MUNICIPAL ENGINEERING DEVELOPMENT and SERVICING STANDARDS

- 2021 -

Table of Contents

Amendments

Date	Amendment No.	**Description** (affected pages / documents)

A. Executive Summary

A.1 INTRODUCTION

Town of Valleyview's Municipal Engineering Development and Servicing *Standards* have been prepared to provide Developer's and other interested parties, information, and minimum acceptable standards for the development of land within the Town. These *Standards* provide governing principles to encourage good engineering and construction practices acceptable to the Town and, when warranted, higher standards shall be applied.

Any deviation from these *Standards* requires a written request by the Developer to the Town for approval prior to implementation.

If any standard within this manual contradict other industry standards, the more stringent standard shall apply. Any reference to bylaws, policies, acts, regulations, or standards means the most recent edition or amendment of referred document to these *Standards*. **It will be Town practice in case of disputes, compliance issues or proposed alternatives to these *Standards* is to refer to the latest version of the City of Edmonton's Design and Construction Standards. The Town reserves the right to the final decision regarding the interpretation of the intent of these *Standards* and the acceptability of changes from these *Standards* proposed by the Developer.**

This manual shall be made available on the Town's website for Developer's to access. Amendments will be implemented on an as-required basis. All users of these *Standards* shall ensure that the latest version of the manual is being utilized. Users are encouraged to check the Town's website periodically.

A.2 RELATIONSHIP BETWEEN TOWN AND DEVELOPER

The Town provides municipal services such as snow clearing and garbage collection to all new developments upon construction completion acceptance. Upon final acceptance, all local improvements, and the responsibilities thereof, are taken over by the Town. For that reason, the Town is responsible to ensure that all local improvements meet minimum acceptable standards, so that they can be properly operated and maintained for the benefit of the end users.

Town involvement, periodic inspections, and acceptance are required in all aspects of servicing and land development.

A.3 DEFINITIONS

Alberta Environment	The provincial ministry responsible for environmental policy and sustainable resource development. Known as Alberta Environment and Parks (2020).
Applicant	See definition for "Developer".
Area Structure Plan (ASP)	An ASP provides the framework for developing and servicing new areas of the Town. An ASP must include the sequence of development proposed for the area, proposed land uses, proposed population density, general location of major transportation routes and public utilities, and all other matters considered necessary by Council.
Commercial	A lot used for the buying and selling of commodities and services.
Construction Completion Certificate (CCC)	A certificate issued by the Engineer and executed by the Town confirming that the work is complete and operational, that all deficiencies have been resolved to the satisfaction of the Town, and that the Warranty Period for the work can commence.
Contractor	Any person(s) or corporation which shall undertake installation of municipal infrastructure and services on behalf of either the Developer or the Town.
Developer	A person(s) or corporation which has applied to subdivide and/or develop, or to service an existing parcel of land, whether as the owner or an agent for the owner of the land.
Developer's Consultant	An Engineer, Landscape Architect, or Alberta Land Surveyor hired by the Developer to assist with the design and oversee construction of the proposed development.
Developer's Representative	An Engineer, Landscape Architect, or Alberta Land Surveyor hired by the Developer to act on the Developer's behalf.
Drainage Parkway	A wide-bottomed ditch used to convey large volumes of stormwater, under controlled conditions, through or past a subdivision.
Easement	An agreement, usually registered on the certificate of title to the property, that gives the Town the right to use a landowner's property in some way (such as to access a utility). Easements can also partially restrict a landowner's use of the affected portions of land.
Engineer	A professional engineer, in good standing with Association of Professional Engineers and Geoscientists of Alberta (APEGA), responsible for: design drawings, specifications of public infrastructure; supervision of work; certification that materials and installation are in accordance with these *Standards*; recording/reporting of as-constructed information; performing other APEGA duties.
Environmental Reserve (ER)	Land owned by the Town to be preserved in its natural state as an Environmental Reserve such as a swamp, gully, ravine, natural drainage course, flood plain, or shoreline, as defined in Section 664(1) of the Municipal Government Act.
Final Acceptance Certificate (FAC)	A certificate issued by the Developer's Consultant and accepted by the Town confirming that the work is complete and acceptable to the Town, that all deficiencies and maintenance work have been resolved to the satisfaction of the Town, and Warranty Period for the work has expired.

Geographic Information System (GIS)	A system for collecting, managing, analyzing, and presenting geographic data that organize layers of information into maps to analyze spatial locations.
High Density Residential	Land that has, or is planned to have, at least one building containing three or more dwelling units which may have a common entrance from street level but does not include row housing.
Industrial	Land used in the manufacturing, processing, assembling, cleaning, repairing, servicing, testing, storage, warehousing, distribution, or trans-shipment of materials, finished goods, products, or equipment, which does not include artisan shops but may include an accessory use like storage, display, sale, and technical or administrative support areas where there are impacts to adjacent lots.
Landscape Architect	A qualified landscape designer, in good standing with the Alberta Association of Landscape Architects (AALA), that is responsible for the design, layout, and supervision of installation of landscape and related work, recording as-built information, certifying material and installation is in accordance with the standards, design drawings, and design specifications, and performing those duties as prescribed by AALA.
Local Improvement	An off-site piece of infrastructure, feature, or upgrade required to support a proposed subdivision or development, which is the responsibility of the developer and includes, but not limited to, deep utilities, shallow utilities, roadways, lanes, street lighting, landscaping.
Low Density Residential	Land that has or is planned to have at least one single or semi-detached dwelling.
Maintenance	All upkeep, repair, or replacement of Local Improvements during the Warranty Period, at the Town's discretion.
Master Plan	A document that outlines existing and future trends for the Town, such as utility (water, sanitary, stormwater) and transportation Master Plans that describe the status of existing systems and any required upgrades to these systems to plan for and support future expansion areas.
Medium Density Residential	Land that has or is planned to have at least one building with three or more dwelling units, such as row housing, three-plex's, or four-plex's.
Multi-Dwelling Residential	Land that has or is planned to have at least one building with three or more dwelling units (row housing, three-plex's, four-plex's), or walk-up apartments, and includes Medium / High Density Residential lands.
Municipal Reserve (MR)	Land owned by the Town for the development of parks, recreation, schools, and buffers between different land uses pursuant to Section 666 and Section 671 of the Municipal Government Act.
Municipal Service	A service provided by the Town upon construction completion acceptance, such as snow clearing or garbage collection.
Open Space	Any parcel of land or body of water that is dedicated and reserved for public use, including Municipal and Environmental Reserves.
Prime Contractor	A company that, through a written, contractual agreement with the Owner (Developer or Town), is responsible for coordinating activities conducted on a worksite, ensuring Occupational Health and Safety legislation is followed, and without written assignment of Prime Contractor, the person with the highest degree of control over a worksite is deemed the Prime Contractor.

Public Utility	An off-site piece of infrastructure, feature, or upgrade that is owned and maintained by the Town, including the water distribution system, sanitary collection system, stormwater collection management system, roadways, and open spaces.
Public Utility Lot (PUL)	Land required to be given under Division 8 of the Municipal Government Act for roads and or Public Utilities.
Record Drawings	A revised set of drawings submitted by the Developer to the Town upon completion of construction that reflect all changes made to the specifications and drawings during construction and include updated dimensions, lengths, elevations, geometry, etc. of the work.
Rural	An area within the Town with rural services.
Rural Services	A level of service that entails individually owned and operated water and sewage systems.
Standards	The Town of Valleyview's Municipal Engineering Development and Servicing Standards.
Standard Proctor Density	A laboratory method of experimentally determining the optimal moisture content at which a given soil type will become most dense and achieve its maximum dry density.
Transportation Association of Canada (TAC)	Is a non-profit association that provides a neutral forum for discussing technical issues related to road and highway infrastructure and urban transportation. It brings together governments, private companies, academic institutions, and other organizations in Canada.
Tangible Capital Assets (TCA)	An economic resource managed by the Town, including roads, buildings, equipment, land, utilities, stormwater management facilities.
Town	The Town of Valleyview.
Traffic Impact Assessment (TIA)	A report, prepared by the Developer's Consultant, which investigates the impact a proposed development may have on traffic operations and recommends any mitigation measures that may be required as a result of the proposed development.
Urban	An area within the Town with urban service.
Urban Services	A level of service that includes a municipally owned water distribution system, sanitary collection system, and stormwater collection and management system.
Warranty Period	A minimum two-year period commencing with the execution of a Construction Completion Certificate and ending with the execution of a Final Acceptance Certificate.
Water Network Analysis (WNA)	A report, prepared by the Developer's Consultant, which demonstrates that the proposed water system is capable of meeting these Municipal Engineering Development and Servicing Standards based on system pressures, flow velocities, head losses, and flow rates and, does not negatively impact adjacent areas or infrastructure.

A.4 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

The Freedom of Information and Protection of Privacy Act is in effect for the Town and it gives any person a right of access to records in our custody or control, subject to limited and specific exceptions. All documents and information, including correspondence, agreements, plans, and specifications that are written, photographed, recorded, or stored by the Town, may be subject to access and privacy provisions of the Act.

Developers and their agents, consultants and Contractors shall identify all information that they consider confidential, and the basis for confidentiality, including those parts of their submission that relate to trade secrets, commercial and financial labour relations, and scientific and technical information.

While the Town will endeavor to use Sections 15 and 16 of the Freedom of Information and Protection of Privacy Act to protect the confidentiality of the information identified by the Developer or his representatives as confidential, other sections of the Act may apply, and the information may have to be disclosed to members of the public who request access to records in the Town's custody and control.

B. Engineering Design & Construction Approval Process

B.1 GENERAL

The *Standards* outlined herein are intended to be minimum standards. Higher standards shall be applied when warranted. **In case of disputes, compliance issues or proposed alternatives to these *Standards*, Town practices will be to refer to the latest version of the City of Edmonton's Design and Construction Standards.**

In addition to these *Standards*, the Town has several other documents that Developers should be aware of in advance of undertaking the design of a specific subdivision or project including:

- **Municipal Development Plan**: Describes general policies and guidelines with respect to land development within the Town.
- **Area Structure Plans**: Provides the framework for developing and servicing new areas of the Town.
- **Land Use Bylaw**: Describes permitted and discretionary uses for each land use district and defines numerous design parameters.
- **Master Plans**: Provides topic specific policies and guidelines, examples include the water, sanitary, stormwater, transportation, and trails master plans.

Developer shall be responsible for the development of subdivision and or other related work within the Town in accordance with standards acceptable to the Town and conforming to good engineering and construction practices.

Town requires a safe work permit to be completed and approved prior to any excavation in a public right-of-way or tie-in into a public utility. Safe work permit applications shall be made a minimum of four (4) working days prior to the planned excavation. Town must also be provided a copy of the Notification and/or Authorization, if applicable, to/from Alberta Environment & Parks. Public Works staff must be present for the connection to existing Municipal water, sewer, and storm utilities.

A copy of all material test results, a final inspection letter from the Engineer of record and, additional information as indicted in Section B.8.1 shall be submitted to the Town prior to applying for a Construction Completion Certificate (CCC).

Communication is key and the Town encourages early preliminary meetings to discuss land development proposals and options.

B.2 PRE-APPLICATION INQUIRY

Developer is required to submit a pre-application inquiry to the Town for the purpose of discussing the project.

The information provided as part of the inquiry shall serve as the basis of the project between the Developer and the Town, and may avoid expenditure by the Developer of time, effort, and money on concepts and plans that are unacceptable.

At a minimum, this information shall describe the proposed development, how it relates to applicable existing planning documentation (such as the Land Use Bylaw and relevant Area Structure Plan), and applicable servicing and infrastructure requirements.

As part of the pre-application inquiry, the Developer shall prepare conceptual plans of the road network, site servicing layouts, and landscape improvements for submission to the Town. These plans are to be accompanied with preliminary calculations supporting the means by which the development will be serviced including all proposed rights-of-way, easements, and PULs.

Conceptual engineering plans are to include a conceptual servicing layout (water, sanitary, storm) with preliminary pipe sizing, volume of stormwater to be stored and the method of storage, and preliminary road network with road classifications.

Conceptual landscape plans are to provide an overview of the development indicating community themes, reserve / open play areas, pedestrian linkage, and facilities including spray parks, playgrounds, gazebos, rest areas, and other park amenities.

Conceptual design package shall include a preliminary geotechnical investigation, prepared by a qualified geotechnical Engineer, highlighting any design constraints which may need to be considered during detailed design.

B.3 SUBMISSION REQUIREMENTS

The following shall be submitted to the Town for detailed design approval application:

1. A covering letter indicating the subject and purpose of the application, an estimated construction commencement date, proposed schedule for site meetings and inspections.
2. Three (3) complete sets of the engineering drawings and one (1) digital PDF file. Sets which do not contain the required drawings (as outlined in Section D and Appendix I) will not be accepted for processing.
3. Three (3) sets of specifications complete with Tender Form Schedule(s) of Quantities.
4. Three (3) copies of Geotechnical Report including water table readings and associated recommendations and, if required by the Town, further analysis of the ground water table:
    - Required at two stages: Conceptual plan & detailed design stage(s).
    - Undertaken by qualified engineering firm specifically prepared for the development / project according to the respective scope and magnitude.
5. Two (2) copies of the engineering calculations for each: water distribution, storm water collection and sanitary sewer systems.
6. Estimated construction schedule outlining the intended sequence of construction and applicable critical dates.

7. Additional technical detail or other information required to satisfy conditions of subdivision approval and/or design submission and may include: design calculations, environmental approval(s), traffic impact assessments, and/or water network analysis.
8. Following the Town's review of the submitted drawings and documents, comments will be forwarded to the Developer's Consultant. Prior to resubmission of any drawings and documents, the Developer's Consultant is to prepare a response letter outlining the comments received from the Town and how each comment has been addressed. Developer's Consultant shall submit the response letter to the Town in support of the revised drawings and documents.
9. Final engineering drawings, diagrams, and reports must be sealed by a qualified Engineer. Landscape plans are to be submitted with the engineering drawings; final landscape plans are to be signed by a qualified Landscape Architect.

Acceptance of the submission does not relieve the Developer of their responsibility for errors or omissions or of their responsibility of meeting all requirements of these Standards and other Federal and Provincial rules and regulations.

B.4 APPROVAL BY THE TOWN

Town shall inform the Developer, within twenty (20) working days after receipt of the detailed design submission, whether the Developer's submission has been accepted. Should the Town not approve a part of the Developer's plans or proposals, they will be returned to the Developer for revision to the satisfaction of the Town. The 20-working day approval period will begin again on the receipt of any resubmission.

Developer will be responsible for any review and inspection costs deemed appropriate by the Town. Costs may be incurred for the following:

- When specialized consulting expertise is required by the Town to review development proposals, concept plans, and drawings.
- When additional staffing is required to review developments.
- For the review of complex resubmissions and deviations from these *Standards*.
- When excessive errors and omissions are encountered.
- When insufficient information is provided.
- When improper procedures are followed.

Town will review Developer's submission and inform them of any anticipated review costs. At the Towns discretion, the Developer shall reimburse the Town prior to review of resubmissions.

B.5 DEVELOPMENT AGREEMENT

General guidelines for the preparation of Development Agreements are:

- Will only be prepared once a set of engineering drawings are approved, or substantially complete (requiring only minor changes).

- Developer must enter into a Development Agreement with the Town prior to commencing construction and in accordance with a set of approved engineering drawings.
- Town will prepare a draft Development Agreement (costs associated with the preparation of this Agreement will be incurred by Developer).
- Development Agreement will specify the required security that a Developer must pay to the Town prior to commencing work.
- Once the elements of the draft Agreement are finalized, a final Agreement will be prepared for signatures by the Developer, the Town's Mayor and CAO.
- Town will give necessary consent to allow Developer to commence construction of local improvements as identified in the approved engineering drawings.

B.6 DEVELOPER RESPONSIBILITIES

Developer shall be responsible for providing all detailed engineering requirements as outlined in these *Standards*. Additional information may be requested by the Town.

Developer's Consultant shall identify and provide justification for any deviations or nonconformances from these *Standards* as part of the submission of the detailed design drawings. Otherwise, the submittal of detailed design drawings will be assumed to be in accordance with these *Standards*.

Under no circumstances will a deviation from these *Standards* be considered by the Town without the submission of detailed documentation demonstrating the justification for the deviation and added benefit to the Town.

Developer shall arrange and negotiate all easements across private lands, crossings of utilities and pipelines and other similar agreements which may be necessary with landowners in the area.

Upon request, Town shall provide all available information for existing utilities including available models, capacities, locations, restrictions, and limitations. Developer's Representative must confirm this information "in the field", as the Town does not guarantee accuracy or completeness of any information provided:

- Town takes no financial responsibility for errors or omissions represented on record information.
- Developer shall contact Alberta One-Call for utility locates prior to proceeding with any ground disturbance.
- Developer will be held responsible for any damage to, and for maintenance and protection of, existing structures and utilities during construction. Existing utilities are to be protected from damage or unauthorized use by means of boundary valves for watermains and plugs for sanitary and storm sewers (per Section B.7.12).

Developer shall submit detailed plans and specifications to applicable Provincial and / or Federal regulatory body(ies), departments and authorities for approval. Developer is also responsible to supply all necessary documentation, plans and specifications required for each application.

Applicable environmental approvals are required prior to execution of Development Agreement:

- Obtaining environmental approval, no way removes responsibility of the Developer to comply with the *Standards* and to receive the Town's acceptance of the detailed plans and specifications.
- Copy(ies) of submission(s), together with approval(s), shall be supplied to Town.

Developer shall retain an Engineer and Landscape Architect who will be responsible for the design and preparation of drawings and specifications for all services as required. All services will be designed in accordance with these *Standards*:

- Design drawings shall show all existing and proposed services.
- It shall be the Developer's Representative's responsibility to coordinate with the utility companies to establish the location of their existing and proposed services.
- Final engineering drawings must be signed and stamped by the Engineer.
- Final landscape plans must be signed and stamped by the Landscape Architect.

Developer shall be required to host a public meeting prior to construction, targeting the area residents, utility personnel and Town staff in attendance.

Developer shall notify the Town in writing, in advance of construction start-up, street closures and or utility shutdowns as indicated throughout Section B.7 General Construction Requirements. Town shall also be notified when streets are reopened, and utilities are back in service. Operation of Town infrastructure shall be under the direct supervision of the responsible Municipal employee(s).

Developer shall develop, maintain, and supervise for the duration of the work, a comprehensive safety program that will effectively incorporate and implement all required safety precautions. The program shall, as a minimum, respond fully to the requirements of all applicable laws, rules, regulations, orders, and general construction practices for the safety of persons or property, including without limitation, any general safety rules and regulations of the Town and any Workers' Compensation or Occupational Health and Safety legislation or regulations that may be applicable (i.e., WHMIS). Upon request, the Developer shall provide a copy of the safety program and/or applicable certification to the Town prior to the commencement of construction. Town requires a safe work permit to be completed and approved prior to any excavation in a public right-of-way or connection to a public utility. Safe work permit applications shall be made a minimum of four (4) working days prior to the planned excavation.

Developer shall submit copies of all material testing results and additional information as indicted in Section B.8.1 to the Town prior to applying for CCC. Developer may apply for CCC of the deep utilities and roads independently.

Final Acceptance Certificate (FAC) for roads shall be issued, subject to all deficiencies being rectified, two (2) years after the issuance of the CCC for roads or one (1) year after the issuance of the FAC for deep underground utility extensions and improvements, whichever occurs later. The FAC for utilities shall be issued, subject to all deficiencies being rectified, one (1) year after the issuance of the CCC for utilities. See Section B.8.

B.7 GENERAL CONSTRUCTION REQUIREMENTS

Developer shall carry out the work for construction of local improvements within the Town in accordance with all Federal, Provincial, and local statutes, acts, bylaws, and regulations. Developer shall meet the following general construction requirements:

B.7.1 Occupational Health & Safety (OH&S)

Developer, including the representative(s), consultant, and contractors, shall comply with current OH&S legislation.

B.7.2 Project Supervision

Developer and their representative(s) are responsible for:

- Layout, field surveys, inspections, material approvals, supervision of all local improvements.
- Periodic / adequate on-site supervision of installations to certify that all local improvements conform to these *Standards*.
- All non-conformance, construction errors and or omissions.
- Correcting and or replacing any unacceptable work.

Town may periodically inspect the work and assist with coordinating the local improvement with other municipal work.

Additionally, Town will advise the Developer's Representative of any unacceptable work (i.e., materials, practices, etc.). If remedial action is not taken to the satisfaction of the Town, a Stop Work Order will be issued to the Developer's Representative and, all work will cease until the unacceptable work is corrected to the satisfaction of the Town.

B.7.3 Right-of-Way Documents

When deemed necessary and, at the sole cost to the Developer, right-of-way / easement documents shall be obtained and prepared by a registered Alberta land surveyor to allow access for maintenance purposes. These documents shall be provided to the Town by the Developer and or their representative.

B.7.4 Design Acceptance

Developer may proceed with the local improvements once:

- Town receives and accepts all certified drawings and specifications.
- Development Agreement has been fully executed between Town / Developer.
- Security deposit has been paid to Town by Developer.

A copy of all accepted drawings and specification must be maintained on-site by the Developer's representative for the duration of the work / local improvement installation.

B.7.5 Construction Commencement Notice

Developer shall provide two (2) weeks' written notice to the Town prior to start of large scaled local improvement / installations (i.e., subdivisions, complex projects) and forty-eight (48) hours' notice for smaller projects (i.e., home / land improvements).

B.7.6 Stockpile Locations

Stockpile locations are to be accepted by the Town at time of engineering drawing review. Developer is responsible to ensure each stockpile location are adequately secure and safety measures (i.e., temporary fencing), dust & weed controls are in place. Silt fencing may be installed for stockpiles adjacent stormwater management facility, road, or ditch.

B.7.7 Dust Control

Developer shall control all dust resulting at the local improvement site and the surrounding area(s) to the satisfaction of the Town and by acceptable means such as calcium chloride, water and or other approved method.

B.7.8 Street & Sidewalk / Overall Site Cleaning

During the construction, warranty period and until issuance of FAC, Developer shall be solely responsible for the removal and disposal of mud and or debris off of streets & sidewalks and from within and outside the project boundary when tracking of mud / debris from the development occurs.

B.7.9 Barricades, Temporary Fence & Safety Provisions

Developer is responsible to protect persons from injury and to avoid property damage. At all times, the Developer shall place and maintain adequate barricades, construction signs, warning lights, and temporary fencing until the work is safe for traffic or pedestrian use and approved by the Town.

B.7.10 Erosion & Sediment Controls

Erosion & Sediment Control (ESC) measures shall be installed to prevent erosion and transportation of sediment from the development. All costs associated with ESC measures, including accountability for complying with the Alberta Environment Act and Regulations, will be borne to the Developer. ESC measures shall:

- Follow City of Edmonton ESC Guidelines / Field Manual.
- Be planned and implemented prior to project start-up.
- Be maintained for the duration of the project, warranty period and issuance of FAC.
- Comply with Federal / Provincial acts, regulations, codes of practice, and guidelines applicable to development activities that result or could result in erosion, sedimentation, or other adverse impacts to the environment.

B.7.11 Traffic & Utilities Controls

Approvals

- Prior to local improvement commencement, Developer shall obtain approval(s) from the Town four (4) working days in advance.
- For work being performed on or adjacent to public roadways or right-of-ways, the Town may request the Developer to provide a traffic control plan. This plan shall include as a minimum: temporary construction signage, barricades, warning lights, detours, etc. This plan must be provided to the Town at least four (4) working days.

Traffic Disruptions

- Construction activities shall be conducted to cause the least interruption to traffic. Developer shall provide and maintain safe and suitable temporary structures (i.e., bridges) at street / driveway crossings where traffic must cross open trenches.
- Hydrants under pressure, valve pit covers, valve / curb stop boxes, and other utility controls shall be unobstructed and accessible during the entire construction period.

Flag persons

- Trained and certified flag persons, able to handle traffic safely and effectively, are required to minimize traffic disruption to the public.

Utility Disruptions

- Provisions must be made for adequate flow of sewers, drains, and water courses encountered during construction. Valves and other existing utility system controls shall only be operated by the Town.

Adjacent Property Owner Notifications

- With Town approval, Developer shall notify property owners who may be affected by the local improvement including service interruptions and paving operations. Notices shall include a description of the disruption, its duration / time frame and, shall be distributed to residents 72 hours prior to the interruption / operations.

Detours

- Prior to any road closures, a *detour plan* must be submitted to the Town by the Developer at their expense, four (4) working days in advance of the road closure. *Detour plan* must include provisions for safe vehicle passage, pedestrian movement, and emergency access.
- Developer shall contact emergency services (fire, ambulance, RCMP, Alberta Health Services) to satisfy any additional requirements within the *detour plan* that they may have. Written confirmation by emergency services of the proposed *detour plan* must be submitted to the Town.
- If the proposed road closure is within 800m radius of a provincial highway, the Developer must notify Alberta Transportation for written approval of the *detour plan* and supply this approval notice to the Town.
- Acceptance of the detour plan by the Town does not relieve responsibility of Developer to maintain provisions outlined in the *detour plan* during construction,

nor imply that Alberta Transportation or emergency services will approve the Developer's proposed *detour plan*.
- Developer is solely responsible to supply, place, and maintain all detour signage for the duration of the road closure / construction.
- Road closure / detours must be advertised to the public via signage at least 72 hours prior to / commencement of the road closure / detour. Changes to the dates of the road closure / detour must require another 72 hour's notification period.

Signage
- Developer is solely responsible to supply, place, and maintain all signs, barricades, etc. to Town's satisfaction and at Developer's expense. Damaged, lost or stolen signage must be repaired / replaced immediately at Developer's expense.
- Signage shall be:
    - Placed in accordance with the Urban Traffic Control Devices Manual.
    - Inspected and maintained on a regular basis (legibility, damage).
    - Mounted on fixtures appropriate for intended use.
    - Remains erect during inclement weather.

Staged Construction
- To allow continuity of traffic flows / work progress during certain phases of the project (i.e. application of new pavement), Developer will be required to stage the work to allow traffic flow through during construction. Staging may be applicable at intersections, where Developer may be required to construct an intersection one-half at a time thus, allowing traffic to cross through at site specific construction gaps until work area can be filled in.

B.7.12 Boundary Controls

Boundary Controls are necessary to protect existing distribution systems from newly developed systems to prevent potential contaminations.

Water Distribution Systems
- A boundary valve shall be placed at the tie-in to existing water distribution system and shall remain closed until CCC is issued. These valves are only to be operated by Town staff in order to fill the watermain for testing / chlorination purposes.
- Developer must provide to the Town:
    - 72 hours' notice minimum to request for boundary valve operation.
    - Fill & Flush Plans prior to undertaking watermain testing for each project.
    - Copies of all bacteriological tests performed.

Sanitary / Storm Sewer Systems
- Plugs are to be placed at the downstream end of new pipes at the tie-in manholes to the existing sanitary and storm sewer systems. Plugs are to remain in place until CCC is issued for each system.

B.7.13 Progress Meetings

Prior to commencement of any construction activity, Developer and or Developer's representative shall conduct a *Pre-Construction Meeting*. Attending representatives shall include Developer, contractor, subcontractor(s), Town. Subsequent *Progress Meetings* are to be held to suit project timelines. Meeting frequency are to be determined between the Town and Developer.

Minutes of all *Meetings* shall be distributed to all project representatives.

B.7.14 Stop Work Order

Town may issue a *Stop Work Order* to the Developer and or its project representatives (i.e., contractor) due to on-site non-conformance issues such as:

- Unsafe work practices,
- Risk of imminent danger,
- Lack of traffic control,
- Work is not in accordance with accepted drawings, specifications, or *Standards,*
- Damage to existing facilities, and or
- No consulting supervision.

If a Stop Work Order is issued, the Developer shall:

- Cease operations immediately,
- Rectify the non-conformance, and
- Obtain written approval from the Town prior to proceeding with the work.

B.7.15 Materials

Developer shall only install materials which have been approved in these *Standards* or pre-approved in writing by the Town. Installation of any non-approved materials will be subject to non-conformance and a *Stop Work Order* will be issued immediately. The *Stop Work Order* will only be lifted once the non-compliant materials are removed and replaced with approved materials and, the Town has given written consent to proceed.

As part of the post-construction submission package, Developer shall submit certification (i.e., report, special letter, support documents) by an accredited materials testing firm or manufacturer which confirms all project materials conform to these *Standards.*

B.7.16 Survey Monument Control

If a survey monument is destroyed, damaged, or removed during the construction or installation of local improvement, Developer shall be responsible to maintain or replace such monument at their sole expense.

B.8 CERTIFICATES (CCC & FAC), WARRANTY PERIOD & PERMITS

B.8.1 General Requirements – CCC

Prior to issuance of CCC, Developer shall submit the following supporting documentation as required / applicable to the local improvement scope:

- One (1) complete set of as-built (record) drawings (Appendix I);
- Lot service records;
- Compaction test results;
- Pressure / leakage testing & chlorine residual / bacteriological test results;
- Closed-circuit television (CCTV) inspection report for sanitary / storm sewers;
- Infiltration or exfiltration test results for sanitary / storm sewers;
- Concrete and asphalt mix designs;
- Density / deflection test results;
- Concrete strength test results;
- Materials testing & asphalt core results;
- An accurate as-constructed bill of materials for Town records / database.

B.8.2 Seasonal Conditions – CCC & FAC

Should seasonal conditions (excessive rains, Acts of God) or inclement weather (snow, ice, freezing conditions) prevent CCC or FAC inspections, execution of the CCC or FAC by the Town will be delayed until appropriate conditions exist. The Town is not responsible for notifying the Developer when inclement weather will delay the CCC or FAC inspection.

B.8.3 Inspections – CCC & FAC

Prior to any CCC or FAC inspection, Developer's Consultant shall conduct a pre-inspection of the project five (5) working days in advance. Any deficiencies shall be documented and submitted to Town at least 72 hours prior to the CCC or FAC inspection. All pre-inspection deficiencies shall be rectified and recorded as completed, with no outstanding deficiencies, certifying local improvement ready for CCC or FAC inspection.

Developer's Consultant shall take the lead role during the CCC or FAC inspection with Town in observance and commenting as required. It is the Developer's Consultants responsibility to confirm that the project has been constructed in conformance of these *Standards*, accepted drawings and specifications.

B.8.4 Construction Completion Certificate (CCC)

Once the project has been satisfactory completed, a CCC inspection conducted and, all deficiencies have been corrected with applicable submissions received, the Developer and their Consultant shall submit to the Town a notification to execute the CCC which:

- Accepts the completed project by the Town; and
- Commences the *Warranty Period* start date.

See Appendix A III.1 for the Town's Construction Completion Certificate which shall be completed and issued by the Developer and the Developer's Consultant.

Separate CCC inspections and *Warranty Periods* commencement dates shall be issued for underground utilities, surface works, and landscaping.

Additional CCC inspections and *Warranty Periods* commencement dates for specific local improvements may be issued at the discretion of the Town.

B.8.5 Warranty Period

Construction cut-off date for underground and surface improvements shall be no later than October 31st. Landscape improvements cut-off date shall be as directed by the Town.

Warranty Period for all work is a minimum of two (2) years. Developer, at their own expense, shall be responsible to rectify any defect, fault, or deficiency of their completed work during the Warranty Period as stated on their CCC.

The Town, upon commencement of the Warranty Period, will assume responsibility for snow removal and garbage pickup on paved streets within the occupied subdivision. The Developer shall remain responsible for all other maintenance and repair items until issuance of the FAC including, but not limited to:

- Third party damages*
- Maintenance of street signs
- Flushing of sewer lines
- Thawing and flushing of watermains
- Maintenance of landscaping

*Third party damages that occurs during the *Warranty Period* will be reviewed by the Town on a case-by-case basis; after consideration by the Town, Developer may be held responsible for the third party damage.

B.8.6 Final Acceptance Certificate (FAC)

Prior to the expiration of the *Warranty Period*, Developer shall request, in writing, a final inspection. Within sixty (60) working days of receipt, the Town will carry out an inspection.

FAC's shall be issued for underground utilities, surface works, and landscaping upon correction of all deficiencies. Specific improvements may be approved under a separate FAC at the discretion of the Town. Warranty Period's for all CCC's shall remain in effect until the FAC is issued by the Town.

See Appendix A III.2 for the Town's Final Acceptance Certificate which shall be executed by the Developer and the Developer's Consultant.

Should seasonal conditions not permit the final inspection, execution of the FAC by the Town will be delayed until appropriate conditions for inspection exist.

B.8.7 Inspection Costs – CCC & FAC

Developer will be responsible for any inspection costs deemed appropriate by the Town. Costs may include, but not limited to, consulting expertise for specialized inspection needs, and excessive deficiencies are present and re-inspections are required.

Inspection costs may take several forms, including lump sum fee charged to the Developer, or invoiced cost by specialized consultant, plus handling & administration fees.

B.8.8 Development & Building Permits

No development or building permit shall be issued until water service is operational for fire protection and all-weather roads are constructed for emergency access.

Both underground and surface CCC's are required prior to issuing development or building permits. Also, building occupancy will not be allowed until these two CCC's are in place.

B.9 CHECKLISTS

Developer's Consultant shall be responsible for completing the following forms, as referenced through these *Standards*:

- ESC Inspection / Maintenance Checklist
- Engineering Pre-Inspection Checklist
- Landscape Pre-Inspection Checklist
- Fence Pre-Inspection Checklist
- Service Report

See Appendix A IV.1 – A IV.5 for the above checklist and report forms.

C. Submission Standards

C.1 DESIGN DRAWINGS

The following *Standards* are the minimum requirements by the Developer for all drawing submittal proposals. Refer to Appendix I for further detailed drawing submittal information.

C.2 REQUIRED ENGINEERED DRAWINGS

C.2.1 Cover Sheet

Cover Sheet shall show name of the subdivision, stage of development and, names of the Developer, consulting engineer and planner, if applicable. The "Town of Valleyview" shall also be identified.

C.2.2 Index Plan

Index Plan shall be prepared on a scale of 1:1000 or a reduction thereof and shall indicate that portion of the street which relates to a particular plan/profile sheet.

This sheet shall list each drawing included in that particular set of drawings. The list shall indicate the drawing set type (review, tender, construction or as-built). Each drawing name is to be listed sequentially along with its corresponding drawing number. Also included on this plan, shall be a key plan in sufficient detail to show the location of the project with respect to major roads and built up centre. Alternatively, the key plan and drawing list may be included on the cover sheet.

C.2.3 Legal, Easement & Land Use Plan

Legal, Easement and Land Use Plan shall indicate proposed land uses in the project along with existing and/or proposed land use on adjacent properties.

All legal and easement information shall be shown on this plan. Street names, lot and block numbers shall be labelled and existing features (i.e., buildings, trees, temporary access roads, etc.) shall be identified.

PUL widths shall be a minimum of 4m for a single service and 6m for a dual service. A 1m easement is required on each side of a PUL. A single service centered in a 6m PUL will not require additional easements.

C.2.4 Road, Lane, Walkway, Lot Grading & Drainage Plan

Road, Lane, Walkway, Lot Grading & Drainage Plan shall indicate all walks, lanes, road and right-of-way widths and alignments, catch basin locations, storm water systems, direction of overland flow on the streets and, local drainage areas which contribute to the storm water collection system.

Lots shall be designed to drain from back to front except where the Developer can satisfy the Town that back to front drainage is not technically feasible. If an alternate system is required, it must be designed so that surface water crosses the fewest lots possible in its path to the street. No more than 2 lots shall be crossed. In extreme cases, the Town may permit more than 2 lots to be crossed provided drainage easements are established. Minimum and maximum slopes on landscaped areas to be 1% and 10% respectively. An initial minimum grade of 10% over a distance of 1.5m is to be provided around all buildings. Driveway slopes must be no less than 2% and no greater than 8%.

This plan shall highlight the following:

- Proposed finished lot corners, suggested minimum mid lot grade elevations, direction of flow of surface drainage on the lot, proposed curb alignments, all required rear and side yard swales, sanitary sewer / storm water inverts, if applicable, at the property line or end of sewer service pipe;
- Bench marks used in the construction of the project;
- Existing contours shown at 0.5m intervals; and
- Overland major drainage system including ponding areas and depths resulting from a 1:100-year storm.

C.2.5 Storm Water, Sanitary Sewer & Watermain Plan

Storm Water, Sanitary Sewer & Watermain Plan shall indicate alignment and locations of mains, size of mains, grade / directions of flow and location of appurtenances.

This plan shall also highlight the following:

- Location and type of sanitary and water services.
- Hydrant coverage radii.
- Waterline bacteriological sampling locations.
- Waterline pressure testing and flushing locations and procedures.

C.2.6 Plan / Profile & Standard Detail Drawings

Plan / Profile and Standard Detail Drawings shall be drawn to avoid clutter and promote clarity and legibility. Refer to Appendix I for detailed information requirements.

D. Roadway Systems

D.1 GENERAL

Roadway Systems covers the general design and construction of our Towns roads, lanes, curb & gutter, sidewalks, driveways, intersections, cul-de-sacs, fencing, landscaping, berms, culverts, utility trenches, street signs and other accessories to be built or re-built within our Town.

Standard Details list for Roadway Systems are provided in Section D.20.

D.2 TRAFFIC AND TRANSPORTATION

The standards within this section are the minimum requirements for *Roadway Systems*. Changes is design values may be considered. Developer's Consultant shall justify these changes with added benefit to the Town's satisfaction.

All designs shall conform to the Town's relevant ASPs and or Transportation Master Plan and shall ensure safe and efficient movement of traffic and pedestrians. Access points between urban and rural collectors points shall be provided to the Town's satisfaction.

Factors affecting roadway capacity and safety:

- **Roadway Geometrics**: Road right-of-way / width, lane width, storage turn bay lengths and geometrics, grade and curvature, intersection configuration, etc.
- **Traffic Characteristics**: Traffic volume, speed, composition, fluctuations, saturation flow, etc.
- **Road Frictions**: Traffic control measures, parking conditions, access locations and numbers, driver sight distance, street furniture, etc.

D.3 ROAD CLASSIFICATION & GEOMETRIC DESIGN STANDARDS

Road classification and designation shall be in accordance with the classification system outlined in the Transportation Association of Canada (TAC) Manual - Geometric Design Standards for Canadian Roads and Streets.

Individual road classification is to be based on functional use:

- **Arterial Roads**: Serve to carry traffic between activity centers such as connecting with collectors, other arterials, or freeways, but not local streets.
- **Collector Roads**: Provides local access to developments and collect traffic from several local streets or industrial area, and channels it towards arterial system; can connect with local streets, other collectors, or arterial roadways.

- **Local Roads**: Intended to provide access to individual properties; only connect to other local roads or collector roads.

Developer and Developer's Consultant are responsible to ensure that:

- Infrastructure is designed and constructed to achieve life expectations consistent with good design and construction practices; and
- Road, walkway, utility, and right-of-way requirements are coordinated, established, and approved in the design stages of subdivision development.

D.3.1 Vertical Alignment

Grade

- Minimum gradient (%) along gutters: 0.6% (tangents) and 0.8% (curb returns).
- Maximum grade shall be 8.0%.
- All roads shall be crowned and shall be designed with quarter crown transitions:
  - Average 2% crown rate; ≤ 6m width
  - Average 3% crown rate; ≥ 7m but ≤ 12m width
  - Crown rate by Designer for road width > 12m

Vertical Curves

- All vertical curves shall be designed to meet minimum design requirements as per Table D1.

  K Value = L / A

  Where: L = Length of vertical curve in metres (m)
  A = Algebraic difference in grade percent

- Minimum length of a vertical curve shall be 30m.
- Vertical curves are not required where algebraic difference of grades is < 2.0%.

Table D1

Design Speed (km/hr)	K Value		
	Crest (m)	Sag (m)	
		Res.	Ind./Comm.
50	7	6	12
60	13	9	18
70	23	12	
80	36	16	

Table D1: Vertical Curve Design Values

Notes: Design speeds are 60 km/hr except minor and major arterials which are 70 and 80 km/hr respectively. Posted speeds are 10-20 km/hr less than the design speed.

D.3.2 Horizontal Alignment

Curves

- Degree of curvature is dependent on road classification and its design speed.
- All horizontal curves shall be designed to meet minimum design requirements as per Table D2.

Table D2			
Classification	Curve Radius Minimum (m)	Gradient Maximum (%)	Intersection Spacing Minimum (m)
Local Residential	60	8	60
Local Industrial	60	6	60
Minor Residential	60	8	60
Major Residential	130	8	60
Industrial Collector	130	8	60
Minor Arterial	450	5	400
Major Arterial	500	3	400

Table D2: Horizontal Curve Design Criteria

Notes: See TAC for super elevation requirements on arterials.

D.3.3 Survey Control Markers & Legal Posts (Pins)

Existing Control

- Developer and their consultant's and contractors shall make every effort to protect existing markers and posts.
- Markers and posts which are destroyed or disturbed shall be replaced by the Developer at his sole expense.

Survey Control Density

- Additional markers, as required by Alberta Forestry, Lands and Wildlife, Alberta Bureau of Surveys and Mapping Branch, shall be added to the existing network by the Developer to maintain the necessary density for survey control.

Legal Posts

- Front lot legal posts shall be clearly marked with a flexible marker post extending a minimum of 1m above grade at initial posting of the subdivision.
- Developer shall instruct the legal surveying consultant to replace any missing or disturbed posts on the subdivision boundary or otherwise disrupted by construction activities. All costs are to be borne by the Developer.

D.4 GENERAL REQUIREMENTS

D.4.1 Pavement Structures

Geotechnical Report for the proposed development shall be submitted to the Town for review as part of the overall submission. Geotechnical Report must include specific recommendations for pavement structure construction based on a 20-year design life for in-situ conditions and projected traffic volume.

Table D3 summarizes the minimum granular and pavement structure requirements for each street classification. Additional pavement structure strengths and/or materials, pending results of the Geotechnical Report, may be required in areas with poor subgrade materials, trucked water, and sanitary service, and or heavy industrial applications.

Alternative pavement designs of equivalent strength along with supporting material may be submitted to the Town for review and approval prior to construction.

Roadways for all urban subdivisions shall be surfaced with hot mix asphalt. Good roadway industry construction practices and techniques shall be employed. Roadway base and subbase construction shall be undertaken with the view that a hot mix asphalt pavement surface will ultimately be the final finished surface. In the case of a final lift being provided in the second year or later, the first lift shall be designed to withstand the expected loads due to construction activity.

Table D3

Street Classification	Road Structure (mm)			
	Hot Mix Asphalt	Granular Base Course	Granular Sub-Base	Subgrade Preparation
Local / Minor Residential	100	150	150	150 min.
Major Residential / Local Industrial / Commercial	130	200	200	150 min.
Industrial Collector / Arterial	150	200	250	150 min.

Table D3: Minimum Pavement Structure Requirements

Notes: All granular structures must be compacted to 100% Standard Proctor Density.
Geotextile may be used under the granular sub-base, if necessary.

D.4.2 Road Construction

Roadway construction shall be in accordance with the design drawings and specifications as accepted by the Town during the design submittal process. All work shall be carried out in an efficient manner with acceptable equipment and capable personnel. Town or their representative shall:

- Have access to the site at all times;
- Be provided with all test results / information to assess Contractor's performance;
- Be notified prior to and have the option to be present at any proof rolls, concrete pours, backfilling operations, or paving operations.

Temporary roads, accesses and or detours, if required, shall be approved by the Town for location and construction type. Developer is responsible to construct, maintain, and remove any temporary road, access or detour as well as provide signage, channelization, detour(s), closures, etc. as per TACs Traffic Control Devices for Canada manual.

Upon completion of the first lift of asphalt and a CCC has been executed, the Town will be responsible for snow removal.

Existing services such as sewer mains, watermains, roadways, landscape areas, etc. are not to be disturbed, become inoperable or be exposed to loads beyond their design capabilities as a result of actions by the Developer, their agents / contractors. Existing services shall be maintained, cleaned and protected from harm by the Developer at all times. Damages to existing services as a result of the Developer actions shall be at their costs for repair, replacement and all incidentals resulting from these damages.

Staged construction, if required, shall be accepted by the Town during the design submittal process. Developer will be responsible for all partially completed works which has been opened for use. All partially completed works shall be properly restored prior to commencing with the next stage of the project.

D.4.3 Sidewalks & Walkways

In existing Town developed areas, minimum width requirements for concrete sidewalks can be maintained at 1.2m and 1.5m for walkways (asphalt trails). New developments, minimum width requirements shall be 1.5m for concrete sidewalks and 2.4m for walkways (asphalt trails). Separate sidewalks or walkways shall be constructed on all major collector roadways and may be used on local residential streets.

All sidewalks and walkways shall be constructed with the same subgrade and granular structure as the adjacent road. This structure shall extend a minimum of 150mm on either side beyond the sidewalk or walkway.

Design of subdivisions should consider pedestrian needs and allow for walkways through cul-de-sacs and other appropriate locations. Sidewalks are required on one side of all streets except arterials. A sidewalk around a cul-de-sac bulb shall be required if it provides continuity with an existing or proposed walkway through the bulb.

Requirements for sidewalks in an industrial area shall be reviewed on an as required basis in conjunction with the proposed commercial character of the area, the need for alternate truck or bus routes, and other municipal services.

Paraplegic ramps are to be used at all curbed intersections and shall be constructed monolithically or securely dowelled.

All sidewalks shall be imprinted with the Contractor's stamp showing company name and year of construction. Frequency of stamps shall be one per residential block or every 200m whichever is less.

1Sidewalks shall also be imprinted with a "CC" to identify all CC locations.

Concrete utilized in sidewalks and walkways shall be as per Section D.5.2 Concrete and be adequate reinforcement with subgrade and base gravel substructures compacted to a minimum 98% Standard Proctor Density.

D.4.4 Concrete Curb & Gutter

Concrete curb & gutter shall be constructed on all streets.

Local and minor residential streets must be low profile curb. Rolled profile curb & gutter is preferred in residential areas. Vertical face curb & gutter is to be used on all major collector and arterial roads. All roads fronting parks, public utility lots, (other than emergency accesses) and walkways shall also require vertical face curb & gutter unless another means of preventing vehicular access onto these public lands is provided.

Curb returns on residential street intersections shall be constructed with a minimum radius of 10m. Curb returns in industrial / commercial areas shall be constructed with a minimum radius of 15m to accommodate truck turning movements.

All concrete curbs and monolithic curbs and walks shall be constructed with the same subgrade and granular structure as the adjacent road. This structure shall extend a minimum of 150mm beyond the back of curb or walk.

Concrete utilized in sidewalks and walkways shall be as per Section D.5.2 Concrete and be adequate reinforcement with subgrade and base gravel substructures compacted to a minimum 98% Standard Proctor Density.

D.4.5 Driveways

Residential subdivision lot layout shall not allow driveways or any portion thereof to access directly onto arterial roadways or be permitted to access an abutting road through a curb return area. For corner lots, the driveway zone must be indicated for the street of lesser traffic only.

All driveways shall be constructed to provide a minimum clearance of 1m from any structure including hydrants, light standards, service pedestals, CCs and transformers.

D.4.6 Berms, Fence & Landscaping

At the discretion of the Town, consistent fencing shall be required on all arterial and collector roadways where the lots back onto a roadway. Berms and fence, if required, shall separate residential developments from high volume arterial traffic.

Fencing proposals are to be reviewed for acceptance by the Town prior to construction. Construction of fencing may not start until an acceptable plan has been provided and written acceptance granted.

All berms shall have maximum slopes of 4:1, a minimum top width of 1m and shall be topsoiled and sodded or seeded. Berm tops shall be contained within the road allowance. Where berm design provides for less than 5m from toe to curb, additional land must be dedicated for the right-of-way.

Fencing along arterial roads and utility lots shall be of a close boarded type and extend to ground level. Fencing along parks, schools and other public open space shall be 1.5m high chain link or lower pipe rail variety at the discretion of the Town. All fences shall be constructed on private property approximately 150mm from the property line.

See Section I.4 Site & Park Development for further *Standards* on berms, fence and landscaping.

D.4.7 Cul-de-Sacs

Maximum length of a cul-de-sac shall be 120m from street curb line to the start of the bulb. Cul-de-sacs more than 120m and less than 170m will require an additional hydrant and water main looping. Where cul-de-sacs more than 170m are proposed, provision must be made for a 6m wide PUL for emergency vehicle access and water system looping. All PUL's shall be developed to a standard acceptable to the Town.

Cul-de-sacs with steep grades are to be avoided. If cul-de-sacs cannot be graded to drain towards the intersection, an outlet for overland flow must be provided by way of a PUL.

Recommended radius of cul-de-sac bulbs is 14m to face of curb. Minimum standard is 11m to face of curb.

D.4.8 Intersections

Minimum angle of intersection for two roadways shall be 75 degrees.

Acceptance of intersection design, driveway locations and fencing shall be subject to review of available sight distances and other safety considerations. Tapering of berms at intersections may be required to provide for the necessary sight distances. Acceptance shall be granted on a case by case basis.

Developer shall provide confirmation that sight distances and horizontal / vertical visibility constraints at arterial roadway accesses meet the applicable stop sight distances.

Minimum centre line to centre line spacing of intersections shall be 60m along local and collector roadways.

All intersections shall have underground storm sewers and catch basins for the collection of surface drainage. Use of road swales shall be at the discretion of the Town.

D.4.9 Culverts

Culverts shall be new corrugated steel or plastic equivalent manufactured in accordance with CAN3-G401. Steel pipe shall be zinc coated with a minimum thickness of 1.6mm.

Corrugated band couplings shall conform to CAN3- G401.

Minimum culvert size shall be 600mm diameter and of sufficient length to accommodate the roadway and turning radius with minimum 3:1 side slopes.

Backfill shall be completed as stated in D.4.11 Utility Trenches.

Bedding shall consist of a minimum 150mm layer of compacted granular material compacted to minimum 98% Standard Proctor Density.

D.4.10 Lanes

All lanes shall be a minimum width of 6m.

At the discretion of the Town, lanes shall be paved a minimum width of 4m with a minimum structure of 75mm depth of asphalt over 300mm of an approved granular base.

An inverted crown (centerline swale) shall be used for lane construction.

D.4.11 Utility Trenches

In all new subdivisions, it shall be Developer's responsibility to ensure that utility trenches are adequately compacted.

Minimum compaction requirements in utility trenches are:

- Road carriage right-of-way: 98% Standard Proctor Density
- Boulevard / lot areas: 95% Standard Proctor Density
- Existing subdivisions: Utility companies shall be responsible to ensure adequate compaction for any new installations or modification of existing lines.

Developer's Consultant is to coordinate locations of shallow utility crossings of roadways with the respective utility company(s). All shallow utilities are to be contained within conduits of appropriate size and number for all roadway crossings.

D.4.12 Street Signs

High intensity reflective material is required for the lettering and background for all signage to match Town standards.

Street name signs at intersections shall consist of white lettering on a blue metal plate.

100mm white address numbering on a blue metal plate will be required on all cul-de-sacs in addition to the street name signage.

Traffic control signage will be required at all intersections.

Lettering sizes shall be:

- 200mm arterial roadways
- 150mm major collector roadways
- 100mm minor collector and local roadways

D.5 MATERIALS

Materials utilized in roadway construction shall be approved by the Town. All materials shall meet the standard manufacturer and approved roadway specifications for the intent of the local improvement. The use of defective, rejected, used, and or substandard materials are prohibited.

D.5.1 Subgrade, Fill / Backfill & Granular Base

Subgrades under the roadway structure shall be constructed of suitable soils, free from organic and frost susceptible materials. Subgrade preparation shall include scarification to a minimum depth of 150mm, windrowing material to the side, compaction of exposed surface to 97% Standard Proctor Density, replacement of windrowed material to grade and compacted to 100% Standard Proctor Density.

Trench backfill under roadways shall be as follows:

- Class I: Use of imported granular backfill.
- Class II: Use of native backfill.
- Class III: Under landscaped areas within the road right-of-way.

Trench backfill for rehabilitation projects under existing roadways shall be approved granular material, compacted to 100% Standard Proctor Density.

Fill areas under subgrade shall be compacted to a minimum of 97% Standard Proctor Density. All materials shall be compacted in layers to obtain uniform compaction.

Granular base / subbase shall be compacted to 100% Standard Proctor Density. Refer to Table D3 for Minimum Pavement Structure Requirements.

Gradation requirements for granular materials shall be:

- Granular base: 20mm
- Subbase: 80mm

Property requirements for granular base / subbase course materials shall be:

- +5000 µm with ≥ 2 fractured faces (% mass): 60 min. / NA
- Plasticity Index < 400 µm: 6 max. / NA
- Liquid Limit: 25 max. / NA
- LA Abrasion Wear (% mass): 50 max. / NA
- Lightweight Pieces (% mass): 2 max. / 1 max.

Refer to Table D3 for Minimum Pavement Structure Requirements.

D.5.2 Concrete

Concrete for roadways including sidewalks, walkways, and structures, shall be Class C type which conforms to the City of Edmonton's Design and Construction Standards – Volume 2 – latest edition.

Property requirements for Class C concrete shall be:

- Minimum 28-day compressive strength (MPa): 30
- Slump (mm): 60 ± 20
- Entrained air limits (% by volume): > 5.5
- Maximum aggregate size (mm): 20
- Maximum water to cement ratio (by mass): 0.45
- Minimum Portland cement content (kg/m^3)
  - Spring / fall mixes: 335
  - Summer mixes: 302
- Cement Type: GU

Hot and cold concrete shall be placed as per CSA-A23.1.

For cold weather concrete pours, adequate protection shall be provided:

- When probability of air temperature will fall below 5 ˚C within 24 hrs. of placement, as forecasted by the nearest meteorological office.
- That will maintain the concrete temperature at a minimum of 10 ˚C for the duration of the required curing period.
- By means of heated enclosures, coverings, insulation, or combination of.

- To avoid cracking of the concrete due to a sudden temperature change near the end of the curing period, protection shall not be completely removed until the concrete has cooled to a temperature per CSA A23.1.

D.5.3 Asphalt

Asphalt concrete pavement (hot mix, ACP, asphalt) shall conform to the City of Edmonton's Design and Construction Standards – Volume 2, latest edition.

Production, placement, compaction, and quality assurance of the hot mix should be pursuant to the requirements of TB-1 "Hot Mix Asphalt Materials, Mixture Design and Construction" as prepared by the National Centre for Asphalt Technology (NCAT) and published by the National Asphalt Pavement Association (NAPA), for guidance in good practices of handling materials and hot-mix production.

Refer to the latest edition of the "Construction of Hot Mix Asphalt Pavements", Asphalt Institute Manual Series No. 22 (MS-22), for guidance in good paving practice.

Refer to Table D3 for Minimum Pavement Structure Requirements.

D.6 CONSTRUCTION STANDARDS

Construction standards used for roadways shall be accepted in the construction industry as specifically set out in the construction specifications, procedures and methods per Asphalt Institute and Portland Cement Association.

Developer shall employ skilled and competent labour for all aspects of the construction operations. Town retains the right to request the removal of incompetent labour.

All construction equipment shall be maintained in proper operating condition. Town retains the right to order the removal or repair of improperly maintained equipment. Equipment shall be used in accordance with the manufacturer's recommendations and within the rated capacities specified.

D.6.1 Asphalt Pay Factors: Thickness & Density

If average core thickness is deficient, the affected area of asphalt pavement will be assessed a pay factor (Table D4) which will be applied to the price of the quantity of asphalt in that mat area. Asphalt pavement with excess thickness may be accepted with no extra payment, if surface, grade, and texture are met.

Table D4	
Thickness Deficiency (%)	Pay Factor (%)
10.0	100.0
11.0	97.0
12.0	93.7
13.0	90.0
14.0	85.5
15.0	80.5
16.0	75.0
17.0	68.0
18.0	60.0
19.0	50.0

Table D4: Asphalt Thickness Pay Factors

Additionally, each mat of asphalt placed shall be compacted to the minimum density as a percent (%) of Maximum Theoretical Density (MTD) for the type of paving application as per Table D5.

Table D5	
Minimum Density (%)	Pavement Type
94	Staged paving for arterials, industrial / commercial, residential local / collector
94	Paving on full depth reclamation
93	Lane paving
93	Rehabilitation overlay (mill and overlay locations)
93	Asphalt walkways

Table D5: Asphalt Density Requirements

If the average core density is less than specified, the affected mat area may be accepted, subject to a pay factor as indicated in Table D6, which will be applied to the price of the quantity of asphalt in that mat area.

Table D6			
Percentage of MTD (94% MTD Required)	Pay Factor (%)	Percentage of MTD (93% MTD Required)	Pay Factor (%)
94.0	100.0	93.0	100.0
93.9	99.9	92.9	98.4
93.8	99.8	92.8	96.8
93.7	99.6	92.7	95.2
93.6	99.4	92.6	93.9
93.5	99.1	92.5	92.0
93.4	98.7	92.4	90.4
93.3	98.3	92.3	88.8
93.2	97.8	92.2	87.3
93.1	97.2	92.1	95.7
93.0	96.5	92.0	84.1
92.9	95.8	91.9	82.5
92.8	95.0	91.8	80.9
92.7	94.2	91.7	79.3
92.6	93.3	91.6	77.7
92.5	92.3	≤ 91.5	grind and resurface
92.4	91.1		
92.3	89.8		
92.2	88.5		
92.1	87.1		
92.0	85.5		
91.9	83.8		
91.8	82.0		
91.7	80.0		
91.6	77.7		
≤ 91.5	grind and resurface		

Table D6: Asphalt Density Pay Factors

D.7 TRAFFIC CONTROL DEVICES, STREET SIGNS & PAVEMENT MARKINGS

Developer shall supply and install traffic control devices, street signs, and pavement markings in accordance with TACs “Uniform Traffic Control Devices for Canada”.

Traffic control devices, street signs, and pavement markings are the primary means of regulating, warning, and guiding traffic. They fulfill a need, command attention and respect, convey clear and simple meaning, and give adequate time for proper response.

D.7.1 Signs & Signals

Street name and traffic control signs shall be:

- Highly reflective, high density, engineer-grade;
- Mounted on 50mm telespar posts (breakaways are not permitted);
- Driven into ground with 900mm anchors; and
- 2m from bottom of sign to surface of ground.

Street name blade configuration signs:

- For speed limits of up to 50 km/hr. 150mm, double-sided, white on blue, with the Town logo displayed.
- For speed limits of 60 km/hr. or more: 200mm, double-sided, white on blue, with the Town logo displayed.
- Contact the Town for an example of required street name blade configuration.
- Installed as per accepted Traffic Control Devices and Street Signs plan.

Red and yellow signs:

- Red Brite-Side Reflective Sign Post Panel shall be installed on all stop signs, with the panel oriented to face oncoming traffic.
- Yellow Red Brite-Side Reflective Sign Post Panels shall be installed on both sides of posts for all yellow signs (i.e. school zone, pedestrian crossing signs).
- All pedestrian signage shall be fluorescent yellow.

Pavement markings:

- Includes: lane markings, stop lines, pedestrian crossings.
- Provided by the Developer at their own expense.
- Local roads: oil-based paint placed on top course hot mix surface.
- Collector / arterial roads: thermoplastic, placed on the top hot mix surface.
- Permanent cold pour applications are not permitted.
- Crosswalks are to be zebra painted.

Signals:

- Traffic control and pedestrian crossing signals shall be provided by the Developer at their own expense.
- Installed at all traffic and pedestrian points on arterial roads as warranted.
- All stop lines shall be perpendicular to the curb line.

D.8 STREET LIGHTING (ROADWAY ILLUMINATION)

D.8.1 General Requirements

Street lighting shall be:

- Installed in all new subdivisions;
- Designed in accordance with:

- TACs “Design of Roadway Lighting, Illuminating Engineering Society (IES)” standards, and
- ATCO Electric requirements.

Streetlight cables shall be installed underground with an acceptable type of steel post streetlights, complete with LED fixtures.

Developer shall:

- Arrange and coordinate all street lighting;
- Install all street light infrastructure at the time of development at their sole costs and as per ATCO Electric requirements;
- Pay all capital contributions; amortization of capital costs is not allowed.

D.8.2 Urban

Urban street lighting layout and location of buried lines shall be as shown on the Standard Details and accepted by the Town at the planning stage.

Streetlights shall be:

- Provided for each internal park area that does not abut onto a lit street;
- Located at the point where each walkway opens out onto the park area;
- Placed at locations that do not interfere with driveways or water / sewer services;
- Located in line with the extension of common property lines between two lots.

D.8.3 Rural

Rural street lighting minimum requirements shall be at:

- All access points to arterial roads, secondary / primary highways;
- All high density country residential subdivisions in accordance with TACs “Rural and Illuminating Engineering Society (IES)” standards;
- Internal park areas that do not abut onto a lighted street;
- Common areas such as mailbox pull-outs, trail crossings, school / play grounds, commercial / industrial areas.

D.9 SOUND ABATEMENT

For new developments adjacent arterial roadways, highways and/or as required by regulatory authorities and the Town, may require a noise impact assessment. All sound abatement designs must be approved by the Town at time of submission.

Sound abatement may entail:

- Berms or elevated contoured embankments (i.e., gentle slopes of 4:1);
- Widening of right-of-way to accommodate means of abatement; and/or
- Barrier fences.

D.10 LANES

General design standards for lanes shall be:

- Minimum 6m right-of-way;
- Residential lanes must be paved for a minimum width of 4m, with centreline swale and 2% cross fall;
- Commercial / industrial lanes must be paved for the full width;
- Higher than normal traffic areas such as commercial developments, may require a wider surfaced width and right-of-way at the Town's discretion;
- Shall match the road structure of the adjoining roadway(s);
- Dead ends must be terminated with a means to turn around;
- Maximum length between streets shall not exceed 350m;
- Layouts should discourage short-cutting between streets;
- Maximum length of drainage shall be 150m to any one catch basin;
- Maximum / minimum grades: 6.0% / 0.9% respectively;
- All grades are to be at property line and tie to back of walk / gutter elevation of the intersecting street;
- May remove sidewalk crossings and replace with depressed crossings;
- Property line elevations are to be a minimum of 100mm above design lane grade for drainage purposes.

D.11 FIRE TRUCK SPECIFICATIONS

Town may require cul-de-sacs to be designed to accommodate the turning movements of a fire truck. All turnarounds, temporary or permanent, shall be designed to accommodate the turning movements of a fire truck.

Developer shall consult with the Town when planning a new cul-de-sac.

D.12 EMERGENCY ACCESSES

For emergency service access at entrances to walkways, the use of bollards or wooden posts shall not be permitted.

D.13 SERVICE ROADS

Service roads may be acceptable for highway commercial access and are subject to the approvals of Alberta Transportation and the Town. Service roads shall be designed to meet all Alberta Transportation requirements.

D.14 DEAD-END ROADS

Industrial subdivisions:

- Other than for an interim solution, dead-end roads shall not be allowed.

Residential subdivisions:

- All dead-end roads shall be provided with a cul-de-sac or turnaround per TAC.
- “Hammerhead” turnarounds are not permitted.
- Maximum length of dead-end roads that service residential lots, without provision of a secondary access, shall be 120m.

D.15 APPROACHES & DRIVEWAYS

D.15.1 Urban Approach / Driveway

Urban approaches and driveways shall be in accordance with TACs “Geometric Design Guide for Canadian Roads” and as required by the Town.

Private driveways and driveway aprons shall be:

- Constructed to provide a minimum clearance of 1.5m from any structure (i.e., light standards, hydrants, service pedestals, transformers, manholes, catch basins).
- On corner lots, located a minimum clearance of 8m from lot property line adjacent to the intersection.
- Clearly labelled on design drawings if locations of driveways are known.
- Installed at the time of sidewalk construction.

Commercial / industrial driveways shall be:

- Minimum horizontal distance of 10m from end of curb return of an intersection to edge of driveway.
- Designed to accommodate types of vehicles the business / industry will generate.

Driveway widths (minimum):

- Residential: 3.2m
- Commercial / industrial: 7.5m to maximum 12.5m
- Apartment: 7.5m to maximum 12.5m
- Residential lanes: 4.0m
- Commercial / industrial lanes: 6.0m

D.15.2 Rural Approach / Driveway

Rural approaches and driveways shall be in accordance with TACs “Geometric Design Guide for Canadian Roads” and as required within the Town’s Land Use Bylaw.

Developer shall:

- Refer to section D.15.1 for driveway width requirements.
- Constructed each driveway to the same structure and surface as adjoining roadway extending to the property line.
- For trucked water and sanitary service developments, design internal private driveways / accesses to accommodate expected wheel loads;
- Pave each driveway / access;
- For residential subdivision developments, construct one driveway to each lot.
- For commercial / industrial lots, not required to be constructed unless the locations are known; Lot owner / Developer will be responsible for constructing such driveways to the standards outlined.

D.16 PEDESTRIAN PATHWAYS

D.16.1 Urban Sidewalks

For new subdivisions / developments, concrete sidewalks shall be a minimum width of 1.5m and shall be:

- On one or both sides of collector and local roads, except were replaced by trails;
- To provide continuity of sidewalks to future development; and
- To maintain continuity of the pedestrian network.

Curb ramps shall be:

- Provided on sidewalks at all roadway intersections and at all pedestrian crossings in accordance with the Standard Details.
- Aligned with one another, with the tooled grooves matching up congruently to facilitate those persons with disabilities to cross the intersection safely.

Note: In existing developed areas of the Town, concrete sidewalks shall be maintained at a minimum width of 1.2m conforming to these Standards. Developer must obtain approval of final design width and structure with the Town.

D.16.2 Trails

For new subdivisions / developments, trails shall be 2.4m wide with a 75mm light duty hot mix surface in accordance with the Standard Details.

Trails are required on both sides of arterial roads and may replace concrete sidewalks on collector or local roads. Trails, where needed, must conform to the most relevant Area Structure Plans or for trail continuity.

Note: In existing developed areas of the Town, trails (walkways / paths) shall be maintained at a minimum width of 1.5m and may conform to these Standards. Developer must obtain approval of final design width and structure with the Town.

D.17 COMMUNITY MAILBOXES

Developer shall accommodate community mailbox locations as per the following:

- Along the side yard of corner lots, between front and rear property lines,
- Provide additional 0.5m x 5m easement if encroaching on private property,
- Next to an open space or playground,
- On the predominantly homecoming side of the street,
- Adjacent to the sidewalk,
- Not along arterial roads,
- Not closer than 10m from a fire hydrant,
- Not above a utility, and
- Location shall not impede pedestrian and vehicle sight distances.

For rural locations, additional requirements include:

- Road and/or right-of-way widening, where necessary.

Mailboxes shall be placed on a concrete pad matching that of the existing sidewalk. Brick or paving stones are not permitted.

D.18 SIGNALIZED INTERSECTIONS

Signalized intersections shall be equipped with an Opticom™ Priority Control System to ensure fire trucks have priority during an emergency.

Opticom™ system shall consist of:

- Compact, weather-resistant RF energy-emitting Opticom™ Model 3100 GPS Radio Unit,
- GPS receiver with antenna, and
- 2.4 GHz spread spectrum transceiver with antenna.

D.19 ROADWAY: CCC, FAC & DEFICIENCY REPAIR REQUIREMENTS

D.19.1 Roadway Inspections

Developer's Representative / Contractor responsibility:

- Surface improvement being inspected shall be clean and free of debris.
- Inspect site and verify that all improvements are in satisfactory condition.
- Flush all roads and gutters with water immediately prior to inspection.

Noncompliance with any of the above is sufficient reason to cancel the inspection.

Deficient areas are to be marked with spray paint and cross-referenced to the numbers used on the written deficiency list and index map.

D.19.2 Roadway General Repairs

All maintenance and repairs are to be carried out in accordance with these *Standards*, except as herein noted:

- Contractor / Developer's Consultant shall obtain any required permitting and/or approvals 1 week prior to commencement of repair work.
- Provide verbal notice to the Town 1 week prior to commencement of repair.
- Provide written notice to residents / occupants of affected and/or adjoining properties 48 hours prior to commencement of repair work.
- All repairs to concrete works, curb, gutter, paved roads, boulevards, landscaped areas, private walks, driveways, etc. shall be cleaned of any repair debris within 24 hours of completion.
- Materials, placement, and testing must conform to the requirements of these *Standards* and/or as required by the Town.
- All coordination and costs of barricading and material testing shall be the responsibility of the Developer.

D.19.3 Concrete Deficiencies

Concrete shall be replaced if one or more of the following exists:

- Cracks greater than 2mm width in curb & gutter or sidewalk.
- Cracks with chipped or spalled edges.
- Any longitudinal crack.
- Random or multiple cracks of any size or more than one crack between any two contraction joints.
- Loss of surface mortar and/or aggregate.
- Sidewalk with less than 10 mm/m or more than 40mm/m crossfall (slope toward curb unless specifically noted otherwise).
- Vertical differential displacements greater than 5mm.
- Joint separation greater than 10mm.
- Settlements greater than 10mm over a 3m length or that cause water retention.
- Settlements causing water retention in front of driveways / curb ramps.
- Concrete that has been disfigured by extraneous means.
- Notable ponding which includes ponding beyond the lip of gutter. Ponding shall be limited to within the gutter.

D.19.4 Concrete Repairs

Repair of concrete work shall be as follows:

- Sections are to be removed at a contraction, expansion, or surface joint.
- If warranted, a 1.5m minimum length of curb & gutter section may be replaced.
- Where curb & gutter or sidewalk deficiencies exist, the entire mono curb, gutter, and sidewalk shall be replaced.
- Existing private walkways and driveways must be adjusted to match repaired concrete sidewalks. Town may require replacement of existing private walkways and/or driveways to provide a satisfactory tie-in.

- Where there is less than 8m of concrete sidewalk, monolithic sidewalk or curb & gutter between repairs, the remaining concrete must be replaced.
- When replacing separate sidewalks, positive drainage from the front of sidewalk to the curb must be maintained throughout the boulevard.

Use of route and seal will only be permitted at the Town's discretion.

D.19.5 Asphalt Deficiencies

Asphalt deficiencies may include, but not limited to:

- Manholes and valves shall be adjusted to final asphalt grade (+0mm, -6mm).
- Asphalt adjacent curb & gutter shall be < 10mm above the lip of gutter. Exception: Structural overlay or rehabilitation where no new curb & gutter has been placed.
- Localized settlement which causes water ponding; repaired at Town's discretion.
- Asphalt surface has coarse and open texture resulting from clay tracking, segregations, petroleum spillage, etc.

D.19.6 Asphalt Repairs

Repair of asphalt work shall be as follows:

- Repairs are to be rectangular or square in shape.
- Grind asphalt adjacent gutter lines and at butt joints to allow for a minimum lift of 50mm of asphalt overlay.
- Grinding shall extend to the full width of the lane from lip of gutter or lane line. Grind seams shall not be allowed in the wheel path.
- Levelling course shall be placed on all subsidence greater than 50mm.
- Edges of existing asphalt shall be ground or cut vertically (minimum 50mm).
- Feather patches are not allowed.
- Repair to asphalt surface failure: Cut out failed road structure and replace.
- Cracks and joints between 2 - 15mm wide are to be routed and sealed.

D.20 STANDARD DETAILS – ROADWAY SYSTEMS

See Appendix V for Standard Detail drawings for Roadway Systems as listed:

R-1 Rolled Curb & Gutter and Crossing Details – Commercial, Lane and Private
R-2 150mm Barrier Curb & Gutter / Crossing Details – Commercial, Lane and Private
R-3 Rolled Monolithic Curb, Gutter & Sidewalk
R-4 150mm Barrier Monolithic Curb, Gutter & Sidewalk
R-5 150mm Barrier Monolithic Crossing Details – Commercial, Lane and Private
R-6 Wheelchair / Bike Ramp Details
R-7 Separate Sidewalk Detail
R-8 Concrete Swale Detail

R-9 4.0m Paved Residential Lane
R-10 Asphalt Trail Detail
R-11 Typical Front Lot Drainage Type A
R-12 Typical Split Lot Drainage Type B
R-13 Typical Rear Lot Drainage Type C
R-14 9.0m Residential Street Section with Monolithic Sidewalk – 20.0m Road Right-of-Way
R-15 11.0m Residential Major Collector Street Section with Monolithic Sidewalk – 24.0m Road Right-of-Way
R-16 14.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 24.0m Road Right-of-Way
R-17 10.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 20.0m Road Right-of-Way
R-18 10.0m Industrial/Commercial Major Collector Street Section with Ditches – 30.0m Road Right-of-Way

E. Sanitary Sewer Systems

E.1 GENERAL

Sanitary Sewer Systems shall be of sufficient capacity to carry peak flows plus infiltration. Factors outlined in the following sections shall be used in the design and construction of sanitary sewer mains and appurtenances to be built or rebuilt in the Town.

These *Standards* provide the minimum design criteria, general construction requirements, and materials for Developers and their consultants to utilize in preparation of specifications and drawings. These *Standards* may be exceeded if warranted. It is the responsibility of the Developer and their consultants to ensure good engineering, designs and construction practices of the sanitary sewer systems on all projects.

Standard Details list for Sanitary Sewer Systems are provided in Section E.8.

E.2 DESIGN FACTORS – SANITARY

E.2.1 Design Flow

Sanitary sewer systems shall be designed on a population density basis:

- Low Density: 40 people / ha
- Medium Density: 80 people / ha
- High Density or mixed use: 200 people / ha

Commercial / industrial design flows will be based on the gross developed area or the specific application.

Sewer main capacity shall be designed to convey the peak hourly sewage contribution plus infiltration, without the use of holding tanks.

E.2.2 Average Flows

Domestic (residential)

- Minimum average contribution of 350 litres per capita per day (G).
- Peak hourly flow for each contributing area calculated at an average flow multiplied by a peaking factor (PF):

$$Q_{PDW} = (G \times P \times PF) / 86{,}400$$

Where: Q_{PDW} = peak dry weather flow (L/s)
G = average daily per capita population (350 L/c/d)
P = design population
PF = peaking factor (see E.2.3)

Non-residential (commercial / industrial)

- For high level planning when specific use is unknown, equivalent populations (ep) can be used:
  - Commercial: 37 ep / ha
  - Industrial: 30 ep / ha
- For design when specific use is known, Table E1 may be used as a guideline:

Table E1	
Type of Establishment	Average Flow Generation (L/day/m2 of floor area)
Office buildings, stores, supermarkets, trade businesses, service stations	8
Restaurants	20
Bars / lounges, banks / financial buildings, medical buildings / clinics	12
Hotels / motels	14
Places of assembly (churches, schools, libraries, theatres)	24
Laundry / dry cleaner	41
Car washes	77
Warehouses	4
Processing plants (meat / food)	115
Factories (manufacture raw into finished products)	33
Auto: dealers, repairs, services	6
Hospitals	1700 L/bed/day

Table E1: Non-Residential Sanitary Flow Generation Factors Based on Land Use

- Peak flow (Q_{PDW}) in L/s for each contributing area shall be calculated based on average flow (Q_{AVG}) in L/s multiplied by a peaking factor (PF*). Therefore:

  $$Q_{PDW} = Q_{AVG} \times PF^*$$

  Where: Q_{AVG} = (Average Flow Generation in Table E1) x (floor area) / 86,400

  PF* = Calculated as per E.2.3 by converting Q_{AVG} to an equivalent population (ep), therefore:
  ep = Q_{AVG} (L/s) x 86,400 / (s/d) / G (L/c/d)

E.2.3 Infiltration

Infiltration allowances for:

Roof leaders / weeping tiles

- If connected to sanitary system in existing areas: Add 0.6 L/s/ha
- Newer areas, not connected to sanitary system: NA

Note: Roof leaders / weeping tiles shall not be connected or be permitted to discharged into the sanitary sewer system.

Weeping tiles may be connected to sumps with pumped discharge directly to ground surface (splash pads are required to ensure positive drainage away from building for a distance of 1.5m). Sump pump discharge lines to the ground surface shall be limited to 1.5m from the face of the building at the point of discharge.

Connections to storm sewer shall be permitted only if the storm sewer system is designed to handle weeping tile flow and only after the Town has reviewed and accepted the design. Alternatives may be submitted to the Town for acceptance.

Geotechnical Report shall address the problems of weeping tile flow associated with a high groundwater table or other subsurface anomalies.

Water-tightness of sanitary sewer / manhole system: Add 0.28 L/s/ha

Existing manholes located in sags: Add 0.4 L/s/manhole

Note: Low areas are subject to flood during major rainfall events; Every effort shall be made to ensure new manholes are not located in sags. If this is the case, inflow / infiltration reduction features shall be installed.

E.2.4 Peaking Factor

Peaking factor (PF):

- Calculated based on the Harmon Formula.

  $$PF = 1 + [14 / (4 + P_{pf}^{0.5})]$$

  Where: P_{pf} = design population, in 1000s

- Minimum 3.0 / Maximum 3.8

E.3 PIPE FLOW & VELOCITY

E.3.1 Gravity Sewers

Full flow sewer capacity = (estimated peak wet weather flow rate) / 0.86

Pipe capacity shall be determined by *Manning's* formula using a minimum "n" value of 0.013 (smooth-walled pipe) or 0.015 (older pipe, assessment purposes).

$$Q = (AR^{(2/3)}s^{0.5}) / n$$

Where:
- Q = pipe capacity (m^3/s)
- A = cross-sectional area of pipe (m^2)
- R = hydraulic radius (area / wetted perimeter)(m)
- s = slope of hydraulic grade line (m/m)
- n = roughness coefficient

Minimum grade of first upstream leg of the sanitary sewer shall not be less than 1.0% unless this upstream leg shall be extended in the future.

E.3.2 Sewage Force Mains

Rate of flow for force mains shall be determined by utilizing the *Hazen-Williams* formula.

$$Q = CD^{2.63}s^{0.54} \times 278.5$$

Where:
- Q = rate of flow (L/s)
- D = internal pipe diameter (m)
- s = slope of hydraulic grade line (m/m)
- C = roughness coefficient (120 for all mains)

E.3.3 Velocities

Flow velocity (m/s) for:
- Gravity: Minimum 0.60 / Maximum 3.0
- Force Mains: Minimum 0.76 / Maximum 1.5

E.4 SEWER PIPE & MANHOLES

E.4.1 Minimum Pipe Diameter for Gravity Sewers

Mains
- Detached dwelling residential: 200mm
- Multi-dwelling residential: 250mm
- Non-residential: 50mm

Services
- Detached dwelling: 150mm
- Multi-unit dwelling: 150mm*
- Non-residential building: 150mm*

*Services for multi-unit dwelling / non-residential buildings shall be sized based on the anticipated peak wet weather flow. Services for these types of developments shall not be less than 150mm diameter.

E.4.2 Pipe Grade

Straight Alignments, minimum pipe grades (%) shall be:
- 200mm: 0.40%
- 250mm: 0.28%
- 300mm: 0.22%
- 375mm or greater: 0.15%

Steeper grades are preferred.

Pipe grades shall increase for each upstream leg of the system:

- 30 to 50 lots: +0.6%
- Less than 30 lots: +0.8%

Curved sewers, increase minimum grade by 50% to above values.

E.4.3 Depth of Cover

Minimum depth of cover for all sanitary sewers shall be 3m from finished surface to pipe crown and shall have sufficient depth to satisfy the following criteria:

- Permit all buildings to drain by gravity to the sewer main;
- Prevent freezing;
- Clear other underground utilities; and
- Prevent damage from surface loading.

When it is not feasible to provide 3m cover, sewer shall be insulated (Dwg. U-17).

E.4.4 Manhole Spacing

Straight alignments, maximum allowable distance between manholes for sewers:

- Less than 600mm: 120m
- 600mm or greater: 150m

Curved alignments, maximum allowable distance between manholes for sewers:

- Less than 600mm: 90m
- 600mm or greater: 120m

Manholes shall be provided at the end of each line, at all changes in pipe sizes, grades, or alignment (i.e., start and end of curved sewer) and, at all junctions.

E.4.5 Curved Sewers

Maximum joint deflection shall be as recommended by the pipe manufacturer. A letter from the pipe manufacturer indicating the maximum joint deflection for proposed curved sewers shall be submitted with the detailed engineering design package to the Town.

Curved sewers shall be aligned parallel to the curb or road centreline.

E.4.6 Hydraulic Losses: Manhole to Manhole

Minimum invert drop across manholes shall be:

- Straight runs / deflections up to 45^{o}: 30mm
- Deflections between 45^{o} to 90^{o}: 60mm

Increasing pipe diameters:

- Crown of downstream shall match crown of upstream.
- Upstream 0.8 depth point shall not be below the downstream 0.8 depth point.

An internal drop pipe shall be installed when the drop between inverts exceeds 0.6m.

Manhole shaft shall be sized to attain an entry access width of at least 0.6m (Dwg. U-3).

E.4.7 Sewer Location

Sanitary sewer mains

- Located within the roads right-of-way (Dwg. R-14 to R-17).
- Require a minimum PUL width of 6m with two (2) utilities; added width may be required for PULs with more than two utilities.
- Maintain minimum clearances from watermains, storm sewers and power / phone / cable infrastructure of:
    - Horizontal: 3m (unless sewer depth requires increased spacing)
    - Vertical: 0.5m (above or below)
- Wherever possible, sanitary sewer mains shall cross under watermains.

Sanitary services

- Installed in a common trench with water services.
- Installed under landscaped areas as close to center of property as possible.

E.4.8 Manhole Details & Abandonment

Manholes shall be designed in accordance to Dwg. U-3 and U-5.

To abandon a manhole:

- Plug all pipes with non-shrink grout;
- Remove and dispose of manhole to 1.0m below ground; and
- Fill remaining cavity with filcrete.

E.4.9 Service Connections

For sanitary sewer services, refer to Dwg. U-9 to U-11.

Sanitary sewer services shall / be:

- Minimum size of 150mm diameter (see E.4.1) PVC DR28 building service pipe conforming to CSA B182.2, latest version thereof; 200mm diameter or greater shall be PVC DR35.
- Have own separate sanitary service at each lot.
- Placed so that when facing the lot from the street, the water service shall be on the right side of the sewer service.
- Located so they do not conflict with driveways.

- Designed as a single connection from the main to the property line.
- Extend beyond the property line and terminate 3m inside the lot or 1m beyond any utility easement, whichever is greater.
- Properly capped or plugged to prevent earth, water, or other deleterious material to enter the pipe. End of pipe (invert) shall be marked by a blue painted vertical P/T stake (50mm x 100mm x 1200mm) extending 0.5m above ground. Marker stakes are required prior to issuance of CCC.
- Designed for gravity flows with a minimum grade of 2.0%.
- Have a minimum depth of cover of 2.75m, from finished surface to pipe crown.
- Installed using Class B sand bedding (see E.7.4).
- Require risers where service connection at main is greater than 4m or deeper.
- For commercial / industrial, multi-dwelling residential, or institutional areas, shall only be made after the service requirements have been determined and a permit approving the installation is issued by the Town.
- Connect to sewer main via:
    - PVC wye fittings for connections below middle of main; and
    - PVC t-fittings for connections discharging into top half of main.
    - Manholes for connections to all multi-dwelling residential, commercial / industrial, or institutional lots, as approved by the Town.
- Stainless steel saddles shall be used for connections to mains where retrofit work.
- Not be connected to roof leaders and building foundation drains.
- Require grease and sediment traps for any facility that is anticipated to discharge sediment and/or grease (i.e., service stations, car washes, hotels/motels, cleaning facilities, institutions, equipment services, food processing, restaurants, etc.); these traps shall meet the Alberta Capital Region Wastewater Commission, in particular Bylaw No. 8 Quality of Wastewater.
- Require inspection / sampling chamber or manhole for all commercial / industrial service connections:
    - Located 0.5m inside road right-of-way;
    - Meet Alberta Capital Region Wastewater Commission, Bylaw No. 8 Quality of Wastewater requirements;
    - Lots pre-serviced with sanitary / water services installed in common trench, require a sampling chamber; All other lots require a sampling manhole.

Service Abandoning:

- A plug shall be installed at the connection to main if service is to be abandoned.

Service Connection Records:

- Developer's Consultant shall provide detailed reports for all installed services.
- Service reports shall provide information related to pipe diameter, invert elevations at the property line, location of services relative to property line(s), manholes or watermain valves, and lot number.

Special design requirements such as pipe foundations, special bedding, anchors, etc., may be required for certain soil conditions and are subject to acceptance by the Town.

E.5 LOW PRESSURE SEWER SYSTEM

E.5.1 Requirements

Low pressure sewer systems for new subdivisions may be permitted if:

- Developer has consulted the Town for approval to design this system;
- System conforms to the Town's Master Plan; and
- System meets minimum *Standards*.

E.5.2 Design Flow

The low pressure sewer system shall be:

- Designed based on the probable maximum pumps operating simultaneously, which is a function of total number of pumps connected to system (Table E2);
- Determined as the product of the maximum number of pumps in operation simultaneously, and the capacity of the average pump within the system;
- Based on all pumps having the same specifications:
    - Environment One Grinder Pumps with a flow rate of 0.7 L/s at 28m of total dynamic head shall be used in the Town.
    - Specified pump is suitable for the proposed development.
    - If not suitable, Developer's Consultant shall submit to Town for a variance and provide evidence that proposed pump alternative will not overwhelm the Town's sanitary sewer system.
- Assume zero inflow and infiltration for a closed system.

Table E2

Total Number of Pumps Connected to System	Maximum Pumps Operating Simultaneously
1	1
2 - 3	2
4 - 9	3
10 - 18	4
19 - 30	5
31 - 50	6
51 - 80	7
81 - 113	8
114 - 146	9
147 - 179	10

Table E2: Low Pressure Sewer System Design Flow

E.5.3 Minimum Force Main Pipe Diameter

Residential areas

- Service connections: 38mm diameter
- Force mains: 100mm diameter
  50mm and 75mm may be allowed at upstream ends of systems, as required to meet minimum velocity specified in Section E.3.3.

Non-residential areas

- Force mains: As required to maintain minimum velocity specified in Section E.3.3.

E.5.4 Isolation Valves

Isolation valves are recommended:

- As a means to isolate a section of pipe for service, repair or maintenance;
- At a maximum spacing of 300m;
- To be installed at intersections to allow each branch to be isolated; and
- To be plug or ball valve types, equipped with gear actuator and non-rising stems operable from ground level.

E.5.5 Flush Points

Flush points are recommended at:

- End of every branch,
- Intermediate points along long stretches of pipe, and
- Low points.

E.5.6 Combination Air / Vacuum Valves

Combination air / vacuum valves are required at the sewer high points or where needed to release entrapped air during normal operation of a vacuum when the pump stops, or the sewer is drained.

E.5.7 Low Pressure Sewer Service Connections

Curb stop (labelled “sewer”) and service box shall be located 0.3m inside the road right-of-way for all low pressure sewer service connections.

Check valve shall be located on private property.

E.5.8 Gravity / Low Pressure Standards

All other *Standards* listed in Section 5 also apply to low pressure sewer systems.

E.6 INSTALLATION – SANITARY

E.6.1 Compaction: Trench & Manholes

Manhole compaction requirements:

- Backfill around manholes shall be compacted with mechanical tampers to a minimum of 98% Standard Proctor Density.

Trench backfill / compaction requirements for sanitary sewer pipe (services / mains):

- Class B sand bedding (see Section E.7.4) shall be compacted to a minimum 95% Standard Proctor Density.
- Trench compaction shall be to a minimum 98% Standard Proctor Density.
- Backfilling shall be carried out using select native material compacted in 150mm layers. Large rocks, topsoil and organic matter, frozen materials, refuse and other deleterious materials shall not be used for backfilling.

E.6.2 Inspection & Testing

Video camera inspection reports shall be conducted on each sewer line and two (2) copies shall be provided to the Town. Video shall be high definition and in colour. Camera shall pan to view all services, manholes and notable items or deficiencies.

Inspection report shall identify the following:

- Date, time, weather conditions, location (street / avenue), manhole numbers, other pertinent information;
- Location and severity of all leaks, cracks, breaks, collapsed pipe, any other defects affecting the performance of the main; and
- Location, position, and condition of all services.

Where deemed necessary by the Town, an exfiltration and/or infiltration test shall be conducted. These tests shall not be required if video inspections are completed immediately after sewer construction and no deficiencies are observed. Any deficiencies shall be corrected by the Contractor and those portions of sewer affected shall be subject to an additional video inspection. Allowable leakage are as follows:

Infiltration Test

- 5.0 L /day/mm dia./km with no allowance for external hydrostatic head.
- Groundwater table is to be above pipe crown at all locations of the test section.

Exfiltration Test

- 5.0 L /day/mm dia./km combined allowable exfiltration from pipe and manholes.
- Hydrostatic head at the high manhole is to be a minimum 0.6m higher than crown of pipe or groundwater table, whichever is higher.
- Water level is not to exceed 7.6m above top of pipe at low manhole.

E.7 MATERIALS & SPECIFICATIONS – SANITARY

E.7.1 General

Developer's Consultant is responsible to:

- Select pipe materials using a rational design method;
- Use following information for guide purposes only;
- Select pipe material and class suitable for proposed application; and
- Request variance for alternate pipe materials with justification. Alternative may only be installed upon written approval from the Town.

E.7.2 Pipe Materials

Gravity Sewers

- PVC (Polyvinyl Chloride):	ASTM D3034, SDR 35 (CSA B182.2)
- Steel (Casing Pipe):	CAN3-Z245.1, Grade 241* (*or higher as required by crossing owner)

Force Mains

- PE (Polyethylene):	AWWA C906, DR11 or approved
- Steel (yellow jacket, epoxy lined):	ASTM A53, Grade B, standard wall or approved

E.7.3 Manholes

Manholes

- Precast sections and grade rings conforming to CAN / CSA A257.4.
- Manufactured using sulfate-resistant Type 50 cement, maximum slump of 75mm and minimum 28-day strength of 25 MPa.
- Precast reinforced concrete sections conforming to ASTM C478 and CSA A257.4; all precast units shall be marked with manufacturer's identification, casting date, cement type and CSA standard.
- Minimum 1220mm inside diameter per Dwg. U-3.
- Standard safety type steps, hot dipped galvanized iron or aluminum, having a minimal tensile strength of 260 MPa.
- Flexible watertight joints sealed with rubber gaskets conforming to ASTM C443, grouted inside and out with non-shrink grout.
- Norwood F39 cast-iron frames and covers conforming to Class 20 ASTM A48, latest revision thereof, true to form and dimension, and free from defects; Covers shall be cast with a single vent hole and stamped with the Town's logo.
- Pre-benched bases for PVC pipe with pre-cored connection holes and watertight; Duraseal, G-Loc joints or approved equal; shall be precast slabs, concrete poured bases, vaults, or precast tees.
- Safety platforms with depths greater than 6m.

- Tee-risers conforming to CSA 257.2 / ASTM C76 for the pipe component and CSA A257.4 / ASTM C76 for manhole riser component; required when concrete mains are over 1050mm inside diameter unless otherwise approved by the Town.
- Perched when adding a manhole along an existing storm sewer and when main size is 600 -1500mm inside diameter unless otherwise approved by the Town.

E.7.4 Pipe Bedding

Granular materials for bedding of pipes and other components in:

- Sound dry soils, use:
  - Class B sand conforming to Table E3.
- High water tabled areas, use washed rock:
  - Wrapped in filter cloth.
  - Consisting of washed, crushed, or screened stone or gravel with hard, durable particles meeting gradation limits in Table E3.
  - Free from sand, clay, cementitious, organic and other deleterious material.

Table E3	
Standard Sieve Size (µm)	% Passing
Class B Sand Bedding	
10 000	100
5 000	70 - 100
1 600	5 - 20
80	0 - 12
Washed Rock Bedding	
25 000	100
5 000	10 (max.)
80	2 (max.)

Table E3: Class B Sand & Washed Rock Bedding Material Gradations

E.7.5 Trench & Backfill

Refer to Dwg. U-1 Pipe Bedding for trenching and bedding details.

E.7.6 Corrosion Protection

All concrete used in a sanitary sewer system shall be sulphate-resistant cement.

For steel applications, a specialist's evaluation of cathodic protection requirements shall be supplied to the Town.

E.7.7 Private Sewer Systems (Rural)

Private sewage system shall be / use:

- Installed in accordance with the Safety Codes Council: Alberta Private Sewage System – Standard of Practice.
- Required for rural residential and commercial / industrial developments without reasonable access to a common sewage collection and disposal system.
- Septic tanks over the use of septic fluids are preferred.
    - Developer's Consultant is responsible to select a septic tank(s) of appropriate size for proposed development.
    - An access road to the tank is required and designed to accommodate sewage collection truck wheel loads.

Owner of a private sewer system shall:

- Ensure that the system is maintained;
- Operate the system within its design parameters; and
- Effectively treat and dispose of sewage and effluent.

E.8 STANDARD DETAILS – SANITARY SEWER SYSTEMS

See Appendix V for Standard Detail drawings for Sanitary Sewer Systems as listed:

U-1 Pipe Bedding Details
U-2 Standard Frame and Covers for Manholes
U-3 Manhole Detail
U-4 Drop Manhole Detail
U-5 Internal Drop Manhole Detail
U-9 Single Water & Sanitary Sewer Service (New Installation)
U-10 Sanitary Sewer Service Connector Riser
U-11 Dual Water & Sanitary Sewer Service (New Installation)
U-15 Typical Pipe Crossing
U-17 Pipe Insulation Detail
U-19 Single Service Layout (New Installation)

F. Water Distribution Systems

F.1 GENERAL

Water Distribution Systems shall be designed and constructed based on the following minimum acceptable standards for general construction requirements, materials, and procedures. These *Standards* may be exceeded if warranted. It is the responsibility of the Developer and their consultants to ensure good engineering, design, and construction practices of the watermains and appurtenances to be built or rebuilt in the Town.

Standard Details list for Water Distribution Systems are provided in Section F.6.

F.2 DESIGN FACTORS – WATER

F.2.1 Design Flow

Developer is responsible for designing a *Water Distribution System* in accordance with the American Water Works Association (AWWA) as part of the overall municipal distribution system. Developer shall provide a hydraulic network analysis (Hardy-Cross method or other suitable computer program) for the proposed development unless the Town approves otherwise. All calculations, schematic diagrams, computer printouts, etc., shall be submitted together with the Developer's design plans.

Water Distribution System shall:

- Deliver peak daily demand plus fire flow, or peak hour flow, whichever is greater.
- Not exceed velocities of:
  - 1.5 m/s during normal operation, or
  - 3.0 m/s during a fire event.
- Meet water demands for residential and non-residential (equivalent population, ep) land uses, based on the following criteria:
  - Low density: 40 people / ha
  - Medium density: 80 people / ha
  - High density: 200 people / ha
  - Commercial / institutional: 37 ep / ha
  - Industrial: 30 ep / ha
- Be based on minimum per capita water demands for the Town:
  - Average Daily Demand (ADD): 350 litres / capita / day (L/c/d)
  - Peak Daily Demand (PDD): 700 litres per day (2X ADD)
  - Peak Hour Demand (PHD): 1050 litres per day (3X ADD)
- Fire flows in accordance with Fire Underwriters Survey as per Table F1.

Table F1	
Land Use / Development Description	Fire Flows L/min. (L/s)
Low Density Residential	
Wood frame construction, 2-stories or less	
100 m2 to 150 m2	5,000 (83)
150 m2 to 275 m2	6,000 (100)
Medium Density Residential	
Wood frame construction, fire separation	
4 units, up to 100 m2 each	8,000 (133)
Walk-up Apartments	
Ordinary construction	
Up to 3,200 m2 (with 10-20m separation)	12,000 (200)
Schools	
Non-combustible construction	
up to 4,000 m2	11,000 (183)
up to 12,000 m2	19,000 (317)
Institutional, Churches	
Ordinary construction, 15% exposure	
up to 850 m2	6,000 (100)
Comercial	
Non-combustible construction, 50% exposure	
up tp 2,900 m2	11,000 (183)
up to 4,200 m2	14,000 (233)
Industrial - Light	
Non-combustible construction	
up to 2,900 m2, 25% exposure	9,000 (150)
up to 2,900 m2, 50% exposure	11,000 (183)
If the Town designates a rural residential area for fire protection, fire flow requirements are:	
Low Density Rural Residential	
2-stories or less, over 30m separation	2,000 (33)
Medium Density Rural Residential	
2-stories or less, 10.1-30m separation	3,000 (50)

Table F1: Fire Flow Requirements Based on Land Use

Developer shall confirm that the required fire flows meet the latest edition of Fire Underwriters Survey “Water Supply for Public Fire Protection” (fireunderwriters.ca).

If automatic sprinkler systems are to be installed in residences, the distribution / storage systems must consider the additional demand resulting from these fixtures.

F.2.2 Fire Department – Buildings

All buildings with internal fire suppression systems shall have:

- Fire Department Connections (FDC) which are the same as on existing hydrants in Town and accessible to Fire Department;
- FDC signage kept visible at all times;
- Lock box compatible with Fire Department requirements.
    - Developer's Consultant to contact Town to confirm lock box model.

F.2.3 Design Computations

Use the *Hazen-Williams* formula:

$$Q = CD^{2.63}s^{0.54} \times 278.5$$

Where: Q = rate of flow (L/s)
D = internal pipe diameter (m)
s = slope of hydraulic grade line (m/m)
C = roughness coefficient (see Table F2)

Table F2

Pipe Material	Roughness Coefficient (C)
PVC	130
Asbestos Cement*	110
Cast Iron*	100
Steel*	120
Ductile Iron*	120

Table F2: Hazen-Williams Roughness Coefficient for Watermains

Note: *These are not accepted pipe materials. Roughness coefficients have been provided for the assessment of existing systems only.

Minimum pressure at peak demand: 280 kPa
Minimum pressure with automatic sprinklers: 350 kPa
Maximum allowable pressure: 550 kPa
Minimum fire pressure at main (demand hydrant): 150 kPa
Minimum zone pressure during a fire event: 280 kPa

F.3 WATER MAINS, HYDRANTS, VALVES & SERVICE CONNECTIONS

F.3.1 Minimum Main Pipe Diameter

Residential:
- Low density residential: 150mm
- Medium density residential: 200mm
- High Density Residential: 250mm

Commercial / Industrial / Institutional: 200mm

Main sizes shall be confirmed by a Water Network Analysis (WNA) and may be increased, as considered necessary by the Town, to accommodate future development.

F.3.2 Dead-Ends

Criteria for watermain *dead-ends*:
- Blow offs shall only be used for temporary dead-ends (interim until subsequent stage(s) of a subdivision development).
- All permanent dead-end watermains shall be provided with a hydrant.
- New subdivisions shall be designed and constructed such that the water systems through and surrounding the area will be looped.
- Except in cul-de-sacs that are less than 120m length, all watermains shall be looped to an adjacent watermain through a PUL.

F.3.3 Water Location

Watermains:
- Located within the road right-of-way as per Dwg. R-14 to R-17.
- Require a minimum PUL of 6m with two (2) utilities; added width may be required for PULs with more than two utilities.
- Maintain minimum *horizontal* clearance from:
  - Sanitary / storm sewers: 3.0m (unless depths requires increased spacing)
  - Power / telephone / cable: 2.0m (including services)
  - Trees: 3.5m
  - Catch basins: 1.5m
- Maintain minimum *vertical* clearance from:
  - Utilities at crossings: 0.5m (above or below)

Services:
- Installed under landscaped areas as close to centre of the property as possible.
- Maintain minimum *horizontal* clearances from:
  - Power / telephone / cable: 2.0m
  - Catch basins: 3.0m
- Maintain minimum *vertical* clearance from:
  - Utilities at crossings: 0.5m (above or below)

F.3.4 Depth of Cover

Minimum depth of cover for all watermains shall be 3m from finished surface to pipe crown and shall be sufficient to depth to satisfy the following:

- Prevent freezing;
- Clear other underground utilities; and
- Prevent damage from surface loading.

When it is not feasible to provide 3m cover from finished surface to pipe crown, the watermain shall be insulated as per Dwg. U-17.

F.3.5 Valves

Valves shall have / be:

- Same size as the main.
- Valve boxes with operating extension stems and rock disk nut.
- Sliding type cast iron valve casings.

Valves shall be located:

- On the projection of property lines.
- At intersections, in line with the face of curb of the intersecting street:
    - 4 valves at cross intersections, and
    - 3 valves at tee intersections.
    - 30m minimum from arterial intersections.
- At both ends of a PUL / walkway / easement:
    - Located 0.5m from the property line, and
    - Inside municipal right-of-way.

For watermain break or shut-down for maintenance purposes:

- Not more than 2 hydrants shall be isolated,
- Maximum 4 valves shall be closed to isolate any one section of watermain,
- Maximum length of a dead-end line is 120m,
- No more than 25 single family homes shall be cut-off from the water supply,
- Commercial sites loop the main feeder with at least one valve on the loop.

Hot-tapped connections shall follow the valving notes outlined above. Hot-tap valves shall be located a minimum of 1.5m from joints.

F.3.6 Hydrant Location

Fire hydrants shall be located at street intersections and spaced as follows:

- Not more than 150m apart nor 100m from a dwelling within low density residential areas, and not more than 90m apart in all other areas.
- For cul-de-sacs less than 75m in length, placed along the intersecting street, at the intersection with the cul-de-sac.

- As per Fire Underwriters Survey "Water Supply for Public Fire Protection".
- As per Dwg. R-14 to R-16 within road cross-section:
    - Valve shall not be located in a sidewalk;
    - Require 3m clearance from franchise utilities such as pedestals, transformers, street lights, etc.;
    - Located at beginning of the curve of the curb return, at the corners of intersections or, at the extension of property lines; and
    - Require a minimum 1.5m clearance perimeter.

F.3.7 Service Connections

For water service connections, refer to Dwg. U-9, U-11 and U-19.

Water services shall / be:

- Single detached residence: 25mm minimum diameter
- Multi-unit dwellings / non-residential: Sized based on calculated water demand
- Minimum horizontal separation from sanitary / sewer / water services of:
    - 50mm diameter or smaller: 0.3m (common trench)
    - 100mm diameter or greater: 3.0m
- Minimum depth of cover of: 2.75m (from finished grade to pipe crown)
- Terminate 3m inside lot / property line or 1m past any utility easement, whichever is greater.
- Minimum distance of 600mm between corporation (main) stops.

Service Abandoning:

- For existing water service connections (as required to be abandoned);
- Main stop shall be closed, and service pipe cut at the goose neck and removed.

F.3.8 Thrust Blocking

Concrete thrust blocks shall be provided at bends, tees, wyes, reducers, plugs, caps, hydrants, valves, dead ends, and transition couplings as per Dwg. U-6.

F.3.9 Chamber Drainage

Chambers or manholes containing valves, blow-offs, meters, or other appurtenances, shall not be connected directly to a storm or sanitary sewer by gravity, nor shall blow-offs or air release valves be connected to any sewer. Such chambers shall be drained either to the surface by gravity, where they are not subjected to flooding by surface water, to absorption pits underground where they are above the groundwater table or pumped to a storm or sanitary sewer. Chambers shall be insulated to prevent freezing.

F.4 INSTALLATION – WATER

F.4.1 Watermains

Watermain installations:

- Minimum depth of cover: 3m (finished grade to pipe crown).
- Class "B" granular bedding: Except where otherwise approved by Town. See Section E.7.4, Table E3 for gradation standards.
- Locations: As per Sections F.3.3 and F.3.4.

F.4.2 Trench Compaction

It is the Developer's responsibility to ensure that:

- Utility trenches are adequately compacted for new installations or modifications of existing lines whether in a new or an existing subdivision.
- Disturbed areas are restored to original condition or better.

Trench backfill / compaction requirements for watermain and service pipes:

- Class B sand bedding (see Section E.7.4) shall be compacted to a minimum of 95% Standard Proctor Density.
- Trench compaction shall be to a minimum 98% Standard Proctor Density.
- Backfilling shall be carried out using select native material compacted in 150mm layers. Large rocks, topsoil and organic matter, frozen material, refuse and other deleterious materials shall not be used for backfilling.

F.4.3 Hydrants

Hydrant installations:

- Set so that the bottom flange is approx. 50mm above final ground elevation.
- Must have breakaway flanges installed at the base of the body and must not extend below the ground grade line.
- Locations as per Section F.3.6

F.4.4 Valves

Valve installations:

- Top of the valve box is to be set 100mm below final grade elevation on gravel areas and between 5mm to 15mm below finished grade on paved areas.
- Rock disk nut shall not be more than 600mm below finished grade.
- Valves on hydrant leads are to be located in boulevard area. All hydrants must be separated from the distribution system by a valve located 1m from the hydrant.
- Locations as per Section F.3.5

F.4.5 Service Connections

Water service installations:

- 2.75m minimum depth of cover (main to curb cock; finished grade to pipe crown).
- Tapping shall be done with full operating pressure in the main unless otherwise approved by the Town.
    - Each service connection shall be tapped into upper portion of watermain at least 45 degrees from the vertical and utilize a corporation main stop.
- Curb cocks (CC) shall have / be:
    - Located 0.3m from property line within the right-of-way.
    - Located such that they do not conflict with driveway locations or are located in concrete driveways or sidewalks.
    - Symbol “CC” stamped in sidewalk opposite the location of the curb cock.
- Each lot must have a separate water service.
- Each dwelling unit or commercial retail unit may require a separate water service at the discretion of the Town.
- Placed so that when facing the lot from the street, the water service shall be on the right side of the sewer service.
- All proposed school sites shall be provided with a water service. Size, type and location will be determined by Town.
- All water service ends shall be wrapped with filter fabric.

F.4.6 Inspection & Testing

Prior to the initial acceptance of the project, all watermains shall:

- Be tested for leakage in accordance with AWWA C603, latest revision.
- Be disinfected in accordance with AWWA C651 continuous feed method. Procedural method of disinfection includes chlorine concentration calculations and contact times which are to be submitted to the Town for acceptance. Upon completion of the disinfection, watermains and services shall be thoroughly flushed until water is visibly clear and chlorine levels are consistent with normal values.
- Conduct bacteriological testing. Developer is to submit one bacteriological sample result for each 90m of watermain installed unless otherwise approved by Town.
    - Upon receipt of bacteriological results indicating the absence of bacteria and approval of the Town, the water system shall be removed from isolation under the direct supervision of the water system operator.

See Section J.5 Watermain Testing for further inspection and testing requirements.

F.5 MATERIALS & SPECIFICATIONS – WATER

F.5.1 Pipe

Acceptable pipe materials for use in the watermain system shall conform to applicable CSA, AWWA and ASTM recommendations (Table F3). Pressure ratings shall be determined by the applications and conditions the pipe shall be subjected to.

Table F3			
Material	Specification	Manufacturer	Model / Type
Polyvinyl Chloride (PVC)	AWWA C900, DR18	IPEX	Blue Brute
Polyvinyl Chloride (PVC)	AWWA C905, DR25	IPEX	Centurion
Polyvinyl Chloride (PVC)	AWWA C900, DR18	Next Polymers	AQUALOC (Class 150)
Polyvinyl Chloride (PVC)	AWWA C905, DR25	Next Polymers	AQUALOC (Class 100)

Table F3: Acceptable Pipe Materials for Watermains

F.5.2 Fittings & Hardware

Table F4 lists the acceptable watermain materials for fittings and hardware.

Table F4	
Type	Specifications
Cast Iron Fittings	AWWA C110, 1.03 MPa working pressure
PVC Fittings	CSA B137.2 (Class 150); AWWA C907 CSA B137.3 (Class 150); AWWA C905
Flanged Joints	Class 150, ASME B16.5, flat-faced
Bolts & Nuts	Stainless Steel, Type 304, wrapped with Denso paste and tape

Table F4: Acceptable Materials for Fittings and Hardware

F.5.3 Cathodic Protection

Buried non-steel metallic fittings, valves, hydrants:

- Fittings and valves shall be cathodically protected with 2.3 kg zinc anodes;
- Hydrants shall be cathodically protected with 5.5 kg zinc anodes; and
- Zinc anodes shall conform to ASTM B418.

Water services:

- All copper services 50mm and smaller shall have a 5.5 kg zinc anode attached to the copper service pipe;
- Zinc anode wire shall be clamped to the copper service pipe within 1m of the curb stop and within the road right-of-way; and
- An all-brass clamp shall be used.

Buried steel pipe and fittings (retrofit work only):

- Require cathodic protection with high-potential magnesium anodes;
- Conduct a soil resistivity analysis along length of pipe to calculate the weight and spacing of anodes; and
- Provide a cathodic protection report along with the detailed design:
    - Cathodic protection design shall be completed by a corrosion specialist.

Anode requirements:

- Zinc anodes shall be Type II in accordance with ASTM B418;
- Anode container shall consist of a water permeable cardboard tube or bag;
- Anode shall be centered in the tube and backfilled with material sufficient to cover all parts of the anode to a minimum thickness of 25mm;
- Backfill material shall possess a maximum resistivity of 50 ohm-cm when wet and as measured by the soil box method in ASTM G57; and
- Water used for wetting backfill material shall be distilled or demineralized with no more than 15-20% water by weight added.

F.5.4 Pipe Bedding

Bedding material for pipes shall conform to:

- Dwg. U-1; and
- Table E3: Class B Sand & Washed Rock Bedding Material Gradations in Section E.7.4 Pipe Bedding.

F.5.5 Trench & Backfill

Refer to Dwg. U-1 for trenching and backfilling requirements.

F.5.6 Fire Hydrants

Hydrants shall be of a style and make acceptable to the Town and shall:

- Be compliant with the City of Edmonton standards.
- Compression type, dry barrel fire hydrants such as Canada Valve, Century model conforming to AWWA C502, latest revision.
- Complete with breakaway flanges with stainless steel nuts & bolts, wrapped in Denso paste & tape, 300mm spool piece and cathodically protected.
- Hydrant connections:
    - One pumper connection, 114.3mm with 4NH threads.
    - Two hose nozzles, 63.5mm with AMA threads.
    - Provide gate valve on each connection between hydrant and watermain.
    - Threads shall be same as existing Town hydrants.
- Main spindles shall turn to the left (counter-clockwise) to open.
- Minimum cover over hydrant leads shall be 3m from finished grade to pipe crown.
- Drain outlets:

  - Developer's Consultant shall confirm groundwater table levels to determine whether to plug drain ports.
  - All hydrants with drain ports plugged to be identified on Record Drawings.
- Enamel painted to CAN/CGSB-1.59:
  - Town hydrant body to be yellow with aluminum colour tops and caps.
- See Dwg. U-8 Off-Line Hydrant Detail.

F.5.7 Gate Valves

Gate Valves:

- Conform with AWWA C509, latest revision, for operation and materials.
- Cast iron epoxy coated valve boxes, Norwood Type "A", cathodically protected.
- Iron body gates with non-rising stem, which opens by turning in a counter clockwise direction.
- Valve ends provided to fit the pipe. Where flanged valves are used, they must be accompanied by flexible couplings.
- Position vertically in line.
- Extension stem to be 25mm square mild steel with 50mm operating nut and flange suitable for minimum 3.0m bury.
- Resilient seated Canada Valve type complete with stainless steel bolts & nuts.
- Have a bypass built into the body of the valve, if gate valves are larger than 350mm.
- See Dwg. U-7 Valve Box and U-18 Typical Blow-Off Details.

F.5.8 Service Connections

Water Service Pipe:

- Approved materials for pipe and appurtenances as listed in Tables F5.
- Services shall be Municipal Service Tubing, SDR9 (Series 200), CTS for services 50mm and smaller; services 100mm or greater shall be PVC DR18.
- Couplings shall be standard brass, compressions type.
- Minimum pipe size:
  - Non-sprinklered dwellings: 20mm (for service lengths under 20m)
25mm (for service lengths greater than 20m)
  - Sprinklered dwelling: 38mm
  - Multi-dwelling residential, commercial, industrial, & institutional: Sized according to anticipated usage

Water Service Fittings:

- Curb stop shall be copper to copper invert, Mueller Brass stop & drain ball valve.
- Curb stop boxes shall be epoxy coated, rods shall be stainless steel.
- Boxes and rods shall be:
  - Norwood C100 for sizes up to 25mm, and
  - Norwood C200 for sizes 32mm to 50mm

- Non-draining curb stops are to be provided in areas with high water table.
- All fittings shall be able to withstand a test pressure of 1,035 kPa.
- Corporation main stop shall be:
    - Mueller Brass compression type conforming to ASTM C800.
    - Stainless steel service clamps with double stainless steel straps.

Table F5		
Manufacturer	Model / Type	Comments
Service Saddles		
Robar	2606	
Corporation (Main) Stops		
Cambridge Brass	E17073	Compression end
Cambridge Brass	E17076	Compression end
Mueller	H-15008	Compression end
Water Service Unions		
Cambridge Brass	E17084	Compression end
Cambridge Brass	E17087	Compression end
Cambridge Brass	E17088	Compression end
Mueller	H-15403	Compression end
Curb Stops		
Cambridge Brass	E17403	Compression end
Cambridge Brass	E17030	Compression end
Cambridge Brass	E17040	Compression end
Mueller	H-15209	Compression end
PVC Services		
IPEX	Blue Brute	AWWA C900, DR18
Pipe Materials for Copper Services		
Wolverine	Type K	
Cerro	Type K	
Halstead	Type K	
Pipe Materials for Polyethylene Services		
Rehau	Municipex	Crosslinked Polyethylene (PEXa) CSA B137.5, NSF 61, NSF 14, AWWA C901

Table F5: Acceptable Materials for Water Services and Associated Appurtenances

Rural Services:

- May require larger service connections due to added demands such as irrigation, higher fixture numbers.
- Shall be sized according to expected demand and distance from main.

F.6 STANDARD DETAILS – WATER DISTRIBUTION SYSTEMS

See Appendix V for Standard Detail drawings for Water Distribution Systems as listed:

- U-1 Pipe Bedding Details
- U-6 Thrust Block Details
- U-7 Valve Box Detail
- U-8 Off-Line Hydrant Detail
- U-9 Single Water & Sanitary Sewer Service (New Installation)
- U-11 Dual Water & Sanitary Sewer Service (New Installation)
- U-15 Typical Pipe Crossing
- U-17 Pipe Insulation Detail
- U-18 Typical Blow-Off Detail
- U-19 Single Service Layout (New Installation)

G. Storm Drainage Systems

G.1 GENERAL

These *Standards* cover the requirements for storm drainage systems and shall be dependent on type of development, drainage area, and length of surface drainage runs.

Developer and the Developer's Engineer are responsible to ensure that the storm drainage system is designed and constructed according to accepted engineering practice. These standards are intended as a guide only and shall not be considered as a substitute for the Developer's Engineer detailed material and construction specifications.

Standard Details list for Storm Drainage Systems are provided in Section G.10.

G.2 STORMWATER MANAGEMENT PLAN

Prior to submission of any detailed design, a *stormwater management plan* shall be prepared by the Developer and submitted to the Town for acceptance. Stormwater management plan shall:

- Identify the impact of the proposed development on the watershed.
- Identify and quantify the amount of upstream drainage entering the proposed development lands, including all points of entry.
- Identify all existing flow channels, drainage patterns/routes, containment areas.
- Identify point(s) of discharge from the lands, as well as type and calculated capacity of the receiving drainage facility(ies), whether natural, man-made, or a combination of both.
- Provide details of required stormwater retention / detention facilities.
- Provide details of water quality enhancement facilities, if required.
- Identify all licensing requirements and / or approvals as may be required by Provincial or Federal environmental acts.

Stormwater runoff generated from within a subdivision shall be routed through a stormwater management facility as required to regulate the rate of outflow prior to discharge, unless otherwise approved by the Town.

These facilities shall be designed in accordance with the "Stormwater Management Guidelines" prepared by Alberta Environment and in accordance with good engineering practice.

A phased construction approach to match expected development sequence may be acceptable to the Town, provided that these guideline requirements are met. Temporary ponds and structures, without the required facilities and design components, are not acceptable.

G.3 MINOR & MAJOR SYSTEMS

Each storm drainage system shall be designed with minor and major systems.

In general, a *minor system* consists of piping, manholes, catch basins, open channels, water courses and outfall structures that have been designed to avoid property damage and flooding due to runoff generated by a 1 in 5-year rainfall event. A *major system* consists of the roads, gutters, lot drainage, drainage parkways, culverts crossing roadways and detention facilities designed to avoid significant property damage and control flooding caused by a 1 in 100-year rainfall event. When the capacity of the minor system is exceeded, the major system must provide a continuous overland flow route allowing the excess runoff to reach the designated ponding areas or water body.

Design of both the minor and major systems must meet the current requirements outlined in the Alberta Environment “Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems” and “Stormwater Management Guidelines”.

Stormwater pipe shall be manufactured conforming with the latest standards by American Society for Testing Materials (ASTM) and Canadian Standard Association (CSA).

G.4 DESIGN FACTORS – STORM

G.4.1 Design Criteria

Use the *Rational Formula* for minor systems with watershed areas less than 65 ha and discharge into detention facilities or other outlets approved by the Town:

Q = CIA / 360

Where:
- Q = quantity of runoff / design flow (m^3/s)
- I = intensity of rainfall (mm/hr)
- A = contributing area (ha)
- C = runoff coefficient (Table G1)

Compatible computer modelling or Hydrograph Methods shall be required for areas greater than 65 ha or for developments requiring storage or detention facilities.

Storm sewers shall convey flows of a 5-year return frequency without surcharging.

Table G1			
Land Use	Runoff Coefficient (C)		
	Minimum	Average	Maximum
Pavement (asphalt / concrete) / Roofs	0.70	0.83	0.95
Parks / Reserves	0.10	0.18	0.25
School / Playgrounds	0.20	0.28	0.35
Residential			
Single Family / Low Density	0.40	0.50	0.60
Multi-Family / Medium Density	0.60	0.68	0.75
High Density	0.50	0.60	0.70
Rural	0.25	0.33	0.40
Commercial			
Downtown	0.70	0.83	0.95
Neighborhood	0.50	0.60	0.70
Industrial			
Light	0.50	0.65	0.80
Heavy	0.60	0.75	0.90

Table G1: Runoff Coefficients for 5-Year & 10-Year Events

Notes: Values within the range depends on soil type if the watershed area is significantly unpaved (sand is minimum, clay is maximum) and on the development nature.

For storms with return periods of more than 10 years, increase the specified values, up to a maximum coefficient of 0.95, as follows:

- 25-year: Add 10%
- 50-year: Add 20%
- 100-year: Add 25%

G.4.2 Rate of Precipitation

Rainfall data shall be taken from most up-to-date / nearest Intensity-Duration-Frequency (IDF) curves: 5-year IDF curve (minor systems) and 100-year IDF curve (major systems).

Inlet time shall be as per Table G2.

Table G2			
Catchment Area	Imperviousness (%)		
	30	50	>70
8 ha or less	8 mins	8 mins	5 mins
Between 8 and 40 ha	9.2 mins	9.2 mins	6 mins
40 ha or greater	10.4 mins	10.4 mins	7.25 mins

Table G2: Design Inlet Time

G.4.3 Final Site and Lot Grading

Following criteria shall be used:

- Each lot shall be graded to drain to the municipal storm drainage system. Cross-lot drainage is not permitted.
- Areas around buildings shall be graded away from foundations to prevent flooding as per Dwg. R-12 to R-13.
- Lots lower than adjacent roadways shall be avoided.
- To provide basic positive drainage until a lot is developed, lot(s) shall be rough graded to allow for earth balancing of future basement excavation / landscaping. Rough grading shall ensure interim positive drainage is maintained.
- Developer shall remove and properly dispose of standing water on lots. Rough grading of lots is required prior to a CCC inspection.
- Developer shall clean-up after rough grading operations and the area around the lot being graded shall be left in a developable condition.
- Building foundations shall be above the major system hydraulic grade line for a 100-year storm event, plus a minimum of 0.3m freeboard.

G.4.4 Foundation Systems

Foundation drains

- Required in all areas without a storm sewer.
- Shall discharge to the nearest downstream storm sewer.
- Dedicated to the collection of foundation drain flows produced from basement sump pump discharge only.

Roof drains

- Shall discharge to surface and not be connected to foundation drain sewer.

Sump pump

- In basement with a pressure discharge connection to a foundation drain service riser pipe on outside of building foundation, and a foundation drain service connection pipe from the riser connection at house to property line are required.
- Pressure discharge connection to gravity foundation drain service riser pipe shall be provided with a clean-out and an overflow discharge to a concrete splash pad.
- Installation and maintenance of on-lot components are homeowner responsibility.

Remainder of system components located within road right-of-way or PUL and consist of:

- Foundation drain service from property line to the storm sewer, or
- Where there is no storm sewer, a foundation drain sewer shall be installed to permit connection of foundation drain services to nearest downstream storm sewer.
- Manholes shall be provided for foundation drain sewer at 120m maximum spacing.

Additional criteria:

- Foundation drain service shall not be discharged to the sanitary system.

- Depth of foundation drain service shall be 2.4m from the finished grade to crown of service at property line. In areas where minimum depth of cover is not feasible, evaluate alternative solutions with Town.
- Depth of foundation drain sewer shall be adequate to receive drainage from foundation drain service such that the service can be connected to sewer above its mid diameter, within 45 degrees of pipe crown. Minimum of 2.4m of cover, measured from finished grade to sewer crown, must be provided. In areas where minimum depth of cover is not feasible, evaluate alternative solutions with Town.
- Foundation drain sump pump discharge collection system shall be sized to provide capacity in free flow based on all connected sump pumps operating concurrently.
- Minimum size and grade of:
    - Foundation drain sewer: 200mm at 0.40%
    - Foundation drain service: 100mm at 1.0%

Roof Drainage

- For single detached and semi-detached dwellings:
    - Discharged to ground and dispersed via splash pads at the downspouts.
    - Point of discharge shall be 1.2m minimum away from building (including downspout extensions) to ensure positive drainage.
- For multi-dwelling residential, commercial, industrial areas:
    - Discharge to storm sewer where new and existing systems are designed to accommodate the direct discharge and only if acceptable to the Town.

G.5 PIPE FLOW & VELOCITY

G.5.1 Storm Sewers and Open Channels

Pipe capacity shall be determined by utilizing *Manning's Formula*:

$$Q = (AR^{(2/3)}s^{0.5}) / n$$

Where:
- Q = pipe capacity (m^3/s)
- A = cross-sectional area of pipe (m^2)
- R = hydraulic radius (area / wetted perimeter) (m)
- s = slope of hydraulic line (m/m)
- n = roughness coefficient (see Table G3)

G.5.2 Culverts

Determine pipe capacity based on inlet / outlet control methods referred to:

- Handbook of Steel Drainage and Highway Construction Products, by the Corrugated Steel Pipe Institute;
- Handbook of Concrete Culvert Pipe Hydraulics, by the Portland Cement Association; and
- Design Guidelines for Bridge Size Culverts, by Alberta Transportation.

Table G3	
Pipe Type	Roughness Coefficient (n)
Smooth-walled (PVC, concrete)	0.013
Corrugated steel (unpaved)	0.024
Corrugated steel (invert paved)	0.020
Gravel lined channels	0.033
Concrete / asphalt lined channels	0.020
Natural streams / grass channels	0.050

Table G3: Roughness Coefficients for Pipe Types

G.5.3 Flow Velocity

Flow velocities for all storm sewers shall be:

- Design: 0.90 – 1.0 m/s (based on *Manning's Formula*)
- Minimum: 0.60 m/s (below 0.60 m/s is not allowed)
- Maximum: 3.0 m/s (greater than 3.0 m/s require special provisions)

G.6 PIPE, MANHOLES & CATCH BASINS

G.6.1 Minimum Pipe Diameter

Minimum pipe diameters for storm sewer systems:

- Storm sewers: 300mm
- Culverts crossing roads: 500mm
- Catch basin leads: 250mm
- Foundation drains sewers: 200mm
- Foundation drains services: 100mm

G.6.2 Pipe Grade

Straight Alignment, minimum pipe grades:

- 200mm nominal diameter: 0.40%*
- 250mm nominal diameter: 0.28%*
- 300mm nominal diameter: 0.22%
- 375 or greater nominal diameter: 0.15%

**Foundation drains sewers only.*

Steeper grades are preferred.

Curved storm sewers, increase minimum grade by 50% to above values.

G.6.3 Depth of Cover

Minimum depth of cover for storm sewers:

- Storm sewers in roads: 2.4m to pipe crown
- Culverts across roads: Greater of half the culvert diameter or 500mm to pipe crown
- Catch basin leads at catch basin: 1.8m to pipe crown
- Landscaped areas: 2.1m to pipe crown

When it is not feasible to provide the required depth of cover from finished surface to pipe crown, the storm sewer shall be insulated as per Dwg. U-17.

G.6.4 Manhole Spacing

Straight Alignment, maximum allowable distance between manholes for storm sewers:

- Less than 900mm: 120m
- 900mm or greater: 150m

Curved Alignment, maximum allowable distances between manholes for storm sewers:

- Less than 1200mm: 90m
- 1200mm or greater: 120m

Manholes shall be provided at the end of each line and at all changes in pipe sizes, grades, or alignment and at all junctions.

G.6.5 Curved Storm Sewers

Maximum joint deflection shall be as recommended by the pipe manufacturer. A letter from the pipe manufacturer indicating the maximum joint deflection for proposed curved sewers shall be submitted with the detailed engineering design package to the Town.

Curved sewers shall be aligned parallel to the curb or road centreline.

G.6.6 Hydraulic Losses: Manhole to Manhole

Minimum invert drop across manholes:

- Straight runs / deflections up to 45°: 30mm
- Deflections between 45° to 90°: 60mm
- Deflections greater than 90°: Use 2 or more manholes

Increasing pipe diameters:

- Crown of downstream shall match crown of upstream.
- Upstream 0.8 depth point shall not be below the downstream 0.8 depth point.

Smooth transitions shall be provided between inverts of incoming sewers and outlet sewers. Extreme changes in elevation at manholes should be avoided.

Where drops greater than 1m cannot be avoided, a specially designed drop manhole will be required to address the hydraulic requirements of the change in elevation. The following shall be considered in the design of the drop manhole:

- Pipe shall be sized so that it does not surcharge.
- Smooth vertical curve shall be formed between inlet pipe and drop shaft with no breaks in grade, projections, or edges.
- Drop shaft diameter shall be equal to or greater in size than that of the largest inlet pipe. For multiple connections, a larger drop shaft shall be supplied.
- Air vents shall be provided.
- Cover shall be able to withstand pressures from air discharge and surcharging.
- Outlet shall provide a hydraulic jump basin to dissipate energy, to convert the flow to subcritical velocity and to allow for air release.

Baffled vertical drop shafts are not permitted due to maintenance and access problems. Vortex type drop shafts are preferred. Proposals to use vortex type drop shafts must be supported by appropriate design calculations and submitted to the Town for acceptance.

G.6.7 Pipe Location

Stormwater mains

- Located within the roads right-of-way as per Dwg. R-14 to R-16.
- Require a minimum PUL width of 6m with two (2) utilities; added width may be required for PULs with more than two utilities.
- Maintain minimum clearances from watermains, sanitary sewers, and power / telephone / cable infrastructure of:
    - Horizontal: 3m (unless sewer depth requires increased spacing)
    - Vertical: 0.5m (above or below at crossing)

Services

- Located adjacent to sanitary service connections at property line.
- Located under landscape areas as close to centre of property as possible.

G.6.8 Manhole & Catch Basin Abandonment

To abandon a manhole and or catch basin:

- Plug all pipes with non-shrink grout;
- Remove and dispose of manhole / catch basin to 1.0m below ground; and
- Fill remaining cavity with filcrete.

G.6.9 Catch Basins & Catch Basin Leads

Catch basins

- Have sufficient numbers, inlet capacities, catch basin leads to receive and convey the calculated stormwater flow.
- Spacing and capacity so that ponding does not occur during a 1:5-year storm.
- Intercept surface runoff.
- Connected in series, provided that the downstream catch basin is a catch basin manhole which discharges into a stormwater manhole.
- Grade rings and frame shall be installed within 50mm plumb with catch basin shaft with 810mm clear distance within catch basin.
- Size (inside diameter): 900mm minimum
- Sump depth: 500mm minimum
- Spacing: 120m maximum
- Flow distance to first catch basin: 150m maximum

Catch basin leads

- Length: 18m maximum (provide manhole if greater than 18m)
- Grade: 2.0% minimum
- All leads shall discharge directly into a stormwater main manhole or a catch basin manhole or as approved by the Town.

G.6.10 Culverts & Rural Drainage

Ditches

- Grade: 0.6% minimum
  2.0% or greater requires erosion protection (i.e., rock ditch, silt or Enviroberm fences, erosion control blankets, etc.)
- Design: 1.5m minimum ditch bottom width
  5.0% minimum slope from roadway

Culverts

- Size as determined by the stormwater drainage analysis (diameter minimum):
  - Roadway crossing: 500mm
  - Residential driveway: 400mm
  - Industrial driveway: 500mm
- Installed in accordance with the manufacturer's recommendations.
- Beveled at both inlet / outlet ends, with invert end extended to toe of side slope.
- Riprap installed at inlet / outlet ends of all culverts.
- Geotextile filter fabric is required in substandard soils / wet areas.

G.7 INSTALLATIONS – STORM

Refer to Section G.6 Pipe, Manholes & Catch Basins for additional install requirements.

G.7.1 Compaction & Backfill

Catch basins / catch basin leads compaction requirements:

- Backfill around catch basins / catch basin leads shall be compacted with mechanical tampers to a minimum 98% Standard Proctor Density.

Manhole compaction requirements:

- Backfill around manholes shall be compacted with mechanical tampers to a minimum 98% Standard Proctor Density.

Trench backfill / compaction requirements for pipe (services / mains, culverts):

- Class B sand bedding (see Section E.7.4) shall be compacted to a minimum of 95% Standard Proctor Density.
- Trench compaction shall be to a minimum 98% Standard Proctor Density.
- Backfilling shall be carried out using select native material compacted in 150mm layers. Large rocks, topsoil and organic matter, frozen material, refuse and other deleterious materials shall not be used for backfilling.

It is the Developer's responsibility to ensure that:

- Utility trenches are adequately compacted for new installations or modifications of existing lines whether in a new or an existing subdivision.
- Disturbed areas are restored to original condition or better.

G.7.2 Inspection & Testing

Refer to Sections E.6.2 Inspection & Testing and J.3 Sanitary Sewer Testing.

G.8 MATERIALS & SPECIFICATIONS – STORM

G.8.1 General

Developer's Consultant is responsible to:

- Select pipe materials using a rational design method;
- Select pipe material and class suitable for proposed application;
- Request variance for alternate pipe materials with justification. Alternative may only be installed upon written approval from the Town.

G.8.2 Pipe Materials

Stormwater mains / leads

- Reinforced Concrete*: CAN/CSA A257.2
- PVC (up to 1050mm diameter): ASTM D3034, CSA B182.2, Class DR35
- PVC (up to 900mm diameter): ASTM F794, CSA B182.4, Ultra-Rib/Ultra-X2

*Concrete pipe shall be sulphate resistant cement conforming to ASTM C14 non-reinforced concrete pipe, or ASTM C76 reinforced concrete pipe, latest revisions thereof, for mains greater than 900mm diameter.

Culverts

- Corrugated steel pipe* (CSP): CSA-G401, stiffness AASHO-M-36

*New galvanized CSP with a minimum wall thickness of 1.6mm, or as required by the loading criteria, and a profile of 68mm X 13mm.

G.8.3 Catch Basins & Catch Basin Leads

Catch basin and catch basin leads shall:

- Precast reinforced concrete sections conforming to most recent ASTM specifications, sulphate resistant with a minimum 28-day strength of 25MPa.
- Constructed to provide a 500mm sump to trap rocks and gravel.
- Flexible watertight joints (Duraseal, G-Loc joints or approved equal) sealed with rubber gaskets conforming to ASTM C443.
- Pre-cored connection holes.
- Top inlet round / top catch basins: Norwood F38 or F39 (lanes / alleys)
- Standard curb and gutter: Norwood F51 with side inlet for all locations
- Rolled curb and gutter: Norwood F33 for all locations
- Other models shall require approval by the Town.

G.8.4 Manholes

Manholes shall:

- Precast sections and grade rings conforming to CAN / CSA A257.4.
- Manufactured using sulphate-resistant Type 50 cement, maximum slump of 75mm and minimum 28-day strength of 25 MPa.
- Precast reinforced concrete sections conforming to ASTM C478 marked with manufacturer's identification, casting date, cement type, and ASTM standard.
- Minimum 1200mm inside diameter per Dwg. U-3.
- Standard safety type safety steps, hot dipped galvanized steel, or aluminum.
- Flexible watertight joints sealed with rubber gaskets conforming to ASTM C443, grouted inside and out with non-shrink grout.
- Norwood F39 cast-iron frames and covers conforming to Class 20 ASTM A48, latest revision thereof, as per Dwg. U-2.

- Pre-benched bases for PVC pipe with pre-cored connection holes and watertight; Duraseal, G-Loc joints or approved equal; shall be precast slabs, concrete poured bases, vaults, or precast tees.
- Tee-risers conforming to CSA 257.2 / ASTM C76 for the pipe component and CSA A257.4 / ASTM C76 for manhole riser component; required when concrete mains are over 1050mm inside diameter unless otherwise approved by the Town.
- Perched when adding a manhole along an existing sanitary sewer or when main size is 600 to 1050mm inside diameter unless otherwise approved by the Town.
- Safety platforms with depths greater than 6m.

G.8.5 Bedding Materials

Granular materials for bedding of pipe and sewer components shall be in accordance to Section E.7.4 Pipe Bedding.

G.8.6 Riprap & Geotextile

Riprap

- Alberta Transportation Class 1M riprap

Geotextile

- Non-woven fabric with the following properties:
  - Grab strength: 650 N
  - Elongation (failure): 50%
  - Puncture strength: 275 N
  - Burst strength: 2.1 MPa
  - Trapezoidal Tear: 250 N
  - Fabric overlap: 300mm minimum

G.8.7 Trench & Backfill

Refer to Dwg. U-1 for trench, backfill and bedding details.

G.8.8 Inlet, Outlet & Outfall Structures

Inlet / Outlet structures

- Obverts shall be above the 1:5-year flood level of receiving drainage course.
- Inverts shall be above winter ice or completely submerged with obverts 1m below normal water levels (NWL).
- Install removable grates at openings to discourage unauthorized access.
- For stormwater storage facilities, all inlet/outlet pipes shall be capped with an impervious material (i.e. clay) to prevent granular bedding materials washing out.

Outfall structures

- Hydraulic analysis is required to ensure that exit velocities will not negatively impact natural watercourses.
- Final velocities into a natural drainage course shall not exceed 1.5 m/s.
- Drop structures, energy dissipaters, riprap and filter fabric shall be provided downstream of the outfall to prevent erosion.
- Construct with lockable grates to allow maintenance but prevent entrance of unauthorized personnel.
- Install guardrails and/or fences to provide fall protection.
- Aesthetically designed as they are generally located within parks, ravines, or riverbanks. Concrete surface treatment is recommended.

G.9 MAJOR SYSTEMS

G.9.1 General

When the minor system capacity is exceeded, the *major system* must provide a continuous route for runoff water to follow. Generally, major system routing shall utilize roadways and open channels and be enhanced by compatible lot grading.

Major system shall accommodate a 1:100-year storm condition with maximum surcharging in the roadway gutter of a local residential street of 300mm.

If downstream constraints require a gutter flow in excess of 500mm, special modelling and design calculations shall be submitted to the Town for review. The Town shall determine the extent, if any, of a relaxation of the maximum 300mm gutter flow standard on an individual basis.

Major conveyance system accommodates flows not intercepted by or beyond the capacity of the minor drainage system through planned surface flow routes and storage facilities. Intent of the major system is to provide surface flow management to minimize flooding and property damage from a 1:100-year rainfall event. Design of the major drainage system must not be limited to the immediate development area but must consider overland flows that may enter the area from adjacent land as well as downstream effects on adjacent development and receiving water bodies.

G.9.2 Lot Grading

Proper lot grading is the first step towards a well-planned major drainage system. The goal of the lot grading shall be to ensure that water flows away from the building, water supply well, and septic bed and, in no case shall ponding levels come within 150mm from the finished ground elevation at the building during a 1:100-year rainfall event.

Flow from lots shall always have an escape route to a public right-of-way. Lot grading plan shall develop a proper balance between the road and gutter elevations, proposed building elevations, surrounding development and existing topography.

Generally, lots shall be designed to drain from back to front. Drainage towards the back of lot will be permitted where laneways or public rights-of-way are in place to accommodate drainage directly from the lot without crossing adjacent lots. An overall drainage plan will be required for all subdivisions.

An initial grade of 10% sloping away from the building for a distance of 1.5m shall be required on all sides. The slope shall continue at a minimum grade of 2.0% to the property boundary. Larger slopes are desirable if topography allows to a maximum of 10%.

G.9.3 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 CCC.

Drainage swales located on private property shall be covered by an easement in favour of the Municipality.

Drainage swales crossing several properties for the collection of runoff shall not be permitted unless special circumstances warrant and approved by the Town.

Concrete swales shall be required when accommodating flow from more than three adjacent lots. Earthen swales shall be protected from erosion by grass cover, appropriate ground cover or geotextile fabric.

Minimum design slope for concrete swales without a concrete gutter and on private or public property is 0.5%.

G.9.4 Roadways

Grading of streets comprising the major drainage system shall:

- Maintain continuity of overland flow routes between adjacent developments.
- Local roads should not have a depth of water more than 300mm above the gutter.
- Depth of water at the gutter shall be less than 500mm for all roadways.

G.9.5 Stormwater Management Facilities

Stormwater management facilities shall be designed to meet Alberta Environment guidelines and the following:

- Drainage master plan must include detailed description of the development area including overland flow, catchment areas, natural storage, planned storage.

- Several different storage methods may be employed such as:
    - ***Retention Storage*** *(wet ponds)*: Collects / stores runoff for a period of time and releases it after the inflow has ceased. Includes constructed wetlands.
    - ***Detention Storage*** *(dry ponds)*: Provides a control outlet to the area restricting flow. When the inflow exceeds the allowed outflow, water is detained in the designated storage area until flows diminish. Low flows are not usually detained.
    - ***Channel Storage***: Constructed with wide bottoms and small grades will provide a type of storage as the channel fills with water.
- Outlet control structure(s) which details:
    - Size and configuration of concrete chamber;
    - Types of hatches (lockable);
    - Access for maintenance (all-weather access suitable for hydro-vac truck);
    - Safety railing location around hatches;
    - Provision for kickplates at the base of railings;
    - Locations and models of davit bases (if required);
    - Locations and models of water level control gates (if required); and
    - Location and size of orifice and provisions for increasing the release rate for rapid drawdown.
    - See Section G.8.8 Inlet, Outlet & Outfall Structures.

Design of the storage facility shall be based on a 1:100-year storm event, plus adequate freeboard to contain the maximum historical event. Developer's Engineer shall include detailed calculations for a range of storm durations to determine the critical volume as well as an analysis of the capacity and characteristics of the downstream receiving drainage course. Measures shall be taken in order to avoid flooding, erosion, or sedimentation in the downstream receiving drainage course.

These minimum standards are not intended to restrict Developers from formulating innovative stormwater management processes intended to protect the environment and improve the stormwater quality prior to release. All stormwater management plans must be submitted to the Town for review and approval.

G.9.6 Wet Ponds / Lakes – Design Standards

Lands covered by the facility including areas covered by water at the normal water level (NWL), inlets, outlets, control structures and access routes shall be designated as PULs.

Private property subject to potential flooding shall be covered by an easement in the favour of the Town. Restrictive covenant shall be placed on lots abutting the facility to control development that will restrict the capacity.

Design shall incorporate a semi-annual turnover at average annual precipitation.

High-water level shall be at least 300mm below lowest building opening on adjacent lots.

Freeboard elevation shall be set so that it is below adjacent house basement footings.

Minimum surface area at NWL shall be 2 ha to discourage small facilities unless otherwise approved by the Town.

Pond / lake shall have maximum side slopes of 3:1 from the lake bottom to 1m below the NWL. Slopes above this level shall have a maximum slope of 5:1, but 7:1 slopes are encouraged where these facilities may be attended by the public. Slopes may be revised in confined spaces or areas with extreme topography at the discretion of the Town.

Active storage depth shall be as required to provide storage for a 1:100-year storm event.

Minimum depth from the NWL to the pond / lake bottom shall be 2.5m to discourage growth of vegetation; however, 3m depth is preferred.

Where the ground water level is below the NWL, the pond / lake bottom shall be of impervious material (permeability coefficient of $1x10^{-6}$ cm/s). Where ground water level is near or above the NWL, the pond / lake bottom may be made of a pervious material based on geotechnical investigation.

Inlets and outlets are to be placed to maximize detention time and water circulation thereby avoiding dead storage areas.

Inlet and outlet pipes are to be fully submerged and at least 200mm above the pond / lake bottom and 1m below the NWL.

Inlet manhole invert shall be at or above the NWL to avoid sedimentation.

NWL elevation collection system shall not surcharge to an elevation greater than the lowest catch basin invert in the collection system during a 1:5-year storm.

Provision shall be made to drain the lake completely by gravity or portable pump system.

An overflow channel and overland drainage route must be provided for above the high-water level.

Edge treatment is required for erosion protection due to wave action from 0.3m below and 0.3m above NWL. Edge treatment shall consist of granular material (chemically sterile, 75mm minimum size, 250mm thick) on top of woven polypropylene fabric.

Buffer strip shall be provided between NWL and the 1:25-year flood level. Difference between the NWL and the 1:25-year flood level shall be limited to 1m vertical rise.

All weather vehicle access must be provided to all control works. Approved fencing and signage shall be installed where necessary for safety purposes.

G.9.7 Dry Ponds – Design Standards

Dry ponds shall be used when topological or planning constraints exist which limit the use of wet ponds or constructed wetlands and designed as an amenity to the development with open space for passive play and links to pedestrian walkways for use by the public.

Lands covered by the facility including areas covered by water at the 1:5-year level, inlets, outlets, control structures and access routes, shall be designated as PULs.

Private property subject to potential flooding shall be covered by an easement in the favour of the Town. A restrictive covenant shall be placed on the lots abutting the facility as required to control development that will restrict the capacity.

All dry ponds shall be designated as off-line storage areas designed to temporarily detain excess flow and control downstream flow to acceptable limits. Low flow conditions shall not be diverted to the dry pond.

Maximum storage depth shall be 3m measured from the invert of the outlet pipe.

Dry pond shall be designed to drain completely after excess flow has dissipated. Pond bottom shall have a minimum slope of 2% towards the outlet. Side slopes shall have a maximum slope of 7:1 within private property and 5:1 within public property.

Grass cover shall be established after completion of construction; However, low flow channel, which shall accommodate a 1:5-year event and low flow condition, can be either aquatic type plants or a rip-rapped channel.

All inlets and outlets shall have grates with a maximum bar spacing of 150mm over their openings to prevent access. Possibility of plugging shall be considered in the sizing of the outlet pipe. Maximum flow through the grating shall be 1.0 m/sec.

G.9.8 Constructed Wetlands – Design Standards

Size should be approx. 5% of the watershed area that it will be servicing.

Approx. 25% of the surface area at NWL should consist of deep pools, 2.4m to 3.0m deep, to allow for settleable solids removal.

Average permanent wetland water depth shall be 0.3m with 1m deep zones, for flow redistribution, fish and submerged or floating aquatic vegetation habitat.

Active storage shall be 0.3 to 0.6m deep. Fluctuation in excess of 1m above NWL should be infrequent to avoid killing vegetation.

Length to width ratio of 3:1 is preferred; however, if space limitations exist, length to width ratio can be as low as 1:1, provided that additional considerations are made to maximize travel time through the wetland for treatment and to prevent short-circuiting.

Deep zone shall be sloped at 1.0% from inlet to outlet; Shallow, marshy areas are to have a smooth bottom to promote sheet flow through the system.

Design shall take advantage of natural topography and drainage patterns and incorporates the surrounding land and aquatic systems (buffer). Design shall also protect the wetland from any potential high flows and sediment loads.

Wetland shall be self-sustaining with minimize maintenance; All-weather maintenance accesses are required to all deep pool areas for sediment removal.

G.9.9 Recreation Usage

Recreational use of wet and dry ponds will be regulated by the Town. Recreational uses are not permitted for constructed wetlands. Suitable recreational facilities such as bicycle trails, benches, trees, etc. shall be provided for stormwater management facilities.

Primary recreational activities will not be allowed upon wet ponds. Ponds will be posted, prohibiting primary recreational activities such as water-based activities where there is body contact with the water, such as swimming and wading.

G.9.10 Erosion

For new developments, Developer's Consultant shall submit an erosion and sedimentation control plan to the Town prior to construction start-up:

- Site erosion and sediment discharge shall be minimized.
- Provides adequate erosion protection for all natural and man-made water courses.

Outfalls for storm sewers shall be designed to control local erosion to the conveyance channel or receiving stream yet, not change the hydraulic characteristics.

All storm drainage systems, including pipe outlets, other drainage channel outlets and or overflows, shall be designed to control erosion that may result from piped or overland stormwater flows and discharge into the storm drainage system.

G.9.11 Maintenance

Developer shall:

- Be responsible for any defects of the works and lands associated with the stormwater management facility including adjacent park lands, for the duration of the Warranty Period.

- Assume full responsibility with respect to the operation and maintenance of the stormwater management facilities in all aspects relating to flows, water volumes, surface debris, aeration, hydrological cycle, hydraulic performance, utility devices such as outlet structures, vegetation control, insect control, and on-shore facilities until issuance of a FAC.
- Be responsible for siltation and debris problems which are caused due to poor erosion control for the development. Should siltation and debris problems occur in the stormwater management facilities that are the result of stormwater draining lands beyond the Developer's control, the Town shall assume responsibility for any necessary remedial actions.
- Monitor and maintain water quality to eliminate any nuisance factors and to protect against health hazards during the Warranty Period.

G.9.12 Site Acquisition & Construction Financing

Acquisition of all stormwater management facility sites shall occur as part of the subdivision approval process, at no cost to the Town. The site must be provided to the Town as a PUL. Easements will need to be established to provide the Town access during construction and Warranty Periods.

All design and construction of stormwater management facilities, interconnecting pipe systems, and outfalls shall be completed to the Town's acceptance and shall be paid for by the Developer. Such works shall be coordinated with the grading and earthworks balance of the subdivision.

When a new development is in the drainage basin of an existing system, designed and constructed by others, the Town will collect off-site levies or development charges from the Developer of the new development which is benefitting from the existing system.

G.9.13 Legal Liability & Safety

Developer shall provide:

- Signage to alert people of potential hazards (No Swimming – Deep Water, subject to flooding, etc.); Primary water contact (i.e., swimming, wading) will be forbidden, as supervision will not be provided.
- Fencing of municipal park areas, as determined during the detailed design stage in consultation with the Town.
- Lighting, in accordance with ATCO requirements, at the interface between the facility and adjacent land. Additional lighting shall be determined at the detailed design stage in consultation with the Town.

G.10 STANDARD DETAILS – STORM DRAINAGE SYSTEMS

See Appendix V for Standard Detail drawings for Storm Drainage Systems as listed:

- R-8 Concrete Swale Detail
- R-11 Typical Front Lot Drainage Type A
- R-12 Typical Split Lot Drainage Type B
- R-13 Typical Rear Lot Drainage Type C
- R-14 9.0m Residential Street Section with Monolithic Sidewalk – 20.0m Road Right-of-Way
- R-15 11.0m Residential Major Collector Street Section with Monolithic Sidewalk – 24.0m Road Right-of-Way
- R-16 14.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 24.0m Road Right-of-Way
- R-17 10.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 20.0m Road Right-of-Way
- R-18 10.0m Industrial/Commercial Major Collector Street Section with Ditches – 30.0m Road Right-of-Way
- U-1 Pipe Bedding Details
- U-2 Standard Frame and Covers for Manholes
- U-3 Manhole Detail
- U-4 Drop Manhole Detail
- U-5 Internal Drop Manhole Detail
- U-12 Precast Concrete Catch Basin Manhole
- U-13 Standard Catch Basin with Sump
- U-14 NF-26 & NF-51 Catch Basin Installation Detail for Curbs
- U-15 Typical Pipe Crossing
- U-17 Pipe Insulation Detail

H. Shallow (Franchise) Utilities

H.1 GENERAL

Gas, power, telecommunications, and street lighting services to be installed underground shall be arranged between the Developer and the respective utility franchise companies. Costs for these services by the respective utility companies shall be paid by the Developer. Developer must also initiate and coordinate the design, approval, and construction of these services.

Each utility company shall submit plans of the proposed work to the Town for approval prior to construction. All shallow (franchise) utilities shall conform to the same standards for trench compaction and clean-up as sewer, storm, and water utilities.

Four-party trenching (one common trench for telephone, cable, gas, electric) located within a 3.5m easement on property is the accepted trench configuration.

H.2 DESIGN STANDARDS – SHALLOW UTILITIES

H.2.1 Design & Approval

To coordinate design of gas, power, telecommunication, and street lighting service systems, it is necessary to first classify and designate cross-sections for each street (and walkway) within a subdivision area, as per Dwg. R-13 to R-18.

Upon approval of a tentative subdivision plan, the Developer's Consultant shall:

- Circulate to each utility company, copies of the approved subdivision plan, complete with street classifications / utility alignments, and any other information the utility companies may require. The utility companies shall indicate on this plan their basic design, complete with all rights-of-way, easements, and PUL requirements, and return it to the Developer's Consultant.
- Review all utility company mark-ups for and eliminating potential conflicts.
- Prepare a servicing plan showing all franchise utilities on a site plan. This site plan shall show the local improvements.
- Circulate the site plan to the respective utility companies for approval.
- Include the site plan with the other engineer drawings to the Town for acceptance.

H.2.2 Location

Power

- Urban: underground
- Rural: above ground (considered if installation may not be practical and or isolated location; requires Town approval)

Distribution cables for primary / secondary power, telecommunications, streetlight feeders shall be installed in one common 300mm wide trench at the required alignment.

Streetlights

- Placed at locations not interfering with proposed driveways.
- Located in line with the extensions of common property lines between two lots.

Face of posts, poles, pedestals, and transformers shall be at least 1m clear from face of the curb.

H.2.3 Separation from Other Utilities

Franchise utilities shall be separated from the deeper municipal utilities (i.e. water, storm, sanitary) by not less than 3m laterally.

A separation of 1.2m from other franchise utilities is also required; common (four-party) trench installations excepted.

H.3 INSTALLATIONS – SHALLOW UTILITIES

H.3.1 Road Crossings

Ducts shall be installed under roadways to accommodate power and telecommunications:

- By trench method during roadway construction, or
- By trenchless method, after the construction of road improvements, to avoid disruptions of surface improvements.

H.3.2 Site Preparation

Developer shall pre-grade all boulevards, lanes, and/or easements, where franchise utilities are to be installed, in accordance with franchise utilities' standards.

H.3.3 Survey

Developer shall be responsible for all survey requirements for the entire installation of franchise utilities including layout, lines, and levels and for the preservation of all stakes and marks during construction.

H.3.4 Trench Compaction

All trenches within municipal property shall be compacted to the following:

- Boulevards and landscaped areas: 95% Standard Proctor Density
- Under roadways: 98% Standard Proctor Density
- Under roadways, top 300mm of subgrade: 100% Standard Proctor Density

- Existing roadways:
  - GBC to match existing roadway: 100% Standard Proctor Density
  - ACP to match existing roadway: 94% Maximum Theoretical Density

H.3.5 Rights-of-Way, Easements & Public Utility Lots

Developer shall:

- Provide rights-of-way, easements, or PULs to accommodate the utility servicing, which are acceptable to the utility companies and registered to the Town.
- Register easements at the time of subdivision registration; or
- If subdivision is not involved, register each lot prior to the sale of any lot in the development area.

H.4 STREET LIGHTING

Developer shall:

- Arranged for a standard of street lighting comparable to existing standards within the Town and specifications currently used by ATCO Electric.
- Install street light cables underground,
- Install an acceptable type of steel post with fixture shall be used. Steel posts shall be low maintenance, colour as approved by the Town.

Town shall:

- Pay rental charges to the utility company for the operation of street lights after the development construction has been accepted by the Town.
- Review and approve the street lighting layout prior to installation.

I. Community Service Development

I.1 GENERAL

Community Service Development shall include:

- Park Development such as boulevards, buffer strips, traffic islands, utility lots, parks, reserves, and play areas / playgrounds;
- Landscaping, Site Furnishings, and Fencing.

I.2 SUPPLEMENTARY DEFINITIONS

Annex H	A supplemental document approved for CSA Z614 titled "Children's Play and Equipment that are Accessible to Persons with Disabilities". Document outlines minimum requirements for playground accessibility.
Low Impact Development (LID)	A land development and stormwater management approach that works with nature to manage stormwater as close to the source as possible. LID focuses on maintaining and restoring the natural hydrological processes of a site.
Naturalization	A type of habitat restoration; the deliberate reintroduction of species that are native to a given area or are well adapted to climate circumstance; activities intended to improve and enhance the natural environment.
Reclamation	A type of habitat restoration; that aims to stabilize disturbed lands to an ecologically productive use.
Restoration	A type of habitat restoration; process of fully re-establishing a target level of ecosystem function and biodiversity to a degraded habitat, as defined by the reference habitat; includes species composition and vegetation community structure.

I.3 SITE & PARK DEVELOPMENT

Developer shall submit detailed plans for *site / park development* to the Town including:

- Existing and proposed elevations.
- Direction of drainage.
- Proposed size, location and type of trees and shrubs, if applicable.
- Layout and design of site furnishings (i.e., play equipment), if applicable.

Developer shall be responsible for grading, landscaping, placing topsoil, planting grass, trees and shrubs, and providing approved site furnishings in all park development areas.

All park developments shall coincide with development of the subdivision and shall be completed within (12) twelve months of the commencement of development construction unless otherwise agreed at the time of the signing the Development Agreement.

Stockpiling of soil or construction materials on existing park development areas shall be prohibited unless special written allowance has been granted by the Town.

Soil preparation, seed & fertilizer and other treatments shall be in accordance with Alberta Agriculturist recommendations for the Valleyview area.

One sewer service and one water service complete with surface connections shall be installed at an approved location to each designated public use or playground park area.

One water service complete with surface connection shall be installed at an approved location to each ornamental park.

Developer shall be responsible for maintenance of all boulevards, buffer strips, utility lots, traffic islands, parks, reserves and play areas until a good growth of grass has been established or for a period of two (2) years following the issuance of the CCC, whichever is longer.

I.4.1 Plant Material Protection

To ensure on-site preservation of plant materials, the Developer shall:

- Preserve existing plant materials if of high quality and worthy of preservation and as approved by the Town.
- Protect plant materials during work on site (i.e., trunks, branches, root systems).
- Provide temporary fencing around all preserved plant materials.
- Retain existing grades around preserved plant materials; if grade is altered (lowered or raised), construct remedial measures to protect plant materials (i.e. tree mounds, retaining walls, tree wells).
- Supply water to all plant materials during first growing season if grades have been alerted in any way.

I.4.2 Site Clearing

As part of on-site site clearing requirements, the Developer shall:

- Locate all underground utilities and protect all survey control monuments prior to construction.
- Remove plant materials as directed and approved by the Town.
    - Roots / stumps: removed to minimum depth of 0.6m below rough grade.
    - Stumps: entangled roots shall be left in ground.
- Burning of debris on-site is not permitted.
- Maintain positive drainage throughout all stages of site clearing and rough grading.

I.4.3 Rough Grading

Minimum requirements for rough grading:

- Avoid damage to root and branch systems of existing plant material being retained.
- All sites requiring topsoil shall be rough graded to within 150mm of final grade.
- Toes of slopes / banks shall be smooth rounded to 8:1 minimum slope.
- Slopes / banks and disturbed areas shall be feathered to meet existing grades.
- Minimum standards for slopes:
    - Berms: 4:1
    - Pedestrian traffic (light): 3:1
    - Drainage swales: 3:1
- Material used for backfill must be free of sticks, stones, debris greater than 7cm, and any other material which may be subject to rot or corrosion.

I.4.4 Topsoil

Topsoil shall:

- Be free of stones larger than 25mm diameter, debris, quack grass, restricted noxious weeds, other plants, and inorganic matter.
- Consist of fertile natural loam suitable for area.
- Be appropriately tested for soil analysis and chemical deficiencies.
- Have a hydrogen ion concentration range of pH 6 - 7.5, contain no toxic materials, and capable of sustaining vigorous plant growth.
- Be spread over the entire area to be seeded / sodded and applied to a compressed depth of no less than 100mm.
- Planting beds shall be excavated and filled with topsoil to a depth of 600mm below finished grade and topsoil shall be applied to a minimum compressed thickness of 100mm above finished grade.

I.4.5 Seeding

Areas to be seeded (in lieu of sodding) must be approved by the Town and will be based on size and intensity of area to be covered. Seeding may be accepted in low traffic areas and for large quantities with Town approval.

Seeding will not be considered acceptable for patchwork in an existing, established turfed areas (i.e., If an established turfed area is disturbed, sodding will be the only acceptable remedial treatment.)

Development areas shall be seeded with Canada No.1 Grade Seed meeting Seeds Act of Canada requirements for area, based on the following ratio / location as per Table I1.

Seed shall be delivered in original containers to site with seed mixtures percentages, year of production, net weight, date, and location bagged, and suppliers' name. Seed must be capable of producing a minimum germination test rate of 75%.

Table I1			
Parks / Boulevards	Roadside	Naturalization	Wet Meadow
55% Red Fescue	55% Red Fescue	35% Awned Wheatgrass	30% Fowl Bluegrass
20% Kentucky Blue Grass	30% Kentucky Blue Grass	25% Slender Wheatgrass	20% Tufted Hair Grass
15% Annual Rye	15% Annual Rye	15% Western Wheatgrass	15% Giant Wild Rye
10% Canada Blue Grass		15% Rocky Mountain Fescue	10% Awned Wheatgrass
		5% Western Porcupine Grass	10% Western Wheatgrass
		5% Junegrass	10% Sloughgrass
			5% Annual Ryegrass

Table I1: Composition of Seed Mixtures per Designated Area

Developer shall provide proof upon request of Certificate of Compliance with the Canadian Wheat Board Act (Seeds Act).

Seeding shall be:

- Applied to a prepared topsoil surface, free of depressions, pebbles, stones, roots and debris;
- Evenly applied at a rate of not less than 3.5 kg per 100 m^2;
- Not be carried out in wind velocities above 8 km/hr.;
- After application, wire raked and rolled with light turf roller; and
- Lightly watered with a fine spray to an absorbed depth of 25mm.
- Maintained by the Developer (watering, rolling, fertilizing, etc.) along with:
    - Submit a 2-year maintenance schedule to Town for approval at the time of the CCC inspection.
    - Provide and maintain barricades and signs to warn traffic entering seeded area until time of final inspection and acceptance by the Town.
- At time of final inspection and acceptance by the Town, the grass shall be:
    - Mowed to a minimum height of 50mm if area is to be maintained;
    - Cover 100% of the seeded area;
    - Completely weed free;
    - Completely free of thin, bare, and dead spots; and
    - In an overall healthy growing condition.

I.4.6 Hydroseeding

Hydroseeding will be acceptable on steep slopes, hard to reach areas, and large areas and must be approved by the Town.

Developer shall provide to the Town for acceptance, the hydroseeding material and installation method to be utilized in the area of application including:

- Mulch type, manufacturer, and specifications (hydraulic, wood cellulose fibre);
- Tackifier type (non-asphalt product, water dilatable with no detrimental effects on germination or existing plants);
- Site procedures including topsoiling, surface preparation, application rates, seasonal restrictions, etc.;

- Seed / fertilizer application rates and application procedures;
- Warning and barrier protection from traffic procedures; and
- 2-year maintenance schedule.

At time of final inspection and acceptance by the Town, the grass shall be as described in Section I.4.5 Seeding.

I.4.7 Sodding

Sodding shall be done in areas of intensive use and for all patchwork and remedial work in areas of established turf.

Developer shall provide to the Town for acceptance, the sod type and installation method to be utilized in the area of application including:

- Sod type and suppliers' specifications (i.e. seed proportions, age, etc.). Sod shall consist of No. 1 Nursery Sod of a uniform mixture;
- Site preparation and installation methods including topsoiling, surface preparation, laying methods, seasonal restrictions, etc.
- Fertilizing, watering application rates and procedures;
- Warning and barrier protection from traffic procedures; and
- 2 year maintenance schedule.

At time of final inspection and acceptance by the Town, the grass shall be as described in Section I.4.5 Seeding.

I.4.8 Naturalization

Developer shall provide a naturalized approach to landscaping. This shall include:

- Major roadways, utility corridors, low-use park spaces, stormwater management facilities areas.
- Use of native trees and seed to reduce need for ongoing maintenance. Tree sizes are to be specified on plans with minimum tree sizes of:
    - Deciduous: 40mm caliper
    - Coniferous: 2m height
- Mowing of naturalized seed areas is to be completed only to establish plant health and must maintain a minimum height of 100 – 150mm. Once seed is established, no additional mowing is to be completed.
- Seed rate and type as per I.4.5 Seeding.
- At time of final inspection and acceptance by the Town, the grass shall be:
    - Grown to full natural height;
    - Cover 100% of the seeded area;
    - Well established;
    - Completely free of weeds, thin, bare, and dead spots; and
    - In an overall healthy growing condition.

I.4.9 Plant Material

Plant material shall be / have:

- First grade quality, free from insects, disease, and physical injury.
- Strong fibrous root systems and must be structurally sound.
- Straight stems, well and characteristically branched for the species.
- Conform to the Horticultural Standards for nursery stock of the Landscape Alberta Nursery Trades Association.

Minimum tree quantities for base level land development:

- Parks: 45 trees / ha
- School sites: 55 trees / ha
- Greenways: 200 trees / ha
- Stormwater management facilities: 70 trees / ha (above normal water levels)

Recommended tree sizes are as indicated in Table I2.

Minimum setback requirements for trees from:

- Above ground utilities: 3.5m
- Overhead powerlines: per utility company authority
- Shallow underground utilities: 1m
- Gas or oil right-of-ways: contact utility company
- Sanitary / sewer pipe & manholes: 2m
- Watermains: 2.5m
- Stop / yield signs: 3.5m
- Other signs: 2m
- Private property on walkways, paths, boulevards: 1m
- Private property on open parkland / crosswalks: 3m

Trees shall not create sightline obstructions at intersections / crosswalks.

Table I2

Height	Caliper / Spread	Staking / Ties	Rootball Diameter
Deciduous Trees			
2.4 - 3.0 m	40 mm	1 stake w/ tie	600 mm
3.0 - 3.5 m	50 mm	2 stakes w/ ties	700 mm
3.5 - 4.5 m	75 mm	2 stakes w/ ties	850 mm
4.5 - 5.5 m	100 mm	2 stakes w/ ties	1050 mm
Coniferous Trees			
1.8 - 2.0 m	975 mm - 1.0 m	2 stakes w/ ties	850 mm
2.0 - 2.5 m	1.0 m - 1.3 m	2 stakes w/ ties	850 mm
2.5 - 3.5 m	1.3 m - 1.5 m	3 guy wires w/ anchors	1220 mm

Table I2: Tree Size Requirements

At time of final inspection and acceptance by the Town, trees shall:

- Conform to the standards for plant materials listed above;
- Be planted and staked for CCC;
- Have stakes removed and be stable at FAC; and
- Exhibit 2 years of healthy growth to the satisfaction of the Town.

I.4.10 Mulches

All mulch shall be:

- Bark or coniferous / deciduous wood chip mulch;
- Size range of 50 – 100mm;
- Free of non-organic material, wood preservatives, and diseased wood;
- Contains no more than 5% total volume of soil, sawdust, and peat moss.

Mulches prohibited for use unless otherwise approved by the Town include rock, gravel, riprap, shale, peat moss, manures, paper products, plastics, rubbers, and lumber containing chemicals or preservatives.

I.4.11 Site Furniture

Standard site furniture to be used for all Town development include picnic tables, benches, and waste receptacles.

Site furniture shall have / be:

- Surface mounted unless stated otherwise.
- Colours accepted and approved by the Town.
- Material type and supplier as approved by the Town.
- Installed as per manufacturer's specifications:
    - Table / bench legs: installed in concrete
    - Waste receptacles: surface mounted on concrete
- Installed plumb and level; aligned with landscape layout plans.
- Exposed hardware shall be painted to match site furniture colour after installation.
- Inspected prior to installation to ensure furniture is free from defects; furnishing exhibiting defects will be rejected and will require replacement immediately.

I.4.12 Uniform Fencing

Fencing within the Town shall have / be:

- Constructed with face of fence posts 150mm inside private property.
- Uniform wood fencing and chain link fencing / gates shall be constructed as approved by the Town.
- All finishes, paint / stain colours shall be indicated on the landscape plans and approved by the Town.
- Constructed adjacent to and at the following locations:
    - Arterial roadways;

  - Parks and playfields;
  - Public walkways and PULs;
  - School sites;
  - Town-owned lands (i.e., firehalls);
  - Medium and high density residential sites;
  - Neighborhood commercial sites;
  - Institutional sites; and
  - Other areas as required by the Town.
- Wood fencing installed where residential property adjoins the above-mentioned facilities. Town may approve chain link fencing where facilities such as playgrounds, parks or school sites are adjacent to arterial roadways.
- Pedestrian gates installed on all residential lots which back onto a public park or special purpose areas. Gates shall be located at the mid-point of each lot and constructed to open inwards onto private property.

Wood rail fencing may be approved by the Town for selected park or walkway areas.

I.4.13 Warranty Period

Developer shall be responsible for, and at their own expense, to remedy any defect, fault, or deficiency in the completed works during the 2-year Warranty Period.

Landscape maintenance shall be conducted throughout the Warranty Period and shall include all measures necessary to establish and maintain plant material in an acceptable, vigorous, and healthy growing condition. Maintenance activities include, but not limited to:

- Watering during establishment period and weekly throughout the Warranty Period;
- Weeding monthly;
- Mowing at regular intervals to maintain a maximum of 75mm height;
- Pruning any broken, damaged, diseased branches; and
- Structural pruning prior to FAC by ISA Certified Arborist.

Maintenance logs are to be kept throughout the Warranty Period and submitted for review prior to FAC including all maintenance items listed above.

Pesticide / herbicide applications are to be completed by a certified company or individual with prior Town approval of the location, mixture, and date of proposed application. A minimum of 5 working days-notice is required prior to applications.

Weeds are to be controlled at CCC and throughout the Warranty Period, with full eradication at the time of FAC. All noxious weeds are to be removed and disposed of prior to flowerings wherever possible to reduce the rate to seed spread.

Any tree replaced during the Warranty Period will require an additional 2 years of Warranty which will commence on the date the tree is replaced.

Third party damage which occurs during the Warranty Period will be reviewed and considered by the Town on a case-by-case basis; Developer may be held responsible for the third party damage.

I.4 STANDARD DETAILS - LANDSCAPING

See Appendix V for Standard Detail drawings for Landscaping as listed:

R-19 Tree Planting Details

I.5 PLAYGROUNDS

I.5.1 Overview

These standards apply to all new playgrounds and those undergoing re-development. A universal design approach for play development and natural learning spaces is supported which meet all applicable codes and regulations, providing a diverse range of settings and play opportunities for the community.

I.5.2 Equipment

All equipment shall meet the minimum requirements of the latest version of CAN/CSA Z614 Children's Playgrounds and Equipment standards.

Playground equipment may include bridges, climbing walls, natural form playing structures, overhead equipment, rotating equipment, sand and water tables, slides, swings, and telescopes.

Outdoor fitness equipment, if incorporated into the development, must meet playground protective surfacing standards including suitable site drainage.

I.5.3 Prohibited Equipment

Prohibited equipment includes tube see-saws, spring toys with chain, mesh decks and mesh in-filled components, poly/plastic bubble panels, pressure-treated / untreated wood*, sectional rubber safety tiles, poly/plastic or roller slides, playground carpet protective surfaces, and teeter-totters.

*Exception: Town crews may perform day to day repairs or playground conservation utilizing wood products to maintain existing wood playgrounds.

I.5.4 Playground Footprints – Protective Surfaces

All playground footprints shall have positive drainage that allows sub-drainage from the footprint to an approved outflow system, regardless of the type of protective surfacing.

Approved protective surfacing materials and safety protocol for use include:

- Engineered wood fiber, or poured-in-place rubber safety surfacing with seamless application (preferred);
- Sand cannot be used as a protective surfacing;
- No change of surfacing within fall zones;
- Alternatives may be considered;
- Installed as per manufacturer specifications.

Minimum standard depth:

- Loose fill at installation: 350mm
- Loose fill after settling: 300mm

I.5.5 Testing Methods

Testing methods for playgrounds shall:

- Meet the current requirements in CAN/CSA-Z614.
- Refer to playground safety surfacing impact testing protocol.
- Remain closed until all testing have been implemented and compliance achieved.

I.5.6 Equipment Layout & Design

Site development plan shall be confirmed and approved prior to finalization of equipment layout design. Fencing, lighting, walkways, washrooms, storage, emergency phone, trees, park furniture, trash units, etc. are amenity considerations for play space facilities on a project-by-project basis, accounting for location, surrounding and adjacent uses.

Final equipment placement will be subject to an in-field assessment between the Developer, equipment supplier and the Town.

Playground equipment shall be constructed and installed according to specifications as shown on the approved design plans, notes, and manufacturer's specifications.

I.5.7 Identification & Correction of Deficiencies

Inspectors are authorized to identify and prioritize deficiencies by applying the CSA standard and their professional judgment to identify hazardous conditions and maintenance concerns. All equipment deficiencies shall be:

- Documented by Developer’s Consultant as determined and rated by the inspector.
- Corrected by the supplier and approved by the Town.

I.5.8 Responsibility of the Supplier / Contractor

Supplier shall:

- Provide a Canadian Playground Safety Institute (CPSI) certified installer.
- Ensure that the certified installer is on-site at all times during the installation.
- Provide the Town with a fully stocked maintenance kit and a manufacturer's installation / maintenance manual upon the completion of each playground installation before the playground is opened.

Developer shall:

- Install 1.8m high security fencing prior to installation which include large, concrete type footings (no clay footings are allowed).
- Provide a schedule to the Town before construction begins.

Playgrounds shall not be opened until all deficiencies are corrected and CCC is issued.

Only the Town's playground inspector shall collaborate with the Town to remove the security fencing, if appropriate for the stage of the site development.

I.5.9 Warranty – Protective Surfacing & Replacement Parts

Materials & Workmanship

- Protective surfacing supplier shall provide a minimum 2-year Warranty.
- Supplier shall ensure that replacement parts are available within the 2-year Warranty Period in the following timelines (or as negotiated):
    - Fasteners & bolts: 5 working days
    - Common wear & tear / moving & swivel components 7 working days
    - Cable, ropes & connectors 14 working days
    - Technical / electronic parts 7 working days
    - Structural components 6 weeks

Performance Criteria

- Protective surfacing installed must meet the performance criteria per ASTM F1292.
- Town will arrange for the on-site field test within 10 to 25 days after installation.
- At the discretion of the Town, additional follow up test(s) may be conducted prior to the issuing of the FAC.
- If follow up test(s) are applied, the performance criteria required shall comply with the current CAN/CSA-Z614 standard in effect at the time of installation.

J. Testing Procedures

J.1 GENERAL

Developer and Developer's Representative are responsible to ensure that all Contractors adhere to the minimum testing requirements outlined in this section.

Developer shall submit all test data performed by the accredited testing company to the Town as outlined in Section 2. Failure to receive test results will be considered sufficient cause for not accepting such work.

J.2 ROADWAY MATERIALS TESTING

Developer shall ensure that a qualified materials testing firm takes representative samples of all materials to be incorporated into the pavement structure, to prepare mix designs for acceptance by the Town, and to carry out quality control testing during construction.

Materials utilized in roadway development shall be tested as outlined in Table J1.

Table J1

Location	Compaction Requirements	Frequency
Site Grading	97% of SPMDD under roadways at ±2% of OMC 97% of SPMDD under sidewalks at ±2% of OMC 95% of SPMDD in landscaped areas at ±2% of OMC	1 test every 1,000 m2 per lift, or minimum 3 tests for small areas
Sand Bedding	Minimum of 95% of SPMDD	1 test every 100 m per lift, or minimum 3 tests for small areas
Trench Backfill	Minimum of 97% of SPMDD at ±2% of OMC Minimum of 100% of one-mould maximum dry density Maximum moisture content: PL + (PI/3) to maximum of 5% above PL	1 test every 100 m per every 2nd lift, or minimum 3 tests for small areas
Subgrade Preparation	Minimum of 100% of SPMDD at ±2% of OMC under pavement structures, concrete curbs / gutters / monolithic sidewalks, commercial and lane crossings, asphalt walkways. Minimum of 97% of SPMDD at ±2% of OMC under concrete separate sidewalks, curb ramps, slabs, shared use trails made of concrete / brick pavers / granular materials.	1 test every 1,000 m2 for roads 1 test every 100 m for sidewalks or curb / gutter Minimum 3 tests for small areas
Granular Base Course	Minimum of 100% of SPMDD under roads, curb & gutters, commercial and lane crossings, concrete monolithic sidewalks, curb ramps, shared use trails. Minimum of 97% of SPMDD under asphalt or concrete separate sidewalks, median or island strips.	1 test every 1,000 m2 for roads 1 test every 300 m2 for sidewalks Minimum 3 tests for small areas

Asphalt Pavement	HT mix for collector and arterial roadways LT hot-mix for local roads, and trails 94% of MTD for roadways 93% of MTD for lanes, and trails	1 Mix Analysis every 1,000 tonnes (min. 1/day) Asphalt content and MTD every 500 tonnes 1 core every 1,000 m2
Concrete	Compressive strength: 30 MPa Air: > 5.5% Slump: 60 mm ± 20 mm Max. Aggregate Size: 20 mm	1 test every 50 m3 (min. 1/day)

Table J1: Specifications for Roadway Materials Testing

Notes: SPMDD: Standard Proctor Maximum Dry Density
OMC: Optimum Moisture Content
MTD: Maximum Theoretical Density
PL: Plastic Limit
PI: Plastic Index
"2% of OMC" is for clay materials.
Moisture content for high plastic clay requires recommendations by a Geotechnical Engineer.

J.3 SANITARY SEWER TESTING

For installed pipes, testing will be dependent of the existing groundwater and, as a minimum, one of the following tests shall be conducted:

J.3.1 Infiltration Test

An infiltration test shall be performed where the existing groundwater level is at least 1m above the pipe crown in the upstream manhole.

Infiltration test procedure:

- Install a watertight plug at the upstream end of the pipeline test section.
- Discontinue dewatering operations for at least 3 days before test measurements are to commence and, during this time, keep at least one third of the pipe invert perimeter wet.
- Prevent damage to pipe and bedding material due to floatation and erosion.
- Place a 90° V-notch weir, or other acceptable measuring device, in invert of sewer at each manhole.
- Measure rate of flow over a 1 hour minimum, recording flows at 5 min. intervals.
- Allowable leakage: 4.6 L/day/mm diameter/km of length for PVC pipe.
- Repair and retest the sanitary sewers as required until test results are within the specified limit.
- Repair visible leaks regardless of test results.

J.3.2 Exfiltration Test

Exfiltration test procedure:

- Test section shall be filled with water, allowing displacement of air in the line, and shall stand for 24 hours.
- Prior to test, add water to ensure a head of 1m over the pipe crown in the upstream manhole. Pressures in excess of 7.6m water head at the lowest point are not recommended.
- Test duration shall be 2 hours.
- Water level shall be measured at the beginning and end of the test in order to calculate the exfiltration.
- Allowable leakage: 4.6 L/day/mm diameter/km of length for PVC pipe.
- Repair and retest the sanitary sewers as required until the test results are within the specified limit.
- Repair visible leaks regardless of test results.

J.3.3 Deflection Test

Where CCTV inspections show evidence of excessive or non-symmetrical deflection, formal deflection tests shall be conducted.

Deflection test procedure:

- A mandrel shall be pulled through the pipe to ensure that excessive force is not used to advance the device through any deflected portion of the pipe.
- Deflection testing shall be performed in conjunction with a CCTV inspection. The mandrel shall be located in front of, and in clear view of, the television camera (approx. 1.5 to 2.5 pipe diameters in front of the television camera).
- Mandrel's shall have / be:
    - Cylindrical in shape, constructed with 9 evenly spaced arms;
    - If larger than 450mm, constructed of special breakdown devices to facilitate entry through access manholes.
    - Barrel section: have a contact length of at least 75% of the base inside diameter of the pipe.
    - Outside diameter: not be less than 95% of the inside diameter of the sewer.
    - Material: steel.
- Deflection testing must be conducted within 30 days of pipe installation.
- If the mandrel is unable to pass through the pipe, the Contractor is to measure the exact inside diameter of the pipe with a deflectometer. If the pipe deflections are found to exceed 5%, the pipe is to be replaced.

J.3.4 Video Inspection Test

CCTV inspections procedure:

- Shall be carried out by the Developer at the end of construction and at the end of the Warranty Period.

- One digital copy in colour format along with inspection reports and summaries of the CCTV inspection, shall be supplied to the Town prior to issuing CCC and FAC.
- CCTV report shall include the location of all service connections together with a statement of opinion as to whether the service connections are leaking.
- Any deficiencies found during this test shall be promptly remedied by the Developer at their expense. Repair all defects which will impair the structural integrity or the performance of the sewer system including, but not limited to improper joints, cracked, sheared, or excessively deflected pipe, sags and rises which pond water in excess of twice the allowable deviation from grade, protruding service connections, and visible infiltration or exfiltration.
- Prior to undertaking any repairs, a meeting with the Town is required to review the proposed construction method.
- Allowable deviation from grade: invert of the pipe shall not deviate from the design grade by more than 6mm plus 20mm per metre of diameter and should not be consistently high or low.

J.3.5 Testing of Force Mains

Force mains shall be tested as described in Section J.4 Watermain Testing.

J.4 WATERMAIN TESTING

J.4.1 Filling & Flushing Strategies

Submissions:

- Filling and flushing strategies are required for all projects.
- Purpose: To create plans for staging and direction of: 1. Fill for a new watermain (filling strategy), and 2. Rate of flow of water for flushing a watermain prior to commissioning (flushing strategy).
- Must be agreed upon by the Town.
- Must be signed and sealed by an Engineer.

Requirements:

- All source water must come from a clean, potable source.
- There must be only one source valve for each stage of fill.
- Valves should be planned with unidirectional flows. Water should not loop back.

Specific Requirements – Filling Strategy:

- Must consist of a drawing indicating the following:
    - Air release locations;
    - High points on transmission mains;
    - Water source for each fill;
    - Staging of fill with current and completed fills highlighted; and
    - All valve positions for each stage.

- Air release locations should be at or near the high point of the watermain.
- Copy of the accepted filling strategy must be on-site during filling activities.

Specific Requirements – Flushing Strategy:

- Flushing runs must be less than 450m in length; Ideal run length is 200m.
- Watermains less ≤ 300mm in diameter should have a flush velocity of 1.5 m/s.
- Watermains > 300mm in diameter should have a flush velocity of 0.9 m/s.
- Water must be exchanged a minimum of 5 times to achieve a completed flush. Water quality sampling reports must confirm a completed flush.
- During a flush, source water should flow from larger to smaller pipe, when possible.
- Flushing strategy should include:
    - Written flushing procedure;
    - Spreadsheet indicating:
        - Order of flushing segments;
        - Water supply (source valve);
        - Discharge location;
        - All valve positions / pipe details for each flushing segment;
        - Required discharge volume (to achieve 5 times the volume of the flushing segment);
        - Ideal flow velocity for the size of the watermain;
        - Ideal flow rate to achieve the velocity;
        - Type, size, and number of ports to discharge the water;
        - Estimated flow rate; and
        - Required flush time.
    - Drawing indicating the following:
        - Water supply (source);
        - Current / completed flush;
        - Opened / closed valve; and
        - Discharge location.
    - Each flushing segment should have its own drawing.

Table J2 provides the number of ports to achieve the required velocity for flushing:

Table J2

Pipe Diameter (mm)	Required Flow (L/s) for 0.9 m/s Velocity	Hydrant Nozzles Required (see notes)		Required Flow (L/s) for 1.5 m/s Velocity	Hydrant Nozzles Required (see notes)	
		63.5mm	114mm		63.5mm	114mm
200	N/A	N/A	N/A	47.1	1	N/A
250	N/A	N/A	N/A	73.6	2	1
300	N/A	N/A	N/A	106.0	2	1
350	86.6	2	1	N/A	N/A	N/A
400	113.1	2	1	N/A	N/A	N/A
450	143.1	2	1	N/A	N/A	N/A

Table J2: Number of Ports Required to Achieve Velocity for Flushing

Notes: Assume a residual pressure of 280 kPa.
With a 280 kPa residual pressure, a hydrant flowing to atmosphere will discharge 63 L/s from a 63.5mm nozzle and 158 L/s from a 114mm steamer (Source: After AWWA C651-14).

J.4.2 Pressure & Leakage Testing

PVC watermains – Pressure and leakage testing procedure:

- Refer to AWWA C605 and AWWA M23.
- Install all water services, air relief services, blow offs.
- Partially or completely backfill the excavation before testing.
- Wait for concrete thrust blocks to cure: 3 days minimum for high early strength concrete, 7 days minimum for normal concrete.
- Ensure that main stops are open and curb stops are closed.
- Inform the Town of the date, time, and location of the tests at least 72 hours prior. Failure to notify the Town may result in tests being unacceptable.
- Open all main valves in the test section.
- Open all hydrant control valves in the test section and be sure hydrants are closed. All hydrants shall be inspected prior to pressure testing to ensure that they are properly installed and that nipples are threaded or locked in place.
- Inform other construction crews or contractors and check that no valves are being operated during the test.
- Test duration shall be 2 hours.
- Maximum length of distribution watermain test sections shall be 450m.
- Ensure air is expelled from the section of watermain by exhausting trapped air at high points and dead ends. Air content can be minimized by 1. Laying pipeline to grade when possible, 2. Bleeding air from the pipe slowly; and 3. Filling the watermain at a velocity of less than 0.6 m/s.
- Test pressure will be 150% of the working pressure or 1036 kPa, whichever is greater, at the point of test but not less than 125% of normal working pressure at the highest elevation on the test section.
- Raise watermain pressure to the appropriate test pressure using either a hand or motor-powered pump located at a hydrant or approved blow off. Hydrant valve will be completely opened, and flow rate will be controlled by the valve at the pump.
- Mark the gauge and level of water in the storage barrel at the beginning of the test. Note: These marks are the basis for calculating water loss.
- Maintain test pressure within ±20 kPa of specified test pressure for test duration.
- Pump test section back to the test pressure at the end of the first 30 minutes. If the allowable leakage is exceeded, air may be trapped. Remove trapped air and repeat the test.
- During the test, walk along the test section and check for signs of leakage or distress at all exposed appurtenances or fittings.
- No allowance can be made for services or in-line valves. Watermain renewal projects may be exempt under some circumstances.
- Allowable leakage shall be calculated based on the following formula:

$$Q_m = LDP^{0.5} / 795{,}000$$

Where: Q_m = quantity of make-up water (L/hr)
L = length of pipe section being tested (m)
D = nominal diameter of pipe (mm)
P = average test pressure (kPa)

No installation will be accepted if the quantity of make-up water is greater than that determined by the above formula.

All test results must be reported on the Leakage Test Report (Appendix A IV.6).

HDPE sanitary force mains – Adjust above procedure as follows:

- Hydrostatic test pressure shall be 1.5 times the pressure class;
- Maintain 1.5 times the pressure class for 4 hours and add water as needed. Do not measure this volume. Hydrostatic pressure expands pipe;
- Begin Test: Reduce pressure to 10 psi (70 kPa) below 1.5 times pressure class. Monitor pressure for 1 hour; and
- Pipe is acceptable if the pressure drop over 1 hour does not exceed 5%.

J.4.3 Flushing

Upon completion of pressure and leakage testing, watermains shall be thoroughly flushed to remove all foreign matter.

Water systems which will not provide watermain flushing velocities of at least 3.0 m/sec shall be flushed using foam pigs prior to disinfecting.

J.4.4 Disinfection

Disinfection procedure:

- Provide at least 72 hours' notice to the Town.
- Perform disinfection in the presence of Town staff.
- Complete flushing operations before beginning disinfection. Disinfection may be done with hydrostatic leakage testing.
- New valves and hydrants are to be open to ensure they are disinfected.
- Disinfect watermains and water services.
- Use continuous-feed method with liquid chlorine, solution-feed chlorinator, and booster pump in accordance with AWWA C651. Introduce chlorine solution for disinfection at appurtenance used for initial flushing of test section.
- Chlorine feed and discharge rates to be in accordance with Table J3. Discharge rate to be accepted by the Town. Ensure free chlorine residual of initial chlorine solution between 25 – 75 mg/L. Chlorine gas will not be permitted for chlorination.
- Open new hydrants and valves on the section of watermain being tested. Supply water for chlorinator from hydrant on an active system or water tank. Use pump to inject chlorine solution into pipe if using water tank.
- Continue feeding chlorinate solution for the length of time indicated in Table J3 for pipe size, length, discharge rate.
- Isolate watermain or water service containing chlorine solution and maintain for 24 hours.

- Determine the chlorine residual after 24-hour retention time using the "drop dilution" method or the method as indicated in AWWA C651. Acceptable minimum free chlorine residual after 24 hours is 10 mg/L.
- Ensure chlorine residual in hydrants used for introducing the chlorine solution does not exceed 75 mg/L at the conclusion of chlorination.
- Perform final flushing of pipe with potable water using the appurtenance used for initial flushing once actual chlorine residual is acceptable. Continue flushing until chlorine residual is less than 2 mg/L.
- Chlorine residual shall be tested in the presence of the Town.
- Complete the Disinfection Report (Appendix A IV.7).
- Discharge chlorine solution flushed from the pipe to the nearest sanitary sewer. Ensure flushing rate of chlorine does not exceed allowable rate approved by Town.
- Disinfect watermains less than 5.5m long and watermain repairs by swabbing or spraying with a maximum 5% solution of chlorine or 1% hypochlorite solution either before or after installation.

Table J3											
Pipe Nominal Size (mm)					**150**	**200**	**250**	**300**	**350**	**400**	**450**
Litres of water per 100m of pipe					1827	3248	5075	7308	9948	12993	16444
				10 mg/L	0.018	0.032	0.051	0.073	0.099	0.130	0.164
				25 mg/L	0.046	0.081	0.127	0.182	0.249	0.325	0.411
				50 mg/L	0.091	0.162	0.254	0.365	0.499	0.650	0.822
				75 mg/L	0.137	0.243	0.381	0.548	0.746	0.974	1.233
Discharge Rate (L/min.)	**mg/L**				**Approx. Flow Through Time for 100m of Pipe** (hours - minutes)						
	10	**25**	**50**	**75**							
Feed Rate (kg/day)					150	200	250	300	350	400	450
100	1.4	3.6	7.2	10.8	0-18	0-32	0-51	1-13	1-39	2-09	2-44
150	2.2	5.4	10.8	16.2	0-12	0-21	0-33	0-49	1-06	1-29	1-50
200	2.9	7.2	14.4	21.6	0-09	0-16	0-25	0-37	0-50	1-05	1-22
250	3.6	9.0	18.0	27.0	0-07	0-13	0-20	0-29	0-40	0-52	1-06
300	4.3	10.8	21.6	32.4	0-06	0-11	0-17	0-24	0-35	0-43	0-55
350	5.0	12.6	25.2	37.8	0-05	0-09	0-15	0-21	0-28	0-37	0-47
400	5.8	14.4	28.8	43.2	0-05	0-08	0-13	0-18	0-25	0-32	0-41
450	6.5	16.2	32.4	48.6	0-04	0-07	0-11	0-16	0-22	0-29	0-36

Table J3: Disinfection Feed Rate

J.4.5 Bacteriological Samples

Bacteriological sampling procedure:

- Testing shall be carried out by the Developer's Representative; Results shall be acceptable to the Alberta Health Authority and the Town.
- 2 sets of 2 samples shall be taken at least 24 hours apart from the end of the main section of pipe being tested. 1 set of 2 samples shall be taken from the end of each branch of pipe connected to the main section (where branches are more than 3m long). Samples shall be taken from the discharge pipe used for leakage testing after adequate flushing time to replace water in the discharge pipe.
- Developer's Representative shall submit the samples to an accredited laboratory as soon as possible after obtaining. Samples that cannot be submitted within 1

hour after collection shall be stored in an iced cooler at 4 ^{o}C during transport to the laboratory. Samples shall be submitted no more than 30 hours after obtaining.

- Disinfection shall be acceptable when bacteriological test results from both samples show:
    - Coliform of < 1 colony forming unit (cfu) per 100 ml;
    - Heterotrophic Plate Count (HPC) does not exceed 500 cfu per ml; and
    - Chlorine residual does not exceed 2 mg/L after flushing.
- Complete the Disinfection Report (Appendix A IV.7) once test results are received from the laboratory.
- If either sample fails bacteriological testing, repeat flushing. Developer's Representative shall take 2 new samples for testing. If either of the second sets of samples fail bacteriological testing, repeat disinfection and flushing procedure until acceptable results are obtained.

J.4.6 Test Results

All testing results shall be documented and submitted to the Town for acceptance prior to commissioning the system and issuance of a CCC.

J.5 STORM SEWER TESTING

Testing of storm sewer pipe and catch basin leads shall consist of:

- CCTV inspections of the entire sewer system as per Section J.3.4.
- Deflection testing as required as per Section J.3.3.
- All tests and repair of deficiencies found during the testing shall be rectified by the Developer at their own expense.
- Prior to undertaking any repairs, a meeting with the Town is required to review the proposed construction method.

K. List of Acronyms & Abbreviations

The following lists of acronyms and abbreviations for the Town's design standards:

K.1 GENERAL

APEGA	Association of Professional Engineers of Alberta
ASET	Alberta Society of Engineering Technologists
ASP	Area Structure Plan
CADD	Computer-Aided Design and Drafting
CAO	Chief Administrative Officer
CCTV	Closed-Circuit Television
CSA	Canadian Standards Association
DWG	Drawings
GIS	Geographic Information System
ID	Inside Diameter
NASSCO	National Association of Sewer Service Companies
OD	Outside Diameter
P.Eng.	Professional Engineer
PPE	Personal Protective Equipment
RET	Registered Engineering Technologist
SWMP	Storm Water Management Plan
TAC	Transportation Association of Canada

K.2 ROADWAYS

AD	Access / Driveway
ALY	Alley
APR	Apron
BAR	Barrier
CGR	Curb and Gutter - Rolled
CGS	Curb and Gutter - Straight Faced
COL	Collector
CR	Curb Ramp
CW	Crosswalk
GR	Guard Rails
IND	Industrial
LN	Lane
MED	Median
PVM	Pavement Markings
RDS	Road Surface
RDB	Road Substructure
RS	Road Sign

RWY	Runway
STRL	Street Light
SWKM	Sidewalk - Monolithic
SWKS	Sidewalk - Separate
TL	Traffic Signals
TWY	Taxiway
WSL	Warning Signal Lights

K.3 PARKS / LANDSCAPE

BRM	Berm
FNC	Fence
GT	Gate
IS	Irrigation Systems
FE	Outdoor Fitness Equipment
LSCP	Landscaping (trees, shrubs, plants, features, grass, etc.)
PA	Park Accessories
PATH	Path / Trail
PGS	Playground Structures / Equipment
PG	Playground
PL	Parking Lot
RW	Retaining Walls
SF	Sports Fields
SHD	Shed
SKP	Skate Park
SKR	Outdoor Skating Rinks
SPP	Splash Park
TREE	Trees / Shrubs (stand alone)

K.4 WATER SYSTEMS

CC	Curb Stop
CHM	Valve and Blow-Off Chamber
FT	Fitting
HYD	Fire Hydrant
HYL	Hydrant Lead
RES	Reservoir
TF	Truck Fill
WM	Watermain
WS	Water Service
WTP	Water Treatment Plant
WV	Water Valve

K.5 SANITARY SYSTEMS

FM	Force Main
FMV	Force Main Valve
LAG	Lagoon
LOF	Sewage Lagoon Outfall
LS	Lift Station
MH	Sanitary Manhole
SAN	Sanitary Main
SC	Service Connection
SLB	Sewage Lagoon Berms
SLL	Sewage Lagoon Liner
SLS	Sewage Lagoon Structures
SS	Sanitary Service

K.6 STORMWATER / DRAINAGE SYSTEMS

CB	Catch Basin
CBL	Catch Basin Lead
CUL	Culvert
DCH	Ditch
OF	Storm Outfall
OUT	Outlet
SMF	Storm Pond
SMH	Storm Manhole
SPS	Storm Pond Structures
STM	Storm Main
SW	Swale

K.7 MATERIALS

AC	Asbestos Cement Pipe
ASPH	Asphalt
CI	Cast Iron Pipe
CMP	Corrugated Metal Pipe
CPP	Concrete Pressure Pipe
DI	Ductile Iron Pipe
GRV	Gravel
PCP	Pre-cast Concrete Pipe
PVC	Polyvinyl Chloride Pipe
STL	Steel Pipe
VCT	Vitrified Clay Pipe

L. References & Resources

Throughout the *Municipal Engineering Development and Servicing Standards*, references may be made to other standards and regulations including, but not limited to the following:

Note: Where these standards refer to bylaws, policies, acts, regulations, or standards, this shall mean the most recent edition or amendments of the referenced document.

- Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems:
  - Standards for Municipal Waterworks
  - Guidelines for Municipal Waterworks
  - Wastewater Systems Standards for Performance and Design
  - Wastewater Systems Guidelines for Design, Operating and Monitoring
  - Stormwater Management Guidelines

- Safety Codes Council:
  - Alberta Private Sewage Systems – Standard of Practice

- Transportation Association of Canada (TAC):
  - Geometric Design Guide for Canadian Roads
  - Manual of Uniform Traffic Control Devices for Canada

- Alberta Transportation:
  - Highway Geometric Design Guide

- City of Edmonton:
  - **Design and Construction Standards**
  - Erosion and Sedimentation Control Guidelines
  - Erosion and Sedimentation Control Field Manual

- Occupational Health and Safety (OHS) Legislation, Act, Regulation, and Code

- 2020 Municipal Development Standards for the Town of Stony Plain

Appendix I. Design Plan Standards

Appendix I. Design Plan Standards

A I.1 DESIGN DRAWINGS

All detailed engineering plans submitted for review and approval to the Town must comply with the following specifications:

A I.1.1 Drawing Techniques

Drawing techniques significant to the preparation of drawings:

- Clarity and legibility will be the governing criteria when preparing drawings.
- Care taken to ensure balanced distribution of detail throughout the drawing.
- Letters and figures will be clearly legible, 2mm size or larger, well-spaced, properly formed and proportioned.
- Lines will be uniform in weight and density.
- New and existing features are readily distinguishable.
- Dimensioning of drawings should be such that it will not be misinterpreted. Dimensions should be given from an iron pin, lot line, chainage station, centerline, curb line, or other approved reference that can be readily established.
- All drawings to be prepared using digital CAD software.

A I.1.2 Scales

Generally, plans will be drawn to the following scales:

- Overall Plans: 1:1000
- Plan / Profile: Horizontal 1:500, Vertical 1:50
- Cross Sections and Details: Horizontal 1:100, Vertical 1:50
- Overall System Network Analysis: 1:2000
- Landscape Plans: 1:200
- Details: 1:100

A I.1.3 Geodetic Datum

Elevations will be relative to Geodetic datum. Reference bench marks, numbers, locations, and elevations shall be shown on the design drawings and identified on the Index Plan.

A north arrow will be shown on each drawing. In general, north arrows should be directed towards the top of the plan.

A I.1.4 Plan Size

Standard A1 (594mm x 841mm), Arch D (610mm x 914mm) or ANSI-D (22" x 34") drawings sizes.

A I.1.5 Special Requirements – Design Drawings & Calculations

Design drawings shall be supplemented with the following information, when applicable:

- Details of special protection for pipe sections which are exposed to high velocities or which require corrosion protection or insulation,
- Drawings required for obtaining permits for crossing oil, gas, power transmission lines, railroads, or highways,
- Details of placement in areas of fill,
- Details pertaining to trenchless installations, and
- Thrust block details.

Design calculations for the sanitary and storm sewer systems shall be included in the drawing package and shall include the following information:

- All manholes and sewer sizes,
- Length of sewer sections, between manholes, in metres (m),
- Grade of sewer sections, between manholes, in percent (%),
- Total area of tributary sewers for each sewer section, between manholes, in hectares (ha) or square metres (m^2),
- Tributary area in hectares (ha) and runoff coefficient (C value) for each storm sewer section, between manholes; tributary areas to be cross-referenced to any summary tables,
- Estimated peak loading based on tributary area and infiltration in litres per second (l /sec),
- Part-full velocity in metres per second (m / sec),
- Pipe capacity in litres per second (l / sec),
- Invert elevations at manholes and catch basins.

Where the size of a development warrants, or is required by the Town, a *Water Network Analysis* shall be carried out by the Developer's Consultant to support the proposed subdivision application and detailed engineering drawings.

A I.2 PLAN AND PROFILE DRAWINGS

A I.2.1 General

Plans are to be drawn to a scale of 1:500 horizontal and 1:50 vertical.

Existing and proposed features are to be clearly delineated.

All drawings must clearly show the following in the *title block*:

- Developer's / owner's name,
- Consultant's name,

- Subdivision / Project name including staging and/or phasing,
- Drawing name,
- Drawing number and job number, if applicable,
- Revision number,
- Horizontal and vertical scales,
- Space for initials of the designer, draftsman and approving principal,
- Space for number, date, description, designer, approving principal of all revisions,
- Space for issue dates including preliminary, approval, tender, construction, as-built, and date / initials of person approving each issue must be shown, and
- Space for professional stamps and permits.

A I.2.2 Road & Right-of-Way Information

Following information is to be shown on the *plan portion* of the drawing:

- Legal subdivision information including lot and block numbers,
- Alignment of proposed street easement or right-of-way; name or temporary designation of the above,
- Alignment of immediately adjacent existing and proposed streets, walks, lanes, ditches, interim or temporary connections, utility rights-of-way, easements, and reserves. Identification of the above is to be by name (i.e., streets or ownership),
- Existing and proposed surface features such as roads, curb & gutter, sidewalk, walkway connections, wheelchair ramps and boulevard areas,
- Dimensions, relative to property lines, of roads and right-of-way widths, sidewalk and curb & gutter locations, and boulevard locations,
- Horizontal curve data including chainages of the BC and EC, delta angle, radius, chord length and arc length for centre line of each roadway. All curb returns must show the radius. Note: This information can be shown in table format,
- Elevations along centerline and curb & gutter of all changes in vertical and horizontal alignment,
- Elevations of BC / EC of all curb returns, including the grades and distances around the curve, and
- Location of all existing survey monuments, if applicable.

Following information is to be shown on the *profile portion* of the drawing:

- Existing ground profile along centre line of the proposed roadway, lane, or utility,
- Proposed centerline elevations including proposed grade (2 decimal places),
- Vertical curve information including chainage and elevations of BVC, PVI and EVC; external value, e; length of curve; elevation and chainage of low point of sag curves and high point of crest curves, K-values, and
- Centerline elevation, if applicable, at all intersecting proposed and existing roads.

A I.2.3 Sanitary Sewer & Storm Water Information

Following information is to be shown on the *plan portion* of the drawing:

- Alignment of mains including distance from property lines,
- Diameter of mains,

- All appurtenances (manholes, catch basins, frame / cover type, plugs, cleanouts, inlet / outlet structures, etc.),
- Leads between catch basins and manholes,
- Rim elevations of catch basins at gutter,
- Direction of flow,
- Service lateral location,
- Radius and length of curved sewers, and
- Augered and cased sections.

Following information is to be shown on the *profile portion* of the drawing:

- Vertical alignment of proposed mains and leads, if applicable along the profile,
- Elevation and diameter of existing and proposed mains and leads, if applicable,
- Other utilities crossing or apertures intersecting the profile that will impact construction. Where possible these should be verified in the field,
- Diameter, length, and percent grades of sewer mains between manholes,
- Inverts of all pipes connecting to a manhole,
- Proposed rim elevations for all manholes,
- Size, type, and class of pipe,
- Type / class of bedding, if different than Class B granular bedding,
- Extent of work required to connect to existing mains,
- Special construction areas (i.e., shored construction or limited space areas), and
- Special appurtenances such as drop structures and safety platforms.

A I.2.4 Water Distribution Information

Following information is to be shown on the *plan portion* of the drawing:

- Alignment of mains including distance from property lines,
- Label size of mains, valves, and appurtenances,
- All appurtenances (hydrants, tees, bends, crosses, valves, blowoffs, plugs, etc.),
- Service lateral location, and
- Augered or cased sections.

Following information is to be shown on the *profile portion* of the drawing:

- Vertical alignment of proposed mains along the profile,
- Elevation and diameter of existing and proposed mains and other utilities crossing or apertures intersecting the profile that will impact construction. Where possible, these should be verified in the field,
- Top of pipe elevations at all tees, crosses plugs / size, type, and class of pipe,
- Type / class of bedding, if different than Class B granular bedding,
- Extent of work required to connect to existing mains, and
- Special construction areas (i.e., shored construction or limited space areas).

A I.2.5 Service Connections

Following information is to be shown on the plan portion of the drawings:

- Location of all services, with references to property lot corner, and

- Invert at property line for each service.

A I.2.6 Shallow Utilities Plan

Following information shall be shown on the *Shallow Utilities Plan*:

- Location and alignments and all pertinent information (i.e., pedestals, transformers, etc.) for all shallow (franchise) utilities (gas, power, telephone, cable),
- Easements, rights-of-way, and PULs,
- Driveway locations, if known,
- Street lights,
- Services,
- Street names, lot / block numbers, and
- Other surface features (i.e., valves, manholes, hydrants, curbs) to identify conflicts.

A I.2.7 Signage & Pavement Markings Plan

Following information shall be shown on the *Signage & Pavement Markings Plan*:

- Traffic signs (types and locations),
- Street name sign locations,
- Information sign locations,
- Details of sign installation,
- Pavement markings, and
- Street names, lot / block numbers.

A I.2.8 Landscape Plan

Following information shall be shown on the *Landscape Plan* and integrated with the detailed engineering drawings:

- Existing and proposed contours at 0.5m intervals within the site and extending 3m beyond, as well as all other grading details,
- Site boundaries,
- Temporary site access(es), laydown and parking area(s),
- Stockpile location(s),
- Existing and proposed utility information,
- Existing vegetation and/or other natural features to remain,
- Existing trees to be relocated,
- Proposed plant material illustrated at the mature spread or diameter, as noted in the Alberta Horticulture Guide (shown in plain view, as well as in a table with the following indicated: quantity of individual species, botanical name and common name, size of material – height and caliper, method of transport – balled and burlap, container stock, bare root, etc., Canadian Plant Hardiness Zone),
- Plant schedules, including overall quantities,
- Areas to be sodded or seeded, with seed mix specified,
- Details of hard and soft landscape installation,

- Type and depth of mulch for shrub beds and tree wells,
- Location of proposed site furnishings and related construction,
- Areas of concrete, asphalt, or special paving,
- Irrigation systems, where applicable,
- Fencing locations and construction details,
- Locations of bollards along PULs, walkways, or trails,
- Lighting details including street lights and park lighting, where applicable,
- Trail locations, details, signage, and proposed drainage,
- Adjacent land use information,
- Total measurements (m^2) of shrubs beds, islands, buffers, PULs, Municipal Reserves, Environmental Reserves, and parks,
- Total measurements (m^2) of sodded and seeded areas,
- Any other details that relate to the landscape design.

A I.2.9 Standard Detail Drawings

Standard detail drawings must be included as part of the set of engineering drawings for each project. Standard size A-1 sheets will be used.

Scale of individual details will be commensurate with the amount of information to be shown along with clarity and legibility.

A I.3 AS-BUILT (RECORD) DRAWINGS

Developer shall submit to the Town all related information giving detailed measurements of the local improvements constructed. Submission of as-built (record) drawings and all other data for record purposes is a condition of the CCC executed by the Town.

A I.3.1 General

Clearly labelled “as-built (record)” of full-size prints (2) and PDF file (1) of the as-built construction drawings and digital files capable of being used with AutoCAD containing identical information must be submitted to the Town within three (3) months of issuance of the CCC. This information shall be submitted with a transmittal complete with project location, construction year, owner / Developer and contractor information clearly identified.

As-built drawings will provide all the information outlined in Appendix I and Section C Submission Standards.

On the as-built drawings submitted to the Town, the following information will be included on each drawing:

- Date of construction completion,
- Date on which as-built details were completed,
- Signature and stamp of professional engineer approving as-built drawings, and

- All makes, size and model of materials used.

A I.3.2 Water & Sanitary Service Connection Information

Location of sanitary service tees or wyes shall be portrayed on the plan portion of the plan / profile.

Service connection provided to each lot shall be shown on the plan portion of the plan / profile and the curb stop location referenced to the property lot corner.

Riser connections will be shown on the profile portion of the plan / profile drawing.

Invert elevation of the sanitary service and at property line or end of service beyond the easement shall be indicated on the lot grading plan.

Additionally, as-built (record) drawings for underground improvements shall include:

- Location of drainage facilities; for example, manholes, catch basins, and the end of pipe stubs;
- Size of manholes, inverts of all pipes entering / exiting manholes;
- Horizontal alignments, sizes, and grades of sanitary and storm sewers;
- Horizontal alignments and sizes of watermains;
- Locations of valves, hydrants, curb stops, and horizontal and vertical bends;
- Elevations of pond/wetland bottom, normal water level, high water level, freeboard;
- Area at pond/wetland bottom, normal water level, high water level, freeboard;
- Notation indicating the elevation of the lowest allowable building opening for lots abutting the stormwater management facility;
- Measurements to locate submerged inlets, outlets, and sediment traps referenced to identifiable permanent features which are not submerged at normal water level;
- Location, material, diameter, inverts, and slope of culverts.

Note:

- This information shall be updated on the construction drawings to as-constructed information, in “red” ink.
- Where the water table is located above the fire hydrant drain, the hydrant drain ports may require plugging. Hydrants with plugged drain ports must be clearly identified on the as-built drawings.

A I.3.3 Surface Improvement Information

As built (record) drawings for surface improvements shall include:

- Elevations of catch basins, manhole covers, and curb returns on the plan / profile drawings, as well as any grade changes which exceed the design grade by more than 0.1% (or 25mm);
- Curve radii, distances from back of walk to property line, and sidewalk widths on the plan / profile drawings;

- Type of curb, whether rolled face or straight face, on an overall plan;
- Elevations at either the roadway crown or lip of gutter;
- Lot corner elevations, swales centreline elevations at beginning and end as well as at property line crossings and any changes in alignment of the swale.

Note:

- This information shall be updated on the construction drawings to as-constructed information, in “red” ink.
- If cross-section design has changed in width or structure, then this shall be indicated on the typical section plan.

A I.3.4 Standard Details

Standard detail drawings will be revised to reflect as-built information.

Appendix II. Safety Program Guidelines

Appendix II. Safety Program Guidelines

A II.1 SAFETY PROGRAM GUIDELINES FOR CONTRACTORS

Introduction

Town of Valleyview is committed to ensuring employee safety is an integral component of all construction activities. To meet our loss prevention objectives, a proper contractor safety program that complements the Town's program is essential.

These guidelines are to assist contractors in establishing and maintaining an acceptable safety program. The guidelines serve as an example of minimum requirements for a contractor's safety program.

Contractors shall not assume these guidelines address every circumstance or that they will not warrant additional precautions. The Town expects contractors to adhere to their responsibilities as employers and to exercise sound judgement in the daily administration of safety procedures.

Contractors are responsible for and shall monitor the safety performance of their agents, employees, and any subcontractor's employees. Nothing in this guideline relieves contractors of their legislated and moral responsibility and liability for work site safety.

Legislation

Contractors shall comply with Federal, Provincial, and local statutes; in particular, the Occupational Health and Safety (OH&S) Act and Regulations. Sufficient copies of the OH&S Act and Regulations shall be available at the work site.

Workers' Compensation and Insurance Coverage

Where the Workers' Compensation Act applies, contractors are expected to maintain a current up-to-date account covering all workers involved in the project. Proof of account status may be required prior to commencement of the project. Appropriate insurance coverage for public liability and property damage is also required.

Commitment To Safety

While engaged in work for the Town or while on Town approved, directed or funded projects, the contractor shall actively promote safe working practices and shall analyze employee activities to identify risk and ensure appropriate precautions are in place to minimize the likelihood of an incident or accident occurring. Management shall develop and, if practical, post or distribute safety policies and procedures appropriate to the project activities.

Safe Performance of Staff Competent Workers	In keeping with OH&S Regulations, the contractor shall ensure that only competent workers or workers under the direct supervision of competent workers shall be permitted to carry out any work in Town. A contractor is responsible for implementing an effective system of safety orientation and education for their staff. A contractor is responsible for ensuring that workers are familiar with and have access to copies of the applicable OH&S Regulations and of this document. Each contractor is responsible for conducting pre-commencement and ongoing qualification verification to ensure that workers have the necessary skill, knowledge, experience and where required, certification to perform the job safely and in accordance with any applicable legislation. This verification will be necessary for jobs employing: drivers; crane and hoist operators; equipment operators; first aiders or other emergency response staff; shippers and transporters of dangerous goods; and persons handling radioactive or explosive materials.
Enforcement	Contractor supervision is responsible for ongoing assessment of employee competence and attitude and for enforcement of safety operating procedures. Contractor employees or supervisors who demonstrate a poor attitude toward safe work and safety procedures are not acceptable for work on Town projects. Contractor supervisors unwilling or unable to demonstrate good safety practices are not acceptable for work on Town projects.
Inspections	Contractors shall use a regular safety inspection system to detect and correct hazardous conditions, violations, and unsafe work practices. Town will periodically participate in and provide support to contractors in their inspection programs. Copies of regular inspection reports shall be maintained and made available to the Town upon request. In addition to regularly scheduled inspections, supervisors / foreman shall conduct continuous work site surveillance taking immediate action to rectify any observed unsafe conditions or actions.

Safety Representatives	Contractors with 100 or more employees working on a project for the Town must employ a full-time safety representative. Contractors with 25 - 99 employees on site must designate one employee as a part-time site safety representative. Designated site safety representatives of a contractor on a Town project site shall meet at least once a month to discuss safety problems, inspections, and exchange information. Minutes of the safety representatives meeting shall be kept, and a copy promptly forwarded to the Town, OH&S and to the nearest Alberta Labour office, as well as being posted at the work site. Where the project utilizes security and/or emergency medical services, both groups shall be represented at the safety representatives meeting.
Pre-Job Orientation	Prior to commencement of the project or entry of contractor's staff and equipment onto the project site, a pre-job orientation meeting shall be held between the contractor, Developer, and the Town. Nature of hazards and any specific safety precautions required will be discussed. Where practical, representatives of all major subcontractors to be utilized by the contractor should be present at the meeting.
Accident Reporting / Investigation	Contractors shall have an effective accident reporting and investigation system and shall ensure that all staff are advised of the importance of prompt reporting and investigation of accidents. Accidents causing injury or having the potential for serious injury shall be reported by the contractor to the appropriate authorities in accordance with applicable Acts and Regulations. Town shall be advised, by the fastest means available, of any serious injuries, accidents or situations having the potential to cause serious injury (as defined in the OH&S Regulations), and dangerous occurrences (as defined in the Transportation of Dangerous Goods Regulations) or reportable incidents under the requirements of the Energy Control Board. Contractors shall provide copies of accident reports to the Town upon request. Reportable accidents include: - Personal injury (medical aid or disabling); - Vehicle accidents; - Spills or accidental release of products that may be potentially harmful to people or the environment; - Fires or explosions; and - Near misses having the potential to cause injury.

Emergency Services	Contractors shall conduct a pre-commencement evaluation of the project and ensure that suitable emergency response plans, equipment and training staff are available to handle emergencies that may arise. Copies of emergency response / evacuation plans shall be made available to the Town upon request. Contractors shall maintain sufficient numbers of trained first aiders, first aid attendants, first aid supplies and emergency conveyances as required by the OH&S Act and Regulations. Contractors are responsible for pre-job contact with the local ambulance service to verify accessibility to the project. Where ambulance service is not available to the site, the contractor is responsible for providing suitable emergency conveyance as specified in the OH&S Act and Regulations.
Personal Behavior	Contractors are responsible for ensuring that no employee or employees of any agents or subconsultants are allowed to enter the project site while under the influence of drugs or alcohol. Contractors are responsible for ensuring that the conveyance or use of firearms on site is prohibited unless prior written authorization has been granted by the Town.
Monthly Safety Summary	Contractors shall provide the Town with a monthly summary of safety activities and incidents occurring on site. This summary should include among other things: - Dates of safety meetings or talks; - Record of safety inspections conducted; - Summary of accidents and reportable incidents; - Any accident statistics (frequency, severity) compiled for the staff on this project; - Safety promotions or awards made; and - Summary of orders received pursuant to OH&S Act.
Equipment Standards	Contractors are responsible for ensuring: - Equipment that they have fabricated or modified has been designed in accordance with good engineering principles and that a stamped and signed copy of the engineer's certification is available to the Town upon request; - All equipment is in safe mechanical condition; - No tools or equipment are modified in any manner that will reduce the original factors of safety or capacity;

- A regular inspection program is in place that will remove or "tag out" any defective tools and equipment immediately;
- No original guards are removed from equipment or tools;
- An effective maintenance program is in place that will maintain equipment in accordance with the manufacturer's recommendations.

Staff Meeting

A contractor shall conduct safety meetings with staff or through an established joint work site safety committee at least once a month while involved on the project. Minutes, complete with attendance records, are to be kept for safety or joint work site safety committee meetings and are to be made available to the Town upon request. Regular five-minute "tailgate" safety meetings are to be held by the contractor's foreman with all crews. Contractor's safety representatives are expected to participate in regular meetings with the Town and with safety representatives from other contractors on site.

A II.2 ACKNOWLEDGMENT OF SAFETY PROGRAM GUIDELINES (FORM)

Acknowledgment of Safety Program Guidelines for the Town of Valleyview

_____

(Name of Contractor, Consultant, Representative, Developer)

_____

(Company Name)

_____

(Address)

_____

(Project Description)

I acknowledge receipt of the guidelines for the Town of Valleyview. I understand it is my responsibility on behalf of the contractor to ensure that these guidelines as well as appropriate federal and provincial regulations or municipal bylaws, are enforced during work at the above project, it is understood that the regulations shall be exceeded when special hazards warrant this.

It is fully understood that the contractor is responsible for and will administer their own safety program, and all incident reports, safety inspection, and accident reports, will be made available to representatives of the Town of Valleyview as named below.

_____

(Town of Valleyview Representative(s))

Signed this ____ day of _____ , 20___.

_____ _____

(Signature) (Witness)

Appendix III. Certificates

A III.1 CONSTRUCTION COMPLETION CERTIFICATE (CCC)

Construction Completion Certificate

The following certificate shall be prepared and executed by the Developer and Developer's Consultant for submission to the Town of Valleyview:

Date: _____

Project description: _____
_____
_____

	Developer	***Developer's Consultant***
Name:	_____	_____
Address:	_____	_____
	_____	_____
	_____	_____
Phone:	_____	_____
Fax:	_____	_____

CCC inspection was performed on the ___ of _____, 20____ and all noted deficiencies have been satisfactorily completed.

I, _____ of _____
(Consultant Name) (Consultant's Firm)

hereby certify that the contract for the above described project has been completed in general conformance with the Contract Documents and the Town of Valleyview's Municipal Engineering Development and Servicing Standards.

Engineer's Seal

Company Permit Stamp

Town of Valleyview

Based on the above certification, the Town of Valleyview accepts that the project is completed and the Warranty Period, as it affects the Town, will commence on the ___ of _____, 20____.

Name: _____ Signature: _____

Date: _____

A III.2 FINAL ACCEPTANCE CERTIFICATE (FAC)

Final Acceptance Certificate

The following certificate shall be prepared and executed by the Developer and Developer's Consultant for submission to the Town of Valleyview:

Date: _____

Project description: _____
_____
_____

	Developer	***Developer's Consultant***
Name:	_____	_____
Address:	_____	_____
	_____	_____
	_____	_____
Phone:	_____	_____
Fax:	_____	_____

FAC inspection was performed on the ___ of _____, 20___ and all noted deficiencies have been satisfactorily completed.

I, _____ of _____
(Consultant Name) (Consultant's Firm)

hereby certify that the contract for the above described project has been completed in general conformance with the Contract Documents and the Town of Valleyview's Municipal Engineering Development and Servicing Standards and, that all deficiencies have been rectified to the Town's satisfaction.

Engineer's Seal

Company Permit Stamp

Town of Valleyview

Based on the above certification, the Town of Valleyview accepts that the warranty period has expired effective the ___ day of _____, 20___ and the Town assumes responsibility for the development as it concerns the Town.

Name: _____ Signature: _____

Date: _____

Appendix IV. Forms

A IV.1 ESC INSPECTION / MAINTENANCE REPORT (SAMPLE)

Project Name:	**File No.:**
	Contract No.:
Inspection Date:	**Date of Last Inspection:**
Inspected By:	**Date:**
Current Weather:	**Weather Forecast:**
Rain (mm) - last week:	**Rain (mm) - last 24 hrs:**
Stage of Construction:	
Contractor(s) On-Site:	
Construction Activities On-Site:	
Heavy Equipment On-Site:	

INSPECTION CHECKLIST	Y / N	COMMENTS	ACTION REQUIRED
Has stripping / grading been phased where possible?			
Have stripped areas / exposed soils / steep slopes been protected / stabilized?			
Have waterways / drainage ways been protected / stabilized?			
Are perimeter controls in place / functioning adequately?			
Are off-site / downstream properties / waterways protected?			
Are construction entrances stabilized to minimize tracking of soil / mud off-site?			
Are sedimentation control Best Management Practices (BMPs) in place / functioning adequately?			
Are transport control BMPs in place / functioning adequately?			
Are erosion control BMPs in place / functioning adequately?			
Other:			
Other:			

A IV.2 ENGINEERING PRE-INSPECTION CHECKLIST

SANITARY SEWER		COMMENTS
Manholes		
Channel	☐	
Base	☐	
Joints	☐	
Cover	☐	
Grade Rings	☐	
Clean	☐	
Main Line		
Compaction Tests	☐	
CCTV Report	☐	
CCTV Review	☐	
Exfiltration / Infiltration Test	☐	
Mandrel Test	☐	
WATERMAINS		
Compaction Tests	☐	
Hydrant Operation	☐	
Valve Operation	☐	
Pressure / Leakage test	☐	
Chlorine Residual Test	☐	
Bacteriological Test	☐	
SERVICES		
Compaction Tests	☐	
CC Operation	☐	
Sanitary	☐	
Sewer	☐	
Water	☐	
Marker Stakes	☐	
Service Reports	☐	
ASPHALT		
ACP Surface Uniformity	☐	
Subgrade Compaction Tests	☐	
GBC Compaction Tests	☐	
Proof Rolls	☐	
ACP Core Results	☐	
Mix Design	☐	
Thickness	☐	
Density	☐	
Clean	☐	
LANDSCAPING		
Positive Drainage	☐	
Sod / Seed, Fertilizer	☐	
Trees / Shrubs / Plants	☐	
Features	☐	

STORM SEWER		COMMENTS
Manholes		
Channel	☐	
Base	☐	
Joints	☐	
Cover	☐	
Grade Rings	☐	
Clean	☐	
Main Line		
Compaction Tests	☐	
CCTV Report	☐	
CCTV Review	☐	
Exfiltration / Infiltration Test	☐	
Mandrel Test	☐	
Catch Basins		
Sump	☐	
Base	☐	
Joints	☐	
Grate	☐	
Location	☐	
Clean	☐	
SWMFs		
Flared Ends (Inlet)	☐	
Flared Ends (Outlet)	☐	
Trash Rack	☐	
Rip Rap (Class, Size)	☐	
Topsoil	☐	
Seeding	☐	
Control Structure	☐	
General Clean-Up	☐	
CONCRETE		
Curb & Gutter	☐	
Sidewalk	☐	
Expansion Joints	☐	
Concrete Tests	☐	
Mix Design	☐	
CC Stamps	☐	
Backfill	☐	
Clean	☐	
SITE GRADING		
Ditches	☐	
Culverts	☐	
Swales	☐	
Clean	☐	
Lots Rough-Graded	☐	
Positive Drainage	☐	

I, _____ of _____ certify that _____
(Consultants Name) (Consultant's Firm) (Project Name)

has been pre-inspected and is ready for a _____ inspection of the _____ works.
(CCC / FAC) (Underground / Surface / Landscape)

Signature: Date:

A IV.3 LANDSCAPE PRE-INSPECTION REPORT

Project Name:		**File No.:**
		Contract No.:
Inspection Date:		**Date of Last Inspection:**
Inspected By:		**Date:**
Current Weather:		**Weather Forecast:**
Rain (mm) - last week:	**Rain (mm) - last 24 hrs:**	**Maintenance Logs:**
Stage of Construction:		
Contractor(s) On-Site:		

INSPECTION CHECKLIST	Y / N	COMMENTS	ACTION REQUIRED
Has planting been completed? Are the counts correct?			
Are trees staked / tied?			
Are trees straight / aligned / at proper planting height?			
Are trees healthy / watered in last 24 hrs.?			
Are tree soil / mulch rings in place?			
Has seeding / sodding been completed? Has it been maintained recently?			
Are there any bare / damaged sections of turf which needs to be replaced / re-seeded?			
Has the site been weeded / sprayed?			
Have all site amenities been installed as per plan?			
Are there any damages to site amenities which require touch-up / replacement?			
Have construction debris / stockpiles been removed from site?			
Other:			
Other:			

A IV.4 FENCE PRE-INSPECTION REPORT

Project Name:	**File No.:**
	Contract No.:
Inspection Date:	**Date of Last Inspection:**
Inspected By:	**Date:**
Current Weather:	**Weather Forecast:**
Stage of Construction:	
Contractor(s) On-Site:	

INSPECTION CHECKLIST	Y / N	COMMENTS	ACTION REQUIRED
Has all fencing been completed as per plans?			
Has the fence alignment / offset been verified?			
Are all posts straight and firmly set in the ground?			
Are all panels securely fastened to posts?			
Are there any damages which require touch-up / replacement?			
Are all gates installed as per plans?			
Do all gates swing into lots without impediment / latch properly?			
Is the bottom of the fence a minimum 75mm above final grade?			
Have construction debris / stockpiles been removed from site?			
Other:			
Other:			

A IV.5 SERVICE REPORT (FRONT)

Street _____

Lot _____ Civic No. _____ Development Permit # _____

PUBLIC

	Water	Sanitary	Storm
Length			
Material			
Diameter			
Colour			
Depth @ Main (m)			
Depth @ PL (m)			
TOP Elev. @ Main			
TOP Elev. @ PL			
Main Diameter (mm)			
Curb Stop to PL (m)			
PL to Stub (m)			

Contractor _____

Inspected By _____

Date _____

Record Drawing # _____

Insulation? ☐ Yes ☐ No

Anode? ☐ Yes ☐ No

PRIVATE

	Water	Sanitary	Storm
Length			
Material			
Diameter			
Colour			
Depth @ Bldg (m)			

Contractor _____

Inspected By _____

Date _____

Insulation? ☐ Yes ☐ No

Sump Pump Connected to Foundation Drain? ☐ Yes ☐ No

Sanitary Service Type? ☐ Gravity ☐ Pressure

Private Pump Stn. Info Lift: _____ Distance: _____

RURAL DEVELOPMENTS

Driveway Culvert? ☐ Yes ☐ No

Precast Headwalls? ☐ Yes ☐ No

Driveway Culvert Info Diameter: _____ Material: _____

Additional Notes & Comments:

Additional Notes & Comments:

See reverse for sketch

A IV.5 SERVICE REPORT (BACK)

PRIVATE

PUBLIC

See reverse for details

A IV.6 LEAKAGE TEST REPORT

The following form shall be prepared by the Developer's Representative for submission to the Town.

Project Name:			**Date:**	
			Drawing No.:	
Location:		**From:**		**To:**
Pipe Size:		**Length of Test Section:**		
Pipe Type:		**Number of Joints:**		
Allowable leakage per hour (L):			**For test pressure of (kPa):**	
Actual leakage per hour (L):			**For test pressure of (kPa):**	

Pump Start Time	Meter Reading	Pump Stop Time	Meter Reading	Total Loss (L)

High Pressure Water Meature Used (brand name, model, serial number):	
Date Meter Tested and Calibrated:	
Date Completed:	**Operator's Signature:**
Company:	**Company's Address:**
Phone No.:	
Developer's Rep. Signature:	**Phone No.:**

A IV.7 DISINFECTION REPORT

The following form shall be prepared by the Developer's Representative for submission to the Town.

CHLORINATION					
Project Name:			**Date:**		
			Drawing No.:		
Location:		**From:**		**To:**	
Pipe Size:	**Pipe Type:**			**Pipe Length (m):**	
Location of No. 1 Flush and Chlorinating Corp.:					
Location of No. 2 Flush and Chlorinating Corp.:					
Rate of Discharge (L/min.):			**Rate of Chlorine Feed (kg/day):**		
Flow thru time (hrs-min.):			**Residual at Finish (mg/L):**		
FINAL FLUSHING					
Date:					
Time Started:			**Chlorine Residual (mg/L):**		
Time Finished:			**Chlorine Residual (mg/L):**		
SAMPLES FOR RESIDUAL CHLORINE TEST					
Sample No.	**Sample Location**	**Discharge Rate (L/min.)**	**Time Taken**	**Date Taken**	**Chlorine Residual**
Operator's Name:			**Operator's Signature:**		
Company:			**Company's Address:**		
Phone No.:					
SAMPLES FOR BACTERIOLOGICAL TEST					
Sample No.	**Sample Location**	**Time Taken**	**Date Taken**	**Total Coliforms**	**HPC**
Testing Laboratory:					
Date Testing Submitted:			**Date Testing Completed:**		
Consulting Firm:					
Developer's Rep. Signature:			**Phone No.:**		

Appendix V. Standard Details

Appendix V. Standard Details

DRAWINGS LIST

Roadway / Right-of-Way:

R-1 Rolled Curb & Gutter and Crossing Details – Commercial, Lane and Private

R-2 150mm Barrier Curb & Gutter and Crossing Details – Commercial, Lane and Private

R-3 Rolled Monolithic Curb, Gutter & Sidewalk

R-4 150mm Barrier Monolithic Curb, Gutter & Sidewalk

R-5 150mm Barrier Monolithic Crossing Details – Commercial, Lane and Private

R-6 Wheelchair / Bike Ramp Details

R-7 Separate Sidewalk Detail

R-8 Concrete Swale Detail

R-9 4.0m Paved Residential Lane

R-10 Asphalt Trail Detail

R-11 Typical Front Lot Drainage Type A

R-12 Typical Split Lot Drainage Type B

R-13 Typical Rear Lot Drainage Type C

R-14 9.0m Residential Street Section with Monolithic Sidewalk – 20.0m Road Right-of-Way

R-15 11.0m Residential Major Collector Street Section with Monolithic Sidewalk – 24.0m Road Right-of-Way

R-16 14.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 24.0m Road Right-of-Way

R-17 10.0m Industrial/Commercial Major Collector Street Section with Separate Sidewalk – 20.0m Road Right-of-Way

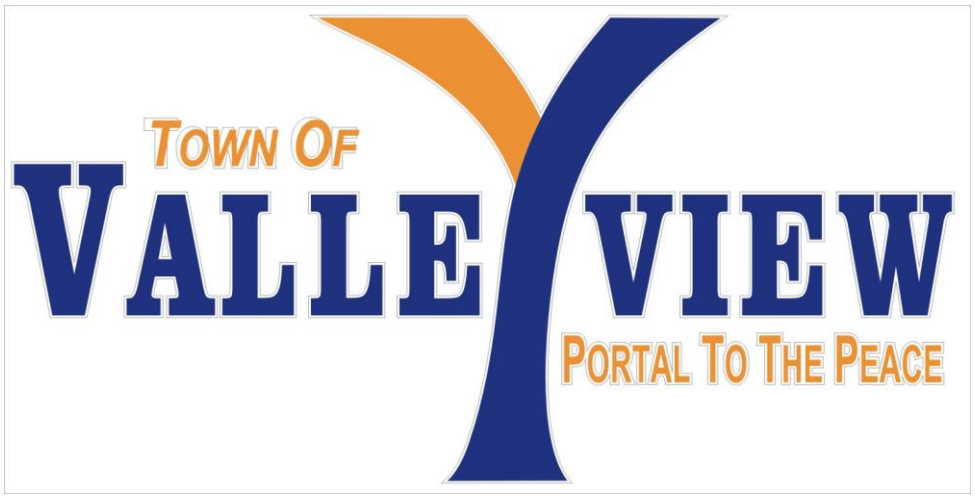
R-18 10.0m Industrial/Commercial Major Collector Street Section with Ditches – 30.0m Road Right-of-Way

R-19 Tree Planting Details

Utilities / Underground:

U-1 Pipe Bedding Details
U-2 Standard Frame and Covers for Manholes
U-3 Manhole Detail
U-4 Drop Manhole Detail
U-5 Internal Drop Manhole Detail
U-6 Thrust Block Details
U-7 Valve Box Detail
U-8 Off-Line Hydrant Detail
U-9 Single Water & Sanitary Sewer Service (New Installation)
U-10 Sanitary Sewer Service Connector Riser
U-11 Dual Water & Sanitary Sewer Service (New Installation)
U-12 Precast Concrete Catch Basin Manhole
U-13 Standard Catch Basin with Sump
U-14 NF-26 & NF-51 Catch Basin Installation Detail for Curbs
U-15 Typical Pipe Crossing
U-16 Installation Details of Pipe Through Borings and Casings
U-17 Pipe Insulation Detail
U-18 Typical Blow-Off Detail
U-19 Single Service Layout (New Installation)

TOWN OF VALLEYVIEW
MUNICIPAL ENGINEERING DEVELOPMENT
AND SERVICING STANDARDS

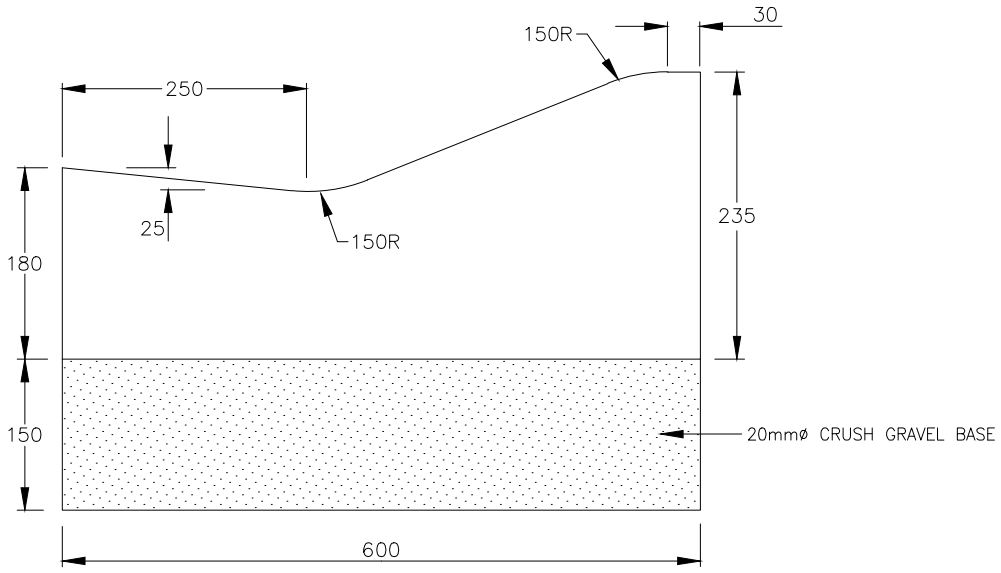


December 2020

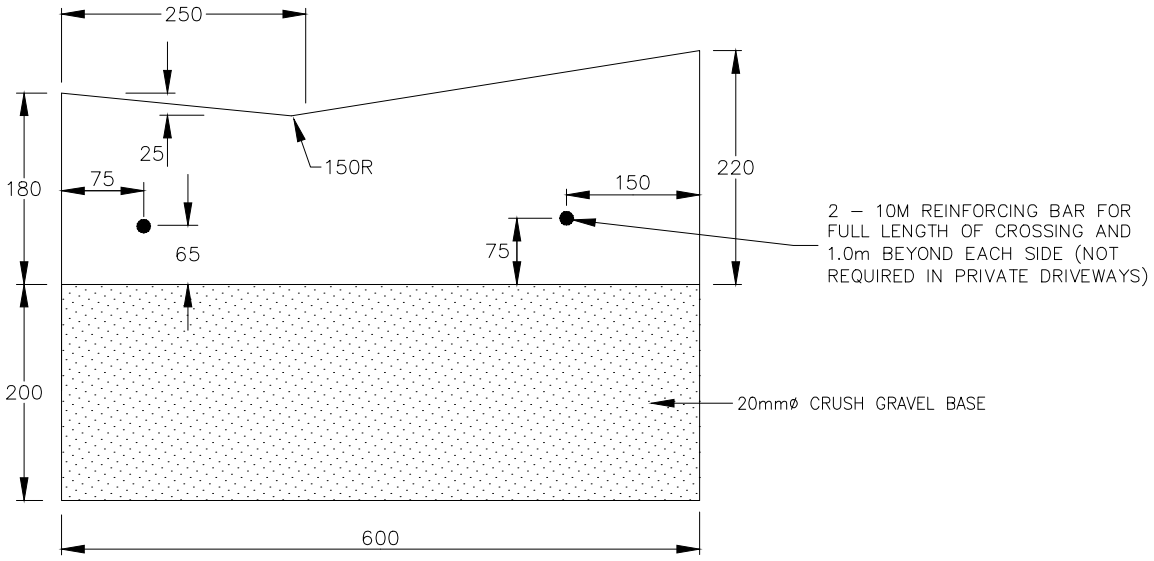
APPENDIX III

STANDARD DRAWING DETAILS

ROLLED CURB AND GUTTER



LANE AND COMMERCIAL CROSSINGS



NOTES:

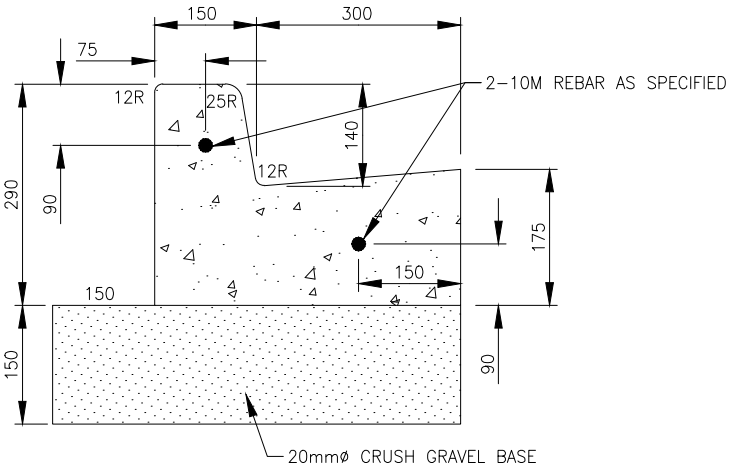
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. CONTROL JOINTS SHALL BE CONSTRUCTED AT INTERVALS OF 3.0m WITH 12mm WIDE GROOVES TO A DEPTH OF 38mm.
3. 2–10M REINFORCING BARS REQUIRED IN CURB AND GUTTER FOR ALL RADII 5.0m OR LESS AND ALL UTILITY TRENCH CROSSING (MIN. 3.0m EACH WAY OF CENTER).
4. EXPANSION JOINTS SHALL BE CONSTRUCTED ON BOTH SIDES OF PUBLIC LANE CROSSINGS.
5. SUB–GRADE COMPACTED TO 98% S.P.D. AND BASE GRAVEL TO 100% S.P.D.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

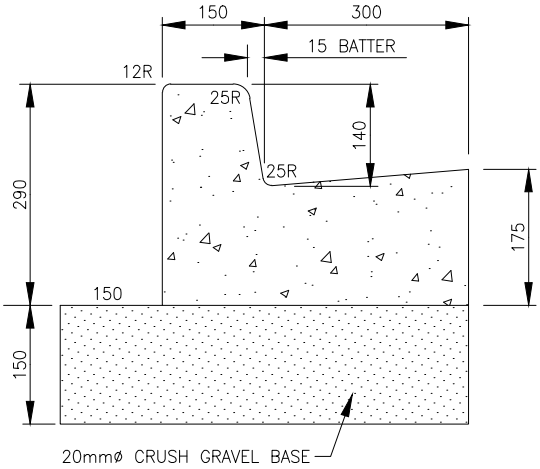
ROLLED CURB & GUTTER AND CROSSING DETAILS – COMMERCIAL, LANE AND PRIVATE

DATE: 2017/05/02

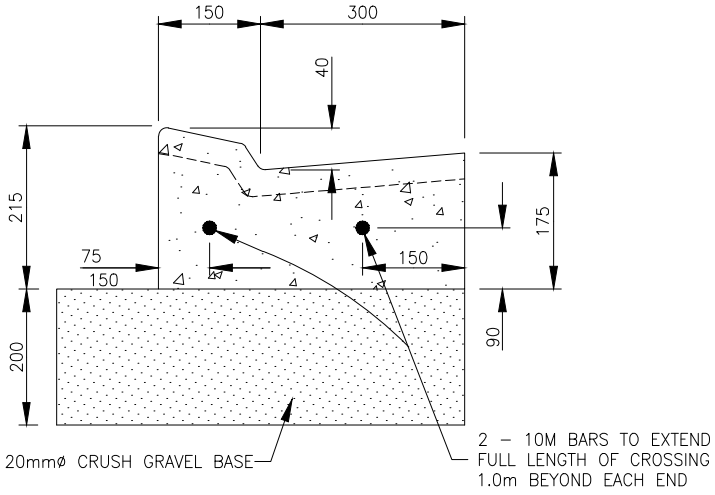
FIGURE: R–1



REINFORCED SECTION



STANDARD SECTION



DRIVE–OVER SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. CONTROL JOINTS SHALL BE CONSTRUCTED AT INTERVALS OF 3.0m WITH 12mm WIDE GROOVES TO A DEPTH OF 38mm.
3. 2–10M REINFORCING BARS REQUIRED IN CURB AND GUTTER FOR ALL RADII 5.0m OR LESS AND ALL UTILITY TRENCH CROSSINGS (MIN. 3.0m EACH WAY OF CENTER).
4. SUB–GRADE COMPACTED TO 98% S.P.D. AND BASE GRAVEL TO 100% S.P.D.

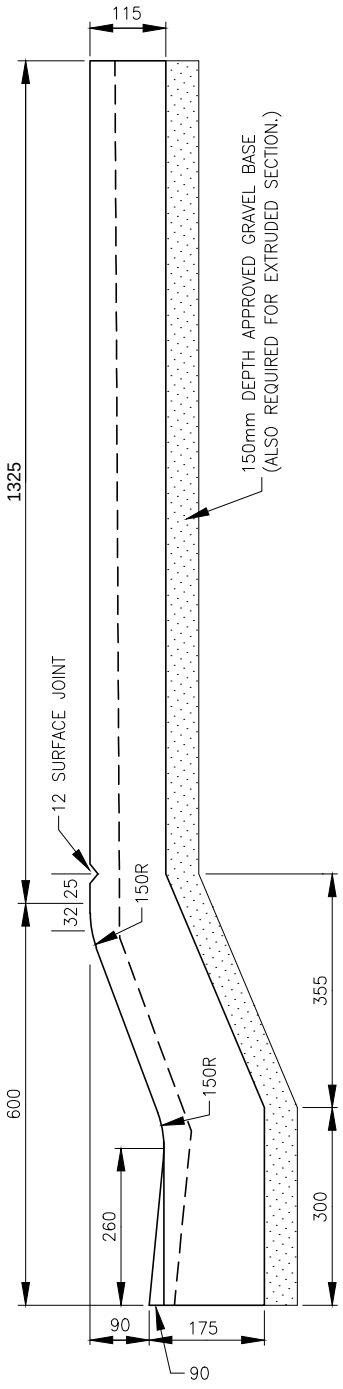
TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

150mm BARRIER CURB & GUTTER AND CROSSING DETAILS – COMMERCIAL, LANE AND PRIVATE

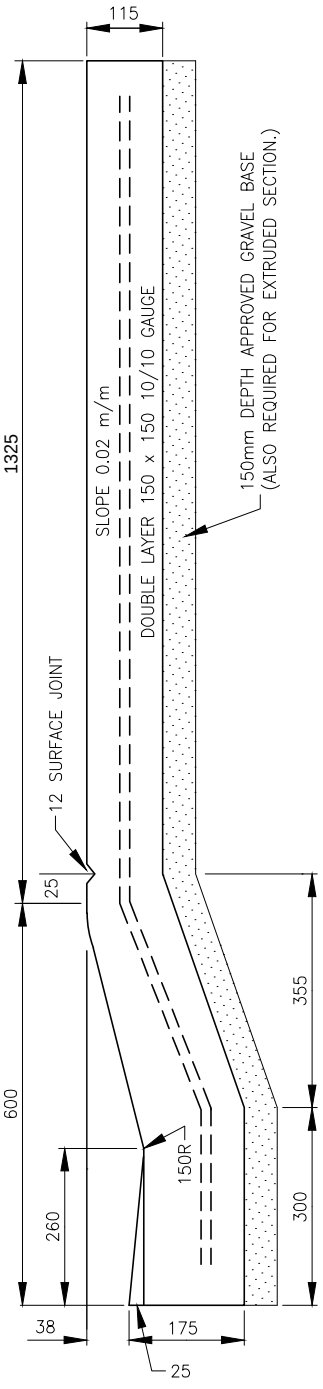
DATE: 2017/05/02

FIGURE: R–2

ROLLED MONOLITHIC SIDEWALK



LANE AND COMMERCIAL CROSSING



NOTES:

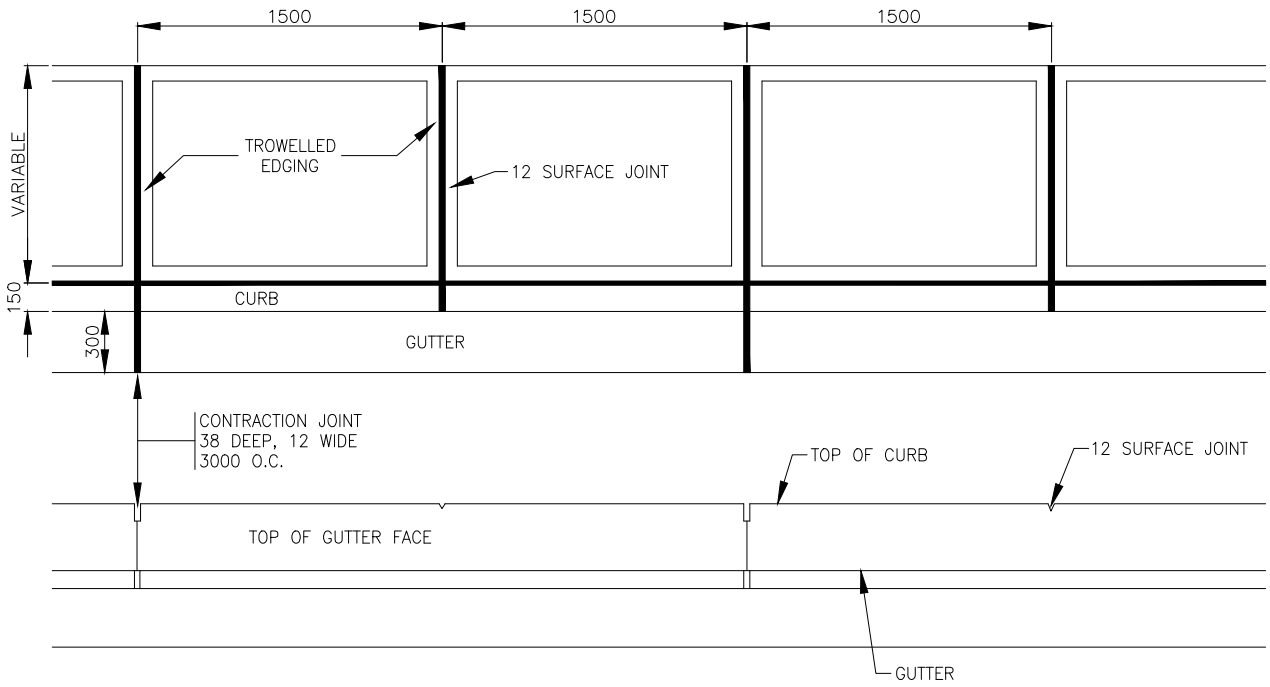
1. 4 –10m REINFORCING BARS REQUIRED AT ALL UTILITY TRENCHES 3.0m EACH WAY FROM CENTER.
2. EXPANSION JOINTS SHALL BE CONSTRUCTED ON BOTH.
3. CONTRACTION JOINTS ARE NOT TO BE PLACED IN DRIVEWAYS.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

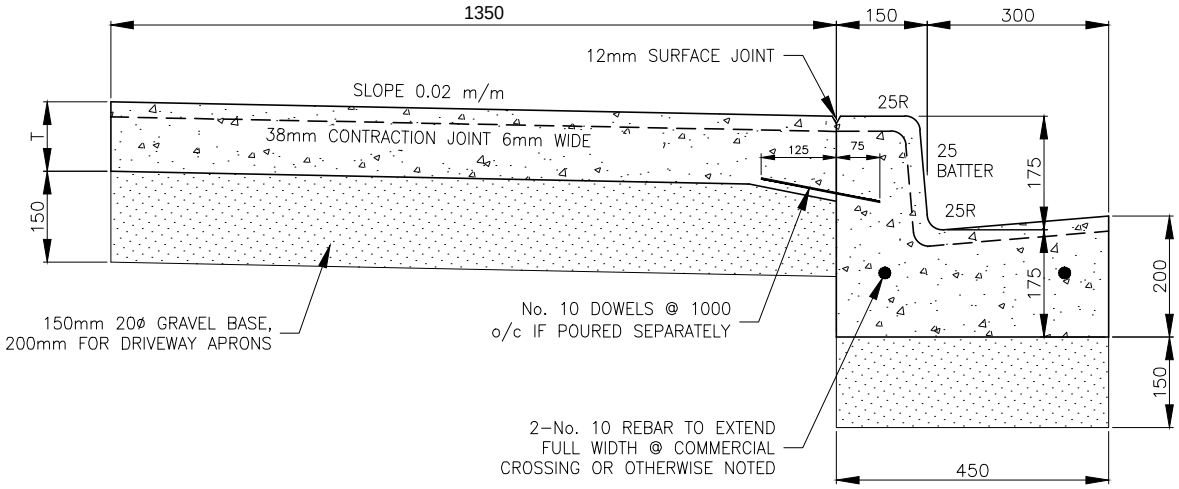
ROLLED MONOLITHIC CURB, GUTTER & SIDEWALK

DATE: 2017/05/02

FIGURE: R–3



T=115mm FOR STANDARD SIDEWALK
T=150mm DROPPED RETAIL ENTRANCE (No. 10 REBAR @ 300 o/c e/w)
T=180mm DROPPED TRUCK ENTRANCE (No. 10 REBAR @ 300 o/c e/w)



NOTES:

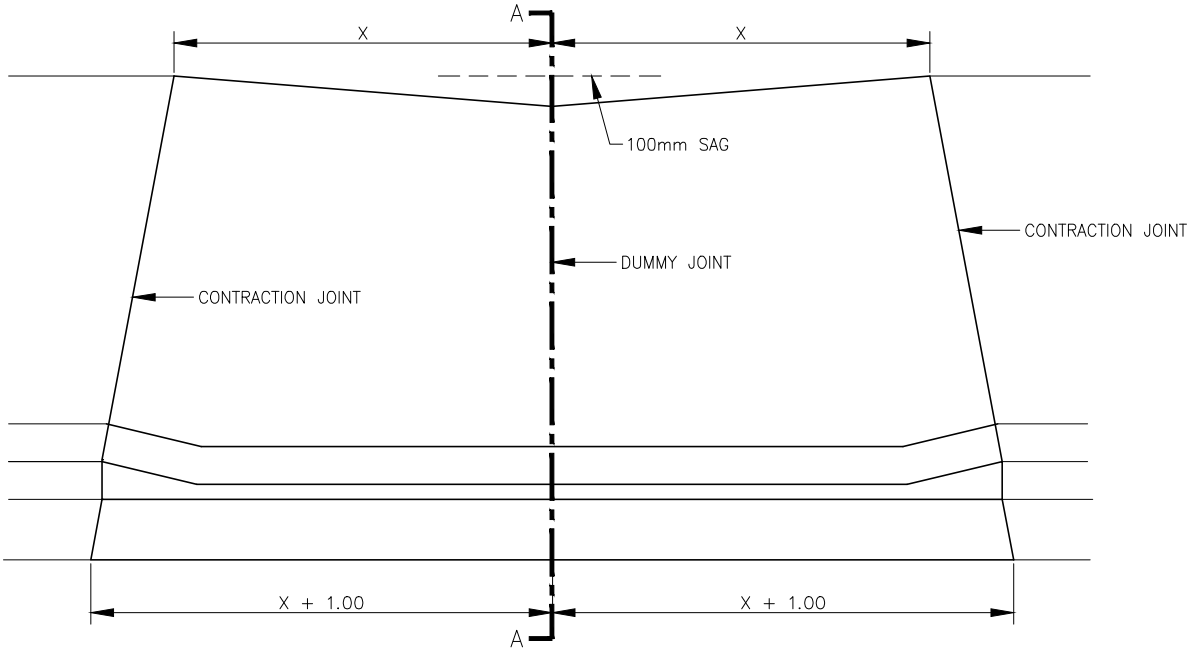
1. EXPANSION JOINTS SHALL BE CONSTRUCTED ON BOTH SIDES OF COMMUNITY ACCESS CROSSINGS.
2. 5-10m REINFORCING BARS REQUIRED AT ALL UTILITY TRENCHES (MIN. 3000 EACH WAY FROM CENTER).
3. SUBGRADE AND BASE GRAVEL COMPACTED TO 98% S.P.D.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

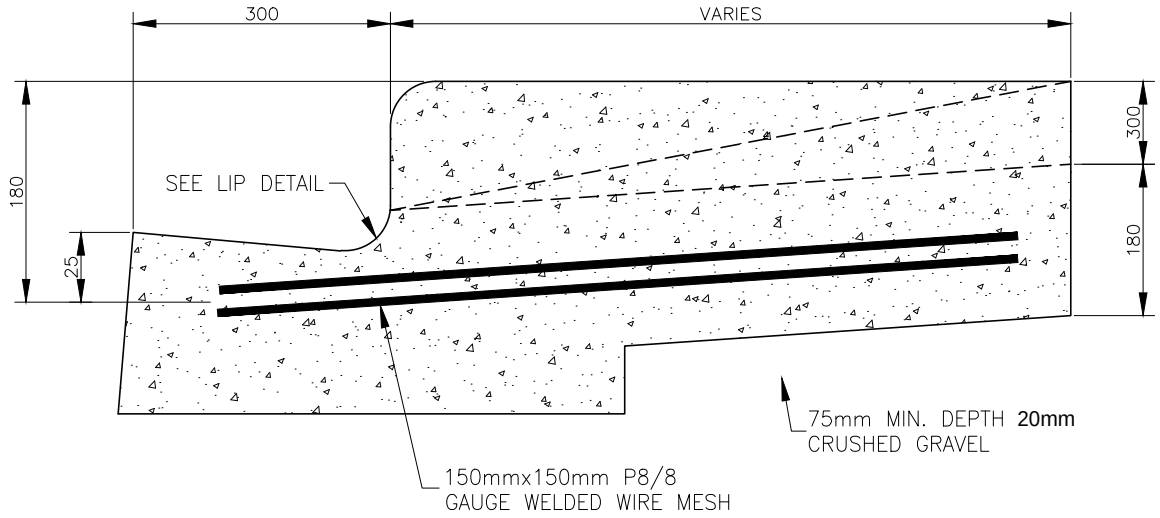
150mm BARRIER MONOLITHIC CURB, GUTTER & SIDEWALK

DATE: 2017/05/02

FIGURE: R-4

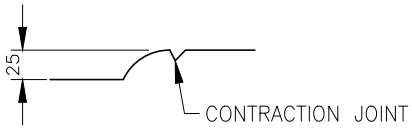


NOTE:
1. MINIMUM X SHALL BE 3m.



SECTION A–A

LIP DETAIL

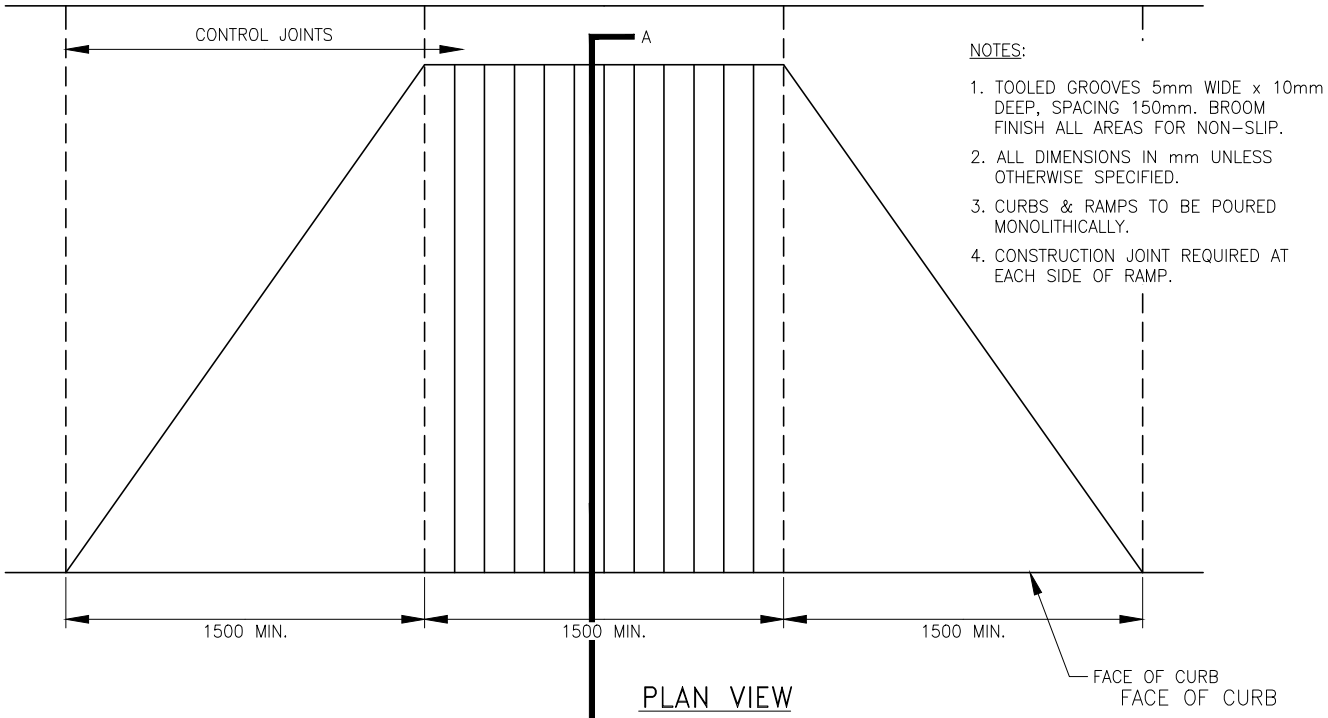


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

150mm BARRIER MONOLITHIC CROSSING DETAILS COMMERCIAL, LANE AND PRIVATE

DATE: 2017/05/02

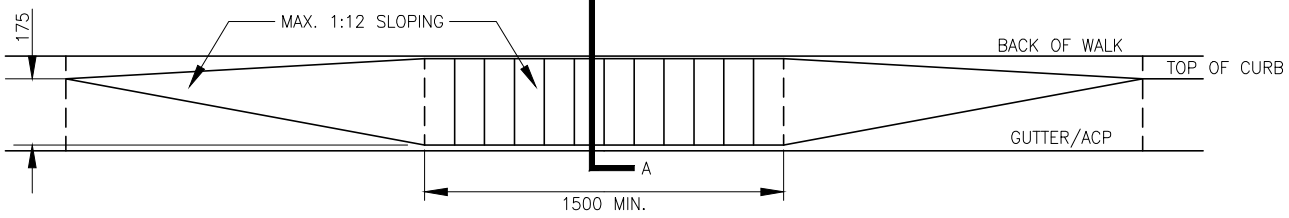
FIGURE: R–5



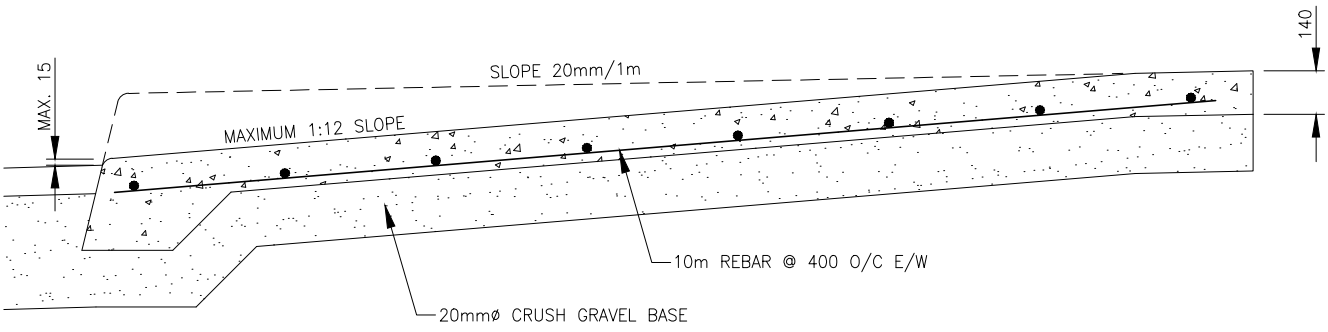
NOTES:

1. TOOLED GROOVES 5mm WIDE x 10mm DEEP, SPACING 150mm. BROOM FINISH ALL AREAS FOR NON-SLIP.
2. ALL DIMENSIONS IN mm UNLESS OTHERWISE SPECIFIED.
3. CURBS & RAMPS TO BE POURED MONOLITHICALLY.
4. CONSTRUCTION JOINT REQUIRED AT EACH SIDE OF RAMP.

PLAN VIEW



ELEVATION VIEW



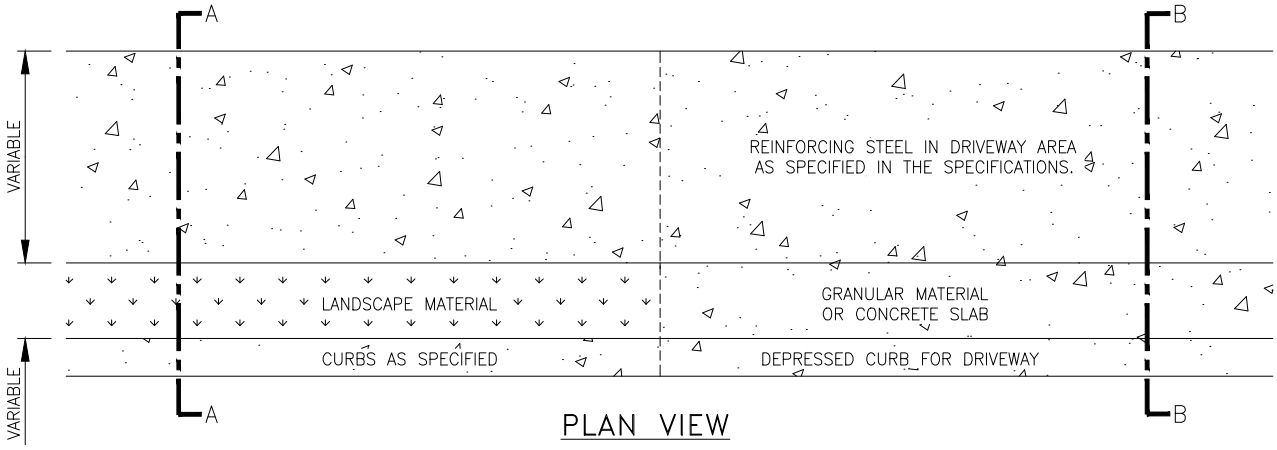
SECTION 'A'-'A'

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

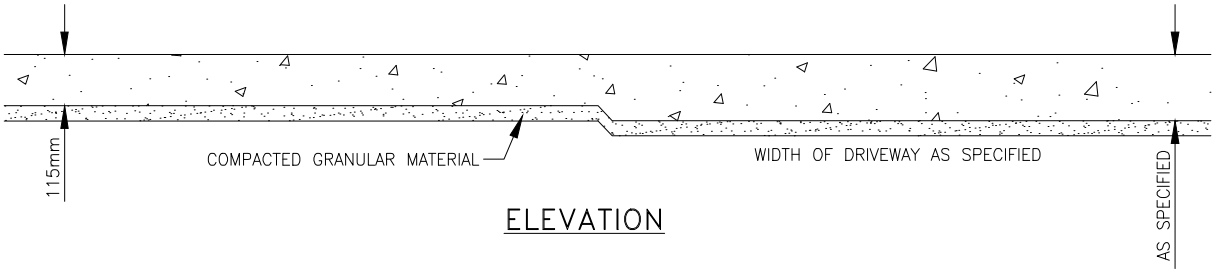
WHEELCHAIR/BIKE RAMP DETAILS

DATE: 2017/05/02

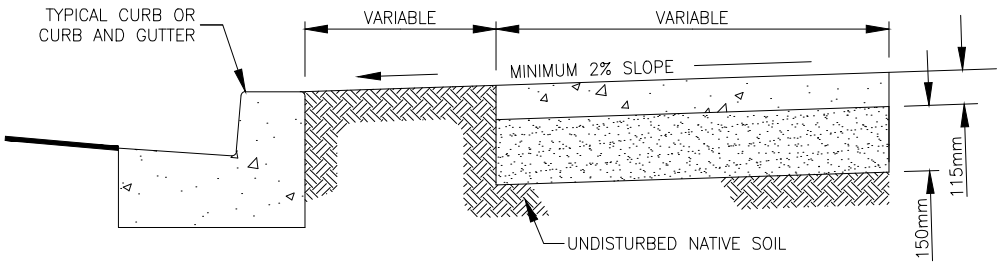
FIGURE: R-6



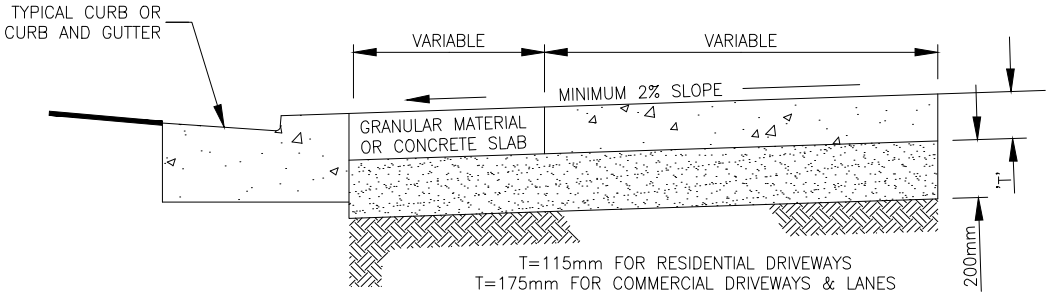
PLAN VIEW



ELEVATION



TYPICAL SECTION A–A



TYPICAL SECTION B–B

NOTES:

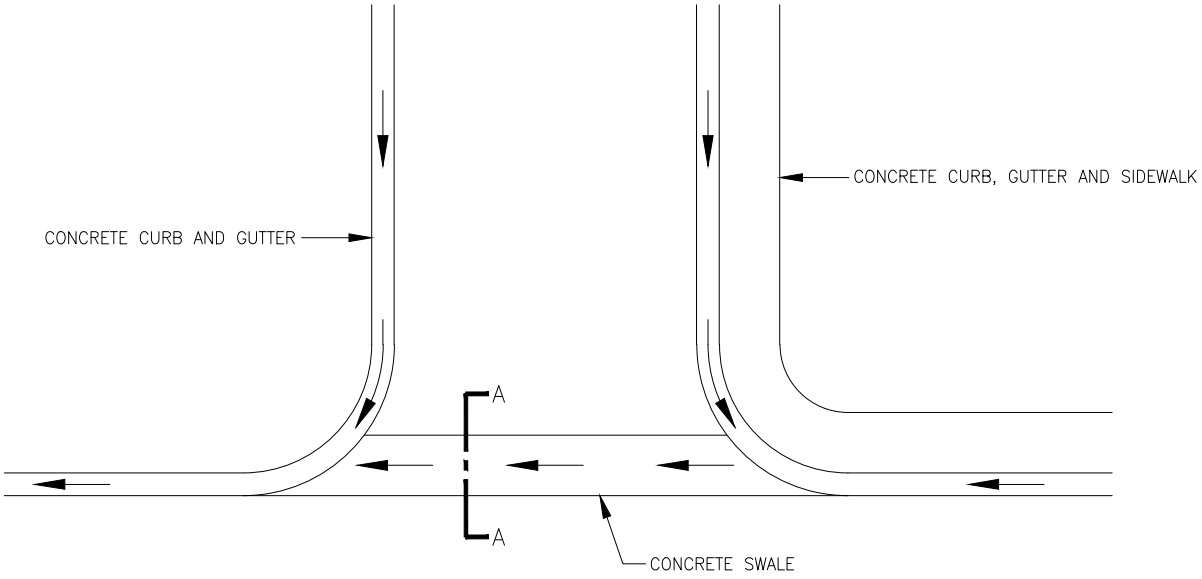
1. EXPANSION JOINTS ARE TO BE LOCATED ON BOTH SIDES OF PUBLIC LANE CROSSINGS. CONTRACTION JOINTS SHALL BE SPACED EVERY 1.5m.
2. DRIVEWAY WIDTHS ARE VARIABLE. THE MINIMUM DESIRED WIDTH SHALL BE AS FOLLOWS: (a) LANES = 6m (b) PRIVATE ENTRANCES = 4m (c) COMMERCIAL ENTRANCES = 7m
3. CONTRACTION JOINTS ARE NOT TO BE CONSTRUCTED IN DRIVEWAYS.
4. DRIVEWAYS MAY BE DEPRESSED IF NECESSARY TO SUIT LOCAL CONDITIONS.
5. CONCRETE STRENGTH TO BE MINIMUM 30MPa @ 28 DAYS.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

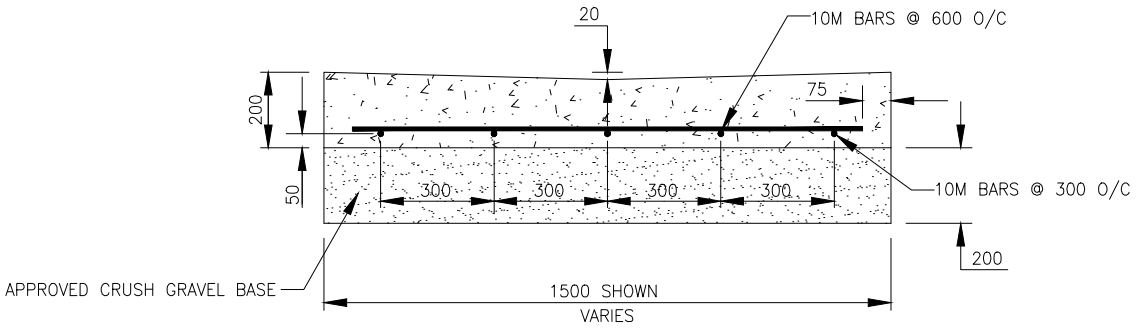
SEPARATE SIDEWALK DETAIL

DATE: 2017/05/02

FIGURE: R–7



PLAN VIEW



TYPICAL SECTION A–A

NOTES:

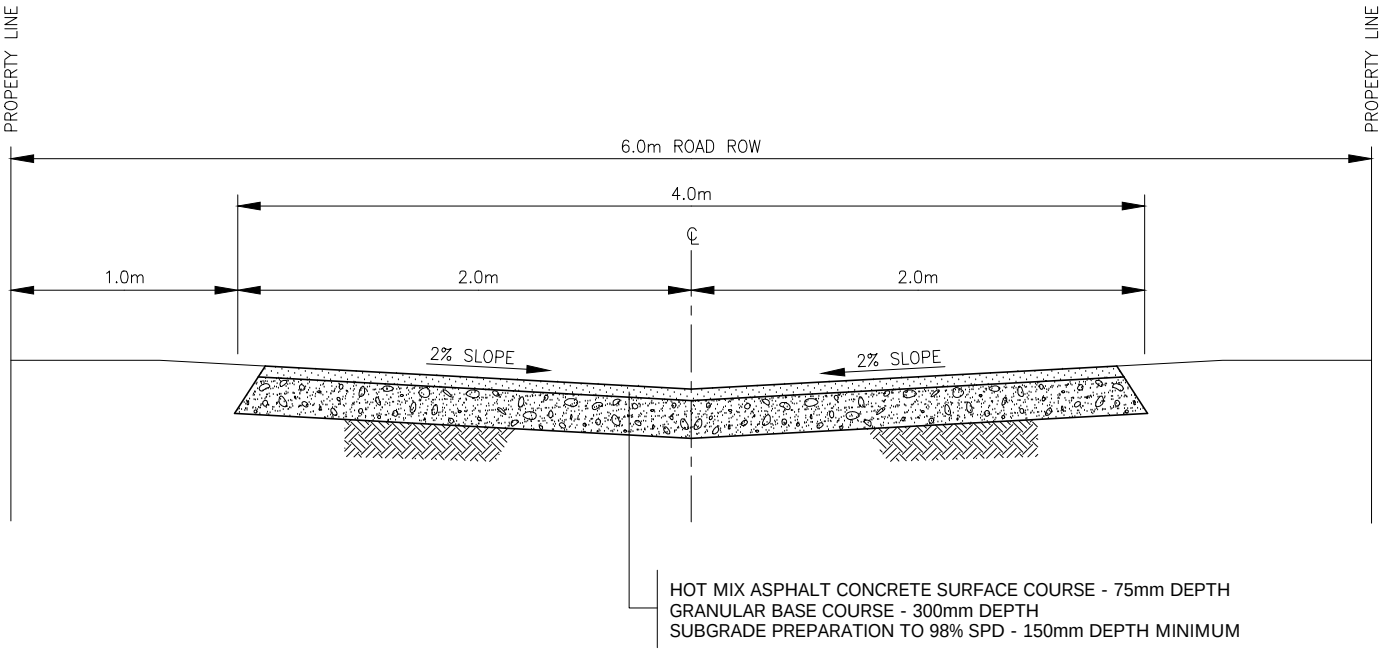
1. ALL CONCRETE SHALL BE 30 Mpa TYPE 50 SULPHATE RESISTANT CONTAINING 6–8% AIR ENTRAINMENT.
2. CONTRACTION JOINTS SHALL BE CONSTRUCTED AT INTERVALS OF 3.0m WITH GROOVES APPROXIMATELY 3mm WIDE TO A DEPTH OF APPROXIMATELY 40mm.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
4. SUB–GRADE COMPACTED TO 98% S.P.D. AND BASE GRAVEL TO 100% S.P.D.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

CONCRETE SWALE DETAIL

DATE: 2017/05/02

FIGURE: R–8



NOTES:

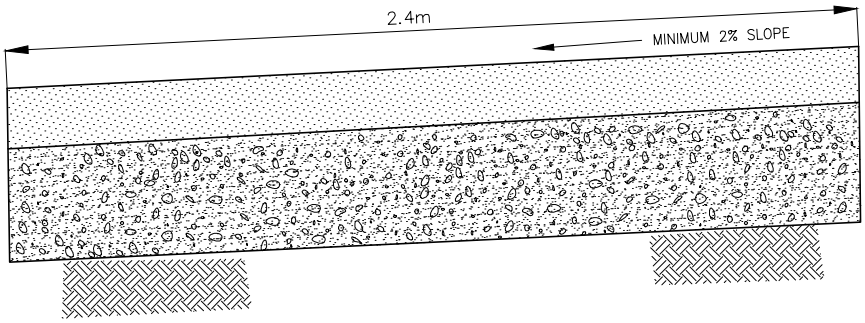
1. MINIMUM ROAD STRUCTURE. ROADWAY TO BE SIGNED BASED ON SITE SPECIFIC SOIL CONDITIONS AND TRAFFIC LOADING.
2. EDGE OF PAVEMENT TO BE WARPED TO FIT DRIVEWAYS.

DATE:
2017/05/02

FIGURE:
R-9

4.0m PAVED RESIDENTIAL LANE

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE



MINIMUM THICKNESS

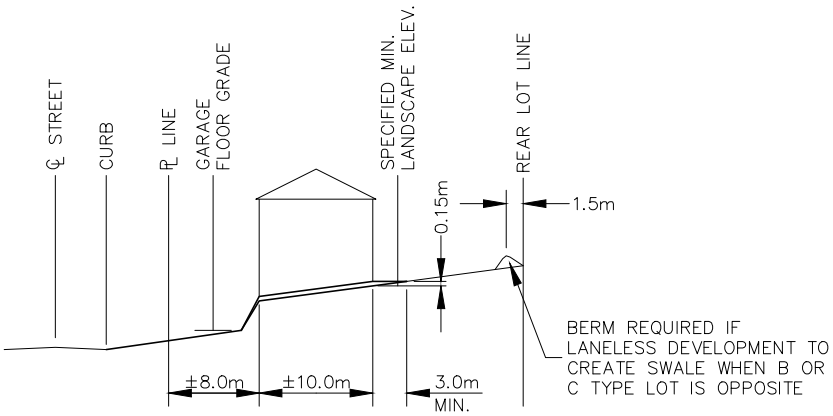
75mm - ASPHALT (LIGHT DUTY)
100mm – 20mm CRUSHED GRAVEL
150mm SUBGRADE COMPACTED TO 98% SPD

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

ASPHALT TRAIL DETAIL

DATE:
2017/05/02

FIGURE:
R-10



BASEMENT GARAGE AND FRONT WALKOUT HOUSE TYPE

N.T.S.

LANDSCAPE CRITERIA

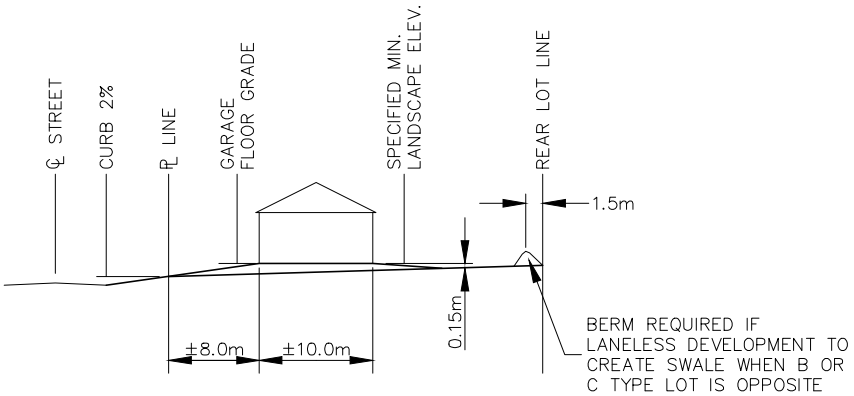
NOTE: TO BE USED AS A GUIDELINE ONLY

CRITERIA 1 – FOR FRONT OF LOT HIGHER THAN BACK OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER FRONT CORNER + 0.50m UNLESS THE HIGHER FRONT CORNER IS 0.20m OR MORE ABOVE THE LOWER FRONT CORNER, THEN USE CRITERIA 2.

CRITERIA 2 – FOR FRONT OF LOT CORNER HIGHER THAN BACK OF LOT CORNER, MINIMUM LANDSCAPE ELEVATION = HIGHER FRONT CORNER + 0.30m.

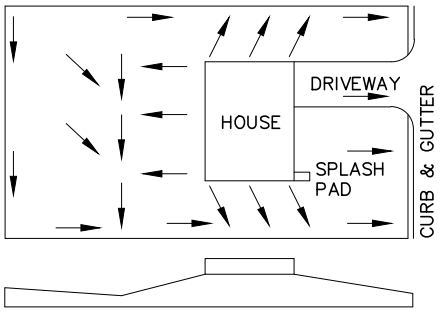
CRITERIA 3 – FOR BACK OF LOT HIGHER THAN FRONT OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER BACK CORNER + 0.30m UNLESS ANY BACK LOT ELEVATION IS GREATER THAN 0.50m ABOVE FRONT ELEVATION IN WHICH CASE SPECIAL CONSIDERATION IS TO BE GIVEN.

SPECIAL APPROVAL IS REQUIRED FOR BASEMENT WALKOUT HOUSE TYPE.



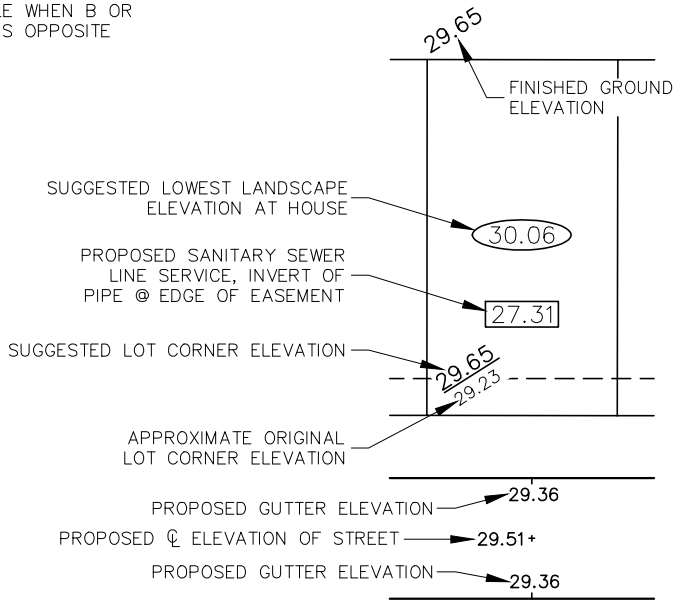
CONVENTIONAL AND SPLIT BUNGALOW HOUSE TYPE

N.T.S.



BACK TO FRONT DRAINAGE WITH SWALES

N.T.S.



TYPICAL LOT GRADING SECTION

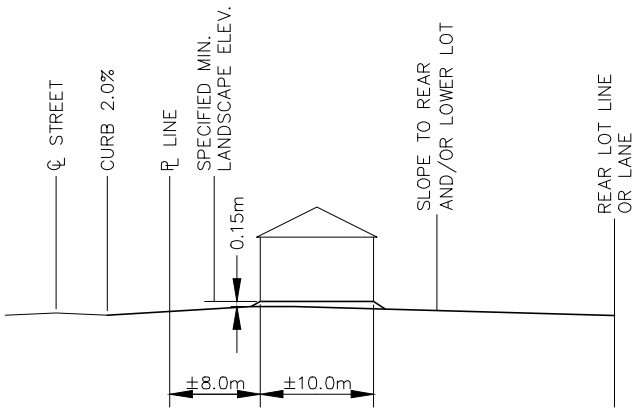
N.T.S.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

TYPICAL FRONT LOT DRAINAGE TYPE A

DATE: 2017/05/02

FIGURE: R-11



CONVENTIONAL HOUSE TYPE

N.T.S.

LANDSCAPE CRITERIA

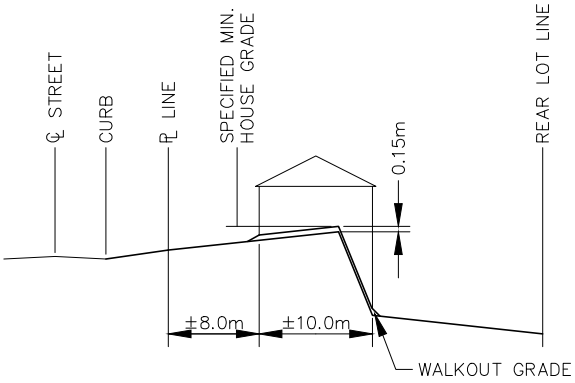
NOTE: TO BE USED AS A GUIDELINE ONLY

CRITERIA 1 – FOR FRONT OF LOT HIGHER THAN BACK OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER FRONT CORNER + 0.50m UNLESS THE HIGHER FRONT CORNER IS 0.20m OR MORE ABOVE THE LOWER FRONT CORNER, THEN USE CRITERIA 2.

CRITERIA 2 – FOR FRONT OF LOT CORNER HIGHER THAN BACK OF LOT CORNER, MINIMUM LANDSCAPE ELEVATION = HIGHER FRONT CORNER + 0.30m.

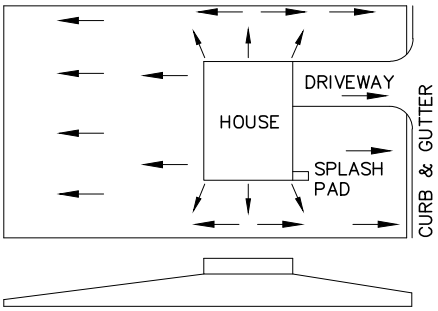
CRITERIA 3 – FOR BACK OF LOT HIGHER THAN FRONT OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER BACK CORNER + 0.30m UNLESS ANY BACK LOT ELEVATION IS GREATER THAN 0.50m ABOVE FRONT ELEVATION IN WHICH CASE SPECIAL CONSIDERATION IS TO BE GIVEN.

SPECIAL APPROVAL IS REQUIRED FOR BASEMENT WALKOUT HOUSE TYPE.



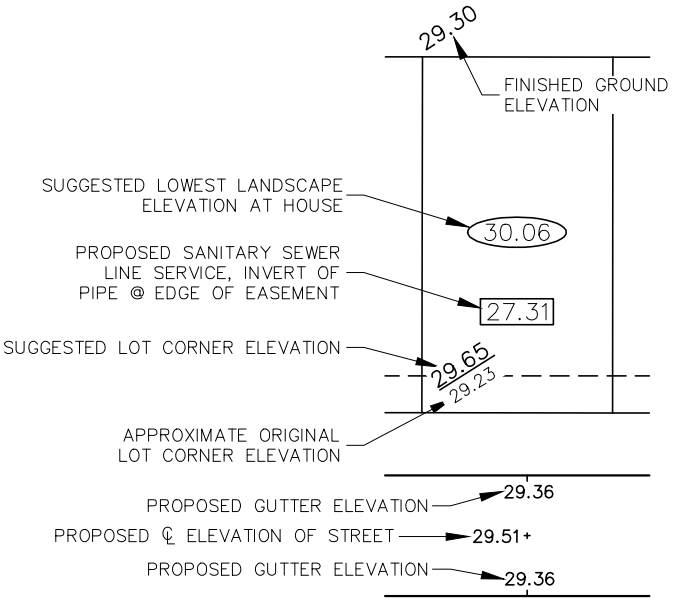
WALKOUT OR BACKSPLIT HOUSE TYPE

N.T.S.



SPLIT LOT DRAINAGE

N.T.S.



TYPICAL LOT GRADING SECTION

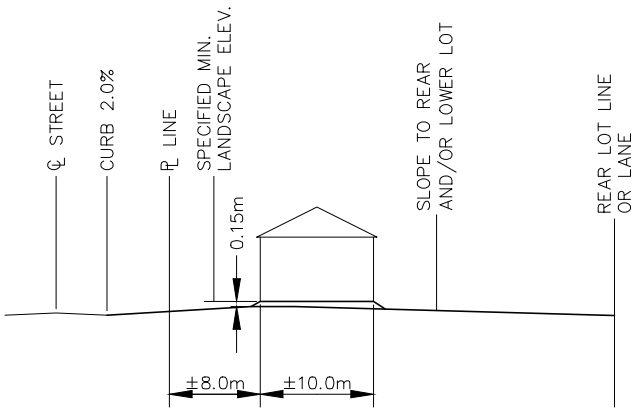
N.T.S.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

TYPICAL SPLIT LOT DRAINAGE TYPE B

DATE: 2017/05/02

FIGURE: R-12



CONVENTIONAL HOUSE TYPE

N.T.S.

LANDSCAPE CRITERIA

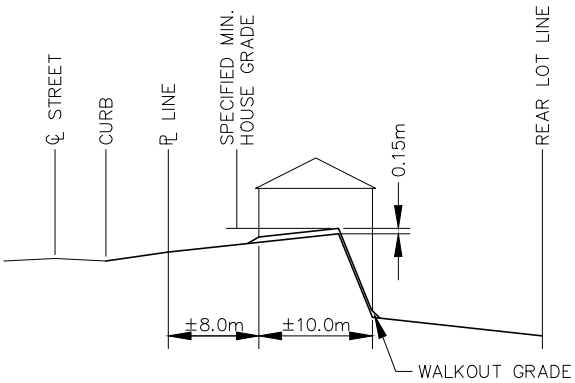
NOTE: TO BE USED AS A GUIDELINE ONLY

CRITERIA 1 – FOR FRONT OF LOT HIGHER THAN BACK OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER FRONT CORNER + 0.50m UNLESS THE HIGHER FRONT CORNER IS 0.20m OR MORE ABOVE THE LOWER FRONT CORNER, THEN USE CRITERIA 2.

CRITERIA 2 – FOR FRONT OF LOT CORNER HIGHER THAN BACK OF LOT CORNER, MINIMUM LANDSCAPE ELEVATION = HIGHER FRONT CORNER + 0.30m.

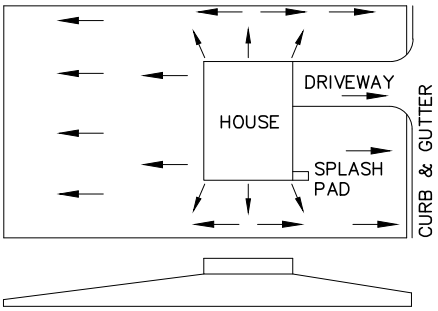
CRITERIA 3 – FOR BACK OF LOT HIGHER THAN FRONT OF LOT, MINIMUM LANDSCAPE ELEVATION = LOWER BACK CORNER + 0.30m UNLESS ANY BACK LOT ELEVATION IS GREATER THAN 0.50m ABOVE FRONT ELEVATION IN WHICH CASE SPECIAL CONSIDERATION IS TO BE GIVEN.

SPECIAL APPROVAL IS REQUIRED FOR BASEMENT WALKOUT HOUSE TYPE.



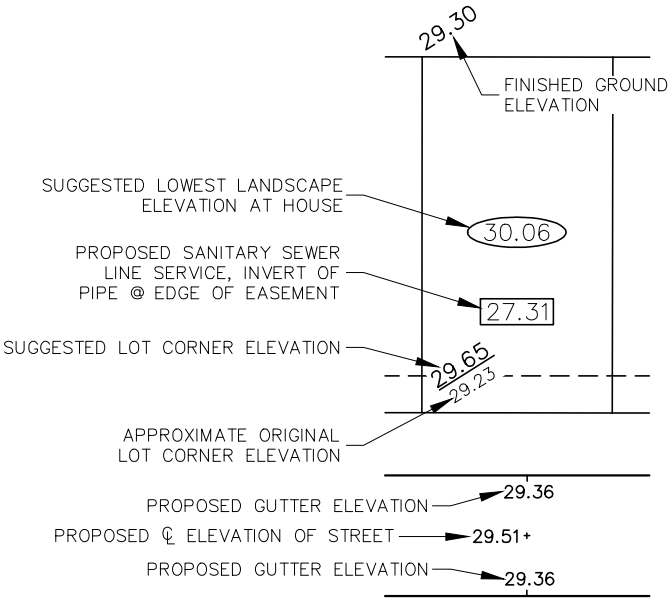
WALKOUT OR BACKSPLIT HOUSE TYPE

N.T.S.



SPLIT LOT DRAINAGE

N.T.S.



TYPICAL LOT GRADING SECTION

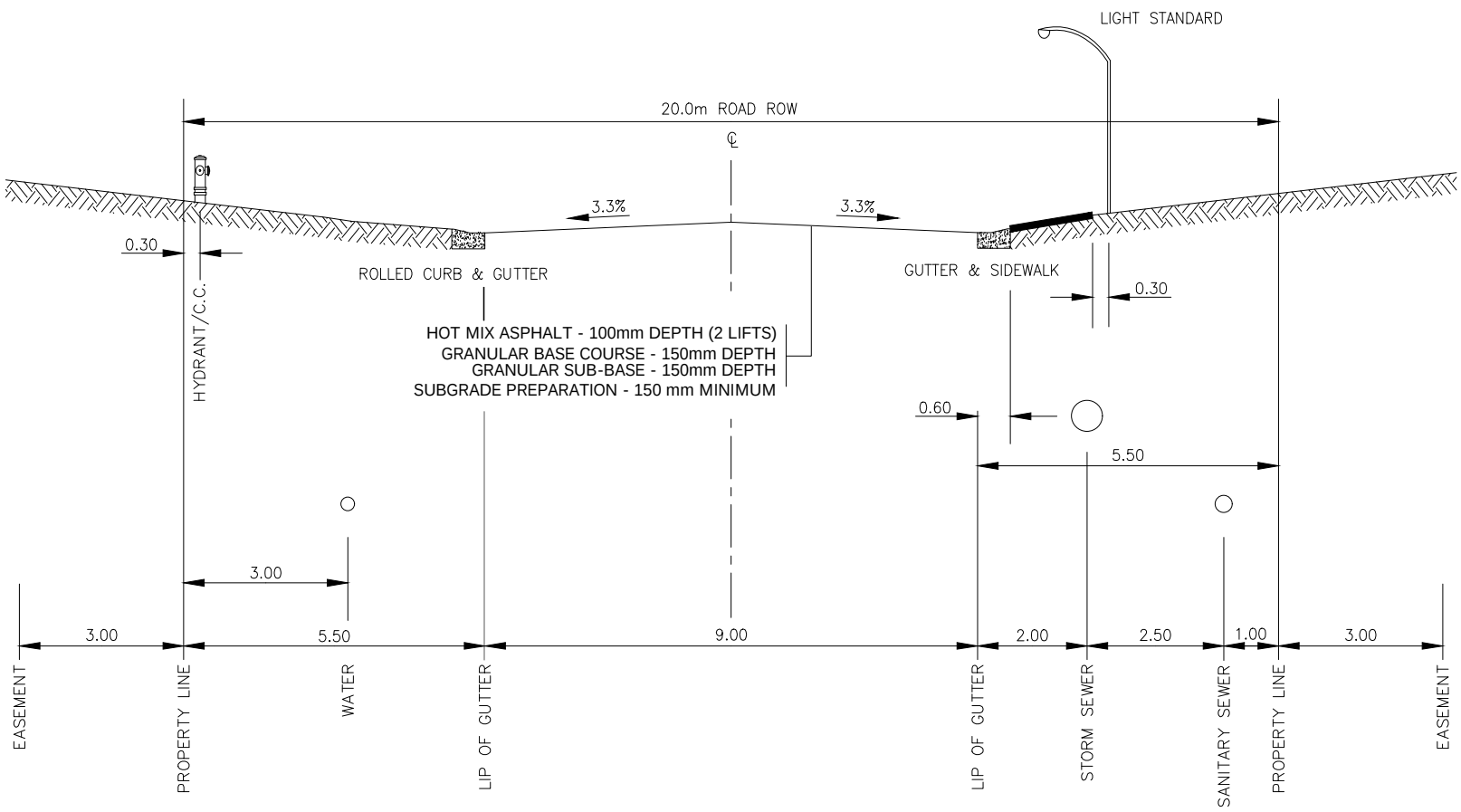
N.T.S.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

TYPICAL REAR LOT DRAINAGE TYPE C

DATE: 2017/05/02

FIGURE: R-13

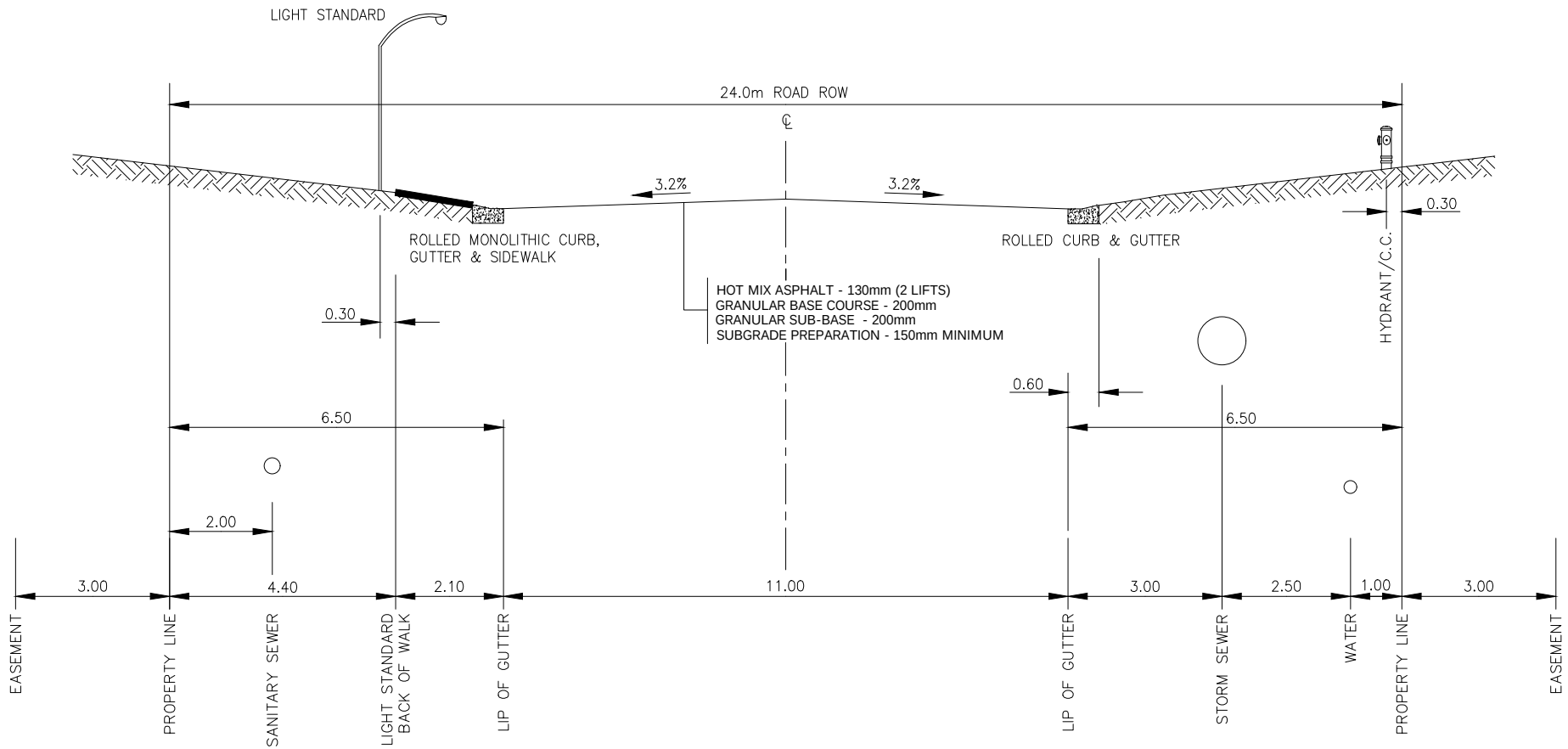


DATE:
2017/05/04

FIGURE:
R-14

9.0m RESIDENTIAL STREET SECTION WITH MONOLITHIC SIDEWALK 20.0m ROAD RIGHT-OF-WAY

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

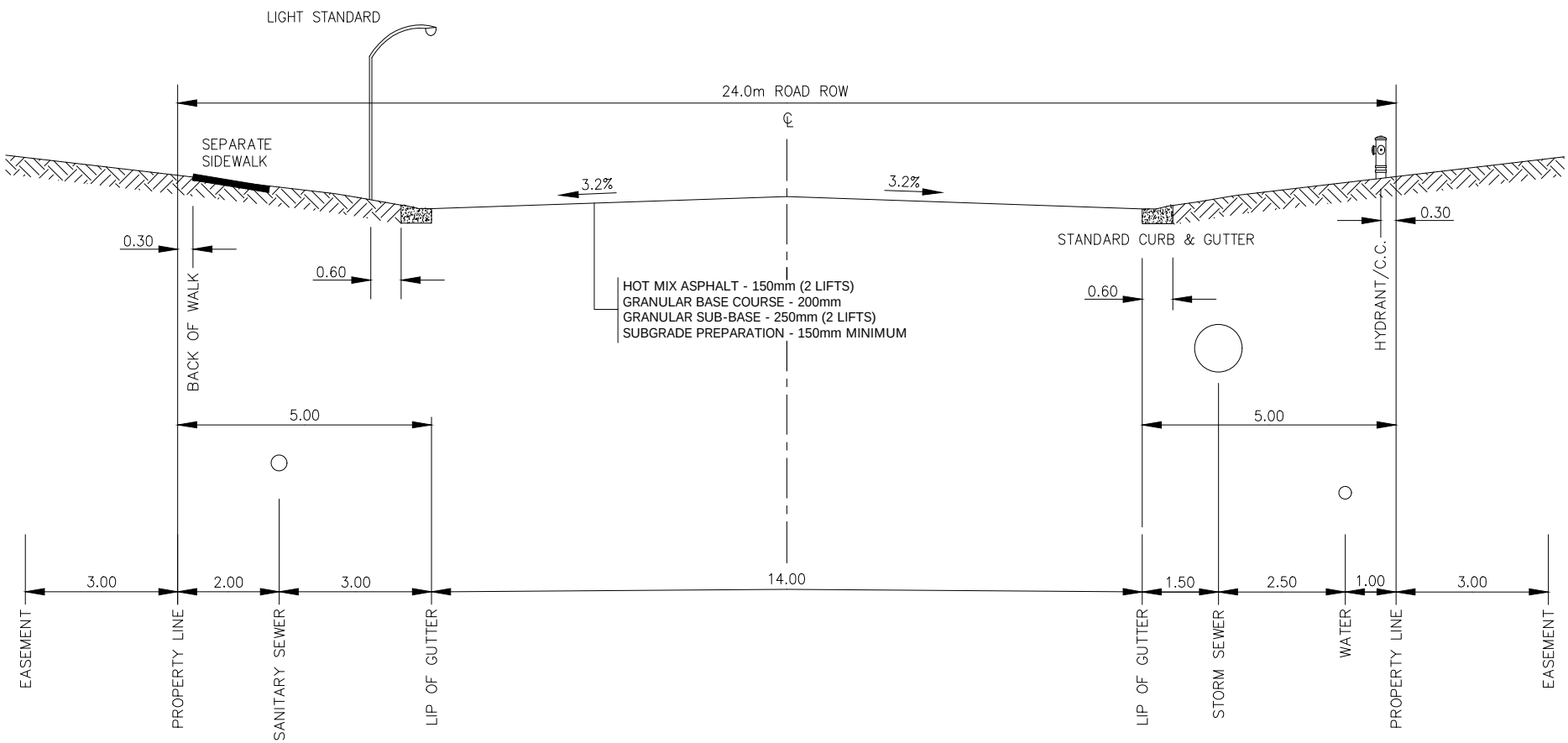


DATE:
2017/05/04

FIGURE:
R–15

11.0m RESIDENTIAL MAJOR COLLECTOR STREET SECTION WITH MONOLITHIC SIDEWALK 24.0m ROAD RIGHT–OF–WAY

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

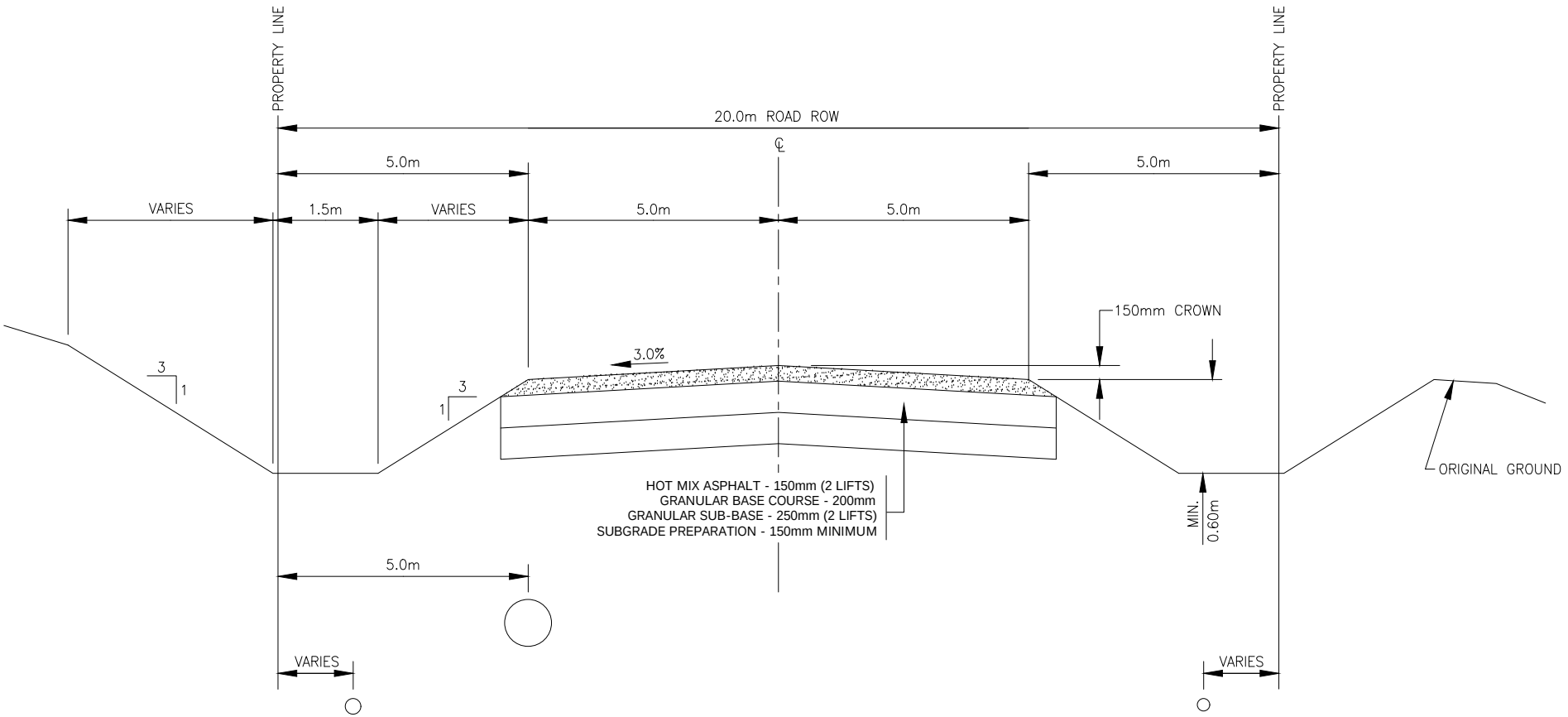


DATE:
2017/05/04

FIGURE:
R-16

14.0m INDUSTRIAL/COMMERCIAL MAJOR COLLECTOR STREET SECTION WITH SEPERATE SIDEWALK 24.0m ROAD RIGHT-OF-WAY

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

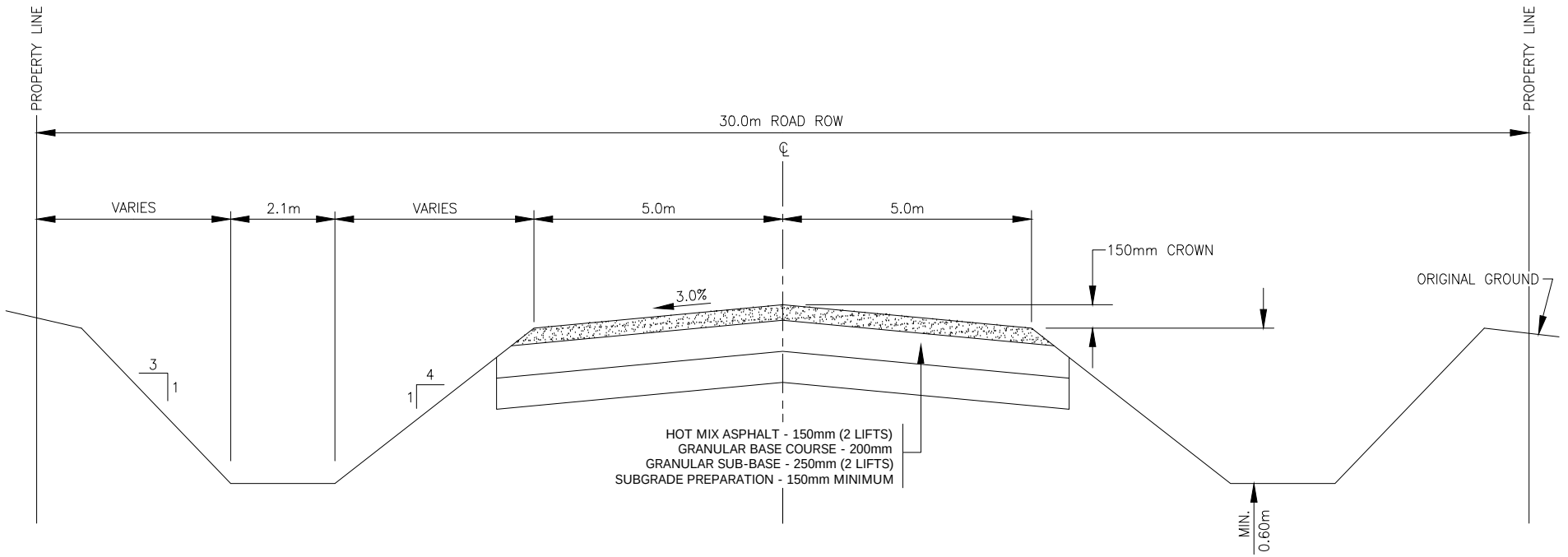


DATE:
2017/05/04

FIGURE:
R-17

10.0m INDUSTRIAL/COMMERCIAL MAJOR COLLECTOR STREET SECTION WITH SEPARATE SIDEWALK 20.0m ROAD RIGHT-OF-WAY

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

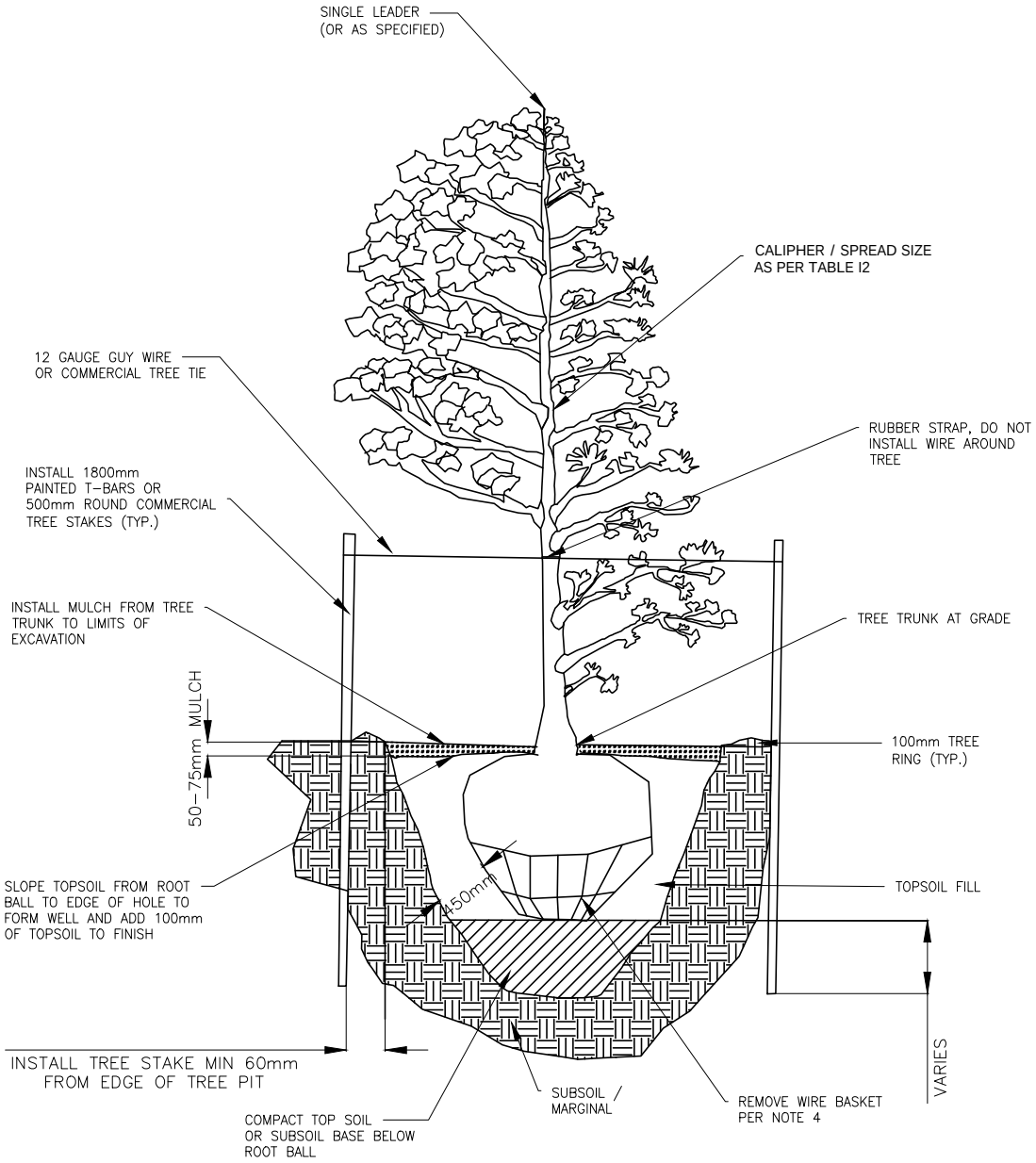


DATE:
2017/05/04

FIGURE:
R-18

10.0m INDUSTRIAL/COMMERCIAL MAJOR COLLECTOR STREET SECTION WITH DITCHES 30.0m ROAD RIGHT-OF-WAY

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE



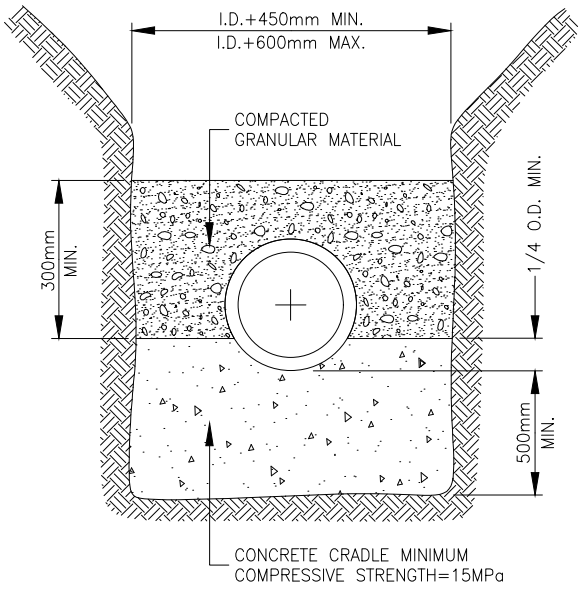
NOTE:
1. REMOVE AIR POCKETS WHEN BACKFILLING.
2. STAKES TO BE PLACED AWAY FROM ROOT BALL.
3. PLANT TREE(S) 25-50mm BELOW EXISTING GROUND LEVEL. IN SOILS CONTAINING HEAVY CLAY, PLANT TREE AT GROUND LEVEL AND BUILD A TOPSOIL WELL ABOVE GRADE.
4. CUT STRAPPING AND PULL DOWN BURLAP AND BASKET FROM THE TOP HALF OF ROOT BALL.
5. TREES TO BE PROTECTED FROM GUY WIRE ENDS USING RUBBER STRAPS.
6. PRUNE DEAD BRANCHES FROM OF TREE.
7. DIMENSIONS ARE IN MILLIMETERS.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

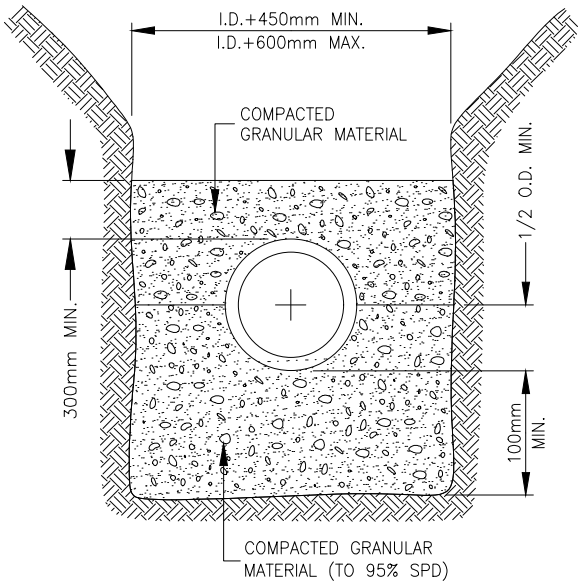
TREE PLANTING DETAILS

DATE: 2018/05/24

FIGURE: R-19

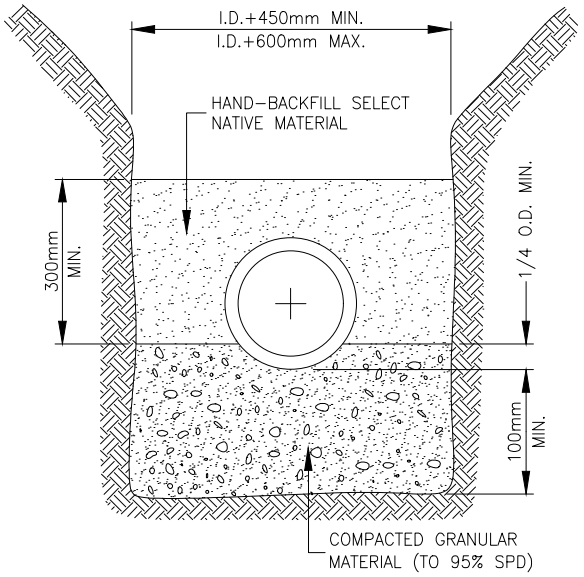


CLASS 'A'

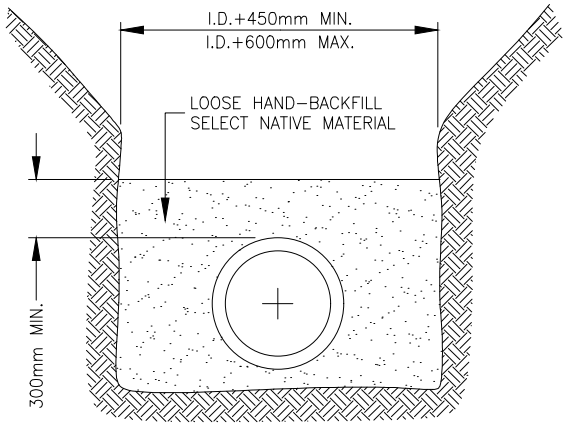


CLASS 'B'
(WATER AND SEWER)

NOTE: ALL GRANULAR BEDDING AND BACKFILL MATERIALS TO BE COMPACTED TO MINIMUM 95% S.P.D. UNLESS OTHERWISE SPECIFIED



CLASS 'C'



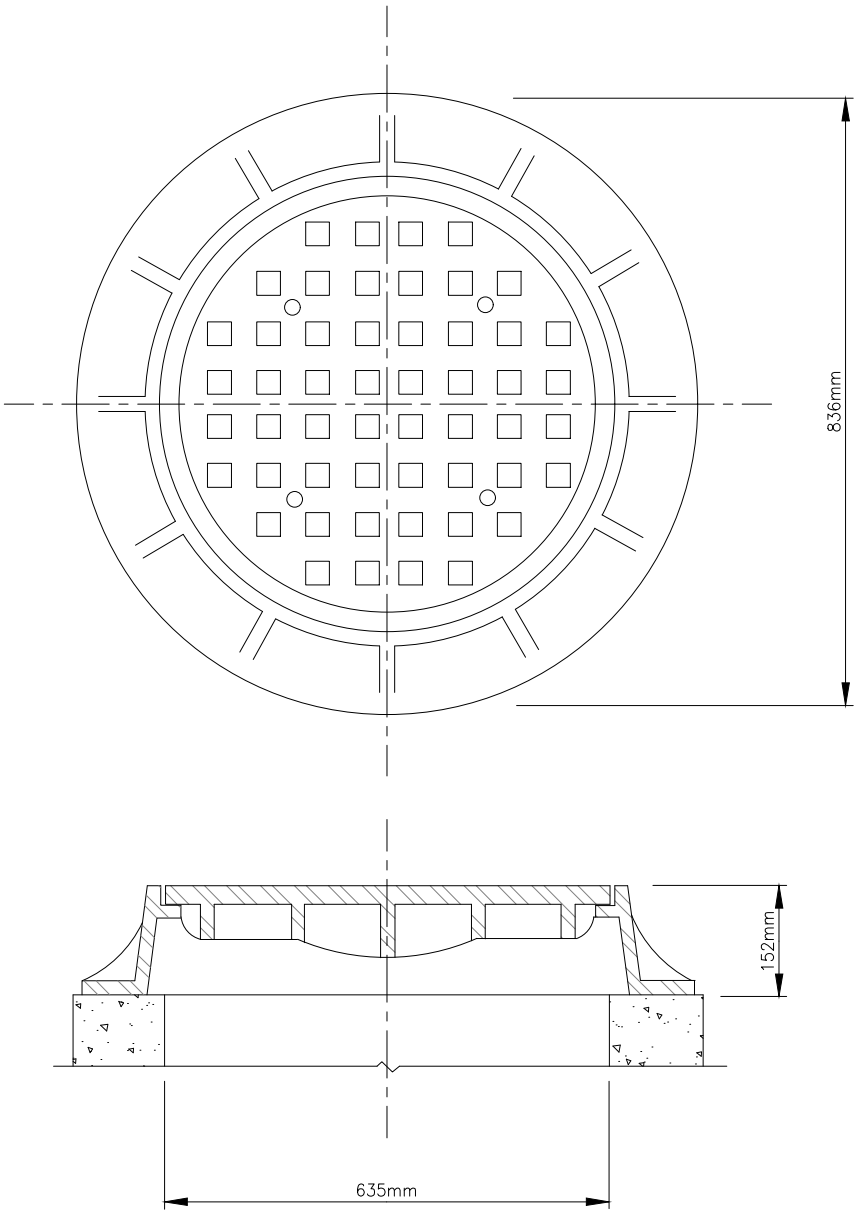
CLASS 'D'

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

PIPE BEDDING DETAILS

DATE: 2017/05/02

FIGURE: U-1



NOTES:

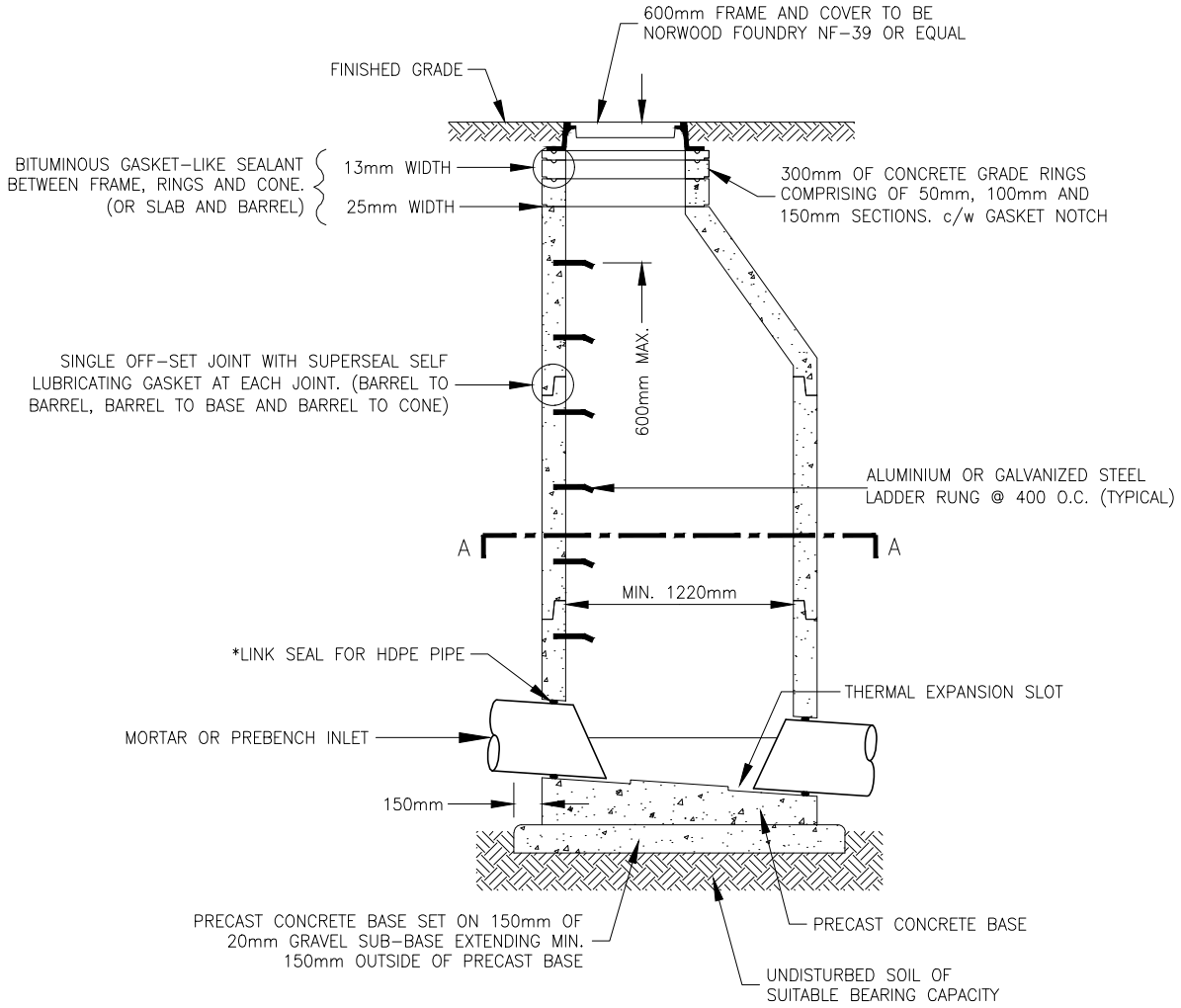
1. MATERIALS: FRAME & COVER–GRAY IRON CLASS 20B
2. PROPORTIONING AND PRODUCING QUALITY CONCRETE AS WELL AS ACCEPTANCE TESTS FOR THE CONSTITUENT MATERIALS ARE SPECIFIED IN CSA STANDARDS A23.1 AND A23.4 FOR CAST–IN–PLACE AND PRECAST CONCRETE RESPECTIVELY.
3. NORWOOD FOUNDRY F–39 OR EQUAL

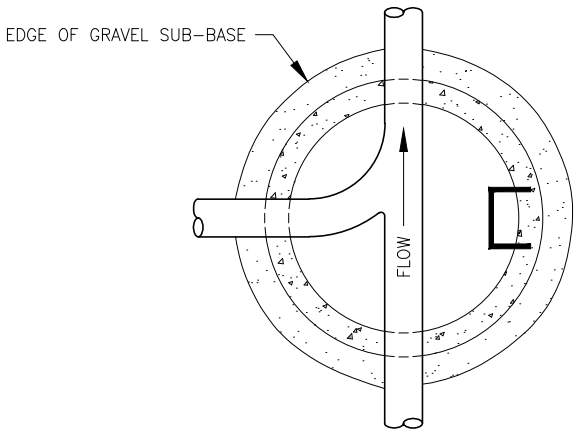
TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

STANDARD FRAME AND COVERS FOR MANHOLES

DATE: 2017/05/02

FIGURE: U–2





SECTION A-A

NOTES:

1. LINK SEAL FOR HDPE PIPE TO BE SET TO ALLOW FOR THERMAL MOVEMENT. BENCHING TO PROVIDE ROOM FOR THERMAL EXPANSION.
2. PRIOR TO WARRANTY EXPIRY. THE GAP (IF ANY) IS TO BE MORTARED OR THE PIPE IS TO BE CUT IF NECESSARY.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

MANHOLE DETAIL

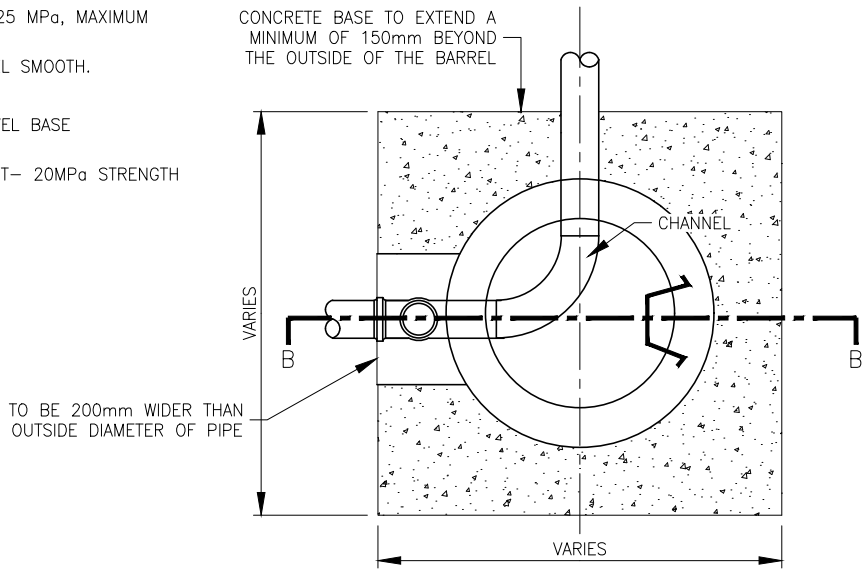
DATE: 2017/05/02

FIGURE: U-3

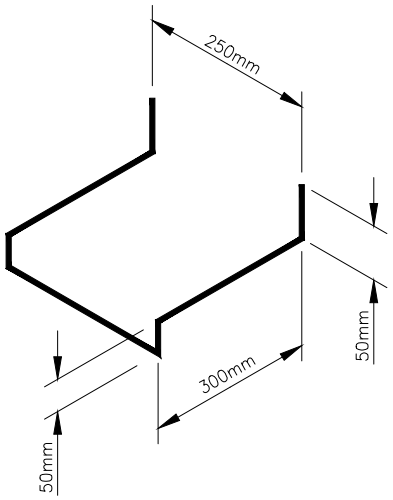
NOTES:

1. ALL CONCRETE SHALL HAVE 28 DAY STRENGTH OF 25 MPa, MAXIMUM SLUMP TO BE 100mm.
2. FORM CHANNEL IN PARTIALLY CONCRETE AND TROWEL SMOOTH.
3. ALL JOINTS MORTARED INSIDE AND OUT.
4. ALL PRECAST BASE ON 150mmx20mm CRUSH GRAVEL BASE EXTENDING 150mm OUTSIDE PRECAST BASE.
5. ALL CONCRETE MATERIAL TO BE SULPHATE RESISTANT– 20MPa STRENGTH IN 28 DAYS.
6. ALL JOINTS TO BE MASTIC SEAL.

MANHOLE DEPTH	BASE DEPTH
UNDER 4.0m	250mm
OVER 4.0m	300mm

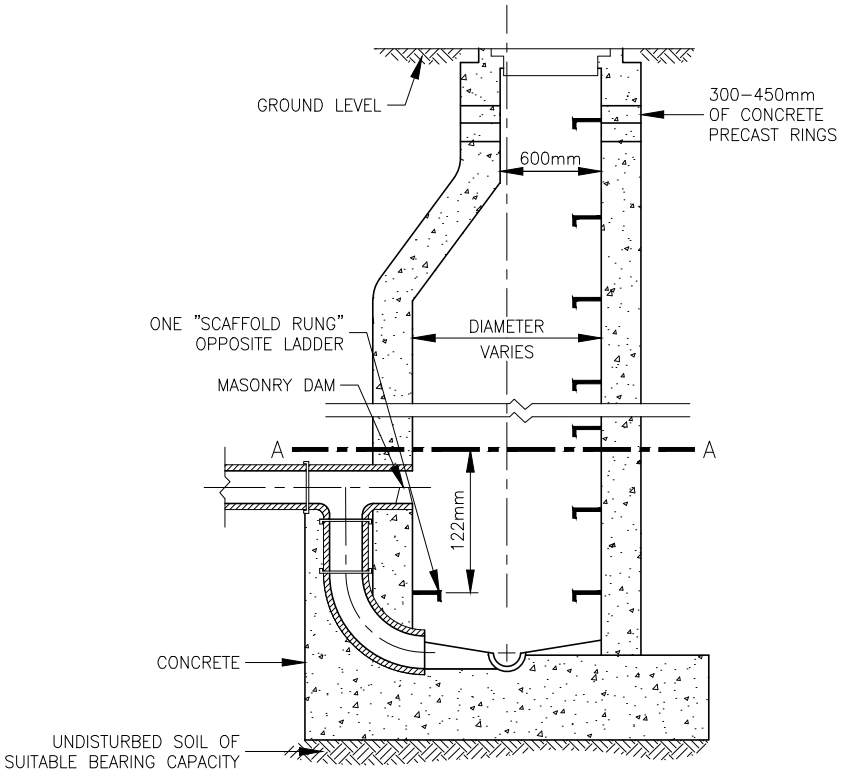


SECTION A–A



MANHOLE RUNG TO BE 20mmø GALVANIZED STEEL @ 450mm O.C.

MANHOLE RUNG



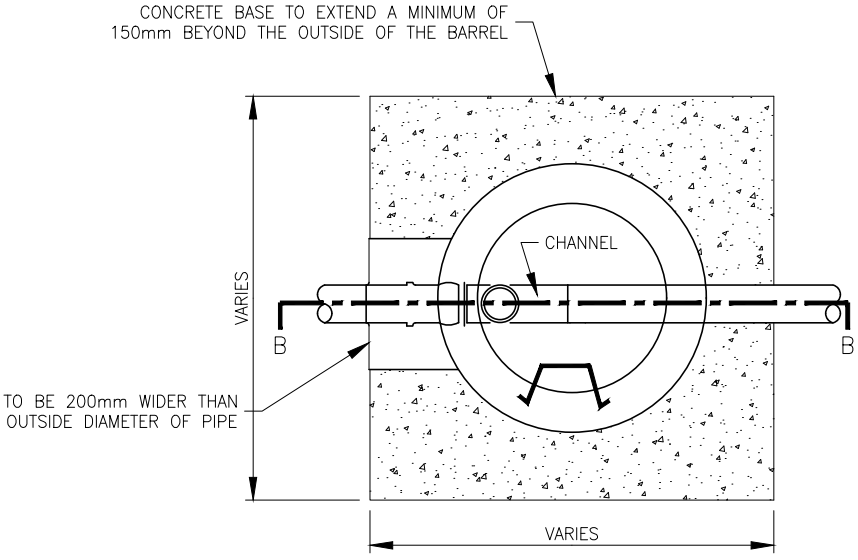
SECTION B–B

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

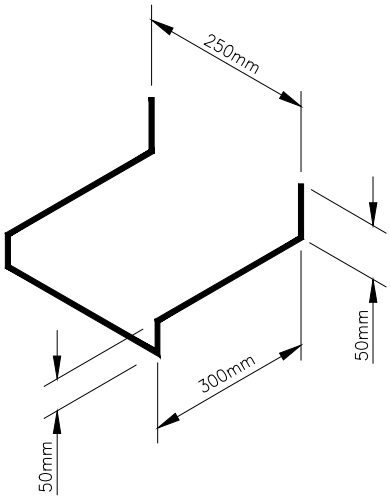
DROP MANHOLE DETAIL

DATE: 2017/05/02

FIGURE: U–4



SECTION A–A



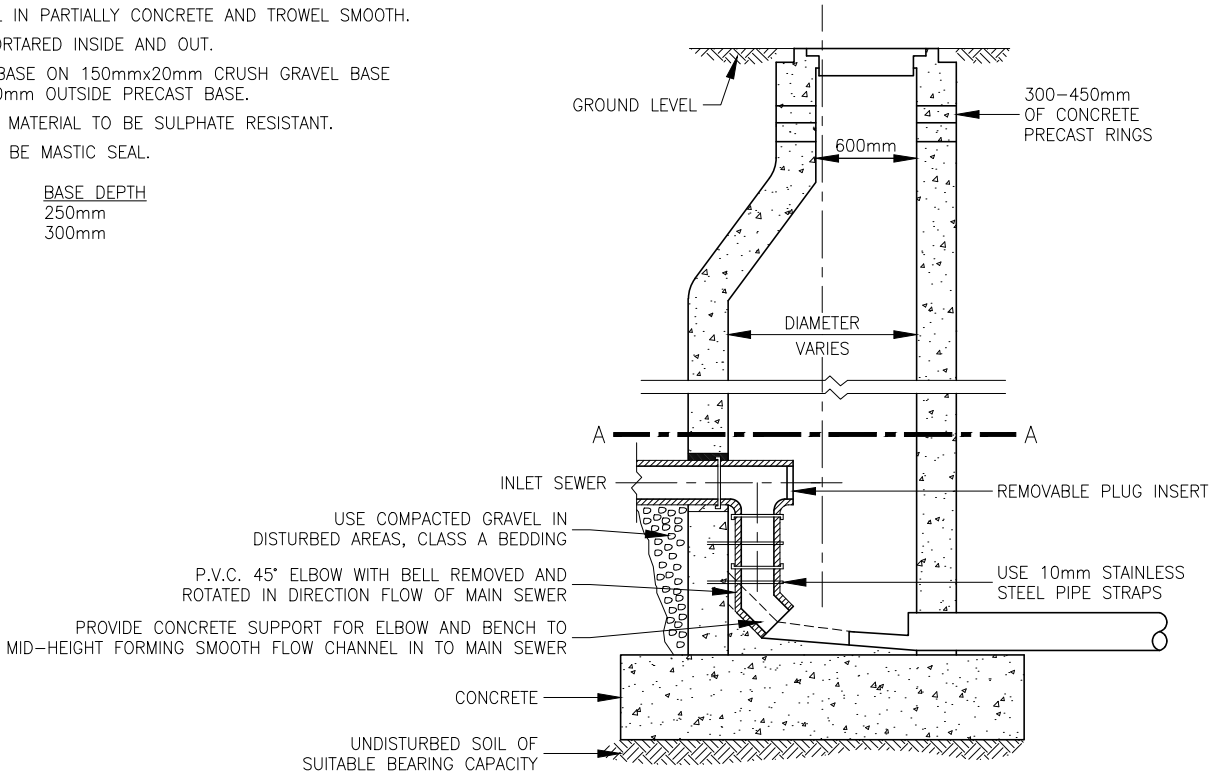
MANHOLE RUNG TO BE 20mmø
GALVANIZED STEEL @ 450mm O.C.

MANHOLE RUNG

NOTES:

1. ALL CONCRETE SHALL HAVE 28 DAY STRENGTH OF 25 MPa, MAXIMUM SLUMP TO BE 100mm.
2. FORM CHANNEL IN PARTIALLY CONCRETE AND TROWEL SMOOTH.
3. ALL JOINTS MORTARED INSIDE AND OUT.
4. ALL PRECAST BASE ON 150mmx20mm CRUSH GRAVEL BASE EXTENDING 150mm OUTSIDE PRECAST BASE.
5. ALL CONCRETE MATERIAL TO BE SULPHATE RESISTANT.
6. ALL JOINTS TO BE MASTIC SEAL.

MANHOLE DEPTH	BASE DEPTH
UNDER 4.0m	250mm
OVER 4.0m	300mm



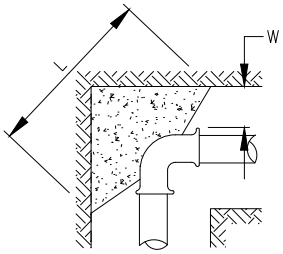
SECTION B–B

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

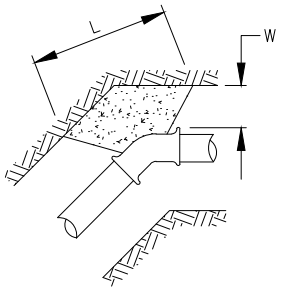
INTERNAL DROP MANHOLE DETAIL

DATE: 2017/05/02

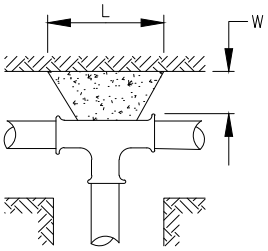
FIGURE: U–5



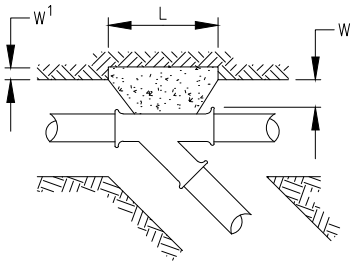
HORIZONTAL 90° BEND



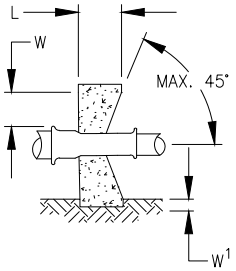
HORIZONTAL 45° BEND



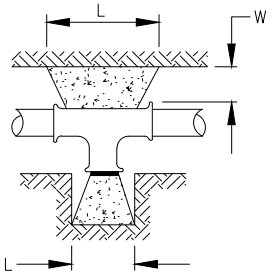
TEE



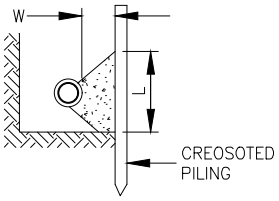
WYE

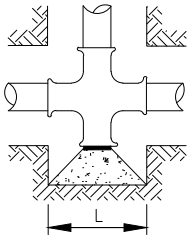


REDUCER

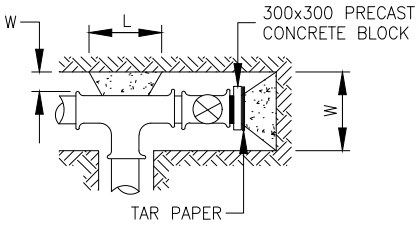


TEE WITH PLUG





CROSS WITH PLUG



TEE WITH VALVE

NOTE:

WHERE GROUND CANNOT BE EXCAVATED TO FREE STANDING UNDISTURBED SOIL, A SMALL PLANK SHEET PILING SHALL BE DRIVEN TO PROVIDE UNDISTURBED THRUST AREA. THE PILING IS TO BE DRIVEN PRIOR TO EXCAVATING FOR THRUST BLOCK. THE PILING SHOULD BE USED ONLY BELOW THE PERMANENT WATER TABLE.

MINIMUM THRUST AREAS FOR FITTINGS AT 1035 kPa PRESSURE AND FOR SOILS WITH MINIMUM BEARING OF 9765 kg/m (NOT TO BE USED FOR SOFT CLAY, MUCK, PEAT, etc.)

TYPE OF FITTING	FITTING SIZE	OUTSIDE OF FITTING TO BEARING FACE	RECESS IN TRENCH WALL	LENGTH	HEIGHT	TYPE OF FITTING	FITTING SIZE	OUTSIDE OF FITTING TO BEARING FACE	RECESS IN TRENCH WALL	LENGTH	HEIGHT
	D	W	W1	L	H		D	W	W1	L	H
90° BEND	150 200 250 300	300 350 375 400		900 1050 1445 1650	450 600 750 900	CROSS	150 200 250 300	300 350 375 400		600 825 975 1200	450 600 825 900
45° BEND	150 200 250 300	300 350 375 400		450 600 750 900	450 600 750 900	45° WYE	150 200 250 300	300 350 375 400	300 400 500 600	450 600 825 900	450 600 825 900
22-1/2° BEND	150 200 250 300	300 350 375 400		450 600 825 900	230 300 450 450	REDUCER*	150 200 250 300	300 350 375 400	150 200 250 300	450 600 825 900	450 600 825 900
TEE	150 200 250 300	300 350 375 400		600 825 975 1200	450 600 825 900	CAPS AND PLUGS (IF NOT BOLTED)	150 200 250 300	300 350 375 400		450 600 825 900	450 600 825 900

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS

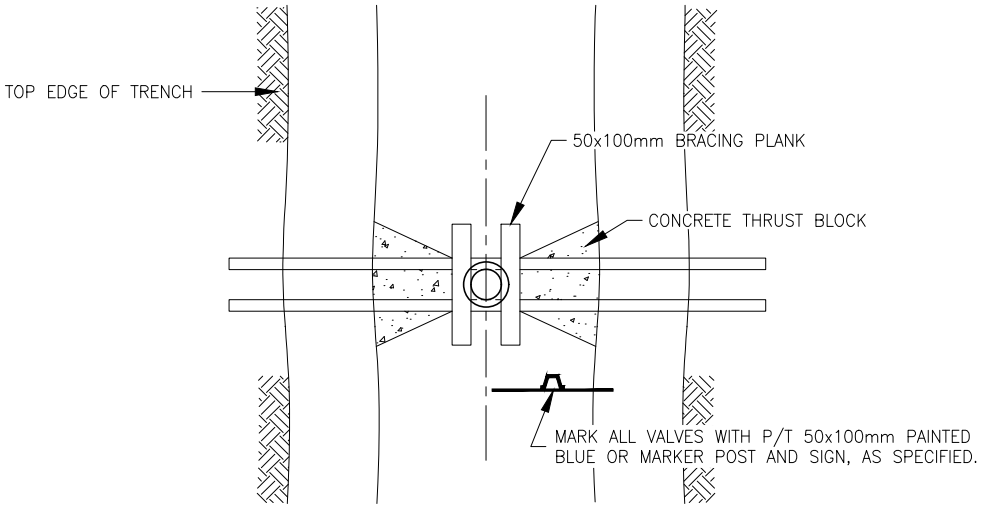
*DIMENSIONS APPLY TO THE LARGER DIAMETER END OF FITTING

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

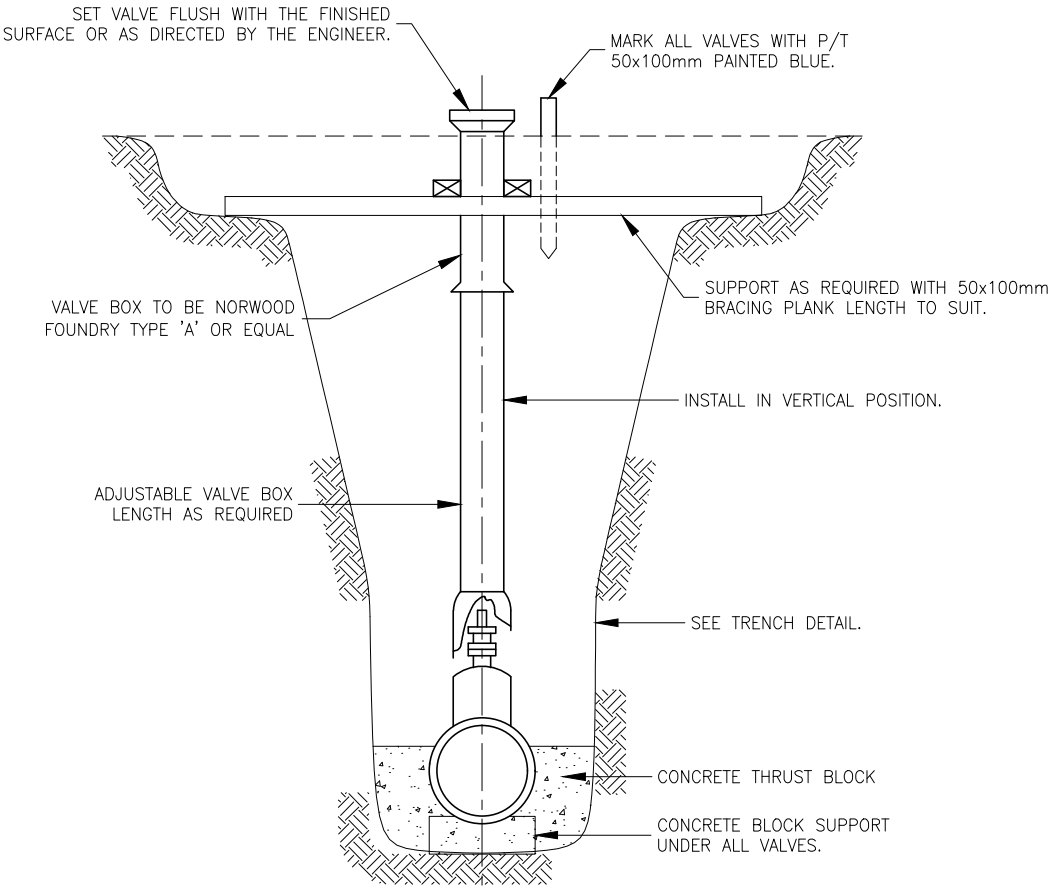
THRUST BLOCK DETAILS

DATE: 2017/05/02

FIGURE: U-6



PLAN



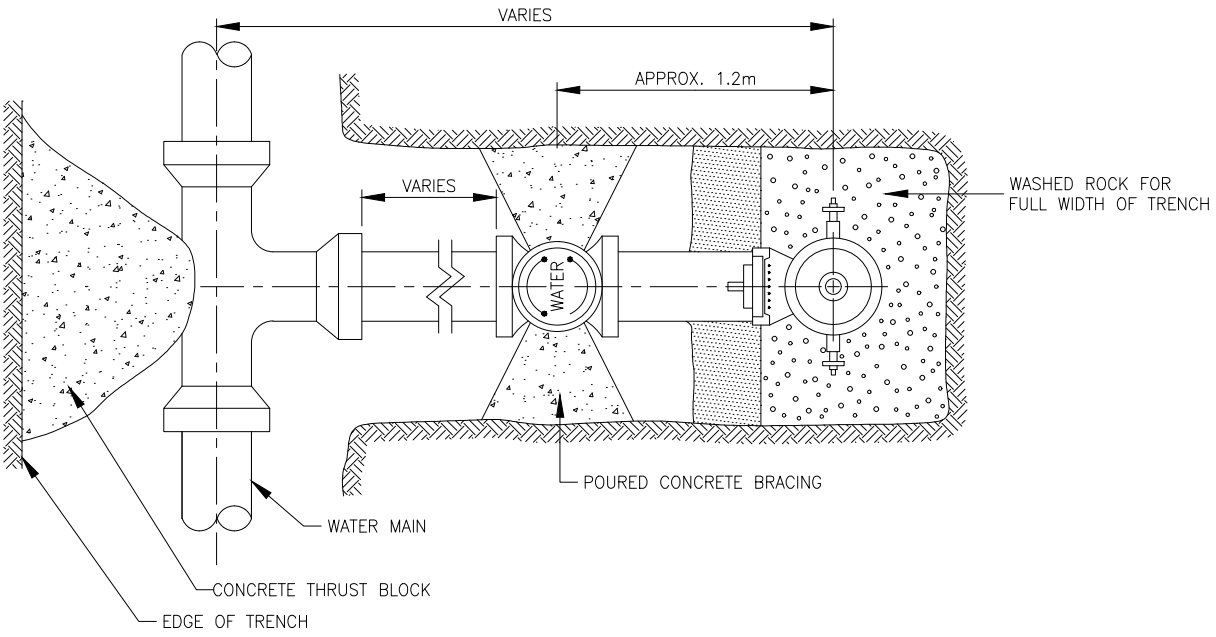
PROFILE

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

VALVE BOX DETAIL

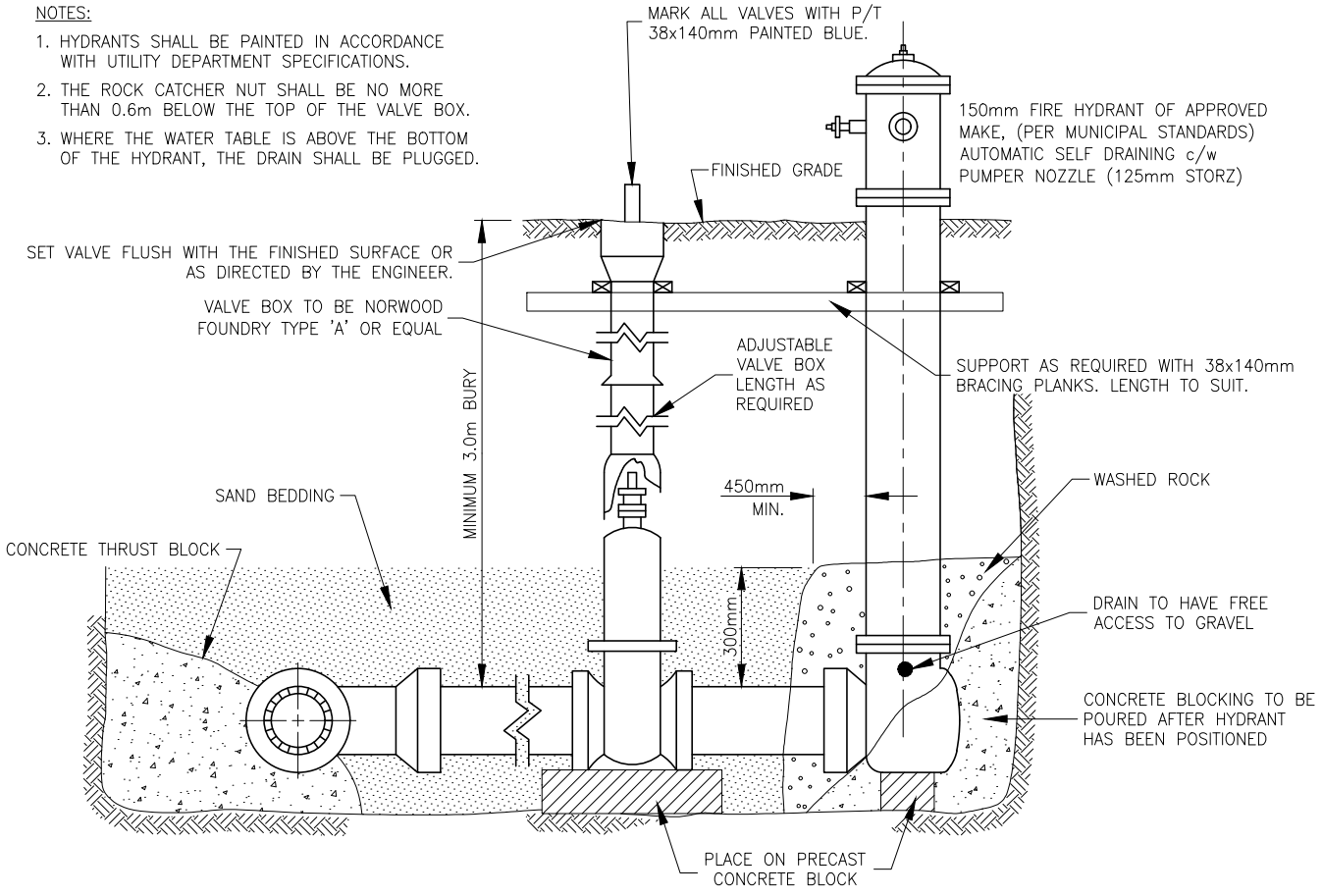
DATE: 2017/05/02

FIGURE: U-7



NOTES:

1. HYDRANTS SHALL BE PAINTED IN ACCORDANCE WITH UTILITY DEPARTMENT SPECIFICATIONS.
2. THE ROCK CATCHER NUT SHALL BE NO MORE THAN 0.6m BELOW THE TOP OF THE VALVE BOX.
3. WHERE THE WATER TABLE IS ABOVE THE BOTTOM OF THE HYDRANT, THE DRAIN SHALL BE PLUGGED.

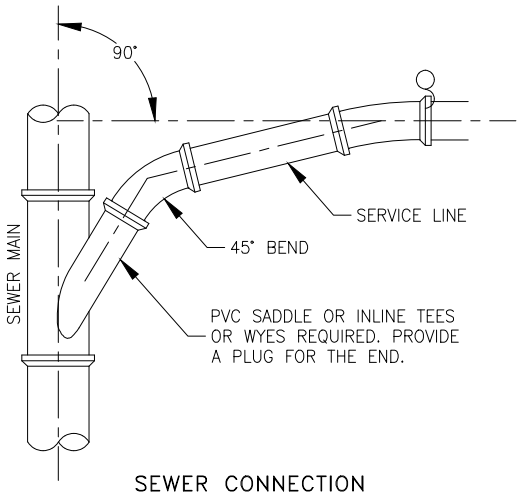


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

OFF-LINE HYDRANT DETAIL

DATE: 2017/05/02

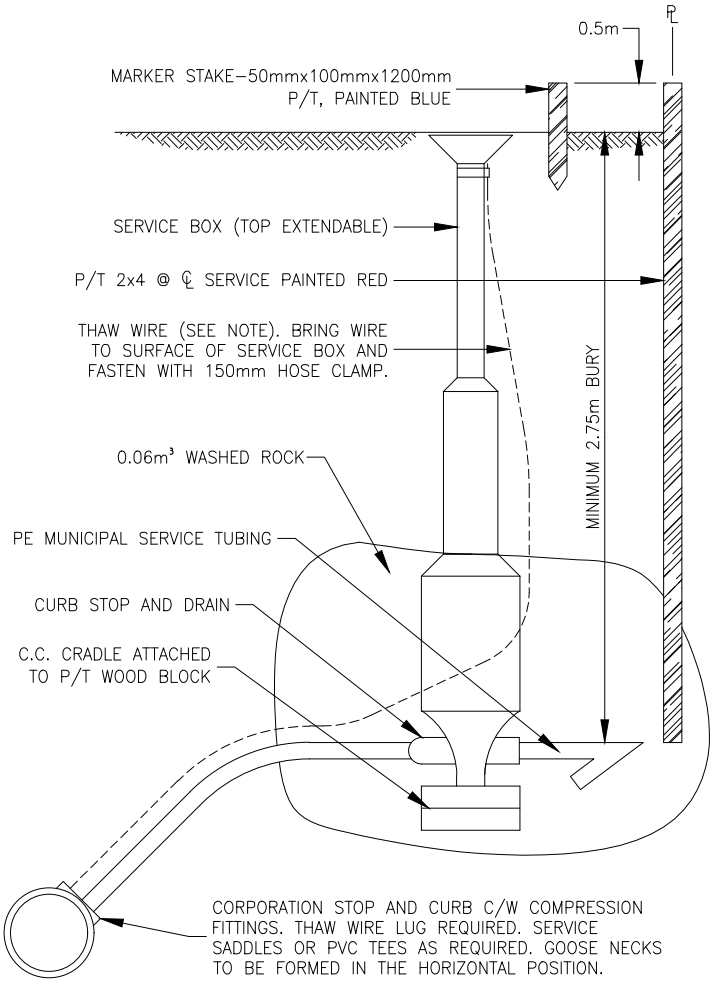
FIGURE: U-8



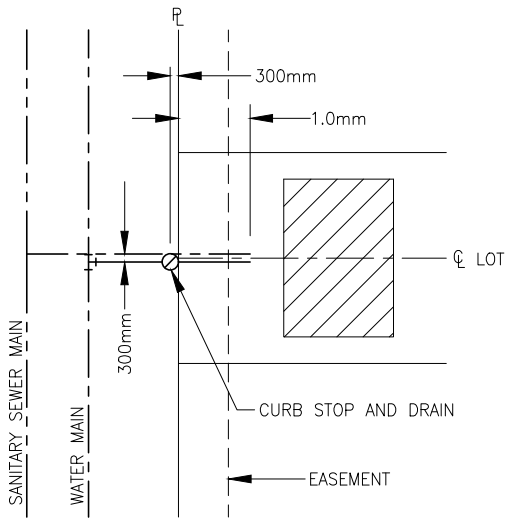
SEWER CONNECTION
PLAN VIEW

NOTES:

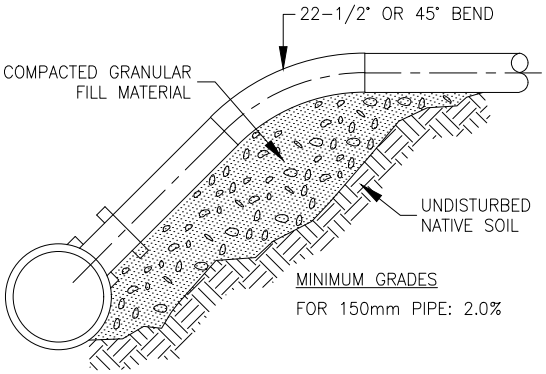
1. SERVICES SHALL BE LAID TO THE CENTERLINE OF THE LOT UNLESS SHOWN OTHERWISE. THE END OF THE PIPE SHALL BE PLUGGED.
2. No. 2 SOLID OR STRANDED POLY-COATED WIRE SHALL BE INSTALLED AS SHOWN ON THIS PLAN FOR COPPER WATER SERVICES.
3. WHERE THE WATER CONNECTION ENDS AT THE STREET PROPERTY LINE, 300mm OF WATER PIPE SHALL BE INSTALLED PAST THE CURB STOP, OR AS OTHERWISE SHOWN. THE END OF THE PIPE SHALL BE CRIMPED OR PLUGGED.
4. SERVICE BOX TO BE TOP EXTENDABLE ONLY.



WATER SECTION



PLAN VIEW



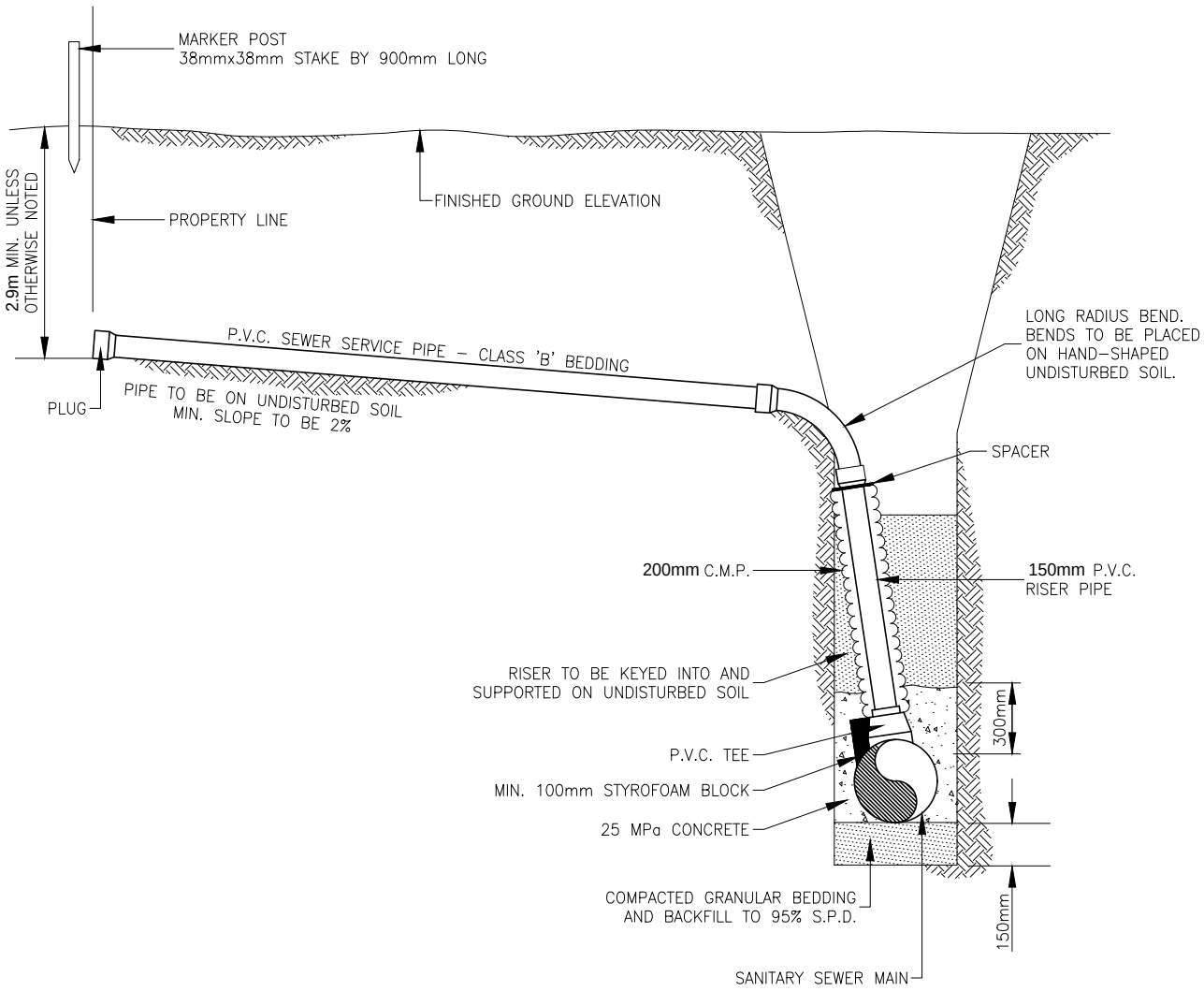
SEWER SECTION

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

SINGLE WATER & SANITARY SEWER SERVICE (NEW INSTALLATION)

DATE: 2017/05/02

FIGURE: U-9

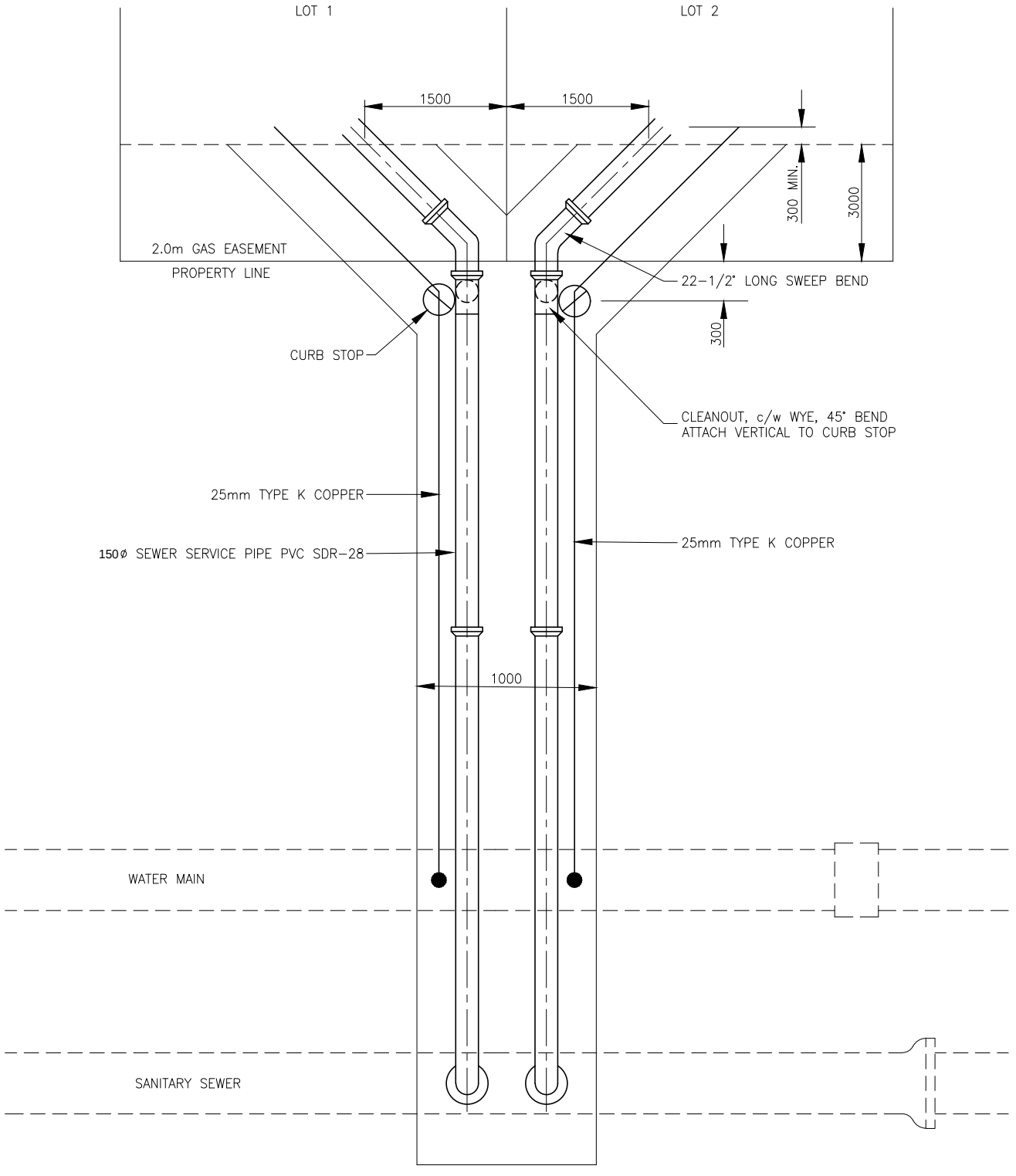


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

SANITARY SEWER SERVICE CONNECTOR RISER

DATE: 2017/05/02

FIGURE: U-10

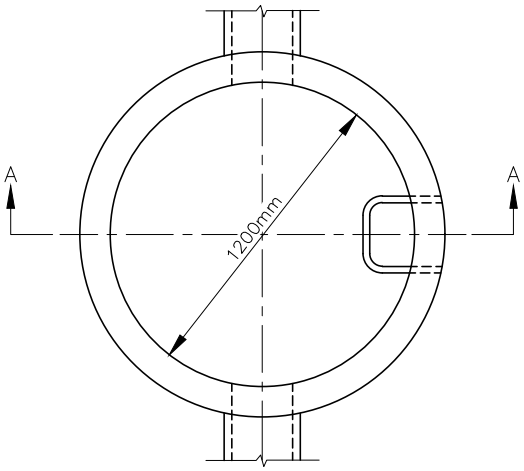


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

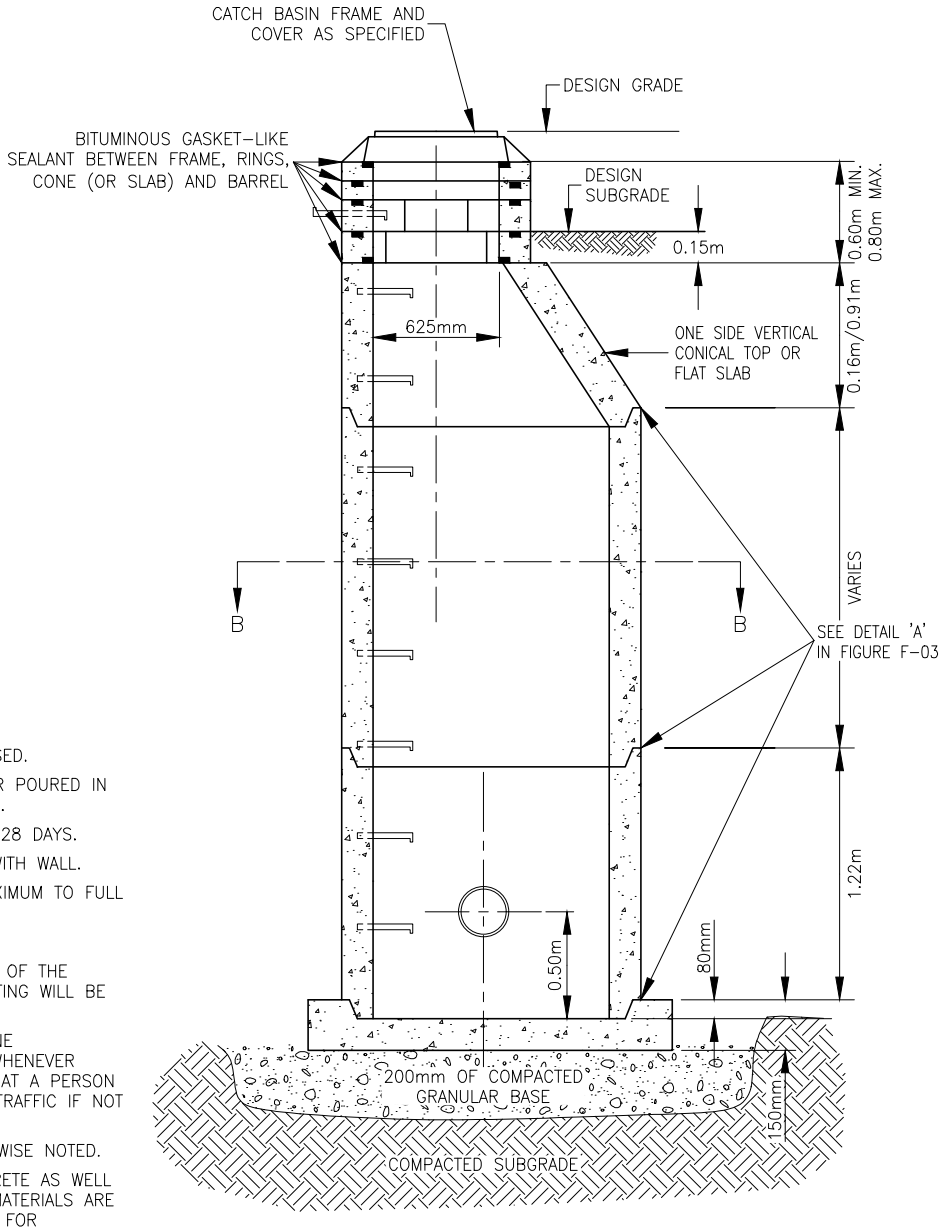
DUAL WATER & SANITARY SEWER SERVICE (NEW INSTALLATION)

DATE: 2017/05/02

FIGURE: U-11



SECTION B – B



SECTION A – A

NOTES:

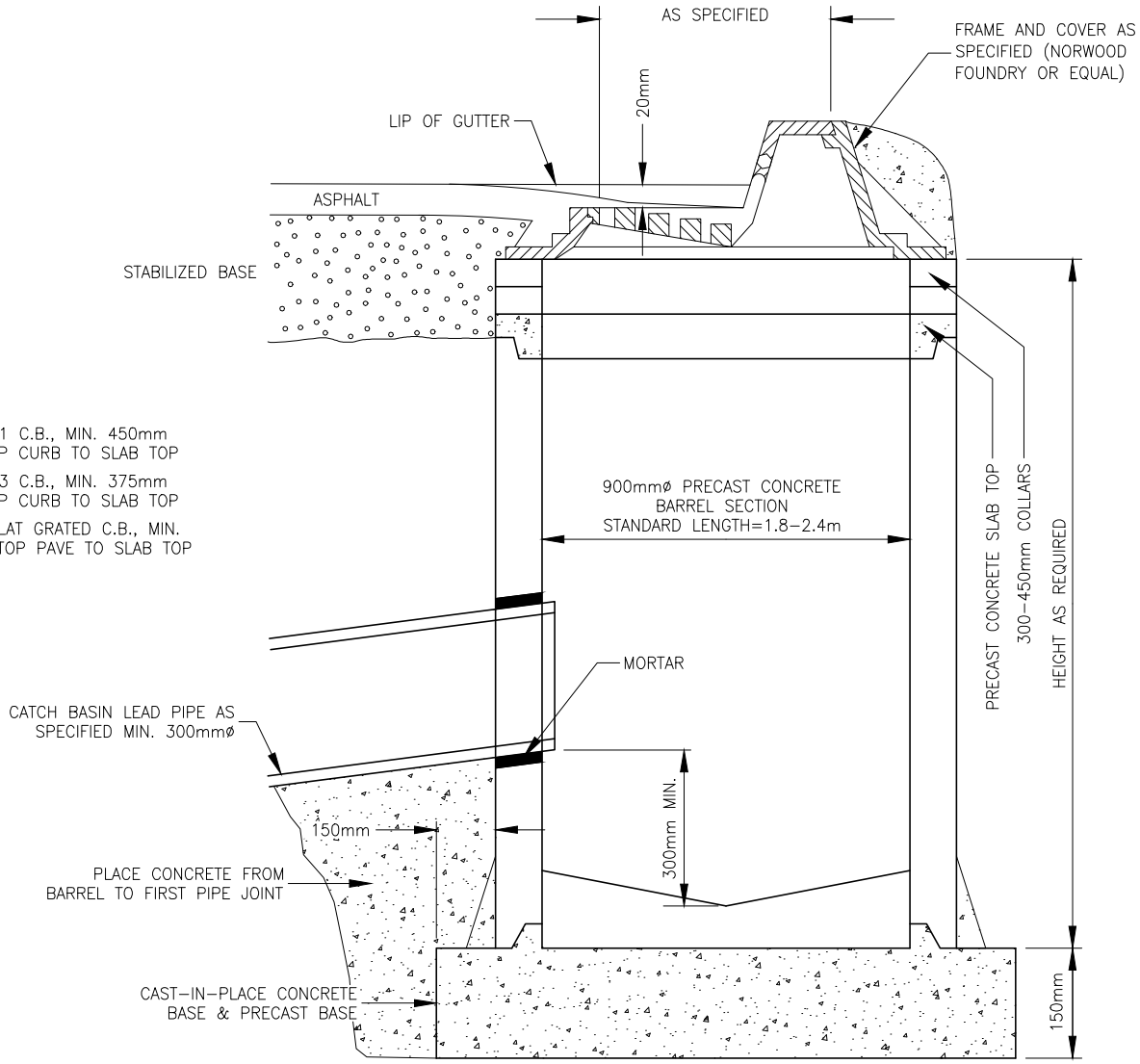
1. MANHOLE BARRELS TO MEET ASTM. C478.
2. POURED IN PLACE CONCRETE BASES MAY BE USED.
3. FOR CB.M.H. OVER 5.0m IN DEPTH, PRECAST OR POURED IN PLACE BASES SHALL BE REINFORCED WITH BARS.
4. POURED IN PLACE CONCRETE TO BE 20MPa AT 28 DAYS.
5. INLET & OUTLET PIPE TO BE GROUTED FLUSH WITH WALL.
6. GALVANIZED STEEL SAFETY STEPS AT 0.41m MAXIMUM TO FULL HEIGHT OF M.H..
7. RUBBER GASKET JOINTS.
8. SAFETY GRATING TO BE USED WHEN THE DEPTH OF THE MANHOLE EXCEEDS 5 METRES. THE SAFETY GRATING WILL BE PLACED AT 3m BELOW THE MANHOLE TOP.
9. SAFETY STEPS SHALL BE ALIGNED ON CENTERLINE PERPENDICULAR TO THE MAIN FLOW CHANNEL. WHENEVER POSSIBLE, THE STEPS SHALL BE ALIGNED SO THAT A PERSON EXITING THE MANHOLE WOULD FACE ONCOMING TRAFFIC IF NOT CONFLICTING WITH THE PREVIOUS REQUIREMENT.
10. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
11. PROPORTIONING AND PRODUCING QUALITY CONCRETE AS WELL AS ACCEPTANCE TESTS FOR THE CONSTITUENT MATERIALS ARE SPECIFIED IN CSA STANDARDS A23.1 AND A23.4 FOR CAST–IN–PLACE AND PRECAST CONCRETE RESPECTIVELY.
12. ALL BARREL JOINTS TO BE GROUTED.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

PRECAST CONCRETE CATCH BASIN MANHOLE

DATE: 2017/05/02

FIGURE: U–12



NOTES:

- FOR F–51 C.B., MIN. 450mm FROM TOP CURB TO SLAB TOP
- FOR F–33 C.B., MIN. 375mm FROM TOP CURB TO SLAB TOP
- FOR F–FLAT GRATED C.B., MIN. 300mm TOP PAVE TO SLAB TOP

NOTES:

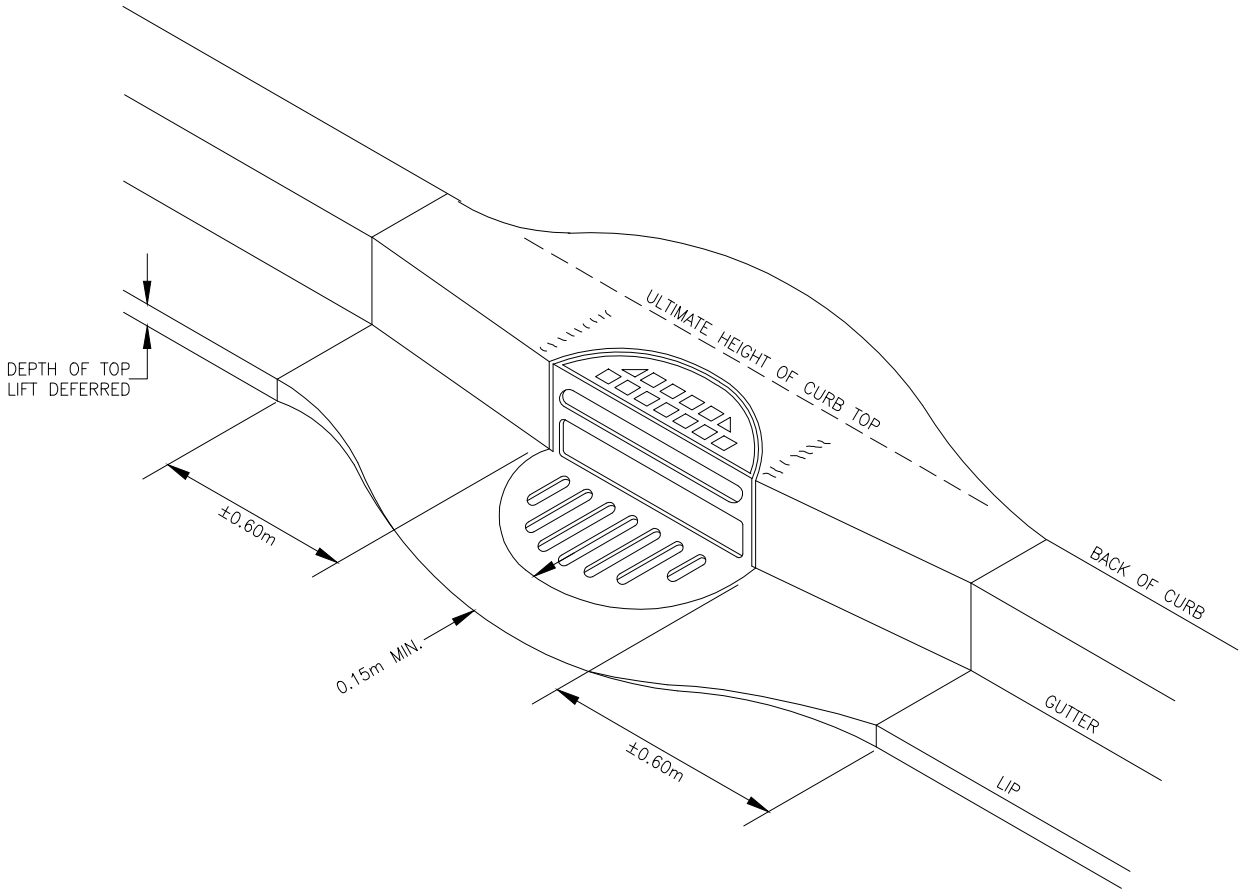
1. CONCRETE BASE POURED IN PLACE. MIN. 150mm THICK, 25MPa TYPE 50 CEMENT.
2. ALTERNATE PRECAST CONCRETE BASE SET ON MIN. 150mm THICK 20mm CRUSH GRAVEL BASE EXTENDING 150mm OUTSIDE BASE.
3. BASE PLACED ON UNDISTURBED SOIL OF SUITABLE BEARING CAPACITY FOR POURED BASE ONLY.
4. MINIMUM DEPTH OF COVER SHALL BE 1.5m TO TOP OF PIPE.
5. PRECAST SECTIONS TO CONFORM TO ASTM C478.

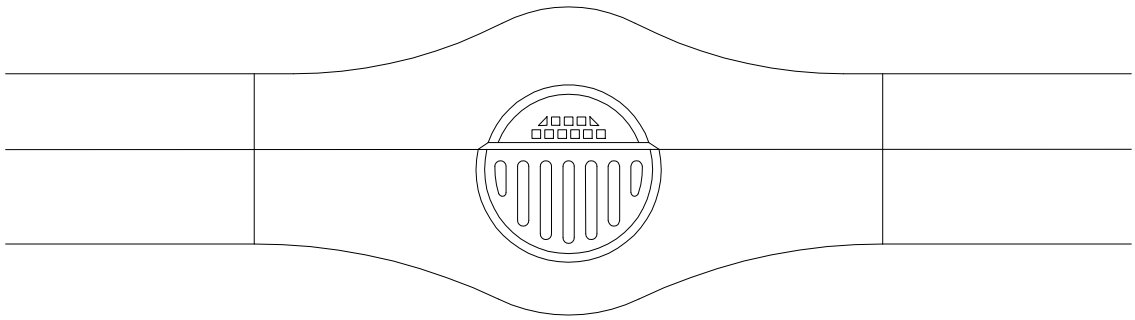
TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

STANDARD CATCH BASIN WITH SUMP

DATE: 2017/05/02

FIGURE: U–13





PLAN VIEW

NOTES:

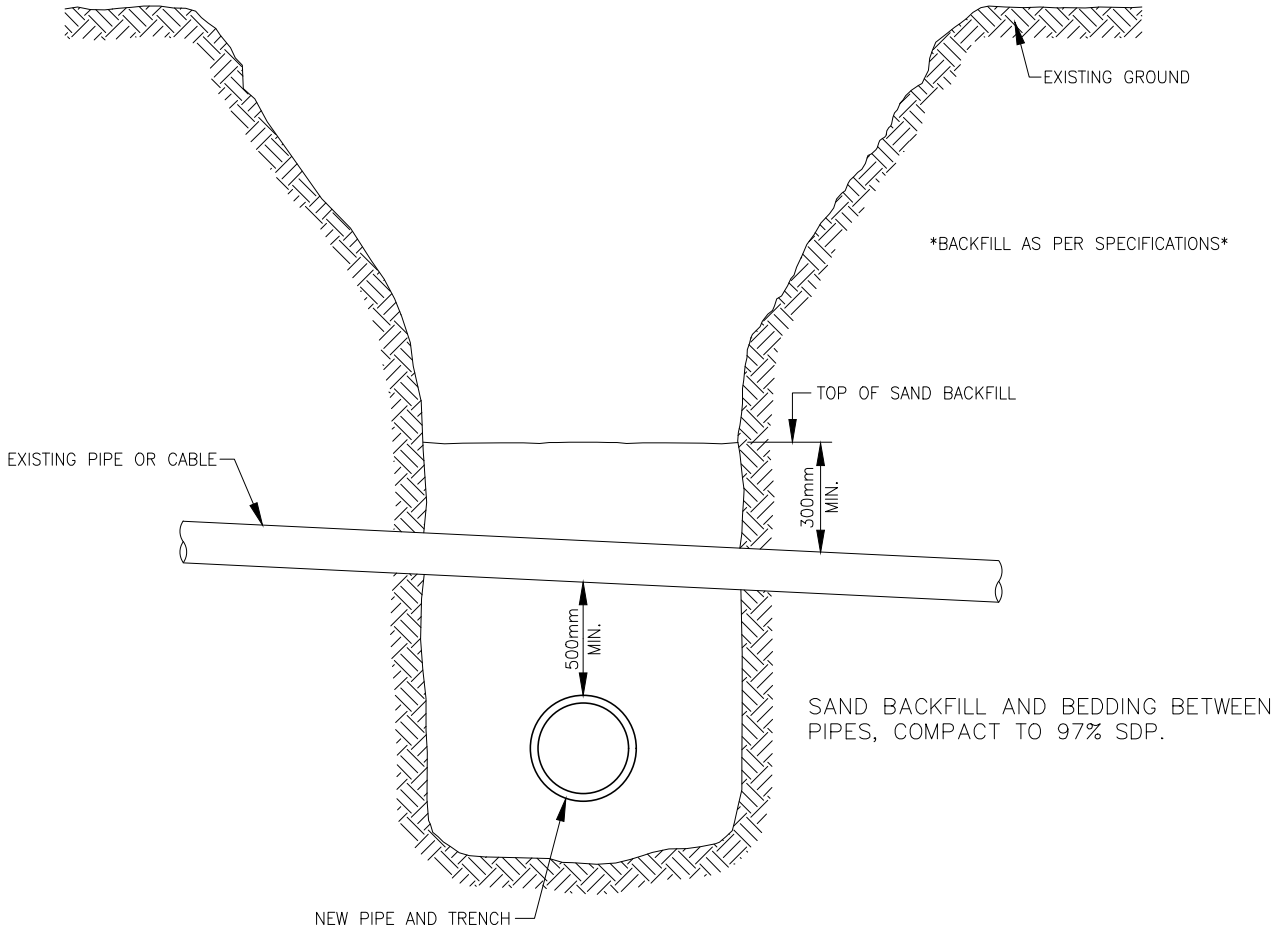
1. TYPICAL CURB & GUTTER TREATMENT AT CATCH BASIN WHEN ASPHALT TOP LIFT IS DEFERRED. LOCATION TO BE DETERMINED BY ENGINEER.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

NF-36 & NF-51 CATCH BASIN INSTALLATION DETAIL FOR CURBS

DATE: 2017/05/02

FIGURE: U-14

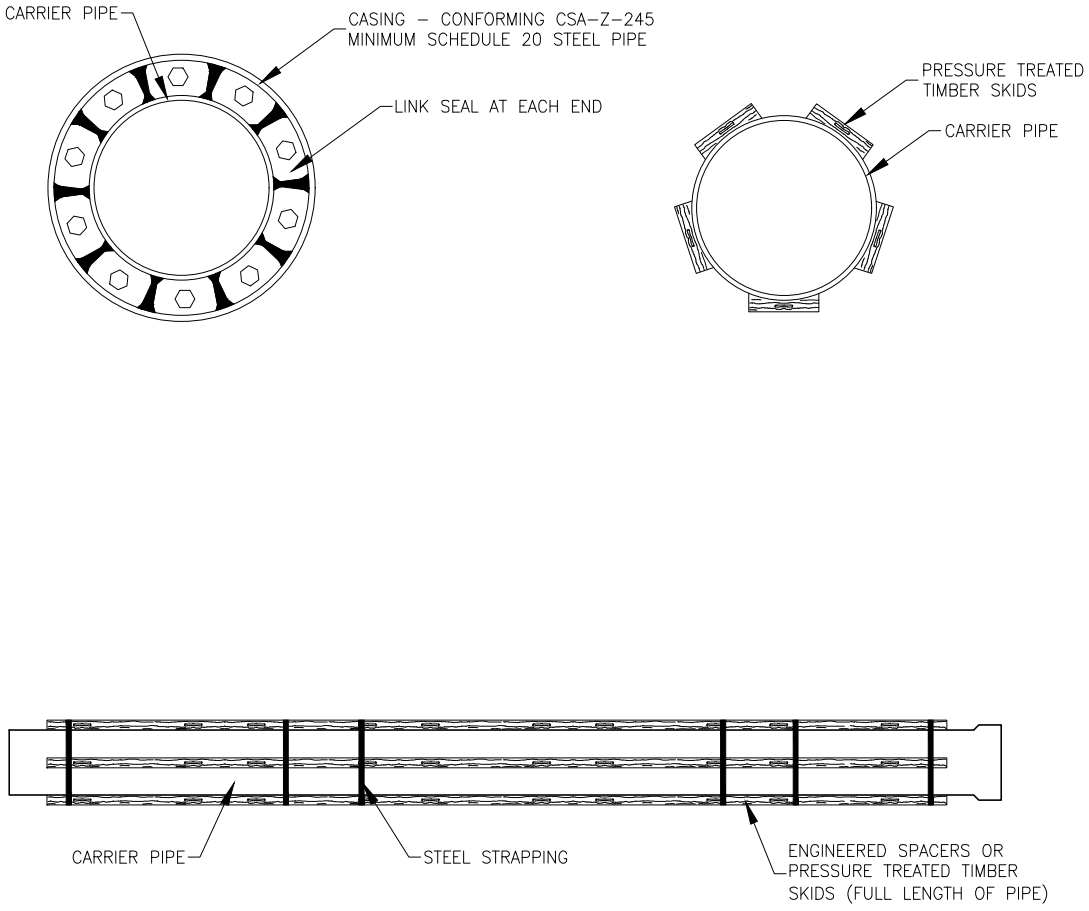


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

TYPICAL PIPE CROSSING

DATE: 2017/05/02

FIGURE: U-15

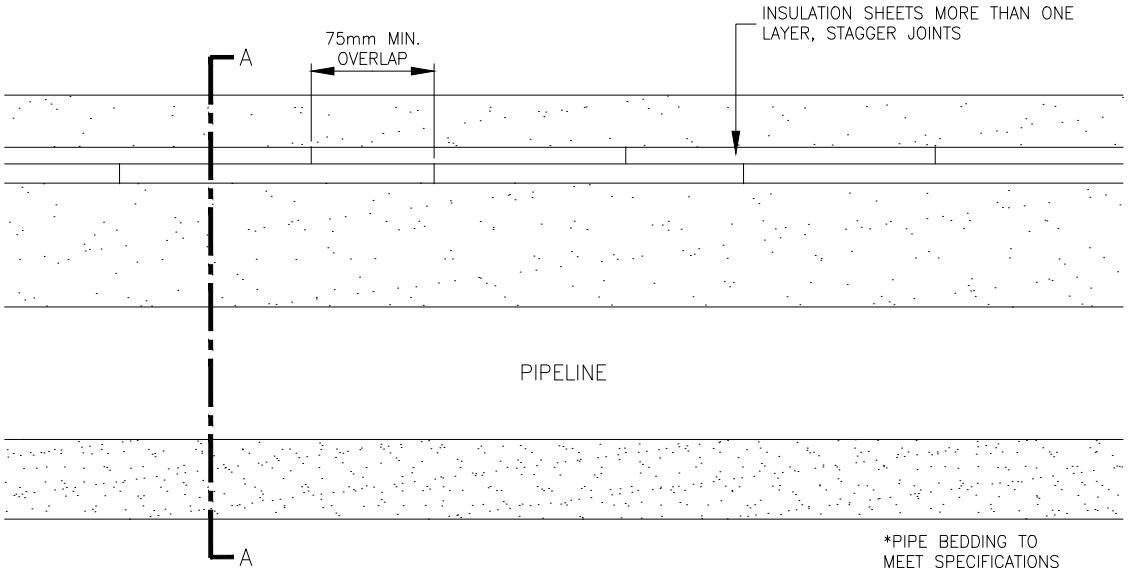


TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

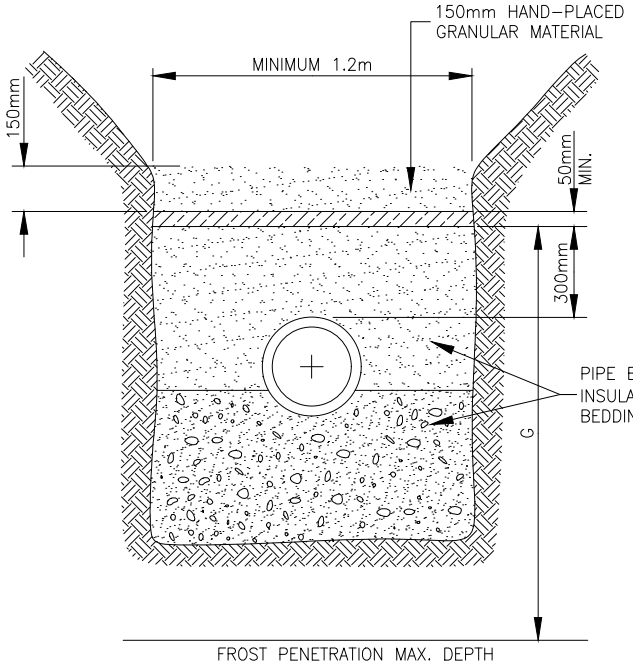
INSTALLATION DETAILS OF PIPE THROUGH BORINGS AND CASINGS

DATE:
2017/05/02

FIGURE:
U–16



ELEVATION



SECTION A – A

NOTES:

1. MAINS AND SERVICES TO BE INSULATED WHERE SHOWN ON DRAWINGS OR AS DIRECTED BY ENGINEER.
2. INSULATION TO BE "PLASTISPAN" RIGID INSULATION OR APPROVED EQUAL.
3. BACKFILLING TO BE CAREFULLY DONE TO PREVENT BREAKING OR CRUSHING THE INSULATION. CRUSHED SHEETS SHALL BE REMOVED AND REPLACED WITH SOUND SHEETS.

SANDY SOIL		CLAY SOIL	
G	THICKNESS	G	THICKNESS
800mm	50mm	600mm	50mm
1200mm	75mm	900mm	75mm
1600mm	100mm	1500mm	175mm
2100mm	150mm	2400mm	225mm
2400mm	200mm		

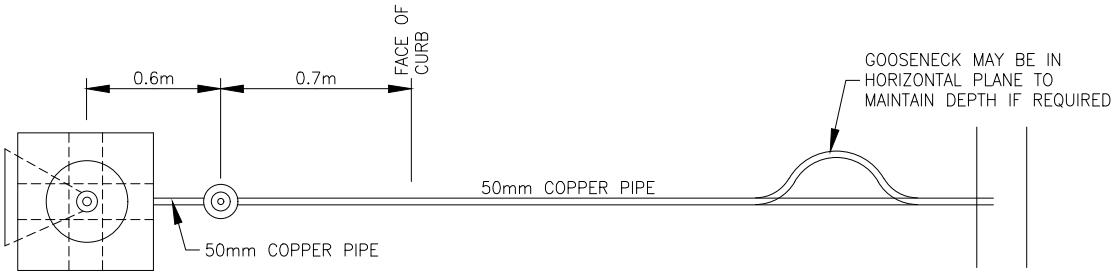
MINIMUM THICKNESS GUIDE

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

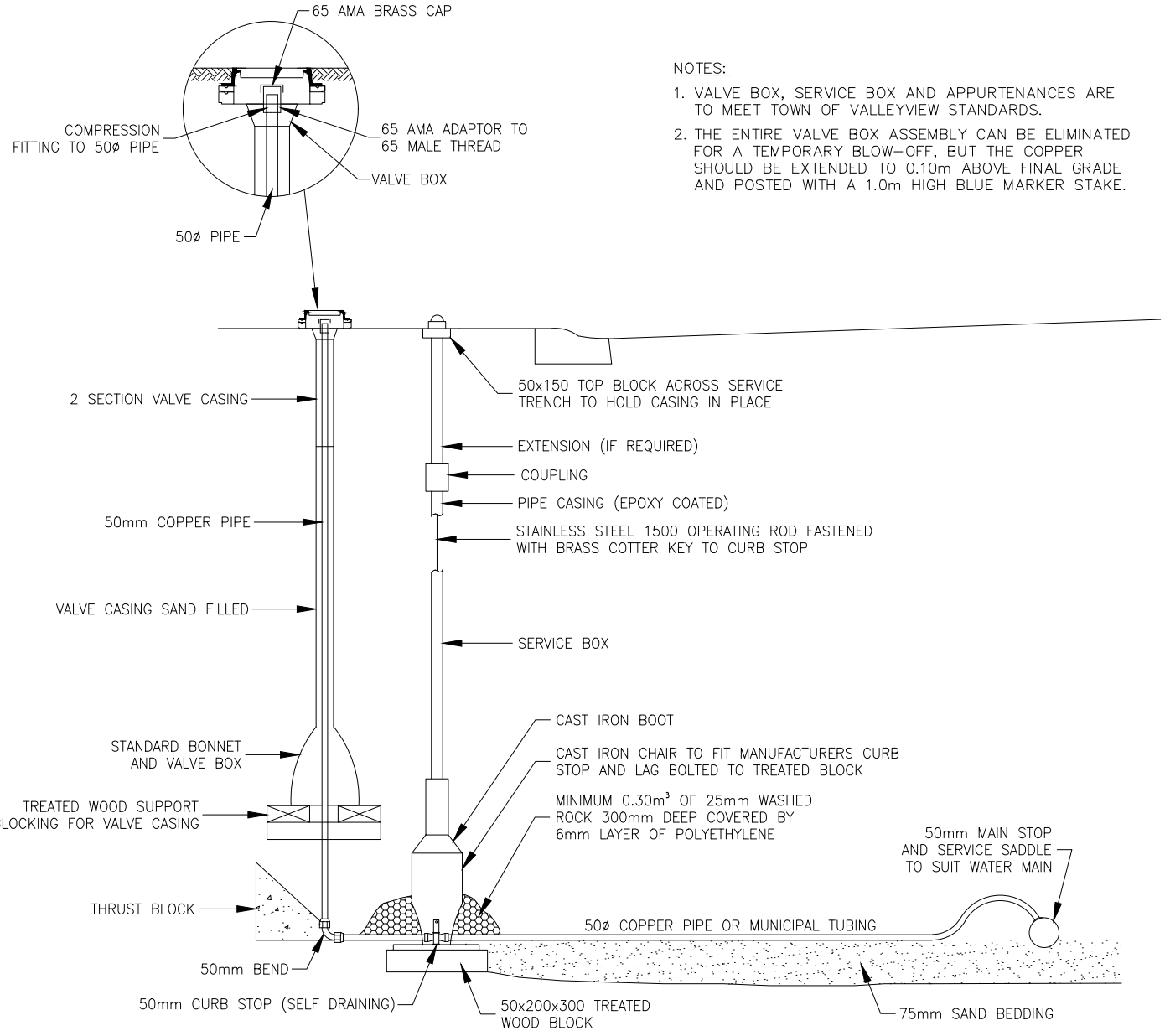
PIPE INSULATION DETAIL

DATE: 2017/05/02

FIGURE: U–17



PLAN



NOTES:

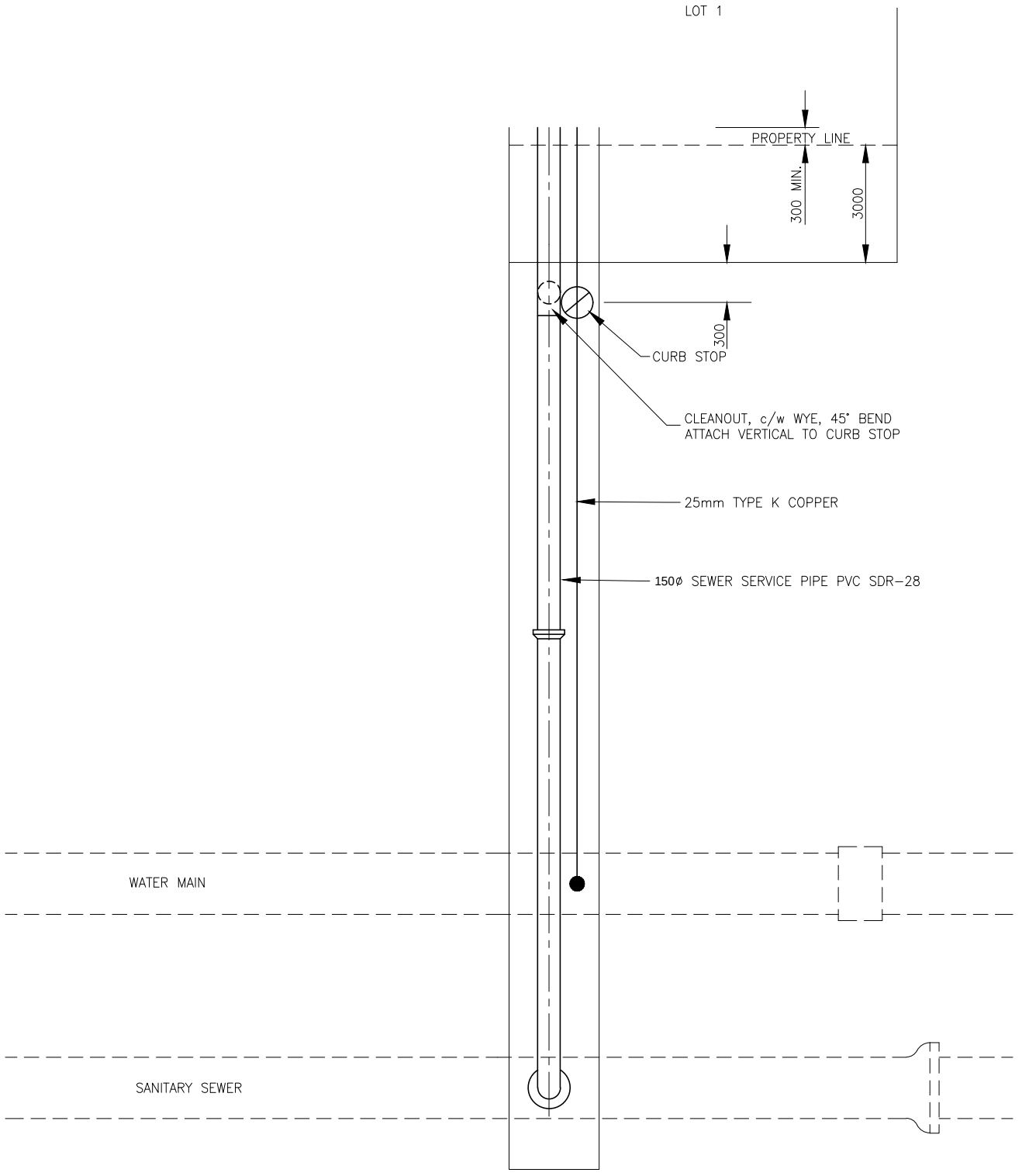
1. VALVE BOX, SERVICE BOX AND APPURTENANCES ARE TO MEET TOWN OF VALLEYVIEW STANDARDS.
2. THE ENTIRE VALVE BOX ASSEMBLY CAN BE ELIMINATED FOR A TEMPORARY BLOW-OFF, BUT THE COPPER SHOULD BE EXTENDED TO 0.10m ABOVE FINAL GRADE AND POSTED WITH A 1.0m HIGH BLUE MARKER STAKE.

TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

TYPICAL BLOW-OFF DETAIL

DATE: 2017/05/02

FIGURE: U-18



TOWN OF VALLEYVIEW
PORTAL TO THE PEACE

SINGLE SERVICE LAYOUT (NEW INSTALLATION)

DATE: 2018/05/24

FIGURE: U-19