Limited or approved equal.

Cane Bottom bolt to be No. 524-#2 (19 x 600 mm long) quantity 7 - 2, with keepers, manufactured by Richards - Wilcox Manufacturing Company or approved equal.

Man Gate Latch to be No. 128-#2 (12 x 200 mm long), quantity - 1, manufactured by Richards - Wilcox Manufacturing Company, or approved equal. Furnish with padlock eye.

Chain to be 38.1 x 22.2 x 6.35 mm diameter galvanized steel, electro-weld type chain, 600 mm long to be looped through vehicle gate bow handles and secured with padlock. Padlock to be supplied by the private property owner.

Surface Applied Wood Preservative

Surface apply Cuprinol clear stain or approved equal wood preservative to all wood components. Treat surface of components with wood preservative before installation. Wherever possible apply preservative after components have been cut and fitted to size. Apply preservative by dipping, or by brush or spray to completely saturate and maintain wet film on surface for minimum 3-minute soak on lumber.

Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of surface applied wood preservative before installation.

Wood Fence and Gate Components

All work to be fabricated and finished as shown on drawings. Members shall fit close and accurately together. Verify all dimensions on site prior to proceeding with fabrication. Whenever possible, members shall be pre-cut prior to treatment. Site cuts are to be treated with two coats preservative brushed in. Allow preservative to cure prior to erecting members. Ensure all ardox nails are installed flush to fence slats.

Fence post brackets to be cast in concrete footings as detailed so that final post alignment is plumb. Supply all components required for anchoring fence posts to concrete footings.

The wood fence shall provide a firm continuous structure. Finished unit should not utilize any cracked or damaged timber panels or posts. Height of fence panels to remain constant above grade. Difference in height of fence panel in relation to next panel due to grade change to be taken up at fence post between panels.

Use Type 50 Sulfate Resistant with compressive strength of 25 MPa at 28 days.

6.7.4 Chain Link Fencing

Material

Pipe material used for fencing shall be hot-dipped, zinc-coated, butt-welded, Schedule 40 seamless steel pipe fabricated in conformance with ASTM A120. Zinc coating shall be not less than 0.61 kg per square meter of total surface area. The use of tubing, conduit, or open seam material will not be permitted. Pipe material shall have the following minimum dimensions:

1.8m Fencing

Type of Post	Outside Dia. (mm)	Min. Weight Per Meter	Min. Wall Thickness
Line Post	60	5.43	3.91
Terminal Post	90	11.30	5.49
Top Rail	42	3.40	3.56
Brace	42	3.40	3.56
Gate Post	100	13.60	5.74

1.2m Fencing

Type of Post	Outside Dia. (mm)	Min. Weight Per Meter	Min. Wall Thickness
Line Post	47	5.43	3.91
Terminal Post	73	11.30	5.49
Top Rail	42	3.40	3.56
Brace	42	3.40	3.56
Gate Post	100	13.60	5.74

Line posts support fencing at points where fabric is continuous. In wet areas they are to be a minimum 3600 mm length. (See Std. Dwg.). All posts are to be capped.

Terminal posts are end posts, corner posts, straining posts, and gate posts, positioned where fencing or fabric is discontinuous and attached to posts by means of tension bars. Posts for barb wire overhang are to be 1050 mm longer than fabric height.

Top rails are horizontal pipes supporting the top selvage of fabric. Top rails shall be continuous at line posts and pass through holes in line post tops.

Braces are horizontal galvanized 45 mm CD pipes positioned at mid-height of fabric and shall extend from terminal posts to the nearest line post along each fabric attached to the terminal post. All fittings shall be galvanized steel or aluminum.

Tension bars shall be 5 x 19 mm and shall have a length equal to the height of the fabric.

Tension bands shall be not less than 9 mm in width and shall be not less than 3.5 mm in thickness.

Couplings shall be an outside type, not less than 175 mm in length, and shall have a material thickness of not less than 3.5 mm.

Extension arms shall be malleable iron or cast iron and shall have provision to accommodate 3 strands of barbed wire at 45° angle overhand. The top strand of barbed wire shall be approximately 300 mm above the fabric. Extension arms shall have holes for top rails.

Post tops shall be of galvanized steel or aluminum. Line post tops shall have holes for top rails.

Zinc coating shall be applied to tension bars, tension bands, fittings, and post tops which are not fabricated from corrosion-resistant material. Zinc coating shall be not less than 0.61 kg/m² of surface area and shall be applied by hot-dip in conformance with ASTM A123.

Tension wire shall be not less than 4.8mm diameter, single strand, electro-galvanized wire that will withstand at least 6 dips in conformance with ASTM A239. Fabric shall be double galvanized 150 x 150mm, 3.7 - 180mm high (See Std. Dwg.). Tension wire shall have an ultimate tensile strength at least equal to that specified for wire for chain link fabric and shall have a corrosion protection system equal to that specified for fabric.

Barbed wire to be galvanized 2mm thickness with 4 point barbs at 150mm centers wire to ASTM A121-77. Fastening clips galvanized to wire.

Gates requirements are as follows:

- gates to be framed with steel pipe ASTM A120-77 standard galvanized. Use 45mm O.D. pipe for outside frame and 40mm O.D. pipe for bracing. Galvanize after welding
- Gate posts to conform to the following:

Opening	Gate Post O.D.
Single to 3.0 m and double to 6.0 m	90 mm 2 hinges per leaf
Single from 3.0 m to 4.3 m and double to 6.0 m	114 mm 3 hinges per leaf provide brace

Single from 4.3 m to 7.6 m and double from 8.5 m to 12.2 m	170 mm 3 hinges per leaf provide brace
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- gate fabric to be 3.7 mm galvanized Chain link with 50 x 50 mm mesh;
- gates shall be fabricated with electrically-welded joints, complete with galvanized, malleable iron hinges, lockable latch & latch catch;
- gate latches shall be suitable for padlock which can be attached and operated from either side of the gate;
- gate hinges shall permit a 90o swing both in and out; and
- double gates to have centre rest with drop bolt for closed position and chain hold open for open position.

Concrete requirements are as follows:

- compressive strength 25 MPa at 28 days;
- use type 50 Sulfate Resistant Cement;
- shop drawings of gates and related appurtenances shall be approved by the Developer and submitted to the City by email to landscape@fortsask.ca for review prior to fabrication of assembly.

Workmanship

Remove debris and grade between posts to provide ground clearance between 40mm and 70mm.

All posts shall be set in concrete and the concrete extended above ground (approximately 25mm) for drainage.

Concrete foundations shall be of such size and shape as required to withstand any strain or shocks ordinarily brought to bear on the fence, but not less than indicated below:

Post Type	Diameter of Concrete (mm)	Depth of Concrete (mm)
Line Post	300	1100
Terminal Post	300	1100
Gate Post 100mm OD	300	1100

- concrete for footings shall be compacted by interval vibrator or by rodding and shall be allowed to set sufficiently before cutting fence - minimum 5 days; and
- if forms are used, compact backfill to density of adjacent in-situ soil.

Posts shall be set in concrete footings plumb and true to line. Spaces between line posts shall be uniform and shall not exceed 3.0 meters. Install straining posts where required.

Top rails shall be secured to terminal posts using receptacle fittings, shall be run through holes in line post tops and joined with couplings.

Chain link fabric shall be suitably tensioned. Fabric shall be attached to terminal posts using tension bars and bands. Tension bars shall be threaded through fabric mesh and shall be connected to terminal posts by means of tension bands spaced not more than 375mm apart. Fabric shall be fastened with tie wire to line posts at approximately 300mm o/c, and to top rails,

braces, and tension wire at approximately 450mm o/c. The bottom selvage of fabric shall be approximately 50mm, but no more than 125mm, above finished grade.

Bottom tension wire shall be strung along the bottom selvage of the fabric, pulled taut, and firmly attached to terminal posts with suitable fittings.

Gates shall be installed at locations shown on the drawings or as directed by the City Representative. Gates shall be hung to be level and 50mm above finished grade. Gates shall swing into the site 90 degrees. A gate "Spot Post" or other means shall be provided to hold the gate open. Gates shall be so constructed that they can be opened and closed smoothly with minimum effort.

Touch up damaged galvanizing by cleaning with a wire brush and applying two (2) coats of galvanizing application.

6.8 Special Features

6.8.1 Playgrounds

Playground Placement

Playgrounds may be proposed inside any MR parcel. Playgrounds shall be situated with the following guidelines:

- good visibility from nearby roadways;
- a distance no less than 15m from any private property;
- with surrounding ground slope no more than 2.5%; and
- along a paved asphalt trail with good access from surrounding areas.

Playground Edging and Base Fill Material

Playground edger must include a cast in place concrete curb with the option of either sand or engineered wood fiber as fill material. Alternatives to fill material will only be considered for accessibility reasons.

Drainage System

Playground subgrade must have positive drainage in one direction no less than 1.0% in grade. A drainage tile system of 100mm dia. socked perforated pipe must be installed at the low end of playground areas, within the perimeter edger and daylighting as required. Where pipes daylight through the perimeter use solid pipe to extend water through the perimeter edger and beyond the playground, or leading directly by pipe to a storm service line. Ensure water flows away from the playground with slopes leading away from the playground.

Playground Site Furniture

Each playground structure shall include at minimum two benches, two waste receptacles and two picnic tables.

Drawings and Submittals

Prior to CCC, the Contractor must provide the City with the following documentation:

- as-built drawings of the playground and all components;

- warranty documents; and
- third party Playground Inspection and Surface Impact Testing reports, to the satisfaction of the City.

All drawing and submittals to be sent by email to landscape@fortsask.ca.

Safety Fencing

The Contractor is responsible for erecting and maintaining a sturdy safety fence around the perimeter of the playground construction area. Construction area must include the playground footprint and any materials storage or stockpile area. The fence material must be min. 1.5m ht, made of moveable metal panel. Safety fencing must be maintained until the playground structure has been granted CCC and all safety reports have been completed to the satisfaction of the City.

6.9 Community Entrance Features

Location

Community entrance features may be proposed by the Developer for review and acceptance by the City. Any entrance feature must be built entirely on private property and no portion of the structure, base, or overhang may be placed on public property. Applicants must register legal easements for any entrance feature on title of the private property upon which it is located. The Developer must demonstrate to the City that this legal easement has been put in place prior to the construction of any permanent entrance feature.

Maintenance

The design for special entrance features shall be subject to the review and acceptance by the City. Entrance features must be low maintenance and be composed of materials that will remain available for years to come should any maintenance be required. The City will also require evidence of an agreement for the long-term care, damage recovery or replacement of any entrance feature for a term no less than 30 years. The Developer shall be fully responsible for establishing this maintenance reserve to the satisfaction of the City.

Should a sign become in disrepair and the Developer is not committed to repair or replace entrance features, the City reserves the right to remove the sign in its entirety.

6.10 Stormwater Management Facilities (SWMFs)

6.10.1 Stormwater Management Facility Configurations

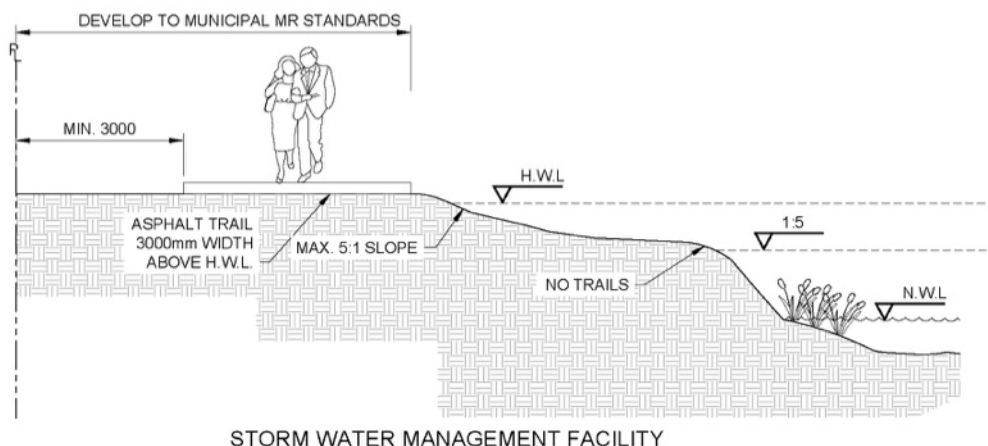
SWMFs must be designed to be naturalized. The City's preference is that SWMFs be developed in the configuration of a constructed wetland. Other SWMF configurations such as dry ponds, wet ponds or confined channel systems must be approved by the City in advance of commencing designs.

6.10.2 Elements of a Constructed Wetland

Elements of constructed wetlands can include, but are not limited to:

- open water areas at depths of 1500 to 2500mm depth below normal water level (NWL), representing 40-60% of the total area within the normal water level;
- emergent vegetation areas at depths of 200 to 300mm depth below normal water level, representing the balance of the total area within the normal water level that is not open

- water. Emergent vegetation zones are to be planted using either live soils from donor wetland, or planted plugs of live bare root plants. Planted plugs must be included in soft landscape detailed drawings. Benches of shallow areas to have emergent vegetation shall undulate in width, and shall not be less than 5m (with exception to areas near inlet / outlet structures);
- grades below NWL should be designed in such a way that maximizes retention time of stormwater passing through the system. Avoid the ability for water to shortcut between inlet and outlet structures;
 - including recreational amenities within SWMFs, such as trails and pedestrian furniture is highly encouraged. Asphalt trails may only be developed above the 1:5 flood elevation and must be asphalt paved and min. 3000mm in width. Gravel trails 2000mm in width may be developed below the HWL but must be above the 1:5 flood elevation. No trails can be implemented whatsoever below the 1:5 flood elevation;
 - areas of SWMFs above the Freeboard elevation are to be built to Municipal Reserve standards which requires minimum 75 trees per hectare. The Developer may negotiate MR credit for portions of areas above freeboard elevations that have sufficient size for open play, that receive the required landscape improvements as credit for Municipal Reserve, and have slopes not exceeding 2.0%. These negotiations must be in place at the time of development agreement;
 - asphalt trails developed above HWL must be at least 3000mm away from any adjacent property line;
 - any other features such as lighting, pedestrian furniture, etc. must be placed above the HWL;
 - the diagram below indicates permitted slopes, setbacks, widths, etc.; and
 - safety signage that indicates potential “thin ice” conditions in winter months (approximately November through April) and “no swimming” in summer months (approximately May through October).



6.10.3 Other Jurisdictions

In addition to the minimum requirements set forth by these standards, the requirements of the Stormwater Management Guidelines for the Province of Alberta, as published by Alberta Environment in its latest edition, must be incorporated into the SWMF design. Where feasible and applicable, Alberta Environment’s stormwater BMPs shall also be applied within the design.

6.10.4 Signage

The Developer shall be responsible for the installation of the following signage near the public entrance to all SWMF parcels:

- Danger Thin Ice. Signs must be in place during months of frozen conditions, being approximately November 1st to April 30th;
- No Swimming. Signs must be in place during months of frozen conditions, being approximately May 1st to October 31st; and
- safety signage to be customized to on site conditions to make the public aware of safety risks associated with amenities such as lift stations, outfall structures, electrical components, etc. Any customized signage must be approved by the City during the course of drawing approval.

6.11 Construction Completion, Warranty and Maintenance Period, Final Acceptance

6.11.1 Construction Completion

CCC Application

Prior to applying for CCC, the Developer Representative must fully inspect all work completed and ensure that all construction techniques and materials conform to the approved drawings, specifications and all Municipal, Provincial and Federal standards, bylaws, guidelines, Acts and Legislation. A CCC request application must be submitted to the City Representative by email to landscape@fortsask.ca requesting an inspection for the entire phase of development – a copy of this application can be found on the City's website – www.fortsask.ca. Three 11x17 hard copies of all pertinent drawings must accompany each CCC request application. Refer to the checklist in Part I for a complete list of deliverables that are required at CCC Application.

CCC Inspection

Within 15 calendar days of receiving a request for CCC inspection, the City will arrange for an inspection to review all aspects included in the CCC request application. CCC inspections may happen at any time from May 1 to October 31, however will be to the discretion of the City if site conditions due to heavy rain, snow cover, temperature and other considerations are cause to delay or suspend an inspection. If an inspection occurs after October 31st of any calendar year, warranty for all plant material will not begin until May 1st of the following year. Seeded areas will not be inspected until which time initial germination has occurred.

The Developer or Developer Representative must provide a representative to attend all inspections.

Standard CCC Records

The Developer Representative shall be responsible for taking notes and providing copies of all documentation to attendees of each inspection. A copy of a standard inspection form can be found on the City's website – www.fortsask.ca. Copies of all forms must be distributed digitally and in hard copy to the City within three working days of any inspection. At the completion of a CCC inspection, the Developer Representative must complete and submit a construction completion certificate, along with all required attachments. A copy of this certificate can be found on the City's website – www.fortsask.ca.

CCC Re-Inspections

The City will attend a first CCC inspection for each stage of development. The City will not segregate sites into smaller stages or portions of sites, unless stipulated in the development agreement and clearly identified as separate components. The City will, however, inspect fencing separate from all other aspects of development. The first inspection will be conducted at no cost to the Developer. The following schedule identifies costs that will be borne onto the Developer by the City for any re-inspections required:

Inspection	Fee to the Developer
First CCC Inspection	n/c
First Re-Inspection	\$1,500
Second Re-Inspection	\$2,500
All Subsequent Inspections	\$2,500

The City may contract landscape inspection services out to a third party and therefore may incur costs for interim construction reviews, pre-inspections, CCC inspections, maintenance monitoring and FAC inspections.

6.11.26 Warranty and Maintenance Period

General

Continuously maintain and warranty landscape work as specified for a period of at least two (2) years from the issuance of a Complete Completion Certificate (CCC) and until the issuance of a Final Acceptance Certificate (FAC). As part of the FAC application, the Developer or its Representative must provide minimum monthly inspection reports from each stage of development for all months of growing conditions (approximately April through November).

Perform maintenance work during regular working hours of 07:00 to 18:00, Monday to Friday. Obtain City approval to do maintenance outside of regular working hours. Provide the City with at least three days advance notification of intent to spray for weed and insect control.

Keep a daily maintenance log throughout contract and submit the log to the City by email to landscape@fortsask.ca at the end of the first year of maintenance, and as part of FAC applications. This log shall include:

- a detail of activities and dates in which activities were carried out; and
- Detail off chemical applications, including target weed or insect, mode, type and rate of application of chemical, date, time, weather conditions and results of application.

During the maintenance period, the Developer shall provide, erect and maintain barricades, signs and protection that may be necessary for the preservation of public health and safety during maintenance activities. The site must otherwise be safe for public use during the warranty period, unless otherwise approved by the City for public closure due to special circumstances.

Provide City with copies of permits and licenses required by regulatory authorities, including current pesticide applicator's license number.

The Developer shall be responsible for all costs incurred related to the liability and damages caused by contractor's personnel and equipment during the term of the contract. Report damages immediately to City and obtain approval of City for repairs and replacements. Return grass areas, plants, equipment and buildings to their original condition before damage. Scalping

of turf and mechanical damage to trees including tearing bark shall be considered as damage and shall be repaired to the City's satisfaction.

Schedule timing of operations to growth, weather conditions and use of site. Provide copy of schedule for approval by city. Do each operation continuously and complete within a reasonable time period. Provide equipment and material necessary for maintenance to acceptable horticultural standards. Coordinate maintenance practices with City. Maintenance schedules may have to be altered to accommodate City's site activities. Collect and dispose of excess material and debris to municipal disposal site following each day's work. Cleanup shall be a continuous operation and at no time shall topsoil or debris of any kind be allowed to remain on roadways overnight.

Turf Maintenance

Maintenance shall include all measures necessary to establish and maintain seeded and sodded areas in an acceptable, vigorous and healthy growing condition during the maintenance and warranty period. Proper grades established, should not have divots, low / high spots.

Maintain turf with sharp mowers at 80-90mm during growing season. Cut as required to maintain specified height. Remove papers, rocks, and other foreign material before cutting. Change direction of cut with each mowing where practical. Do not remove grass clippings from turf areas unless volume is such as to be harmful to turf areas or unsightly. Remove clippings from sidewalks, roads, parking lots, windows or building during the same mowing and remove from site. If growth of turf has exceeded 90mm, raise mower blades so that not more than 30% of grass blade will be cut at one time. Do not allow turf height to exceed 100mm.

Adjust fertilizer requirements according to soil test analysis. Use only mechanical equipment. Check calibration of spreader to ensure that specified rate is used. Spread 50% of fertilizer in one direction, then 50% at right angles. Water, immediately after fertilizing, according to manufacturer recommendations; obtain moisture penetration of 50mm minimum. Apply fertilizer at manufacturer's specified rates. Fertilize three times per growing season:

- spring – apply 12-51-0 fertilizer (or approved equal) before May 31st;
- summer- apply 27-14-0 fertilizer (or approved equal) during the first two weeks of July; and
- fall – apply 16-20-0 fertilizer (or approved equal) during the last two weeks of August.

For sodded areas, supply labour, water truck, pumps, potable sprinkler systems and water necessary to provide adequate watering to maintain plant growth during warranty period. Fire hydrants shall not be used as a source of water supply unless written approval is provided by the City.

Mow grass to height of 60mm. After mowing, rake thoroughly, removing loose and dead grass, stones and debris. Spread topsoil to maximum thickness of 15mm, filling in low areas and bare spots. Overseed areas with seed mixture equivalent to existing grasses at manufacturer specified rates. Rake seed into topsoil. Roll lightly. Water to ensure penetration of 80 mm and at frequent intervals to maintain vigorous growth.

Cut out areas of dead or unhealthy sod and replace with new sod. All repair areas to be square or rectangular. Rake topsoil before installing new sod. Butt new sod tightly to adjacent existing sod

and grades. Roll lightly to reduce contact with soil. Water to ensure penetration of 80 mm and at frequent intervals to maintain healthy growth.

Tree and Shrub Maintenance

Tree and shrub maintenance shall include all measures necessary to establish and maintain all plants in an acceptable, vigorous and healthy growing condition during the maintenance and warranty period.

Deep water trees and shrubs to maintain adequate moisture level within root systems to meet the plant's requirements. The Developer is responsible for supplying loading, hauling and distributing water.

Cultivate upper 40mm of soil monthly. Edge plant beds evenly to depth of 100 mm in lines of original layout. Remove weeds bi-weekly including their roots. Do not damage roots of plants. Collect and dispose of paper, refuse and dead plants.

Keep stakes and guy wires taut and plants plumb for duration of maintenance period. Remove flagging/rope from plants at time of planting.

The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches. Only clean, sharp pruning tools shall be used. All cuts shall be clean and cut to the branch collar, leaving no stubs. Pruning of trees and shrubs shall be performed by an experienced pruner knowledgeable on horticulture industry standards.

All plant materials found dead or not in a healthy, satisfactory growing condition or which, in any other way, does not meet the requirements, shall be replaced immediately by the contractor at the contractor's own expense.

Apply a high phosphorous fertilizer, 10-52-10 (or approved equal) at manufacturer specified rates at the time of planting and each spring prior to June 1st. No fertilizer should be applied in July or August. Apply water after fertilizing to ensure penetration of fertilizer level.

Weed, Insect and Disease Control

Ensure proper, positive identification of infestations and consult with the City before taking corrective action. Before chemical applications, obtain written approval from the City and treatment area to be posted. Use equipment and containers free of harmful residues not related to specific control measures applicable to situation. Perform disease, weed and insect control, in accordance with Provincial chemical application regulation. Notify the City of intent at least three days before any chemical application. Prepare and apply chemical according to manufacturer specification by licensed applicator. Minimize drift at all times. Carry out treatment with regard to climatic effect on surroundings and occupants of buildings. Public notification of any spraying activities is required.

Apply chemical to eradicate weeds or perennial grass in turf areas, driveways, interlocking concrete paving stone areas, along fences, storage areas, parking lots, gravel and rip-rap stone areas with boundary of site. Repair and pay for damage caused by application of herbicides. Effectiveness of treatment program to be determined by inspection by City. Repeat as required.

Make weekly inspection of lawns and plants for insect and disease infestations. Laboratory testing may be required for diagnosis of disease. Apply chemicals based on development stage of

insects' life cycles. Repair and pay for damages caused by application of chemicals. Effectiveness of treatment program to be determined by inspection by the City. Repeat as required.

Spring and Fall Tasks

Complete spring clean-up as soon as working conditions are favourable and by May 15. Remove and dispose of sand, gravel, salt and debris, accumulated during winter months, to municipal disposal site. Remove any snow fences, stakes and sand containers from the site. Clean plant beds and planters of debris and dead plant material. Loosen and lightly cultivate soil without disturbing roots of permanent plantings.

In the fall, remove and dispose of annuals from plant beds and planters within one week after first killing frost. Deep cultivate plant beds and planters. Cut back foliage of perennials within one week after killing frost. Stake locations of perennials if required. Deep water trees and shrubs between October 1 to 15.

6.11.3 Interim Inspections

Routine Site Reviews

The City will conduct routine reviews of construction progress to ensure proper construction techniques, materials and methodologies are used. The City may provide feedback in writing to the Developer to highlight any discrepancies or concerns that require correction. Should corrections not be made in a timely manner, requests for future inspections will be rejected until which time concerns are rectified.

Pre-Inspections

The City reserves the right to conduct pre-inspections in advance of scheduled CCC and FAC inspections to bring specialist staff on site to observe completed work. Feedback from these pre-inspections may be brought forward to scheduled inspections and added to deficiency lists.

Mid-Term Seed Area Maintenance Inspection

As noted in Section C.2.3 of this standard, the Developer is responsible for scheduling an interim inspection with the City, approximately one year after CCC, for any development that includes seeded areas. The purpose of this inspection is to ensure full coverage of seed and to ensure weed control has been completed during the first twelve months of growth. The City, at its own discretion, may inspect sites on a routine basis during the warranty period and require the Developer to mitigate for any concerns with germination, turf coverage and weed control.

6.11.4 Final Acceptance Certificate Inspection

General

Final inspection of seeded and sodded areas will be made prior to the end of the warranty period. At the time of inspection the turf should be mowed and shall be alive and in a healthy satisfactory growing condition, free of weeds. Replacing areas that show root growth failure, deterioration, bare or thin spots or which have been damaged by any means to the satisfactory of the City.

Final inspection of trees and shrubs will be made prior to the end of the warranty period. At the time of inspection all non-mulched beds and tree pits shall be freshly cultivated. Mulched beds and tree pits shall be refilled to original specified depths. All planting areas and tree pits shall be free of weeds and debris. Any plant that is dead, not true to name or specified, or not in satisfactory growth, shall be removed and replaced.

Record Drawings

No more than three months prior to any anticipated FAC inspection, the Developer Representative must provide record drawings for any stage of development. As-builts shall include an accurate record of all improvements as constructed or changed during the course of the maintenance period. Any approved design information that was altered since drawing approval will be struck through and replaced with field verified data. All changes will be shown in red text. The Applicant must provide two hard copies of record drawings, along with a digital submission of drawings in AutoCAD compatible format.

In addition to the information required for detailed drawings, record drawings shall include, at minimum, the following additional information:

- date of construction completion;
- date which as-built drawings were completed;
- name of contractor(s);
- construction start and completion dates; and
- all street names and addresses for properties within the scope of work.

Upon review and acceptance of record drawings by the City, the Developer Representative shall convert red line markups to black and prepare project record drawings. After verification by the professional member, the Developer Representative shall provide one copy of the record drawings in AutoCAD compatible format and one set of signed .pdf files of all drawings. FAC inspection request forms will not be accepted until which time any final record drawings have been accepted by the City.

FAC Application

Prior to applying for FAC, the Developer Representative must fully inspect all work completed and ensure that all construction techniques and materials conform to the approved drawings, specifications and all Municipal, Provincial and Federal standards, bylaws, guidelines, Acts and Legislation. An FAC request application must be submitted to the City by email to landscape@fortsask.ca requesting an inspection for the entire phase of development – a copy of this application can be found in Part I: Applications, Checklists and Forms. The City requires that all aspects of development included in detailed drawings per phase and in accordance with the development agreement be inspected at the same time.

FAC Inspection

Within 15 calendar days of receiving a request for FAC inspection, the City will arrange for an inspection to review all aspects included in the FAC request application and shown on the record drawings. FAC inspections will only occur when all plant material is in full leaf, and allowable full timing will be to the discretion of the City. No FAC inspection will occur past September 30. FAC inspections can be requested 60 days prior to the CCC warranty date.

The Developer or Developer Representative must provide a representative to attend all inspections.

At the completion of an FAC inspection, the Developer Representative must complete and submit a final acceptance certificate, along with all required attachments. A copy of this certificate can be found on the City's website – www.fortsask.ca.

FAC Re-Inspections

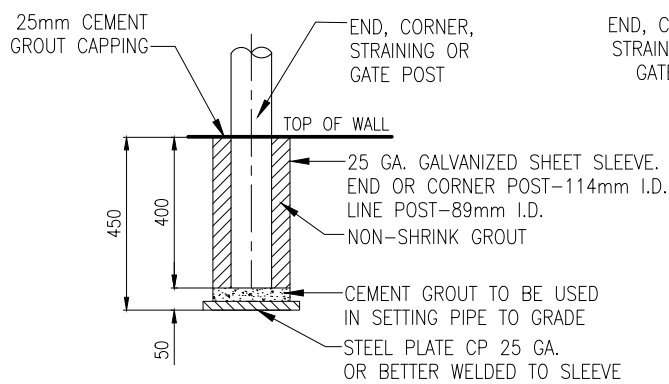
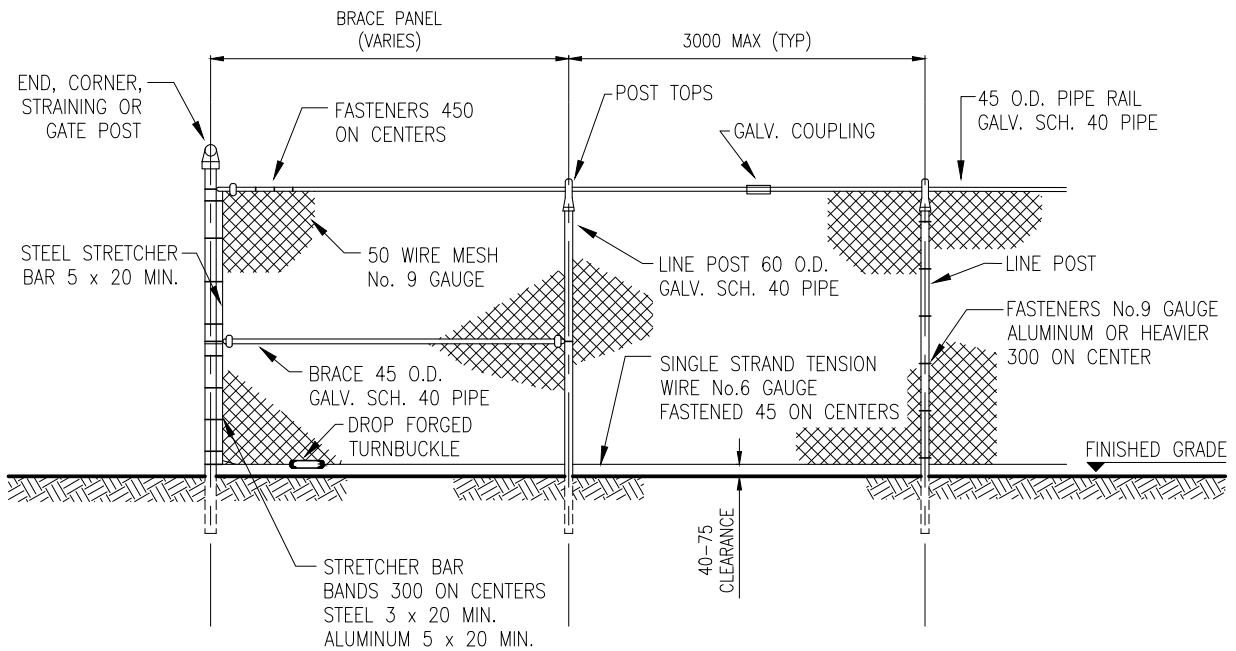
The City will attend a first FAC inspection for each stage of development. The City will not segregate sites into smaller stages or portions of sites, unless stipulated in the development agreement and clearly identified as separate components. The first inspection will be conducted at no cost to the Developer. The following schedule identifies costs that will be borne onto the Developer by the City for any re-inspections required:

Inspection	Fee to the Developer
First FAC Inspection	n/c
First Re-Inspection	\$1,500
Second Re-Inspection	\$2,500
All Subsequent Inspections	\$2,500

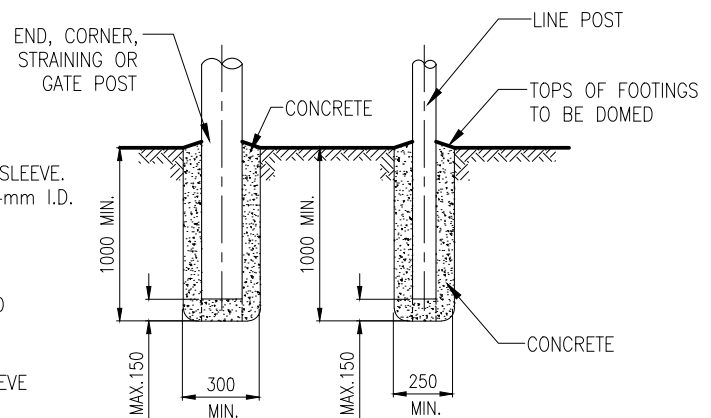
The City may contract landscape inspection services out to a third party and therefore may incur costs for interim construction reviews, pre-inspections, CCC inspections, maintenance monitoring and FAC inspections.

6.12 Standard Drawing Details

- L-1 Chain Link Fence
- L-2 Chain Link Single Gate
- L-3 Chain Link Double Gate
- L-4 Wooden Fence
- L-5 Step Down Fence
- L-6 Wood Post & Rail Fence
- L-7 Typical Tree Planting
- L-8 Typical Tree Trench Planting
- L-9 Typical Shrub Planting
- L-10 Bench
- L-11 Picnic Table
- L-12 Waste Receptacle
- L-13 Typical Concrete Pad
- L-14 Bike Rack
- L-15 Trail Sign
- L-16 Wood Bollard
- L-17 Swing Gate Bollard
- L-18 Concrete Playground Edger
- L-19 Gravel Trail



ON RETAINING WALL



IN EARTH

NOTE:

- DEEPER PILES MAY BE REQUIRED IN AREAS OF POOR SUBGRADE MATERIAL OR IN AREAS OF UNCONTROLLED FILL.
- ALL COMPONENTS TO BE POWERCOATED BLACK.

POST DETAILS							
DESCRIPTION	O.D.	LENGTH					
		FABRIC WIDTH 1830		FABRIC WIDTH 1525		FABRIC WIDTH 1220	
		STANDARD	RETAINING WALLS	STANDARD	RETAINING WALLS	STANDARD	RETAINING WALLS
LINE POST	60	2670	2170	2360	1870	2050	1560
END, CORNER, STRAINING AND GATE POST WITH OPENINGS 450 MAXIMUM	90	2890	2320	2590	2020	2290	1710
GATE POST OPENINGS 800 MAX.	114	2890	-	2590	-	2290	-

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

CHAIN LINK FENCE



CITY OF
FORT SASKATCHEWAN

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

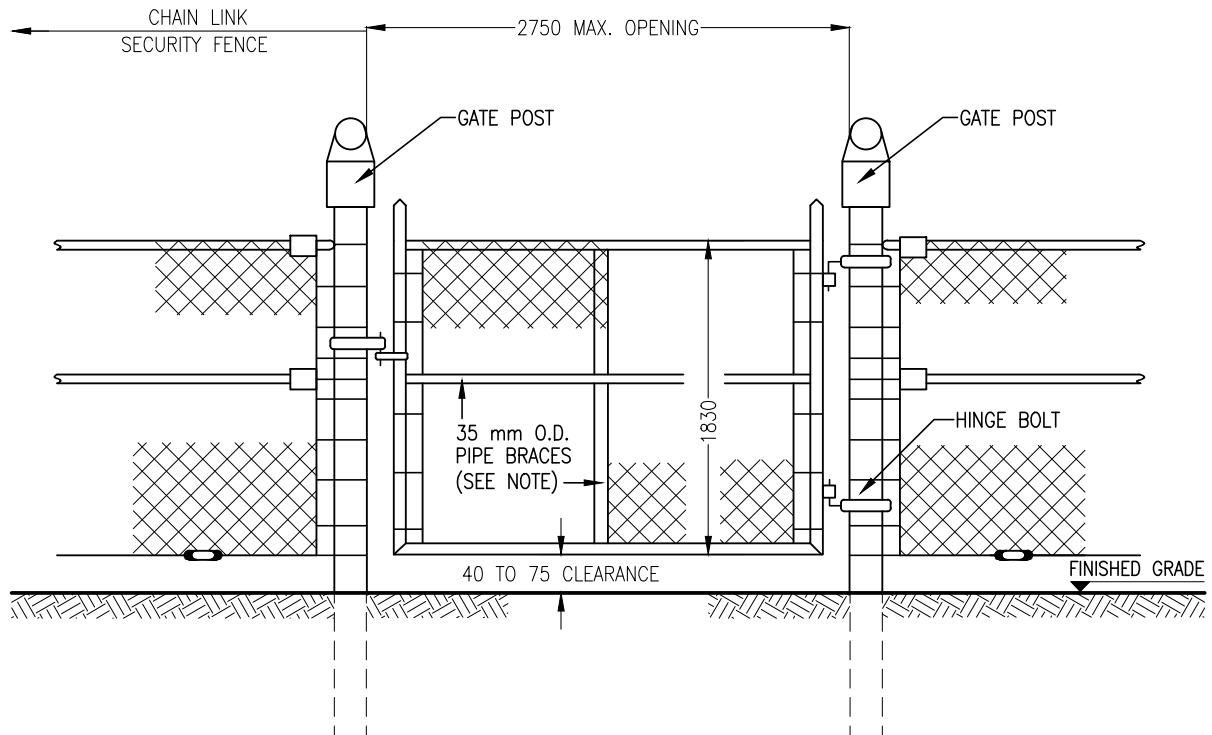
REVISION NUMBER: 2

DATE: MAY 2019

NOT TO SCALE

DRAWN: EDS Group

L-1



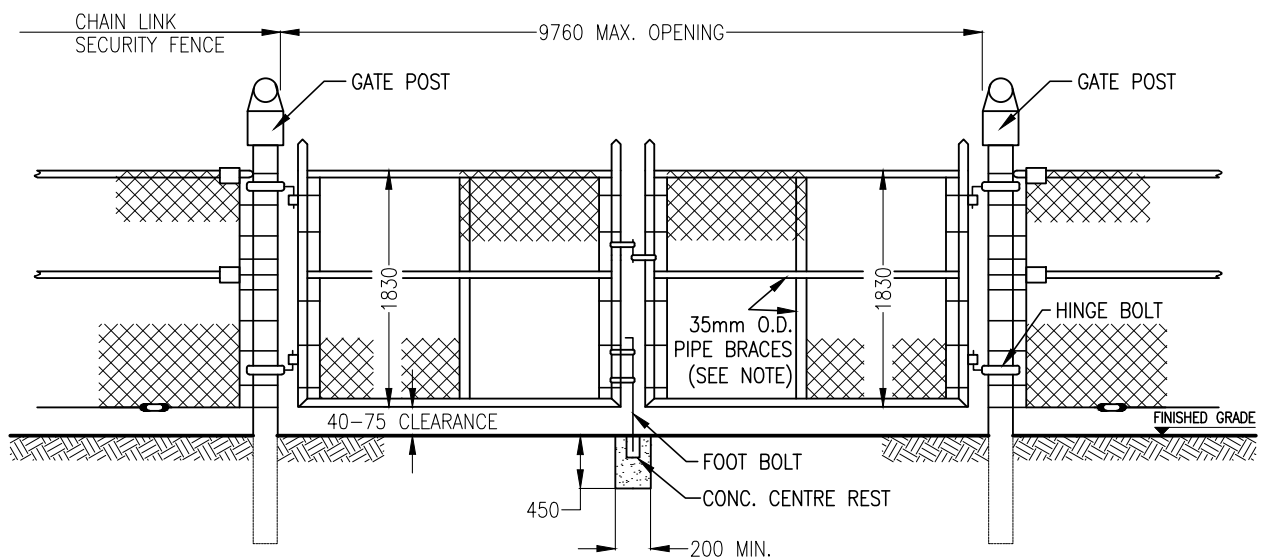
NOTE:

PIPE BRACES

- GATE LEAVES UP TO 1830 WIDE HORIZONTAL BRACE ONLY.
- GATE LEAVES OVER 1830 WIDE BOTH HORIZONTAL & VERTICAL BRACES.
- ALL COMPONENTS TO BE POWERCOATED BLACK.
- REFER TO DETAIL L-1 FOR POST DETAILS.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

CHAIN LINK SINGLE GATE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-2
NOT TO SCALE	DRAWN: EDS Group	



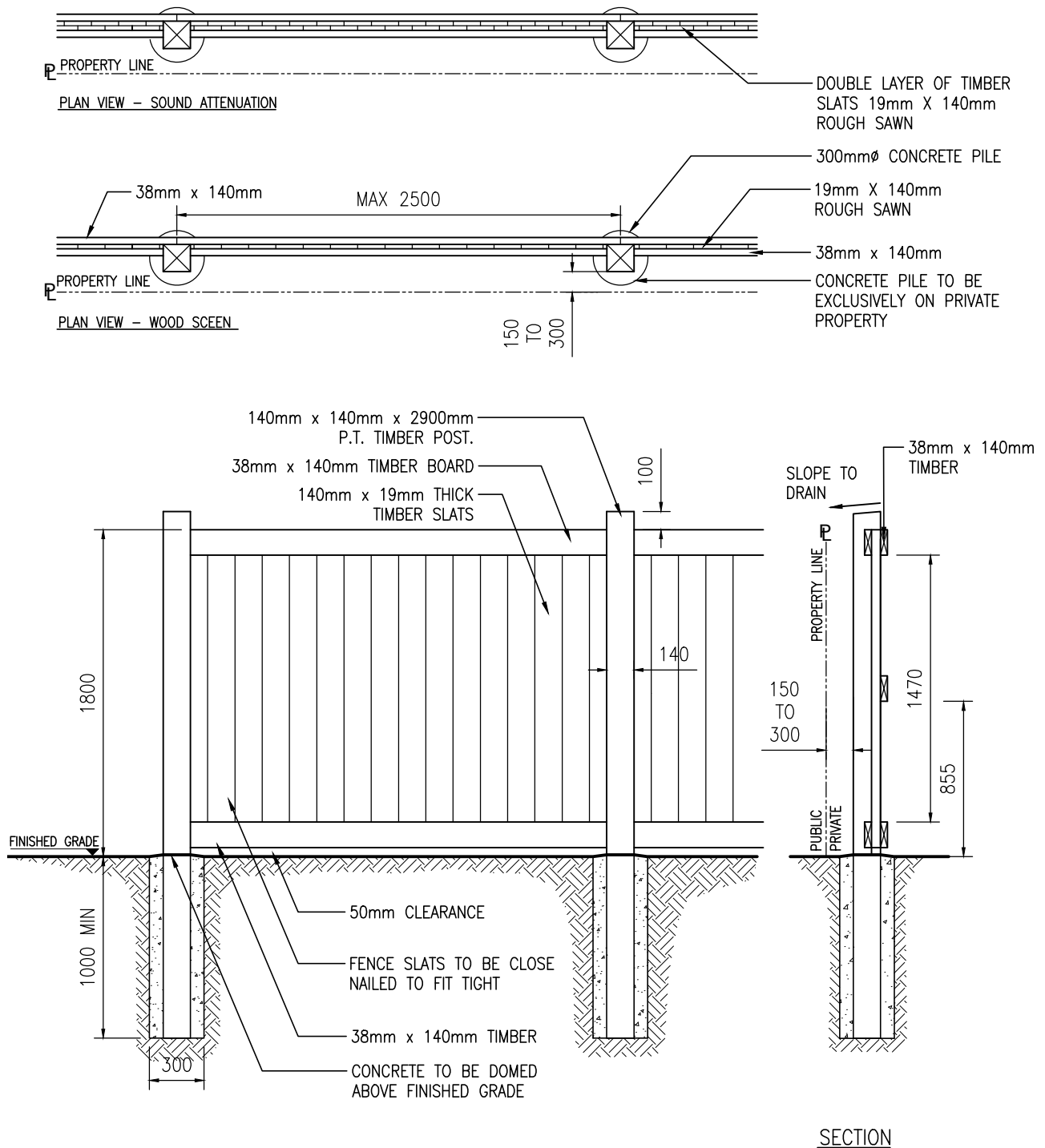
NOTE:

PIPE BRACES

- GATE LEAVES UP TO 1830 WIDE HORIZONTAL BRACE ONLY.
- GATE LEAVES OVER 1830 WIDE BOTH HORIZONTAL AND VERTICAL BRACES.
- ALL COMPONENTS TO BE POWERCOATED BLACK.
- REFER TO DETAIL L-1 FOR POST DETAILS.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

CHAIN LINK DOUBLE GATE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: B	DATE: MAY 2019	L-3
NOT TO SCALE	DRAWN: EDS Group	

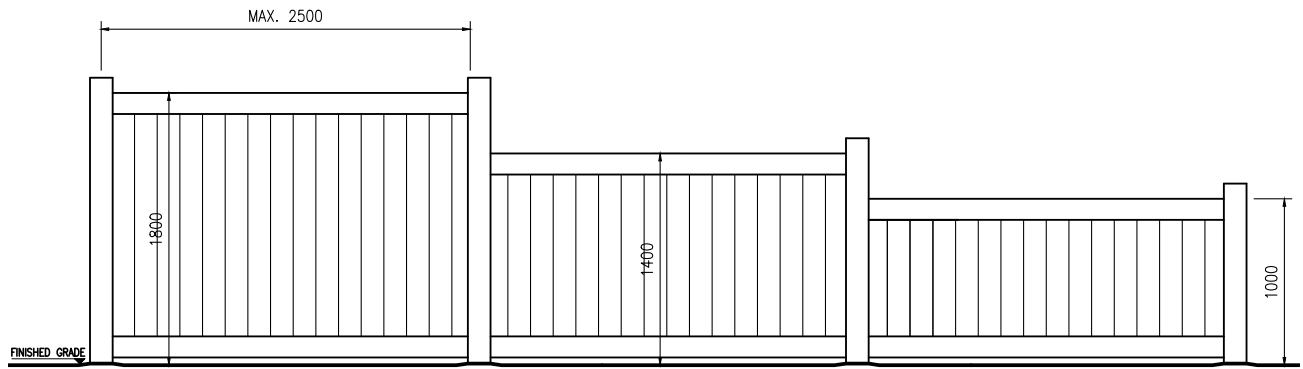


NOTE:

- POSTS SHALL BE LOCATED AT LOT CORNERS w/ INTERMEDIATE POSTS, EVENLY SPACED 2500 O.C. MAX.
- POSTS TO BE A MINIMUM LENGTH OF 2900 & MUST BE INSTALLED IN A PLUMB POSITION.
- ALL WOOD COMPONENTS TO BE CEDAR, SPF OR S4S TIMBER.
- PRESSURE TREATED POSTS TO BE TREATED WITH A SOLUTION OF PENTACHLOROPHENOL AND PETROLEUM TO CSA-080.
- TIMBER SLATS SHOULD FIT TIGHT TO ACCOMMODATE SHRINKAGE.
- ALL NAILS TO BE GALVANIZED SCREW NAILS AND TO CONFORM TO C.S.A. G164.
- NAILS TO BE 89mm COATED FOR STRINGERS TO POSTS AND 50mm ARDOX FOR BOARDS.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

WOODEN FENCE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-4
NOT TO SCALE	DRAWN: EDS Group	



ELEVATION

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

STEP DOWN WOODEN FENCE

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: 1

DATE: MAY 2019

NOT TO SCALE

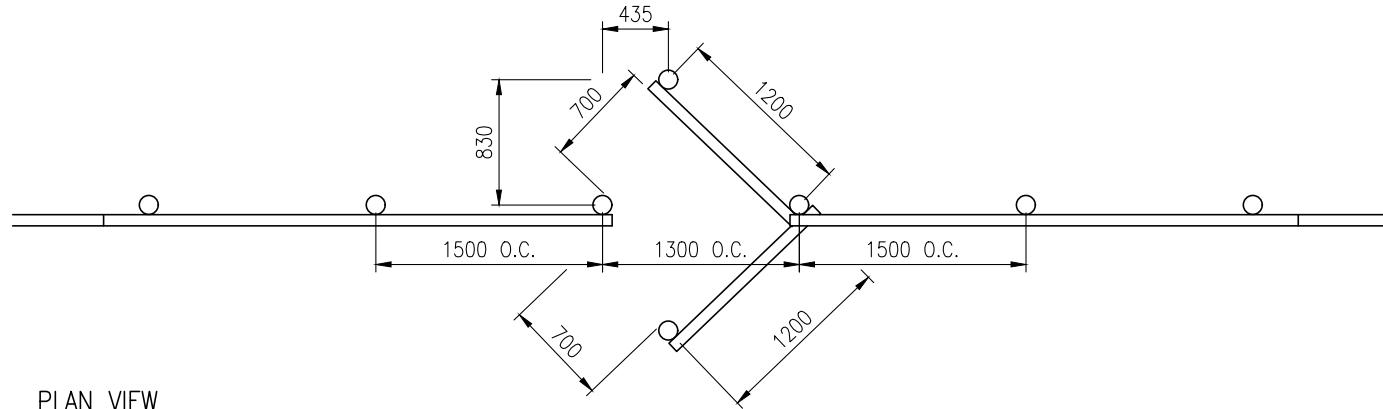
DRAWN: EDS Group



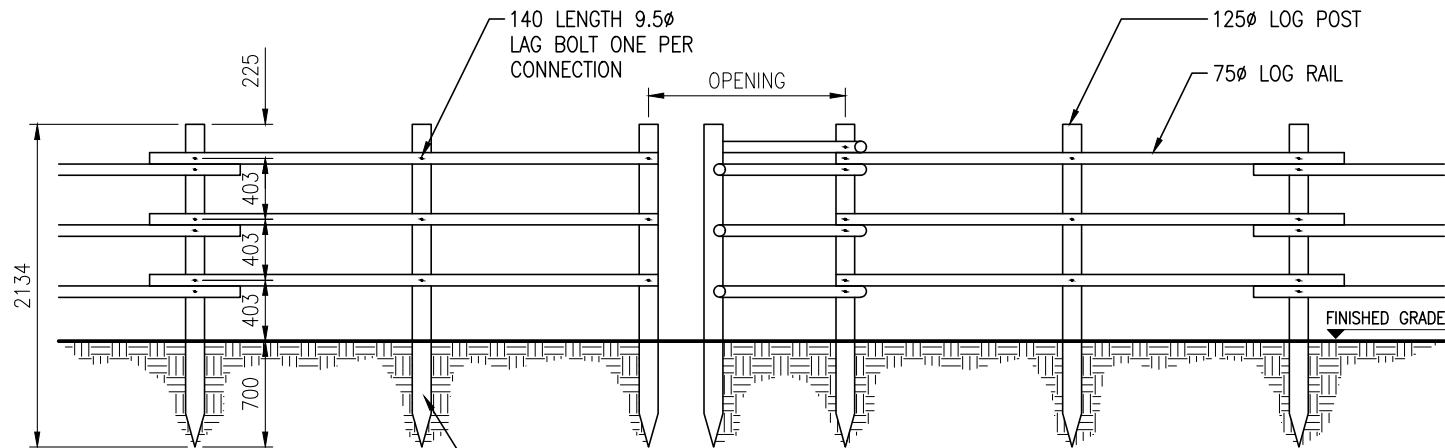
CITY OF
FORT SASKATCHEWAN

DWG. NO.

L-5



PLAN VIEW



ELEVATION

NOTES:

- PRESSURE TREATED SPRUCE POSTS AND RAILS.
- HOT DIPPED GALVANIZED LAG BOLTS.
- OPENINGS AS DIRECTED BY THE CITY.
- THE USE OF THIS FENCING STYLE TO BE USED IN PUBLIC PARK SPACE AT THE DISCRETION OF THE CITY.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

WOOD POST & RAIL FENCE

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: 2

DATE: MAY 2019

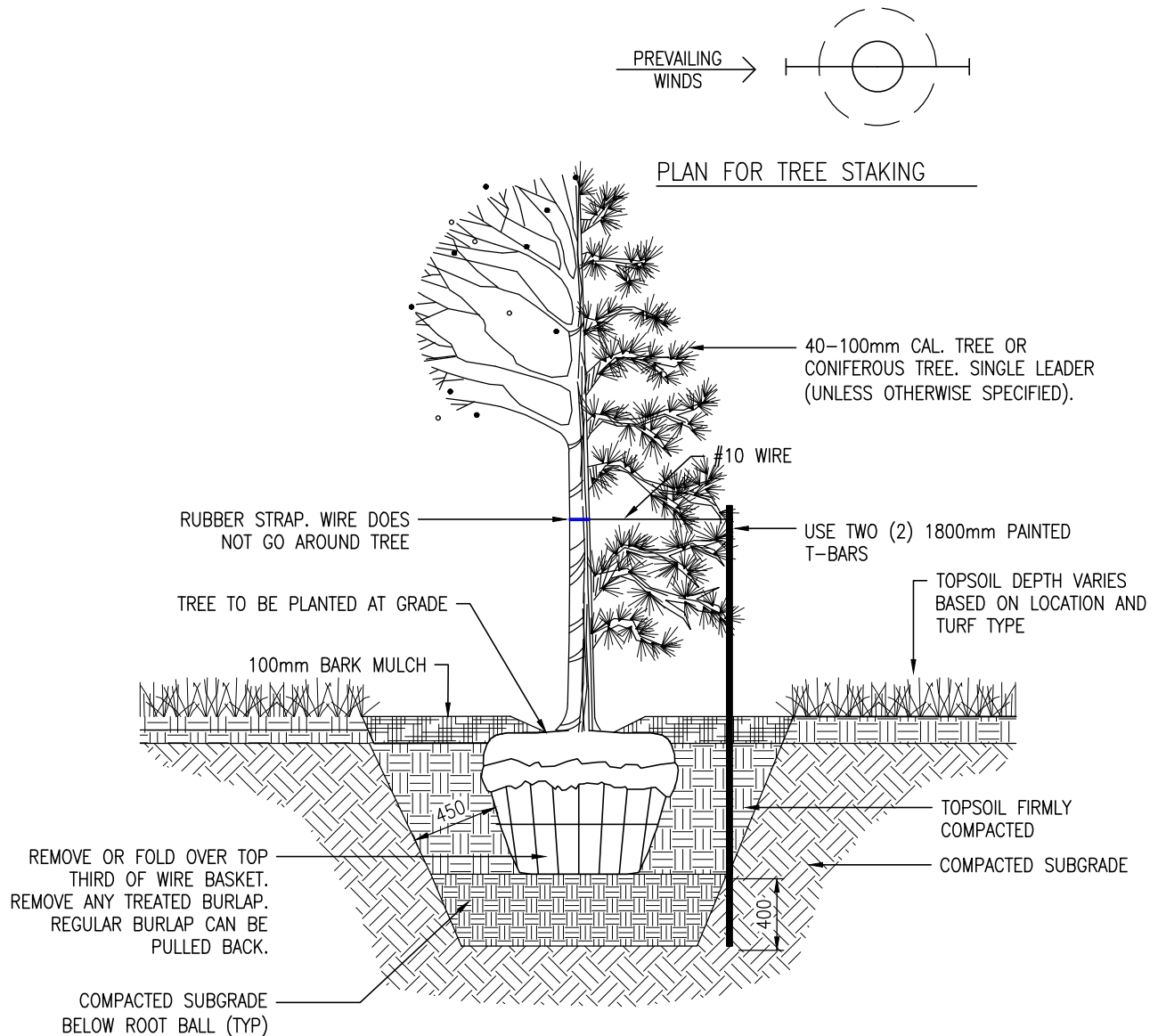
NOT TO SCALE

DRAWN: EDS Group



DWG. NO.

L-6

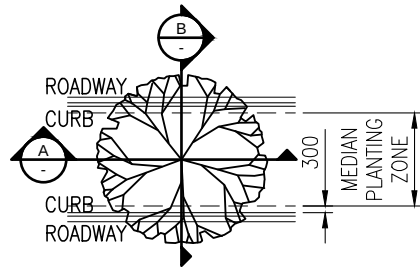


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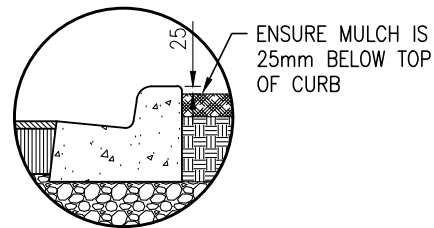
- EDGE OF BED TO BE STAKED & APPROVED BY DEVELOPER'S REPRESENTATIVE.
- IF TREE IS IN WIRE BASKET, CUT & REMOVE TOP THIRD OF BASKET OR FOLD DOWN TOP THIRD BEFORE PLANTING. PULL BACK BURLAP (NON-TREATED BURLAP ONLY).
- TREES TO BE PLANTED AT GRADE.
- PLACE ROOT BALL ON COMPACTED OR UNDISTURBED SUBGRADE.
- SCARIFYING OF THE TREE WELL IS REQUIRED.
- MULCH TO BE 50mm AWAY FROM ROOT FLARE/TRUNK. EXTEND TO THE EDGE OF THE DRIP LINE OR 1000mm.
- ON SITES OF EXTREME COMPACTION SCARIFYING IS RECOMMENDED.
- PRUNE DEAD BRANCHES TO MAINTAIN NATURAL FORM OF TREE - DO NOT PRUNE HEAVILY AT PLANTING.
- STAKE BEYOND EDGE OF ROOT BALL. BARS SHOULD BE HAMMERED DOWN INTO SOLID FOOTING (AT LEAST 400mm INTO SUB-SOIL BASE).
- USE RUBBER STRAPS AT END OF ALL GUY WIRES TO PROTECT THE TREE AT POINT OF CONTACT.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

TYPICAL TREE PLANTING		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-7
NOT TO SCALE	DRAWN: EDS Group	



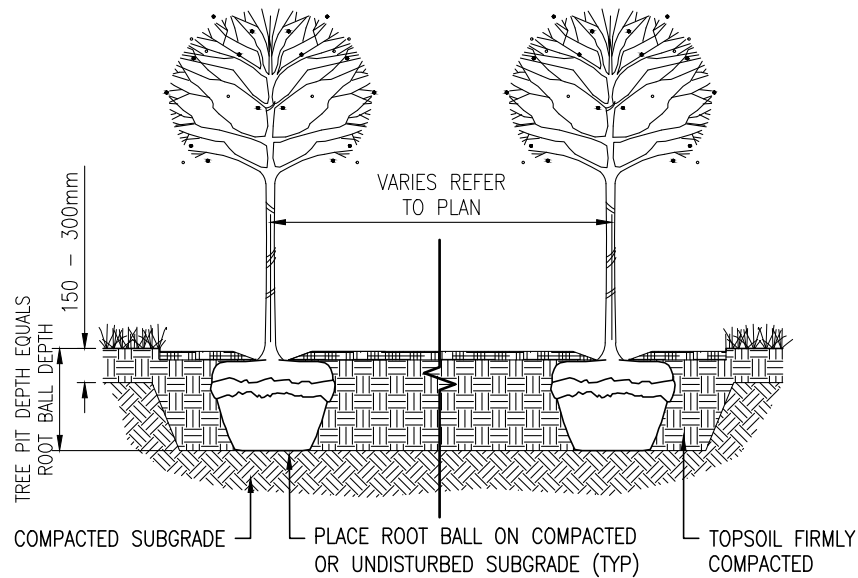
PLAN VIEW



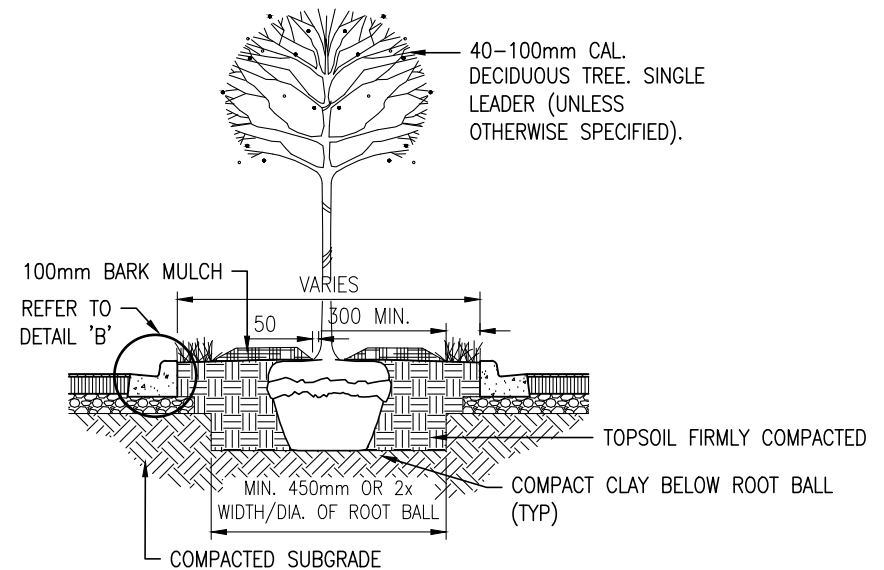
DETAIL 'B'

NOTE:

- DO NOT ALLOW AIR POCKETS TO FORM WHEN BACK FILLING.
- TREES TO BE PLANTED AT GRADE w/ TRUNK FLARE VISIBLE (NO MORE THAN 25mm ABOVE GRADE).
- IF TREE IS IN WIRE BASKET, CUT & REMOVE. IF TREE IS IN TREATED BURLAP, CUT & REMOVE. IF TREE IS IN REGULAR BURLAP, PEEL BACK.
- MULCH TO BE 50mm AWAY FROM ROOT FLARE/TRUNK.
- ON SITES OF EXTREME COMPACTION SCARIFYING OF THE TREE WELL IS REQUIRED.
- PRUNE DEAD BRANCHES TO MAINTAIN NATURAL FORM OF TREE – DO NOT PRUNE HEAVILY AT PLANTING.
- CROWN MEDIAN TO ENSURE POSITIVE DRAINAGE.
- DEPTH OF LOAM MIN. 150mm TO OPTIMUM OF 300mm. TREE SPADE OPTION IF DEPTH IS 300mm.
- REMOVE STAKING ONE YEAR AFTER INSTALLATION OR AS DIRECTED BY THE CITY REPRESENTATIVE.
- WHERE ADJACENT TO A CURB, MULCH SHALL BE 25mm BELOW TOP OF CURB.



SECTION A



SECTION B

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

TYPICAL TREE TRENCH PLANTING

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: 2

DATE: MAY 2019

NOT TO SCALE

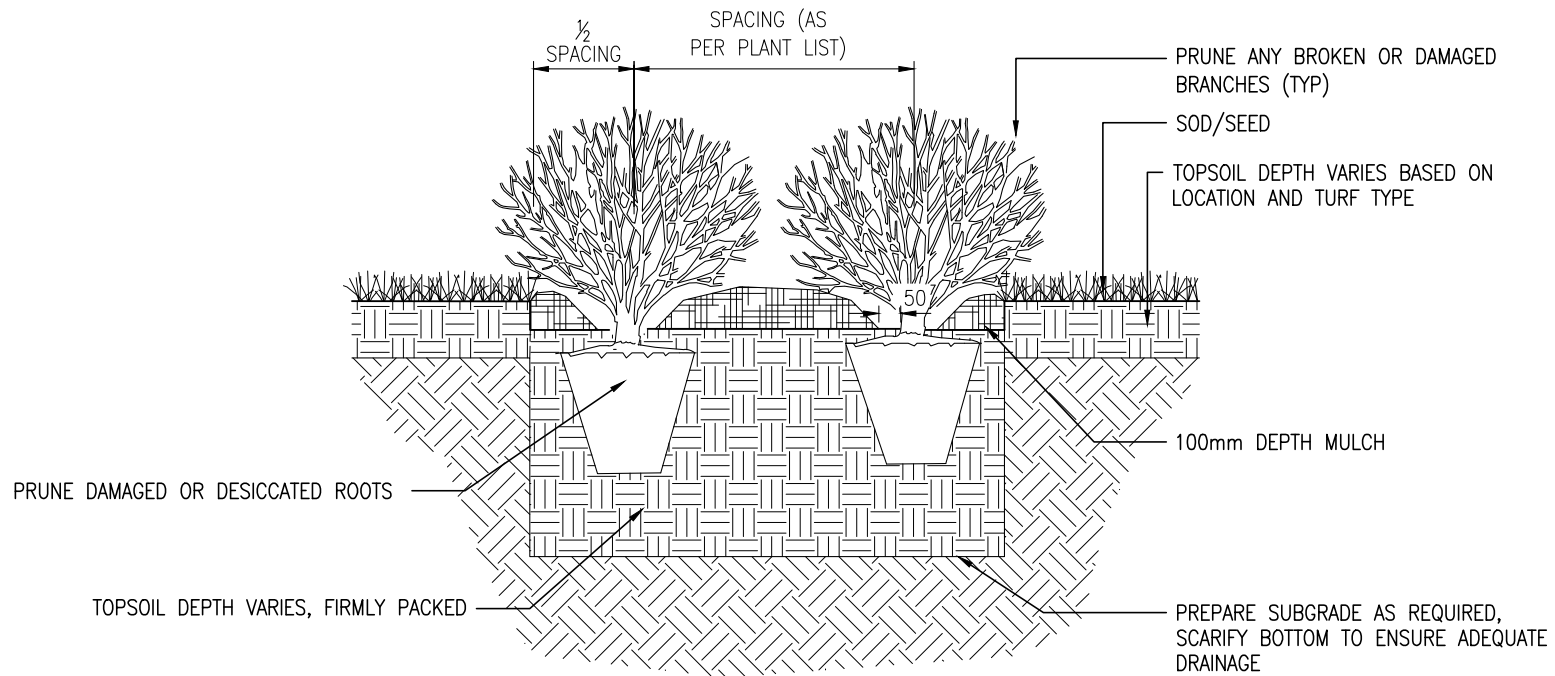
DRAWN: EDS Group



CITY OF
FORT SASKATCHEWAN

DWG. NO.

L-8



ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

TYPICAL SHRUB PLANTING

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

REVISION NUMBER: 2

DATE: MAY 2019

NOT TO SCALE

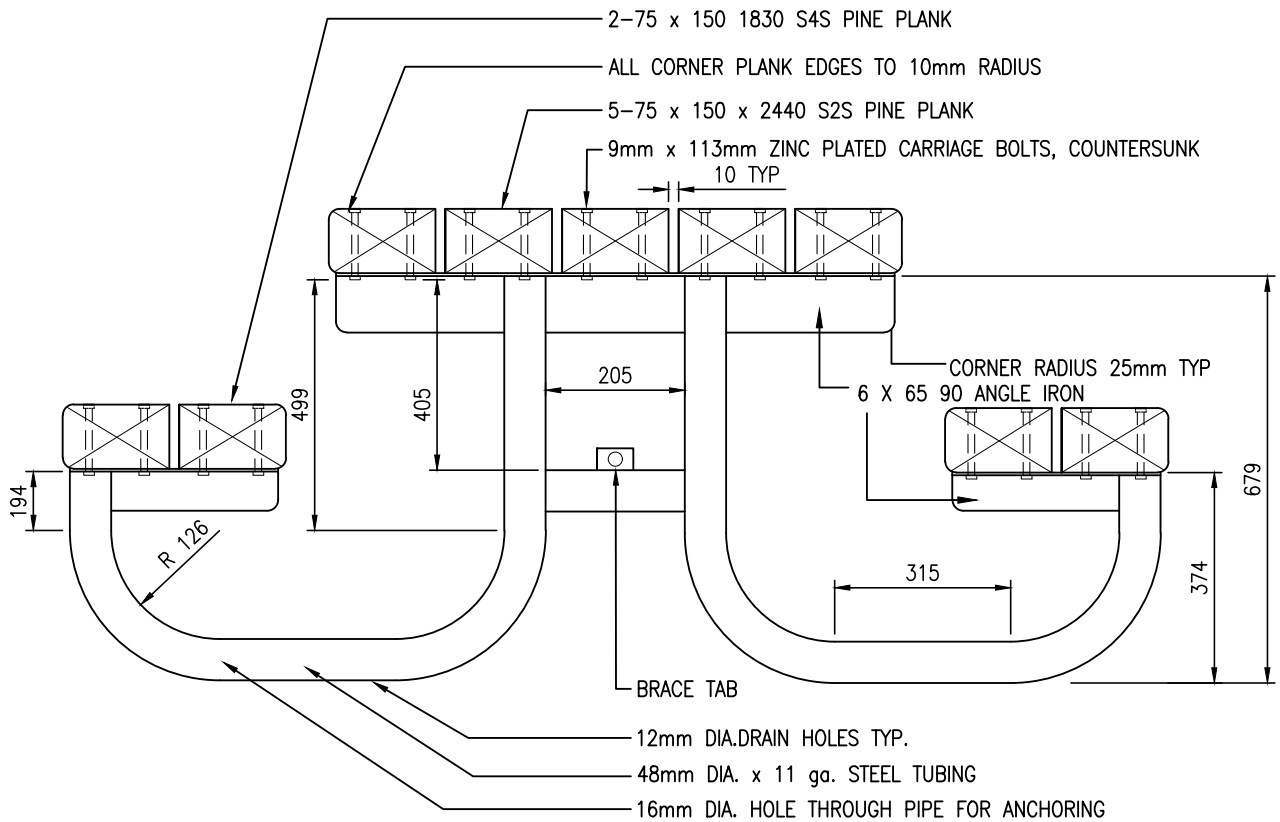
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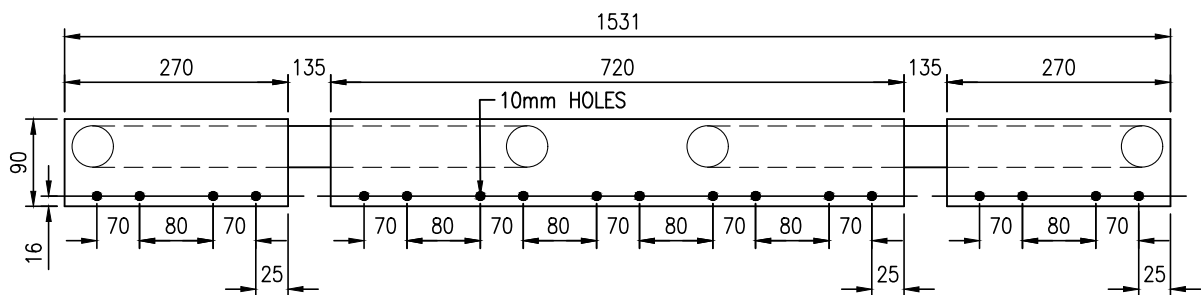
DWG. NO.

L-9

9 x 100 x 955 SEAT AND BACK SUPPORT STEEL FLATS, DRILL HOLES FOR CARRIAGE BOLTS, 9mm DIA.



SECTION



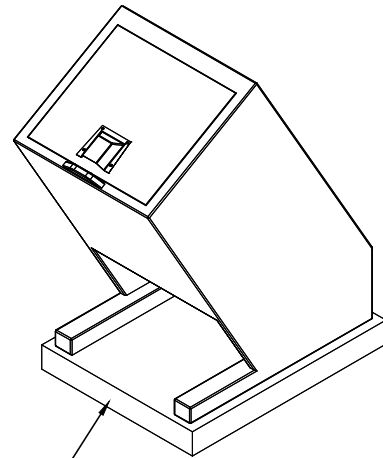
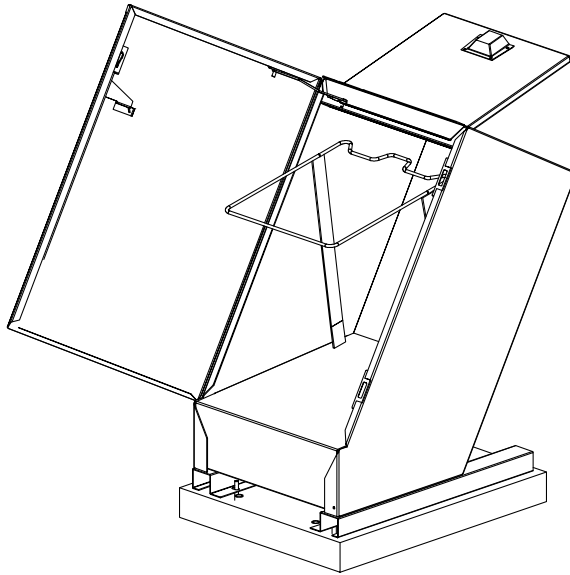
PLAN (END FRAME ONLY)

NOTES:

- FRAME COMPONENTS SHALL BE ELECTRONICALLY WELDED.
- WOOD COMPONENTS TO BE TREATED WITH CHROMATED COPPER ARSENIC (C.C.A.) GREEN.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

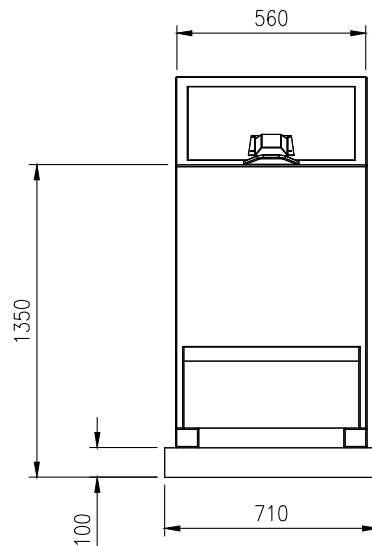
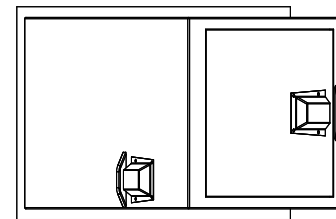
PICNIC TABLE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-11
NOT TO SCALE	DRAWN: EDS Group	



MOUNTING PAD SEE L16 FOR
CONCRETE SPECIFICATIONS

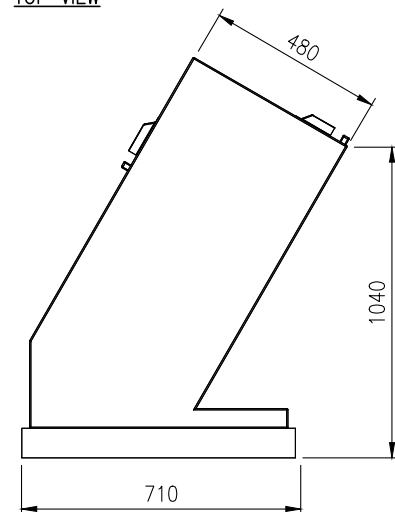
NOTE:

- HBIS CONTAINER (STANDARD) SP-HBIS-N
- GALVANIZED STEEL WITH POWDER COAT PAINT ARISTO BLUE
- STAINLESS STEEL HINGES AND LATCHES
- USES POLY BAG 2.5mil 1070mm X 1270mm
- MANUFACTURER:
HAUL-ALL EQUIPMENT SYSTEMS
WWW.HAULALL.COM
1-888-428-5255



FRONT VIEW

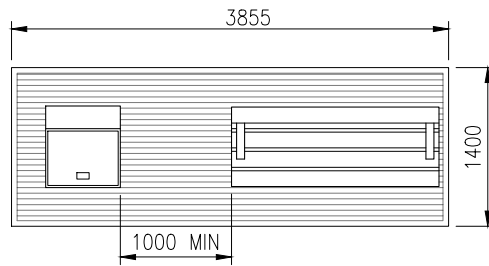
TOP VIEW



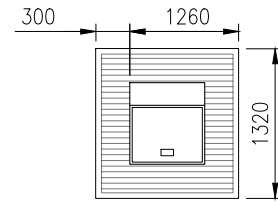
SIDE VIEW

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

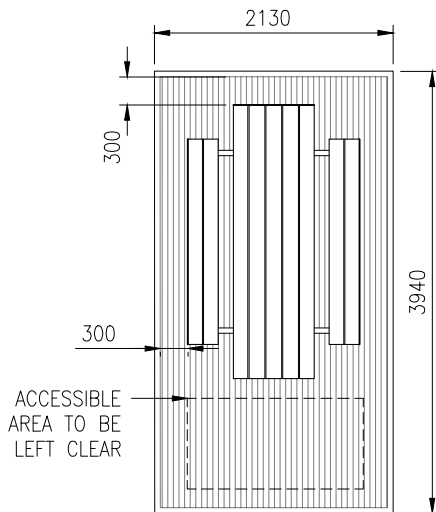
WASTE RECEPTACLE		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 1	DATE: MAY 2019	L-12
NOT TO SCALE	DRAWN: EDS Group	



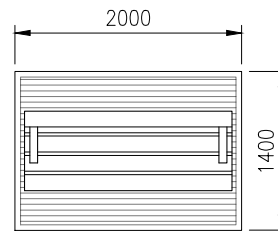
PLAN VIEW BENCH AND WASTE RECEPTACLE



PLAN VIEW WASTE RECEPTACLE



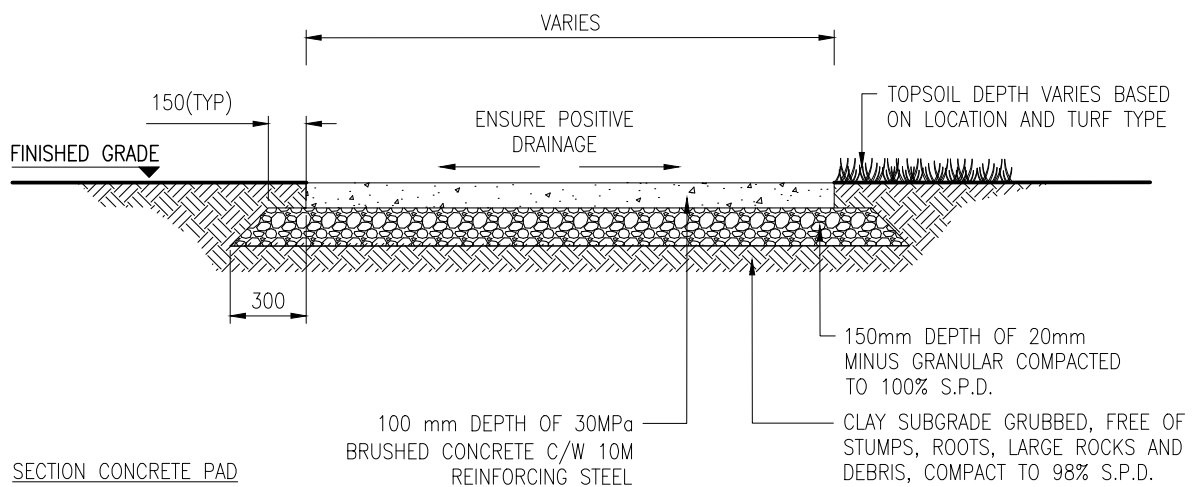
PLAN VIEW PICNIC TABLE



PLAN VIEW BENCH

NOTE:

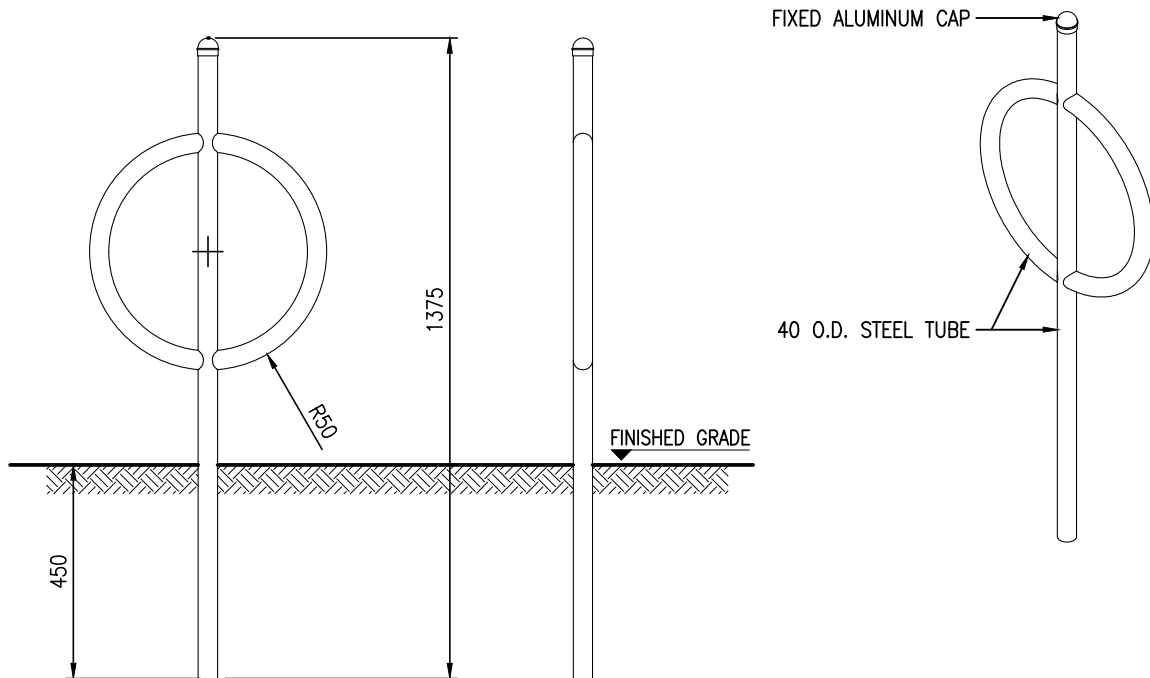
- SEE L10 FOR BENCH MODEL AND MOUNTING DETAIL.
- SEE L11 FOR PICNIC TABLE MODEL AND MOUNTING DETAIL.
- SEE L12 FOR WASTE RECEPTACLE MODEL AND MOUNTING DETAIL.
- CONCRETE PAD TO BE BROOM FINISHED LINES PARALLEL TO LONGEST DIMENSION.
- SAW CUT ANY CONCRETE THAT EXCEEDS 2250mm IN LENGTH.
- REBAR TO BE SPACED AT 500mm GRID.



SECTION CONCRETE PAD

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

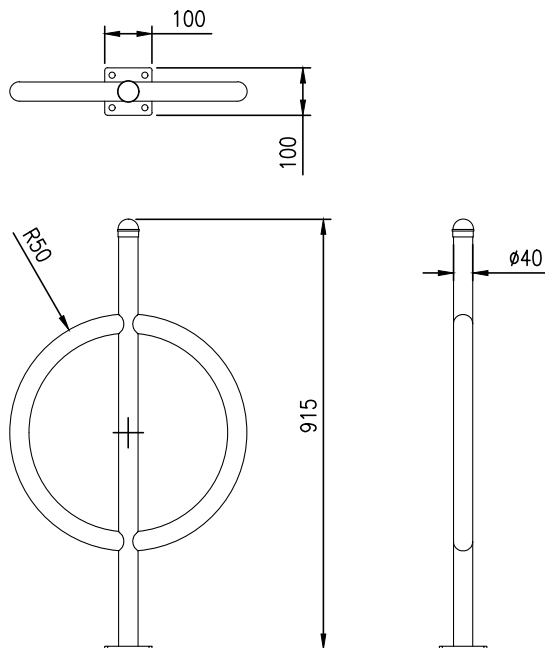
TYPICAL CONCRETE PAD		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 1	DATE: MAY 2019	L-13
NOT TO SCALE	DRAWN: EDS Group	



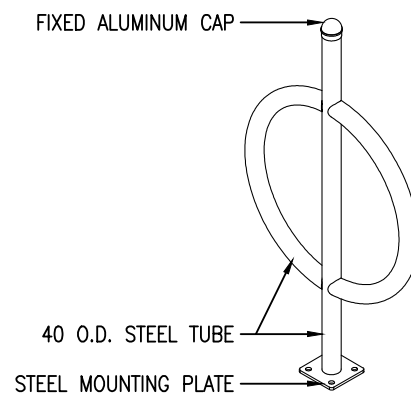
MODEL 101 (IN -GROUND MOUNTED)

NOTES:

- ALL METAL COMPONENTS TO BE POWDERCOATED BLACK.
- INSTALL AS PER MANUFACTURER'S SPECIFICATIONS.

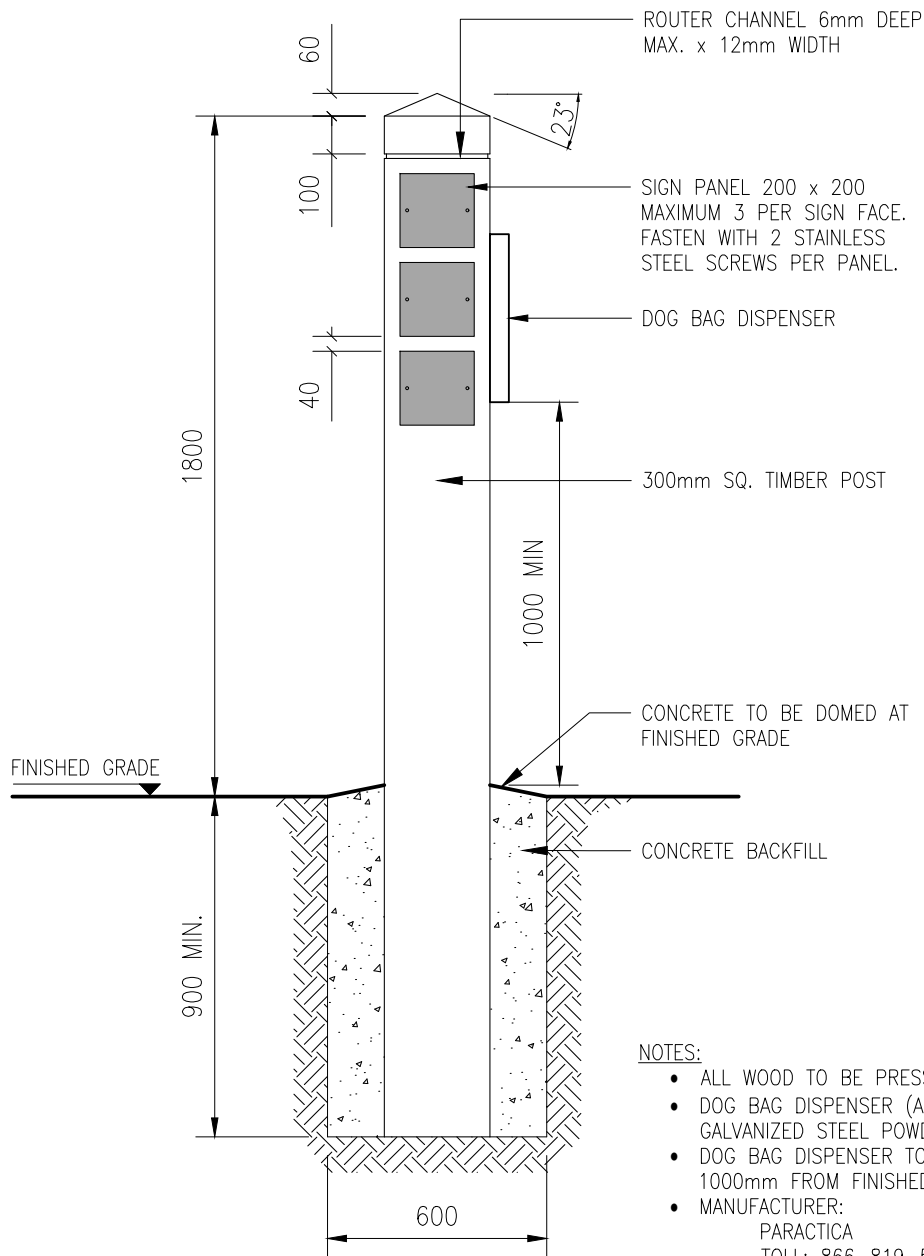


MODEL 102 (SURFACE MOUNTED)



ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

BIKE RACK		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-14
NOT TO SCALE	DRAWN: EDS Group	



NOTES:

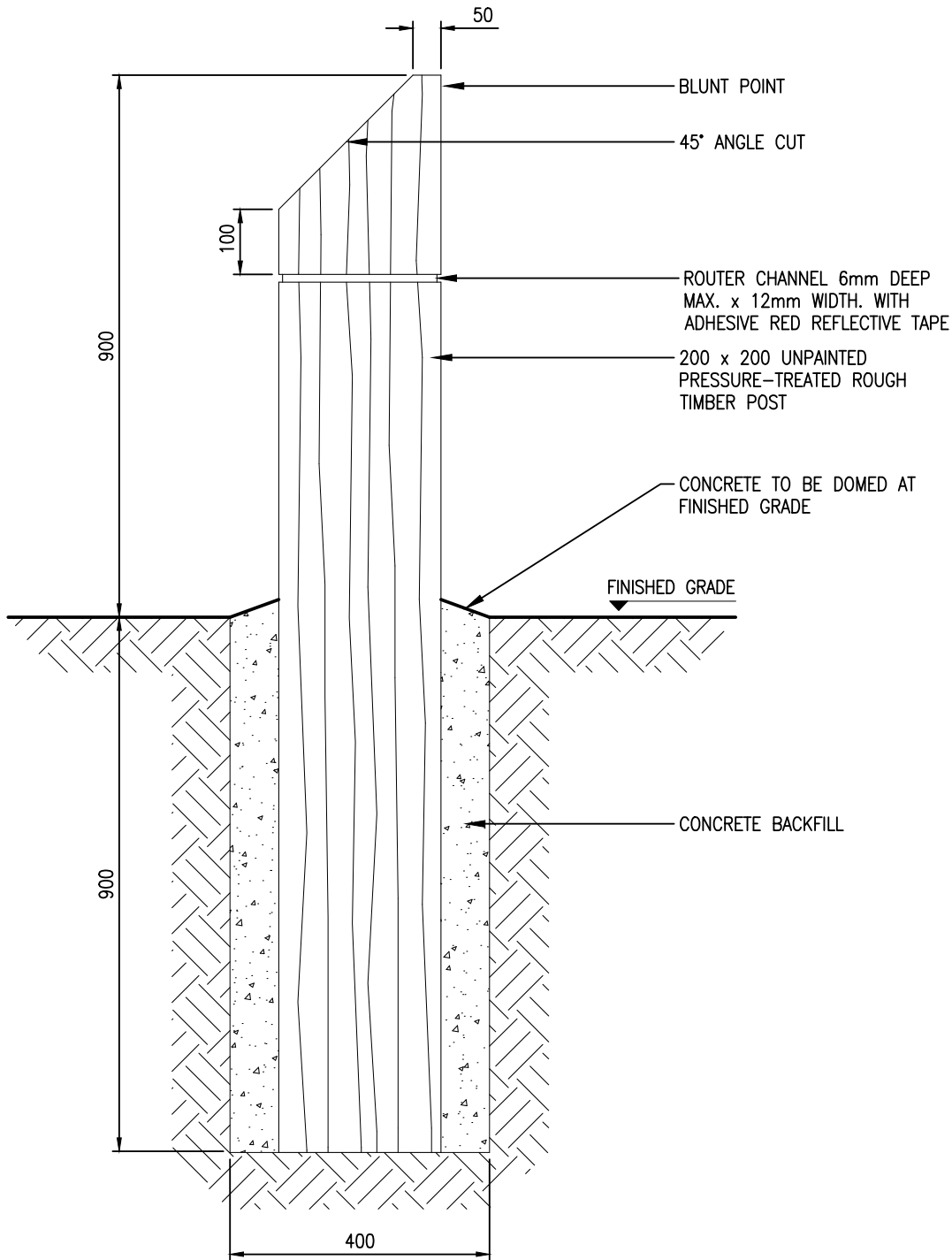
- ALL WOOD TO BE PRESSURE TREATED, INCISED.
- DOG BAG DISPENSER (ARTICLE #201) BLUE 14 GAUGE GALVANIZED STEEL POWDER-COATED RUST RESISTANT.
- DOG BAG DISPENSER TO BE MOUNTED TO POST MIN. 1000mm FROM FINISHED GRADE.
- MANUFACTURER:
PARACTICA
TOLL: 866-819-5559
PHONE: 519-624-9001



ELEVATION

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

TRAIL SIGN		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-15
NOT TO SCALE	DRAWN: EDS Group	

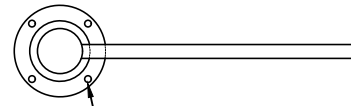
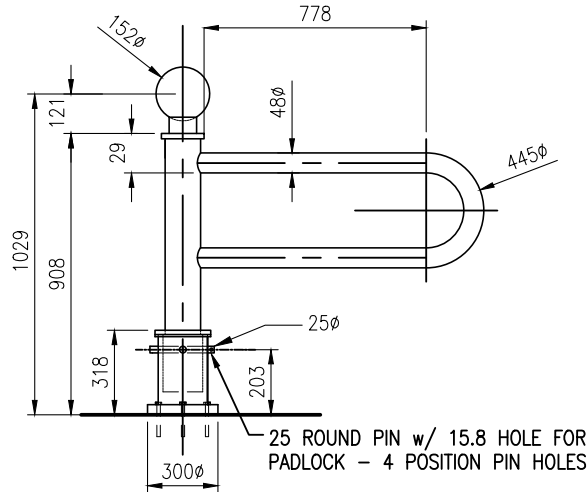


NOTES:

- REMOVE ALL LOOSE CHIPS AND SPLINTERS, SAND CUT EDGE LIGHTLY
- TREAT CUT FACE WITH PRESERVATIVE MATCHING UNCUT WOOD, TO MANUFACTURER'S INSTRUCTIONS
- INSTALL POSTS PLUMB, ALIGNED & VERTICAL WITH CUT SLOPES ALL FACING IN ONE DIRECTION
- WHERE MULTIPLE POSTS ARE REQUIRED, SPACE EQUALLY, NOT EXCEEDING 1500 O.C.
- INSTALL ALL WOOD BOLLARDS AT A UNIFORM HEIGHT USING A STRING LINE TO A TOLERANCE OF MAX. 15mm

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

WOOD BOLLARD		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 2	DATE: MAY 2019	L-16
NOT TO SCALE	DRAWN: EDS Group	



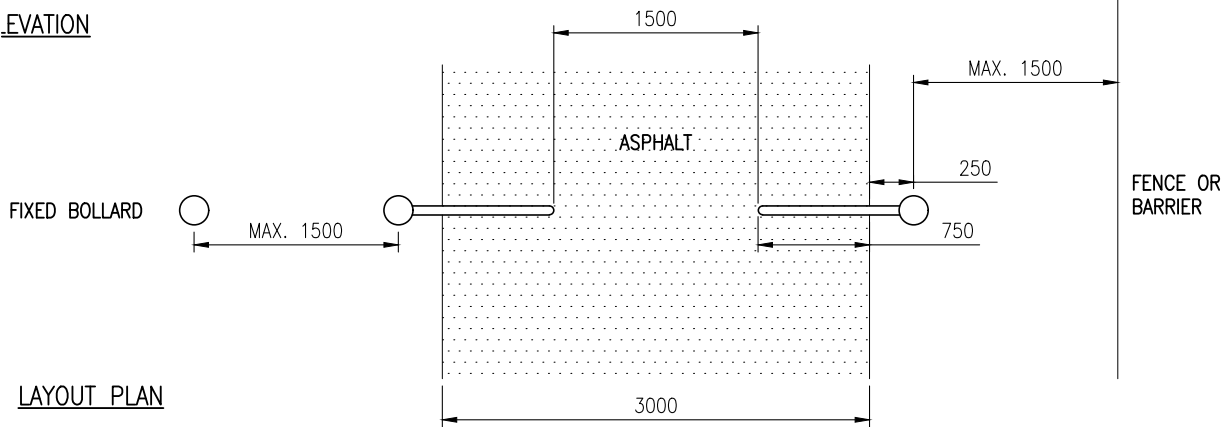
300 ROUND BASE PLATE w/ 4 - 25mm HOLES ON 260 BOLT CIRCLE. 4 - 150 LONG 19ø GALVANIZED BOLTS (COARSE THREAD) c/w FLAT WASHERS & NYLOCK NUTS. BURR THREADS TO PREVENT REMOVAL.

PLAN

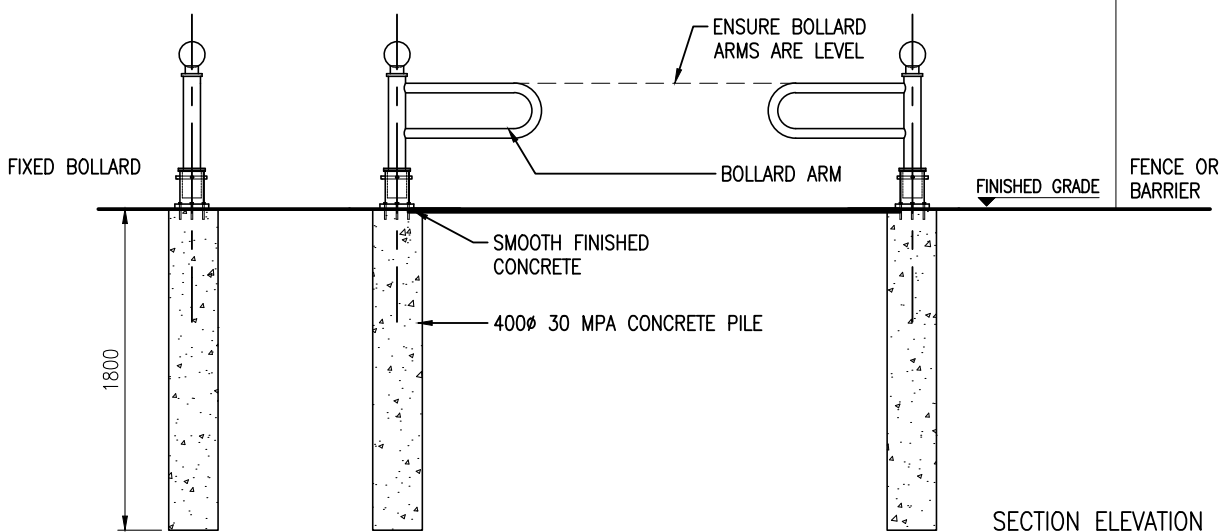
NOTES:

- ALL METAL COMPONENTS TO BE POWDER COATED; COLOUR TO BE 'BLACK' GLOSS FINISH.
- BOLLARDS AVAILABLE FROM:
SAVAGE METALWORKS
PHONE: (780) 992-7954

ELEVATION



LAYOUT PLAN



SECTION ELEVATION

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

SWING GATE BOLLARD



CITY OF
FORT SASKATCHEWAN

CITY OF FORT SASKATCHEWAN STANDARD DETAIL

DWG. NO.

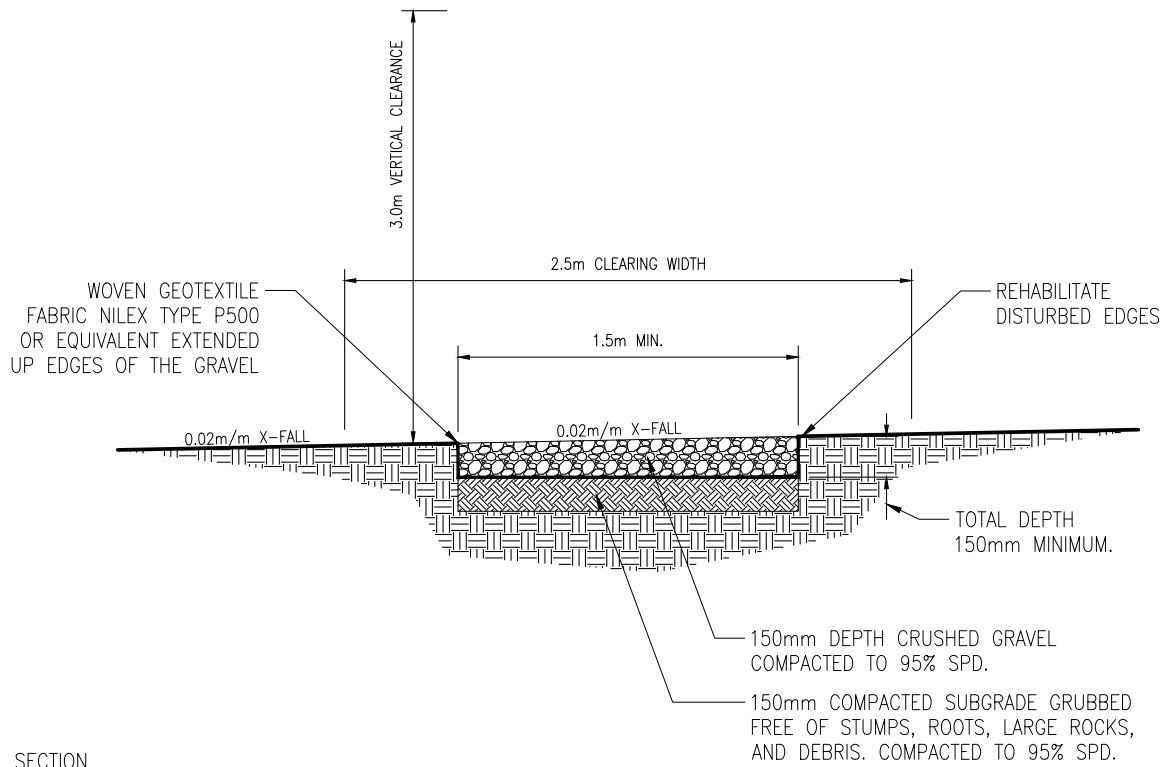
REVISION NUMBER: 2

DATE: MAY 2019

NOT TO SCALE

DRAWN: EDS Group

L-17



SECTION

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE NOTED

GRAVEL TRAIL		 CITY OF FORT SASKATCHEWAN
CITY OF FORT SASKATCHEWAN STANDARD DETAIL		DWG. NO.
REVISION NUMBER: 1	DATE: MAY 2019	L-19
NOT TO SCALE	DRAWN: EDS Group	