Town of Midland

Engineering Development Design Standards

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Forward

This Development Standards Manual has been prepared by the Town of Midland to reflect subdivision and site plan applications through the development processes as they exist in 2024. Collaborative efforts from experts in multiple Town Departments/Disciplines, were obtained to provide the most accurate and current information as possible.

It is recognized that this manual cannot consider or provide direction for all circumstances encountered. The Town reserves the right to apply discretion in the interpretation of these guidelines and that the use of other applicable guidelines and good engineering judgement will be required when reviewing each project.

Disclaimer

The Town of Midland has supplied this manual with the express understanding that it shall not be liable in any manner whatsoever to any person, corporation or organization for damages, injuries, or costs, resulting from the use of the information supplied.

It should be understood that changes and revisions to these standards will be necessary over time and that it is the responsibility of the applicant/designer to obtain the latest version available at the time of design. Users shall refer to the Town of Midland Website www.midland.ca to ensure they are following the most recent version of the manual and that current revisions are being considered. Current Legislation shall be followed at all times.

Manual Update Record

Revision No.	Date Approved

Definitions

In this specification, the following definitions shall apply:

"Town" shall mean the Town of Midland.

"Contractor" shall mean the firm of Contractors, the company or individual acting as the Contractor and having entered into a contract with the Developer/Owner to install the services.

"**Developer(s)/Owner(s)"** shall mean the person(s) appearing on the subdivision agreement with the Corporation of the Town of Midland.

"Town Representative" shall mean any person assigned to a project by the Town to carry out work on their behalf. The name of the Representative shall be specified prior to the start of construction on any project.

"Consultant" shall mean professional engineers licensed to practice in Ontario and shall be responsible for the preparation of drawings and specifications to the satisfaction of the Town's Engineering Department. The Consultant shall act on behalf of the Developer/Owner.

"AWWA" shall mean the American Water Works Association.

"MPUC" shall mean the Midland Power Utility Corporation.

"CSA" shall mean the Canadian Standards Association.

"DFO" shall mean the Department of Fisheries, Canada.

"MNR" shall mean the Ontario Ministry of Natural Resources.

"MECP" shall mean the Ontario Ministry of Environment.

"MTO" shall mean the Ontario Ministry of Transportation

"SSEA" shall mean the Severn Sound Environmental Association.

"OHBDC" shall mean the Ontario Highway Bridge Design Code.

"OPSD" shall mean the Ontario Provincial Standards Drawings.

"OPSS" shall mean the Ontario Provincial Standard Specification.

Introduction

The Town of Midland Development Standards purpose is a guideline for land development and to help the design and installation system within the Municipality. Improvements or any changes may be considered at the discretion of the Town of Midlands Engineering Department. These requirements, however, are general and do not relieve the Consulting Engineer of the responsibility for submitting a finished product of competent engineering design and construction. More detailed requirements, policies, and procedures are found throughout this manual under the respective sections.

All Municipal engineering works shall be designed and constructed in accordance with this document, the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), the Transportation Association of Canada (TAC), The Ministry of Environment Conservation and Parks (MECP) and Accessibility for Ontarians with Disabilities Act (AODA). In the case of a discrepancy the Town Standards shall prevail.

1 Submission Requirements

1.1 Subdivision and Site Plan Requirements

1.1.1 The Planning Act and Approval Authority

Plans of Subdivision are processed and approved under Section 51 of the Planning Act. Process and circulation requirements are identified in O. Reg. 544/06 of the Planning Act. The Town of Midland is the delegated approval authority for Draft Plans of Subdivision under this Act. Under provincial legislation, Site Plan Control was introduced (Section 35(a) of The Planning Act 1973), providing the legislative authority for municipalities to implement the Site Plan Control process. The Site Plan Approval Process has been described in the Town's Site Plan Application Manual. Site Plan Control is a planning tool provided to municipalities under Section 41 of The Planning Act (RSO 1990).

1.1.2 Submissions to Government Agencies

The Consultant shall deal directly with the Ministry of the Environment (MECP), Ministry of Natural Resources (MNR), SSEA, Department of Fisheries and Oceans (DFO) and any other government agencies for works that fall within their jurisdiction. It is the responsibility of the Consultant to ensure that all correspondence, comments, and approvals are provided to the Engineering Department.

1.1.3 Pre-Servicing Policy for Subdivision Development

Subsequent to Draft Plan Approval and prior to execution of a Subdivision Agreement, the Town may consider agreeing to pre-servicing of the subdivision at the owner's risk when the following conditions have been met:

a) Written acceptance from the Town and the executive Director of Newmarket Tay Power for specific works for which pre-servicing can proceed.
b) Engineering drawings have been accepted for construction for the works under consideration.
c) Written approval of various agencies, e.g., MECP, NVCA, MNR, MTO, Ministry of Citizenship, Culture and Recreation, where they relate to installation of services permitted by pre-servicing.
d) Written confirmation from utility companies including, but not limited to, Newmarket Tay Power, Rogers Cable and Enbridge Gas, that satisfactory agreement has been reached for provision of respective services.

e) Upon approval of the pre-servicing application, the Developer must execute and deposit with the Engineering Department, a pre-servicing agreement.
f) No permission will be given to construct external services prior to full registration unless a Letter of Credit has been deposited with the Town, for the total cost of the services and all restoration. Connections to existing services will not be permitted until the plan is registered.
g) All other documents considered necessary for the works under the Pre-servicing Agreement including 300 mm reserves, easements, etc., must be approved as to form and description.
h) The engineering and legal fees for the Town must be paid to the Town prior to the commencement of any works.
i) Required Insurance Certificate is to be submitted as per the Pre-servicing Agreement. A certified cheque to cover the insurance deductible is to be attached.
j) A cash deposit as security for possible emergency maintenance work by the Town is to be submitted as required by the Engineering Department (5% of Schedule "E," or a maximum of $10,000). The cash deposit is to be returned at the time of registration of the subdivision.
k) Any required rezoning by-laws must be in effect.
l) If the underground pre-servicing has been completed prior to the registration of the plan of the subdivision, the Town will not require the full value of the Letter of Credit provided an appropriate reduction request has been submitted and approved by the Engineering Department.
m) Above ground works will not be permitted to commence until the execution of the Subdivision Agreement.

1.1.4 Subdivision Agreement Schedules

The following schedules will be required under the Subdivision Agreement:

Schedule "A" – Description of Lands affected by this Agreement

Schedule "B" – Draft Plan of Subdivision

Schedule "B-1" – List of Drawings

Schedule "C" – List of Easements to be granted

Schedule "D" – Itemized Estimate Costs of construction for each part of the Public Works to be installed

Schedule "E" – Lots Unsuitable for Building Purposes

Schedule "F" – Local Improvement Charges to be commuted

Schedule "G" – List of Services to be provided by the Developer and specifications regarding these services.

Schedule "H" – Agreement for Special Building Permits

Schedule "I" – Sample acceptable Letter of Credit

Schedule "J" – Lands to be conveyed to the Town

Schedule "K" – Declaration of Progress and Completion

Schedule "L" – Draft Plan Approval conditions

Schedule "M" – Architectural Design Guidelines

Schedule "N" – Copy of Record of Site Conditions as registered with the MECP

1.1.5 Administration Fees, Securities, Development Charges

The administration fees, securities, and development charges applicable to subdivision or site plan development are stipulated in the subdivision or site plan agreement. The consultant shall submit a full detailed cost estimate of internal (private) and external (Town property) works using the Town's template.

The securities or letter of credit shall be a 100% deposit of external works plus 1.76% non refundable HST and for internal works a 50% deposit for internal works plus 1.76% non refundable HST. Additional to the securities an engineering inspection fee which is a percentage based off the total cost estimate (100% Internal and 100% external plus 1.76% non refundable HST) which is stipulated in the fees and charges by-law.

Reductions in securities will be considered in accordance with the provisions of the subdivision or site plan agreement.

1.1.6 Town of Midland By-Laws

Prior to work taking place within the Town of Midland, the following By-Laws may apply:

- Zoning By-Law
- Development Charges By-Law
- Water and Sewer By-Laws
- Entrance Permit By-Law
- Water Conservation By-Law
- Parks By-Law
- Noise By-Law
- Property Standards By-Law
- Accessibility By-Law
- Composite Fees By-Law
- Water Conservation By-Law

These departments are involved in the development/infrastructure include but are not limited to the following:

- Engineering
- Planning and Building Services
- Operations
- Town of Midland Fire and Emergency Services
- Finance
- By-Law
- Legal services

The various external agencies that may be involved in the Subdivision/Site Plan process include but are not limited to the following:

- Severn Sound Environmental Association
- County of Simcoe
- Newmarket Tay Power
- Enbridge Gas
- Telecommunications provider (i.e. Hydro One Networks Inc, Bell Canada, Rogers, Etc.)
- Canada Post
- Ministry of Transportation
- Ontario Ministry of Environment and Climate Change
- Ontario Ministry of Natural Resources and Forestry
- Municipal Property Assessment Corporation
- Simcoe Muskoka Catholic District School Board
- Simcoe County District School Board
- Department of Fisheries and Oceans

1.1.7 Purpose of Subdivision Control

Plans of Subdivision are required where lands are proposed to be subdivided into two or more lots with the creation of a public right-of-way. Subdivision approval is required to ensure that:

- The land is suitable for its proposed new use;
- The proposal conforms to provincial legislation and policies, and local official plans and community plans (if applicable);
- The timing for the consideration for the proposed subdivision is in accordance with Town of Midland's Growth Management Strategy and/or other applicable plans, strategies, or policies;
- The Town is able to ensure that developments are appropriate and do not put undue pressure on Town's infrastructure, services, or finances;
- The Town's and other agency's requirements (e.g., dedications, street widening, roadway improvement, drainage, servicing, etc.) are implemented;
- Municipal infrastructure and other amenities are available to prospective residents of the subdivision;
- The proposed plan of subdivision is consistent with the Town of Midland's Strategic Plan and all other relevant Council policies and objectives; and
- The subdivision is consistent with other Town documents and plans such as Affordable Housing Strategy, Intensification Area Urban Design Guidelines, Multi-Modal Active Transportation Master Plan, Waterworks Master Plan and the Parks and Trails Master Plan

1.1.8 Purpose of Site Plan Control

The site plan process ensures developments are environmentally sensitive, accessible, functional, and achieve the preferred design objectives of the Town.

Matters which must be considered during development include site layout, landscaping, drainage, municipal infrastructure, vehicle and pedestrian access, and site and building design. This means that development proposals must satisfy existing zoning requirements and be appropriately planned and designed in the context of site plan control.

The provisions of By-Law 2013-13 designated site plan control areas within the Town of Midland pursuant to Section 41 of The Planning Act. Therefore, any lot being used for multi-unit residential,

commercial, or industrial which abuts specific major roads, and institutional developments within the Town's municipal boundaries must obtain site plan approval prior to the issuance of a building permit. Applicants are advised to contact the Planning and Building Services Department to confirm whether or not a particular development is subject to site plan control.

1.1.9 Construction Act

The Developer shall comply with all provisions of the Construction Lien Act, R.S.O. 1990, c.C.30, and shall hold in its possession all statutory holdbacks and any additional funds required to be held by the Construction Lien Act. These holdbacks and funds shall not be disbursed except in accordance with the Construction Lien Act, and as stipulated in the Agreement.

1.2 Engineering Submissions

1.2.1 Introduction

This section outlines the required submissions to be made to The Town of Midland's Engineering Department. All submissions are to be coordinated by the Consulting Engineer. This Manual applies to all new subdivisions, condominiums, site plans, and where deemed applicable by the Town, will apply to capital projects, and reconstruction projects. Note, that all Town policies, procedures, master plans and By-laws are also applicable.

1.2.2 Reports

Submission requirements for each application (Subdivision or Site Plan) will be identified through the Draft Plan Approval process or Pre-Consultation process. All reports must be carried out by a competent professional in the specific area, certified to practice in the Province of Ontario.

1.2.3 First Submission

A complete first submission shall be submitted by the Consultants to the Engineering and Planning Departments. Any submissions found to be incomplete will be returned to the Consultant. The following documents shall be submitted to the Town electronically:

1) A Letter of Retainer from the Consulting Engineer stating that they have been engaged for the design and general construction inspection of all works, and coordination of sub-consultants.
2) One complete Vector PDF digital set of the following drawings are required:
    a. Cover Sheet
    b. Site Plan
    c. Proposed Final Plan for Registration (M-Plan).
    d. General Plan of Services
    e. Composite Utility Plan
    f. Sanitary Sewer Plan (including external drainage plan where applicable)
    g. Storm Sewer Plan (including external drainage plan where applicable)
    h. Overall Grading Plan
    i. Landscaping Plan
    j. Tree Preservation Plan
    k. Plan and Profile drawings of all streets, easements, and external works
    l. Detail sheets including standard and special details
    m. Other plans as required such as site plan, detention pond plan, etc.

3) A summary of lot area and frontage for each Lot/Block to be developed to confirm by-law compliance prior to registration and Building Department Administration.
4) One complete copy of the following documents are required:
    a. Stormwater Management Report
    b. Storm Sewer Design Sheets
    c. Soils Report
    d. Hydrogeology Report
    e. Environmental Site Assessment (Phase 1 & Record of Site Conditions) (As required)
    f. Traffic Impact Study (As Required)
    g. Archaeological Report (As required)
    h. Environmental Site Assessment
    i. Functional Servicing Report
    j. Detailed Landscaping Cost Estimates
    k. Internal and External cost estimates

1.2.4 Excess Soils O.Reg 406/19

The Project Qualified Person ("QP") shall assess the project for management of excess soilds as defined in O.Reg 406/19. Should the assessment conclude that the excess soils generated from the project area qualify for an exemption or otherwise do not trigger the Regulatory Planning Requirements (RPR) then a statement and reasoning to the conclusion of the assessment shall be included in the Geotechnical Report or as a standalone letter. When the assessment concludes the RPR are triggered, the QP will prepare and submit the reports as outlined in O.Reg 406/19 as standalone reports.

1.2.5 Parks and Landscaping Submission

1) A Letter of Retainer from the Consulting Landscape Architect stating that they have been engaged for the design and complete general construction inspection of all landscape works, plus an outline of the items contained within the submission.
2) A covering letter from the Consulting Engineer (or Consulting Landscape Architect) stating that the landscape work is in conformity with the proposed grading and municipal services for the development, plus an outline of the items contained within the submission.
3) One Vector PDF copy of the following drawings (where applicable):

    - Existing Natural Features Assessment
    - Tree Survey/Vegetation Analysis and Tree Preservation Plan
    - Streetscape and Buffer Planting Plans
    - Detailed Park Development Plans
    - Stormwater Management Pond Planting Plan

4) Landscaping cost breakdowns.
5) Revised landscape drawings as per Town comments.

1.3 Interim Submissions

Submit <u>all</u> the materials with each interim submission including those requiring revisions and those that don't in Vector PDF digital form.

1.3.1 Second and Subsequent Submissions

A covering letter shall be submitted to address any previous comments where appropriate.

The above procedure shall be repeated as necessary until approval of the engineering drawings and calculations have been received.

a. Copies of all other applicable approval agencies comments.
b. All revised drawings, proposed M-Plans and R-Plans.
c. Original plus one copy of Ministry of Environment application forms signed by the Developer and Consulting Engineer.
d. Subdivision Agreement Schedules pertaining to Engineering Submission.
e. Composite Utility Plan
f. In addition to storm sewers, sanitary sewers and watermains, MECP approval is required for proposed engineered channels, storm water retention ponds and storm water management features. The Town will not sign the MECP Application until satisfied with the engineering design. It is the Consultant's responsibility to forward the complete application to the MECP.

1.4 Final Submission

The following plans and documents shall be compiled and submitted in their entirety by the Consultant in one complete package. Any incomplete submissions, delivered to the Town, shall be returned immediately.

1. Copy of the Proposed M-Plan and R-Plan.
2. A complete set of all drawings listed in Schedule "B-1" of the Subdivision Agreement
3. Drawing originals (stamped and signed by the Consulting Engineer).
4. A digital copy of the complete set of engineering drawings in accordance with the Town CAD requirements.
5. The final storm drainage plan and the storm sewer design sheet labeled final design.
6. Copies of all required approvals, i.e. MECP, etc.
7. Detailed cost breakdown of all proposed works.
8. Copies of the Owners insurance certificate as per the Subdivision Agreement.
9. The Developer shall submit evidence, in writing, that agreements are in place with the Bell Telephone Company, Cable TV and Hydro for the allowances within the plan of subdivision.
10. The Developer shall submit evidence, in writing, that agreements are in place with MPUC or any approved Contractor for the installation of street lighting.
11. The Developer shall submit evidence, in writing, that satisfactory arrangements are in place with Canada Post for the location of mailboxes. One set of drawings accepted for construction will be returned to the Consultant. Only drawings accepted for construction shall be utilized during construction of the works. Any changes in drawing originals by the Consulting Engineer are subject to approval by the Town. Upon completion of the construction of the services, the Consultant shall obtain the "as-constructed" field information and revise the original drawings accordingly.

1.5 Approvals

When all outstanding comments have been addressed, the original mylar drawings shall be submitted to the Town Engineer for endorsement by the Town Engineer. Upon return of the endorsed set of originals to the Developer's Engineer, a set of mylar copies shall be forwarded to the Manager of Engineering.

A copy of all other approvals including all requisite draft plan condition approvals, which may be required for the development, shall be submitted to the Town Engineer. This may include, but not be limited to,

the approvals received from the following authorities: Ministry of the Environment, Ministry of Transportation, Ministry of Natural Resources, etc.

1.6 Drawing Requirements

1.6.1 Specifications for Engineering Drawings

1. Format
   - Autodesk, AutoCAD, Dwg format Minimum version R14, unless otherwise approved.
2. Materials for Final Submission and "as-constructed" drawings
   - Digital PDF
   - AutoCAD dwg

1.6.2 Quality

All original drawings and prints shall be neat and legible and be provided in vector PDF format.

1.6.3 Drawing sheet size

PDF drawings shall be in 24x36 format.

1.6.4 Scales

Standard metric scales to be used are 1:20, 1:25, 1:50, 1:100, and their factors of 10. Scales shall be as follows and shown on the drawings:

- the key plan shall be shown on the cover sheet at a scale of 1:5000, or an appropriate scale for the size of the development;
- the General Service Plan and the Sanitary and Storm Sewer Plans shall be 1:1000, or an appropriate scale for the size of the development.
- Plan-profile drawings are to be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50

2 Design

The purpose of this section is to outline the minimum design requirements for the construction of municipal services in the Town of Midland. These requirements are general in nature and do not relieve the Developer of the responsibility for submitting a completed product demonstrating competent engineering design in full compliance with all applicable legislation. See Appendix D for site plan and subdivision design checklist.

2.1 Basic Information

The following standards shall apply in preparation of the drawings:

- All plans shall include a north arrow in the upper right quadrant. All east-west streets shall generally be drawn with the north arrow pointing to the top, all north-south streets with the north arrow generally pointing to the right, and all cul-de-sacs or other roads where this does not apply shall be drawn with the stations numbered from left to right.
- All elevated data shall be referred to geodetic datum and at least one benchmark shall be shown on each plan indicating a proposed elevation;
- The intersection of centrelines of streets shall be used as zero chainage. The centreline chainage is to be shown in ink from the outset, calculated from the final survey. When the

plan must be broken because of curvature, etc., the profile shall be broken as well, so that insofar as possible, chainage points in plan and profile will coincide vertically;

- In general, east-west streets shall have zero chainage at their westerly limits and north-south streets shall have zero chainage at their southerly limits. Chainages on a plan-profile shall increase from left to right.
- All existing utilities, structures, and other features such as trees and hedges shall be shown and identified using a broken line. All services to be constructed are to be shown in solid lines;
- The beginnings and ends of curves must be shown on a plan and profile with the radius of curvature shown on the plan. Chainages of points of curvature shall be calculated from the final plan. The chainage elevations and names of intersecting streets shall be shown in plan and profile;
- The drawings shall be in ink at the outset, according to the final survey. Street names shall be kept clear of the road allowance;
- The drawings shall show any required off-street drainage and separate profiles should be prepared for drainage easements.
- The drawings shall clearly show the proposed profiles, road widths and cross-sections, ditches, ditch gradients, curb and gutter gradients, culvert sizes, gauges and gradients, existing and proposed services, and limits of the proposed work. All detail for intersecting streets, including grades, must be shown for a minimum distance of 30 metres from the intersection of the intersecting street. All street lines shall be shown and all easements for drainage or services. Larger scale detail may be required for congested bends and/or cul-de-sacs.
- The drawings shall show the lot frontage distances and dimensions of the easements and land to be dedicated to the Town.
- The Town Engineering Consultants shall be consulted as to the manner of showing information not set out in these requirements.

2.2 General Servicing Plans

General plans showing above-ground services and appurtenances are to be drawn to a scale of 1 to 1000 and shall indicate, but not be limited to, the following:

- roadways and street names;
- watermains and appurtenances, with notes showing sizes;
- maintenance hole and catch basin numbers;
- sewers with notes showing sizes and direction of flow;
- lot numbers per registered plan with provision to add street addresses when available;
- school signs;
- street signs;
- future land use signs;
- barricades;
- fencing;
- retaining walls;
- rear lot/block catch basins;
- easements including dimensions and descriptions;

- driveway location for corner lots;
- bus stop platforms;
- community mailboxes;
- hydro vaults, streetlights, sidewalks.

2.3 Storm Drainage Plans

Storm drainage plans are to be drawn to a scale of 1 to 1000 (a scale not exceeding 1 to 5000 will be accepted for large external drainage areas) and are to indicate the total area to be drained by the proposed storm sewers. The storm drainage plan is to be compatible with the grading plan and the Town's latest contour mapping.

The storm drainage plan shall indicate, but not be limited to, the following:

- existing contours;
- drainage patterns of adjacent lands;
- run-off coefficients and areas (ha) of tributary areas outside the development and for each section of the storm sewers within the development;
- direction of run-off;
- street names;
- maintenance hole numbers;
- sewer sizes, slope, and directions of flow;
- any catch basins or swales, on the lots or blocks, required to collect the run-off;
- temporary or permanent quantity and quality storm water management facilities;
- major and minor overland flow routes;
- culverts and other drainage appurtenances.

2.4 Grading Plans

Grading plans are to be drawn to a scale of 1 to 500 or larger showing existing contours established from a topographic survey of pre-development conditions.

The grading plans shall indicate, but not be limited to, the following:

- existing contours extended outside the subject lands far enough to determine the existing drainage pattern;
- driveway locations and building envelopes;
- centre line elevations of existing roads at 20m intervals;
- elevations of existing trees, structures, watercourses, etc.;
- proposed elevations of roads at 20m intervals;
- proposed elevations at front and rear of building envelope;
- proposed elevations at the corners of each lot and block;
- proposed elevations side yard highpoints, if applicable;
- proposed 0.5.m contours for grading within large blocks and parks;
- proposed grades for major and minor overland flow routes;
- lot fabric of subject lands including lot, block, and easement description;
- physical structures such as fencing, retaining walls, etc.;
- proposed grades for storm system to intercept block and external drainage
- proposed elevations for top and bottom of curb;

2.5 Plan-Profile Drawings

Plan-profile drawings are to be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50 and are to conform to the following:

- where multiple drawings are required for one street, match lines must be used and there shall be no overlap or duplication of information;
- where intersecting streets or easements are shown on a plan-profile, only the diameter of the pipe and direction of flow of the intersecting sewers shall be shown;
- on profile portion of drawings, the type of sewer, diameter, length, grade, and class of pipe shall be shown;
- on profile portion of drawings, the watermain diameter, length and class of pipe shall be shown;
- only the type and diameter of pipe shall be shown in the plan portion;
- where possibility of conflict with other services exist, connections are to be plotted on the profile or a crossings chart included;
- pavement/road base designs for the particular roadway are to be indicated on all plan-profile drawings;
- the detail information from all borehole logs is to be plotted on the profile drawings and located on the plan;
- gutter drainage details for turning radii, cul-de-sacs, and intersections.

2.6 Erosion and Sediment Control Plans

Erosion and sediment control plans are to be prepared in accordance with Provincial Standards.

2.7 Park Development

Detailed Park Development Plans are to be submitted by the Consulting Landscape Architect. A complete set of detailed design plans and working drawings are required. Park plans are to be submitted at a scale of 1:500 and shall indicate, but not limited to, the following:

- existing contours;
- drainage structures and direction of overland drainage;
- species and size of existing plant material to remain and be protected;
- species and size of plant material to be removed;
- layout of all proposed recreation facilities;
- layout of parking lot and spaces (including handicapped parking);
- proposed site amenities including benches, bike racks, trash receptacles, signs;
- perimeter fencing;
- park lighting;
- all surface treatments;
- all proposed plant materials.

A Park Development Cost Estimate based on estimated quantities with corresponding unit prices is required. The Developer's responsibility for park development includes rough grading topsoiling (min 150mm), and hydro seeding and installation of perimeter fencing according to Town's standards.

2.8 Trails and Walkways

The Developer may be required to design and construct a trail system, pathways, and linkages to existing trail systems. Trail development will be implemented according to Town of Midland Trail Standards.

Pathways will be required adjacent to parkland and walkway easements adjoining parallel roads or acting as service access shall be fenced, gated, and planted according to Town standards. The provision of new trails shall be consistent and support the existing Town-wide trails network.

Trails extending the existing Canada Trails network shall be 4.57 meters wide concrete trail per town details.

Proposed trails should link together local points of interest, all open space amenities, civic institutions and connect to the Canada Trails network. To the extent possible, the route should be off-road, utilizing public open spaces, right-of-ways, and easements.

Trails connecting through urban areas located within the road right-of-way should be paved multi-purpose cycle ways.

Trails through sensitive natural features should be designed as soft surface paths and located to avoid fragile areas.

Entrance points to the trail system should be marked with signage co-ordinated with the Town.

2.9 Landscaping

All landscape plans shall be drawn and stamped by a full member of the Ontario Association of Landscape Architects. All landscape plans shall be drawn at a minimum scale of 1:500.

The landscape documents may include the following drawings:

- existing natural features assessment;
- tree survey/vegetation analysis;
- tree preservation plan and details;
- streetscape and buffer planting plans and details;
- detailed park development plans and details;
- trails master plans and details;
- landscape restoration plans and details;
- stormwater management pond planting plan.

Detailed cost estimates will be required for all approved landscape plans. This estimate will be used for security purposes. All streetscape plans shall be consistent with the Town of Midland Subdivision Design Guidelines and will require Town approval before implementation of the plans.

The streetscape plan shall show the following:

- all existing trees and natural features to remain;
- all building envelopes, driveways and sidewalks;
- all walkways, trails and easements;
- all required fencing including privacy, acoustic and chain link;
- all proposed plantings;
- all entry features;
- location of street lighting;
- location of public utility boxes and easements and hydrants.

Construction details will be required for all landscape elements to be implemented as part of the development.

All required landscape Restoration Plans and Stormwater Management Facility Planting Plans will require the Town of Midland's approval prior to implementation of the plans.

Developers are required to display approved landscape plans at the sales pavilions for the homebuilders in the new subdivision.

2.10 As-Constructed Drawings

Before the expiration of the maintenance period for both underground and above-ground services, "as-constructed" drawings are to be forwarded to the Town's Manager of Engineering for review and comments. Revisions must have been made to the drawings to reflect any changes to the line and/or grade of the roadways and services, and to incorporate all the grading modifications resulting from final lot grading. All manholes, catch basins, valves, hydrants, curb stops, and service connections shall be properly tied into fixed reference points.

If any revisions are required, one set of red-lined drawings will be returned to the Developer's Engineer.

When all revisions and/or corrections have been made, a complete set of "as-constructed" drawings shall be submitted to the Manager of Engineering in Vector PDF, and in DWG format.

The drawings shall be sealed and signed by a Registered Professional Engineer and stamped "as-constructed" and dated. The Town performs a spot check of elevations and locations.

The "as-constructed" drawings shall include the following information:

2.10.1 Storm System

- Invert elevations of all storm sewers.
- Invert elevations of all storm manholes.
- Revised percentage of all storm sewers along with "as-constructed" distances between manholes.
- Any additional information that has been required for construction after approval of engineering drawings.

In addition the following shall be indicated on the "as-constructed" drawings:

- pipe/culvert size, grade, type, class/gauge, bedding;
- chainage from MH along main to service tees.

2.10.2 Sanitary System

- Invert elevations of all sanitary sewers.
- Invert elevations of all sanitary manholes.
- Revised percentages of all sanitary sewers along with "as-constructed" distance between manholes.
- Locations measurements to all sanitary service connections to each individual lot. These should have swing ties from property corners or other fixed structures such as fire hydrants and manholes.
- Any additional information that has been required for construction after approval of the engineering drawing.

In addition, the following shall be indicated on the "as-constructed" drawings:

- pipe size, grade, type, class, bedding;
- chainage from MH along main to service tees;
- dimensions from lot corners and elevations for service laterals.

2.10.3 Water System

- Elevations of top of watermains every 20 metres.
- Location measurements to all water service boxes for each individual lot. These should have swing ties from property corners, buildings or other fixed structures such as fire hydrants and manholes.
- Location by measurement of tees, bends, valves, and dead ends.
- Any additional information that has been required for construction after approval of the engineering drawings.
- Obvert elevations at 30m intervals.
- Chainage from appurtenances along main-to-main stops.
- Dimensions from lot corners and elevations for service laterals.

2.10.4 Road Systems

- Elevation of centre line of roadway every 20 metres.
- Revised horizontal and vertical curve information.
- Any additional information that has been required for construction after approval of engineering drawings.
- Revised benchmarks located in a permanent location throughout the new development at sufficient intervals such as on fire hydrants and/or other permanent structures.

In addition, the following shall be indicated on the “as-constructed” drawings:

- driveways, lay-byes, curb depressions;
- road signage;
- laneway marking and stop bar locations.

2.10.5 Lot Grading

- Elevations of the final lot grades for all lot corners for the entire plan of subdivision.
- Invert elevations of all culverts.
- Invert elevations of all ditches at 20 metre intervals.

3 Construction

3.1 Introduction

Following Engineering approvals, the Construction phase of development may commence. The Developer is permitted to do Works on their Lands, conditional on the following:

- Pre-Servicing, Subdivision or Site Plan Agreements are in place;
- The Developer is to provide the Town with a list of names and phone numbers of personnel responsible for the Works;
- The engineering conditions and engineering drawings must be approved by the Manager of Engineering;
- The Developer must meet all Financial Requirements (securities, contributions, fees);

- MECP, MTO, CA and other applicable agency approvals must be in place;
- Liability insurance in accordance with Schedule O of the Subdivision Agreement must be in place; and
- A Pre-construction meeting is held.

During the construction period of the Plan of Subdivision or Site Plan, the Consultants will be responsible for the following:

- No deviation from the approved drawings will be permitted unless approval through the Engineering Department;
- All survey markers must be replaced by a registered Ontario Land Surveyor following disturbance or removal;
- Control monuments will be protected from damage during construction;
- All Roadways, within and adjacent to the Plan of Subdivision or Site Plan, must be kept free of soil and construction debris to the satisfaction of the Engineering Department;
- Sediment and Erosion Control in accordance with approved plans;
- The Consultant must provide direct supervision and oversee all Works related to the plan of subdivision or Site Plan. This will include the preparation of inspection reports, daily work record etc.; and
- Recording of the as-built data.

3.2 Pre-Servicing of Subdivisions or Site Plans

Landowners may proceed with internal site servicing Works at their own risk including, but not limited to, storm sewer and sanitary sewer, utilities, watermains, and roads prior to the registration of the agreement, permitting a Pre-Servicing Agreement has been entered into with the Town.

In accordance with the Pre-Servicing Agreement, the Developer may be required to:

- Retain a Consultant to oversee the Pre-Servicing Works;
- Complete all Works in accordance with all Town and provincial requirements, and the approved plans;
- Be responsible for the completion of any Works required as a result of subsequent changes to the approved plans;
- Obtain all necessary approvals from all regulatory authorities. Pre-servicing shall not proceed until such approvals are obtained and written confirmation is received from the Town;
- Arrange for a Pre-Servicing meeting with the Town;
- Provide a construction newsletter, including details on:
    - Limits of construction
    - Summary of proposed work
    - Construction commencement and completion dates
    - Access to private properties
    - Municipal service impacts (water, sanitary, garbage, transit)
    - Third party service impacts (hydro, gas, communications)
    - Public safety impacts
    - Consultant/Contract primary contact
    - Town primary contact
- Provide proof of insurance, security, fees and contributions;

- Deliver a copy of the approved construction drawing in digital electronic format acceptable to the Town; and
- Abide by all other requirements of the Pre-Servicing Agreement.

3.3 Pre-Construction Meeting

The Pre-Construction Meeting shall be initiated by the Developer and/or their Consultant prior to the commencement of any site Works. This meeting shall be held at a mutually convenient time at the site or an Online meeting. The meeting shall include representatives from the following parties;

- Developer and/or their Representative.
- Contractor;
- Town of Midland Engineering department;
- Town of Midland Water Operations Department;
- Town of Midland Roads, Parks and Fleet Department;
- Town of Midland Planning and Building Services Department;
- Utility Company(s) Representative
- Engineering Consultant;
- Landscape Architectural Consultant; and
- Geotechnical Consultant

Any other meetings that will be required throughout the Development Process shall include those parties that are required depending on the specific phase of the project. Site meetings are required bi-weekly once construction commences.

3.4 Dewatering

Temporary Dewatering is accepted during the construction periods subject to the following conditions:

1. The Geotechnical Engineer or Hydrogeologist shall complete a field test pit, borehole test or a hydrogeological study to determine the actual pumping rate that will occur during the construction periods.
2. A report, duly signed and stamped by a qualified Geotechnical Engineer / Hydrogeologist shall be submitted to the Town to include at a minimum the following information:
    a. Test results and expected pumping rate and Zone of Influence (ZOI)
    b. Identify any impact on adjacent wells and natural environmental features (e.g. watercourse, wetland, wood lot, etc.) and its Mitigation Plan
    c. State any impacts from temporary dewatering will be mitigated during and after completion of the dewatering work. Appropriate parameter threshold values, target levels, and mitigation strategies for the project will be developed and can be incorporated into an Environmental Impact Assessment (EIA) study
    d. A plan showing the discharge locations, flow rate, storm capacity if discharging to a storm sewer, water quality control measures, etc. and Site Alteration Plans. Approvals must be obtained from the appropriate Town's department and if required, York Region before discharging to any outlet
    e. Discharge must be sampled and conform with applicable By-laws
    f. Environmental Mitigation Plan, if required, conforming to the accepted EIA report

3. If the test pumping indicates that the temporary pumping rate is greater than 50,000 L/d, an MECP's Permit-To-Take Water (PTTW) is required, copy of which shall be submitted to the Town before construction starts. No PTTW is required if the pumping rate is below 50,000 L/d, but a report as identified above will be required.
4. If a well monitoring and mitigation plan is required as a result of the above findings, a qualified Geotechnical Engineer or Hydrogeologist shall submit to the Town a well monitoring and mitigation report for review and acceptance, as outline below. The report shall be subject to peer review at Owner's cost:
    a. Detail hydrogeological investigation regarding aquifers and groundwater conditions
    b. Inventory of existing wells in the ZOI which may be impacted by the dewatering activities
    c. Baseline survey for water quality and quantity in the existing wells prior to any construction activities
    d. Carry out water quality and quantity survey during construction and post construction for at least one year after construction is completed, at regular intervals (minimum once in three months)
    e. Prepare a short term and long term mitigation / contingency plan which include 24 hour emergency contacts and investigation protocols
    f. Communicate monitoring program and mitigation plan to the owners of wells
    g. The Owner shall deposit a Letter of Credit at the rate of $20,000 per private well in the ZOI up to a maximum of $200,000 for ensuring mitigation measures. The Letter of Credit shall be released following acceptance by the Town of a post-construction monitoring report demonstrating that water level and water quality parameters have returned to their pre-construction conditions

4 Inspections

4.1 Introduction

The Development's consultant shall supervise the construction of all new subdivisions and site plans, ensuring that all infrastructure (both above and below ground) are constructed to Town and provincial standards. Development consultants are responsible for:

- Overseeing the construction and maintenance requirements for new development subdivisions and site plans;
- Providing detailed site inspections for all municipal Works constructed; and
- Providing sign-off for release of securities.

In order to ensure all new infrastructure has been constructed to Town and Provincial standards, the consultant shall conduct several detailed inspections over the course of the Works. Once the consultant approves the subdivision and site plans, the Town representative will conduct an inspection of the works and has the final sign off and can release securities.

4.2 General Inspection

The construction of all infrastructure shall be subject to general inspection, which is the responsibility of the Developer / Consultant. The details and criteria for these inspections can be found in the following sections:

- Water
- Sanitary
- Storm Sewers
- Roadways - In addition, the following testing shall be completed for new roadways:
    - Air test;
    - Slump test;
    - Cylinders;
    - Compaction test;
    - Materials samples;
    - Deflection tests of subgrade (under supervision of geotechnical engineer); and
    - Geotechnical engineer to submit report including test results and sign off that subgrade meets requirements.

4.3 Letter of Credit Reduction Inspections

An onsite inspection should be arranged with the Town, Consultant and Contractor to determine if a reduction is acceptable from the Towns perspective. The following items must be completed:

- Consultant's letter stating that all Works conform to provincial and municipal design, construction and testing standards;
- Sign-off from Town of Midland's Water Operations, including passing of pressure tests and tracer wire testing;
- All sewers to be flushed;
- Clean-up and repair of all roadways on which obstructions or mud and dust are created, or which are damaged by the installation and maintenance of any Works. Clean-up must be completed 24 hours prior to inspection;
- All curbs to meet Town and OPS standards;
- Base course asphalt review;
- Maintenance hole and catch basins parged;
- All issues identified during one-off inspections must have been addressed; and
- Video inspection of all underground infrastructure.

Within three (3) business days of the inspection, the Consultant shall provide to the Engineering Department a complete list of deficiencies identified. See Appendix A for typical deficiencies.

4.4 Maintenance Period

4.4.1 Developer Obligations During the Maintenance Period

In accordance with the agreement, the Developers obligations during the maintenance period are:

- Maintain and keep in proper state of repair and operation all of the municipal works constructed, planted, installed or provided by the developer.
- Any deficiencies or defects noted during the maintenance period are the responsibility of the developer, and all complaints and concerns will be deferred to the consultant for resolution. A list of typical deficiencies can be found in Appendix A.
- Maintain all underground and surface works in working order and in good repair for the period, and ensure that the storm sewer system, and appurtenances are in a satisfactory working condition and are free from debris, silt etc. should the efficiency of the storm sewer become

reduced die to building activity, the developer shall be responsible for any cleaning, flushing etc. necessary to restore the storm sewer to full capacity for the duration of building activity.

- Ensure that all subdivision streets are swept once a week or more frequently as conditions warrant during construction.
- Shall maintain all surface landscaping works.
- Ensure all storm water management facilities be inspected within 24 hours after each significant rainfall event (>25mm).

4.4.2 Municipal Obligations During Maintenance Period

- Respond and carry out emergency repairs on an as needed basis at the owners expense and the developer will be notified of these repairs within 25 hours.
- Be responsible for the operation of all water valves and hydrants.

4.5 End of Maintenance Period Inspection

Inspection should be arranged with the Engineering Department. Prior to any inspection, the following items must be completed:

- Consultant's letter stating that all Works conform to provincial and municipal design, construction and testing standards;
- Sign-off from Town of Midland Water Operations, including passing of pressure tests and tracer wire testing;
- All sewers to be flushed;
- Clean-up and repair of all roadways on which obstructions or mud and dust are created, or which are damaged by the installation and maintenance of any Works. Clean-up must be completed 24 hours prior to inspection; and
- All issues identified during inspections must have been addressed, and if necessary confirmed via CCTV inspection.

If the Developer fails to comply, the Town shall be entitled to arrange for the necessary work to be undertaken at the Developer's expense, and to draw upon any security provided under the Agreement to the extent necessary to pay such costs.

4.6 Geotechnical Engineering Requirements

At the preconstruction meeting, the General and Geotechnical Consultant are required to provide the Town with a Schedule of the works, together with the names of all inspectors to be on site during the construction of the various phases of the works.

The General Consultant must have their own site representative on site during any grading and/or construction works.

The Geotechnical Consultant must ensure that OPSS 501 and 401 regarding backfilling and compaction within road allowances and lots where fill exceeds 1.0 m in thickness is strictly adhered to. The Geotechnical Consultant's certification must make reference to this specification.

4.7 Inspection- Consultants

In new developments, the owner shall engage a Geotechnical Engineering Consultant to prepare a report on the existing soil conditions which is to include:

1) The identification, description and limits of the existing soil regimes, including the extent of topsoil and its suitability for reuse.
2) The suitability of native materials for trench backfill.
3) The procedures to be used for high moisture contents and water table levels which may affect the proposed servicing or structural works of the concerned area and surrounding lands.
4) The extent of native material which is unsuitable for trench backfill and the procedure for dealing with is such that it will not affect the structural stability of the proposed municipal services. The contractor must follow O. Reg 406/19 onsite and excess soil management.
5) Areas and procedures to be followed where blasting may be required with due consideration to surrounding structures and services.
6) The road material depths for pavement design.
7) Any special recommendation for bedding materials.
8) Potential corrosive or chemical problems that may affect services or structures (e.g. high sulphates) and the method of resolving such problems.
9) Recommendations in dealing with filling conditions within the road allowances, on building lands, in the construction of berms etc.
10) Identify problem areas and recommend mitigating procedures regarding the stability of existing slopes and the extent of unstable soils or conditions.
11) Any special recommendations to be followed in the design and construction of building foundations.
12) The engineering properties of the native material including frost susceptibility, natural moisture content, compaction characteristics, relative density and structural integrity.
13) Recommendations in achieving proper compaction.
14) Recommendations in dealing with deep excavation of trenches.
15) Recommendations in dealing with septic or well systems that may be affected by the proposed building and servicing works.
16) The report is to confirm that sufficient boreholes have been taken to establish definite requirements and recommendations for the servicing and building works. General Soils Report must identify minimum bearing capacity of the native soil (i.e. 75 kPa) preferably on a hole by hole basis. Boreholes located in the area of proposed underground municipal services are to be taken to a depth of at least one (1) meter below the deepest trench.
17) Requirements and recommendations contained within this report along with borehole logs and grain size analysis of the native soils are to be incorporated by the engineering consultant into his first submission to the Town Engineer. Any such requirements and recommendations that are not so incorporated are to be drawn to the Town's attention with specific reasons.
18) During construction, the owner is to retain a geotechnical consultant to supervise the installation of bedding and the backfilling of all trenches within road allowances and easements. A trench backfill certification is required to indicate that sufficient tests have been carried out to obtain a representative report as to the compaction of the backfill and they find the backfill to be in compliance with Town Specifications and requirements.

19) A final subgrade certification is to confirm that the final subgrade conditions are equal to or better than those anticipated in the preparation of the pavement design. If these conditions are less than what was anticipated, the owner and the Town are to be immediately advised with a new pavement design recommendation.

Example of certification letter: "This certification has been made to the best of the Geotechnical Consultant's knowledge and information. This certification however, does not relieve the Contractor, the Owner or any other parties of their respective responsibilities pertaining to maintenance or otherwise."

NOTE: The material testing of any major structure, as determined by the Town, is to be carried out by an independent testing firm. Such testing is to be carried out in accordance with the latest revision of the O.P.S.S. and C.S.A. requirements. All test results are to be forwarded to the owner, the engineering consultant, and the Town, with the appropriate comments and recommendations. Upon completion of the material testing, the testing firm is to certify to the owner and the Town that the material requirements for the concerned structure have been achieved.

5 Roadway Design

5.1 Introduction

The following standards are the Town of Midland's design requirements when constructing a roadway within the Town. It is the developer's responsibility to comply with these standards and should provide a competent engineering design. Any deviation from the minimum Town standards shall have a copy of written approval of the Town attached.

5.2 Provincial Standards

MTO and TAC Geometric Design Guide for Canadian Roads (2017) Standards shall apply together with these Town Standards. Where there are any apparent conflicts or discrepancies the Town Design Standards shall take precedence.

5.3 General Design Criteria

The following are general requirements for a roadway:

- center line radius horizontal curves per MTO Geometric Design Standards
- 20.75 m minimum radius to property line from center line for residential cul-de-sacs
- 21.0 m minimum radius to property line from center line for industrial/commercial Cul-de-sacs
- minimum grade = 0.5%, maximum grade change = 1% in 6 m, with a minimum Road cross fall of 3%, maximum grade to be no greater than 7%, 3% maximum cross fall in cul-de-sacs

The following are general requirements for the design of right-of-ways and roads:

- All roads to be constructed in the Town of Midland shall be designed to urban standards unless specific approval from the Town is received prior to the development plan receiving draft plan approval. Roads designed to rural standards will only be considered for estate residential or industrial developments or for developments within the Little Lake Watershed.
- Where the development adjoins or incorporates an existing Highway, County Road or Town arterial road as shown on the Town's Official Plan, the Developer shall deed to the Ministry of Transportation of Ontario, County or Town the required widenings and/or daylighting.

- Minimum horizontal curve centerline radius shall be 14.5 for all cul-de-sacs and crescents. Minimum horizontal curve centerline radius for all other roadways shall be in accordance with MTO Geometric Standards.
- Minimum K-Values for all roadways shall be in accordance with MTO Geometric Standards. In all cases, the K-Values for crests and sags shall be no less than 8 and 4 respectively. Vertical curves are required for a change in grade greater than 1%.
- The minimum grade for all roadways shall be 0.5%.
- The maximum grade shall be 7% for local residential roadways and 6% for all other roadways.
- Minimum right-of-way width and pavement width shall follow Table 1- Roadway Design.
- The edge of the roadway paved surface shall have a minimum radius at intersections of 8 m for residential roads and 18 m for industrial roads.
- Finished roadways shall have a crossfall of 3% from the centerline to each outside curb line.
- On all streets, horizontal and vertical sight distances conforming to MTO geometric design standards shall be provided.
- Cul-de-sac turning circles shall have a minimum radius of 21.0 m to property and 15.0 m for asphalt.
- The road design for industrial and/or commercial developments shall take into account the type of traffic anticipated on the development. Granular base thicknesses, asphalt type and thickness, shoulder width, cul-de-sac radii shall be designed specifically for the development utilizing these standards as minimum requirements.
- Where new roads are to connect to existing roads the design shall extend along the existing road for a sufficient length to verify a satisfactory transition.
- All roads are to be extended to the limit of the subdivision boundary and shall terminate at a cul-de-sac when not connecting to an existing road unless otherwise approved by the Town Engineer.
- Roads shall be classified as arterial, collector or local in accordance with the Town Official Plan.
- Provisions shall be included in the road design for communal (super) mailboxes. The developer will be responsible for providing parking areas, structural concrete foundations, electrical supply etc. all as required by the Town, in locations designated by the Town.
- Private internal roadways shall conform to OPSD-352.01.

Category	R.O.W. (m)	Pavement Width (m)	Boulevards (m)	Type	
Residential Roads	20	8	2	Local Urban	
	26	8	2	Local Rural	
	26	14	2	Major Collector	Bike Lane Parking Lane
	26	9.5	2	Major Collector	Multi Use Trail Parking Lane
Industrial Roads	20	8	2	Local	

Arterial Roads	30	14	2	Arterial	4 Lanes Multi Use Tails both sides

Table 1- Roadway Design

5.4 Clearing and Grubbing

It is the Town's policy to preserve trees wherever possible. Therefore, trees shall be removed from the Road Allowance only to obtain proper sight distances, grading, ditching etc. All stumps, logs, brush, boulders, debris etc. shall be removed from the development site and deposited in a disposal area approved by the Town and all other affected authorities.

5.5 Grading

The boulevard area from the curb to the property line shall be graded to provide positive drainage toward the roadway if possible, minimum 2% grade.

For roads having an approved rural design section (i.e. estate residential or industrial) the area between the edge of the road shoulder and the street line shall be graded and the ditches cut with maximum slopes of 3 m horizontal to 1 m vertical from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fills over 1.5 m measured vertically from the edge of shoulder to the toe of slope shall not be steeper than 3:1. The ditch shall be located at the toe of the fill slope.

All shoulders, side slopes, ditches and boulevards to the street line shall be protected with a minimum 150 mm of topsoil and nursery sod.

Riprap (150 mm size minimum) over filter fabric shall be provided in areas requiring erosion control and as required by the Manager of Engineering.

5.6 Base Construction

The sub-grade shall be shaped to conform to the required grade and shall have a cross fall of 3% from the centerline of roadway to each side. The native sub-grade shall be compacted to a minimum of 95% SPD and shall be proof rolled. Granular Subbase and Base shall conform and be placed in accordance with OPSS 1010. Granular Subbase "B" shall be placed in a minimum of 300mm depth for local roads and 450mm Industrial, Collector, and Arterial. The Granular is to be compacted and tested to 100% SPD. Granular Base "A" shall be placed in a minimum of 150mm depth and compacted and tested to 100% SPD.

No granular base shall be placed until the grade on which it is to be laid has been inspected and approved by a Geotechnical Inspector.

5.7 Sub-Drains

For roadways with curb and gutter, sub drains shall be provided on both sides of the road base for the purpose of draining the granular road to a suitable outlet. The sub-drains shall be installed for the complete length of roadway unless the recommendations of the soils report specify a shorter length. However, in no case shall the length of the sub-drains be less than 15 m on each side of all catch basins.

The sub-drains shall consist of 150 mm diameter CSP piping with a filter fabric rap.

5.8 Curb and Gutter

Single stage curb and gutter shall conform to OPSD 600.04. Two stage curb and gutter shall conform to OPSD 600.07. Materials shall be in accordance in OPSS.

A minimum of 150mm of Granular Base under the curb line and extending 300mm beyond the back of the curb is required. The base shall be compacted to 100% SPD.

Mountable curbs shall be used for lanes and may be used for site plan developments in low speed applications. The use of a mountable curb for any other application shall be accepted by the Manager of Engineering.

Single stage curb and gutter may be installed after the placement of base asphalt and granulars, provided that prior to the placement of curb and gutter, the limit of the base asphalt extends a minimum of 1.0 m beyond the proposed face of curb and that a machine laid asphalt gutter is provided as per OPSS 312.

Concrete shall be a minimum of 32.0 MPA at 28 days with 5.0% to 8.0% plastic air content. Maximum slump shall be 60 mm and maximum water-cementing ratio (W/CM) shall be 0.45. All concrete shall follow the requirements of OPSS.MUNI 1350 and CSA A23.1 Exposure Class C-2

5.9 Utilities

All proposed new utility installations within the municipal ROW require Municipal consent from the Town's engineering department. Any utility ducts required to cross roads shall be confirmed with the utility company during the design process. All ducts must be placed in conjunction with the road base construction and prior to installation of subdrains.

5.10 Sidewalks and walkways

5.10.1 Sidewalks

A 1.5 m wide concrete sidewalk shall be placed in locations approved by the Town at minimum on one side of each roadway.

All sidewalks shall be constructed on a properly constructed foundation of 150 mm minimum depth of Granular "A" compacted to 100% SPD and be paved with concrete full width. Thickness to be 150 mm across residential driveways and 200 mm across commercial and industrial entrances. All concrete materials and work shall conform to OPS Specifications.

- 0.5% minimum to 5% maximum grade with a minimum cross fall of 2% - no steps allowed
- OPSD 310.010, 310.030
- Concrete shall be a minimum of 32.0 MPA at 28 days with 5.0% to 8.0% plastic air content. Maximum slump shall be 60 mm and maximum water-cementing ratio (W/CM) shall be 0.45. All concrete shall follow the requirements of OPSS.MUNI 1350 and CSA A23.1 Exposure Class C-2
- Sidewalk to be continuous through all driveways and entrances
- At every signalized and unsignalized intersection, a minimum of 3 Tactile plates shall be placed in accordance with OPSD 310.030, OPSD 310.033 and OPSD 310.039.
- Every 1.5m either an expansion joint, dummy joint or contraction joint shall be placed in accordance with OPSS.MUNI 351 and OPSD 310.010

5.10.2 Walkways

Walkways shall be designed in accordance with Ontario Regulation 413/12, Accessibility for Ontarians with Disabilities Act, 2005. Walkways shall be minimum of 1.5m wide and placed in locations approved by the Town.

All walkways shall be constructed on a properly constructed foundation of 150 mm minimum depth of Granular Base and paved with concrete full width. Thickness requirements same as sidewalks. All concrete materials and work shall conform to OPSS.

Removable metal bollards, placed at 1.0 m spacing, shall be placed at each end to restrict vehicular traffic.

5.11 Pedestrian Ways

5.11.1 Trailways

The Developer may be required to design and construct a trail system, walkways and linkages to existing trail systems. Trail developments will be implemented according to Town standards. All trail and walkway developments shall be shown on the landscape plans.

The minimum standard for the Multi-Use urban trail shall be:

- 3.0 m width, of 150 mm concrete;
- Concrete shall be a minimum of 32.0 MPA at 28 days with 5.0% to 8.0% plastic air content. Maximum slump shall be 60 mm and maximum water-cementing ratio (W/CM) shall be 0.45. All concrete shall follow the requirements of OPSS.MUNI 1350 and CSA A23.1 Exposure Class C-2
- 6x6x6Ga welded wire mesh;
- 150 mm granular A base compacted to 100% SPDD;
- broom finish with tooled edges and control joints.

5.11.2 Intersections

For design criteria see Ministry of Transportation Policies and Guidelines

5.11.3 Boulevards

Boulevards are defined as the area between the property line and the back of the curb. They shall be sodded between road and property line at 2% minimum to 7% maximum slope. They shall be constructed with positive drainage at the same slope as the driveway. Concrete shall be placed between intersecting sidewalks and curb at intersections

5.11.4 Ramps

Where a trail or sidewalk access route is equipped with a ramp, the ramp must meet the following requirements as per O.Reg. 413/12:

- The ramp must be a minimum of 0.9m
- Must have a clear height that provides a minimum clearance of 2.1m above the ramp
- The ramp must have a maximum slope of no more than a 1:10
- Must have 1.67m landings at the top and bottom and where there is an abrupt change in direction
- Must be equipped with handrails

5.12 Ditches and Culverts

- all ditches are to be protected from erosion and restored with 100 mm top soil and staked sod or other erosion protection method as directed
- entrance culverts to be a minimum 450 mm in diameter (1.6 mm CSP gauge)
- road crossing culverts to be minimum 600 mm in diameter (2.0 mm CSP gauge)
- all culverts to be supplied with headwall end protection constructed of flag stone, interlocking wall systems and/or concrete or other materials as approved by the Town of Midland, to a maximum elevation that is flush with the top surface of the driveway

5.13 Hot Mix Asphalt

5.13.1 General

As soon as the granular base has been completed, it shall be thoroughly compacted and shaped and the base course asphalt placed. See Table 2 for make up.

Category	Surface Course Asphalt	Base Course Asphalt	Granular A Base	Granular B Sub-base
Local	40mm SP12.5	50mm SP19	150mm	300mm
Industrial, Collector and Arterial	50mm SP12.5	100 mm SP19	150mm	450mm

Table 2- Asphalt Make Up

Developments with ditches are to have a 0.5 m asphalted shoulder and a 1.0 m shoulder. Grades are to be verified prior to acceptance.

Prior to roller compaction on the hot mix asphalt, all grades shall be verified and obvious defects in the material placed shall be corrected. Irregularities in the alignment and grade along the outside edges shall be corrected.

At the end of each completed portion and prior to opening the lanes to traffic, the completed sections of HMA course shall be ramped transversely to the existing pavement to a maximum of 30H:1V. In all cases, the ramps shall not form part of the permanent asphalt pavement and shall be removed prior to continuing paving operations.

The temperature of the HMA prior to placement shall be within the temperature range that corresponds to the PGAC manufacturer's recommended mix temperature. The temperature of the HMA immediately after spreading and prior to initial rolling shall not be less than 120 °C.

The surface course Asphalt shall not be placed for at least two years in a development from the date of placement of the base course asphalt and until 70 percent of the houses have been constructed, which ever is greater. Tack Coat shall be applied in accordance with OPSS 308.

All asphalt materials and work shall conform in all respects to OPSS. Testing will be carried out as required by the Geotechnical Consultant.

The above depths of asphalt are minimums and the actual depth may increase to reflect the requirements of the Pavement Design Soil Report and/or local conditions if deemed necessary by the Manager of Engineering.

Base course asphalt shall be in accordance with OPSS.MUNI 310 with a minimum insitu A.C. content of 4.7%;

Surface course asphalt shall be in accordance with OPSS.MUNI 310 with a minimum insitu A.C. content of 5.0%;

Industrial subdivisions will require specific pavement design included in the soils report.

Tests of subgrade materials must be conducted by a recognized soils laboratory and be acceptable to the Town. Copies of tests, along with proposed road designs, shall be submitted to the Town.

5.13.2 Operational Constraints

Paving shall not be carried out if the roadbed is frozen. The granular grade shall be free of standing water at the time of HMA placement. The surface of a pavement upon which HMA is to be placed shall be dry at the time of HMA placement. A HMA course shall not be placed on a previously laid course until a minimum 4 hours have elapsed, following final compaction of the previous course, and the temperature of the previous course is 60 °C or less.

Binder courses shall not be placed unless the air temperature at the surface of the road is a minimum of 2 °C and rising.

For surface course, the air temperature at the surface of the road shall be at least 7 °C, except for Superpave 12.5 FC2, the air temperature at the surface of the road shall be at least 12 °C.

5.13.3 Patching

Prior to HMA patching, temporary patching material shall be removed from the locations designated for such removal in the Contract Documents.

The resulting areas shall be filled and compacted with HMA, as specified in the Contract Documents. The HMA patching material shall be machine laid to the required thickness, grade, and crossfall.

Transverse and longitudinal joints between the existing pavement and the patch shall be perpendicular butt joints formed by a milling process or keyed in, as specified in the Contract Documents.

5.13.4 Compaction

Compaction shall be accomplished using the minimum combination number of rollers. The Contractor shall determine the correct sequence of rollers used for compacting in order to achieve compaction requirements. The operating speed of steel drum rollers shall not exceed 5 km/h and shall be operated in a manner to avoid undue displacement of the mix. Rollers shall operate with the drive wheel forward in the direction of paving.

Rolling procedures shall be as follows:

a) Breakdown Rolling

The mix shall be uniformly compacted as soon after placing as it can support the roller without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

b) Intermediate Rolling

The intermediate roller shall follow the breakdown roller as closely as possible. Passes shall overlap previous passes. The roller shall be operated to prevent pick-up of the HMA on the tires.

c) Finish Rolling

Finish rolling shall start longitudinally at the higher edge and proceed towards the lower edge.

5.13.5 Tolerances and Surface Appearance

After final compaction, each course shall be smooth and true to the established crown and grade. HMA binder and surface courses shall be free from deviations exceeding 6 mm and 3 mm, respectively, as measured in any direction with a 3 m straight edge.

Each course after final compaction shall be of uniform texture and shall be free of defects such as segregation, fat spots, oil spills, and roller marks. Defective areas shall be removed and replaced with HMA of the same type and compacted to the satisfaction of the Contract Administrator. If the Contractor's actions fail to prevent continued medium or severe segregation regardless of cause, the Contract Administrator may instruct the Contractor to cease paving until the problem has been corrected.

5.14 Special Road Designs

Special road designs, which are not covered by Town of Midland Standards, shall be in accordance with the most recent provisions of the geometric design standards manual and urban street geometrics, as adopted by the Municipal Engineers Association. (i.e. Special Design will be required in high density residential, commercial and industrial areas).

5.15 Builders Road

A road will be classified as a "builders' road" when the granular bases and sub-drains, first stage curb and gutter, base course asphalt and rough grading of the boulevards has been certified complete by the Developer's Engineer and accepted by the Manager of Engineering.

OPSS Granular 'A' and Granular 'B' materials are most commonly used for road construction in the Town of Midland (see 6.6 Base Construction).

Pavement specification shall be increased as follows:

- The binder course (base) asphalt under the bus route or curb lane must be increased by 50 mm;
- On four lane roadways and bus routes, the base course asphalt shall be HDBC (OPSS 1149).

5.16 Driveways

a. Driveways to be a minimum of 50 mm HL3A on a minimum of 200 mm of Granular 'A' for Residential and 75 mm HL3A on a minimum of 250 mm of Granular 'A' for Commercial/Industrial or alternative equivalent surface material as approved by the Manager of Engineering (paving stone, concrete)
b. Concrete shall be a minimum of 32.0 MPA to 28 days with 5.0% to 8.0% plastic air content. Maximum slump shall be 50.0 mm and maximum water-cementing ratio (W/CM) shall be 0.45. All concrete shall follow the requirements of OPSS.MUNI 1350 and CSA A23.1 Exposure Class C-2
c. All driveways shall be paved from road edge to minimum property line
d. Minimum grade: 0.5%

e. Minimum radius to edge of pavement at cul-de-sacs: 15.0 m residential, 17.0 m industrial/commercial
f. Curb sections may be no closer than 1.5m from the edge of the street pavement
g. Height of the curb shall be no more than 150mm above the finished pavement
h. Curb to be depressed at intersection for sidewalks (i.e. Wheel Chair Ramps, per OPSD 310.050)
i. Concrete curb and gutter to be continuous through all entrances
j. Driveway section to be 4.0 m at single driveways and 6.0 at double driveways, width of triple driveways to satisfy zoning by-law requirements (not more than 50% of lot frontage)
k. Rural driveways shall include an entrance culvert unless the driveway is at a ditch highpoint.
l. Unless warranted by specific conditions the pipe size for a new culvert installation shall be a minimum 450mm diameter dimension, in either aluminized corrugated steel or double walled smooth interior high density polyethylene (HDPE) pipe
m. The maximum length of culvert is 18.0 metres
n. All rural driveways require an entrance approval permit.
o. The maximum grade for access driveways shall be 7% unless otherwise approved by the Town Engineer. This maximum grade is not recommended and should be employed only in exceptional cases where conditions prohibit the use of lesser grades. The minimum grades permissible are 2% on boulevards and 1% on lots. Maximum grade change shall be in accordance or OPS303.02
p. All access driveways shall be located a minimum of 1.5 m from light poles, hydro transformers, catch basins, hydrants, watermain valves, Bell manholes, Bell, and Cable T.V. junction boxes, side lot lines and water service valve boxes. All access driveways shall also be located a minimum of 10 m from the street lines for corner lots. Where frontage limitations interfere with standard locations site specific solutions shall be detailed with the Plan and Profile and Lot Grading Plans
q. Headwalls shall be constructed to protect the driveways from erosion and underpinning at the culvert edge. Head walls may be constructed of formed concrete or masonry laid and secured in place
r. Minimum distance of driveway from an intersection shall be 15.0 m measured from the tangent curb line of the adjacent road intersection and no portion of driveway shall be located within a sight triangle. For retrofit situations, minimum distance of driveway from an intersection shall be checked with Town staff.

5.17 Street Name Signs

Street name signs shall be supplied and erected by the Developer.

Street name signs shall be double sided 160mm extruded aluminum with length to suit lettering. Lettering shall be white on a blue retro-reflective background with a Town of Midland Logo (See appendix E for a Street Name Sign example). Signs shall be mounted on 73mm diameter galvanized steel post imbedded at least 1.2 metres into the ground. Mounting hardware shall be extruded aluminum post caps, cross mounting bracket or end bracket, installed in accordance with manufacturer's recommendation.

Street name signs shall be installed at all intersections within the development.

5.18 Traffic Signs

Traffic control signs shall be supplied and erected by the Developer as directed by the Manager of Engineering. Signs shall be in compliance with the Ontario Traffic Manual (OTM) Regulatory Signs and shall be placed in accordance with the OTM and the Highway Traffic Act. All traffic control signs are to be made with high intensity type reflective sheeting (a minimum sheeting level of Type III or IV must be used for Stop signs and appurtenances and Yield signs and appurtenances). Where warranted, the Manager of Engineering may require Warning Signs.

Unless other directed, posts shall be galvanized steel U-Flange type imbedded at least 1.2 metres into the ground with length to suit the application.

5.19 Pavement Markings

Upon completion of the final asphalt paving and upon notification by the Town, the surface of the roadway shall be painted in conformity with the standards of the Ministry of Transportation Ontario at all intersections, school crossings, walkways and railway crossings to clearly indicate the proper traffic zones and stop lines.

5.20 Accessible parking

Off street parking facilities must provide the following two types of parking spaces for the use of persons with disabilities as per O.Reg.413/12:

- Type A, a wider parking space which has a minimum width of 3.4m and signage that identifies the space as “van accessible”
- Type B, a standard parking space which has a minimum width of 2.4m

The minimum parking spaces for off-street parking shall be as per the Towns Zoning By-Law.

5.21 Traffic Calming Measures

Traffic calming measures may be required as part of the original design of roadways where traffic calming issues are anticipated and in accordance with an accepted Traffic Impact Study. Further, the Owner shall be responsible to implement traffic calming measures up until Assumption of Subdivision, should unanticipated requirements arise after a development becomes occupied. Town of Midland traffic calming implementation requirements shall be followed according to the “Town of Midland Traffic Calming Policy” – October 2021.

5.22 Bike Lanes

- Lane width for a dedicated bike lane, along curb lane, shall be 1.5 m with a 0.5 m painted buffer or as per requirements of OTM Book 18.
- Lane width for a dedicated bike lane, adjacent to a parking bay, shall be 1.5 m with a 1 m painted buffer or as per requirements of OTM Book 18.

6 Storm Drainage System

6.1 General

The following sections are design guidelines to provide a solid engineering basis for storm drainage and stormwater management design, establish uniform guidelines of minimum standards, and improve processing of site plan and subdivision applications for the approval of the Town.

The stormwater drainage system is to be design in accordance with MECP "Design Criteria for Sanitary Sewers, Storm Sewers, and Forecemains for Alterations Authorized Under Environmental Compliance Approval V1.1 July 28, 2022" in support of the Town CLI-ECA issued by the MECP.

6.1.1 Required System

Generally, storm drainage shall be accommodated by a system of curb, gutter and storm sewers in all subdivisions except industrial or rural subdivisions of subdivisions within Little Lake Watershed for which open ditch drainage may be permitted if minimum design criteria can be realized. The storm drainage system is to be designed to limit flood damage and hazards under long term storm conditions, to provide a reasonable level of convenience and safety for pedestrian and traffic use by removal of lot and street surface runoff under short term storm conditions and to prevent the impairment of water quality and disturbance to natural streams.

6.1.2 Service Areas

The system shall be designed to service all areas within the subdivision to their maximum future development in accordance with the Official Plan. Allowance shall be made for inflows from the appropriate adjacent storm sewers, subdivisions or areas. Discharge of the system is to be to the appropriate adjacent sewer or watercourse. The exact location for connecting sewers or channels to adjacent sewers or areas shall be approved by the Town Engineer.

6.1.3 Minor System

Storm Sewers shall be designed for at least a 5-year return frequency storm without surcharge and are to be sized using the Rational Method. Relevant figures are to be entered on Storm Sewer Design Sheets.

6.1.4 Major System

The combination of overland flow system and minor system shall be designed for the 100-year return frequency storm.

6.1.5 Sewers General

- minimum cover = 1.5 m frost protection from obvert of pipe
- minimum vertical and horizontal pipe separation between sewer and watermain to be no less than 0.5 m this is to be reviewed by the Manager of Engineering.
- structural design checks shall be carried out to ensure that the combined live and dead loading does not exceed the three edge crack bearing strength of reinforced concrete pipe or exceed 5% maximum vertical deflection in the case of PVC pipe
- the minimum grade for the furthest upstream storm manhole run must be not less than 1.0%

6.2 Stormwater Management

A hierarchy of preferred stormwater management practices is outlined in the MECP 2003 Stormwater Management Practices Planning and Design Manual. It consists of (i) Stormwater Lot Level Controls, (ii) Stormwater Conveyance Controls and (iii) End-of-pipe Stormwater Controls.

a) Stormwater Lot Level Controls

Stormwater lot level controls involve treating stormwater before it reaches the development conveyance systems. The following are different types of lot level controls available:

- Reduced Lot Grading

- Rear Lot Ponding
- Soak away Pits

b) Stormwater Conveyance Controls

Stormwater conveyance controls are implemented as part of the conveyance system. Stormwater conveyance controls can be shown in these types of systems:

- Pervious Pipe Systems
- Pervious catch basins
- Grassed Swales
- Open Ditches
- Permeable pavers
- Underground storage
- Oil/Grit separators
- Parking lot storage
- Directing roof leader to rear yard ponding areas, soak away pits, or to cisterns or rain barrels
- Sump pumping foundation drains to rear yard ponding areas

c) End-of-pipe Stormwater Controls

End-of-pipe stormwater controls receive stormwater from a conveyance system and discharge the treated water to receiving waters. The various types of end-of-pipe systems are as follows:

- Wet Ponds
- Dry Ponds
- Constructed/Artificial Wetlands
- Infiltration Trench
- Infiltration basin
- Filter Strip
- Sand Filter
- Oil/Grit Separator

6.2.1 Stormwater Management Requirements

The stormwater management requirements generally must reflect district solutions and vary depending upon the watershed, and in some cases the storm sewer shed, that the site is located. Site specific requirements can be obtained from the Town. A stormwater management report will be required for all development applications.

6.2.2 On-Site Stormwater Management Reports

A Stormwater Management Report setting out the existing and proposed drainage System shall be submitted for approval to the Manager of Engineering. The report must also be submitted for approval to the Ministries of the Environment and Natural Resources and address the following points:

- the modified rational method, or equivalent, is to be used for the analysis;
- a control device (orifice) must have a diameter of no less than 75 mm in order Prevent clogging of the opening;
- control devices shall be installed on the upstream side of the maintenance hole;
- storm connections from the building roof and foundation drains must be made downstream of the maintenance hole and/or catch basin inlet controls;
- ponding limits and available storage are to be depicted on the site servicing drawings, and the maximum ponding depth in parking areas is not to exceed 250 mm;
- an overland flow route shall be clearly marked on drawings. The grading of parking lots and landscaped areas must provide a safe path for the overland flow route to the surrounding municipal right of way during storms exceeding the design storm event;
- roof drains should be selected to give a minimum discharge of 0.042 cms/ha of roof area;
- details and concepts are to conform to the Urban Drainage Design Guidelines, set out by the MECP;
- all on-site storm water management requires a Certificate of Approval from the MECP under the Transfer Review program. Two completed MECP Application forms are to be submitted to the Town;
- where applicable, approval will be required from SSEA;
- a Professional Engineer must approve and stamp the on-site storm water management report and site servicing drawings;
- on-site storm water management applications are to be accompanied with four folded site servicing drawings and four on-site storm water management reports.

6.2.3 Quality Control

Potential increases in runoff rates resulting from new development shall be controlled as required by the Town. Typical methods of quality control are temporary storage of water on parking lots, discharging rainwater leaders onto grassed areas and downstream stormwater retention ponds. Where downstream constraints exist such as those established by the Town or the Ministry of Natural Resources, the drainage report shall demonstrate how runoff rates will be controlled to satisfy those constraints.

In the absence of such constraints, the post-development flows from the 5-year return frequency storm generally shall not exceed the flows for pre-development conditions for the same storm at the outlet for the minor system unless it is demonstrated to the satisfaction of the Town Engineer that uncontrolled flows will have no adverse effects. Similarly for the major system, post-development runoff from 25 year and 100-year return frequency storm generally shall not exceed the pre-development runoff for the same storm. Quality control facilities shall be provided to the satisfaction of the Town Engineer, the Ministry of the Environment of Conservation and Parks, and the Ministry of Natural Resources and Forestry.

Stormwater quality controls are to be implemented on all applications in accordance with the applicable master drainage or sub watershed plan or site-specific stormwater management plan. The Town of Midland requires MECP Level 1 quality control on all sites.

6.2.4 Water Quantity

Post-to-pre quantity control shall be provided unless otherwise directed by the Town or Severn Sound Environmental Association (SSEA). Under certain circumstances where the proposed development or site plan is located in close proximity to Georgian Bay and where there are no downstream landowners, the post-to-pre peak flow control requirements may be waived subject to approval by the Town and SSEA.

6.2.5 Water Balance

All new developments and site plans shall provide post-to-pre infiltration on-site where soils permit and unless otherwise established at the plan stage. Sites shall minimize any anticipated changes in the water balance between pre-development and post-development conditions and shall provide a minimum infiltration equivalent to the first 5mm of any given rainfall event.

6.2.6 Hydrologic and Hydraulic Studies

When required, hydrologic studies shall employ an appropriate modeling technique with defensible parameter values. The study shall describe the modeling parameters and the criteria for their selection as well as input and output data. The consultant is to assume full responsibility for the proper application of the hydrologic models. The Town recommends that the Consultant follow the MTO Drainage Management Technical Guidelines. To facilitate municipal review, the following documentation must be submitted.

A. Map showing the modeling sub catchments.
B. Summary tables that provide the following data on each modeling sub catchment:
    - total drainage area;
    - pre- and post-development impervious area;
    - pre- and post-development runoff coefficient to each ground cover element (rooftop, street, grass, etc.);
    - total drainage area devoted to each hydrologic soil group;
    - storage volumes associated with pre- and post-developed runoff control measures.
C. Map showing the drainage areas with modeling parameters, proposed facilities, and pre- and post-development flows at all crossings.

6.2.7 Meteorology

The intensity-duration frequency (IDF) curves used for the Town of Midland were originally derived from rainfall data taken from the Orillia Atmospheric Environment services weather station. The equations for these curves are as follows:

2 Year Storm	1=	$\frac{807.44}{(T.C. +6.75)\ 0.828}$
5 Year Storm	1=	$\frac{1135.4}{(T.C. + 7.5)\ 0.841}$
10 Year Storm	1=	$\frac{1387}{(T.C. + 7.97)\ 0.852}$
25 Year Storm	1=	$\frac{1676.2}{(T.C. +8.3)\ 0.858}$

50 Year Storm 1= $\frac{1973.1}{(T.C. + 9.0)\ 0.868}$

100 Year Storm 1= $\frac{2193.1}{(T.C. +9.04)\ 0.871}$

Based on these IDF curves, the Consultant is to develop the proper design storms for use in hydrologic studies.

In general, the SCS design storms should be used for determining the hydrographs for undeveloped watersheds and for checking detention storages required for quantity control. The Chicago design storm method should be used for determining hydrographs in urban areas and also for checking detention storage. In many cases, the consultant will be required to run both sets of design storms to make sure that the more stringent is used for each individual element of the drainage system (pipe flow, street flow, channel flow, detention storage).

The time step for discretization of the designed storm can vary according to the size of the sub-watershed but must not exceed the estimated time of concentration. The maximum rainfall intensity should be compatible with that of real storms on record.

6.3 Storm Sewer Design

6.3.1 Hydraulic Design

Storm Sewers shall be a minimum of 300 millimetres in diameter PVC, concrete pipe or corrugated metal.

Manning's Formula shall be used to calculate required pipe sizes.

$$V=\frac{R^{2/3}S^{1/2}}{n}$$

V is average velocity (m/s)
R= Hydraulic radius (m)
S= Energy slope (m/m)
n= Manning's roughness coefficient

The value of the roughness coefficient 'n' used in the Manning's formula shall be as follows:

- concrete Pipe	0.013
- concrete box culverts	0.013
- corrugated Metal 68 x 13 mm corrugations	0.024
- corrugated Metal 25% paved invert	0.021
- PVC Pipe	0.013

The minimum velocity shall be obtained by selecting a slope to ensure that cleansing velocities occur once in two years on the average. Generally, 0.75 metres per second for the 5-year return storm design flows may be used.

The first leg shall have a minimum of 1.00%. All other legs shall have a minimum grade of 0.50%.

The normal maximum velocity shall be 5.00 metres per second at full flow for sewers and 1.50 metres per second for channels. Energy dissipaters at outlets will be designed to reduce velocities to 1.00 metre per second or less.

A sufficient drop shall be provided across each manhole to offset any hydraulic losses, the obverts of inlet pipes shall not be lower than obverts of outlet pipes and drop structures shall be used only when drops of more than 0.9 metres are necessary. Calculations for hydraulic losses shall be included with storm design information.

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

6.3.2 Runoff Calculations

Flow Calculations

Rainfall equations or curves and design storm hydrographs must be approved by the Director of Public Works.

When the Rational Method is used, an initial inlet time of 15 minutes shall be used except where the zoning requires the use of a coefficient of 0.6 m or higher in which case a 10-minute inlet time shall be used.

Run-off coefficients are to be determined from the most recent MECP Guidelines. A minimum run-off coefficient of 0.55 is to be used for undeveloped upstream area where future residential development is expected and 0.75, where future industrial, high-density residential or commercial development is expected.

Run-off coefficients for the Rational Method shall be as follows:

Category	Soil Type, Area or Medium	Coefficient	Category	Soil Type, Area or Medium	Coefficient
Lawns	Sandy soil, Flat, 2%	0.05-0.10	Industrial	Light Areas	0.50-0.80
	Sandy soil, average, 2-7%	0.10-0.15		Heavy Areas	0.60-0.90
	Sandy soil, steep%	0.15-0.20	Parks, Cemeteries		0.10-0.25
	Heavy soil, flat, 2%	0.13-0.17	Railroad Yard Areas		0.20-0.40
	Heavy soil, average 2-7%	0.18-0.22	Unimproved Areas		0.10-0.30
	Heavy soil, steep, 7%	0.25-0.35	Streets	Asphalt	0.70-0.95
Business	Downtown Areas	0.0-0.95		Concrete	0.80-0.95
	Neighborhood Areas	0.50-0.70		Brick	0.70-0.85
Residential	Single-Family Areas	0.30-0.50	Driveways and Walkways		0.75-0.85
			Roofs		0.75-0.95
	Multi-units Detached	0.40-0.60	Apartment Dwelling Areas		0.5-0.70

	Multi-units, Attached	0.60-0.75	
	Suburban	0.25-0.40	

Table 3- Run-off Coefficients

Storm sewers shall be designed to drain all lands based on the Rational Method. The Rational Method calculations must be checked using a model approved by the Town Engineer where the drainage area is greater than 10 hectares. The larger of the flows is to be used in the design of the sewer system unless approved otherwise.

Q= 0.0028 C I A where: Q = Flow in cubic metres per second
A = Area in Hectares
C = Run-off coefficient
I = Intensity in mm/hr

6.3.3 Intensity of Rainfall

The intensity of rainfall is to be determined from the Intensity-Duration-Frequency values from the Atmospheric Environment Services Orillia Station.

6.3.4 Time of Concentration

The minimum initial time of concentration is to be 15 minutes.

6.3.5 Pre-Development

To calculate the initial time of concentration (tic) for upstream, undeveloped lands, the following formulas may be used: Bransby Williams, HYMO/OTTHYMO, SCS Upland Method, etc. The most appropriate method will be determined at the discretion of the Town.

6.3.6 Post-Development

To calculate the initial external time of concentration (tc) for external lands that are scheduled for future development, a straight line is to be drawn from the furthest point within the watershed to the proposed inlet. The top 50 metres shall have an initial tc of 10 minutes and the remainder shall have tc assuming the velocity in the sewer is 2m/s. The summation of the two tc's will give the future external time of concentration.

If the upstream area has adequate storm sewers, channels, or culverts, the velocity of the flow through these sewers, channels, or culverts shall supersede the 2m/s calculation.

6.3.7 Drainage Area

Drainage systems must be designed to accommodate all upstream drainage areas considering interim and ultimate conditions.

6.3.8 Sewer Material

Pipes for main sewers shall be concrete or PVC DR35 with a minimum diameter of 300 mm and shall conform to CSA Standard A257.1 with a minimum strength of 65D Class III or as required by depth.

Pipe for catch basin leads shall be concrete with a minimum strength of E.S. or PVC DR28 rubber gasket type joints with a diameter of 250 mm for singles and 300 mm for doubles.

Sewers shall be constructed with bedding as per OPSD 802.03, Class B-1, Granular "A" compacted to 95% SPD unless otherwise directed by the Town Engineer.

Catch basin frames and grates shall be as per OPSS.MUNI 1850 and shall be as manufactured by McCoy (or approved equivalent).

6.4 System Layout

Roof leaders are to be discharged to the ground surface to splash blocks and flows are to be directed away from the building in such a way as to prevent ponding or seepage into weeping tile. Where flat roofs are used, as in commercial or industrial sites, detention roof hoppers requiring smaller or fewer roof leaders cannot be used as part of the stormwater management design.

Weeper tiles are not to be directly connected to the storm sewer system unless permission is received from the Director of Public Works.

All other connections to the storm sewers shall be made as approved by the Manager of Engineering.

Storm sewers shall generally be located as per the standard detail drawing for storm sewer. At bends in the road allowance the storm sewer shall follow along the same side.

When storm sewers or open drainage channels are located on easements the easement width shall be 4.0 minimum. This minimum must be increased where the depth or diameter of service dictates greater working room.

A minimum depth of 1.5 metres to the spring line from the finished road or ground surface elevation, or a sufficient depth for any foundation drains or other connections shall be provided. Fill beneath sewers is to be compacted to 95% SPD.

Minimum clearances between services shall be 0.5m in accordance with MECP guidelines.

6.5 Maintenance Holes

Maintenance holes shall be placed at the end of each sewer, at changes in size and material and at changes in grade and alignment. Curved or properly deflected sewer lines may be allowed with the approval of the Manager of Engineering.

Maintenance hole tops are to be set to base course asphalt grade and then adjusted to final grade when top lift of asphalt is placed. A self-levelling frame and cover shall be used for all new maintenance holes that are within the asphalt roadway.

Deflection of storm sewers at a maintenance hole shall not be more than 90 degrees.

Drop maintenance holes shall be provided for all sewer junctions having an elevation difference in excess of 0.9 metres that cannot be eliminated by changing sewer grades.

Where maintenance holes are located in areas to be flooded by the major storm design and surcharged sewer design is not used, manhole covers shall be of the sealed variety.

Where maintenance holes are located where the surcharged sewer design hydraulic grade line is higher than the rim elevation, manhole covers shall be of the bolted variety.

Full height benching within maintenance holes shall be completed as per OPSD.

The maximum change in direction is 90 degrees for pipes 900mm and smaller and 45 degrees for pipes over 900mm.

6.5.1 Maintenance Hole Requirement

Maintenance holes shall be precast and shall be designed and constructed in accordance with OPSS MUNI 402 and OPSD 704.010. Where the standard drawings are not applicable, the maintenance holes shall be individually designed and detailed.

a. Location and Spacing

Maintenance holes shall be located at each change in alignment, grade, or pipe material, at all pipe junctions, at the beginning or end of radius pipe sections and at intervals along the pipe to permit entry from maintenance to the sewer.

Size of Pipe	Metres
300 to 750 mm dia.	110
825 to 1200 mm	125
Over 1200 dia.	155

Table 4- Maintenance Hole Spacing

The change in direction of flow in any maintenance hole shall not be more than 90 degrees. Maintenance holes shall be located, wherever possible, a minimum of 1.5 m away from the face of curb and/or any other service.

b. Head Losses and Drops

Suitable drops shall be provided across maintenance holes to compensate for the loss in energy due to the change in flow velocity and for the difference in the depth of flow in the sewers.
In order to reduce the amount of drop required, the designer shall, wherever possible, restrict the change in velocity between the inlet and outlet pipes to 0.6 m/s.
Hydraulic calculations shall be submitted for junction and transition maintenance holes on sewers where the outlet is 1050 mm diameter or greater. In addition, hydraulic calculations may be required for maintenance holes where the outlet pipe is less than 1050 mm diameter if, in the opinion of the Town, there is insufficient invert drop provided across any maintenance hole.
Regardless of the invert drop across a maintenance hole as required by calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipe at any maintenance hole location.
The minimum drops across maintenance holes shall be as follows:

Change in Direction	Minimum Required Drops
0 degrees	30mm
0-45 degrees	50mm
46-90 degrees	80mm

Table 5- Required Drops in Maintenance Holes

6.6 Catch Basins

Catch basins are to be located at all low points, upstream of pedestrian crossings and not within 1.0 m of curb depressions. Preferable, catch basins where required will be adjacent to lot lines.

The maximum allowable spacing shall be 80 m where catch basins are not used as inlet controls. Where catch basins are designed for inlet controls, spacing shall be determined by design. See table 6 below for spacing requirements

Catch basin leads shall be minimum 250 mm at a minimum grade of 0.7% for single catch basins and 300 mm at a minimum grade of 0.7% for double catch basins. Leads shall connect to manholes where possible. Where catch basins are designed for inlet controls, lead sizes down to 150 mm for singles or doubles can be used where such sizes will limit flows to the gravity capacity of the sewer system.

The maximum drainage area for any catch basin shall be 2000m2 of paved area or 5000m2 of grassed area. Additional catch basins may be required at road intersections, elbows, and cul-de-sacs to facilitate satisfactory drainage.

Rear lot catch basins shall be located 1.5 m from the back lot line and 1.0 m from the side lot line and the catch basin and lead shall be located in a minimum 4.0 m wide easement centered on the lot line.

6.6.1 Catch basin Requirements

Catch basins must be precast and shall be designed and constructed in accordance with the most recent OPSD 704.010 and OPSS.MUNI 402 requirements.

a. Location and Spacing

Catch basins shall be selected, located, and spaced in accordance with the conditions of design. The design of the catch basin location and type shall take into consideration the lot areas, the lot grades, pavement widths, road grades and intersection locations.
Maximum spacing for catch basins including cul-de-sac gutters shall be as follows:

Road Grade	Maximum Spacing
0.5 to 0.75%	70m
0.76 to 3.0%	95m
3.1 to 4.5%	90m
Greater than 4.6%	75m

Table 6- Catch Basin Spacing

Catch basins shall be generally located upstream of pedestrian crossings. Catch basins shall not be located in driveway curb depressions.

b. Catch basin Types

Typical details for single, double, and rear lot type catch basins are shown in the OPSD.
Any special catch basins and inlet structures must be fully designed and detailed by the Engineer for approval by the Town.
Double catch basins are to be installed at the low point of any road.

c. Catch basin Leads

For single catch basins the minimum size of connection shall be 250 mm and the minimum grade shall be 2.0%. For double catch basins, including rear lot catch basins, the minimum size of connection shall be 300 mm and the minimum grade shall be 2.0%. Doubles with back arches to be provided in sags.

In general, catch basins located in close proximity to a downstream maintenance hole shall have their leads connected to the maintenance hole. Long catch basin connections (in excess of 20 m) shall be connected to a maintenance hole.

d. Frame and Grate

The frame and cover for catch basins in roadway or walkway areas shall be as detailed in the OPSD 400.02, with type B open cover. Catch basins located within the traveled portion of a roadway shall have the frame elevation set flush with the surface of the base course asphalt. The adjustment and setting of the frame and cover shall be completed in accordance with the details provided in the OPSD 704.010. Catch basins located in grassed areas shall have the Birdcage Grate per 400.120.

6.7 Oil/Grit Separators

Oil/Grit separators may be installed where a water quality control pond/wetland is not feasible. They are only permitted as a pre-treatment in the treatment train approach in conjunction with other stormwater management options.

When completing sizing calculations for oil/grit separators, the following guidelines shall apply:

- TSS removal efficiency equivalent to the enhanced level of treatment is required (i.e. minimum 80% TSS removal).

The owner is responsible for maintaining and repairing oil/grit separators installed on private property. Operation and maintenance requirements for oil/grit separators shall be identified in the SWM report for the site and shall be implemented by the owner to ensure that the continued performance of the device as designed is achieved.

6.8 Underground Storage and/or Infiltration

Underground storage may be used where surface SWM storage is not feasible, or the volume is not adequate (subject to acceptable geotechnical and hydrogeological investigations in support of the approach). If the underground storage facility is designed for infiltration of road or parking lot runoff, a pre-treatment structure shall be provided. The outlet structure shall be designed to meet the SWM control requirements. Operation and maintenance requirements for the underground storage facilities shall be identified in the SWM report for the site and shall be implemented by the owner to ensure that the continued performance of the facility as designed is achieved.

6.9 Storm Sewer Requirements

a. Trunk Sewer System

A trunk sewer system shall be defined as part of a drainage system that drains an area of 100 ha of land or greater. Trunk storm sewer systems shall be designed to accommodate a 25 year storm.

b. Pipe Capacities

Manning's formula shall be used in determining the capacity of all storm sewers. The capacity of the sewer shall be determined on the basis of the pipe flowing full.

c. Flow Velocities (Flowing full)

For circular pipes the minimum acceptable velocity is 0.75 m/s and the maximum acceptable velocity is 4.0 m/s

d. Minimum Sizes

The minimum size for an on street storm sewer shall be 300 mm.

e. Depth of Storm Sewers

Storm sewers shall have a minimum frost cover of 1.5 m. Where the minimum cover is not possible the Engineer shall provide a design solution with consideration for additional loading due to frost.

f. Location

The storm sewers shall be located as shown on the standard Town of Midland road cross section drawings.

A minimum clearance of 500 mm shall be provided between the obvert of the sanitary sewer and the invert of the storm sewer. The sanitary sewer connections are required to go under the storm sewer.

g. Radius of Pipe

Radius pipe shall be allowed for storm sewers 975 mm in diameter and larger provided that a maintenance hole is located at the beginning or at the end of the radial section. The minimum center line radius allowable shall be in accordance with the minimum radii table as provided by the manufacturers.

h. Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

i. Sewer Alignment

Storm sewers shall be laid in a straight line between maintenance holes unless radius pipe has been designed. Joint burial (common trenching) with sanitary sewers will be considered when supported by the recommendations of a soils report prepared by a qualified Geotechnical Engineering Consultant.

j. Changes in Pipe Size

No decrease of pipe size from a larger upstream to a smaller size downstream will be allowed regardless of the increase in grade.

k. Standard Easement Requirements

The minimum width of easements for storm sewers shall be in accordance with the following guidelines.

Size of Pipe	Depth of Invert	Minimum Width of Easement
250 to 375mm	3.0m maximum	4.0m
450 to 675mm	3.0m maximum	4.5m
750 to 1500mm	3.0m maximum	6.0m
1650mm and up	4.0m maximum	4.0 plus 3 times O.D. of pipe

Table 7- Easement Widths

For easements containing more than one pipe or underground service the minimum width will be based on the above chart for the maximum pipe size plus 3.0 m.

Regardless of the preceding, all situations will be reviewed and judged on individual cases at the discretion of the Town.

In areas where it is difficult to control the infiltration of ground water into the sewer trenches, clear stone may be used provided it is completely wrapped in a suitable geotextile, selected, and installed in accordance with the manufacturer's requirement.

The width of trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher strength pipe is utilized.

i. **Testing and Acceptance**

All storm works shall be thoroughly flushed and/or cleaned of debris and all pipes shall have a CCTV inspection as per OPSS 409 as part of the final acceptance inspections.

6.9.1 Roof Leaders, Foundation Drains and Storm Connections

Roof Leaders

Roof leaders shall not be connected directly to the Town sewer systems. Leaders shall discharge to concrete splash pads in landscaped areas and directed to side yard swales. Roof leaders can also be connected to an infiltration system on private property.

Foundation Drains

It is the Town policy that foundation drains shall not be connected directly to the Town sewer systems. A sump pump system shall discharge to a concrete splash pad in a landscaped area and with the water directed to side yard swales. The geotechnical report shall consider the ground water table elevation and recommend minimum basement elevations. Foundation drains discharge water that becomes a nuisance shall be corrected.

6.9.2 Channel, Culvert and Overland Flow

For channel, culvert, bridge and/or erosion control projects the proponent is responsible for obtaining all necessary approvals from the governing agencies, such as the MNR, DFO and/or MECP.

Culverts and Bridges

Road Classification	Design Flood Frequency
Arterial	1:100 Year to Regional
Collector	1:50 Year
Urban Local	1:25 Year
Rural Local	1:25 Year
Temporary Detour	1:10 Year
Driveway	1:5 Year

Bridges and other major drainage structures shall require special designs as determined by the Town. Hydraulic calculations will be required.

The frequency and magnitude of flooding or erosion shall not be increased on upstream or downstream properties.

6.10 Open Channels

The proposed criteria for an open channel design shall be submitted to the Town for approval prior to the actual design being undertaken. Open channels shall be defined as major system overland flow channels, minor system outfall channels or natural channels. Major system overland flow channel designs may be required to accommodate the regional storm or the 100-year storm for new development.

"Natural" channel design criteria will be determined on a site-by-site basis. The following guidelines must be considered:

Open Channels	Minimum Velocity	Maximum Velocity
Grass Lined- Natural	0.7m/s	1.5m/s
Grass lined- Maintained	0.7m/s	1.5m/s
Gabion Lined	0.7m/s	2.5m/s
Concrete lined	0.7m/s	4.0m/s

Table 8- Channel Design

6.11 Open Ditches

In industrial developments, rural developments or developments within the Little Lake Watershed open ditches may be permitted by the Town. Ditches shall be constructed below the sub-grade of the roadway a maximum of 0.5 m and a minimum of 0.15 m.

The minimum ditch grade shall be 0.5% and the maximum 6%. In exceptional cases and where ditches are on easements off the Road Allowance, ditches with grades greater than 6% may be allowed by the Manager of Engineering but these shall be suitably protected against erosion to the satisfaction of the Engineers.

The minimum ditch protection on all ditches shall be 150 m of topsoil and staked sod on the side slopes and bottom of the ditch regardless of the ditch gradient.

Normal ditch to ditch road culverts shall be installed where required as follows:

a. Minimum Length; as required from centre of ditch to centre of ditch;
b. Minimum size; 500 mm diameter for road crossing, 450 mm driveway;
c. Material; standard galvanized corrugated pipe, spirally corrugated pipe will not be permitted;
d. Gauge; as recommended by manufacturer for H20 Highway loading, minimum 2.0 mm thickness;
e. Cover; 300 mm minimum for road crossings;
f. Bedding; culverts shall be bedded and backfilled with granular material in accordance with OPSS.

Open channels are to be designed as follows:

a. For the Regional Storm where the upstream watershed area exceeds 1 square kilometer;
b. For a minimum 25-year return frequency storm with protection from erosion damage for larger storms if required by the Town Engineer;
c. To maintain the natural storage characteristics of the watercourse;

d. To maintain a natural appearance as far as possible;

Outfall structures to existing channels or watercourses shall be designed to minimize potential erosion or damage in the vicinity of the outfall from maximum design flows.

6.12 Watercourse Erosion and Bank Stability

Where erosion or bank instability is already evident in an area to be developed or re-developed, the Town of Midland requires that the situation be stabilized by appropriate remedial measures. Where development will cause significantly increased downstream erosion, the Town also requires the Developer to mitigate further damage by appropriate remedial measures.

Where designing remedial erosion or bank stabilization works, preservation of the watercourse dynamics and natural valley aesthetics must be secondary only to achieving a sound technical solution. A normal bank flow channel has a capacity of about the 1:2 year flood. Protection to this level will be adequate provided care is taken to prevent any damage by higher floods and provide that the channel bank is not coincident with a higher valley bank. In this latter case, it may be necessary to protect the bank to a level as high as the 1:100 year flood or even the flood resulting from the Regional Storm.

The proposed criteria for an erosion or bank stability design shall be submitted to the Town for approval prior to the actual design being undertaken.

6.13 Stormwater Management Facility

A stormwater management facility is required for all developments unless the area to be developed drains to an existing facility designed to accommodate the proposed development or unless approval is obtained from the Town Engineer to delete the facility. The requirement for the stormwater management facility is in addition to requirements for other measures.

The stormwater management facility must be a wet retention pond and shall be designed for quality control and quantity control as deemed necessary by the Manager of Engineering.

Wet retention pond design criteria are as follows:

a. Permanent pool storage volume shall be equal to 2.5 times the volume of runoff generated from the 2-year storm over the entire area.
b. Water quality surcharge storage volume shall be equal to the runoff volume generated from a one inch storm.
c. The water surcharge storage shall be released over 24 hours.
d. A sediment forebay lined with an appropriate system to be incorporated into the design to collect the heavier suspended particles.
e. Side slopes shall be sloped no greater than 4:1 and shall be benched every one metre in height.
f. The pond bottom shall be topsoiled.
g. The depth of the permanent pool shall vary from 0.45 to 1.2 metres.
h. The outlet structure shall be constructed with a removable plug for draining the permanent pool
i. The length to width ratio of the pond shall be a minimum of 3:1.
j. An access road shall be constructed to allow maintenance
k. The inlet and outlet shall be protected with rip-rap and filter cloth.

6.14 Overland Flow Routes

An overland flow route continuous to the nearest major channel must be established through all areas and shall be contained within either the road right-of-way or by easements.

The depths of flooding permitted on streets and at intersections during the 1:100 year storm are as follows:

* No building shall be inundated at the ground line, unless the building has been flood proofed;
* For all classes of roads, the depth of water at the gutter shall not exceed 0.3 m.

Flow across road intersections shall not be permitted for minor storms (generally 1:10 year). To meet the criteria for major storm run-off, low points in roads must have adequate provision for the safe overland flow.

6.15 Inlet/Outlet Structures

Inlet and outlet structures shall be fully detailed on the engineering drawings. The details provided shall include the existing topography, proposed grading and the works necessary to protect against erosion.

Adequate means such as gabion basket, riprap or concrete shall be provided at all inlets to protect against erosion and to channel the flow to the inlet structure and at all outlets to prevent erosion. The extent of the erosion protection shall be indicated on the engineering drawings and shall be dependent upon the velocity of the flow in the storm sewer outlet, the soil conditions, the flow in the existing watercourse and site conditions.

The inlets and outlets must be protected to prevent unauthorized access and debris accumulation.

Outfall structures to existing channels or watercourses shall be designed to minimize potential erosion or damage in the vicinity of the outfall from maximum design flows.

The obvert of the outlet pipe is to be above the 25-year flood elevation of the receiving channel.

6.16 Parking Lot Storage

Parking lots may be used to store run-off to reduce peal flow rates to storm sewer systems. The maximum ponding depth shall be 300mm and grading shall be between 1% and 5%. The outlet flow may be regulated through the use of orifice plates. The 5-year and 10-year ponding elevations and storage volumes at each ponding location must be included on the design drawings. In addition, regulatory storm overland routes are also to be indicated on the drawings.

6.17 Maintenance

The Developer shall maintain the complete storm sewer system, including routine cleaning for the duration of the maintenance period. The storm sewers shall be maintained until assumption of all municipal services in the subdivision.

Channel works (including headwall structures) shall be maintained until assumption of the subdivision.

7 Sanitary Drainage System

7.1 General

7.1.1 Required Systems

The sanitary sewer system is to be designed to carry domestic, commercial, and industrial sewage for each area or development under consideration. Flow is to be by gravity and pumping will be considered only where other alternatives are not possible and only with the approval of the Manager of Engineering.

If a pumping station is approved by the Town, it shall be designed in accordance with the MECP guidelines with standby power, separate dry well and Town of Midland Standard SCADA Controls all to the satisfaction of the Director of Environment and Infrastructure.

The sanitary drainage system is to be designed in accordance with MECP "Design Criteria for Sanitary Sewers, Storm Sewers, and Forecemains for Alterations Authorized Under Environmental Compliance Approval V1.1 July 28, 2022" in support of the Town CLI-ECA issued by the MECP.

7.1.2 Service Area

The system shall be designed to service all areas within the subdivision to their maximum future development in accordance with the Town's Official Plan. Allowance shall be made for inflows from the appropriate adjacent subdivisions or areas and shall meet with the approval of the Manager of Engineering. Discharges of the system are to be into appropriate sewers and are to be approved by the Town Engineer. The exact location for connecting to sewers in adjacent subdivisions or areas shall be as approved by the Director of Public Works.

7.1.3 Drains

All floor drains are to be connected to the sanitary sewer. Foundation drains, sump pumps and roof water leaders are not to be connected to the sanitary sewer.

7.1.4 Design Flows

The sewers are to be sized for maximum design flows plus an allowance for infiltration. Minimum velocities and slopes are to be determined for maximum design flows without infiltration.

The average daily domestic flow is to be taken as 450 L/day capita. Occupancy shall be taken as 3.0 persons per Single Family Dwelling, 2.5 persons per Townhouse Unit and 2.0 persons per Apartment Unit.

Other flow rates shall be as follows:

Commercial	-	2.5 L/day/m2 of floor area
School	-	100.0 L/day/student
Light Industrial	-	35.0 m3/day/Ha

Maximum design flows are to be determined using average daily flows and the Harmon Peaking Factor.

A wet weather infiltration rate of 20,000 litres/hectare/day = 0.23 litres per second per gross hectare is to be used. To satisfy self-cleaning requirements in sanitary sewers, assume dry weather infiltration reduces to zero for several days during dry months.

7.2 Sanitary Sewers

7.2.1 Sewer Design

Manning's formula shall be used (see section 7.3.1) for determining the capacity of the sewer. A roughness coefficient of n=0.013 shall be used for all types of pipe.

The minimum size of sewers shall be a diameter of 200 mm.

The minimum velocity for sewers operating partially full shall result in self-cleaning equivalent to that produced by flow in sewer operating full at a velocity of 0.6 m/s.

The maximum velocity shall be 3.0 m/s at full flow.

A sufficient drop shall be provided across each manhole to offset any hydraulic losses, the obverts of inlet pipes shall not be lower than obverts of outlet pipes and drop structures shall be used only when drops of more than 0.9 metres are necessary.

The minimum drop across manholes shall be as follows:

Change in Direction	Minimum Required Drops
0 degrees	30mm
0-45 degrees	50mm
46-90 degrees	80mm

Table 9- Maintenance Hole Minimum Drops

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

The first leg shall have a minimum grade of 1.00%. All other legs shall have a minimum grade of 0.50%.

7.2.2 System Layout

When sanitary sewers are located in easements the easement width shall be 4.0 m minimum. This minimum must in increased where the depth of diameter of service dictates greater working room.

A minimum cover of 2.8 metres below the centre line road elevation and sufficient depth for basement floor drains and frost cover shall be provided. The maximum depth of cover is not to exceed applicable OPSD related to the pipe material unless pipe strength design calculations are provided for approval by the Town. Where sewers are located within an easement a minimum frost cover of 1.9 m may be used provided such sewers cross below watermains. All sanitary sewers are to be installed with bedding (well graded OPSS Granular 'A' or as recommended and approved by the Geotechnical Engineer and the Town) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032, as applicable. Compaction is to be a minimum of 95% SPD or as indicated in the approved Geotechnical Report. In soft or wet conditions, additional Geotechnical investigation and testing may be necessary to determine the appropriate bedding and backfill measures.

Minimum clearances between services shall be provided in accordance with MECP guidelines. Generally, the watermain shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the watermain, (150mm minimum). When there is conflict with the elevation of the

sewer and the watermain such that the watermain cannot pass over the sewer, then the watermain shall be designed such that it passes under the sewer subject to the following conditions:

- There shall be a minimum vertical separation of 0.5m between the bottom of the sewer pipe and the top of the watermain;
- The watermain shall be lowered below the sewer using vertical thrust blocks and restraining joints;
- The length of the watermain pipe shall be centered at the point of crossing so that the joints are equidistant and as far as possible from the sewer, and;
- The sewer shall be adequately supported to prevent joint deflection and settling.

7.2.3 Maintenance Holes

Maintenance holes shall be in accordance with OPSD 701 and are to be placed at the end of each line, at changes in size and material, and at abrupt changes in grade and alignment. Curved or properly deflected sewer lines are allowed with approval of the Town.

Maintenance hole types and sizes shall be in accordance with MECP guidelines. All maintenance holes are to be pre-benched to the satisfaction of the Town.

No sanitary sewer maintenance hole may be constructed closer than 1.5 m to the curb.

All maintenance holes within an asphalt roadway or maintenance access shall include a self adjustable auto-stable frame. Structures outside roadways or existing frame and grates in base asphalt which require adjustment for top lift asphalt may use lift rings (when approved by the Town). Otherwise, when adjusting the top elevation of maintenance holes, a minimum of one to a maximum of three adjustment units shall be installed on the top of the structure. The maximum vertical adjustment of maintenance holes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Frost straps to be installed by OPSD 701.100.

The maximum spacing between maintenance holes shall be 110 m.

Drop maintenance holes shall be provided for all sewer junctions having an elevation difference in excess of 0.9 metres that cannot be eliminated by changing sewer grades.

Where maintenance holes are located in areas to be flooded by the major design storm, maintenance hole covers shall be of the sealed variety and the maintenance hole is to be suitably vented.

Sanitary connections to maintenance holes will be allowed only if the invert is connected no higher than the obvert of the outlet pipe in the maintenance hole and property benched.

The change in direction of flow in any maintenance hole shall not be greater than 90°.

Where maintenance hole depths exceed 5.0 m, safety grating as per OPSD, shall be incorporated into the manhole. Safety grating shall not be more than 5.0 m apart. Whenever practical, a safety grating shall be located 0.5 m above the drop structure inlet pipe.

Maintenance holes shall be pre-benched to the obvert level. Benching between the channel edge and the inside wall of a manhole shall be a min. of 250 mm in width.

7.2.4 Sanitary Service Connections

Single sanitary laterals for residential and industrial use, shall generally be located at the centre line of the lot with the water service located 2.5 m to the north or west of the sanitary lateral. Connections for commercial, institutional, or multiple use will be considered on an individual basis if similar locations cannot be used. Non-standard locations must be detailed on plan and profile and lot grading plans.

Service connections shall be located at a minimum depth of 2.0 m at the property line, and sufficient depth for basement floor drains and frost cover. Residential service connections shall have a cleanout complete with a cap on property line. Service connections should cross under any watermains. Fill beneath services is to be compacted to 95% SPD.

Connections for commercial, industrial, and institutional will be considered on an individual basis but will generally be 150 mm diameter with a maintenance hole on property line.

7.2.5 Materials

For sizes of 200 to 375 mm diameter pipe shall be PVC SDR 35, rubber gasket type joints and shall conform to CSA (B-182.2, 3, 4).

Single residential sanitary connections shall be provided, minimum 125 mm diameter complete with a PVC cleanout at property line with a steel cap.

The minimum slope shall be 2%. Connections for commercial, industrial, and institutional will be considered separately and generally be 150 mm minimum diameter with an inspection maintenance hole of property line with only one lateral entering the structure.

Service lateral pipe shall be PVC SDR 28, rubber gasket type joints and shall conform to CSA (B- 182.2, 3, 4).

Any other sewer materials shall first be submitted to the Manager of Engineering and can only be used if accepted. See Appendix B for wastewater materials list.

7.2.6 Testing of Sewers and Manholes

The complete sewer system including service connections to the property line and manholes shall be tested in accordance with OPS. Approximately one year prior to the expiration of the maintenance period the complete system shall be inspected by an approved video camera testing company and the Town shall be provided with a copy of the appropriate data prior to final approval. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Manager of Engineering.

7.2.7 Service Connections

- one connection per development lot
- see OPSD 1006.010

7.2.8 Maintenance

The Developer shall maintain the complete sanitary sewer system including routine flushing for the duration of the maintenance period. The sanitary sewer will not be released from the maintenance period until assumption of the subdivision.

7.2.9 Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

- Ministry of the Environment and Energy Guideline for the Design and Sanitary Sewage Works
- Minimum pipe diameter to be no less than 200 mm

8 Water System

8.1 General

The water distribution system is to be designed as a network system to meet the water demand for each area or development under consideration. To ensure reliability, a looped system must be provided to the satisfaction of the Town. See Appendix C for the Approved Water Materials List.

8.2 Supply System

In most cases the water supply for new developments will be from the existing Town of Midland system. In cases where the Developer is required to provide a supply system, these standards shall apply.

The water system shall be designed to service all areas within the development to their maximum future development in accordance with the Town's Official Plan.

Depending on the ultimate size and type of development and availability of ground water, the supply system shall consist of two or more wells with submersible pumps with a below grade reservoir and continuous running high lift pumps.

8.2.1 Source

In the absence of an existing municipal supply system a new well supply system shall be provided.

A well evaluation report prepared by a Hydrogeologist, approved by the Town of Midland, must be submitted for all wells.

Water quality shall be as stipulated in Section 9.1.10.

A "Permit to Take Water" must be obtained by the Developer from the Ministry of the Environment for each well to be used in the system. This permit must be transferred to the Town of Midland at the time of takeover.

The well supply must have a rated capacity which meets or exceeds the peak hourly design rate.

A 100% standby well is required with each well that is developed, and it is to be fully operational. The separation between production wells and standby wells is to be determined by a Hydrologist approved by the Town of Midland.

The wells must have a minimum casing diameter of 150 mm I.D. and be equipped with a stainless-steel well screen with slotted openings designed for the aquifer materials in which the screen is set.

Generally, the wells must be equipped with submersible turbine pumps although line shaft turbines may be required on large high-volume installations.

The pumps shall be manufactured by a company approved by the Town of Midland.

Generally, the pumphouse and control building shall be located to allow ease of access for equipment. The well shall be equipped with a pitless adapter which will keep the discharge from the well at a depth of at least 1.5 m. The well shall be capped at least 0.3 m above ground level and have an approved well seal. A 1.2 m diameter flat top M.J. with standard frame and cover or equivalent protection may be required around the well above the discharge pipe as directed by the Town of Midland. For larger high-capacity wells consideration may be given to housing the well in a pumphouse, in which case the well not be more than 1.2 m from an exterior wall.

Each well shall be equipped with an altitude gauge for water level monitoring with the gauges mounted inside the control building.

A low-level cut-off shall be installed on each well pump to prevent the operation of the well pump under dry conditions.

Each well discharge shall be equipped with a rate of flow controller and check valve. Valving shall be provided to allow the operation of each well individually to be pumped to the system or to waste.

Electrical controls shall be provided to operate each well independently or together and on “automatic” or “hand” modes.

Each well is to be equipped with a meter.

8.2.2 Type of System

A double pumping reservoir system consisting of a storage reservoir with high lift pumps shall be constructed to the Town of Midland’s requirements all as described in subsequent sections herein.

When the Town of Midland gives special approval for a direct pumping system the capacity for such a system must exceed the requirements of the Ministry of the Environment for small water systems with the largest pump out of service.

Proper pump cycling shall be controlled by pneumatic tanks with one 450- litre precharge tank being provided for each 45.45 litre per minute of pumping capacity at design flow to allow a 10-minute cycling time. The tanks shall be set on concrete pads to allow circulation of air under tanks.

The configuration and valving of the “bank” of pneumatic tanks shall be such to allow the removal of any one tank without interruption of service to any other.

The pump pressure controls shall be set to allow a 140 kPa differential from pump on to pump off to maintain at least 140 kPa on the upper floor of the highest dwelling in the development. A second pressure switch shall be provided and set at 35 kPa below the number one pump control to permit the operation of the two pumps at times of high demand. An automatic alternator shall also be provided for the well pumps.

A pressure relief valve with discharge directed through the pumphouse wall shall be provided on the main header.

8.2.3 Reservoir

The reservoir shall be sized to supply the difference in flow between the duty well capacity and 4.5 litres per minute per dwelling unit for a period of 12 hours, but in no case shall contain less than 180,000 litres of usable water, (90,000 litres per cell) plus water for fire protection. The requirements of the Public Fire Protection Survey as outlined in "Water Supply for Public Fire Protection" shall be used in determining the required fire flow. Alternately the reservoir shall be sized in accordance with MECP design guidelines although the Volume shall not be less than that to meet the above requirements.

The reservoir shall be constructed of reinforced concrete below grade and be divided into two equally sized cells.

Pumps, valves, and controls shall be so installed to allow the use of either cell during cleaning operation of the other.

Each cell must be vented to the atmosphere and must have vandal proof hatches to provide convenient access and prevent contamination. Manufactured aluminum ladders shall be installed for access to the reservoirs.

Overflow drains shall be provided. Such drains shall be properly screened and terminate at least 600 mm above ground level.

8.2.4 High Lift Pumps and Controls

At least two high lift duty pumps shall be provided and one high lift fire pump. When the minimum of two duty pumps are supplied, each shall have a capacity of 4.5 litres per minute per dwelling unit at a sufficient pressure to maintain 345 kPa on the upper floor of the highest dwelling during a maximum day demand.

The pumps shall be 1750 rpm, 600 Volt, 3 phase vertical turbines manufactured by a company approved by the Town of the Midland.

The pump controls shall permit the manual selection of "lead" pump as well as provide hand and automatic modes of operation.

A pressure switch and time delays shall be provided to start the second pump during peak flow conditions and the fire pump as required by demand.

A combination float gauge and level controller shall be provided for the reservoir. Controls shall be provided for start and stop of well pumps as well as low level cut out for the high lift pump.

A pressure regulating valve shall be installed on each pump discharge to control the discharge pressure, a relief valve shall be installed to allow recirculation of some water back to the reservoir.

8.2.5 Building

The permanent pumphouse or control building shall be constructed of concrete block with brick veneer. A conceptual sketch of the building shall be approved prior to the design of the structure. The building shall be designed to blend in with the area.

A complete colour and paint schedule shall be submitted for approval by the Town of Midland.

The building shall be sized to allow ease of access to all equipment for servicing as well as space for chemical storage. If a fire pump is not required at the time of construction, sufficient space should be provided for such an installation in the future including installation of grating etc. for exhaust venting. A metal clad door sized for equipment removal must be provided complete with an approved heavy-duty lockset and all exterior openings and equipment shall be of vandal proof design.

The diesel generator shall not be located over the reservoir and shall be arranged so as a fuel spill will not enter the reservoir.

The floor must be sloped to drain to a central floor drain which discharges to a sewer or waste disposal system through a screened 100 mm diameter pipe.

The building elevation must conform with the requirements of the lot grading plan with the building set a minimum of 300 mm above the surrounding ground. An exterior concrete slab, 0.6m wider than the door and 1.2m wide shall be provided at the entrance as well as 1.2m concrete walkway to the driveway. Building slab to be 150mm above driveway elevation.

Forced ventilation must be provided by combination of a fan in the roof or upper wall and a louvre near the bottom of the opposite wall. Generally, gravity louvres will be satisfactory, however on larger installations when the louvres are necessary to exhaust air from the standby power system, the louvres shall be motorized. Thermostatic controls as well as a manual override switch should be provided to operate the ventilation system. Louvres are to be vandal proof of a type approved by the Town of Midland.

Thermostatically controlled electric heater shall be provided to meet Ontario Hydro heating standards. The entire building must be insulated to conform with Ontario Hydro's Standards for electrical heating.

A fire extinguisher, type ABC shall be provided in each building.

All other safety equipment required by the Ministry of Labour and Occupational Health and Safety Act shall be installed (i.e.: chlorine eyewash etc.)

All interior and exterior doors and trim shall be painted to a colour scheme approved by the Town of Midland.

A 1.8m x 1m wooden work bench painted and properly finished shall be provided with overhead lighting.

A suitable lifting device shall be provided as approved by the Town of Midland.

8.2.6 Process Piping and Plumbing

The pipework and valves in the building shall be arranged to allow for cleaning, testing and well pumping to waste all while keeping the system in operation.

Waste Lines from the wells through the wall shall be equipped with an attachment for a manometer tube and orifice for flow measurement and should discharge to a dry well or storm drain.

Flow to the distribution system shall be monitored by an approved positive displacement or turbine type meter calibrated in cubic metres. A valved by-pass shall be provided around the meter to allow continuous operation with the meter removed.

A minimum of 2 pressure gauges with stopcocks must be provided on all discharge lines. Flexible couplings, air relief valves, pressure relief valves, flow control valves all shall be installed as required by the Town of Midland.

Sampling taps shall be provided on each well discharge line as well as on the main header beyond the feed point of any chemicals.

All pipework shall be at least 450 mm above the floor and 450 mm from any wall. Pipework shall generally be flanged cast iron although threaded galvanized pipe may be permitted in sizes less then 75 mm diameter. Chemical lines shall be suitably sized P.V.C.

Pipe supports shall be located such that support is maintained if valves or pipe sections are removed and shall be of an approved design to provide both support and adequate thrust restraint. Suitable provisions shall be made in the piping for swab launching.

All pipework, valves, walls, ceiling, and floor shall be painted according to a colour scheme approved by the Town of Midland.

A sink and appropriate eye wash facilities shall be incorporated into the building.

8.2.7 Electrical

All electrical work must be carried out to Ontario Hydro Standards and the inspection certificate must be issued prior to start of operation.

All disconnects including the main supply must be of the breaker type.

All motors shall generally be three phase, although single phase motors may be necessary in isolated areas. All motors shall be equipped with magnetic starters. All motors are to be protected against single phasing.

All A.C. control systems shall be 100 volts. Rigid electrical conduit must be used throughout the pumphouse as well as for the lines to the wells. Lightning arresters shall be provided to protect all pumps.

An appropriate outlet for welding equipment shall be provided. Additional electrical outlets shall be provided near the work bench.

A motor control centre shall be provided for all 600 V switchgear rather than numerous individual panels.

Lighting shall be provided for all buildings. A weather-proof switch and electrical outlet shall be placed adjacent to the door. An exterior vandal proof pole light shall be provided for the driveway.

8.2.8 Property and Access

All wells, pumphouses and equipment shall be located on property deeded to the Town of Midland. The property shall be graded to allow good drainage and with the exception of the driveway, the entire area shall receive 75 mm of topsoil and be sodded. A minimum of 10 low lying shrubs shall be planted at designated locations. A landscaping plan shall be submitted for approval.

A 4.6 m wide paved driveway must be provided to the entrance of the pumphouse complete with an acceptable turn around area. The appropriate granular bases and asphalt thickness shall be designed to support heavy equipment.

The site shall be fenced with 1.2 m chain link galvanized fence and access gate.

8.2.9 Water Quality and Treatment

In general, the water quality must meet the standards set down by the Ministry of the Environment. The degree of treatment and equipment required will be dependent on the chemical and bacteriological quality as well as the turbidity of the raw water.

As a minimum, two chlorinators with 140 litre storage tanks and the necessary plastic tubing and connections must be provided. The feed pumps must be wired to the circuits of the well pumps so that chemical is added when the pumps are operating. An approved chlorine residual "test kit" shall be provided for each installation.

8.2.10 Standby Power

For all developments, a diesel generator set shall be installed, capable of providing power for all the equipment provided and equipment required for future expansion.

The diesel engine shall be equipped to start operating automatically in the event of a power failure and be equipped with time delays for starting, stopping load transfer as well as an alternator, block heater and protection against overheating, over cranking and low oil pressure.

All necessary vents and motorized louvers must be supplied with the equipment. A permanent battery charger shall be included in the installation.

In general, the diesel generator set, fuel supply tanks and control shall be supplied in accordance with the current MECP guidelines for Diesel Generator Sets.

8.2.11 Operating Manual

An operator's manual shall be prepared and turned over to the Town of Midland for the System.

The manual must contain:

- "As Constructed" mechanical and electrical drawings;
- "As Constructed" building and lot details;
- "As Constructed" distribution system plans showing services, valves, hydrants, etc.
- Pump literature, curves, and operating instructions;
- Operating and maintenance instructions for standby equipment, meters, chlorinators, pressure reducing valves, etc.;
- Names, addresses and telephone numbers of all equipment suppliers and Installers;
- Information on guarantees for all equipment;
- Copies of the "Permit to Take Water" and "Certificate of Approval" for the Supply and Distribution System;
- Hydrogeologist's Report;
- Complete copy of Engineering Tender Documents and specification.

8.3 Distribution System

8.3.1 General

The water distribution system is to be designed as a network system to meet the water demand for each area or subdivision under consideration. Long dead-end mains and single supply systems are to be

avoided. A minimum of 2 supply lines shall be installed between the water supply works and the distribution system.

8.3.2 Service Area

The system shall be designed to service all areas within the subdivision to their maximum future developments in accordance with the Town's Official Plan. Allowance shall be made for connection to appropriate mains in adjacent subdivisions or areas and shall meet the approval of the Town of Midland. The exact location for connecting to mains in adjacent subdivisions or areas shall be as approved by the Town.

8.3.3 Design Flows

Watermains shall be designed to carry maximum day demand plus fire flows based on the latest publication of the Public Fire Protection Survey, or peak hour flow whichever is greater.

The average daily demand is to be taken as 450 litres/capita/day.

The estimated populations and areas for the different neighbourhoods shall be in accordance with the Official Plan.

The maximum day and peak hour factors shall be determined from the current MECP design guidelines although the following are considered minimums:

- Maximum daily demand factor: 2.0
- Peak hourly demand factor: 4.5

Peak flows, other than domestic flows shall be determined on an individual basis.

8.3.4 Selection of Main Sizes and Pressures

The Hazen-Williams formula ($V = 0.85\ C\ R^{0.63}\ S^{0.54}$) shall be used for computing friction losses and subsequently sizing the watermains.

For new mains the values of "C" coefficient shall be 120 for 150 mm diameter PVC pipe and 110 for 200 mm diameter PVC pipe.

The minimum size of mains shall be 150 millimetres in diameter in residential subdivisions and 200 mm diameter industrial developments.

The minimum pressure during the peak hourly demand shall be 275 kPa (40 psi). The minimum pressure during maximum daily demand (MDD) shall be 345 kPa (50 psi).

The maximum pressure under static load or during the minimum hourly demand shall be 550 kPa.

The minimum fire flow in a residential area is to be 45 litres per second and the minimum fire flow in an industrial area is to be 75 litres per second. Watermains are to be sized accordingly.

The minimum pressure when the system is tested for fire flow in conjunction with the design maximum daily demand shall be 140 kPa.

A hydraulic network analysis of a water distribution system shall be carried out if design flow rates result in excessive head losses and main sizes greater than the minimum specified (150 mm) main sizes or when

requested by the Town of Midland. Hydraulic analysis shall include allowances for demands of adjacent areas anticipated to be met by transmission through the design area.

8.3.5 Oversizing

Oversizing of watermains will be provided as required to provide for adjacent areas where service is expected to be extended, and to provide fire flow requirements including oversizing of hydrants, openings, and leads as required.

8.3.6 Layout Details

a. Watermains

The Town will permit the use of Polyvinyl Chloride PVC (Class 150) or Ductile Iron (Class 52) watermains, 400 mm dia. Pipe size.

All PVC watermain shall be colour coded blue. Minimum cover of 1.8 m over the mains in urbanized areas and 2.2 m in rural areas.

Watermains shall be located on the opposite side of the road from the proposed hydro distribution and opposite to the sidewalk.

A minimum of 0.5 vertical clearance between the watermain and all utilities.

Metallic warning tape shall be used over all watermain.

Watermains shall generally be located as per standard detail drawing to the limits of the subdivision.

When watermains are located on easements the easement width shall be 4.0 m minimum.

A minimum cover of 1.8 metres or 1.9 metres below road centerline, whichever is deeper, is required.

Minimum clearances between other types of services (i.e.: sanitary) shall be provided in accordance with MECP guidelines. A minimum of 0.5m of vertical clearance shall be met.

b. Hydrants

Hydrants shall be located generally on lot lines and where practical, 1.5 metre minimum away from edge of driveways, walkway ramps and house service connections.

Hydrants shall also be located at the end of all 150 mm or larger dead end watermains.

The maximum spacing for hydrants shall be 150 metres for low density residential and 90 metres for higher density residential, industrial, commercial, and institutional or as approved by the Town Fire Department, with a maximum 120 metres fire hose length to the rear of all residential buildings.

Hydrant flange elevation should be set at a grade that will give a final flange elevation of 100 mm above final grade.

Maximum hydrant spacing is 152 m in residential areas and 92 m in General Services areas.

Painting of Hydrants will be completed by the Town of Midland.

c. Valves

Valves shall be located generally on side lot lines at or near intersections, and as required for spacing. Generally, 4 valves shall be placed at cross-intersections and 3 valves at tee intersections, such that broken sections can be isolated without jeopardizing flow to other sections.

Valves shall be spaced so that no more than 40 dwelling units are isolated along a watermain and at a maximum spacing of 150 metres for distribution watermains and 400 metres for trunk supply watermains.

Air valves shall be considered at high points of all watermains where possible, installed together with valves in valve chambers.

Drains shall be considered at low points of all watermains and where possible, installed together with valves in valve chambers. Dead end mains shall drain to the supply end where possible. All drains must have outlets which are separate from sewer systems.

Valves shall be installed with a maximum separation of 305 m in all areas, or with a maximum of 60 services between valves.

Valves more than 1.7 m in depth shall require a valve stem extension.

Pressure reducing valves may be required in certain areas within the Town of Midland limits.

d. Service Connections

Single service connections of 25 mm diameter with a curb stop shall be provided to each lot on the property line. The water service shall generally be located 2.5 metres to the north or west of the sanitary lateral which is located at the centre of the lot. Connections for commercial, institutional, industrial, parklands or multiple uses will be considered on a specific basis.

Service connections shall be located at a minimum depth of 1.8 metres.

Fire Connections may be required for industrial, commercial, or institutional lots.

e. Restraining Watermain

Restrained watermain shall be used where any utility is located in excess of 5.5 m below finished grade and future excavation may expose the watermain. Restraint on PVC or Ductile Iron watermain shall be obtained by using tie rods with bell clamps, complete with a welded ring by the manufacturer, on the spigot end of the ductile iron pipe. All steel rods shall be stainless steel.

Concrete thrust blocking shall be installed at all tees, vertical and horizontal bends, hydrants, ends of watermain and connections 100 mm and larger, as per OPSD 1103.010 and OPSD 1103.020.

f. Fittings

Mechanical joint Ductile Iron fittings shall be used on Ductile Iron watermain. Mechanical joint fittings or PVC push-on fittings meeting AWWA Specification C-907 and CSA B137.2 shall be used where applicable, on 150 mm to 400 mm in diameter PVC watermains. Should Ductile Iron mechanical joint fittings be employed, the Contractor shall install sacrificial caps on every bolt. Corrosion protection including Zinc anodes and sacrificial caps shall be provided at all fittings in accordance with OPSS.MUNI 442.

PVC joints using mechanical joint fittings are to be square cut, not beveled.

g. Watermain Offsets

Typical watermain offsets from the property line shall be in accordance with the Town of Midland's typical cross section drawings, or as approved by the Town. Anyone making a connection to the existing watermain distribution system must make an application to the Town of Midland for an Additional Connection Permit. No construction shall begin without receiving Town of Midland Municipal Consent.

The standard offset of all watermains must be maintained on any curved line. Pipe deflection should be used wherever possible to minimize the use of bends. Wherever it is necessary to deflect from a straight line, either in the vertical or horizontal plane, the amount of deflection shall not exceed that required for satisfactory making up of the joint, as directed by the manufacturer. If, in the opinion of the Town Representative the deflection is excessive, they will order the pipe removed and reinstalled with the use of bends and proper thrust restraint, to provide for acceptable deflection.

h. Service Saddles

Service saddles must be used on all PVC watermain and on ductile iron watermain where tapping size is 38mm or 50mm.

i. Tappings

Ductile Iron watermain services larger than 25 mm require a tapping saddle and sleeve and shall be located at the 3 o'clock and 9 o'clock position.

On PVC watermain, tapping of 19mm to 25mm shall be at the 10 o'clock or 2 o'clock position. The tap must not be closer than 600mm from the ends of the pipe. Avoid tapping into discoloured areas of the pipe and do not tap a curved pipe. All tappings on PVC watermain require saddles.

Tapping of 38mm to 50mm shall be at the 3 o'clock or 9 o'clock position. Only approved PVC tapping machines are to be used on PVC watermain by competent personnel and a protective blanket must be used if tapping under pressure. Extra precaution should be taken during installation in cold weather.

j. Watermain Bedding

Watermain shall be constructed with beddings as per OPSD 802.010 (granular 'A' embedment material) for flexible pipes and OPSD 802.030 or 802.031 class 'B' (granular 'A' bedding material, granular 'A' or select native cover material) for rigid pipe unless otherwise approved by the Town, or alternative embedment material. Alternative embedment material shall be sand meeting gradation requirements of OPS 1004.05.05 compacted to 95% standard proctor density. Geotechnical certification of alternative material and compaction must be provided every 150 meters. The compaction testing must include the entire envelope (haunches, bedding and top of pipe).

k. Pipe Deflection

On a radius, lengths should be assembled in a straight line and then curved in the trench. All curvatures result from the bending of the pipe lengths. Deflection of the joint is very slight, up to one degree. The Contractor shall follow, at all times, manufacturer specifications for pipe deflection.

Offset per 20 ft (6.1 m) length pipe size

4" (100 mm) – 24" (610 mm)

6” (150 mm) – 17” (420 mm)
8” (200 mm) – 12” (305 mm)
10” (250 mm) – 11” (280 mm)
12” (305 mm) – 9” (230 mm)
16” (400 mm) – 6” (150 mm)

l. Protection of Existing Utilities

It shall be the Contractor’s responsibility to protect and support existing underground/overhead utilities, which may be encountered during the progress of the work.
Any existing utilities, which must be relocated, shall be at the Contractor’s expense with no cost to the Town.

Utility poles, which require support, shall be held with the appropriate equipment as supplied by the Contractor at his expense. The attachment of this equipment shall be made by the Utility Company. The Contractor must always have a qualified person on site to operate any vehicle, used to support utility poles.

m. Temporary Connection

The new watermain shall be isolated from the existing water distribution system using a physical separation until satisfactory bacteriological testing has been completed and accepted by the Town Engineer. Water required to charge the new main shall be supplied through a temporary connection between the existing water system and the new main.

The temporary connection shall incorporate an appropriate cross-connection control device, consistent with the degree of hazard for backflow protection of the active distribution system (e.g., a double check valve assembly or a reduced pressure zone backflow preventer per CAN/CSA-B64.10). The cross-connection control device shall be disconnected (physically separated) from the new main during hydrostatic testing and reconnected afterwards. Refer to the attached detail drawing entitled “Typical Temporary Connection for Watermains” for limits of payment to be included in the lump sum price for this item and additional details. The lump sum price shall include the cost for labour and equipment to backfill the temporary connection during the water main construction and the re-excavation of the trench to disconnect the temporary connection.

n. Initial Tie-In

At the discretion of the Town’s Representative, a Contractor may be permitted one initial tie-in to the existing watermain by installing a new resilient seat gate valve. The Contractor shall supply all materials, excavation, labour, equipment, and restoration. The Town’s Representative shall be present to inspect the tie-in by the Contractor. Should there be an existing valve in place for tie-in purposes, the contractor may utilize this valve with the understanding that should this valve fail, for any reason during the testing procedure, it shall be the Contractor’s responsibility to replace the valve, including all labour, material, and excavation. The Town’s Representative shall determine the location of the tie-in. All required tappings, on existing charged watermains must be performed by the Town. If a tapping sleeve and valve is required for the initial tie-in, they must be supplied and installed by the Contractor. A Town Representative must be present during the installation.

There shall be a daily charge for operation of a valve for filling the watermain.

Failure to comply with this regulation will result in a charge by the Town of Midland By-Law department.

Should the Town's Representative deem that circumstances do not allow an initial tie-in, then the Contractor shall use a by-pass complete with a check valve and shut off. The location of the by-pass shall be at the discretion of the Town's Representative.

A Town Representative must complete all tappings off any existing charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the Town's Representative to complete the tappings. The Contractor shall be responsible for all Town costs associated with tapping watermains.

The Contractor shall remove all temporary services from the watermain when the services are no longer needed and replace them with brass plugs.

The Contractor shall not operate any existing valves, existing blow-offs, existing hydrants or remove any anti-tampering devices for any reason.

If an existing hydrant is used for by-pass purposes, there shall be a daily charge for installing and removing a gate valve, as supplied by the Town. Only gate valves supplied by the Town shall be used. It shall be the Contractor's responsibility to supply a check valve immediately downstream of the Town-installed gate valve.

o. Tracer Wire

Tracer wire shall be installed on all watermains, and hydrant laterals, and water service laterals.

Tracer wire shall be #12 AWG (0.0808" in diameter) high strength copper clad steel conductor (HCCCS), insulated with a 30 mm high density polyethylene (HDPE) insulation rated for direct burial use at 30 volts. Tracer wire shall not be wrapped around bolts or components along mainline and shall not be placed under any pipe or appurtenance. Tracer wire shall be laid flat and securely affixed with mastic tape to the top of the watermain at 5.0 m intervals.

Breaks or cuts in the tracer wire are only permitted at the following prescribed locations:

- hydrant laterals,
- water services (fire and domestic),
- tees and crosses.

Tracer wire shall be looped at each hydrant such that the tracer wire is brought above ground in a 1" rigid PVC conduit placed at the back of the hydrant and looped back down the hydrant lead to the mainline. The looped wires are to be tightly taped together and left untouched in a hydrant Three Terminal Test Station, which is to be installed at the back of each hydrant and bolted at the flange.

To ensure there is no damage to the tracer wire during or after construction, the Town's Representative shall do a continuity test on the wire during testing procedures. Should the Town's Representative find a problem with continuity or installation of the tracer wire, the contractor/developer shall be responsible for the repair, at no cost to the Town.

In non-standard locations, such as easements, parks, townhouse/condominium developments and reconstruction projects, metallic warning tape shall be used over all watermains. The metallic warning tape shall be laid in the trench 0.3m (12”) to 0.5m (19”) directly above the watermain.

p. Back flow Prevention

Backflow prevention devices must be installed and maintained on all existing and/or proposed water services to industrial, commercial, institutional, and multi-residential buildings to prevent the flow of contaminants into the municipal drinking water system.

Where a private water system is connected to the municipal water system, the municipal water system shall be protected through premise isolation of the private system by installation of a backflow prevention device in an aboveground enclosure.

All backflow prevention devices, appurtenances and enclosures must be selected and maintained in accordance with the manufacturer's specifications, and the guidelines set out in the most recent version as well as AWWA, Canadian Cross Connection Control Manual, CSA Standards, Ontario Building Code and applicable Provincial Regulations.

8.4 Swabbing/Charging the Watermain

Each section of water main shall be cleaned with a minimum of two clean new swabs.

Additional swabbing is required at the Contractor’s expense if the water is not clear after the second swab has passed through the watermain. Swab length shall be 1.5 x swab diameter. Swab diameter shall be 50 mm greater than the inside diameter of the watermain. Swab density is to be 1.5lb/board ft. (high memory foam).

Supply, installation and subsequent removal of temporary swab retrieval stubs/ports and all associated costs shall be included in the lump sum price for this item. The flow rate for swabbing/flushing should be sufficient to maintain the velocity in the main of 0.76 m/s to 0.91 m/s in order to keep particles in suspension. Preliminary flushing of the main shall immediately follow the swabbing operation.

Swabs shall be supplied by the Contractor. The swabs shall be numbered, and the Town’s Representative is required to witness the installation of swabs by the Contractor. A swabbing schedule shall be prepared by the Developer’s Consultant and approved by the Town’s Representative. The swabbing schedule shall indicate where the swabs are to be installed and removed.

8.5 Hydrant Flow Testing

Fire flow testing shall be arranged through a customer service representative at Water Operations. This testing is required for all development applications to establish and confirm boundary conditions for the development and will provide the basis for the water analysis. Hydrant flow testing shall be conducted in accordance with the guidelines set out in the current edition of National Fire Prevention Association (NFPA) 291: Recommended practice for Fire Flow Testing and Marking of Hydrant, this will include achieving adequate pressure drop at the residual hydrant or flowing the total demand necessary for fire-fighting purposes.

Contractors performing the test should consider the following practice:

- It is best to conduct the flow test during peak hours in the morning to reflect the worst-case scenario.
- While some flow test can involve many hydrants flowing at the same time to achieve the minimum pressure drop or the desired flow, for a typical single hydrant flow test, the closest hydrant downstream of the building supply line should be the Test Hydrant or Residual Hydrant where system pressures are taken, and the subsequent downstream hydrant will be the flowing hydrant to obtain pitot pressure reading.
- Ensure that the test is not performed below 0 degrees Celsius unless the contractor assumes all responsibility for road conditions and any potential winter control measures that are required.

8.6 Pressure Testing

Pressure testing of all new water systems will be completed by the Town's Representative and shall be undertaken in accordance with the Town's Commissioning Procedure. Prior to commencing the pressure test, the Contractor shall operate all line valves for the Town Engineer and verify that they are in the open position.

The test pressure shall be 1035 kPa which shall be maintained continuously for the duration of the two hour test. No additional water can be added to the system during the test. The allowable leakage is ***ZERO.*** If the pressure test meets this criterion, the system as a whole, shall be accepted.

If the above criterion is not met, the system will be divided into sections no greater than 305 m in length. Each section will be tested individually and will be required to meet the testing criteria.

8.7 Chlorinating

Watermains and services shall be disinfected in accordance with AWWA C651- as amended.

Upon approval of the pressure test, the Town's Representative shall proceed to chlorinate the new system, using a Contractor-supplied 19mm temporary service. The service shall have a tail brought above grade a minimum of 1 m to allow access for the chlorine pump. This service should be at the tie-in point on the newly-installed watermain. The point of chlorination must be located in such a way that the new system is chlorinated using a flow of water from the existing system to distribute the chlorine.

The Contractor shall "NOT" operate any main valves, hydrant blow-offs, by-passes or any other appurtenances within the new system during the period of chlorination.

The entire system shall be filled with heavily chlorinated water, with an initial concentration of 50 mg/L available chlorine and allowed to remain in the new system for a minimum of 24 hours. During this time, all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenance.

At the end of the 24 hour period, the treated water in all portions of the main shall have a residual of not less than 10mg/L of free chlorine. If the chlorine residual is less than 10mg/L of free chlorine in any portion of the test section, the disinfection procedure shall be repeated.

8.8 Flushing

After the requirements of the disinfection section have been met, heavily chlorinated water shall be completely flushed from the watermain and all branches until chlorine levels in the watermain are no higher than levels generally prevailing in the distribution system.

The Contractor must supply a means of flushing the system, as determined by the Town's Representative. Only the Town's Representative shall operate valves for flushing the system.

It is the responsibility of the Contractor, during charging, swabbing, chlorination and flushing of the system, to supply a means for the water to escape without causing damage/erosion to the existing grade of the property or any adjacent property. The Town's Representative shall not flush the system if it is felt that proper precautions have not been taken by the Contractor to do so. Any damage caused by flushing during chlorinating or charging of the watermain must be restored to the original state or better by the Contractor at his expense. The Town shall not be responsible for any damage or repair caused by flushing the watermain.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine. Special attention should be given to any areas that are close to streams, ponds or ditches that may be contaminated by runoff water from the flushing chlorine from the watermain. It is the responsibility of the Contractor to provide a means of safely removing the chlorinated water in these areas.

If dechlorination is necessary, there are several chemicals which can be used effectively. Adequate dosage of the chemical and mixing with the chlorinated water must be ensured. The amount of dechlorination chemical required can be determined from the following equation:

Excess chlorine residual x factor = dechlorination chemical required

This can be calculated in mg/L or whichever unit is appropriate.

Five examples of dechlorination chemicals are listed below:

a. Hydrogen peroxide (Factor = 0.479). This may be the best option when discharging to an environmentally sensitive receiving water. It is inexpensive and an overdose will only add more oxygen to the watercourse.
b. Sulphur Dioxide (Factor = 0.901). This chemical is inexpensive but it will slightly lower the pH in the receiving water.
c. Sodium Thiosulphate (Factor = 2.225). This will cause some sulphur turbidity but an excess is essentially harmless.
d. Sodium Sulphite (Factor = 1.775). Excess will lower the dissolved oxygen in the receiving water.
e. Sodium Pyrosulphate (Sodium Metabisulphite) (Factor = 1.338). Excess will lower the dissolved oxygen in the receiving water.

The Contractor shall supply all materials, labour, and excavation necessary for flushing the new system.

8.9 Sampling

The Contractor shall provide sufficient blow offs/sampling ports (including their eventual removal) to accommodate the sampling requirements detailed herein. After the requirements of previous sections have been met, two consecutive sets of water samples, taken at least 24 hours apart, shall be collected at the ends of all branches, stubs, and not more than 350 m apart along the length of the watermain. In addition, it is recommended that the existing distribution system be sampled for testing as well. The

watermain shall not be flushed or disturbed during the minimum 24 hour period between sets of samples.

The Town Representative (Certified Water Distribution Operator) shall take water samples, for analysis, from all newly installed watermains after the system has been flushed. The new system shall become part of the existing water system upon potability confirmation from the Town Representative.

Bacteriological Testing Criteria is as follows:

	Maximum Allowable
Escherichia Coli (E. Coli) or Faecal Coliform	0
Total Coliforms (but not E. Coli or other faecal coliforms	0
Heterotrophic Plate Count Analysis	500 colonies/ml
Background Colonies on a Total Coliform Membrane Filter Analysis	200 colonies/membrane filter analysis

All samples from both sets of samples shall meet the above bacteriological testing criteria before the Municipality will grant approval for connection of the new watermain to the active distribution system.

If the sample does not pass, additional swabbing, chlorinating and flushing will be required until a successful potability result has been obtained. All costs shall be at the Contractor's expense.

8.10 Continuity Test

The Town's Representative shall do a continuity test on the watermain or tracer wire during the test procedures. Should the Town's Representative find a problem with continuity or installation of the tracer wire, the Contractor will not be allowed a final tie-in to the system. The Contractor/Developer shall be responsible for the repair, at no cost to the Town.

8.11 Tie-Ins

Upon receipt of Ministry of Environment approvals by the Town and all testing has been completed to the satisfaction of the Town's Representative, the remaining tie-ins may be scheduled. At the discretion of the Town's Representative, the Contractor may be permitted to do the tie-in. A Town Representative must be present when the Contractor performs the tie-in. When the Contractor is not granted permission to do the tie-in, the Contractor shall provide all the materials, excavation, labour, equipment, necessary safety devices and restoration for the Town Representatives to complete the actual tie-in. The Contractor shall provide assistance as required by the Town's Representatives.

8.12 Maximum Velocity

The maximum velocity for all watermains; under normal operating conditions (average and maximum day demands) will not exceed 1.5 m/s, while during fire flow conditions, the maximum velocity will not exceed 5.0 m/s. In all cases, watermain diameters shall be such that a flushing velocity of 0.8 m/s can be achieved for cleaning and flushing procedures.

8.13 Minimum Slope

The minimum slope for a transmission watermain installation is 0.5% unless otherwise approved by the Town. This is to prevent the accumulation of trapped air and to avoid localized high points.

8.14 Maintenance

The watermain system shall be maintained until assumption of all services in the subdivision.

8.15 Materials

8.15.1 General

All materials are to be verified with the Town of Midland prior to ordering to avoid any conflicts.

8.15.2 Watermain

150 mm and larger diameter watermains, fittings and connections shall be manufactured in accordance with the latest specifications of the American Water Works Association and the Canadian Standards Association for 1000 kPa rated working pressure as follows:

- Cement mortar lined ductile iron pipe – conforming to CSA B131.10, may be used with plastic wrap, or other approved form of electrochemical corrosion protection where corrosive soils are present.
- Polyvinyl chloride pipe (CL150 C 900) – conforming to CSA B137.3, AWWA C900 may be used for distribution watermains, diameter 150 mm to 300 mm (DR 18 minimum), including approved fittings compatible with Ductile iron pipe and including tracer wire between hydrants or other conducting appurtenances.
- All watermain joints to be approved push-on, mechanical or flange type joints as required for a 100 kPa rated working pressure.

8.15.3 Service Connections and Meters

For service connections and water lines less than 150 mm in diameter, fittings and connections shall be manufactured in accordance with the latest specifications of the Ontario Plumbing Code, Canadian Standards Association, and the American Society of Testing and Materials for 1000 kPa rated working pressure as follows:

- Copper type k tubing and fittings, including electrochemical corrosion protection where connected to ductile iron watermains.
- Non-copper service pipe shall be a continuous run of cross-linked polyethylene (PEX) tubing minimum 25 mm in diameter complete with tracer wire and stainless-steel inserts at all joints.

Joints and connections complete with restrainer clamps shall be pressure tested with the watermain system and shall be in accordance with Town of Midland Specifications, the Plumbing Code and The Building Code.

All service boxes are to be installed flush with the finished grade on each individual lot Main stops and saddles shall be used on each service. Services shall be provided to service the parkland at convenient locations. Services are not to be installed in driveways if possible.

8.15.4 Hydrants

Hydrants shall meet the requirements of A.W.W.A. Standard C-502.

8.15.5 Valves

Valves up to 300 millimetres will be gate valves of the solid wedge, double disc type according to A.W.W.A. Standard C-509.

8.15.6 Specifications

The following specified materials or approved equivalent are required for the distribution systems:

- Hydrants -Canada Valve Century/Premiere Model Opening counter clockwise, AWWA C502
- Valves -Mueller Resilient Seat AWWA C509
- Valve Boxes -Bibby
- Saddles -Rockwell 371 & 372
- Main Stop -Mueller AWWA C800
- Curb Stop -Mueller AWWA C800
- Service Boxes -Mueller
- Meters -Supplied by the Town of Midland at builder's cost

8.16 Residential Domestic Water Service

8.16.1 Design

Each residential building lot will be permitted one service. The service pipe must be laid at right angles to the watermain and in a straight line from the watermain to the meter.

The only exception to the aforesaid would be in a multi-family residential development, when ownership of the property is maintained by one person or corporation.

On crescents or cul-de-sacs the service lateral may be laid at other than right angles to the watermain, but in a straight line from the watermain to the meter.

Service boxes shall be located on the property line in residential areas. A 36" stainless steel service box rod must be installed.

The Town of Midland will not issue building permits prior to the watermain and services being installed.

8.16.2 Installation

A Town Representative must complete all tappings of an existing charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the Town's Representative to complete the tapping. The Contractor shall be responsible for all Town costs associated with tapping watermains.

All 19mm and 25mm services shall be tapped at the 10 o'clock or 2 o'clock position. The copper or PEX service shall be installed with a goose neck at the watermain. The height of the goose neck should be kept to a minimum. Refer to SD 101.1. Services 38mm and 50mm require a saddle and shall be at the 3 and 9 o'clock position. Refer to BSD-49. All services off PVC watermains require a service saddle.

The Contractor shall install a marker of 50mm x 100mm lumber, 2.5m in length, at each curb stop at the time of installation. The marker should project 1.3m above ground and be identified by painting the top 300mm with blue paint. These markers must be removed at the time of acceptance of the watermain.

The Town requires three working days notice from receipt of payment, made at building permit stage, to complete a tapping.

All residential service fittings shall be compression copper connections.

8.16.3 Residential Service Specifications

Copper service pipe shall be a continuous run of type "K" (W.H.) 3rd party soft copper, minimum 25mm in diameter.

Non-copper service pipe shall be a continuous run of cross-linked polyethylene (PEX) tubing minimum 25 mm in diameter complete with tracer wire and stainless-steel inserts at all joints.

Copper or PEX services shall enter through the building wall or under the footings.

On a service of 50mm and smaller, a main stop shall be installed at the watermain.

Water services terminated in a crawl space or any other inaccessible areas will not be accepted.

Any services larger than 50mm shall be installed in accordance with procedures outlined in "Section F-Installation and Construction".

Curb boxes shall be sized for the service. The service box shall be installed in a perpendicular manner, properly adjusted to final grade. A 36" stainless steel service box rod must be installed.

Curb stops shall be placed on the street line.

Curb stops shall be ball style with compression connection.

Couplings shall be copper compression.

There shall be no couplings under the foundation or floor of the building or inside the building. Only one coupling is permitted between the curb stop and the angle meter valve for services under 50mm.

No couplings will be permitted between the watermain and the curb stop for services under 50mm.

An angle meter ball valve, complete with compression connection, is to be installed on all residential water services, at the point the service enters the building and prior to the water meter.

Angle meter valves shall be no less than 300mm and no more than 450mm above the finished grade.

Trench depth shall be a minimum of 1.7m deep from final grade. Where the 19mm service cannot maintain 1.7m due to the elevations of utilities, the contractor shall install 4.0m of 100mm PVC SDR28 liner a minimum of 0.5m below the utility. This will allow for the installation/removal of the water service.

Service 25mm to 52mm in diameter shall be embedded in sand, conforming to OPS 1004.05.05, and 100mm above and below the service pipe.

The Contractor will be responsible for any costs associated with the relocating of service(s) that do not comply with the Town's specifications.

8.16.4 Residential Service Inspections

The Contractor shall schedule service inspections forty-eight hours in advance with the water department.

All applicable inspections fees, meter fees and/or tapping fees must be paid prior to scheduling of inspections.

Should the Town's Representative be required to return to the site for an extra inspection (due to curb box damage, curb box not accessible, coupling not exposed, approved angle meter valve not installed, leakage or the remote wire test fails), the Contractor shall reschedule another inspection and shall be invoiced a service charge.

Copper pipe or PEX must be extended inside the building to the meter location and the angle meter valve must be installed. All services must be completely accessible at all times.

It is the responsibility of the Contractor to provide the appropriate protection to prevent damages caused by the flushing procedure.

During winter conditions, the same procedures shall apply. The Contractor is responsible for protecting the service from adverse weather conditions, including freezing.

8.16.5 Procedure for Pressure Testing Residential Water Service

In all residential subdivisions (including Townhouse Developments), the Town will allow the contractor to excavate, install the 25mm (residential) copper or PEX water service and backfill with direct inspection by a Town Representative. This inspection is to be scheduled with the building department.

When a Town Representative arrives to install a water meter, a pressure test of the water service will be performed at this time.

The water service will be thoroughly flushed and then a pressure gauge will be installed by the representative at the angle meter valve location. The curb stop is then operated by the Town Representative to pressurize the service and then stop is turned off.

The pressure gauge will register system pressure and must be left in position a minimum of three minutes after the gauge needle has stabilized. No drop in the registered pressure on the gauge will be considered an acceptable test.

Tests that have not passed will be flushed by the Representative and re-tested. If the second test does not pass, the builder will be notified to have the water service excavated and repaired. The Town's Representative will retest at the builder's expense.

The Town's Representative shall record service sketch measurements for locating the curb stop/box with respect to the watermain, property line and the building.

Should the Contractor use the water service prior to meter installation, a back flow device shall be installed.

8.16.6 Water Service Repair Procedure

When a water service is identified as leaking, the Town's Representative will establish an approximate location of the leak. The location of the leak will determine who is responsible for the remedial action.

The property owner is responsible for repairs to all leaks located on private property. If the leak, in the Town's Representative's opinion, requires immediate attention, the Town will undertake the necessary repairs or replacements. The property owner will be invoiced for the costs involved. The property owner may be able to recover the repair costs from the builder.

8.16.7 Assumed Subdivision

The Town will repair all leaks located on assumed road allowances using procedures deemed appropriate by the Town's Representative, at the Town's expense.

8.16.8 Unassumed Subdivision

The Town's Representative will contact the Developer to explain the situation and confirm a repair date.

If the scheduled date is unacceptable in the Town's Representative's opinion OR if the Developer refuses to acknowledge responsibility OR if in the Town's Representative's opinion the leak requires immediate attention, the Town will undertake the necessary repairs or replacements. The Developer will be invoiced for the costs involved. Should the invoice not be paid, the Town will proceed to recover the costs by drawing on the Letter of Credit for this development.

8.16.9 Residential Water Meters

For meters up to and including 50mm, the Developer/Owner shall provide a capital contribution to the Town for the applicable meter, service inspection costs and installation of the water meter. This meter shall be provided and installed by the Town prior to occupancy of the premises. All meters above 50mm shall be supplied and installed by the Developer/Owner. The meter will be the property of the Town at the time of occupancy.

8.16.10 Care of Water Meter

All Residential meters shall be maintained and repaired by the Town. Meters damaged due to neglect or by freezing, shall be repaired or replaced at the expense of the Developer/Owner. All General Service meters shall be Direct Read.

8.16.11 Approval of Water Meters

All water meters will register in cubic metres and shall incorporate the use of outdoor remote reading devices.

8.16.12 Location of Water Meters

Water meters located in a crawl space or other inaccessible areas will not be accepted.

The Developer/Owner shall keep the water meter accessible, clean dry and protected from freezing.

8.16.13 Remote Wire Installation/Inspection

The Developer/Owner shall be responsible to install wire for the remote meter. The meter wire shall be installed from the water meter location to within 0.3 metres of the electric meter base outside of the building. A 300mm (12") coil of wire must be left at the angle meter valve and outside of the building at the meter base. The remote meter wire must be installed a minimum of 200mm (8") from any electrical wiring and inside the building, not underground. The remote wire will be tested for continuity at the time of the service inspection and pressure test. Should the remote meter wire test fail, the water service will not be connected until the remote meter wire is repaired. It will be the responsibility of the

Developer/Owner to repair the remote meter wire to the satisfaction of the Town's Representative. Four-conductor wire will not be accepted.

8.16.14 Failure to Register Properly

Where the Town has established that a water meter has failed to register accurately, the Town estimate the quantity of water consumed. The recorded consumption prior to such failure will be the basis of estimating quantities consumed during the failure.

8.16.15 Testing

The Town reserves the right to test the water meter at any time.

8.16.16 Dispute Test of Water Meters

Upon written request by the consumer, the Town may test any water meter at the expense of the consumer. If the meter is found to be inaccurate, the Town shall adjust the water bills accordingly.

8.16.17 Discontinue the Supply

The Town may interrupt the supply of water to any premises that has overdue and unpaid accounts. The Town shall restore the supply of water upon payment to the Town of such overdue amounts plus any applicable service charge.

8.16.18 Draining and Plumbing

Where the owner has requested the water supply to be shut off at the curb stop, the Town will not be responsible for draining the water meter and plumbing apparatus to prevent freezing or other damage.

8.17 Not for Resale

Water supplied by the Town shall not be resold nor shall water servicing be extended without the written permission of the Town.

8.18 Specifications for General Services, Domestic, and Fire Services

Written material approval list, for the materials required, shall be submitted to the Town Representative for approval before commencing with the installation of the water services.

The Developer/Owner shall determine the pipe size for the proposed domestic service. This service shall provide the corresponding flow calculations for any domestic service larger than 50mm.

The contractor may utilize an existing valve for tie-in purposes if available. It is understood that should this valve fail, for any reason during the testing procedure, it shall be the Developer/Owner's responsibility to replace the valve, including all labour, material, and excavation.

All water services from 100mm to 300mm shall be ductile iron or PVC. Should a soils report indicate aggressive soils are present on the site, PVC water main shall be used. **The service pipe material must be Ductile Iron from the restraining flange to a minimum of 3 metres outside the foundation. The internal piping must also meet the most current Building Code and/or National Fire Protection Act. This service must have some form of Cathodic Protection.**

There shall be a daily charge for operation of a valve for filling the service as per Town of Midland By-Law.

The service pipe(s) shall be laid at right angles to the watermain and in a straight line from the watermain to the property line on the building lot frontage. A valve is not required on the property line for services larger than 50mm, due to the use of "main" valves on larger services.

All main stops, curb stops, meter stops, and shut off valves up to and including 50mm are to be ball valves. Valves over 50mm shall be gate valves.

Any water service 50mm and less shall have a curb stop and box on the property line. A Town Representative shall complete all tappings off any existing charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the Town Representative to complete the tapping. The contractor shall be responsible for all Town costs associated with tapping watermains.

All domestic water services 50mm and less shall be type "K" (W.H.) 3rd party soft copper or non-copper service pipe shall be a continuous run of cross-linked polyethylene (PEX) tubing with tracer wire and stainless-steel inserts at all joints.

8.19 Watermain Installation Charges

For installation fees, water meter costs, inspections, removals and fire protection charges, see the

8.20 Plans

The Developer/Owner or his Consultant shall submit a proposed design for any extension of the water distribution system to the Town's Engineering Department for approval. For a private residence the owner shall receive an Addition Connection Permit from the Engineering Department.

The preliminary submission shall consist of digital copy:

One (1) copy of the **"Overall General Plan"** (scales 1:500 to 1:2000)

One (1) copy of the **"Plan and Profile Drawings"** (scale 1:500 or 1:250 horizontal and 1:50 vertical)

One (1) copy of the **"Proposed Registered Plan"**

This preliminary plan shall show the size and type of watermain, the location of mains, valves, hydrants, services, bends, tees, and crosses in relation to all other utilities. The submission also shall include the location of proposed and existing elevation. These plans shall be on D standard size sheets of paper. This preliminary submission shall be reviewed by the Town's Engineering Department and one (1) copy shall be given back to the Developer/Owner showing all the changes that are required.

The final submission shall consist of one set of digital copies of the following:

"Overall General Plan" (scale 1:500 to 1:2000)

"Plan and Profile Drawings" (scale 1:500 or 1:250 horizontal and 1:50 vertical)

"Ministry of Environment Application for Approval of Water Works" and supporting documents.

Digital data must be AutoCad compatible with the Town of Midland and must be tied to the horizontal Cosine Network NAD83.

8.21 Approvals

The Town of Midland will not release consent for the issue of building permits prior to the watermains and services being installed, approved, and connected to the existing municipal water distribution system.

Approval for Construction shall be given if:

1. The Town has approved all drawings and materials.
2. The Town has received a copy of the Ministry of Environment Certificate of Approval, and number.
3. The subdivider's agreements have been signed.
4. All the letters of credit have been placed.
5. All the cash contributions have been made between the Town of Midland and the Developer(s)/Owner(s).
6. All the drawings pertaining to roads, sanitary and storm sewer locations have been signed by the Town of Midland.
7. All municipal consents have been approved by the Town of Midland.
8. The Town has received 48 hours notice prior to construction.
9. The required liability insurance has been taken out. Refer to Section E.

Should the Subdivider's Agreement not be signed, the Developer/Owner will be permitted to start work on their own lands once the following conditions are met:

1. MECP Certificate of Approval obtained.
2. The Engineering Fee is paid to the Town.
3. Insurance requirements are in place.
4. The housekeeping deposit is paid.

No connection to existing municipal services or work on Town property will be permitted until after registration of the plan of subdivision, site plan approval or additional connection permit.

All field or design changes affecting servicing drawings shall be forwarded to the Town Representative for comment prior to any further work proceeding.

No tie-ins to the existing municipal water distribution system will be allowed until the Subdivision Agreement has been signed by all parties.

Upon completion of the testing procedure, the Consultant shall deposit with the Town, within 30 days, Mylar drawings showing "as constructed" details of all watermains, fittings, water services and hydrant locations, complete with constructed elevations. These drawings shall be drawn on D standard size sheets, with scales of 1:500 or 1:250 for "Plan and Profile Drawings" and 1:500 to 1:2000 for "Overall General Plans".

Failure to provide "As-Constructed" drawings will result in the Town taking the responsibility to produce "As Constructed" drawings. All associated costs shall be at the expense of the Developer/Owner.

8.22 MECP Approvals

The application for MECP Approval Application and Certificate of Approval must follow the most recent "Schedule B" of the "Drinking Water Works Permit (#122-201)".

8.23 Inspection

The Town requires an inspection of all distribution systems installed.

The Contractor shall notify the Town Engineering Department 48 hours before commencing any work.

The Town does not provide full time inspection but a Town Representative will be on site as long as required, to ensure proper installation, materials, and construction is adhered to as outlined in this document.

The Town Representative shall be introduced to the Contractor at the pre-construction meeting.

The Town Representative is not responsible for ensuring that the trench meets the criteria set out by the "Occupational Health and Safety Act". Safety shall be adhered to at all times.

The Developer/Owner shall pay the Town for the services of the Town Representative at regular rates through Friday, 8:30 a.m. to 4:30 p.m. Overtime rates shall apply for all other times, including statutory holidays and Town holidays. When a contractor is going to work outside of normal working hours he should notify the Town's Engineering Department a minimum of 48 hours before work is to commence.

The Contractor should follow all instructions given by a Representative of the Town relating to the quality or type of material, installation or construction practices.

The Developer/Owner agrees to have a surveyor verify the final installation grades, elevations and the trench locations for the watermain, main valves, hydrant valves and top flange elevations of the hydrants. The surveyor shall provide the Town Representative with a daily written verification.

The Town Representative has the right to suspend the work immediately if the work practices being employed, the materials being used or the proposed layout is insufficient. This will be in the form of verbal notification, followed by a written notification. Work shall not recommence until the written notification has been rescinded by the Town Representative.

The Town's Representative, in consultation with the Consulting Engineer and the Design Staff, reserves the right to order field revisions at the expense of the Developer/Owner.

8.24 Contractors Supervision

The Contractor shall have a Supervisor/Foreman in charge at all times. This person shall be responsible for notices, communication or installation instructions and safety precautions.

8.25 Liability Insurance

The Contractor shall provide, maintain and pay for insurance and all required assessments to protect himself and the Town from claims under the Worker's Compensation Act and from any other claims for damages arising from personal injury, including death, and for claims for property damage that may arise from his operation under this contract.

The Developer/Owner shall save harmless, the Town, its agents and employees from and against all claims, demands, losses, costs, damages, actions, suits and proceedings arising out of or attributable to any act or omission in connection with the development and servicing of this plan of subdivision, and without limiting the generality of the foregoing, including inspections of the services arising out of, or attributable to the development.

8.26 Installation and Construction

Prior to the installation of the watermain and appurtenances, the Contractor shall notify the Town's Representative 48 hours in advance.

The Consultant/Contractor shall obtain all necessary permits and consents associated with the excavation and installation of water distribution systems on existing Town of Midland road allowances. The Developer/Owner shall have survey markers and/or property bars defining the boundary of each lot, easement, and road allowance.

Materials:

A complete list of materials, which will be used to install the water distribution system, shall be sent to the Town Representative for approval before construction commences.

The Contractor shall inspect all materials before installation and reject any pieces showing breaks, cracks or other defects. Before the watermain is lowered into the ground it shall be brushed out to ensure that there is no dirt or foreign material in the watermain.

8.27 Watermain and Appurtenances

Sacrificial caps and anodes shall be used on all mechanical joint fittings on every bolt. The Contractor shall provide for sufficient bolt lengths to accommodate the caps.

Concrete thrust blocking shall be installed at all tees, vertical and horizontal bends, hydrants, ends of watermains and connections 100mm and larger, as per the standard drawing OPSD # 1103.010 and # 1103.020. PVC 'tee' pressure fittings require additional thrust blocking on either side of the tee legs. In cases where concrete thrust blocking is inappropriate, restraining glands may be used at the discretion of the Town's Representative.

All watermain, tees, horizontal bends and branch valves in fill areas shall be restrained with tie rods, 19mm stainless steel, in addition to concrete thrust blocking.

The Contractor shall install the pipe and appurtenances to the line and grades noted on the construction drawings, with a minimum depth cover of 1.7m in residential areas and 2.2m in rural areas. The Contractor is responsible to notify the Town's Representative immediately of any discrepancies to line or grade.

Bonding wedges, as supplied by the manufacturer are NOT to be installed on ductile iron pipe.

All couplings must be installed with the proper restraining glands.

9 Street Lighting, Utilities, and Traffic Signals

9.1 General

The location of all utilities must be established and resolved in conjunction with the Town and the Utility Companies, while generally following the locations shown on the typical road cross-sections.

Compaction of backfill for utility trenches shall be 95% Standard Proctor within boulevards and 100% for driveways and road crossings.

Design Engineer is required to prepare the Composite Utility Plans, secure approvals by all utility companies, including Newmarket Tay, and include in the set of Engineering Drawings being part of Subdivision Agreement. Composite Utility Plans must be available for review the latest at the 2nd submission of engineering drawings.

9.2 Utilities

Telecommunications, hydro, and gas services shall be underground and shown on the typical road cross-sections. They shall be installed by the corresponding contractor.

9.3 Streetlighting

All roadways are to be lit unless written approval is received from the Town. Streetlights shall be provided throughout all developments and may be required on roadways bordering developments if deemed necessary by the Town.

A qualified engineering consultant shall prepare the streetlight design, including photometric layouts using an approved computer lighting program such as AGI 32, Auto Lux, or equivalent.

All drawings must be sealed by a registered electrical Professional Engineer, licensed to practice in the Province of Ontario. Any attachments to hydro poles must have Hydro Authority approval and comply with Regulation 22/04 (or the latest revision thereof). All roadway lighting design and construction is subject to Electrical Safety Authority (ESA) inspection and approval.

The Transportation Association of Canada (TAC) “Guide for Design of Roadway Lighting”, Volumes 1 and 2 provide comprehensive design guidelines and may be used for lighting devices for roadways and associated facilities.

9.3.1 Design Criteria

Streetlights on 9.1 m concrete poles or sectional steel high mast poles shall be installed throughout the subdivision and may be required on arterial or Provincial roadways bordering the development if deemed necessary by the Town. Any reconstructions in the town may require updating or replacing the street lighting. The type and layout of the street lighting must be to the satisfaction of Newmarket Tay Power and the Town.

The maximum allowable spacing shall be 45 m unless specifically approved by the Town. Poles must be installed on projections of lot lines.

Street lighting units shall normally be Full Cut-off Dark Sky compliant LED Edge slim low-profile fixtures, photocell controlled with no less than 6320 delivered lumens (Generation B - Four Light bar assembly), silver coloured, as manufactured by Ruud/Beta LED Lighting (Ruud/Beta Part No. X–SL–O–H–08–D–U–S–H–R), or approved equivalent. In cases when the Developer wishes to install streetlights having a particular style, approval for the use of such streetlight units shall be obtained from the Town and from Newmarket Tay Power but in any case, they must be LED light units.

9.3.2 Lighting and Uniformity Ratios

Street lighting shall be supplied and installed on all streets and pedestrian walkways in the subdivision.

Road Classification/ Uniformity Ratio	(ROW/Pavement)	Illumination Level
Residential	20m/8.5m	2 Lux/6:1
Urban Collector 26m/14.5m	26m/14.5m	6 Lux/3:1
Minor Arterial, Ind. Collector	30m/16.0m	9 Lux/3:1
Walkways		2 Lux/6:1

Poles to be stress-crete poles or Powco Steel octagonal hot-dipped galvanized Series 1100 poles or equivalent. Any use of decorative style luminaire fixtures and/or special poles to be pre-approved by the Engineering Department. See OPSD drawings 2100.01, 2101.01, 2103.04, 2210.01, 2225.01, 2250.01, 2410.01 and 2420.01

9.3.3 Approval and Construction

Approval of plans for streetlighting must be obtained from the Town. The Developer must guarantee and maintain the lighting until final acceptance of the development. The Town, upon energization of the streetlighting, will pay energy charges.

9.4 Traffic Signals

Traffic signal design is to be prepared in accordance with M.T.O. Traffic Manual Book 12 and the appropriate M.T.O. and electrical design codes. All work shall be performed in accordance with the current edition of the Ontario Electrical Code, including all appending bulletins issued by the Electrical Safety Authority which are applicable to the work. All work shall be governed by Federal, Provincial and Local laws and by-laws pertaining to the work, as well as by the latest issue of CSA Standards pertinent to the work. All electrical work is subject to inspection by the Electrical Safety Authority. In the event of a conflict between regulations, the strictest regulation shall apply.

In addition to accommodation of traffic flow, the signalized intersection design shall include pedestrian requirements and accessibility features. All signalized crossings must be designed in accordance with the TAC “Guidelines for the Understanding, Use, and Implementation of Accessible Pedestrian Signals”. Accessibility features must include gentle grades for sidewalks, drop curbs (painted yellow), and directional lines in the sidewalk to provide guidance for the visually impaired. Pedestrian crosswalk features shall include single head “walk/don’t walk” heads, countdown heads, and audible pedestrian heads with tactile push button.

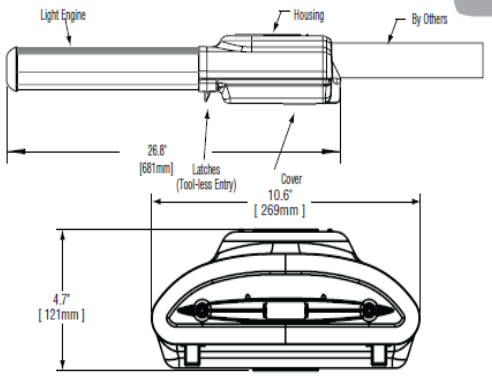
XSL0-07-09 LEDway® Streetlight – Type III Medium

Rev. Date: 8/12/11

Catalog #: X - SL - 0 - - - D - - - - -

Reset





Notes:

Product	Family	Mounting	Optic	# of LEDs (x 10)	LED Series	Voltage	Color Options	Drive Current
X	SL	0[1]	H[2] M[3]	07 08 09	D	U Universal 120–277V V Universal 347–480V	S Silver[4] T Black[4] Z Bronze[4] B Platinum Bronze[4] W White[4]	D 700mA (Standard) C 525mA H 350mA

Factory-Installed Options

Please type additional options in manually on the lines provided above.

- 7 4300K Color Temperature[5]
- Y 0–10V Dimming[6,7,8]
- F Fuse[9,10]
- G Hi/Low (175/350/525, dual circuit input)[11,12]
- N No Quick Disconnect Harness or Leveling Bubble[13]
- M Power Door[14]
- R NEMA Photocell Receptacle[9,15]
- J Door Safety Tether[16]

Footnotes

1. Horizontal tenon mount
2. IESNA Type III Medium distribution with full backlight control
3. IESNA Type III Medium distribution with partial backlight control
4. Light engine portion of extrusion is not painted and will remain natural aluminum regardless of color selection
5. Color temperature per fixture; 6000K standard; minimum 70 CRI
6. Control by others
7. Refer to dimming spec sheet for availability and additional information
8. Can't exceed the specified drive current. Consult factory if exceeding the drive current is necessary.
9. Not available with all multi-level options. Refer to multi-level spec sheet for availability and additional information
10. When code dictates fusing use time delay fuse
11. Refer to multi level spec sheet for availability and additional information
12. Sensor not included
13. Standard product features unless N option is specified
14. All connections between door and fixture are shipped unconnected from the factory; door release spring included to open door automatically when the latches are released
15. Photocell by others
16. Stainless steel aircraft cable

LED PERFORMANCE SPECS

# of LEDs	Initial Delivered Lumens – Type III Medium w/ Backlight Control @ 6000K	B	U	G	Rating**	Initial Delivered Lumens – Type III Medium w/ Partial Backlight Control @ 6000K	B	U	G	Rating**	Initial Delivered Lumens – Type III Medium w/ Backlight Control @ 4300K	B	U	G	Rating**	Initial Delivered Lumens – Type III Medium w/ Partial Backlight Control @ 4300K	B	U	G	Rating**	System Watts 120–480V	Total Current @ 120V	Total Current @ 240V	Total Current @ 277V	Total Current @ 347V	Total Current @ 480V	L_{70} Hours* @ 25° C (77° F)	50K Hours Lumen Maintenance Factor* @ 15° C (59° F)
350mA Fixture Operating at 25° C (77° F)																												
70	4,725 (07)	1	2	1		5,600 (07)	1	2	2		4,355 (07)	1	2	1		5,161 (07)	1	2	1		75	0.67	0.38	0.35	0.25	0.20	> 150,000	
80	5,363 (08)	1	2	2		6,356 (08)	1	2	2		4,943 (08)	1	2	1		5,858 (08)	1	2	2		86	0.77	0.42	0.39	0.28	0.22	> 150,000	94%
90	5,988 (09)	1	2	2		7,097 (09)	1	3	2		5,519 (09)	1	2	1		6,541 (09)	1	2	2		96	0.84	0.46	0.42	0.31	0.24	> 150,000	
525mA Fixture Operating at 25° C (77° F)																												
70	6,615 (07)	1	3	2		7,840 (07)	2	3	2		6,097 (07)	1	2	2		7,226 (07)	1	3	2		117	0.99	0.53	0.47	0.37	0.29	140,000	
80	7,508 (08)	1	3	2		8,898 (08)	2	3	2		6,920 (08)	1	3	2		8,201 (08)	2	3	2		135	1.13	0.59	0.53	0.42	0.32	136,000	93%
90	8,383 (09)	1	3	2		9,936 (09)	2	3	2		7,727 (09)	1	3	2		9,157 (09)	2	3	2		149	1.27	0.65	0.58	0.47	0.35	132,000	
700mA (Standard) Fixture Operating at 25° C (77° F)																												
70	8,269 (07)	1	3	2		9,800 (07)	2	3	2		7,621 (07)	1	3	2		9,032 (07)	2	3	2		162	1.35	0.69	0.61	0.49	0.36	115,000	
80	9,385 (08)	1	3	2		11,123 (08)	2	3	2		8,649 (08)	1	3	2		10,251 (08)	2	3	2		188	1.55	0.79	0.69	0.55	0.41	110,000	91%
90	10,479 (09)	1	3	2		12,420 (09)	2	3	2		9,658 (09)	1	3	2		11,447 (09)	2	3	2		210	1.69	0.86	0.76	0.62	0.45	107,000	

* For recommended lumen maintenance factor data see TD-13

** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-07BugRatingsAddendum.pdf

NOTE: All data subject to change without notice.

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XSL0-07-09 LEDway® Streetlight – Type III Medium

Rev. Date: 8/12/11

General Description

Fixture housing is all aluminum construction. Standard fixture utilizes terminal block for power input suitable for #2–#14 AWG wire and operates at 700mA. Drive current is field switchable. Fixture is designed to mount on 1.25" IP (1.66" O.D.) and/or 2" IP (2.375" O.D.) horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes two axis T-level to aid in this process). Fixture carries a limited five year warranty.

Electrical

Modular design accommodates varied lighting output from high power, white, 6000K (+/- 500K per full fixture), minimum 70 CRI, long life LED sources. Optional 4300K (+/- 300K per full fixture) also available. 120–277V 50/60 Hz, Class 1 LED drivers are standard. 347–480V 50/60 Hz option is available. LED drivers have power factor >90% and THD <20% at full load. Quick disconnect harness suitable for mate and break under load provided on power feed to driver for ease of maintenance. Units provided with integral 10kV surge suppression protection standard. Surge protection tested in accordance with IEEE/ANSI C62.41.2.

Finish

Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable silver powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Bronze, black, white and platinum bronze powder topcoats are also available. The finish is covered by our 10 year limited warranty.

Fixture and finish are endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117.

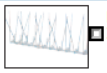
Testing & Compliance

UL listed in the U.S. and Canada for wet locations. Consult factory for CE Certified products. Meets CALTrans 611 Vibration Testing and GR-63-CORE Section 4.4.1/5.4.2 Earthquake Zone 4. Certified ANSI C136.31-2001 bridge and overpass vibration standards. Dark Sky Friendly. IDA Approved. RoHS Compliant.

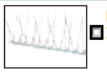
Patents

U.S. and international patents granted and pending. BetaLED is a division of Ruud Lighting, Inc. For a listing of Ruud Lighting, Inc. patents, visit www.uspto.gov.

Field-Installed Accessories

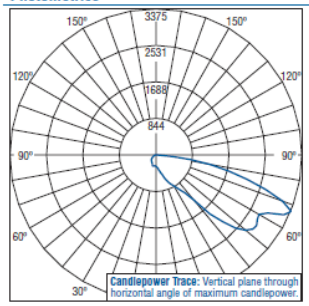


Bird Spikes for Light Engine
XA-BRDSPK90

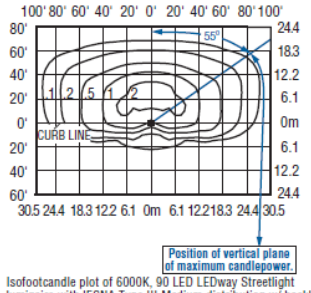


Bird Spikes Kit for Housing
XA-BRDSPKHSG

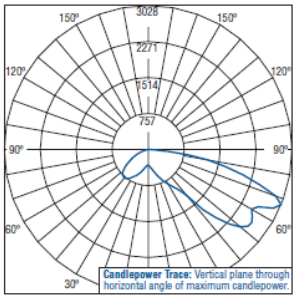
Photometrics



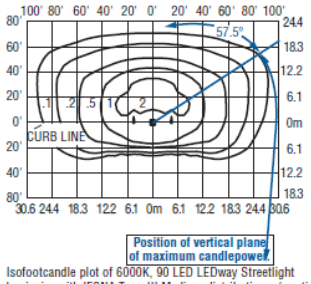
Independent Testing Laboratories certified test. Report No. ITL683s9. Candlepower trace of 6000K, 40 LED LEDway Streetlight luminaire with IESNA Type III Medium distribution w/ backlight control. Luminaire with 5,084 initial delivered lumens operating at 700mA. **All published luminaire photometric testing performed to IESNA LM-79-08 standards.**



Isofootcandle plot of 6000K, 90 LED LEDway Streetlight luminaire with IESNA Type III Medium distribution w/ backlight control mounted at 25' A.F.G. Luminaire with 10,479 initial delivered lumens operating at 700mA. Initial FC at grade.



Independent Testing Laboratories certified test. Report No. ITL688s9. Candlepower trace of 4300K, 40 LED LEDway Streetlight luminaire with IESNA Type III Medium distribution w/ partial backlight control. Luminaire with 5,440 initial delivered lumens operating at 700mA. **All published luminaire photometric testing performed to IESNA LM-79-08 standards.**



Isofootcandle plot of 6000K, 90 LED LEDway Streetlight luminaire with IESNA Type III Medium distribution w/ partial backlight control mounted at 25' A.F.G. Luminaire with 12,420 initial delivered lumens operating at 700mA. Initial FC at grade.

LEDway® EPA & Weight Calculations

Approximate Weight 120–480V[1]		
70–90 LED fixture	21.0 lbs. (9.5kg)	
EPA		
Horizontal Tenon Mount		
1 fixture	0.706	
EPA		
Round External Mount / Square Internal Mount Horizontal Tenons with Fixture(s)		
PT-1H/PD-1H4	Single	0.928
PT-2H(90)/PD-2H4(90)	90° Twin	1.267
PT-2H(180)/PD-2H4(180)	180° Twin	1.746
PT-3H(90)/PD-3H4(90)	90° Triple	1.932
PT-3H(120)	120° Triple	1.712
PT-4H(90)/PD-4H4(90)	90° Quad	2.336

1. Add 5 lbs. (2.3kg) for transformer in 347–480V fixtures when multi-level options are selected.

NOTE: All data subject to change without notice.

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10 Erosion and Sediment Control

10.1 General

All erosion and sediment controls are temporary measures constructed prior to any other site work and shall be maintained until assumption of the subdivision. Prior to assumption of the subdivision all temporary measures shall be removed, and any disturbed areas stabilized.

All erosion and sediment control measures shall be inspected by the Consultant once per week and after each rainfall of 1 cm or greater. Inspection reports shall be forwarded to the Town Engineering department within 5 days of inspection.

Erosion and sediment control measures shall be designed in accordance with Provincial guidelines.

10.2 Catch Basin Sediment Control

The requirement for catch basin sediment control is as follows:

- during construction, all catch basins shall be provided with sediment control and this shall be maintained until assumption;
- catch basins shall be cleaned as a minimum at least once before base course asphalt is applied and just prior to assumption of the subdivision.

10.3 Stone Pad Construction Entrance- Construction Access

In order to reduce the tracking of mud onto paved streets, a pad of crushed stone shall be constructed at the site entrance and exit leading onto any existing road. The stone pad shall be a minimum of 450 mm thick, 30 m long and 5 m wide. The first 15 m from the entrance/exit shall be constructed with 50 mm clear stone. The remaining 15 m shall be constructed with 150 mm rip rap.

The stone pad must be maintained as required given the site conditions to ensure mud tracking is kept to a minimum.

In some cases the drawings shall specify a required truck hall route.

10.4 Utilities

The appropriate utility company or their approved contractor shall install the services for Bell, Hydro, Gas, Cable TV. The Developer must bear the cost of any surcharges for underground installation made and must grant any necessary easements for their services. Utility crossings for new roads shall be placed prior to placement of granular road base material. Utility crossings for existing roads shall have the asphalt surface saw cut and removed for a width of the trench plus a minimum of 0.5 metres out form each side of the trench walls. Compaction of backfill for utility trenches shall be 95% Standard Proctor Dry Density.

10.5 Canada Post

The Engineer must communicate directly with Canada Post for locating their proposed facilities. All proposed locations must be shown on the Composite Utility Plan. Any temporary placement of post boxes must be placed in accordance with approved final location.

11 Grading

11.1 General

Lot grading ensures that surface water and shallow groundwater is effectively managed in a manner that does not negatively affect adjacent properties. Lot grading should be designed and constructed so that surface water flows away from buildings, over grassy surfaces where possible, to an appropriate receiving area which could be a natural water feature, or a constructed infiltration implement. This will promote infiltration, reduce the velocity of runoff, and prevent nuisance flooding.

The Town's objective is to ensure that the property owner (i.e. resident) will have maximum use of their property while still providing effective drainage within the development or site. The following criteria should be used in the preparation of all lot grading plans.

Surface drainage from residential lots or commercial blocks shall not be permitted to drain into parkland without prior approval from the Town's Engineering Department.

Proposed grading of any site will not interfere with, or significantly alter existing drainage patterns, and shall not increase discharge to adjacent lands, including those with surface water features or other environmentally sensitive areas.

Grades are required to match the adjacent properties and/or approved lot grading. Drainage shall be managed by the use of swales and provide positive drainage away from buildings.

Proposed elevations that define the grading of the property are to be shown on the General Lot Grading Plan. The Town shall accept Lot Grading Plans and Certification of Lot Grading works from the following qualified professionals:

- Professional Engineer - P.Eng.,
- Ontario Land Surveyor – OLS
- Certified Engineering Technologist (C.E.T.).

Please refer to Appendix D for the Site Plan and Subdivision checklist.

11.2 Requirements for Engineered Lot Grading

- All Lots contained within an Unassumed Plan of Subdivision
- All Lots contained within an Assumed Plan of Subdivision
- Lots defined as Infill Development – Urban / Settlement Areas / Rural
- All Lots defined as Waterfront / Shoreline Development Areas
- House Additions
- Accessory buildings

11.3 Grades

Grass surfaces shall have a minimum acceptable gradient of 2% and maximum of 33%. A minimum grade of no less than 2% and no more than 5% is required adjacent to buildings. The minimum Table Distance required at the rear of the building is 5.0m, and along one side is 0.6m where applicable zoning requirements permit.

All retaining wall structures placed in areas where the grade separation exceeds 1m in vertical height are to be design by a Professional Engineering and constructed of material suitable to the Engineering Department, require a permit, and separate retaining wall design drawings.

Driveway grades shall be between 2.0% and 7.0%. Driveways with reverse slopes are not permitted.

All boulevard areas shall be graded with a constant slope to the street limit, minimum slope to be 2.0%; maximum slope to be 7.0%.

11.4 Rear Yard Catch Basins

Rear lot catch basins are to be contained within a Town of Midland's easement and shall outlet directly to a municipal maintenance hole/catch basin at the street/property line. The use of rear lot catch basins (within an easement) shall require the written approval of the Town's Engineering Department prior to installation and may only be used when on-site constraints do not permit drainage into street level storm devices.

11.5 Swales

Drainage flows from one lot shall not enter onto another lot unless confined to common swales and are part of an overall subdivision grading plan (swales from one lot to another should flow directly) or the outlet is established on title in the form of a drainage agreement or easement to the satisfaction of the Town. Driveways shall not be used as outlets for any swales.

The maximum flow which may be discharged into a side yard swale, or any road allowance shall be no more than three (3) backyards or 60m (approximate area of 600m2). Individual lot drainage is preferred.

All rear yard drainage shall be directed away from the houses in defined swales which outlet at the curb, sidewalk, or a catch basin. Swales shall have a minimum depth of 150mm, and maximum depth of 200mm, with maximum side slopes no greater than 3:1. The maximum flow allowed in a rear yard swale shall be from six (6) rear yards and in no case will the swale lengths be greater than three (3) lot widths for single and semi-detached houses.

11.6 Lot Development Plan- Required Details

a) Indicate house type (normal, side split, backsplit, etc.)
b) Show finished first floor elevation.
c) Show finished garage floor elevation.
d) Show existing and proposed elevations at lot corners.
e) Show driveway location, elevation on sidewalk and grade.
f) Show locations of entrances.
g) Show locations of municipal walkways and proposed grade.
h) Show direction of surface flow.
i) Show locations of swales.
j) Show locations of patios, decks or porches.
k) Show location of terraces.
l) Show location and elevation of retaining walls (if applicable).
m) Show centre-line elevations of roadway, adjacent to the lot(s).
n) Show locations for catch basins, hydrants, street lights, transformers, telephone pedestals and sidewalks.

o) Label street(s) adjacent to lot(s).
p) Show all proposed rear lot catch basins, and top of grate elevations.
q) Scale to be 1:200 or 1:250 for a single lot.
r) Show top of footing elevations.
s) Show proposed minimum top of foundation wall elevation.
t) Show municipal address for each lot.
u) Show (%) percent grades on driveways (2% min., 7% max.).
v) Show proposed ground elevations adjacent to the buildings and at the house corners these elevations should be minimum 0.15 m lower than top of foundation wall elevation.
w) Show proposed elevations on the swales where the grade changes and elevations adjacent to the building corners.

11.7 Lot Grading Procedure

11.7.1 Grading Submission Procedure

One (1) certified digital copy of the proposed lot grading plan are to accompany all building permit applications. (All building permit applications are to be completed through Cloud Permit).

The proposed and final grading certificates and drawings are to be certified by the Engineering Consultant responsible for the original design of the Subdivision.

The submission to the Planning and Development Department and the Town Engineer for preliminary lot grading certification will require the appropriate grading plan which is to contain the following wording: "I hereby certify that the proposed grading, building type and appurtenant drainage and storm water management works comply with sound engineering design and that the proposed grading is in conformity with the approved overall grading plan."

The wording is to be followed by the Professional Engineers stamp and signature.

11.7.2 Lot Grading Inspection and Certification

It is the Developer's responsibility to correct any drainage problems during the term of the Subdivision Agreement. The Developer is also responsible for certification of each lot's grading and sodding as required by the Town of Midland, prior to occupancy.

Builders' site grading plans are to show underside of footing elevations and top of foundation wall elevations. Where multi-level footings and/or foundation walls are intended, all levels are to be shown. Engineered fill level is to be shown where applicable.

Prior to a building's superstructure proceeding, the Developer's Engineer must certify that the final footing and foundation elevations conform to the site grading plans and the Building Code.

The following shall take place before the Engineering Department will accept a Lot Grading Certificate from a Consulting Engineer:

1. The Consulting Engineer has advised the Town – in writing – that they have completed an initial inspection of the site to assure themselves that the lots which they propose to certify have been graded and sodded in accordance with the grading plan and the preliminary Lot Grading

Certificate, and the house has been built and the ground elevation adjacent to the house are compatible with the lot grading which has been carried out.

2. The Consulting Engineer will then arrange for their representative, the builder and/or their representative, and the Town Engineer and/or their representative to visit the site and review each lot in the plan, which is to be certified, and to agree on those lots which can be certified by a visual inspection. Further, this inspection is also to reveal those lots that require more surveying or more work to determine how they can be certified. The Consulting Engineer will immediately certify all lots in writing where an agreement has been reached by the parties in the field.
3. The Consulting Engineer will re-survey those lots which cannot be certified by a visual inspection, or, if not necessary, require the builder to do further work in order that such lots can be made certifiable. It should be noted that if the builder will not correct the work as instructed by the Consulting Engineer, this responsibility will fall directly upon the Developer.
4. Lots which cannot be certified due to poor grading or due to changes in the type of house, which was built on the lot, will be brought to the attention of the Manager of Engineering – in writing – by the Consulting Engineer. The Consulting Engineer, on behalf of the Developer, will prepare a new grading plan(s) for the lots which have not been built according to plan and will submit the revised plan to the Town, to the builder, and to the homeowner (if applicable).
5. The foregoing is an attempt to establish a system which will likely cover 98% of the lot grading problems presently being experienced. However, it is acknowledged that there are going to be problems that cannot be covered by this procedure. These problems will be dealt with between the Town, the Consulting Engineer, the Developer, and the Builder, as they arise.
6. Prior to assumption, if the residing homeowner modified grades within his own lot, causing adverse affects to neighbouring lands, the Developer will be required to rectify the grading infraction to the satisfaction of the Town Engineer.

It is recommended that the Developers consultant with the Town, file the actual grades being certified including underside of footing and top of foundation wall. This will allow a record to be kept for the duration of the Subdivision Agreement. This record will be available to resolve disputes involving changing or certified grades between certification and the Town's assumption of the subdivision.

11.8 Landscaping Implementation Procedures

Once the infrastructure of the subdivision is in place and housing is under construction, the developer must hire a landscape contractor to install the approved landscape components. The landscape architect shall inspect and certify the installation.

11.9 Tree Planting

One tree per lot shall be planted in a location stipulated or approved by the Town. A minimum separation of 3 m is required between the tree location and any service to the lot.

Each tree shall have a minimum height of 3.2 m and a diameter of 50 mm measured 0.3 m above grade, and must be planted in accordance with good nursery practices. The trees selected may be any two or more varieties chosen from the following: Acre platanoides – Norway Maple including Crimson King and Schwedleri; Ginkgo biloba – staminate trees only; Moraine Locust; Quercus Borealis – Red Oak; Tilia

cosdata – Little Leaf Linden. Other species and varieties may be planted subject to the written approval of the Town.

11.10 General Streetscape Standards

The standard details and specifications found in this section govern planting and fence construction along roads of all classifications. The streetscape design must conform to the Town of Midland Subdivision Design Guidelines.

11.11 Notes for Streetscape Submission Drawings

The following notes pertaining to layout requirements are to be included on all streetscape submission drawings:

NOTE 1

Depicted on this plan are the species and the approximate location of street trees. Once driveways, utilities and light standards have been installed, the exact location of street trees will be staked on site by the Landscape Architect and approved by the Town prior to planting.

NOTE 2

Minimum clearances for Street Trees (when trees are planted 1.5 m from the curb):

- 2.0 m from water hydrants;
- 2.0 m from driveways;
- 2.0 m from neighbourhood mailboxes;
- 3.0 m from hydro transformers;
- 5.0 m from streetlight poles;
- 15.0 m minimum from street line (street intersection as measured from back of curb) and behind the daylight triangle as per the Geometric Design Standards for Ontario Highways;
- 18.0 m from face of all warning signs.

When the minimum distances noted above are not achievable, street trees may be planted in an alternate location, 0.5 m from the property line (0.8 m behind the sidewalk) and adjacent to any fences. In cul-de-sac locations the street tree may be planted just inside the private property line. If a tree is planted in an alternate location, the distances marked with an asterisk must still be maintained.

NOTE 3

The tree pits and planting beds for all trees and shrubs located within 1 metre of underground utilities are to be hand dug.

NOTE 4

Minimum clearance for fences from fire hydrants is 1.0 m.

NOTE 5

All plant material must conform to the Canadian Standards for Nursery Stock and must be guaranteed for a minimum period of 24 months following acceptance of the work by the Town. Adequate

11.12 List of Details and Specifications

The following standard details are to be provided in your submission

1) Deciduous Tree Planting
2) Coniferous Tree Planting
3) Shrub Planting
4) Tree Preservation Detail
5) Chain Link Fence
6) Wood Privacy Fence
7) Emergency Access and Walkway Gate
8) Removable Bollard
9) Multi-Use Urban Trail (Paved)
10) Multi-Use Rural Trail
11) Walking/Hiking Trail

11.13 Minor Road Street Trees

Minor Roads should be planted with high branching deciduous trees (60 mm caliper minimum). It is recommended that a variety of species be employed in groups.

11.14 Corner Lot Treatments

Corner lots exposed to Minor Roads require special privacy measures that may include fencing, tree planting or a combination of both to ensure a useable private amenity area

11.15 General Planting Considerations for Internal Streets

The following list of planting design guidelines represents the general streetscape planting objectives for the Town. Streetscape and buffer plans should meet the Town of Midland Subdivision Design Guidelines.

Tree Spacing – The recommended spacing is a minimum of one street tree planted every ten metres along all minor internal streets.

Lot configuration – The planting design must address the variations in lot configurations. The recommended spacing suggests that most lots will receive at least one tree, although the shape and configuration of the property will be the final determinant of tree layout.

Utilities – The presence of utilities, mailbox clusters and the curb may interfere with the preferred placement of street trees. The planting design must be flexible enough to accommodate on-site adjustments.

Horticultural accents – In locations where the subdivision layout and roadway design permits horticultural accent plantings, the use of smaller flowering trees are shrubs encouraged in continuous mulched beds.

Walkway Easements – Walkway easements adjacent to side yards and rear yards shall be fenced to discourage trespassing.

Landscape Buffers – In locations where landscape screening is required along primary roadways, the use of a wide variety of evergreen and deciduous trees and evergreen and deciduous shrubs is encouraged. The materials should be planted in naturalistic groupings in continuous mulched beds.

Boulevard Restoration – The boulevards along the Town's road right-of-way must be sodded.

11.16 Standard and Guidelines for Naturalization Areas

All disturbed natural open-space blocks, and lands adjacent to conservation areas, as well as the lands surrounding stormwater management facilities are to be re-vegetated using naturalizing plant materials. The planting design must employ native plants using a variety of trees shrubs and ground covers to re-establish the local ecosystem. If the site had been previously disturbed, landscape restoration strategies must be employed to reinstate a naturalized landscape condition.

11.17 Notes for Naturalization Submission Drawings

The following layout note is to be included on the submission drawings for all areas to be naturalized:

NOTE 1

All plantings and hard landscape features are to be staked out on site and approved by the Landscape Architect and Town prior to installation. Any deviations from the approved landscape plans require prior Town approval.

11.18 Sodding and Seeding

Each lot is to be entirely 50mm sodded over 150 mm of topsoil.

11.19 Lot Development Plans

After approval of the overall grading plan and prior to the issuance of building permits, the Consulting Engineer shall submit to the Manager of Engineering for approval of 2 sets of the proposed lot development plan for those particular lots (or set of dwellings in the case of townhouse or multi unit dwellings) for which a building permit is desired. That submission would be accompanied by a letter which would express the Consulting Engineer's approval.

It is expected that the majority of proposed lot development plans would conform to the general lot grading plan. All deviations which are certified by the Consulting Engineer and subsequently approved by the Town will require a revision to the overall lot grading plan.

11.20 Fencing

Chain link fence, 1.5 m height, shall be installed along all walkways, open spaces, parks, steep slopes, school, commercial and industrial properties and as required by the Town. The fence shall be installed as per OPSS and OPSD with top rail, knuckled top edge fasteners, knuckled bottom edge and No. 9 gauge wire mesh.

Privacy fence, as per Town Standard and sound attenuation fence shall be installed where required.

Fencing shall be in accordance with the most recent requirements and specifications of the Town as shown on the standard drawings.

Fencing is required:

- along side yard flankage and/or rear yards backing onto roadways unless noise attenuation barriers are required;
- along public walkways (In accordance with Town Standard 900.00 and 915.00);
- parks, ponds and open space blocks;
- as designated by the Director of Public Works;
- acoustic fencing per approved report.

The minimum requirement for residential screen fencing is 1.8 m.

11.21 Maintenance Agreement for Naturalization Areas

Carrying out a maintenance program for the first two years after planting the naturalization areas will significantly reduce the mortality rate of the trees, shrubs, grasses, etc. and help to establish healthy vegetative cover.

At the time of planting, the planting details and specifications should be followed faithfully. This means, among other things, the proper transportation and handling of plant material, the use of fertile planting soil, the proper staking of trees and the proper installation of rodent protection.

Maintenance shall include:

- apply appropriate fertilizer to promote growth;
- prune dead or diseased tissue;
- remove dead plant material;
- replace dead coniferous naturalization species to maintain a minimum live-stocking standard of 90%;
- Suppress weed growth around new trees and shrubs by adding mulch and/or removing weeds by hand. Weeds shall not be cut down with a power trimmer.

An assessment of plant material is to be carried out annually by the Landscape Architect between mid-July and early September and reported to the developer, the contractor and the Municipality in the form of a Naturalization Assessment Report. Plant vigour can be determined by a visual inspection of the current year's foliage.

The initial inspection and assessment will be conducted in the summer following the planting. It will take account of the survival and condition of the plants. It will also include a summary of the maintenance operations performed. Finally, the assessment will propose any additional maintenance measures thought necessary, and recommended where, the following spring, plants need to be replaced or new plants added.

The second assessment will be conducted the following year, and will provide similar information to the first.

The third and final assessment will take place just prior to assumption. The final report will provide a complete summary of the initial plantings, as well as a record of the replacements and maintenance services carried out during the guarantee period. The report will also make note of any additional work that should be performed prior to the Town conducting their own final inspection.

11.22 Retaining Walls

Retaining walls shall be constructed according to the following:

- where retaining walls are required they shall be constructed on the higher lot such that the wall and tie-back do not cross property lines;
- retaining wall design and construction shall be certified by the Engineer prior to site plan or subdivision approval;
- retaining walls shall be constructed on private property, not on property to be assumed by the Town.

11.23 Block Grading

All block grading shall conform to the storm water management report. The Developer shall be responsible for the grading of blocks until assumption of the subdivision.

The Developer and his Consultant shall be responsible for approval and certification of the following:

- certification that the block grading plan conforms to the storm drainage plan. The block grading plan and certification shall be submitted with the building permit application;
- certification of the final grading for each block conforms to the storm drainage plan and the block grading plan.

11.24 Block Grading Criteria

The criteria for block grading is as follows:

- rear to front block grading is preferred;
- where catch basins are used for block drainage all buildings and structures shall be protected from storm water if the inlet is blocked or surcharged by a major storm event;
- where block drainage is surcharged to an existing overland flow route the route shall be protected from erosion;
- no more than 5% of the block surface area shall drain directly into the abutting road allowance;
- minimum slope for swales shall be 2%;
- maximum ponding depth for swales shall be 0.35 m.

11.25 Ground Cover

The requirement for block ground cover is as follows:

- all blocks shall be sodded using 100 mm topsoil and No. 1 nursery sod for 5 m width around their perimeter when base course asphalt is placed, the remainder of the block shall be at minimum seeded using 100 mm topsoil, with seed of the quality and quantity approved by the Town, and mulch;
- The Developer shall be responsible to maintain the block until a building permit is granted, or in the case of blocks to be deeded to the Town, until the subdivision is assumed;
- all swales, drainage easements and slopes greater than 10% shall be sodded using 100 mm topsoil and No. 1 nursery sod.

Appendix A: Typical Deficiencies

Typical Deficiencies	
Items	**Deficiencies**
Sidewalks	• Cracks • Heaving • Marks in the surface of the concrete e.g.: names, footprints, scratches etc. as per OPS 351.07.09 • 2001Amending O. Reg 239/02
Boulevards	• Dead grass • Stones/ rocks in the boulevards • Settlement
Streetscape	• Non-caliper size compliance for boulevard trees • Unapproved substitutions • Damaged trunks/stems • Poor form and/or branching heights • Crooked or leaning street trees
Curb and Gutter	• Cracks • Heaving • Gouges deeper than 1 inch in the face of the curb
Driveway ramps	• Difference in the top of the driveway ramp and the sidewalk or curb greater then 2cm
Fencing	• Non-compliant gauge of material for chain link fencing, posts, and rails • Use of soft aluminum ties • improper setting of post footing elevation below grade • incomplete fastening practices with joist hangers • gaps below fencing which exceed tolerances as per standards
Base asphalt & surface asphalt	• Cracks in the asphalt such as progressive edge cracking, alligator, and bleeding • Grass/ weeds growing at the edge of the asphalt between the curb and asphalt • Dips in the asphalt • Rutting
Sanitary pipes & Storm pipes	• As per NASSCO's pipeline Assessment & Certification Program • Cracks • Fractures • Sags • Broken pipes • Deformed pipes • Joint offsets or separation
Watermains	• Cracks • Fractures • Leaks • Valve boxes broken • Wrong number of turns on valve boxes, hydrants etc.

Appendix B: Wastewater Materials List

Material	Certification	Specifications	Manufacturer
Sewer Main			
PVC	CSA B182.2	• DR35 • Colour: Green • Rubber gasket in integral bell and spigot joints • "Kor-n-seal" gaskets on all pipes entering maintenance holes	• Ipex • NAPCO • Rehau • Diamond Plastics
Connection Tees			
PVC	CSA B182.2	• DR28 • Injection molded or factory fabricated gasketed tees	• Ipex • NAPCO • Rehau • Diamond Plastics
Service Laterals			
PVC	CSA B182.2	• DR28 • Colour: Green • Rubber gasket in integral bell and spigot joints	• Ipex • NAPCO • Rehau • Diamond Plastics
Test Fittings			
PVC	CSA B182.2	• Straight test fitting at property line	• Ipex
Cast Iron	CSA B70	• Straight test fitting at property line	• Crowle
Service Saddles			
PVC	CSA B182.2	• For use as a new service connection to an existing municipal sewer only • SDR35 Gasket Hub x Gasket Saddle Tee c/w Stainless Steel Clamps and Short Skirt	• NAPCO • Galaxy Plastics Ltd. • IPEX
Maintenance Holes			
Concrete	CSA A257.4	• Rubber gasket type joints certified to CSA A257.3 • “Kor-n-seal” gaskets on all pipes entering maintenance holes • Frost Straps to be included.	• OCPA Plat Pre-qualification Member
Frames and Grates			
Cast Iron	OPSS 1850	• Grate as per OPSD 401.010 (closed cover) with date and “SANITARY” cast into the cover	• Bibby-Ste-Croix Star Pipe Canada
Ductile Iron	OPSS 1850	• Adjustable/Autostable Frame • C-50M-ONT • C-50M-ONT (Watertight Option) • SELFLEVEL – MC401010243	• Bibby-Ste-Croix • EJ Canada

Adjustment Units			
Concrete	CSA A257.4	• Pre-cast concrete grade adjustment units with Moduloc tape between layers	• OCPA Plant Prequalification Member
Ductile Iron	CSA A257.4	• Riser rings (only to be used when approved by the Town)	• Sigma
Forcemain			
PVC	CSA B137.3 AWWA C900 or, AWWA C905	• SDR26 • Colour; White	• IPEX • NAPCO
Watertight Frame and Grate			
Watertight Frame & Grate	ASTM D2240, ASTM D412, ASTM D573, ASTM D395, ASTM D746		• Hamilton-Kent

Appendix C: Water Materials List

APPROVED WATER MATERIALS LIST



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Pipe			
Watermain up to and including 300mm diameter	Ductile Iron with Polyethylene encasement	U.S. Pipe Canada Pipe Company ULC Atlantic States Clow Water Systems Pacific States Griffin Pipe Products	Tyton Joint Pipe
	Polyvinyl Chloride (PVC)	IPEX Royal Pipe JM Eagle Diamond Plastics Corp. National Pipe Inc.	Blue Brute CIOD PVC P.P BLUE BRUTE CSA C900CSA Dura-Blue
	Molecularly Oriented Polyvinyl Chloride (PVCO)	IPEX	Bionax
	High Density Polyethylene		
Watermain 400mm diameter	Polyvinyl Chloride (PVC), DR 18	IPEX Royal PIPE	Centurion CIOD PVC P.P.
Services			
Service Material	Copper 25mm to 50mm	Type "K", 3rd Party (W.H.) soft copper	
	Cross-liked Polyethylene – 25mm to 50mm	Rehau AquaPure	Municipex, Blue 904
Service Fittings			
Corporation (Main) Stop	No Lead Alloy – 25mm to 50mm	Cambridge Brass Ford Meter Box Company	301NL-A3H3 301NL-A4H4 301NL-A6H6 301NL-A&H7 FB1000-3Q-NL FB1000-4Q-NL FB1000-6Q-NL FB1000-7Q-NL
Curb Stop	No Lead Alloy – 25mm to 50mm	Mueller Canada Cambridge Brass Ford Meter Box Company	B-25222N or B-25218N 202NL-H3H3 202NL-H4H4 202NL-H6H6 201NL-H7H7 B44-333-NL B44-444-NL B44-666-NL B44-777-NL
Service Boxes	Standard Coated Cast Iron (Extension required if greater depth are encountered)	Mueller Canada Clow Canada Bibby Ste Croix	A726/A728 A800 D1, D2 VSB1, VSB2
Service Box Rods	Stainless Steel (S.S. or Brass cotter pins)	Mueller Canada Clow Canada	88036 T4-36
Service Saddles (Saddles are mandatory on all types of piping material)	D.I. Watermain (Only double strap, AWWA threaded saddle to be used)	Smith-Blair Ford Meter Box Company Robar Cascade	313 F202 2408 CSC2

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	P.V.C. Watermain (25mm to 50mm) Type 304, S.S. including hardware, double bolt, broad band, AWWA Threads.	Smith-Blair Ford Meter Box Company Cambridge Brass (Teck Saddle) Robar Cascade	373, 3742 FS303DB, FS313 Series 403DB ,2616DB ,2626DB
Tapping Sleeve	D.I. (Order with Stainless Steel Bolts, MJ Outlet and epoxy coated)	Ford Meter Box Company Robar Smith-Blair Mueller Canada	FTSS, FTSC 6906 622 H-621
	PVC (Stainless Steel, MJ Outlet, Full Surround Gridded Gasket)	Smith-Blair Robar Ford Meter Box Company	663 6606 Fast Tap
Couplings	No Lead Variety – 25mm to 50mm	Mueller Canada Ford Meter Box Company Cambridge Brass Mcdonald Brass	H-15403 C44-77 118-H3H3 , 118-H7H7 4758T
Angle Meter Stops	25mm	Mueller Canada Ford Meter Box Company Cambridge Brass Mcdonald Brass	B24258-B20298 BA43-444W-NL 210NL-H4F4 4602B-22
Fittings			
Fittings	Ductile Iron + PVC (Mechanical Joint, Ductile Body and Glands cement lined seal coat to AWWA C104/A21.4)	Tyler Union/Biddy Sigma Star	As per manufacturer
Couplings	Ductile Iron/PVC (Mechanical Joint, Ductile Body and Glands cement lined seal coat to AWWA C104/A21.4)	Sigma	As per manufacturer
	Dresser Type for DI, CI, PVC, and (HDPE – Use Hymax only)	Robar Smith-Blair TPS EBBA FORD	As per manufacturer As per manufacturer HYMAX 3800 MEGA Coupling Ultra-Flex
	Cast Iron/Oversized Main (DI bodies couplings)	Robar Smith/Blair Dresser TPS	1406 441 As per manufacturer HYMAX 2000
Restraining Glands	DI Watermain (Colour Code "black" for Ductile Iron use. Tie rods stainless steel)	Smith-Blair Star Ford Sigma Clow	Cam-Lock 111 Stargrip Uni-Flange Series 1400 One-Lok TUFGrip-TGD
	PVC Watermain	Star Ford Meter Box Compnay Sigma Clow Smith-Blair	Stargrip Uni-Flange Series 1400 One-Lok, PV-Lock TUFGrip-TGP Cam-Lock 120
	PVCO	Sigma Clow Star	PV-LokPWPF PV-LokPWPF One-Lok SLC TUFGrip StargripPVCo

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Valves			
Gate Valve	Resilient Seated Gate Valve M.J. x M.J. (52 mm square nut, M.J. x M.J. (100mm – 600mm) open counter clockwise, Epoxy Coating	Mueller Canada Clow AVK Bibby	A-2361-23 F-1600 (A2369/2340) Series 25/00 As per manufacturer
Tapping Valve	Resilient Seated Valves Tapping Flange x M.J. 52 mm square nut. (100mm – 600mm) open counter clockwise, Epoxy Coating	Mueller Canada Clow Bibby AVK	H-687 F-6114 As per manufacturer 25/30081
Air Release	I.P. Thread x I.P. Thread (ball type)	ARI	D-090-P D-040-C
Pressure Reducing	Flange x Flange	Cla-Val Singer	90-01 106 / 206-PR
Valve Box	Regular Style 5 ¼ - 130mm Slide Valve Boxes Guide Plate Extension 305mm Extension 457mm	Bibby-Ste-Croix Sigma	
Hydrants			
Fire Hydrant	1.98 meters (6', 6") barrel length chrome yellow: post type dry barrel compression shutoff with ball valve closing with flow: M.J. elbow, 2 CSA 2.5" standard hose connections, 4" Storz threadless pumper connection as per NFPA 1963 and AWWA C502, breakaway flange, self-draining.	Clow Canada Valve	D67M Premier Century
Sampling Stations			
Sampling Stations	Extreme cold climate option (for bury at 5' and more)	Kupferle	Eclipse #88
Chambers			
Water Chamber	Watertight Precast Concrete (OPSD 1108.010) 2 piece monolithic construction		
Cathodic Protection			
Anodes	Zinc	Interprovincial Corrosion Control Bren Technologies	
Sacrificial Caps	Cathodic Protection (Nuts and Caps)	Maple Agencies-Exothermal Industries Duratron Bren Technologies Integrity Pipeline Ltd	Protecto Caps 175P190 DSN0750 SAP CAP Integrity Cap
Protective Coatings	Protective coatings for metal fittings	Interprovincial Corrosion Control Denso North America Petro Coating System Ltd	PetroWrap Denso Wrap
Miscellaneous			

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Insulation	Extruded Polystyrene	Styrofoam Highload 40	DOW Chemical Canada
Tracer Wire	#12 AWG/TWU Stranded Copper	Electrical Suppliers Canada Wires Phillips Maple Pirrelli Copperhead Pro-Line	
Tracer Wire Connectors	Water proof connector	Copperhead King Innovation	Snake-Bit DryConn – DBSR or Direct Bury Log

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Appendix D: Site Plan and Subdivision Design Checklist

Site Plan and Subdivision Design Checklist

The following are the requirements of a site plan or subdivision drawing application. Along with these requirements, the applicant must follow the Town development standards as well as Ontario Provincial Standards.

General:

- Drawings are stamped by an engineer
- Lot lines including dimensions
- Location of proposed buildings and accessory buildings dimensioned to other buildings and lot lines
- Location and design of facilities and enclosures for the storage of garbage
- Off-street vehicular loading, parking areas, bike lanes, bike stalls, access driveways, including driveways for emergency vehicles, and the type of surfacing
- The location, amount, and dimension of parking spaces, including barrier free spaces
- Walkways and means of pedestrian access which offer safe access to and from site, facilities designed for persons with disabilities and type of surfacing
- Walls, fences, hedges, trees, shrubs or other groundcover or facilities for the landscaping of the lands or the protection of adjoining lands
- The type and location of lighting
- Existing municipal infrastructure and connections (ex. Municipal water and sewer mains, stormwater catchment and fire hydrants)

Grading Plan:

- Benchmark for the property
- North arrow
- Existing elevations and contours (arrows showing surface flows)
- Finished floor and top of foundation elevation on all buildings
- Finish grade around the building (Must be 0.15m below finish floor elevation)
- Minimum 2% grade away from building
- Swales, ditches, or water courses with outlet details (Minimum 0.15m deep, Minimum 2% or Max 3:1 slope)
- Arrows showing slope and direction of water (Min 1% in paved areas, Min 0.5% on roadways 2% in grassed areas)
- Roof leader details and where they outlet
- Driveway slopes and spot elevation (maximum 7% slope)
- Driveway culvert location existing or proposed with the addition of a headwall on either end
- Location of catch basins, manholes and soak away pits
- Location and type of all utility services
- Location of existing municipal services
- Location and Elevation of all Entrances including # of Risers
- Existing and proposed sidewalks including depressions in sidewalks to grade level for barrier-free access as well as tactile plates on all crossings
- Location and Elevation of Retaining Walls (Top of Wall and @ Grade)

- Location of curbs, drop curbs and elevation at top and bottom
- Curbing/curve radii at all street access and driveway intersections
- Grading along property lines matches existing grades of adjacent properties

Servicing plan:

- General servicing drawing
- Plan and profile drawings for each roadway including all services, manholes and catch basins
- Indicate the top and invert elevation of each structure on Plan and Profile
- Parallel pipes maintain a 2.5m separation
- Minimum separation of 0.5m between pipes crossing each other
- Manholes are to not be in the wheel driving location in roadways
- Minimum slope on pipe is 0.5%

Watermain:

- Location and size of (existing and proposed) Municipal Watermain Systems abutting the site
- Watermain piping (existing and proposed) – location, size connections and class of pipe
- Provide cathodic protection on all fittings including anodes and sacrificial caps
- Location and size of water meter and valve chambers
- Minimum depth of watermain is 1.7m
- Building must be within 45m of a municipal hydrant, or a new hydrant must be installed on the property
- In subdivisions, there shall be valves at every intersection and at each connection of a structure (90, tee or hydrant)
- For site plans and residential houses, a curb stop valve shall be installed at property line

Sanitary sewer:

- Location and size of Municipal Sanitary Sewer Systems abutting the site (existing and proposed)
- Sanitary laterals and connections (existing and proposed) – location, size, grade (slope) and class of pipe
- Cleanouts are mandatory on property lines in developments and must be complete with a steel cap and furnco
- A sanitary manhole must be placed at property line for site plans

Storm Sewer:

- Location and size of Municipal Storm Drainage Systems abutting the site (existing and proposed)
- Storm sewer laterals and connections (existing and proposed) – location, size, grade (slope) and class of pipe
- Catch basins (existing and proposed) – locations, labelled, proposed and existing elevations for grates, inverts, class of pipes and grades
- OGS unit details, location, inverts, and orifice plate details
- Show invert and finish grade elevations of all maintenance holes
- Maximum spacing for catch basins including cul-de-sac gutters shall be as follows:

- Road grade 0.5% to 0.75% - 70 m
- Road grade 0.76% to 3.0% - 95 m
- Road grade 3.1% to 4.5% - 90 m
- Road grade greater than 4.6% - 75 m

Storm Water Management Report:

- A SWM report must be included for all site plan and subdivision applications
- Water balance must be met through storm water applications
- Maximum capacity for a storm sewer system is 80%
- If a hickenbottom is in a storm pond, hardening details must be shown for around the riser and should be complete with an orifice plate
- Emergency spillway for ponds
- Storm drainage and hydraulic grade line calculations
- A minimum of 0.3m of freeboard in the storm water pond
- 80% TSS must be removed
- Pre and post development drainage and calculations
- If infiltration applications are present, an infiltration rate calculation is required
- Rainfall depth/intensity along with source of values
- Time of concentration: pre- and post-developed conditions
- Hydrology report included
- Outlet protection at outfall of facility
- Top of bank and bottom elevations of facility
- Sediment forebay
- Maintenance access to sediment fore bay, riser structure and one side of the basin ponding area
- Safety fence or other safety features
- Side slope of basin and embankments is a maximum 4:1
- Elevations of permanent pool

Erosion Control Plan:

- Location and details of silt and sediment control measures
- Minimum 30m mud mat driveway

Utilities:

- Combined trench detail with utilities shown in cross section details in the general notes (utilities condensed as possible)
- Lighting details and specs plan
- Photometric plan
- Traffic signal plan if required

Landscaping Plan:

- Tree locations and species
- Sight triangles
- Cross sections of tree and shrub plantings

Appendix E: Example of Street Name Sign


JOHNSON ST.
idland

Appendix F Water Commissioning Procedure



Town of Midland Water & Wastewater Services

Watermain Commissioning Procedure

2020/11/18

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Definitions

In this specification the following definitions shall apply:

“AWWA” shall mean the American Water Works Association

“Appurtenance” means an appurtenance, within the meaning of O. Reg. 170/03, which is in contact with drinking water.

"Town" shall mean the Town of Midland

"Contractor" shall mean the firm of Contractors, the company or individual acting as the Contractor and having entered a contract with the Developer/Owner to install the watermains, services and/or appurtenances.

"Commissioned" shall mean deemed as “in service” by Town of Midland staff for the distribution of potable/safe drinking water

“Connection” means all watermain and appurtenances installed between an existing watermain and a new or future watermain/appurtenance

"Flushing" shall mean the sudden rush of water for the purpose of cleaning, scouring or the turnover of watermain

“Microbiological test” shall mean water samples taken and analyzed for E. coli, and Total Coliform

“Ministry” shall mean Ministry of the Environment, Conservation and Parks

“MECP” shall mean Ministry of the Environment, Conservation and Parks

“Non-commissioned” shall mean a watermain that is not in service and unavailable for distribution of potable/safe drinking water

“Town of Midland Water Operator” shall mean a MECP Certified Operator employed by Town of Midland

“Potable” shall means safely drinkable

“Drinking Water” shall mean drinking water within the meaning of the Safe Drinking Water Act.

“Sample Set” shall mean a round of samples collected at the same moment in time consisting of 1 (one) or multiple sample point locations

“Sample Round” shall mean consists of two (2) sets of samples

“Swab” shall mean polyurethane foam plug used to clean watermain

“Certified Operator” means certified operator within the meaning of O.Reg. 170/03 employed by the Town

“Acceptable Disinfectant Concentration” means:

a) Disinfectant concentration of at least 0.2 mg/L free chlorine residual,
b) Disinfectant concentration that is representative of the residual in the area, determined by testing upstream and downstream from the testing location or by using documented benchmarks for the area, as long as free chlorine concentrations are at least 0.05 mg/L.

Legislation, Acts and Regulations

This document does not supersede, nor replace any legislation governing the disinfection of potable water systems. This document provides the Town's preferences under normal circumstances. All watermain, appurtenances, and components shall comply with all applicable current industry standards and specifications for quality management and quality control, such as:

- The Canadian Standards Association (CSA)
- American Water Works Association (AWWA)
- American Standard and Testing Materials (ASTM)
- Underwriters Laboratory (UL)
- Approved Manufacturer's Product List for Water Systems
- NSF International (NSF)
- Drinking Water Quality Management System (DWQMS)

The Town of Midland has adopted Ontario Ministry of the Environment, Conservation and Parks (MECP) Watermain Disinfection Procedure (August 1, 2020) for commissioning all new and temporary watermains. Additional to this procedure, the Town of Midland also has an obligation to adhere to the most current version of AWWA Standard C651 as required under the Drinking Water Works Permit (DWWP) issued to the Town of Midland by the MECP.

Service pipes of 100mm diameter shall be considered as watermain for the purposes of this procedure. All new mains will be physically separated from the existing water distribution system during the commissioning process. Requests for isolation (by a valve) of the new watermain from the existing water distribution system will be reviewed on a case by case basis and shall be permitted only if physical separation is not a viable option. The decision of the Town of Midland will be considered final.

A Town of Midland Water Operator is required to witness all steps of the commissioning procedure.

Notice for Town Water and Wastewater Service Inspection

All requests for commissioning activities must be scheduled through the Water and Wastewater Services office by providing a minimum of three (3) business day's notification to the Town. Scheduling an Operator can be done through the Town of Midland Water and Wastewater Services 705-526-4268 Ex. 4207 or email: wwtc@midland.ca

Mandatory Submissions

Drawings must identify street names and highlight the limits by lot/block numbers of the watermain commissioning area. The general plan must contain ONLY site servicing information (No grading/landscaping, etc.).

The contractor shall submit a disinfection proposal plan to Water and Wastewater Services. This plan shall be reviewed and approved prior to any work commencing and will include:

a) watermain dimensions, watermain material, disinfection method, contact time, concentration, receiving location and source of water supply.

b) chemical volumes, watermain volume, flushing discharge rate and chemical application rates.

Site Meetings

A site meeting with Water and Wastewater Services is mandatory prior to the start of the commissioning process. Arrangements for the site meeting shall be coordinated by the Contractor and shall be made through the Town of Midland's Water and Wastewater Services office.

All commissioning and disinfection of new watermains and temporary watermains are to be completed in accordance with Ministry's Watermain Disinfection Procedure and the most recent version of the American Water Works Association (AWWA) Standard C651. A Town of Midland Water Operator must be present to witness all steps within this procedure.

Installation and Certification of Backflow Prevention Device

- A RP (Reduced Pressure Principle) backflow preventer (in accordance with CSA approved B64.10 and B64.10.1 standard) shall be used and installed as per manufacturer's specifications on all by-passes between potable and non-potable water sources
- All water used for commissioning purposes taken from the Town of Midland's Water Distribution System shall be through a metered by-pass
- All backflow preventers shall be tested and certified in place by an Ontario Water Works Associations (OWWA) Certified Cross Connection Control Specialist
- Copy of the Test Report must be provided to the Town of Midland Water and Wastewater Services
- Backflow preventers shall not be removed until completion of the commissioning project
- If the Backflow Preventer is moved from its originally tested location, it must be retested as detailed above
- Installation of backflow preventer must be done with proper fittings of appropriate pipe material
- Any connecting risers/pipes must be of potable water grade
- Where possible the use of threaded fittings is preferred
- The connection must be constructed with every attempt to prevent material failure, and to protect the workers in the event of a material failure
- Backflow preventer must be installed above grade level as per manufacturer's specifications
- It is recommended that the backflow preventer/meter/fitting assembly be chained and locked to hydrant, to prevent theft or accidental removal
- Season requirements should be adequately address (example, winter freezing, summer heat)
- Please refer to Appendix B for typical RP backflow preventer installations.

Water Meter

- It is the responsibility of the Contractor to install a water meter to account for water, volumes, and flow rates
- Meter must be easily read and remain connected until completion of the commissioning project

Loading and Swabbing

- Each section of watermain shall be cleaned using a minimum of two swabs
- All swabs shall be clean and new
- Swabs shall be minimum one size larger than the pipe diameter (example, 6" pipe requires 8" swabs)
- All swabs shall be marked in the order by which they are launched preferably using a NSF approved non-toxic marker
- All swabs must be collected after launching
- Swabs shall be supplied by the Contractor
- Preliminary flushing of the watermain shall immediately follow the swabbing operation

Flushing for Turbidity and Turbidity Testing

- Watermain shall be flushed to ensure that air and other material have been removed. This includes all hydrant leads, services and sample point locations
- The watermain must be flushed until a turbidity of less than 1.0 NTU is achieved. If turbidity of 1.0 NTU cannot be achieved within 8 hours of flushing, the watermain shall be re-swabbed
- Turbidity results shall be taken at each sample location
- The flushing velocity shall not be less than 0.91 m/s (3.0 ft/sec) in order to achieve 2.5 to 3.0 log removal of particles as per AWWA C651. If such flow rate is not possible, then flushing at the maximum expected velocity for the line for 2-3 times the volume of the line may be acceptable

Hydrostatic Pressure Testing

- Restrained fittings are required on riser caps
- Pressure gauges must be in good working condition
- Source water connection shall be physically separated from the new watermain during hydrostatic pressure test
- Watermains must hold at 1034 kPa (150 psi) for 2 consecutive hours, with no leaks and no additional water added once pressurized
- Failure will result, in rescheduling of appointment which will include retesting of turbidity and hydrostatic pressure test
- HDPE Pipe Material - The test procedure shall consist of initial expansion and test phases. During the initial expansion phase, the test section shall be pressurized to the test pressure and sufficient make-up water added each hour for 3 hours to return to test pressure. The test phase begins after the initial expansion phase.

Chlorination

- Continuous feed chlorination will be used and introduced through the by-pass (backflow protected) using the water from the distribution system
- Sodium Hypochlorite used for disinfection shall meet the requirements of both the American Water Works Association ("AWWA") and the American National Standards Institute ("ANSI") safety criteria standards NSF/ANSI/CAN 60
- Chlorine concentration range should be within the range of 50-100 ppm
- Superchlorinated water must sit in the watermain for 24 hours
- After 24 hours of contact time, chlorine high count must be taken at all sample points prior to flushing the watermain. The maximum allowable decrease in concentration, can not be more

than 40% of the initial concentration to a maximum of 50 mg/L. If any one chlorine concentration sample fails, then re-chlorination of watermain is required.

- Note: appropriate high count instrument shall be used to verify high chlorine concentrations
- Test strips may only be used as a checking tool, concentrations are to be determined using the high count kit
- The contractor shall not operate any main valves, hydrant blow-offs, by-passes or any other appurtenances within the new system during the period of chlorination

Dechlorination

- Appropriate instruments shall be used to verify chlorine concentration
- Watermain shall be flushed so that all superchlorinated water is removed from all points of the watermain being commissioned. This includes all hydrant leads, services and sample point locations
- All superchlorinated water shall be neutralized before discharging into the natural environment
- It is the responsibility of the Contractor to provide a means of safely removing the chlorinated water in these areas.
- Contractor shall supply all materials, labour, and excavation necessary for flushing the new system

Sampling

- After final flushing and before the new watermain is connected to the existing water distribution system, two (2) consecutive sets of microbiological samples* shall be taken at least 16 hours apart (as per AWWA C651, section 5.1)
- At least one (1) set of samples shall be collected from every 370 meters (1200 feet) of the new watermain, plus one set from the end of each branch
- When microbiological samples are taken from new watermains that have not been placed into service, the Operating Authority shall ensure that additional samples are taken at the same time from the same location and are tested immediately for, free chlorine residual
- The watermain shall not be flushed or disturbed during the minimum 16 hour period between sets
- Sample points shall be constructed with appropriate fittings
- If services are used as sample points they must be capped or taped to prevent contamination from entering the service pipe
- Coordination to obtain samples will be arranged by the Contractor
- All water distribution samples will be conducted by a Town of Midland Water Operator
- It is the Contractors responsibility to coordinate with Accredited Laboratory to have samples tested
- Microbiological samples taken in accordance with ANSI/AWWA Standard C651 shall include as a minimum Escherichia coli and Total Coliform

*Watermain guidelines for microbiological test results are as follows:
Total Coliform =0, E.Coli =0

Tie-Ins/Connecting New Watermains to the Existing System

- Town of Midland Water Operator shall be present to witness all tie-ins.
- Any connections equal to or less than one pipe length 6m, the Town of Midland Water Operator must be present to witness the installation and disinfection of the connection to ensure that the sanitary construction practices and disinfection requirements of Sections 4.10 and 4.10.1 of ANSI/AWWA C651 are met. If the Town of Midland Water Operator confirms the above practices, the connection can be placed into service with no microbiological sample required.
- Any connections greater than one pipe length 6m must be set up aboveground, disinfected, and bacteriological samples taken. Exception will be considered with written approval from the Town of Midland Water and Wastewater Services, if the connection:
    a) Crosses a transportation corridor, the extended closure of which could result in significant community impacts (e.g., traffic congestion, loss of emergency vehicle access, safety concerns), or
    b) Cannot be constructed to with one pipe length of the existing watermain due to the potential for destabilizing an existing thrust block.

  The following procedure shall be carried out:

  1. The new watermain and appurtenances forming the connection shall be sprayed or hand swabbed with a minimum 1% sodium hypochlorite solution, aboveground or in the excavation, immediately prior to installation.
  2. A Town of Midland Water Operator is required to witness the installation of the connection to ensure that sanitary construction practices are followed, and proper disinfection is performed.
  3. The connection shall remain isolated from the existing drinking water system, except while being flushed or sampled, until satisfactory results are received from two microbiological samples are taken by a Town of Midland Water Operator.
  4. If hydrostatic testing is required, it must take place only after satisfactory results from the microbiological samples referred to above are received. Drinking water shall be used for hydrostatic testing.

Tapping of Watermains

- Live tapping (i.e., “wet” tapping) of a watermain that is part of the Drinking Water System must be performed by a Town of Midland Water Operator; however, a person or contractor who is not a certified operator or Town of Midland Water Operator may perform wet taps provided they are being directly supervised by a Town of Midland Water Operator.
- Where existing watermains are tapped, the pipe surface at the location of the tap shall be cleaned and disinfected using a minimum 1% sodium hypochlorite solution. All drill/cutting/tapping bits and all surfaces of mainstops, service saddles, tapping sleeves and valves which come into contact with drinking water shall be cleaned and disinfected using a minimum 1% sodium hypochlorite solution immediately prior to installation. If any of the

disinfected surfaces come into contact with the soil and/or water in the excavation prior to use, the cleaning and disinfection procedure shall be repeated.

Service Pipes

- Service pipes of 100mm diameter and greater shall be considered as watermain for the purposes of this procedure and shall be disinfected and tested in accordance with the requirements of ANSI/AWWA C651 as modified by this procedure.
- Service pipes of a diameter less than 100mm, sanitary conditions shall be maintained during installation/repair, and flushing shall be conducted before they are placed into service.

Placing New Watermain into Service

- Valves opened to place a new watermain into service shall, in all cases, be operated by a Town of Midland Water Operator. As part of placing a watermain into service, flushing through the connection shall be performed until a Town of Midland Water Operator verifies that an Acceptable Disinfectant Concentration is present in the new watermain.

APPENDIX A – SAMPLE RP (Reduced Pressure Principle) Setup

Examples of Reduced Pressure Principle Backflow Preventer Installations



Figure A-1: Temporary connection from a hydrant with *Backflow Prevention* using a CSA-certified reduced pressure principle backflow preventer.



Figure A-2: Temporary connection from a watermain with *Backflow Prevention* using a CSA-certified reduced pressure principle backflow preventer.

APPENDIX A – Continued

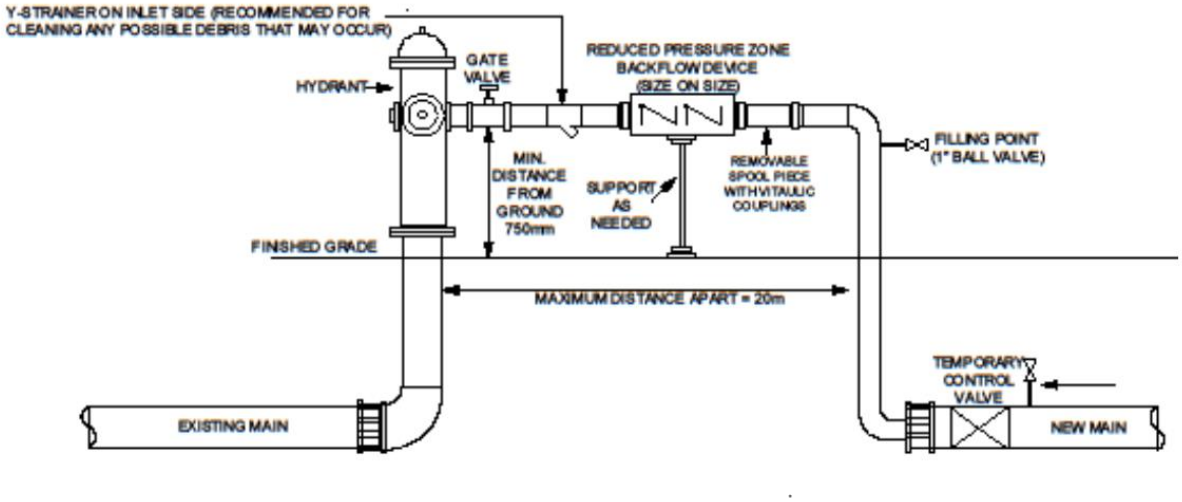


Figure A-3: Schematic of temporary connection from hydrant with *Backflow Prevention* using a CSA-certified reduced pressure principle backflow preventer.

APPENDIX B – SAMPLE Project Checklist

Location:_____

Contractor:_____**Phone**_____

1. **Witness 2 swabs exit new water main** ☐

Operator:_____ Date and time:_____

2. **High-velocity flush (3ft/s velocity is required, if not possible, flush at minimum 3 times the pipe volume at maximum velocity)** ☐

Operator:_____ Date and time:_____

3. **Pressure test @ 150 psi for 2 hrs (zero allowable leakage)** ☐

Operator:_____ Date and time:_____

4. **Superchlorinate water main between 50 – 100 mg/L. Confirm with High Range Kit.** ☐

Operator:_____ Date and time:_____

5. **Super chlorinated water to sit in new water main for minimum 24 hours.** ☐

Operator:_____ Date and time:_____

6. **Chlorine Concentration can drop no more than 40% of the initial concentration. This is confirmed with a verified High Range Kit.** ☐
   (Example 40% of 50mg/L = 20 mg/L. Therefore 30 mg/L must remain after 24 hours)

Operator:_____ Date and time:_____

7. **Flush super chlorinated water down to acceptable disinfectant concentration is achieved.** ☐

Operator:_____ Date and time:_____

8. **Sample (first set of Microbiological samples)** ☐

Operator:_____ Date and time:_____

9. **Let water sit for minimum 16 hours.** ☐

Operator:_____ Date and time:_____

10. **Sample (second set of Microbiological samples)** ☐

Operator:_____ Date and time:_____

11. Post tie-in/connection flushing through the connection ☐

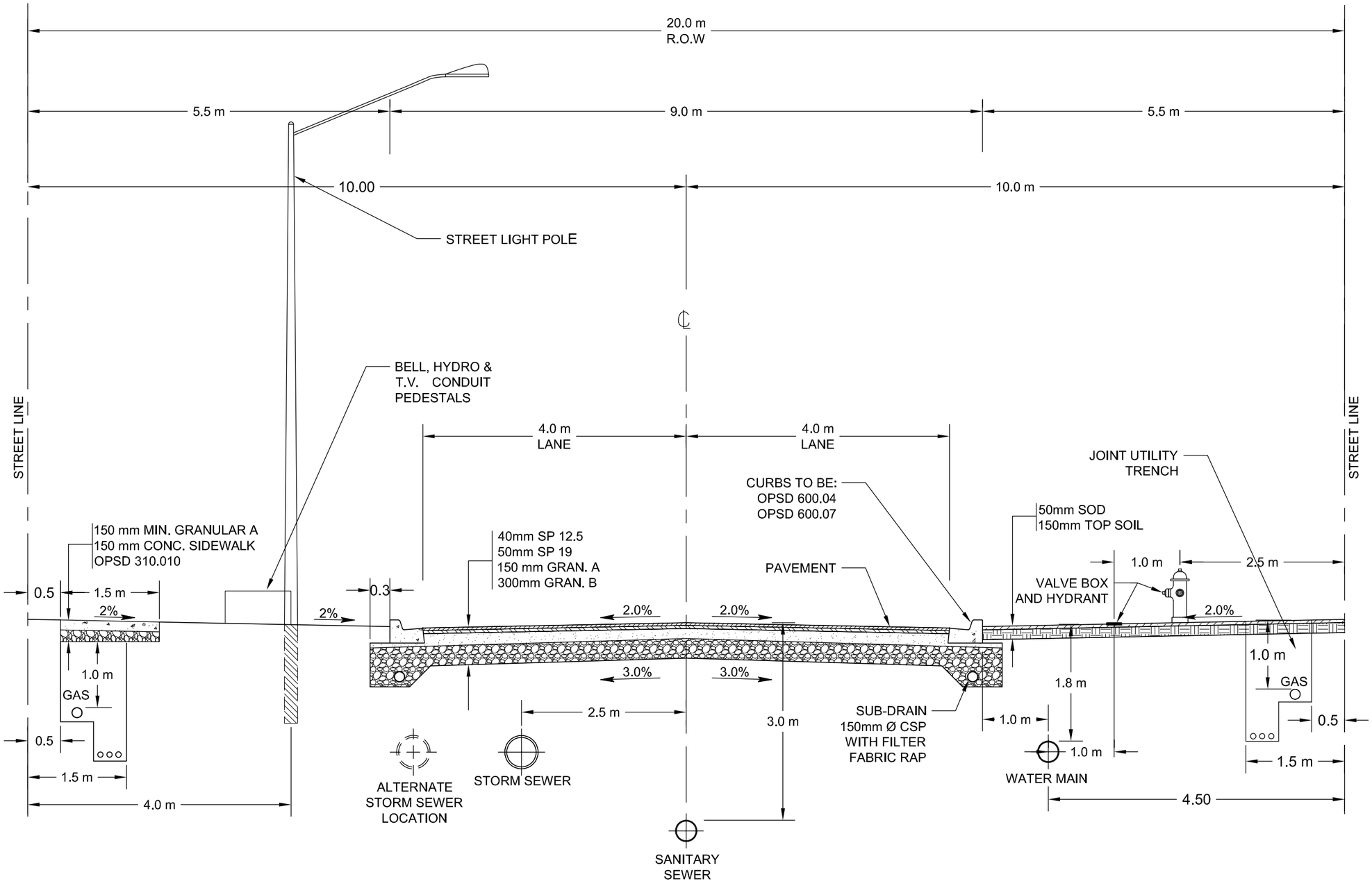
Operator:_____ Date and time:_____

12. Flush of all services along commissioned watermain ☐

Operator:_____ Date and time:_____

Amount of chlorine needed to superchlorinate:___L (C1xV1=C2xV2) ***Comments:***

Appendix G: Detailed Design Drawings



No.	Issue / Revision	Date	Auth.

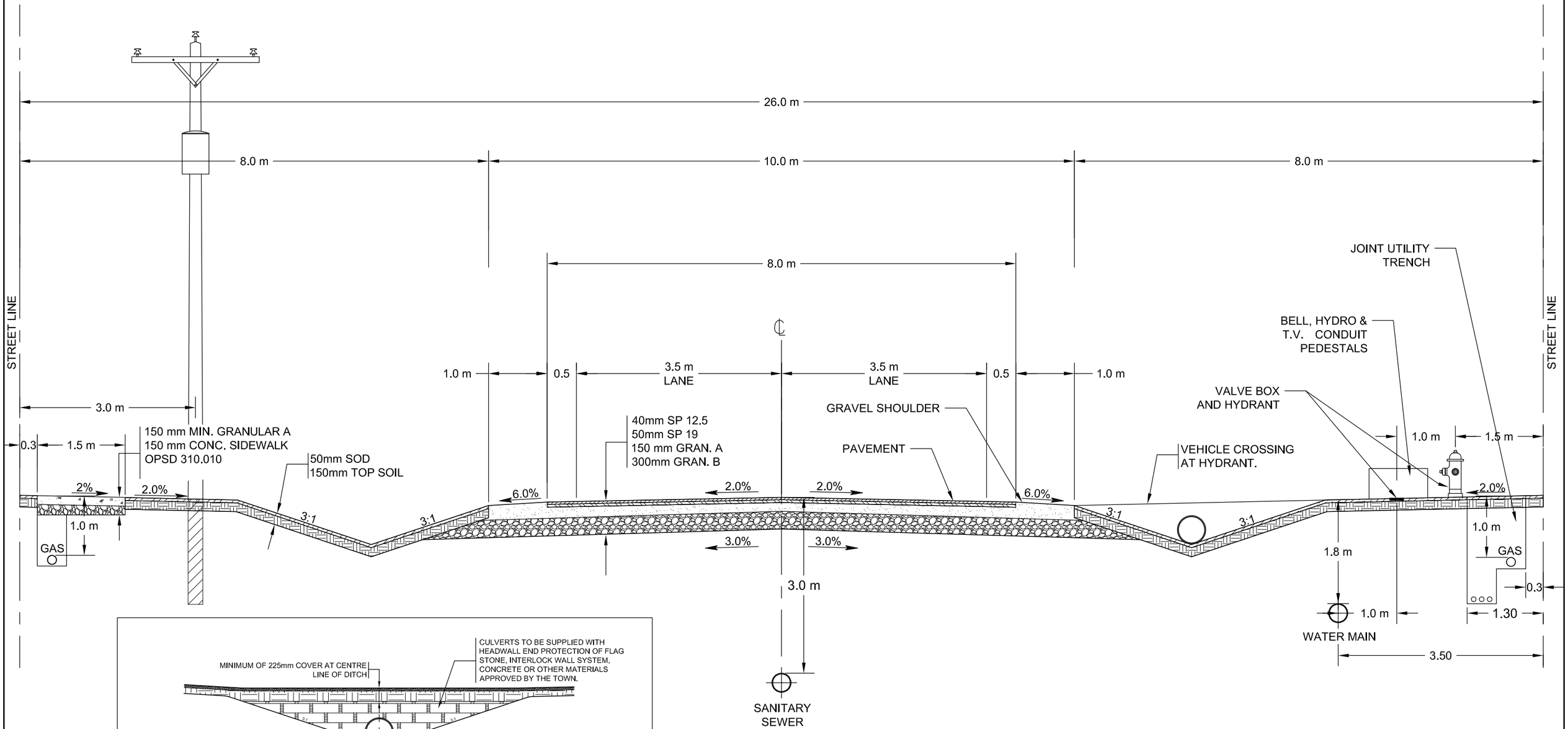
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Residential Roads
R.O.W - 20 m
Local Urban

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R1



NOTES:

1) NO DRIVEWAY OR CULVERT SHALL BE LOCATED CLOSER THAN 1.5m TO ANY WATER VALVE, CURB STOP, LOT LINE, TRANSFORMER OR STREET LIGHT.
2) RETAINING WALLS GREATER THAN 1 METER IN HEIGHT, ABOVE INVERT OF PIPE SHALL HAVE TIE-BACKS

CULVERT END WALL DETAIL

No.	Issue / Revision	Date	Auth.

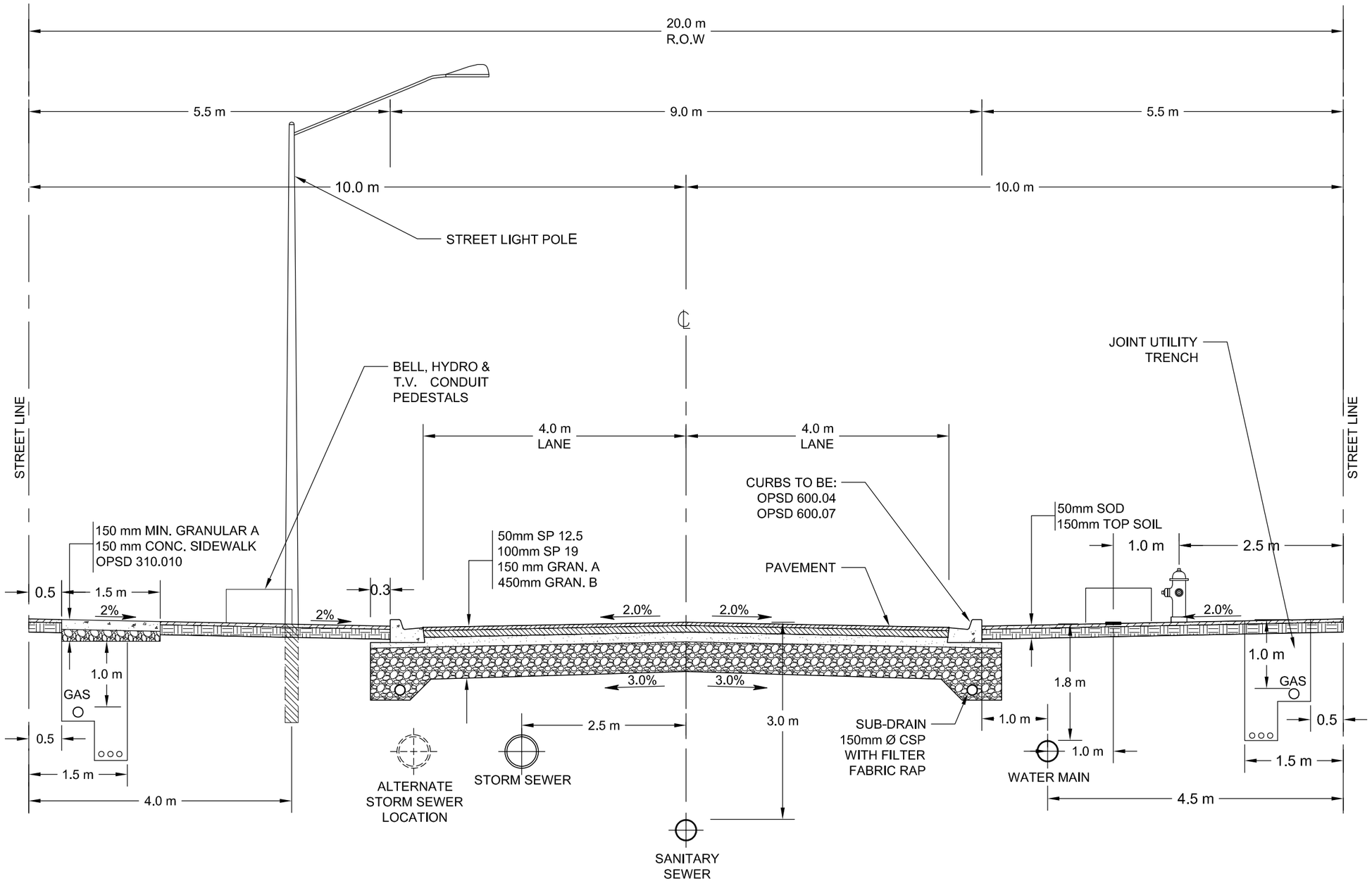
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Residential Roads
R.O.W - 26 m
Local Rural

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R2



No.	Issue / Revision	Date	Auth.

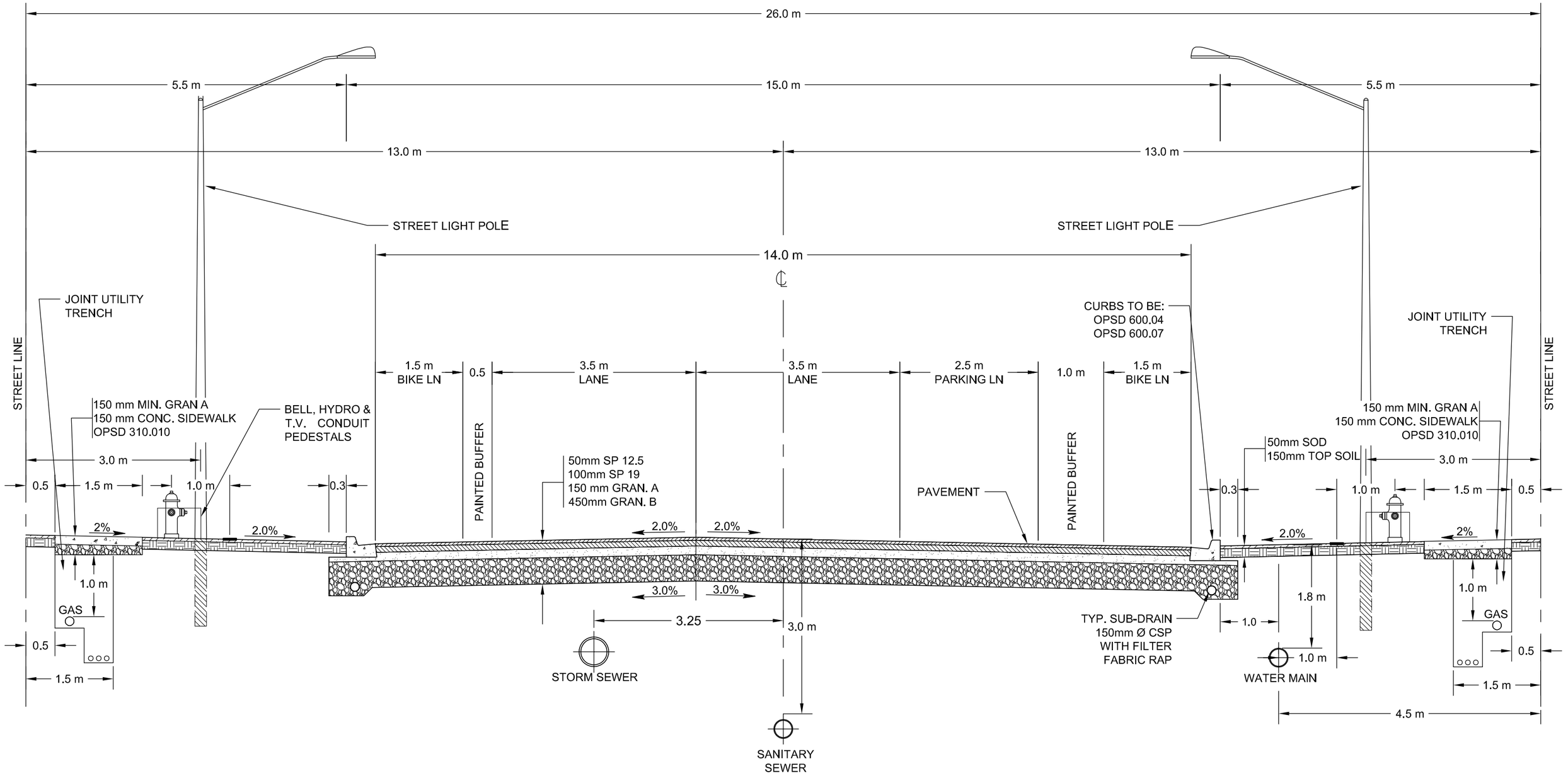
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Industrial Road
R.O.W - 20 m
Local Urban

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R3



No.	Issue / Revision	Date	Auth.

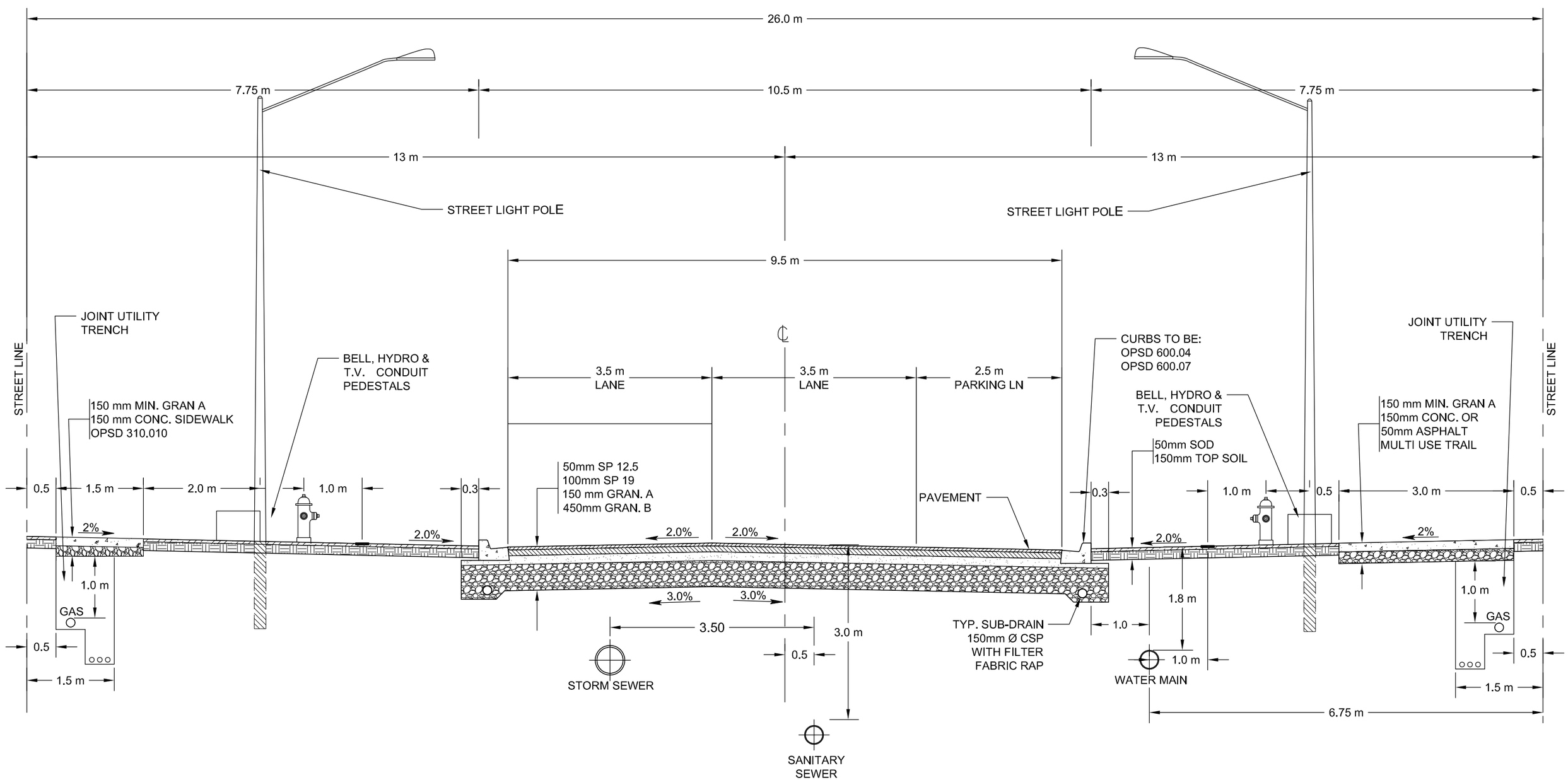
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Residential Road
R.O.W - 26 m
Major Collector with Bike Lanes and Street Parking 1 side

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R4A



No.	Issue / Revision	Date	Auth.

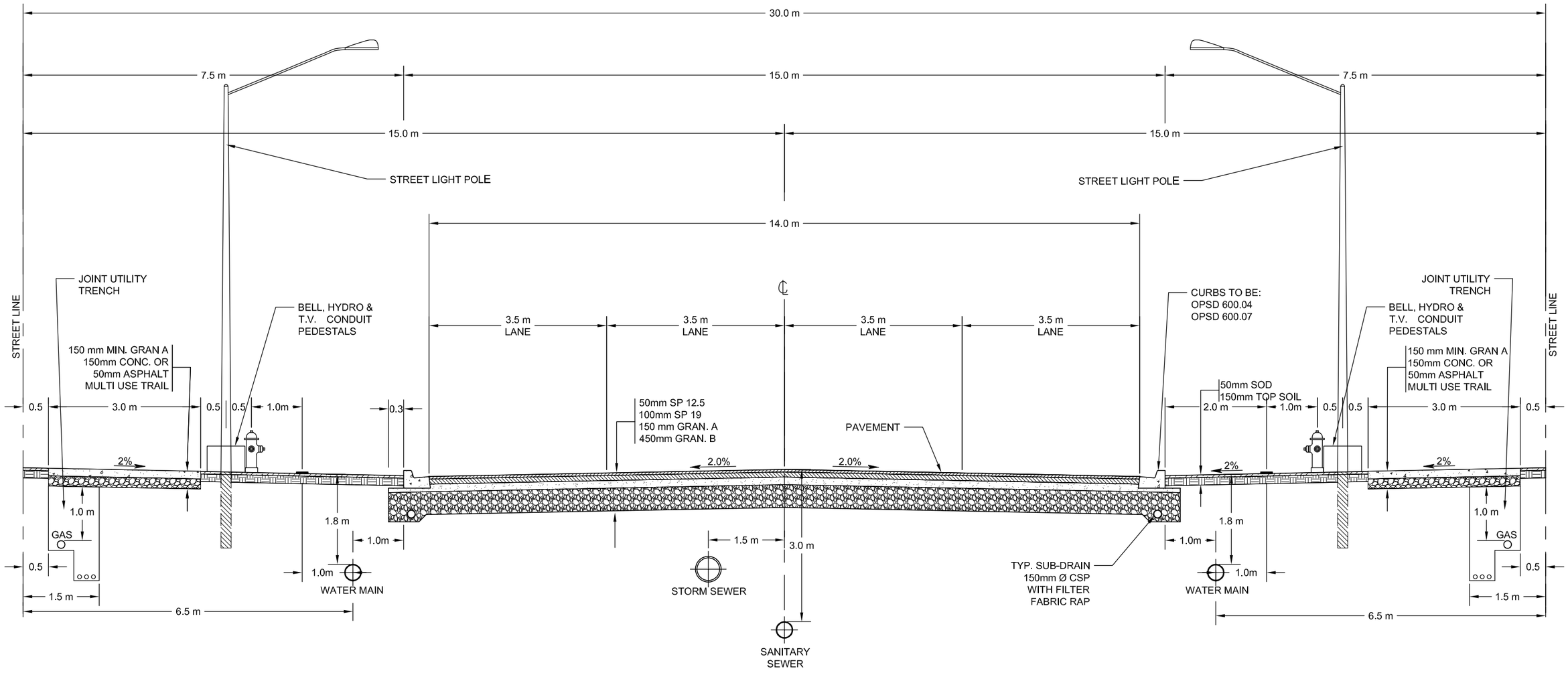
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Residential Road
R.O.W - 26 m
Major Collector with Muti Use
Trail and Street Parking 1 side

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R4B



No.	Issue / Revision	Date	Auth.

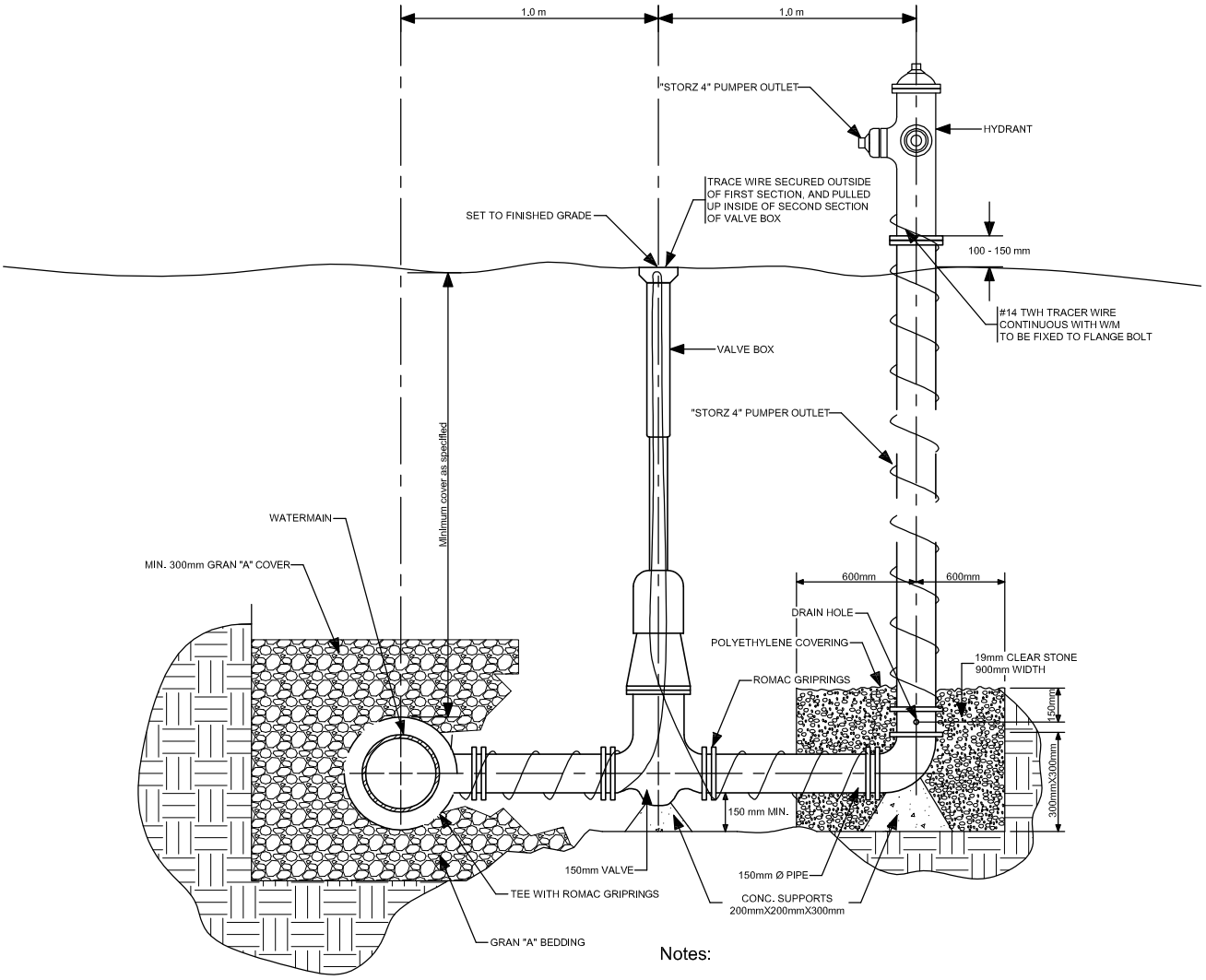
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing :
Arterial Road
R.O.W - 30 m
Arterial with Muti Use Trail

Plot Date: Feb 24, 2023 | Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R5



Notes:

1. All concrete supports to be poured against undistrbed ground.
2. Polyethylene bond breaker to be used between concrete and fittings.
3. Flange of standpipe extensions not to be in frost zone.
4. all hydrants to be self draining unless otherwise specified.

No.	Issue / Revision	Date	Auth.

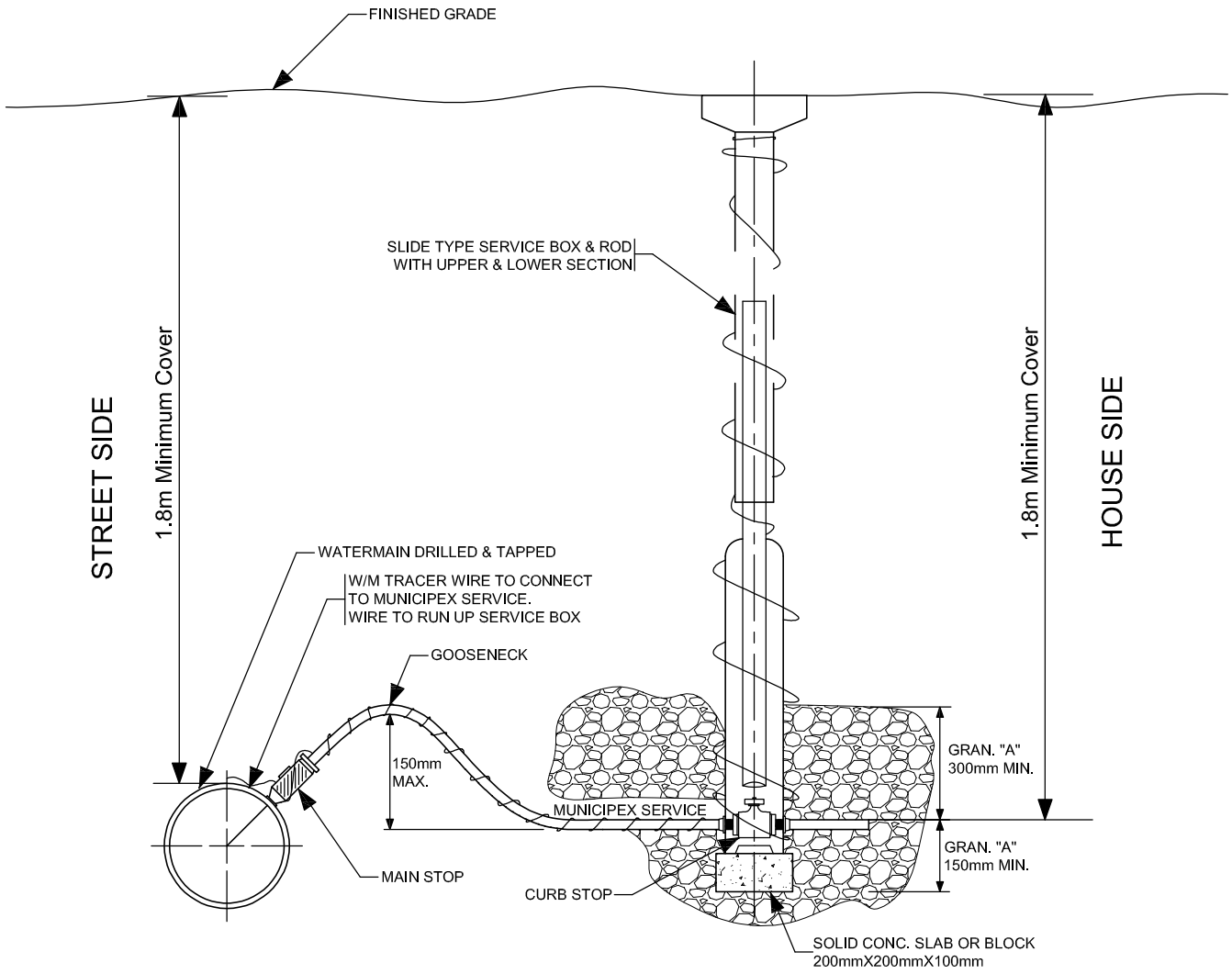
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawing:
Typ. Hydrant and Valve Installation Details

Plot Date: Feb 2, 2023
Scale: NTS

Project :
Engineering Standards

Drawing No. :
STD-R6



Notes:

1. SERVICE TO PVC MAINS TO BE MADE USING SERVICE SADDLES.
2. TRACER WIRE ON PVC MAIN MUST ALSO CONNECT TO MUNICIPEX SERVICE.
3. NO COUPLINGS WILL BE PERMITTED BETWEEN THE MAIN STOP AND THE SHUT-OFF UNLESS THE SERVICE LENGTH EXCEEDS 20.0m.
4. ALL SERVICES TO BE INSTALLED 90 ° TO THE LONGITUDINAL AXIS OF THE WATERMAIN.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.
6. MUNICIPEX IS TO BE USED BETWEEN THE CURB STOP AND THE HOUSE.
7. GROUND CLAMPS MUST BE ALL BRONZE OR BRASS, APPROVED MANUF. "THOMAS & BETTS", BU SERIES - ALL BRONZE, OR EQUIVALENT.

No.	Issue / Revision	Date	Auth.

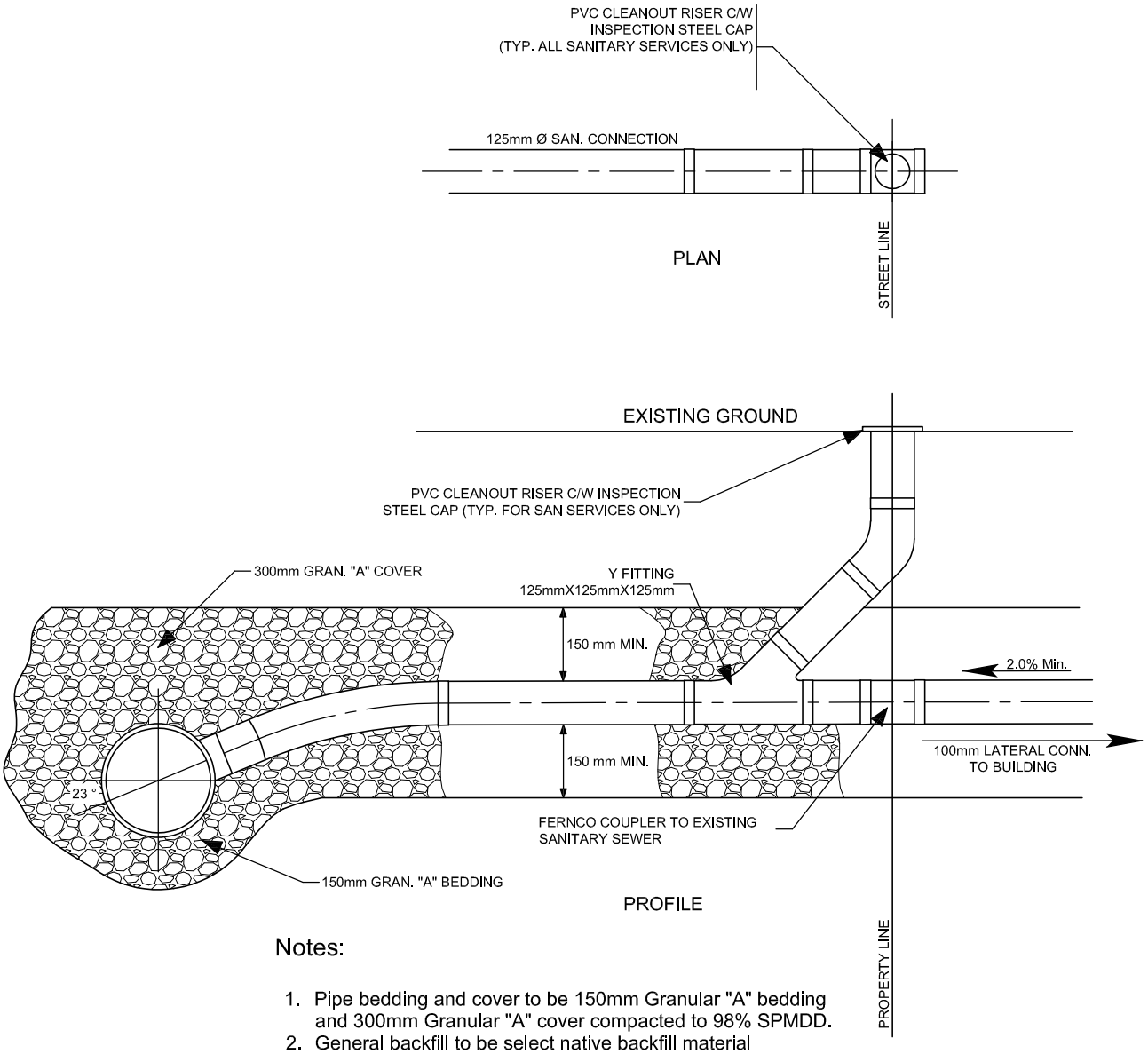
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawings:
Residential Water Service Connection

Plot Date: Feb 2, 2023
Scale: NTS

Project:
Engineering Standards

Drawing No. :
STD-R7



Notes:

1. Pipe bedding and cover to be 150mm Granular "A" bedding and 300mm Granular "A" cover compacted to 98% SPMDD.
2. General backfill to be select native backfill material compacted to 95% SPMDD.
3. Pipe to be below frost line.
4. Type to be used:
   Polyvinyl Chloride sewer pipe 8182.18181.2
   Acrylonitile - Butadiene - Styrene 8181.1
5. Colour of sanitary service pipe is to be green.
6. Sanitary lateral to be single service at the center of each lot.
7. Water service connections are single services offset 2.5m from sanitary lateral.
8. Steel cap on the cleanout is t be used in Driveways.

No.	Issue / Revision	Date	Auth.
1.	Removed Crowle Fit.	12/16/25	J.D.

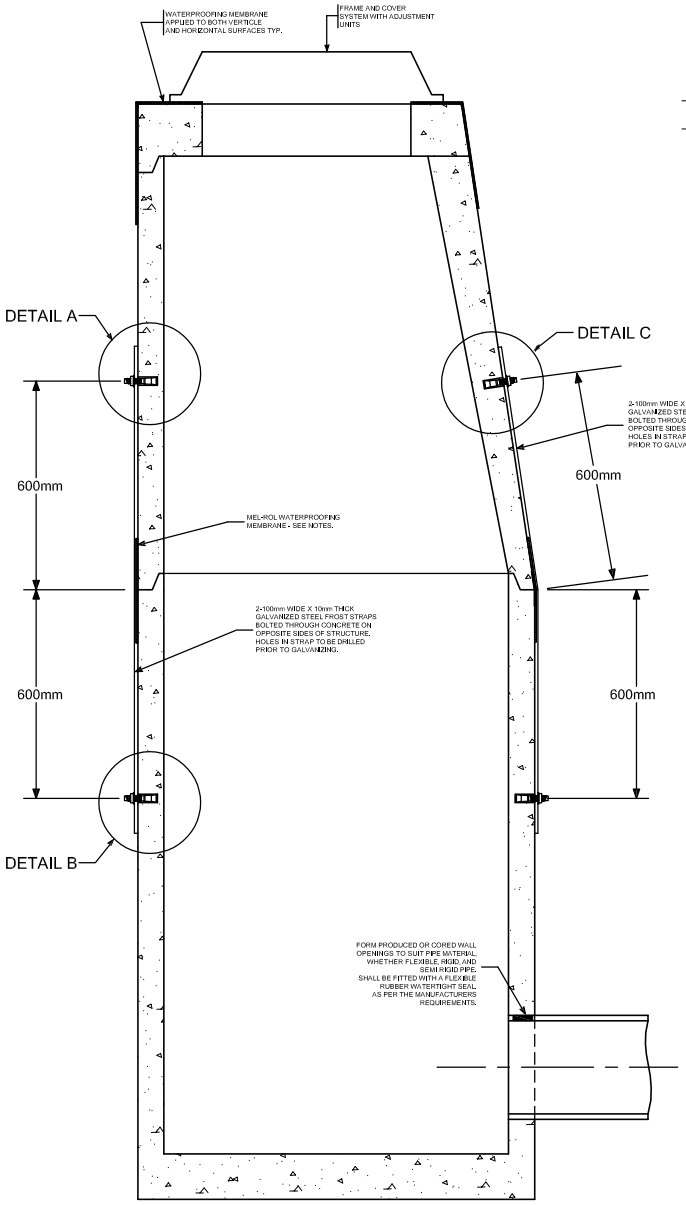
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

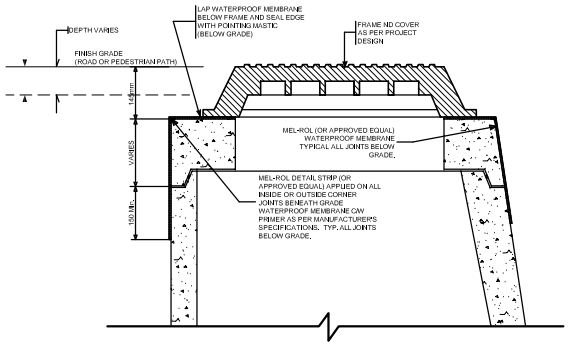
Drawing :
Typical Sanitary Sewer Connection and Clean Out

Plot Date: Feb 2, 2023 | Scale: NTS

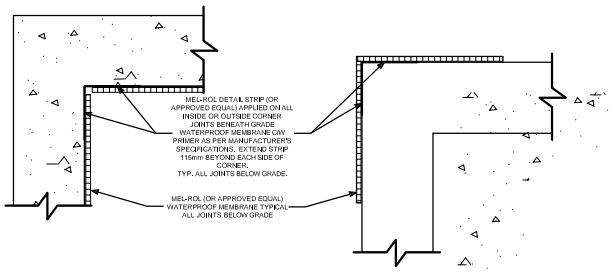
Project :
Engineering Standards

Drawing No. :
STD-R8



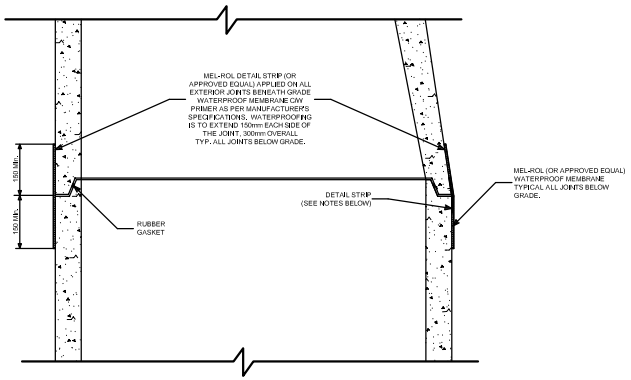


TYPICAL WATERPROOFING DETAILS FOR BELOW GRADE MAINTENANCE HOLE TOP SECTIONS

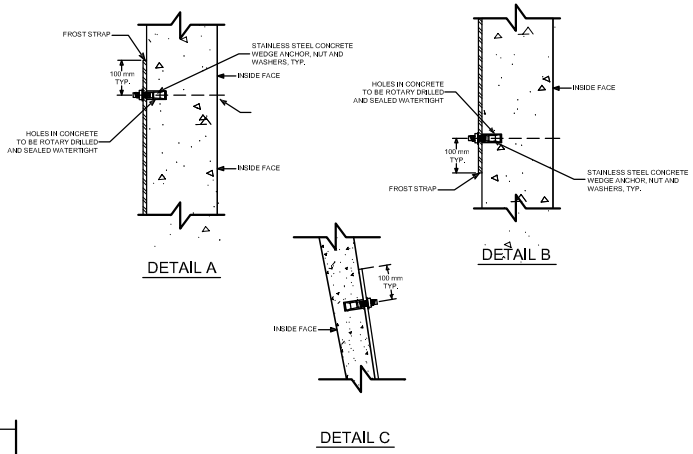


TYPICAL INSIDE CORNER WATERPROOFING DETAILS

TYPICAL OUTSIDE CORNER WATERPROOFING DETAILS



TYPICAL WATERPROOFING DETAILS FOR BELOW GRADE MAINTENANCE HOLE JOINTS



Notes:

1. Depth of frost strap shall be as specified.
2. Frost straps shall be placed so they do not interfere with sewer pipe opening and the steps.
3. Frost straps are to be place on structures being installed below grade.
4. Galvanizing shall be according to CAN/CSA G164.
5. All dimensions are in millimeters unless otherwise shown.
6. Mel-Rol product is to be used and applied or approved equal and is be installed as per the manufacturers instructions.
7. All joints below grade are to have waterproofing membrane applied 150mm to each side of joint and 300mm overall.
8. Inside and Outside corners are to have a Mel-Rol Detail strip applied prior to waterproofing membrane to be installed.

No.	Issue / Revision	Date	Auth.

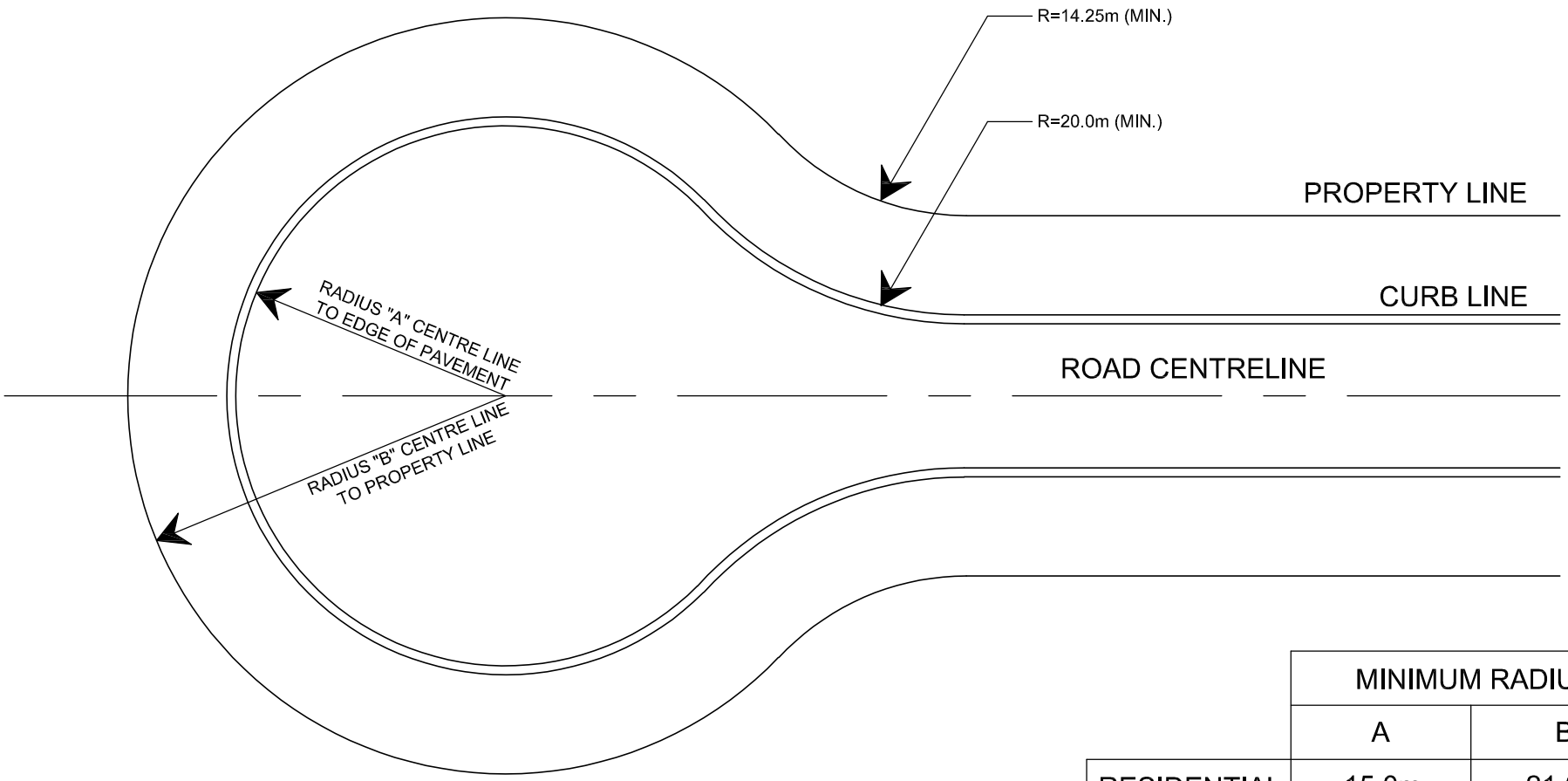
Town of Midland
575 Dominion Ave.
Midland, Ontario L4R 1R2
www.midland.ca
705.526.4275

Drawings:
Maintenance Hole, Frost Straps and Waterproofing Details

Plot Date: Feb 2, 2023
Scale: NTS

Project :
Engineering Standards

Drawing No. :
STD-R9



	MINIMUM RADIUS	
	A	B
RESIDENTIAL	15.0m	21.0m
INDUSTRIAL	15.0m	21.0m

No.	Issue / Revision	Date	Auth.

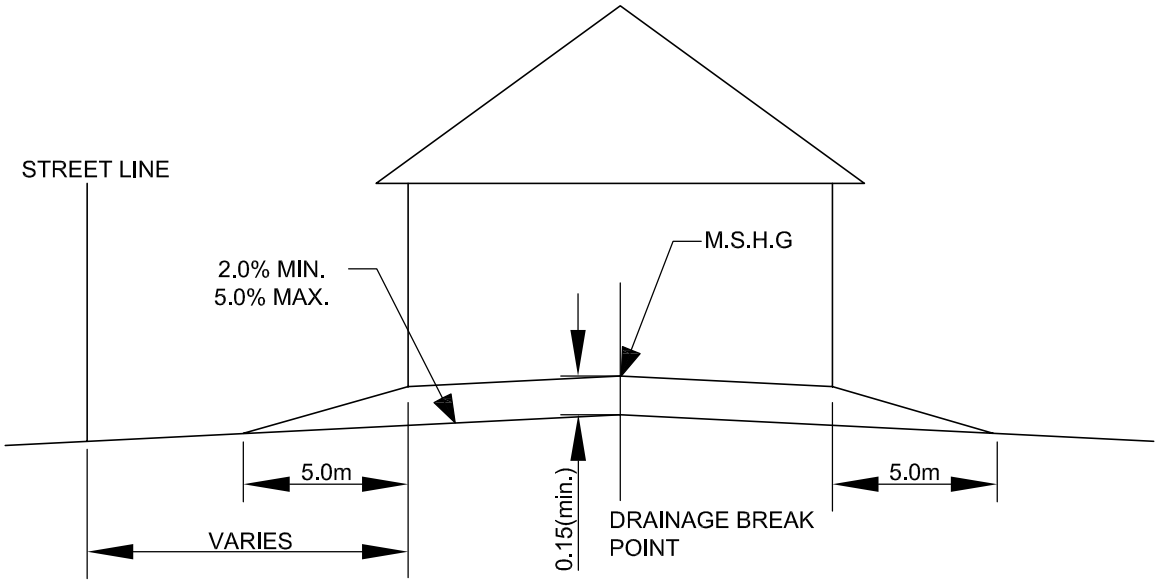
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Project Name :
Permanent Cul-De-Sac

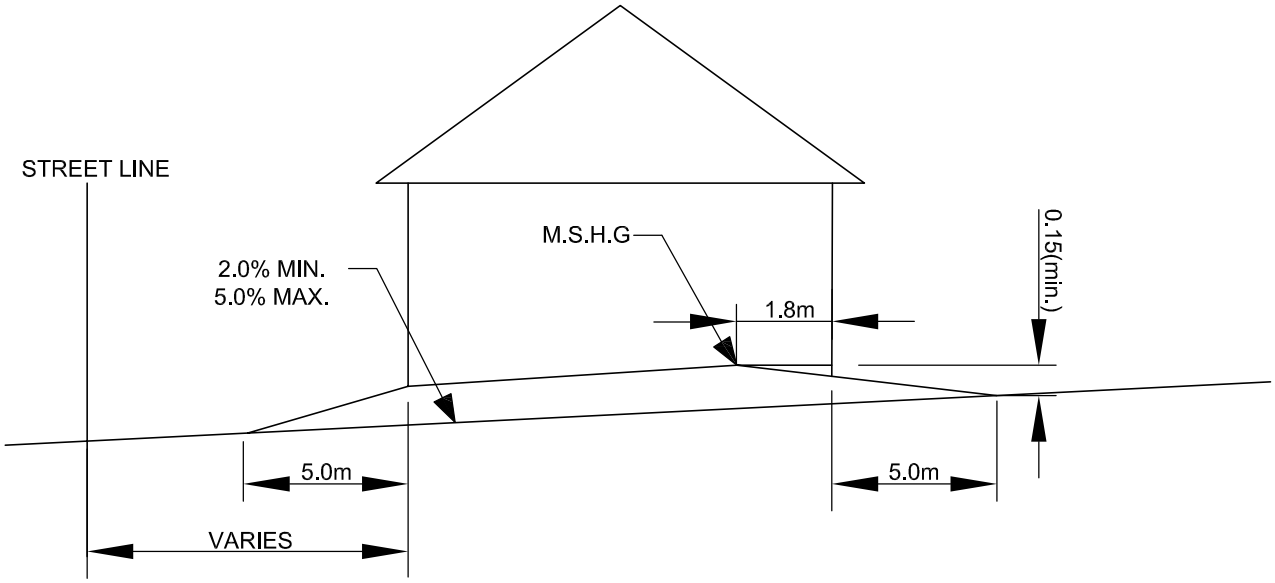
Plot Date: Feb 2, 2023
Scale: NTS

Drawing :
Engineering Standards

Drawing No. :
STD-R10



TYPICAL SECTION - SPLIT LOT DRAINAGE



TYPICAL SECTION - BACK TO FRONT LOT DRAINAGE

Notes:

1. THE MINIMUM SPECIFIED HOUSE GRADES (M.S.H.G.) ARE TO BE DETERMINED BY:

A) SPLIT DRAINING LOT:
THE HIGHEST SPLIT POINT ELEVATION FOR EACH INDIVIDUAL LOT PLUS 0.15m APRON.

B) FRONT DRAINING LOT:
FROM THE HIGHEST FRONT LOT CORNER OF EACH INDIVIDUAL LOT DETERMINE THE ELEVATION AT 5.0m PAST THE REAR OF THE HOUSE AND ADD 0.15m APRON (0.75 Min.)

No.	Issue / Revision	Date	Auth.

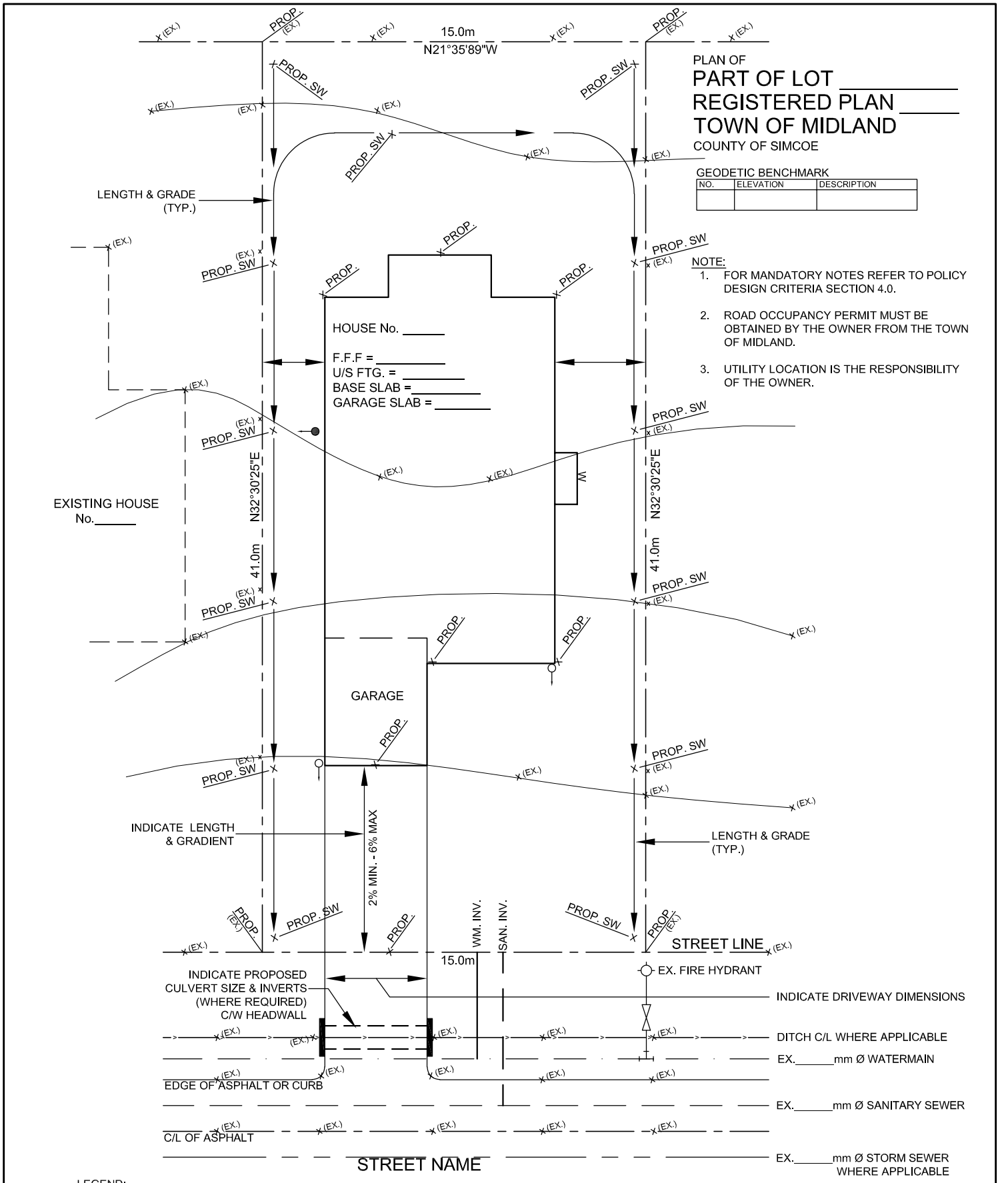
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Drawing :
Typical Grading Sections

Plot Date: Feb 2, 2023
Scale: NTS

Project :
Engineering Standards

Drawing No. :
STD-R11



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Drawing :
MINIMUM LOT GRADING & DRAINAGE PLAN REQUIREMENTS

Plot Date: Feb 2, 2023 | Scale: NTS

Project :
Engineering Standards

Drawing No. :
STD-R12

MINIMUM RESTRAINING LENGTH ON EACH SIDE OF FITTING PVC DR 18 WATERMAIN

BENDS

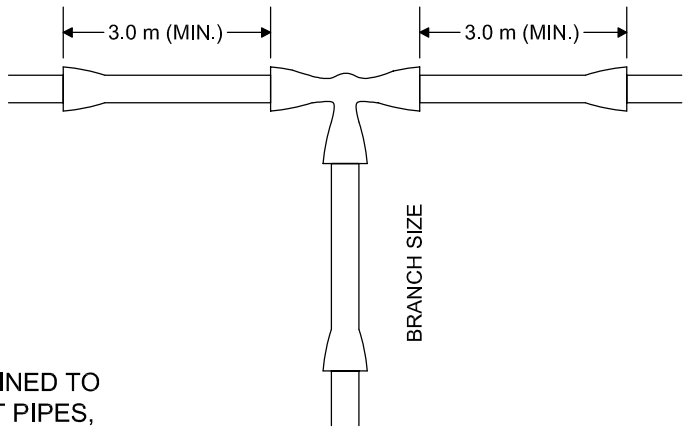
HORIZONTAL BENDS, DEAD ENDS AND INLINE VALVES	150mm Ø PIPE SIZE (m)	200mm Ø PIPE SIZE (m)	250mm Ø PIPE SIZE (m)	300mm Ø PIPE SIZE (m)
11.25 °	0.6	0.6	0.6	0.9
22.5 °	0.9	1.2	1.5	1.5
45 °	1.80	2.4	2.7	3.4
90 °	4.27	5.5	6.7	7.9
VALVES OR END CAPS	9.1	12.2	14.4	17.0

REDUCERS

ONE PIPE SIZE SMALLER	150mm Ø PIPE SIZE (m)	200mm Ø PIPE SIZE (m)	250mm Ø PIPE SIZE (m)	300mm Ø PIPE SIZE (m)
	6.7 (100X150mm	6.4 (150X200mm)	5.7 (200X250mm)	5.7 (250X300mm)

TEE (RUN SIZE)

BRANCH SIZE	150mm Ø PIPE SIZE (m)	200mm Ø PIPE SIZE (m)	250mm Ø PIPE SIZE (m)	300mm Ø PIPE SIZE (m)
150mm	0.3	0.3	0.3	0.3
200mm	3.6	0.9	0.3	0.3
250mm	7.6	5.8	3.4	1.2
300mm	11.5	9.8	7.9	6.1



NOTE:

1. ALL FITTINGS MUST BE RESTRAINED TO ADJUST PIPE AND SUBSEQUENT PIPES, SUBJECT TO THE ABOVE TABLES.

2. THESE ARE MINIMUM GUIDELINES ONLY. CONTRACTOR TO PROVIDE RESTRAINT PLAN BASED ON SITE CONDITIONS AND MANUFACTURER'S SPECIFICATIONS.

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Drawing :
WATER MAIN
THRUST RESTRAINT
AT FITTINGS

Plot Date: Feb 2, 2023 | Scale: NTS

Project :
Engineering Standards

Drawing No. :
STD-R13

GENERAL NOTES:

1) ALL MEASUREMENTS ARE IN METERS, PIPE SIZES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.

2) LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. CONFIRM EXISTING UTILITY LOCATIONS AND ELEVATIONS PRIOR TO CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORKS.

3) ONTARIO PROVINCIAL STANDARDS SPECIFICATIONS (OPSS), ONTARIO PROVINCIAL STANDARD (OPSD), AND THE TOWN OF MIDLAND'S STANDARDS SHALL APPLY TO ALL WORKS TAKING PLACE IN THE TOWN BOUNDARIES.

4) ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY TOWN OF MIDLAND ENGINEERING DEVELOPMENT DESIGN STANDARDS, SECONDLY THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).

5) ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE TOWN OF MIDLAND PRIOR TO THE COMMENCEMENT OF WORK WITHIN ANY TOWN RIGHT-OF-WAY.

6) CONTRACTOR SHALL COORDINATE HIS WORK SUCH THAT HE DOES NOT INTERFERE WITH WORK BEING UNDERTAKEN BY A UTILITY COMPANY.

7) UTILITIES CROSSING, WHERE REQUIRED, SHALL BE SUPPORTED AS PER OPSD 1007.01 AND ANY EXISTING STRUCTURES SHALL BE PROPERLY SUPPORTED.

8) DRIVEWAY ACCESS TO OCCUPIED RESIDENCES SHALL BE RESTORED AT THE END OF EACH WORKING DAY.

9) NATIVE MATERIAL SUITABLE FOR BACKFILL SHALL BE COMPACTED TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY, UNLESS OTHERWISE NOTED. ENGINEERED FILL (ON LOTS). SHALL BE COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY.

10) GRANULAR MATERIAL AND BEDDING MATERIAL SHALL BE PLACED IN LAYERS 150mm IN DEPTH AND COMPACTED TO 98% (ROAD GRAN "A" & GRAN "B") OR 98% (BEDDING AND COVER) STANDARD PROCTOR MAXIMUM DRY DENSITY OR AS DIRECTED BY THE SOILS CONSULTANT.

11) ALL DISTURBED AREAS WITHIN EXISTING MUNICIPAL RIGHT-OF-WAYS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITIONS OR BETTER AS DETERMINED BY THE TOWN OF MIDLAND (MIN.150mm TOPSOIL AND SOD). ALL OTHER DISTURBED AREAS TO BE TOPSOILED AND SEEDED PRIOR TO ACCEPTANCE.

12) ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE, THE GRASS HAS ESTABLISHED GROWTH AND APPROVED BY TOWN ENGINEER.

13) ALL GRADING MUST BE CONFIRMED BY THE TOWN OF MIDLAND ENGINEERING DEPARTMENT.

14) ALL SIDEWALKS SHALL BE CONSTRUCTED ON A PROPERLY CONSTRUCTED FOUNDATION OF 150mm MINIMUM DEPTH OF GRANULAR "A" AND BE PAVED WITH CONCRETE FULL WIDTH. THICKNESS TO BE 200mm ACROSS COMMERCIAL AND INDUSTRIAL ENTRANCES. ALL CONCRETE MATERIALS AND WORK SHALL CONFORM TO OPSS USING THE TOWN OF MIDLAND CONCRETE MIX DESIGN.

15) CHAIN LINK FENCE INSTALLED AS PER OPSD 972.130 WITH TOP RAIL, KNUCKLED TOP EDGE FASTNERS, KNUCKLED BOTTOM EDGE AND NO. 9 GAUGE WIRE.

16) ALL SEWER SYSTEMS INCLUDING SERVICE CONNECTIONS TO THE PROPERTY LINE, MANHOLES AND CATCHBASINS SHALL BE THOROUGHLY FLUSHED AND/OR CLEANED OF DEBRIS AND ALL PIPES SHALL BE TESTED IN ACCORDANCE WITH OPS AND SHALL BE INSPECTED BY AN APPROVED VIDEO CAMERA TESTING COMPANY AND THE TOWN ENGINEER SHALL BE PROVIDED A COPY OF APPROPRIATE DATA UPON COMPLETION OF CONSTRUCTION AND PRIOR TO FINAL APPROVAL. ANY SECTION OF SEWER OR SERVICE CONNECTION THAT FAIL TO MEET THE REQUIREMENTS SHALL BE REPAIRED OR REPLACED AT THE DIRECTION OF THE TOWN ENGINEER. ONLY CHEMICAL PRESSURE GROUTING REPAIR TECHNIQUES WILL BE CONSIDER ACCEPTABLE.

WATERMAIN NOTES:

1) A) WATERMAIN MATERIAL TO BE PVC(CLASS 235, DR-18) AND, SHALL SATISFY AWWA C900-16 SPECIFICATION.

B) MECHANICAL JOINT FITTINGS MEETING AWWA SPECIFICATIONS C-907 AND CSA B137.2 SHALL BE USED WHERE APPLICABLE ON 150mm TO 400mm Ø PVC WATERMAIN. SHOULD DUCTILE IRON MECHANICAL JOINT FITTINGS BE EMPLOYED THE CONTRACTOR SHALL INSTALL SACRIFICIAL CAPS ON EVERY NUTS ON EVERY BOLT. PVC JOINTS USING MECHANICAL JOINT FITTINGS ARE TO BE SQUARE CUT, NOT BEVELED.

C) MINIMUM RESIDENTIAL SERVICE TO BE 25mm MUNICIPEX WITH TRACERWIRE.

2) A) WATERMAIN SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010 GRANULAR "A" FOR FLEXIBLE PIPES AS OPSD 802.030 OR 802.031 CLASS "B" , GRANULAR "A" BEDDING MATERIAL OR SELECT NATIVE COVER MATERIAL FOR RIGID PIPE UNLESS OTHER APPROVED BY THE TOWN OF MIDLAND.

B) SERVICES 25mm TO 50mm IN DIAMETER SHALL BE EMBEDDED IN SAND OR "A" GRAVEL 100mm ABOVE AND BELOW TO CONFORM TO OPSS 1004.05.

3) CONTRACTOR SHALL INFORM THE TOWN OF MIDLAND A MINIMUM OF 48 HOURS IN ADVANCE IF THEIR INTENTIONS TO COMMENCE WORK.

4) CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION AND MATERIALS TO INSTALL ON INITIAL TIE-IN REQUIRED TO FACILITATE THE TESTING OF THE NEWLY INSTALLED DISTRIBUTION SYSTEM PRIOR TO CONNECTIONS TO THE EXISTING SYSTEM. WATERMAIN TO BE PRESSURE TESTED, SWABBED AND CHLORINATED BY THE CONTRACTOR, UPON SUCCESSFUL TEST RESULTS, THE FINAL TIE-IN TO BE COMPLETED BY CONTRACTOR WITH THE TOWN OF MIDLAND SUPERVISION AND ASSISTANCE WITH OPERATING THE EXISTING WATER SYSTEM FOR A WATER SYSTEM SHUT-OFF. RISER PIPES ARE TO BE INSTALLED AS PER STANDARD, AND REMOVED AS DIRECTED. SWABBING/TESTING SCHEDULE TO BE SUPPLIED BY THE CONTRACTOR TO THE TOWN OF MIDLAND TO REVIEW AND APPROVE.

5) THE CONTRACTOR IS RESPONSIBLE FOR THE SWABBING, PRESSURE TESTING, CHLORINATION AND FLUSHING BEYOND THE INITIAL PROCEDURE WILL BE AT THE CONTRACTORS EXPENSES AND AT THE DISCRETION OF THE TOWN OF MIDLAND. THE CONTRACTOR SHALL MAKE ALL CONNECTIONS TO THE EXISTING WATERMAINS INCLUDING EXCAVATION, BACKFILLING, AND MATERIALS AS REQUIRED, UNDER THE TOWN OF MIDLANDS SUPERVISION.

6) CONTRACTOR TO USE THE TOWN OF MIDLAND WATERMAIN COMMISSIONING PROCEDURE. GENERAL INSTALLATION AND TESTING WATERMAIN AND APPURTENANCES TO BE IN ACCORDANCE WITH OPSS 421.MUNI, OPSS 411 AND TOWN WATERMAIN COMMISSIONING PROCEDURE.

A) ALL WATERMAINS ARE TO BE SWABBED USING A MINIMUM OF 2 CLEAN NEW MARKED SWABS 2" LARGER THAN THE PIPE DIAMETER AND FLUSHED BY THE CONTRACTOR'S ENGINEER AND THE TOWN'S REPRESENTATIVE TO BE PRESENT DURING THE TESTING.

B) WATERMAINS SHALL NOT BE CONNECTED TO THE EXISTING WATERMAIN UNTIL BACTERIOLOGICAL TESTING HAS BEEN SUCCESSFULLY COMPLETED.

C) THE TOWN AND ENGINEER TO RECEIVE A MINIMUM 72 HOURS NOTICE PRIOR TO TESTING OF THE WATERMAINS.

7) ALL NEW SERVICE BOXES TO BE LOCATED ON PROPERTY LINE AND OUT OF THE DRIVEWAY AND SIDEWALKS.

8) NO WATERMAIN IS TO BE LAID ON FILL UNTIL THE DENSITY REPORT HAS BEEN SUBMITTED TO AND APPROVED BY THE ENGINEER. FILL TO BE PLACED TO 0.6m MINIMUM ABOVE THE TOP OF THE WATERMAIN GRADED AND COMPACTED AS PER OPSS 501. TESTS SHALL BE TAKEN ALONG THE CENTER LINE OF THE WATERMAIN AND 2.5m EITHER SIDE OF THE WATERMAIN AT A MAXIMUM INTERVAL OF 30m FOR EACH 0.6m LIFT. ALL TEES, HORIZONTAL BENDS, AND BRANCH VALVES IN FILL AREAS TO BE TIED WITH TIE RODS IN ADDITION TO CONCRETE BLOCKING ACCORDING TO NOTE 8.

9) A) THRUST BLOCKING: CONCRETE THRUST BLOCKS ARE TO BE INSTALLED AT ALL TEES, BENDS, ENDS OF MAINS AND CONNECTIONS 100mm AND LARGER AS PER OPSD 1103.010 AND 1103.020 AND THE TOWN OF MIDLAND STANDARD DRAWINGS STD-R13. AT ALL THRUST BLOCK LOCATIONS RESTRAINING DEVICES ARE REQUIRED IN ADDITION TO STANDARD CONCRETE THRUST BLOCKING.

B) ALL SEGMENTS OF THE FITTING AND THE WATERMAIN AT THE THRUST BLOCK LOCATION SHALL BE RESTRAINED AT LEAST 10M EACH SIDE OF THE THRUST BLOCK WHERE THE DEFLECTION ANGLE AT THE THRUST IS MORE THAN 11-1/4". TIE RODS AND CLAMPS SHALL BE GIVEN TWO COATS OF BITUMASTIC PAINT.

C) IMPORTED GRANULAR FILL (OPS GRANULAR "A" OR EQUIVALENT) IS TO BE USED BEHIND THE THRUST BLOCK AND FOR A MINIMUM DISTANCE OF 2m EACH SIDE OF THE THRUST BLOCK. THIS IMPORTED GRANULAR FILL IS TO BE COMPACTED TO A MINIMUM OF 100% STANDARD PROCTOR MAXIMUM DRY DENSITY. PRIOR TO CONSTRUCTION OF THE THRUST BLOCKS THE CONTRACTOR SHALL OBTAIN THE WRITTEN APPROVAL OF THE BACKFILL FROM A QUALIFIED GEOTECHNICAL ENGINEER.

WATERMAIN NOTES CONT'D:

10) ROMAC GRIP RINGS TO BE USED ON ALL MECHANICAL FITTINGS.

10) CONTRACTOR TO PERFORM CONSTRUCTION SUCH THAT WATER SERVICE IS MAINTAINED AT ALL TIMES.

11) TRACING WIRE TO BE INSTALLED ON TOTAL LENGTH OF PVC WATERMAIN (#12 TWU STRANDED COPPER FOR OPEN CUT CONSTRUCTION OR #8 TWU FOR DIRECTIONAL BORING INSTALLATION), BROUGHT TO SURFACE AT ALL WATER VALVE BOXES AND COILED UNDER THE VALVE BOX CAPS.

12) INSULATE WATER SERVICES WITH HI-40 INSULATION WHERE 0.5m SEPARATED FROM OTHER UTILITIES CANNOT BE MAINTAINED. INSULATION TO EXTEND 0.5m BEYOND OUTSIDE DIAMETER OF BOTH PIPES.

13) WHERE WATER SERVICES CONFLICT WITH OTHER UTILITIES, DEFLECT SERVICE SO AS TO PROVIDE A MIN. 0.5m CLEARANCE. MAINTAIN MIN. DEPTH OF COVER AT ALL TIMES.

14) SERVICE CONNECTIONS SHALL BE PLACED AT A MINIMUM SEPARATION OF 1.0m AND A MINIMUM OF 0.6m FROM JOINTS. (ENDS OF PIPE).

15) MINIMUM HORIZONTAL CLEARANCE BETWEEN WATERMAIN AND SEWERS TO BE 2.5 METERS.

16) A) FIRE HYDRANT TO BE CANADA VALVE CENTURY/PREMIERE MODEL OPENING COUNTER CLOCKWISE, AWWA C502 WITH STORTZ PUMPER ATTACHMENTS (SEE TOWN OF MIDLAND, TYPICAL HYDRANT AND VALE INSTALLATION DETAIL ON STD-R6)

B) VALVES: MUELLER RESILIENT SEAT AWWA C509

C) VALVE BOXES: BIBBY

D) SADDLES: ROCKWELL 371 & 372

E) MAIN STOP: MUELLER AWWA C800

F) CURB STOP: MUELLER AWWA C800

G) SERVICE BOXES: MUELLER WITH STAINLESS STEEL RODS

17) FIRE HYDRANT TO BE OFFSET 0.3m FROM ANY PROPERTY LINE, AND 1.5m FROM ANY DRIVEWAY.

18) MINIMUM DEPTH OF COVER OVER WATERMAIN TO BE 1.8m AS SHOWN IN THE TOWN OF MIDLAND STANDARD DETAILS.

19) WHERE 25mm SERVICE CANNOT MAINTAIN 1.7m DUE TO ELEVATIONS OF UTILITIES, THE CONTRACTOR SHALL INSTALL 4.0m OF 100mm PVC SDR28 LINER A MINIMUM OF 0.5m BELOW THE UTILITY.

20) WHERE WATERMAIN CONFLICTS WITH SEWER PIPES, DEFLECTION WATERMIAN OVER SEWERS. DO NOT USE BENDS IF POSSIBLE. PROVIDE A MINIMUM OF 0.5m CLEARANCE BETWEEN WATERMAIN AND SEWERS. MAINTAIN MINIMUM DEPTH OF COVER OF 1.7m AT ALL TIMES.

21) MINIMUM HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWERS TO BE 2.5m.

22) ALL VALVES TO BE RESILIENT CLOW CANADA F6100 SEAT GALE VALVES.

23) PRESSURE REDUCING VALVES SHALL BE CLA-VAL MODEL 90-48 (OR EQUIVALENT) COMPLETE WITH DURTLYN SLEEVES AND PRESSURE GAUGES IN 1500 VALVE CHAMBER OPSD 1101.010 C/W SUMP.

24) DOUBLE CHECK VALVES (FOR FUTURE PRIVATE SITE PLAN WORKS) SHALL BE 150mm WATTS SERIES 909 OR APPROVED EQUIVALENT.

25) VALVES IN EXCESS OF 1.7m IN DEPTH SHALL REQUIRE A VALVE STEM EXTENSION.

26) RISER PIPES ARE TO BE INSTALLED AS PER STANDARD, AND REMOVED DIRECTED.

27) CATHODIC PROTECTION OF ALL WATERMAIN FITTINGS AND APPURTENANCES TO BE PROVIDED AS PER TOWN STANDARD. THE ANODE SHALL BE CONNECTED USING THE "CADWELD" METHOD INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. ALL "CADWELDS" ARE TO BE COVERED WITH ROYSTON HANDY CAMP PATCH. THE ANODE SHALL BE CONNECTED TO MAIN STOP AND CURB STOP IN CONJUNCTION WITH AN ELECTRICAL BRASS GROUNDING CLAMP. ALL FITTING BOLTS ARE TO BE FITTED WITH 19mm SACRIFICIAL ZINC CAPS.

No.	Issue / Revision	Date	Auth.

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Drawing :

General Notes

Plot Date: Feb 24, 2023 | Scale: NTS

Project: Engineering Standards

Drawing No. : STD-NOTES

SANITARY NOTES:

1) SANITARY GRAVITY SEWER SHALL BE PVC (CLASS DR35 OR DR28) OR CONCRETE PIPE, WITH RUBBER GASKET JOINTS WHICH CONFORM TO C.S.A. B-182.2,4,4. CONCRETE SANITARY SEWERS SHALL HAVE A MINIMUM STRENGTH OF 65 N/m/mm CONFORMING TO C.S.A. STANDARD A257.2-1982, CLASS 50-D.

2) SEWER SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010 GRANULAR "A" FOR FLEXIBLE PIPES AND OPSD 802.030 OR 802.031 CLASS B FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE TOWN OF MIDLAND.

3) PRECAST SANITARY MAINTENANCE HOLES SHALL CONFORM WITH OPSD 701.010 (1200mm) OR OPSD 701.011 (150mm), WITH FRAME & COVER OPSD 401.010 TYPE"A" AND SOLID RECTANGULAR RUNGS, OPSD 405.020.

4) SANITARY MAINTENANCE HOLE BENCHING AS PER OPSD 701.021.

5) SANITARY SERVICE CONNECTION SHALL HAVE A CLEAN OUT WITH A CAP FLUSH TO FINAL GRADE AS PER MIDLAND STANDARD STD-R8:

A) SANITARY LATERAL CONNECTION TO BE LOCATED 2.5M RIGHT OF CENTRE LINE OF LOT.

B) LOCATION OF LATERAL TO BE MARKED AT PROPERTY LINE WITH A 60mmx100mm WOOD MARKER, PAINTED GREEN, AND EXTENDING FROM THE SERVICE INVERT TO 300mm ABOVE GROUND LEVEL.

C) PIPE TO BE MINIMUM 125mm PVC DR28, RUBBER GASKET TYPE JOINTS AND SHALL CONFORM TO CSA(B-182.2,3,4)(COLOURED) FOR RESIDENTIAL HOUSE AND MINIMUM 150mm PVC DR28 FOR INDUSTRIAL, COMMERCIAL DEVELOPMENT.

D) MINIMUM DEPTH OF LATERAL AT PROPERTY LINE SHALL BE MEASURED FROM THE SEWER OBVERT TO FINISHED GROUND SURFACE ELEVATIONS UNLESS OTHERWISE NOTED.

E) ALL CONNECTIONS TO NEW SANITARY MAINS SHALL BE PRE-MANUFACTURED, FABRICATED TEES, CONNECTIONS TO EXISTING SANITARY SEWER SHALL BE MADE WITH APPROVED FACTORY MADE TEES OR INSERT A-TEES IN STRICT ACCORDANCE TO MANUFACTURERS GUIDELINES.

F) MINIMUM PIPE SLOPE TO BE 2.0% MAXIMUM 8.0% AS PER OPSD 1006.020.

6) MAXIMUM DEFLECTION FROM COMBINED LIVE AND DEAD LOADING SHALL NOT EXCEED C.S.A, O.P.S OR MANUFACTURERS RECOMMENDED SPECIFICATIONS.

7) MAINTENANCE HOLE TOPS (FRAMES) AND CATCH BASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. A MAXIMUM OF 300mm OF ADJUSTMENT UNITS SHALL BE PROVIDED.

8) MINIMUM COVER 3.0m OVER TRUNK AND LOCAL SEWER.

9) ALL SANITARY MAINTENANCE HOLES SHALL BE INSTALLED WITH FROST STRAPS AS PER MIDLAND STANDARD STD-R9 OR OPSD 701.100

10) ALL SANITARY MAINTENANCE HOLE SHALL BE INSTALLAED WITH WATERPROOFING AS PER MIDLAND STANDARD STD-R9.

STORM NOTES:

1) STORM SEWER TO BE PVC (CLASS DR35 OR DR28) OR REINFORCED CONCRETE PIPE (CLASS 65-D MIN.). PIPE MATERIAL FOR REINFORCED CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 65N/m/mm AND BE CERTIFIED TO C.S.A STANDARD A247.2-1982M CLASS 65-D. PVC MATERIALS TO BE CERTIFIED TO C.S.A STANDARD 182.2 AND 182.4 UNLESS OTHERWISE DIRECTED BY TOWN ENGINEER.

2) STORM SEWER SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010 GRANULAR "A" FOR FLEXIBLE PIPES AND OPSD 802.030 OR 802.031 CLASS B FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE TOWN OF MIDLAND.

3) PRECAST STORM MAINTENANCE HOLES SHALL CONFORM WITH OPSD 701.010 (1200mm) WITH FRAME & COVER OPSD 401.010 TYPE "A" AND SOLID RECTANGULAR RUNGS, OPSD 405.020.

4) CATCHBASIN LEADS TO BE 2.0% MIN. GRADE, 250mm Ø FOR SINGLE CATCHBASIN AND 300mm Ø FOR DOUBLE CATCHBASIN.

5) MAINTENANCE HOLE BENCHING SHALL CONFORM TO OPSD 701.021.

6) CATCH BASIN MAINTENANCE HOLES SHALL HAVE A 300mm SUMP AND NO BENCHING.

7) PIPE JOINTS TO CONFORM TO CSA STANDARDS (B-182.2,3,4 AND A257.3)

8) ALL CONNECTIONS TO THE STORM MAIN SHALL BE MADE WITH A STORM MAINTENANCE HOLE OR APPROVED FACTORY CONNECTION AS PER OPSD-708.01 OR 708.03.

9) MAINTENANCE HOLES TOP (FRAMES) AND CATCH BASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. A MAXIMUM OF 300mm OF ADJUSTMENT UNITS SHALL BE PROVIDED.

STORM CONT'D:

10) STORM SEWER TO BE A MINIMUM 300mm Ø WITH JOINTS CONFORMING TO C.S.A.STANDARD A257.3.

11) NO FLEXIBLE PIPE SEWERS WILL BE INSTALLED WITH A DEPTH OF COVER GREATER THAN 6 METERS UNLESS SPECIFICALLY APPROVED BY THE TOWN OF MIDLAND.

12) ALL PIPE HANDLING INSTALLATIONS SHALL BE STRICT COMPLIANCE WITH MANUFACTURERS INSTALLATION GUIDES AND THE O.C.P.A OR UNIBELL GUIDELINES.

13) ALL STORM MAINTENANCE HOLES SHALL BE COMPLETE WITH FROST STRAPS PER MIDLAND STANDARD DETAILS STD-R9 OR OPSD 701.100.

14) WHERE FROST SUSCEPTIBLE SOILS ARE ENCOUNTERED AND THE OBVERT OF THE STORM SEWER IS LESS THAN A DEPTH OF 1.5m FROM THE FINISHED ASPHALT SURFACE, THE FOLLOWING MEASURE ARE TO BE APPLIED:

A) WHERE THE SUBGRADE CONSISTS OF HIGHLY FROST SUSCEPTIBLE SOILS THE SUBGRADE SHALL BE REPLACED WITH NON FROST SUSCEPTIBLE SOIL TO DEPTH OF 1.2m OVER THE ENTIRE ROAD PLATFORM.

B) WHERE THE SUBGRADE CONSISTS OF MODERATELY FROST SUSCEPTIBLE SOILS THE SUBGRADE REPLACEMENT SHALL BE TAPERED AT A SLOP OF 10 HORIZONTAL: 1 VERTICAL, FROM THE STORM SEWER TRENCH TO THE EDGE OF THE ROAD PLATFORM.

ROAD NOTES:

1) SUBGRADE AND BOULEVARD MATERIAL TO BE COMPACTED TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THE MATERIAL'S SPMDD.

2) GRANULAR A AND B TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 100% OF THE MATERIAL'S RESPECTIVE SPMDD.

3) CURB AND GUTTER TO BE BARRIER CURB AS PER OPSD 600.010 (COMMERCIAL, MULTI-RESIDENTIAL, RESIDENTIAL) IN ALL ROADS. CURBS TO BE SINGE STAGE ONLY, UNLESS APPROVED BY TOWN OF MIDLAND.

4) ROAD WORKS TO CONFORM TO STD-R1 TO STD-R5, R.O.W 20m, 26m, AND 30m.

5) ROADS SHALL BE KEPT CLEAN DURING CONSTRUCTION AT THE CONTRACTOR'S EXPENSE.

6) SIDEWALKS TO COMPLY WITH OPSD 310.010 AND ARE TO BE 1.5m WIDE. MINIMUM THICKNESS AS FOLLOWS:
i) RESIDENTIAL DRIVEWAY 150mm
ii) COMMERCIAL/INDUSTRIAL DRIVEWAY 200mm (REINFORCEMENT AS PER OPSS IF REQUIRED)

7) NATIVE SUBGRADE SHALL HAVE A CROSSFALL OF 3% AND THE MATERIAL SHALL BE APPROVED BY A GEOTECHNICAL CONSULTANT.

8) ROAD SURFACE TO HAVE AN CROSS FALL OF 2%.

9) ALL CURB RADII TO BE MINIMUM OF 10.0 METERS AT THE EDGE OF ASPHALT.

10) CURBS TO BE DEPRESSED AT INTERSECTION FOR SIDEWALKS PER OPSD 310.030.

11) NATIVE SUBGRADE TO BE COMPACTED TO MINIMUM 98% STANDARD PROCTOR MAXIMUM DRY DENSITY AND SHALL BE TESTED BY THE GEOTECHNICAL CONSULTANT.

12) THE ROAD AND CROSS SECTION SHALL INCORPORATE 150mm Ø SUBDRAIN WITH FACTORY INSTALLED FILTER FABRIC (OPSD 216.021) AS REQUIRED.

13) GRADE AND CROSS FALL ADJUSTMENT OF MAINTENANCE HOLE AND CATCHBASIN FRAMES SHALL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE. CAST IRON ADJUSTMENT UNITS SHALL BE USED FOR ALL MAINTENANCE HOLE AND CATCH BASIN GRATES TO BE SET AT PROPER GRADES FOR SURFACE COURSE ASPHALT ONLY. ALL OTHER ADJUSTMENTS UNITS FOR ALL MAINTENANCE AND CATCHBASIN FRAME AND GRATES SHALL BE CONCRETE (PER OPSD 704.010). ALL MAINTENANCE, CATCH BASINS, ETC SHALL HAVE A MAX OF 300mm OF ADJUSTMENT TO ALLOW FOR FUTURE ADJUSTMENT UP OR DOWN.

14) ADJUSTMENT UNITS SHALL BE CERTIFIED TO MEET ALL PERTINENT OPS, CSA, ASTM, AND MTO-DSM LIST, OR OTHER INDUSTRY GUIDELINES FOR MATERIALS, PERFORMANCE AND USE AS APPLICABLE.

15) ADJUSTMENT UNITS AND JOINTS SHALL BE SEALED AND OR PARGED IN COMPLIANCE WITH MANUFACTURERS SPECIFICATIONS AND GUIDELINES.

ROAD CONT'D:

16) MORTAR SHALL BE USED FOR LEVELING PRECAST UNITS ONLY, THE THICKNESS OF MORTAR SHALL BE 10mm TO FILL ALL VOIDS CREATED BY IRREGULARITIES IN THE PRECAST UNITS TO ENSURE AN EVEN SURFACE ONLY.

17) NON-COMPRESSIBLE BACKFILL SHALL BE USED DURING REBUILDING, ADJUSTING, OR ANY OTHER APPLICABLE CATCHBASIN OR MAINTENANCE HOLES WORKS.

18) DRIVEWAY APRONS TO BE CONSTRUCTED
i) RESIDENTIAL - MIN 50mm HL3 ON MIN. 200mm GRAN "A".
ii)COMMERCIAL - MIN 50mm HL3 ON MIN. 250mm GRAN "A" AND MIN 300 GRAN "B".

19) UNDERGROUND CONDUIT:
THE CONTRACTOR SHALL SUPPLY AND INSTALL 100mm "HEAVY-WALLED" RIGID PVC CONDUIT, SCEOTRE/CANRON TYPE 2 OR APPROVED EQUIVALENT AS PER CSA STANDARDS C22. NO. 212.2 ALL COUPLINGS, ELBOWS, ETC. SHALL BE BONDED WITH ADHESIVES RECOMMENDED BY THE CONDUIT MANUFACTURER IN A MANNER THAT PREVENTS THE ENTRY OF MOISTURE AND BACKFILL MATERIAL, ETC. THE CONDUIT SHALL BE INSTALLED IN LOCATIONS, AS NOTED ON THE CONTRACT DRAWINGS, AT A MINIMUM DEPTH F 0.6m BELOW FINISHED GRADE. BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF PSS FORM 1010, GRAN "A" AND GRAN "B" TYPE 1 AND SHALL BE COMPACTED TO 100% MAXIMUM DRY DENSITY. EARTH BACKFILL SHALL BE COMPACTED TO 98% MAXIMUM DRY DENSITY.

20) A 400N TEST STRENGTH NYLON ROPE "FISH LINE" SHALL BE PLACED WITHIN EACH RUN OF CONDUIT WITH 1.5m OF EXCESS ROPE LEFT COILED WITHIN THE CHAMBERS AT EACH END OF THE CONDUIT.

21) CONCRETE ELECTRICAL HANDHOLES:
HANDHOLES SHALL INCLUDE CAST IRON COVERS, SONO TUBES AND CONCRETE. THE INSIDE DIAMETER SHALL BE 0.46m. OAKS PRECAST OR APPROVED EQUIVALENT HANDHOLES THAT CONFORM TO OPSD 211.02 MAY BE USED. CAST IN PLACE HANDHOLES MUST HAVE INSIDE CHAMBERS SONO TUBE REMOVE WHEN CONCRETE HAS HARDENED. THE NUMBER AND ORIENTATION OF CHAMBER ENTRY SLEEVES SHALL BE IN ACCORDANCE WITH THE CONTRACT DRAWINGS. THE TOP OF THE JUNCTION BOX SHALL BE SET TO AN ELEVATION THAT CONFORMS TO THE SURROUNDING ELEMENTS (E.G. CURBS, SIDEWALK, ETC.). ALL HANDHOLES SHALL HAVE LIDS FASTENED AND LIFT RINGS REMOVED.

22) EACH CHAMBER SHALL PROVIDE FOUR (4) SPARE AND CAPPED ENTRY SLEEVES SPACED EVENLY AT NINETY DEGREE INTERVALS AROUND THE CIRCUMFERENCE OF THE CHAMBER IN ADDITION TO THE ENTRY POINTS FOR THE ROAD CROSSING CONDUITS.

23) DURING INSTALLATION OF UNDERGROUND CONDUIT AND CONCRETE ELECTRICAL HANDLES FOR THE TRAFFIC SIGNALS, A REPRESENTATIVE FROM THE TOWN OF MIDLAND PUBLIC WORKS DEPARTMENT IS TO BE PRESENT.

EROSION AND SEDIMENT CONTROL NOTES:

1) PRIOR TO CONSTRUCTION ADVISE THE TOWN OF MIDLAND AND CONSERVATION AUTHORITY OF STAFF RESPONSIBLE FOR SITE SEDIMENT CONTROL SUPERVISION, INSPECTION AND MAINTENANCE, INCLUDING AFTER HOUR CONTACTS AND PROVIDE WRITTEN INSPECTION AND MAINTENANCE SCHEDULE OF SEDIMENT CONTROL DEVICES.

2) INSTALL SEDIMENT CONTROL DEVICES AS IDENTIFIED OF THE APPROVED EROSION CONTROL PLAN PRIOR TO COMMENCEMENT OF TOPSOIL STRIPPING OR EARTHWORKS OPERATION.

3) ENSURE TOPSOIL, STRIPPING, GRADING AND UNDERGROUND WORKS CONFORM TO APPROVED GRADING, SERVICING AND EROSION CONTROL PLAN;

4) CONTRACTOR TO CONDUCT REQUIRED WEEKLY INSPECTION, MAINTENANCE AND REPORTING OF SEDIMENT CONTROLS TO THE TOWNSHIP AND CONSERVATION AUTHORITY AND STABILIZE SITE AS REQUIRED THROUGHOUT SITE CONSTRUCTION SCHEDULE.

5) CONSTRUCTION AREAS THAT EXCEED 30 DAYS OF INACTIVITY SHALL BE STABILIZED BY SEEDING. THIS IS TO INCLUDE STOCKPILES OF FILL AND TOPSOIL.

6) EROSION AND SEDIMENT CONTROLS TO BE DESIGNED IN ACCORDANCE WITH THE TOWN OF MIDLAND AND CONSERVATION STANDARDS.

7) ALL SEDIMENT CONTROL BASINS SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-23A.

8) ALL SEDIMENT CONTROL FENCES SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-23 DRAFT.

9) ROCK CHECK DAMS SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-24 DRAFT.

10) MUD MATTS TO BE USED AT ALL CONSTRUCTION ENTRANCES AND EXIT LOCATIONS AND BE A MINIMUM 30m IN LENGTH AND 5m IN WIDTH. THE PAD SHALL BE A MINIMUM OF 450mm THICK, CONSTRUCTED WITH 50mm Ø CLEAR STONE IN THE FIRST 15m OF THE PAD EXTENDED FROM THE STREET. THE REMAINDER OF THE PD SHALL BE CONSTRUCTED WITH 150mm Ø STONE.

11) CONTRACTOR TO MAINTAIN ALL ROADS AFFECTED BY CONSTRUCTION FREE OF SEDIMENT BY SWEEPING AS NECESSARY OR AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR TOWN OF MIDLAND.

12) CONTRACTOR TO IMPLEMENT APPROPRIATE DUST CONTROL MEASURES TO PREVENT EXCESSIVE DUST ON SITE OR MIGRATION OF DUST TO ADJACENT PROPERTIES.

13) ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER AS DETERMINED BY THE TOWN OF MIDLAND.

14) ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE, AND THE GRASS HAS ESTABLISHED GROWTH; SUBJECT TO APPROVAL BY THE TOWN OF MIDLAND.

No.	Issue / Revision	Date	Auth.

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Drawing :

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STD-NOTES