

ENGINEERING STANDARDS

TOWN OF GRAND VALLEY



Date: November 2013

Consolidated May 2016

AMENDMENTS

| | | |
|----------|------------------------|---------------------------------------|
| May 2015 | Resolution #2015-05-09 | Appendix A-3, Storm Sewer connections |
| May 2016 | Resolution #2016-05-14 | Amends 7(1), (5) and 5 (1) |
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GRAND VALLEY ENGINEERING STANDARDS

Section 1 - Introduction and Background

General

These engineering standards have been developed to set out the Town of Grand Valley's servicing requirements for residential, industrial, commercial, or institutional development in the urban area of the Town. Residential developments are subject to overall development approval by the Town. Industrial, commercial and institutional development is subject to site plan approval.

The standards are also intended to assist applicants with the preparation of the background planning and servicing reports, and other documentation, they are required to submit in support of a planning application. The engineering standards are not intended to circumvent or supersede any part of the planning process, and therefore should not necessarily be read as a standalone document.

Standards Not All Inclusive and Minimum Requirements May Be Exceeded

The standards are not all inclusive. There may be unique or unusual site constraints or circumstances which will require a detailed engineering analysis to determine the most appropriate way to deal with that constraint or circumstance.

In addition, other documents, such as the development agreement may set out additional monitoring and testing conditions that must be satisfied before the services in a development are accepted by the Town.

Where the requirements set out in these standards exceed the minimum requirement of other standards, specifications or drawings, the requirements of these standards shall prevail.

Conformity with the Standards

Where the standards say "shall be determined by the Town", the applicant shall ask the Town, in writing, for specific direction on that item as early as possible in the engineering design process.

If an applicant wishes to deviate from the standards, particularly with certain materials that may be specified, the applicant shall make a written request to the Town for approval of the deviation as early as possible in the engineering design process.

Reference to Other Standards and Guidelines

Throughout the standards, there is reference to other Provincial Standards and Design Guidelines, including but not necessarily limited to, the Ontario Provincial Standard Specifications, the Ontario Provincial Standard Drawings, the Ministry of Transportation

Geometric Design Standards for Ontario Highways, and the Ministry of the Environment Design Guidelines for Drinking-Water Systems and for Sewage Systems. In all cases, the version of those standards, drawings and guidelines that are current at the time the design is approved for construction shall be adhered to.

There are references to the Ontario Provincial Standard (OPS) Specifications or Drawings with the words “meeting the requirements of” or “conforming to” the applicable specification or drawing. The engineering design drawings for a project shall identify the actual OPS Specification or Drawing that the Contractor is to adhere to when constructing the various components of the works.

Material Specifications, General

In most cases, the standards allow the use of materials that meet the requirements of an industry recognized specification (AWWA, OPS, CSA, etc.). However, to help ensure the quality of the material that will ultimately be assumed and maintained by the Town, the Town reserves the right, in its sole discretion, to provide applicants with a list of acceptable suppliers for some or all of the materials that will be used on a project.

Background Reports

As part of the planning process, the Town’s Official Plan requires an applicant to submit a number of background reports or studies that address the issues and impacts there may be with respect to the proposed land use change. The background reports or studies to which the engineering standards may be applicable include, but are not necessarily limited to, an overall Servicing Feasibility Study and/or a Servicing Options Study which has regard for any of the Town’s Master Servicing Studies, a Stormwater Management Report, and a Geotechnical Report.

Some of the information in the engineering standards will help insure the required information is included in the background reports/studies, as described below.

The *Servicing Feasibility/Servicing Options Study* shall address the following:

- how the site will be serviced with municipal water, sewage collection, and storm drainage;
- how the servicing scheme impacts the existing municipal services and roads, and how the proposed servicing schemes relate to the Town’s Master Servicing plans;
- how the servicing of future development areas that abut or drain through the development will be accommodated;
- what off-site changes are required to the existing roads, watermains or sewers to accommodate the development; and
- such other site specific constraints there may be, or that the Town may identify, during its review of the planning application.

The *Geotechnical Report*, prepared by a qualified Geotechnical Consultant, shall address, or make recommendations on, the following:

- the general soil conditions that exist on the site;
- any existing hydrogeological conditions that might be altered by development of the site such as the performance of existing wells;
- any groundwater monitoring that should be done prior to, during, or after construction;
- how any unusual soil conditions that are identified during the field investigation are to be dealt with during construction;
- the pipe bedding and cover/embedment material that is recommended for all buried rigid or flexible pipe;
- the methods to be used to deal with structurally weak or unstable soils;
- the methods to be used to deal with subsurface groundwater conditions;
- any special requirements to be adhered to when handling the existing materials that are approved for use as trench backfill and road subgrade;
- the granular and asphalt types and depths that are to be used for the road structure; and
- any special requirements with respect to the building construction that will occur on the site.

The *Storm Water Management Report* shall establish or make recommendations on the following:

- the level of storm water run-off control and infiltration that is needed to meet the requirements of the regulatory agencies and these engineering standards;
- any existing hydrologic condition that might be altered by the development of the site and how the impacts can be mitigated;
- how the impact of storm water run-off on abutting properties, including municipal lands, will be controlled and mitigated to the satisfaction of the Town; and
- the type, size and configuration of the control and infiltration facilities that will be put in place to achieve the requirements noted above.

Other Reports

The Applicant may be required to submit such other reports the Town deems necessary to address site specific issues that may be encountered. These '*other reports*' may include reports on such things as the following:

- traffic issues on both the proposed and existing road network;
- the maintenance implications of special design features that are proposed to be incorporated into the design; and
- such other specific issues as the Town may determine, at its discretion.

Boulevard Trees

Trees are to be planted on the boulevards in new developments. The tree species will be determined by the Town. In consultation with a qualified landscape consultant, the Town will develop a list of approved trees that may be planted in new developments.

The proposed tree locations, and the species of the tree that is to be planted, shall be shown on a landscaping plan for the development that is prepared by a qualified landscape architect.

Generally, the trees will be planted on the property line, but shall be located so as not to interfere with the buried services or block the lighting from the street lights, over the life of the tree. Refer to the Roadways Section of these standards for the distances trees are to be setback from driveways and other utilities.

Fencing

The fencing requirements for a new development, perimeter and internal, will be determined by the Town on a case by case basis and in general conformity with the Town's fencing bylaw. The type of fence (chain link, page wire, or wood screen) will be determined by the Town, and appropriate details and specifications provided to the applicant.

Engineering Drawings

The engineering drawings that are submitted for review and approval by the Town, shall include, but are not necessarily limited to the following:

1. A cover page showing the name of the development, a key map, and a list of drawings that make up the complete set;
2. A general plan(s) showing the above ground services that are to be constructed, including the curbs, catch basins, hydrants, water service boxes, sidewalks, street lights, transformers, trees, community mail boxes, special design features, and insofar as possible, the proposed driveway locations.
3. A general plan(s) showing the underground services that are to be constructed including the sanitary sewers, the storm sewers, the watermains and line valves, the hydrants, the water service boxes and for clarity, the curbs on the road;
4. A Notes/Specification drawing(s) specifically listing the material and construction specifications that are applicable to the development, and in particular, the Ontario Provincial Standard Specifications and Drawings that are generally referred to in these specifications.
5. Plan and profile drawings of all the streets in the development, and such other existing Town streets that are being upgraded as part of the development;

6. Plan and profile drawings of all sewer outlets or watermain that are beyond the limits of the development;
7. A general plan of the stormwater management facilities;
8. An electrical and utility servicing plan(s);
9. A traffic control plan(s), including pavement markings; and
10. Such detail drawings and landscaping plans as are necessary to show all the relevant construction details of the work to be constructed.

All engineering drawings shall be on 610 mm x 914 mm sheets.

Except in situations where conceptual designs are being shown for large areas, the minimum scale used shall be 1:1000. Plan and profile drawings will typically be at a 1:500 or 1:250 horizontal scale and a 1:50 vertical scale. Detail drawings shall be at scales that are easily read and clearly show an adequate level of detail.

Digital copies of all approved construction drawings, and all as-built drawings, shall be provided to the Town in a format that is acceptable to the Town. In addition, the Town may request digital copies of the drawings that are submitted for review.

Refer to the individual Sections of these standards for details on specific drawings, over and above those referred to above, that the Town may request be submitted for review and approval by the Town.

GRAND VALLEY ENGINEERING STANDARDS

Section 2 - Sanitary Sewers

Design Criteria

The following is the design criteria to be used for sanitary sewers in new developments that will be maintained by the Town.

General

1. No foundation drainage shall be allowed to enter the sanitary sewer. Only wastewater complying with the Town's sewer use bylaw, as amended, shall be allowed to enter the sanitary sewer system
2. Where the flows or configuration of a development require pipe or maintenance hole structures that are greater than the sizes shown in this standard, calculations, or a detailed drawing, shall be submitted to demonstrate that the size being proposed is adequate to meet the design requirements, to the satisfaction of the Town.

Design Population and Flows

3. The flow per unit for a single family, semi- detached, or street townhouse development shall be based on four (4) people per unit and an average daily flow of 450 litres per person, per day. The average daily flow per unit for a multi-residential development block, where the services will not be assumed by the Town, may be reduced, at the discretion of the Town, subject to the proposed design flow being supported by relevant historical data and meeting the requirements of the Ontario Building Code and other applicable provincial standards.
4. The design population for Service Areas beyond the development shall be based on land use designations and projected densities in the Town's Official Plan. The extraneous flow allowance for a residential development shall be 0.2 L/gross ha/sec. In this context, Service Areas are defined to mean areas within the urban boundary as defined in the Town's Official Plan, and areas beyond the urban boundary, as the Town may determine from time to time, based on master servicing studies it undertakes.
5. The peaking factor for residential development shall be calculated using the Harmon Formula, $M = 1 + \frac{14}{4 + P^{0.5}}$

Where:

M = Peaking Factor; and

P = Population in Thousands,

The maximum peaking factor shall be 4.0 and the minimum peaking factor shall be 2.0.

6. The peak domestic sewage flow shall be calculated using the following formula
- $$Q(d) = \frac{PqM}{86.4} + IA$$

Where:

Q(d) = the Peak Domestic Sewage Flow (including extraneous flows) in L/s;

P = Design Population in Thousands;

q = Average daily per person flow, not including extraneous flows in L/person/day;

M = Peaking factor;

I = Unit of peak extraneous flow in L/s; and

A = Gross tributary area in hectares.

7. The average daily and peak design flows for Industrial, Commercial and Institutional (ICI) design flows shall be determined in accordance with the Ministry of the Environment Design Guidelines for Sewage Works, 2008, or the latest revision thereof. The ICI design flows may be reduced, at the discretion of the Town, subject to the proposed design flow being supported by relevant historical data, as determined by the Town, and meeting the requirements of the Ontario Building Code and other applicable provincial standards.

Pipe Design - Capacity, Sizing, Slope and Depth

8. Pipe capacities shall be determined using the Chezy-Manning formula, based on a pipe full flow condition, and a minimum Manning roughness coefficient of 0.013.
9. All sanitary sewers shall be designed so that the hydraulic grade line under peak flow conditions is equal to, or below, the obvert of the pipe.
10. The minimum sanitary sewer size shall be 200 mm.
11. The minimum sanitary sewer service pipe size on the municipal right-of-way shall be 125 mm. A separate sanitary sewer service shall be installed to each residential unit in a development with single family, semi-detached, or street townhouse units when the frontage of the lot is 6.0 metres or greater. A single 125 mm sanitary service from the sanitary sewer in the street to the street line may be used to service two residential units in a development with single family, semi-detached, or street townhouse units when the frontage of the lot is less than 6.0 metres.

12. Where the development is of sufficient size to generate the necessary flows, the sewer slope shall be set to achieve a minimum flushing velocity of 0.6 m/s when the pipe is flowing full.
13. Except on an end-run of sewer, the minimum slope on a sanitary sewer pipe shall be 0.5 percent. On end-run sewers, the minimum grade shall be 1.0 percent.
14. Sanitary sewers, with services connected to them, shall be installed deep enough to allow the services to the houses to be connected to the main in accordance with the applicable Ontario Provincial Standard (OPS) Drawing and run from the main to under the footing of the house at a minimum, and constant, 1.0% grade.
15. The grade of the top of the sewer service pipe at the property line shall be 2.6 to 3.0 metres below the finished grade.
16. Sanitary sewers that do not have services connected to them shall be installed with a minimum 2.0 metres of cover.
17. The separation distance between sanitary sewers and watermains shall be as set out in the Ministry of the Environment Design Guidelines for Sewage Works, 2008, or the latest revision thereof, or other applicable Ministry procedures.

Maintenance Holes – Location, Sizing and Spacing

18. Maintenance holes shall be located at all changes in pipe direction and grade, but at no more than the distances set out in the following table:

| Pipe Size (mm) | Spacing (m) |
|-------------------------|-------------|
| Up to and including 600 | 100 |
| Over 600 | 130 |

19. At junction and transition maintenance holes, the minimum drop across the benching from the lowest incoming invert to the outgoing invert in a maintenance hole shall be based on hydraulic calculations. For all other maintenance holes, the minimum drop shall be based on the change in direction between the incoming pipe(s) and outgoing pipe according to the following table. Where the minimum drop can be achieved, the invert of the pipe(s) entering and the pipe leaving the structure shall be set at the same elevation.

| Change in Flow Direction (Degrees) | Drop across the structure (mm) |
|------------------------------------|--------------------------------|
| 0 | 50 |
| 1 to 45 | 75 |
| 46 to 90 | 100 |

20. The maximum change in sewer direction at a maintenance hole shall be 90 degrees.
21. For changes in the sewer alignment 45 degrees and below, and when only one pipe enters and leaves the maintenance hole, the size of the maintenance hole shall be based on the following table:

| Pipe Size (mm) | Maintenance Hole Diameter (mm) |
|---|--|
| Up to and including 300 | 1200 |
| Over 300 mm and up to and including 600 | 1500 |
| Over 600 | As per the precast manufacturer's recommendation |

For two or more pipes entering the maintenance hole, or if the change in flow direction across a maintenance hole is more than 45 degrees, the maintenance hole diameter shall be increased, as necessary, to provide benching that will ensure a smooth transition of the flow direction and prevent the buildup of materials on the benching. The size of maintenance hole shall be to the satisfaction of the Town.

22. Maintenance holes that require a safety platform shall be minimum 1500 mm diameter.
23. Internal drop structures shall be used when the elevation difference between the invert of the inlet and outlet pipe at the maintenance hole is more than 600 mm.
24. Aluminum safety platforms shall be installed in maintenance holes where the total distance from the top of the frame and grate on the maintenance hole to the top of the benching is greater than 5.0 metres.

Pumping Stations

25. The design criteria set out above applies to gravity sewers. Where a change in elevation cannot practically be overcome with a gravity sewer, a pumping station may be used, with the Town's consent.
26. Prior to undertaking the design of a pumping station, the applicant shall submit a design brief, which among other things sets out the proposed capacity, configuration and sizing of the facility. If the use of a pumping station is approved, the design shall adhere to the criteria for pumping stations as set out in the MOE Design Guidelines for Sewage Works, 2008, as amended.
27. The design concept shall be approved by the Town before the applicant proceeds with the final design.

Materials

1. The following specifies the materials that shall be used for the construction of a gravity sanitary sewer system.
2. Sanitary Sewer Pipe and Services shall be PVC, minimum SDR 35 for sanitary sewers and minimum SDR 28 for sanitary sewer services, with bell and spigot joints using elastomeric gaskets. The PVC pipe shall conform to the applicable OPS Specification. The Town may require the applicant to submit strength calculations to show the pipe is structurally adequate for the use intended.
3. The sanitary sewer service pipe shall be a green colour.
4. Sanitary Maintenance Holes shall be precast concrete, with tapered top sections, subject to the maintenance holes being deep enough to accommodate a tapered top section. The maintenance holes shall conform to the applicable OPS Drawings for precast maintenance holes.
5. The pipe embedment material shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
6. The granular bedding under the maintenance hole structures shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
7. Native material shall be used to backfill all pipes from the top of the embedment or bedding material to the top of the road subgrade, subject to the material being deemed appropriate for that purpose by the geotechnical consultant.
8. Granular material, as recommended by the Geotechnical Consultant, shall be used to backfill around sanitary maintenance holes from the top of the bedding material to the top of the road subgrade in accordance with the applicable OPS Specification and Drawing.
9. Aluminum safety platforms shall conform to the applicable OPS Specification and Drawing.
10. Materials used for frost straps shall conform to the applicable OPS Drawing for frost straps.
11. The frame and cover for sanitary sewer maintenance holes shall be cast iron, circular frame, with circular 745 mm cover, conforming to the applicable OPS Specification and Drawing.

12. The adjustment units shall be circular precast concrete, or polyethylene, meeting the requirements of the applicable OPS Specification.
13. Pursuant to By-law 2013-17, a backwater valve shall be installed on the sanitary service when the Town deems it is appropriate to do so during the planning and permitting process.

Construction

1. Sanitary sewers and services shall be installed, inspected, and tested in accordance with the applicable OPS Specifications and Drawings.
2. Sanitary sewer and service pipes shall be installed in granular embedment material in accordance with the applicable OPS Drawing for flexible pipe embedment and backfill.
3. The sanitary sewer services shall be connected to the sanitary sewer main using prefabricated tees, and in accordance with the applicable OPS Drawing. The service connections shall be connected to the main at a 45 degree angle up from the horizontal. The service connection shall be installed, using sweep or 45 degree fittings, such that a minimum slope can be maintained on the service and the required depth of cover at the property line is achieved.
4. Maintenance holes, frost straps, and frames and covers shall be installed in accordance with the applicable OPS Specifications and Drawings.
5. The degree of compaction that is to be achieved in the backfill material shall be as recommended in the Geotechnical Report.
6. Internal drop structures, when required, shall be installed in accordance with the applicable OPS Drawing.
7. Aluminum safety platforms shall be installed in accordance with the applicable OPS Drawing.
8. Adjustment units shall be set in accordance with the manufacturer's recommendations and to match the slope of the road or curb so the grates sit flush with the surface asphalt or concrete curb.
9. Adjustment units shall be installed in accordance with the applicable OPS Specification subject to the following. The maximum depth of adjustment units shall be 300 mm. At a minimum, 2 - 50 mm deep adjustment units shall be used. The remaining adjustment depth shall be completed using the least number of standard thickness units as is possible. When completed, the outside surface of

the adjustment units shall be uniform over the entire depth of the adjustment units.

10. Leakage and deflection testing of all PVC sanitary sewers shall be done in accordance with the applicable OPS Specification.
11. Closed circuit television inspections shall be done on all sanitary sewers in accordance with the applicable OPS Specification. The inspections shall be done in such a way that the integrity of the service connections is confirmed. The camera inspections shall be recorded on a compact disc, in a format acceptable to the Town.
12. At a minimum, two closed circuit television inspections shall be done; one upon completion of the construction prior to Preliminary Acceptance and one prior to Final Acceptance. Preliminary and Final Acceptance shall be as defined in the applicable development agreement. Additional closed circuit television inspections, which may be required by the Town, shall also be completed in accordance with the applicable OPS Specification.
13. The Town may require a closed circuit television inspection to be done on any or all of the sanitary sewer services, in its sole discretion.
14. In those locations where the Town has requested one, the backwater valve shall be installed under the basement floor inside the unit in a location where it is readily accessible for maintenance.

GRAND VALLEY ENGINEERING STANDARDS

Section 3 - Watermains

Design Criteria

The following is the design criteria to be used for watermains in new developments that will be maintained by the Town.

General

1. All new watermains shall be designed to meet the requirements of the MOE Design Requirements for Drinking-Water Systems, 2008, or the latest revision.
2. Generally, the watermains in a development shall be sized to supply water to the development to meet two criteria;
 - a) peak hour demand at a minimum residual pressure of 275 kPa (40 psi); and
 - b) a minimum fire flow of 79 L/s to the highest lot in the development with a 140 kPa (20 psi) residual pressure and with the maximum day demand elsewhere in the Town's overall system.
3. The Town will instruct the Applicant on the level of analysis that is required to determine the appropriate watermain sizes in the development, including what oversizing is to be done to service lands beyond the limits of the applicant's development. When the analysis is most appropriately done using a computer model, the Town will arrange for its consultant to do the modeling and back charge the Applicant for the costs incurred. When the analysis does not require modeling, the sizing analysis shall be done by the Applicant and the calculations submitted to the Town for approval.
4. All residential and industrial, commercial, and institutional (ICI) developments that are connected to the water distribution system shall have a water meter installed on the service no more than 1.0 metre inside the building. The meter type and manufacturer shall be approved by the Town, and shall be equipped with a remote readout device compatible with the Town's meter reading and billing system.
5. A Watts, No. 7 Dual Check Valve backflow preventer valve, shall be installed on the water service into residential units. It shall be located on the house or unit side of the meter. The valve shall be rated for 1041 kPa, and be the same size as the water meter. Appropriate expansion tanks shall be installed on the hot water heaters in the houses or units, as required.

6. For ICI developments, the size and type of backflow preventer valve shall be determined on a site specific basis.

Design Population and Flows

7. The average day water demand for a single family, semi-detached, or street townhouse development will be provided by the Town, based on the historical demand in comparable developments in the Town.
8. The maximum day and peak hour flows for residential units shall be calculated using the Maximum Day and Peak Hour factors in the MOE Design Guidelines for Drinking-Water Systems, 2008, or the latest revision.
9. The average day demand and maximum day and peak hour factors for ICI design flows shall be determined in accordance with the Ministry of the Environment Design Guidelines for Drinking-Water Systems, 2008, or the latest revision. The ICI design demands may be reduced at the discretion of the Town, subject to the proposed demand being supported by relevant historical data, as determined by the Town, and to them meeting the requirements of the Ontario Building Code and other applicable provincial standards.
10. The design population for service areas beyond the development shall be based on land use designations and projected densities in the Town's Official Plan.

Pipe Design - Capacity, Sizing, Layout and Depth

11. Pipe capacities shall be determined using currently available modeling techniques with a Hazen Williams roughness coefficient of 100.
12. Except as permitted below on cul-de-sacs, the minimum size watermain shall be 150 mm.
13. Watermains servicing industrial, commercial or institutional developments shall be sized to provide the required fire flow to the development, as determined by the Town.
14. The watermains in a development shall be looped wherever possible, or provisions made that they can be looped when the system is extended in the future. The maximum length of watermain that can be installed without looping shall be 150 metres.
15. On cul-de-sacs in residential developments, 50 mm diameter watermains shall be used to loop the watermain around the cul-de-sac to help ensure the water is turned over and does not stay in a larger diameter pipe for extended periods of time.

16. Water services to single family, semi-detached, or street townhouse residential units less than 30 metres long, as measured from the watermain to the house, shall be minimum 19 mm diameter. Water services to single family, semi-detached, or street townhouse residential units that are longer than 30 metres, as measured from the watermain to the house, shall be minimum 25 mm diameter. The size of service to a multi-residential building shall be based on the number of units in the building, the length of the service, the average operating system pressure at the site, and the requirements of the Ontario Building Code.
17. The minimum cover on all watermains and services shall be 1.8 metres below the finished grade over the pipe.
18. The separation distance between watermains, sanitary sewers and storm sewers shall be as set out in the Ministry of the Environment Design Guidelines for Drinking-Water Systems, 2008, or the latest revision thereof, or other applicable Ministry procedures.

Hydrants and Valves

19. Hydrant sets shall be installed on the watermains so that the spacing between hydrants is 100 metres. The spacing may be varied slightly to avoid conflict with other above ground features or driveways, but the adjusted spacing shall not exceed 120 metres. The Town may require additional hydrants to ensure adequate coverage for the structures being protected.
20. Valves shall be installed at all intersections where watermains on the intersecting streets are connected. Generally, there shall be one less valve than street at the intersection.
21. Valves on 200 mm diameter and smaller watermains shall be spaced no more than 250 metres apart. Valves on 300 mm diameter and larger watermains shall be spaced no more than 300 metres apart.
22. Valves 250 mm diameter and smaller shall be installed with valve boxes. Valves 300 mm diameter and larger shall be installed in minimum 1500 mm diameter precast concrete valve chambers.

Corrosion Protection

23. Corrosion protection shall be provided on all metallic fittings, valves, and hydrants.
24. A minimum amount of corrosion protection in the form of sacrificial zinc anode caps shall be provided on all metallic valves, fittings and hydrants. Corrosion protection beyond the minimum amount shall be installed if it is so recommended in the Geotechnical Report.

Materials

1. The following specifies the materials that shall be used for the construction of the water distribution system and services to the property line.
2. Watermains 100 mm diameter and greater shall be PVC Class 150, DR 18, to AWWA C900-07 with bell and spigot joints. Watermains 50 mm and smaller shall be polyethylene Series 160 to CSA B137.1-09 with compression fitting joints. Use of watermains or services greater than 50 mm or less than 100 mm will only be permitted in exceptional circumstances.
3. Services shall be polyethylene Series 160 municipal service tubing, copper tube size, to CSA B137.1-09.
4. Fittings for watermains, 100 mm diameter and larger shall be cast iron to AWWA C110/A21.10-08 with mechanical joint end configurations.
5. Fittings for watermains 50 mm diameter and smaller shall be no-lead brass, compression joint fittings, compatible with the polyethylene pipe being used and appropriate for the use intended, as recommended by the manufacturer.
6. Valves shall be resilient seat gate valves, counter clockwise opening, to AWWA C509-09, with mechanical joint end configurations.
7. Hydrants shall be Mueller Canada Century hydrants, compression type, with 2 – 65 mm threaded outlets and 1 – 100 mm pumper nozzle with a Storz connection that is compatible with the Town's equipment. Hydrants shall be self-draining, counter clockwise opening, and painted red.
8. Hydrant markers shall be 'Owl Lite' Model H804Y, or equivalent.
9. Corrosion protection shall be provided on each metallic fitting, valve and hydrant using "Protecto-Caps" sacrificial zinc anodes.
10. Watermain valve boxes shall be 130 mm, sliding type, cast iron.
11. Watermain valve chambers for 300 mm valves shall be 1500 mm diameter precast concrete, conforming to the applicable OPS Drawings for precast valve chambers. Valve chambers for watermains greater than 300 mm diameter shall be sized for the site specific application to the satisfaction of the Town.
12. The frames and covers for valve chambers shall be cast iron, square frame with circular cover and plug conforming to the applicable OPS Drawing.
13. The adjustment units shall be square precast concrete meeting the requirements of the applicable OPS Specification.

14. Corporation stops shall be ball type, with AWWA thread on the inlet side and copper tube size compression fitting end on the outlet side.
15. Curb stops shall be ball type with a copper tube size compression fitting on both ends.
16. Curb boxes shall be the sliding type, iron curb boxes. The operating rod and pin shall be stainless steel.
17. Services that are 50 mm diameter and less shall be connected to the watermain using stainless steel, double bolt, service saddles. Services that are 100 mm and greater shall be considered a "watermain" for installation purposes, and shall be connected to the branch of a mechanical joint tee installed on the watermain that is reduced, as necessary, and is appropriately restrained.
18. Tracer wire shall be 12 gauge, 7 strand copper wire, with an outer plastic coating.
19. Restraining rings, appropriate for the application intended and recommended by the manufacturer, shall be used at all mechanical joint connections and where watermain is installed in fill material. All tie rods and nuts shall be galvanized steel.
20. Concrete used for thrust blocking shall meet the requirements of the applicable OPS Specification.
21. The watermain and service pipe embedment material shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
22. The granular bedding under the valve chambers shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
23. Native material shall be used to backfill all pipes from the top of the embedment or bedding material to the top of the road subgrade, subject to the material being deemed appropriate for that purpose by the geotechnical consultant.
24. Granular material, as recommended by the Geotechnical Consultant, shall be used to backfill around precast valve chambers from the top of the bedding material to the top of the road subgrade in accordance with the applicable OPS Specification and Drawing.

Construction

1. The watermains, water services, and watermain appurtenances (hydrants, valves, etc.) shall be installed, inspected, and tested in accordance with the applicable OPS Specifications and Drawings.
2. In so far as possible, the service pipe between the corporation stop and the curb stop shall be a continuous length of pipe with no joints.
3. Pipe embedment material for flexible pipes shall be placed around the pipe in accordance with the applicable OPS Drawing.
4. Valve chambers, where used, shall be installed in accordance with the applicable OPS Drawings, with valve operators installed in accordance with the applicable OPS Drawing.
5. A minimum 150 mm of Granular A shall be used as bedding material under the valve chambers.
6. "Protecto Caps" corrosion protection units shall be installed on 50 percent of the bolts on each bolted mechanical joint connection on the metallic fittings, valves and hydrants. "Protecto Caps" corrosion protection units shall be installed on both ends of all tie rods that are used for mechanical restraint. Additional corrosion protection, in a form satisfactory to the Town, shall be installed if it is so recommended by the Geotechnical Consultant.
7. The degree of compaction that is to be achieved in the backfill material shall be as recommended in the Geotechnical Report.
8. When it is necessary to operate a valve on an existing watermain to facilitate the installation, flushing or testing of a new watermain, the existing valves shall be operated by Town authorized personnel only.
9. During the installation of the watermain, sufficient sample stations shall be installed to allow the Town to ensure there is adequate chlorine distributed throughout the watermain section being disinfected.
10. Thrust restraint rings shall be used at all bends, hydrants, and dead ends. Concrete thrust blocking shall be used as soil conditions may dictate.
11. On hydrant installations, tie rods shall be installed between the tee on the watermain and the valve, and between the valve and the hydrant.
12. Thrust restraint rings shall be used at all joints on watermain that is installed in fill material. The limits to which the restraint rings are used shall be to the satisfaction of the Town.

13. All service connections shall be installed using a service saddle or tee, with the branch reduced, as required, to the appropriate size. Direct taps of PVC watermain pipe is not permitted.
14. The tracer wire shall be attached to the watermain at 3 metre intervals, and brought to the surface at all hydrant settings.
15. Blow offs shall be installed, in accordance with the applicable OPS Drawing, on dead end watermains, or in locations where the Town directs they are to be installed, to ensure water can be flushed from a watermain where low flow conditions may exist.
16. Service boxes, line valve boxes and valve chambers shall be installed in areas that will be grassed or otherwise covered with soft landscaping. Line valve boxes and valve chambers must not be installed on the travelled part of a roadway, in a driveway or in a pedestrian walkway that will be finished with asphalt or other hard surfacing material. The service box location shall consider the orientation of the unit and the width of the driveway, insofar as possible. The watermain or service routing shall be adjusted to achieve this requirement in a way that is acceptable to the Town.
17. Adjustment units on valve chambers shall be installed in accordance with the applicable OPS Specification, subject to the following. The maximum depth of adjustment units shall be 300 mm. At a minimum, 2 - 50 mm deep adjustment units shall be used. The remaining adjustment depth shall be completed using the least number of standard thickness units as is possible. When completed, the outside surface of the adjustment units shall be uniform over the entire depth of the adjustment units.
18. Granular A shall be placed under the base of the valve chamber. Valve chambers shall be backfilled to a depth of 300 mm with approved granular material. .
19. All new watermains shall be swabbed in accordance with the applicable OPS Specification, prior to being pressure tested and disinfected.
20. When a new watermain is being charged, pressure tested, or disinfected, certified backflow preventer valves shall be installed and maintained on the line providing the supply water to the new watermain.
21. New watermains shall be pressure tested, disinfected, and flushed in accordance with the applicable OPS Specification. Pressure testing against an existing valve is not permitted.

22. The Town shall determine when a new watermain is ready for connection to the existing Town system, and will advise the appropriate persons that the work to make the connection(s) can be scheduled.
23. Town authorized personnel must be present to monitor the final connection to an existing live watermain. The Contractor shall adhere to any directions given by authorized representatives of the Town.

GRAND VALLEY ENGINEERING STANDARDS

Section 4 - Storm Sewers

Design Criteria

The following is the design criteria to be used for storm sewers in new developments that will be maintained by the Town. This section should be read in conjunction with the Stormwater Management and Grading and Surface Drainage sections of these standards.

General

1. The overall storm drainage system shall be designed to minimize the risk of flooding within the development and to avoid any impact, or at least minimize the impact, on abutting properties as a result of the development; ie, abutting lands shall not receive additional runoff as a result of the development.
2. Rear lot catch basins may be used to help minimize the impact on abutting lands due to runoff from a new development. However, the number of rear lot catch basins shall be minimized, to the satisfaction of the Town. Refer to the Grading and Surface Drainage Section for further details.
3. The storm drainage system shall be designed to consist of two components. The minor system shall be designed to handle flows for the more frequent storms, and includes the drainage swales, street gutters, catch basins and storm sewers. The major system shall be designed to handle flows from the less frequent storms and includes the components of the minor system plus the roadways, stormwater management facilities and natural drainage courses.
4. Generally, the facilities that are constructed in a development shall be oversized to accommodate the predevelopment flows from drainage areas which flowed through the site prior to the site being developed. However, the Town may require an applicant to oversize some storm sewers and/or stormwater management facilities to accommodate future post development flows in order to minimize the amount of infrastructure that is built and ultimately assumed by the Town. Cost sharing arrangements for such oversizing, if any, shall be incorporated into the development agreement for the site.
5. Where the flows or configuration of a development require pipe or maintenance hole structures that are greater than the sizes shown in this standard, calculations, or a detail drawing, shall be submitted to demonstrate that the size being proposed is adequate to meet the design requirements to the satisfaction of the Town.

6. Generally, the minor storm system shall be installed deep enough so that individual storm water service laterals can be run to each lot to convey water directly from the footing drains by gravity, or from sump pumps installed in sumps to which the footing drains are connected. It is preferable that the storm service laterals be installed at a lower elevation than the footing drains so the flow to the storm sewer is by gravity and sump pumps can be avoided. When the storm service laterals service a unit with a sump pump, there shall be a physical air break between the sump pump discharge pipe and the storm service lateral. The details of how the storm service lateral is finished at the unit shall be to the satisfaction of the Town. (See Appendix C-1).

Design Parameters and Methods

7. The Rainfall Intensity for the various frequency storms shall be taken from the Fergus Shand Dam, Atmospheric Environment Weather Station data. The most current data available at the time of the design shall be used.
8. The rainfall distribution shall be based on a 3 hour Chicago distribution.
9. The minor system design shall be based on:
 - a) the 1:5 year storm on local streets; and
 - b) the 1:10 year storm for collectors and arterials built to an urban standard.
10. The outlet sewers for collectors and arterials shall be designed for a 1:10 year storm.
11. The major system shall be based on the Regional Flows, or the 1:100 year storm, whichever generates the greatest runoff values.
12. Where a development connects to a Town road with an open ditch drainage system, and a culvert is required to maintain that open ditch drainage system, the culvert shall be sized based on the 1:50 year storm.
13. The inlet time shall be calculated using a currently accepted method, but shall be a minimum 10 minutes.
14. For drainage areas two (2) hectares or less in area, the rational method may be used to determine the runoff volume that is to be accommodated in the overall drainage system. If the rational method is used, a composite runoff coefficient shall be calculated for the drainage area using values that range from 0.10 to 0.35 for lawns and grassed areas to 0.95 for impervious areas such as roofs, asphalt, or concrete.
15. For drainage areas greater than 2 hectares in area, the runoff volume that is to be accommodated in the drainage system shall be determined using modeling

programs that are available and current, as of the time the background reports for a development are submitted to the Town for approval. The programs must also be recognized as an industry standard and approved by the Grand River Conservation Authority and the Town.

Pipe Design - Capacity, Sizing, Slope and Depth

16. Storm Sewer Pipe capacities shall be determined using the Chezy-Manning formula with the pipe flowing full.
17. The minimum roughness coefficient shall be 0.013 for all pipe materials with smooth inside walls, and 0.024 for corrugated steel culvert pipe.
18. Storm sewers with service laterals connected to them shall be designed so that the hydraulic gradeline under peak flow conditions in the storm sewer is equal to or below the obvert of the pipe. Otherwise, the hydraulic grade line shall be no more than 1.0 meter above the top of the pipe.
19. The minimum storm sewer size shall be 300 mm.
20. The minimum storm service pipe size shall be 150 mm. A separate storm sewer service shall be installed to each residential unit in a development.
21. The minimum slope on a storm sewer shall be adequate to create a flow velocity of 0.75 m/sec under pipe full flow conditions. The maximum slope on a storm sewer shall be such that the pipe full velocity does not exceed 4.5 m/sec.
22. Storm sewers that do not have services connected to them shall be installed with a minimum 1.5 meters of cover.
23. The separation distance between storm sewers and watermains shall be as set out in the Ministry of the Environment Design Guidelines for Sewage Works, 2008, or the latest revision thereof, or other applicable Ministry procedures.

Maintenance Holes – Location, Sizing and Spacing

24. Maintenance holes shall be located at all changes in pipe direction and grade, but at no more than the distances set out in the following table:

| Pipe Size (mm) | Spacing (m) |
|-------------------------|-------------|
| Up to and including 600 | 100 |
| Over 600 | 150 |

25. At junction and transition manholes, the minimum drop across the benching from the lowest incoming invert to the outgoing invert in a maintenance hole shall be based hydraulic calculations. For all other maintenance holes, the minimum drop

shall be based on the change in direction between the incoming and outgoing pipes according to the following table.

| Change in Direction (Degrees) | Drop across the structure (mm) |
|-------------------------------|--------------------------------|
| 0 | 20 |
| 1 to 45 | 50 |
| 46 to 90 | 80 |

26. The maximum change in sewer direction at a maintenance hole shall be 90 degrees.
27. For zero degree turns and when only one pipe enters and leaves the maintenance hole, the size of maintenance holes shall be based on the following table:

| Pipe Size (mm) | Maintenance Hole Diameter (mm) |
|--------------------------------------|--|
| Up to and including 300 | 1200 |
| Over 300 and up to and including 600 | 1500 |
| Over 600 | As per the precast manufacturer's recommendation |

For other pipe configurations, the maintenance hole diameter shall be increased as necessary to accommodate benching that will ensure a smooth transition of the flow direction and prevent the buildup of materials on the benching.

28. Maintenance holes that require a safety platform shall be minimum 1500 mm diameter.
29. External drop structures shall be used when the elevation difference between the invert of the inlet and outlet pipe at the maintenance hole is more than 600 mm.
30. Aluminum safety platforms shall be installed in maintenance holes when the total distance from the top of the frame and grate on the maintenance hole to the top of the benching exceeds 5.0 m.

Street Catch Basins and Leads

31. The maximum spacing of catch basins on streets constructed to an urban standard shall be 75 metres.
32. Twin inlet or double catch basins shall be installed at all sags in the road profile.
33. At intersections, catch basins shall be installed:
 - a) at the start and end of the curb radius on each street at an intersection, except where the slope of the road grade is away from the intersection; and

- b) to ensure that surface water does not drain across any road surface at the intersection.
- 34. Street catch basins shall have 600 mm deep sumps.
- 35. Single catch basins shall be connected to storm sewers with 250 mm diameter leads using prefabricated tees on the storm sewer.
- 36. Twin inlet or double catch basins shall be connected to storm sewers with 300 mm diameter leads using prefabricated tees on the storm sewer.

Rear Lot Catch Basins and Leads

- 37. Refer to the Grading and Surface Drainage Standard for details on the use of rear lot catch basins.
- 38. Rear lot catch basins shall be sumpless.
- 39. The catch basin lead from a rear lot catch basin shall be 250 mm, and shall be connected to the storm sewer on the street at a maintenance hole.
- 40. The minimum cover on rear lot catch basin leads shall be 1.2 metres.

Materials

- 1. The following specifies the materials that shall be used for the construction of storm sewer system.
- 2. Except for rear lot catch basin leads, storm sewer pipe, up to and including 600 mm diameter shall be PVC, with a minimum SDR 35, conforming to the applicable OPS Specification. The Town may require the applicant to submit strength calculations to show the pipe is structurally adequate for the use intended.
- 3. Storm service laterals shall be 150 mm diameter, PVC SDR 28 pipe, conforming to the applicable OPS Specification.
- 4. PVC storm service laterals shall be a white colour.
- 5. The storm sewer pipe for rear lot catch basin leads shall be non-reinforced, non-pressure, circular concrete pipe, Class 3, with rubber gasket joints conforming to the applicable OPS Specification. The maximum height of fill above the pipe shall be determined from the applicable OPS Drawing. The Town may require the applicant to submit strength calculations to demonstrate the pipe is structurally adequate for the use intended.

6. Storm sewer pipe greater than 600 mm diameter shall be reinforced, non-pressure circular concrete pipe Class 65-D, with rubber gasket joints, conforming to the applicable OPS Specification. The maximum height of fill above the pipe shall be determined from the applicable OPS Drawing. The Town may require the applicant to submit strength calculations to show the pipe is structurally adequate for the use intended.
7. The pipe embedment material for the flexible PVC pipe shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
8. The pipe bedding and cover material for the rigid storm sewer pipes shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions. If additional pipe support is required due to the soil conditions that are encountered, the recommendations of the geotechnical consultant shall be adhered to.
9. Storm Sewer Maintenance Holes shall be precast concrete conforming to the applicable OPS Drawing for the diameter of precast maintenance hole required. Tapered top sections shall be used where the storm sewer maintenance hole is deep enough to allow it to be used.
10. Materials used for frost straps shall meet the requirements of the applicable OPS Drawing for frost straps.
11. The granular bedding under the maintenance hole structures shall be Granular A conforming to the applicable OPS Specification, or such other material as may be recommended by the geotechnical consultant, based on the site specific soil conditions.
12. Native material shall be used to backfill all pipes from the top of the embedment, bedding or cover material to the top of the road subgrade, subject to the material being deemed appropriate for that purpose by the geotechnical consultant.
13. Granular material, as recommended by the Geotechnical Consultant, shall be used to backfill around storm maintenance holes from the top of the bedding material to the top of the road subgrade in accordance with the applicable OPS Specification and Drawing.
14. The frame and cover for storm sewer maintenance holes shall be cast iron, circular frame, with circular 745 mm cover, conforming to the applicable OPS Specification and Drawing.

15. Catch basins, single or twin inlet, shall be precast concrete, conforming to the applicable OPS Drawing.
16. For road catch basins, the pipe connecting the catch basin to the storm sewer shall be 250 mm diameter, PVC pipe.
17. The embedment material for the catch basin connection pipe shall be Granular A conforming to the applicable OPS Specification.
18. Knockouts shall be provided in the catch basins for sub-drain connections at all catch basins.
19. The adjustment units shall be precast concrete, or polyethylene, conforming to the applicable OPS Specification.
20. The frame and grate for all road and rear lot catch basins shall be cast iron, square frame with square, flat grate for catch basins with perforated openings, conforming to the applicable OPS Specification and Drawing.

Construction

1. Storm sewers and services shall be installed, inspected, and tested in accordance with the applicable OPS Specifications and Drawings.
2. The stormwater service connections shall be connected to the storm sewer using prefabricated tees or saddles. The service connections shall be connected to the main at a 45 degree angle up from the horizontal.
3. Concrete storm sewers shall be installed with Class B bedding in accordance with the applicable OPS Drawing for rigid pipe bedding, cover and backfill.
4. PVC storm sewer services shall installed in accordance with the applicable OPS Drawing for flexible pipe embedment and backfill.
5. Maintenance Holes and frames and covers shall be installed in accordance with the applicable OPS Specification.
6. Street catch basins shall be installed so that the front face of the unit is parallel with the road, and so that the rear face of the unit is in line with the gutter line of the curb. Tapering the adjustment units to set the catch basin frame and grate squarely in the curb is not permitted.
7. Rear lot catch basin leads shall be concrete encased through the depth of the building envelope.

8. Adjustment units shall be set in accordance with the manufacturer's recommendations and to match the slope of the road or curb so the grates sit flush with the surface asphalt or concrete curb.
9. Adjustment units shall be installed in accordance with the applicable OPS Specification subject to the following. The maximum depth of adjustment units shall be 300 mm. At a minimum, 2 - 50 mm deep adjustment units shall be used. The remaining adjustment depth shall be completed using the least number of standard thickness units as is possible. When completed, the outside surface of the adjustment units shall be uniform over the entire depth of the adjustment units.
10. Catch basin leads shall be connected to the storm sewers in accordance with the applicable OPS Drawing.
11. Catch basin adjustment units shall be set in accordance with the manufacturer's recommendations and to match the slope of the road and curb so the grates sit flush with the surface asphalt and curb.
12. Testing of all storm sewers shall be done in accordance with the applicable OPS Specification.
13. Closed circuit television inspections shall be done on all storm sewers in accordance with the applicable OPS Specification. The inspections shall be done in such a way that the integrity of the service and catch basin lead connections is confirmed. The camera inspections shall be recorded on a compact disc, in a format acceptable to the Town.
14. At a minimum, two closed circuit television inspections shall be done; one upon completion of the construction prior to Preliminary Acceptance and one prior to Final Acceptance. Preliminary and Final Acceptance shall be as defined in the applicable development agreement. Additional closed circuit television inspections, which may be required by the Town, shall also be completed in accordance with the applicable OPS Specification.
15. The Town may require a closed circuit television inspection to be done on any or all of the stormwater services, in its sole discretion.

GRAND VALLEY ENGINEERING STANDARDS

Section 5 - Roadways

Design Criteria

The following is the design criteria to be used for roadways in new developments that will be maintained by the Town.

General

1. The width of the road right-of-way (ROW) for local roads and minor collectors shall not be less than 20 metres. For collectors and arterials, the minimum width of the ROW will be 26 metres. The minimum width for all emergency access routes shall be 6m and shall be signed accordingly. The minimum width for condominium roads shall be 8.5m.
2. The classification of a road, and the width of its ROW, may or may not be reflected in the Town's Official Plan. The classification and the ROW width will be determined by the Town through its planning process, generally based on the projected traffic volumes that will be generated and its connectivity with the existing road network. For a specific development, the required road ROW widths will be set when the plan is draft approved.
3. Subject to the detail standards below, the roads shall be designed in accordance with the Ministry of Transportation Geometric Design Standards for Ontario Highways.
4. The urban roadway section for new roadways on 20 metre ROW's in residential developments is shown on the standard road cross section that is included with these standards. The road section shows the location of the services and utilities that will be constructed within the ROW.
5. The improvements on existing roads that are to be undertaken as part of a development shall be established by the Town during the plan approval process. The design of such improvements shall be based on the Ministry of Transportation Geometric Design Standards for Ontario Highways.

Design Criteria

6. The centre line road grade shall be set so as to maintain a minimum grade on the curb of 0.5%.
7. A continuous grade shall be maintained on the curb around the radius at an intersection, or other change in road direction, to avoid ponding water.

8. The maximum centre line road grade shall be 8%.
9. Vertical curves, calculated in accordance with the Ministry of Transportation Geometric Design Standards shall be used to effect gradual changes between tangent grades where the change in tangent grade is more than 0.50 percent. When a vertical curve is used to design a sag in the road profile, adjustments shall be made to ensure the catch basin that will be installed in the sag, is set at the low point in the profile and the minimum curb grade is maintained.
10. The overall road alignment, including the property line radii for horizontal curves and crescent corners, will be established by the Town as part of the draft plan approval process. The center line of the travelled road will generally be equidistant between the two property lines.
11. The minimum curb radii at intersections shall be 10.0 metres.
12. At crescent corners, the center line of the driving surface, and the curb locations, shall be adjusted, as required, to achieve appropriate cross fall on the asphalt, to ensure continuous drainage along the curb, and to provide a comfortable driving crossfall.
13. The road cross section for a 20 metre right-of-way shall be as shown on the applicable Standard Road Cross Section drawing in Appendix A of these engineering standards.
14. When special, site specific design features are proposed on the driving surface of the road, the curbs shall be constructed so that the width of asphalt on the driving surface through the special feature is the same over its entire length.
15. The buried and above ground utilities shall be constructed within the ROW at the locations shown on the applicable Standard Road Cross Section.
16. Subject to the minimum depths specified below, the granular and asphalt depths shall be as recommended in the geotechnical report for the development.
17. The road structure shall consist of Granular B, Granular A, Base Course Asphalt and Surface Course asphalt. The minimum depth of each material that is to be used shall be as set out in the following table. The Geotechnical Consultant may recommend additional depths of some or all of the materials based on the site specific soil conditions that are encountered.

| Material | Minimum Depth (mm) | |
|------------|--------------------|-----------------|
| | Local Streets | Collector Roads |
| Granular B | 450 | 600 |
| Granular A | 150 | 150 |

| | | |
|------------------------|----|----|
| Base Asphalt (HL 8) | 50 | 60 |
| Surface Asphalt (HL 3) | 40 | 50 |

18. All “wire” utilities (electrical, telephone, and cable) and natural gas utilities shall be installed within the utility corridors shown on the Standard Road Cross Section. When the utilities are in a common trench, the arrangement of those utilities shall be acceptable to the utility companies.
19. All “wire” utilities, constructed in the boulevard, shall be in appropriately sized ducts, with a minimum 300 mm of sand placed over the highest utility in the trench. The colour of the duct used for each utility shall be acceptable to the Town, and consistent with a recognized industry standard. A marking tape shall be laid on the top of the sand prior to the trench being backfilled.
20. Where “wire” utilities cross roads, all the utilities shall be installed in concrete encased ducts in a pattern that is acceptable to the utility companies involved. The concrete encasement for utility crossings shall be installed below the subdrain.
21. The termination and junction locations for the telephone and cable TV utilities shall be in the street light poles so that pedestals for those services are not required.
22. Load distribution centre (LDC) street light poles shall be used for terminations of, and junctions for, secondary street lighting cable. The number of LDC poles that are required will be dependent on the number of street lights in the development.
23. The overall design for the electrical service in a development shall ensure that when a street light pole and transformer are located on the same lot, the two are placed as close to each other as is permitted by the responsible electrical authority.
24. Subdrains shall be continuous along the length of the road and connected to all street catch basins.
25. All roads that will be assumed by the Town shall have an asphalt surface.
26. Roadway lighting shall be provided at levels recommended by the Transportation Association of Canada Guide for the Design of Roadway Lighting or such other standard as the Town may direct.
27. Subject to the location of the community mail boxes, additional street lights, or other lighting acceptable to the Town, may be required to provide adequate area lighting at the community mail boxes.

28. Sidewalks shall be constructed on one side of local streets. Generally, the sidewalk shall be placed on the side of the street which provides the greatest pedestrian connectivity, as determined by the Town.
29. Sidewalks shall be constructed on both sides of minor collectors, collectors and arterial roads.
30. The minimum sidewalk thickness shall be 125 mm. The thickness shall be increased to 175 mm where the sidewalk crosses a driveway.
31. Where there is sidewalk on one or both sides of the street, the boulevard between the curb and the sidewalk shall be topsoiled and sodded. Where there is sidewalk on one side of the street only, the boulevard between the curb and the property line shall be topsoiled and sodded.
32. Where the sidewalk crosses a driveway, the boulevard between the curb and the sidewalk shall be paved with a minimum 50 mm lift of asphalt on a minimum 300 mm Granular A base. At driveways, where there is sidewalk on one side of the street only, the boulevard between the curb and the property line shall be paved with a minimum 50 mm lift of asphalt on a minimum 300 mm Granular A base. .
33. The Town will designate the level of traffic control to be provided at each intersection, and what driver and/or pedestrian warning signs are to be installed at high pedestrian traffic locations, such as schools and parks.
34. New boulevard trees shall be planted so as to maintain a minimum setback from the following surface features:

| Feature | Minimum Setback for Boulevard Trees (metres) |
|-----------------------|--|
| Driveways | 2.0 |
| Curb Stops | 2.0 |
| Hydrants | 3.0 |
| Watermain Line Valves | 3.0 |
| Streetlight Poles | 3.0 |
| Transformers | 2.0 |

Materials

1. The following specifies the materials that shall be used for the construction of streets and roads.
2. Subdrains shall be 150 mm perforated, high density polyethylene, drainage tubing, with a geotextile filter sock, similar to the Armttec Big 'O" product. The pipe shall have a corrugated exterior and interior wall and a minimum stiffness of

- 210 kPa at 5% deflection. The pipe and the geotextile filter sock shall conform to the applicable OPS Specifications.
3. Concrete encased ducts for “wire” utilities shall conform to the applicable OPS Drawing for Rigid Ducts Encased in Concrete.
 4. Except as specified below, the Granular A and Granular B used for the road construction shall conform to the applicable material OPS Specification for aggregates - base, subbase, select subgrade and backfill material, for municipal oriented projects. The grain size distribution for the Granular B shall be within the limits shown in Appendix B of these Engineering Standards.
 5. Recommendations in the geotechnical report for the development for variances to the material specification shall be adhered to.
 6. Hot mix asphalt used for the road construction shall conform to the applicable material OPS Specification for aggregates - hot mix asphalt, for municipal oriented projects.
 7. Concrete used for concrete curb and gutter shall conform to the applicable material OPS Specification for concrete curb and gutter.
 8. Concrete used for sidewalk shall conform to the applicable material OPS Specification for concrete sidewalk. The 28-day compressive strength shall be 30MPa, and the maximum aggregate size shall be 19 mm.
 9. Topsoil used for final grading on the boulevards shall conform to the applicable material OPS Specification for topsoil. Soil from swamps or muskeg is not permitted as an alternative.
 10. Sod used for final surface cover on the boulevards shall conform to the applicable material OPS Specification for Kentucky Bluegrass/Fine Fescue sod.
 11. Street light poles for roadway lighting in residential areas shall be Stress Crete ‘Alexander’ style street light poles, with a 9.1 metre above grade pole height and suitable for direct bury. The colour and finish shall be as determined by the Town. A sufficient number of the poles shall have load distribution centres for terminations and junctions of the street lighting power supply. The Town reserves the right, in its sole discretion, to allow the use of street light poles that are a different style, height, and/or manufacture when existing street light poles are being replaced, when new lighting is being installed in an industrial, commercial or institutional development, etc.
 12. The arms on the Stress Crete Alexander poles shall be 1.8 metre aluminum, Victorian Style, scroll arms. The colour and finish shall be as determined by the

Town. If the Town chooses to allow an alternate street light pole, the length and style of the arms shall be compatible with the street light pole and the fixture.

13. The street lights shall be 100 Watt, 120 Volt, solid state lighting (LED), with a flat array, flat glass lens design with a Type II distribution. The lights shall be dark sky compliant. The colour and finish shall be as determined by the Town. The lights shall be energized and de-energized with a photo cell mounted on each light with a twist lock receptacle. If the Town chooses to allow an alternate street light pole and arm, the Town may also choose an alternate fixture to suit the application.
14. Materials used for regulatory traffic control signs, traffic warning signs, and parking restriction signs shall be in accordance with the requirements of the applicable volume of the Ontario Traffic Manual.
15. All regulatory signs shall have High Intensity Grade reflective coating.
16. Street name signs shall be heritage style signs of a design and with lettering and finish acceptable to the Town.
17. The materials used to install the signs shall be according to the following table.

| Sign | Material Used to Install Sign |
|------------------------------------|--|
| Traffic control at an intersection | 2.4 metre, heavy duty U-flange with 1.2 metre stub |
| Traffic warning | 2.4 metre, heavy duty U-flange with 1.2 metre stub |
| Parking restriction | 2.4 metre, heavy duty U-flange with 1.2 metre stub |
| Street name | 60 mm, outside diameter, round, hot dipped galvanized, steel post. |
| Dead end checkerboard | 150 x 150 mm pressure treated wood post |

18. Temporary dead ends shall be barricaded with steel beam guide rail conforming to the applicable OPS Specification and Drawing and a checker board warning sign in accordance with the applicable volume of the Ontario Traffic Manual.

Construction

1. Excavations for road construction shall be to the width and depth required to build the road structure recommended by the geotechnical report and in accordance with the standard road cross section that is to be constructed.

2. Subdrains shall be installed and constructed in accordance with the applicable OPS Specification and the Typical Road Cross Section, and shall be continuous along the full length of the curb.
3. The subdrain shall be installed in a rectangular trench 500 mm wide, and deep enough so that the top of the subdrain is a minimum 75 mm below the top of the constructed subgrade elevation.
4. Where additional granular material has been used to replace unsuitable subgrade material, the subdrain shall be installed at a grade to ensure that all the granular can drain to the subdrain.
5. In all cases, the knockouts in the catch basins for the subdrains shall be low enough to ensure there is always positive drainage to the catch basin and no low spots in the subdrain where water can pond.
6. Granular A, 150 mm deep, shall be used for bedding material under the subdrain. The embedment material on the sides, and over, the pipe shall be a free draining granular material as recommended in the geotechnical report.
7. The subdrains shall be continuous along the full length of the road and laid at a grade that will ensure water drains to the catch basin and does not pond in the subdrain.
8. The Town reserves the right to request a closed circuit television camera inspection of the entire length of the subdrain pipe after it is installed.
9. The concrete encased electrical ducts for the “wire” utilities shall be constructed in accordance with the applicable OPS Drawing. The ducts shall extend 0.5 metres beyond the back side of the curb. The ducts shall be installed below the subdrains, and to ensure there is a continuous grade on the subdrain to the outlet.
10. The shaping and compaction of the subgrade material shall be in accordance with the Standard Road Cross Section and the applicable OPS Specification.
11. Prior to granular materials being placed, the road sub-grade shall be compacted to the density recommended by the geotechnical report. If the required degree of compaction cannot be achieved, the unsuitable sub-grade material shall be removed and replaced with suitable material, or the sub-grade shall be reinforced with filter fabric, as may be recommended by the Geotechnical Consultant. The Geotechnical Consultant shall confirm that the road sub base is structurally adequate prior to any granular materials being placed.

12. The placement, shaping and compaction of the granular and asphalt materials shall be in accordance with the requirements of the applicable OPS Specifications and the geotechnical report for the development.
13. The Geotechnical Consultant shall determine when each layer of granular or asphalt has been properly placed and compacted, and is structurally adequate, prior the next layer of granular or asphalt being placed. Unstable or unsuitable material shall be replaced as directed by the Geotechnical Consultant.
14. Unless otherwise specified by the Town, the concrete curb and gutter shall be Concrete Barrier Curb with Standard Gutter as shown on the applicable OPS drawing.
15. The curb and gutter shall be constructed in accordance with the requirements of the applicable OPS Specification.
16. The curb shall be cut for a driveway access after the house style and orientation is known.
17. The bottom of the curb cut for driveways shall start at the projection of the outside house wall, or at a projection of the line that is 0.6 metres from the edge of the garage door, whichever is less. Despite the maximum driveway width that may be permitted in the zoning bylaw, the maximum width of driveway cut at the bottom of the curb shall not be more than the distance between the outside edges of the garage door(s), plus 1.2 metres, or 6.0 metres, whichever is less.
18. The back of the curb shall be cut at a 2:1 slope up from the bottom of the horizontal curb cut at each end of the curb cut.
19. The width of the driveway driving surface may be widened on private property, but the driveway width shall be such that it does not exceed the maximum driveway coverage of the front yard as set out in the zoning by-law. If the driving surface is widened, the water service boxes must not be covered.
20. The minimum length of raised curb between driveways shall be 1.0 metre. Exceptions may be made on crescent corners, as necessary, to accommodate a house and driveway configuration.
21. Sidewalks on local, collector and arterial roads will generally be 1.5 metres wide. The Town may require wider sidewalks in high pedestrian areas.
22. Sidewalks shall be constructed in accordance with the requirements of the applicable OPS Specification and Drawing. The sidewalk shall be constructed on a minimum 150 mm of Granular A base.

23. Topsoil shall be placed on the boulevards in accordance with the requirements of the applicable OPS Specification except that the topsoil on the boulevard shall be a minimum 150 mm deep.
24. Sod shall be placed in accordance with the requirements of the applicable OPS Specification.
25. Shop drawings of the proposed street light poles, arms, and fixtures shall be submitted to the Town for approval prior any materials being ordered.
26. Street light poles shall be installed plumb, and in accordance with the manufacturer's recommendation.
27. Traffic control, traffic warning, parking restriction, street name signs and pavement markings shall be installed in the locations directed by the Town, and in accordance with the applicable volume of the Ontario Traffic Manual.
28. Steel beam guide rail shall be installed with galvanized steel posts, with composite offset blocks, in accordance with the applicable OPS Specification and Drawing. The checkerboard warning sign shall be mounted on a 150 x 150 mm pressure treated wood post, and adequately braced to prevent wind damage.

GRAND VALLEY ENGINEERING STANDARDS

Section 6 - Stormwater Management

Design Criteria

Insofar as possible, it is an objective of the Town that when constructed stormwater management facilities will be an extension of the open public space in a development. The following general and specific design criteria for stormwater management facilities are intended to reflect that objective. The Town will determine if the proposed design meets that objective.

General

1. The stormwater management facilities shall be designed so that they are safe for passive public access. The Town will determine when and where fencing is to be provided.
2. When directed by the Town, appropriate signage shall be erected to advise the public that the lands are being used for stormwater management purposes.
3. Insofar as possible, the number of stormwater management facilities within a drainage area shall be minimized.
4. Stormwater management facilities shall be designed in accordance with the latest revision of the Ministry of Environment Stormwater Management Planning and Design Manual, and to the satisfaction of the Grand River Conservation Authority and the Town.
5. The overall landscaping of the stormwater management facilities shall be to the satisfaction of the Town.
6. Erosion control devices and temporary sedimentation ponds shall be installed/constructed as required to minimize erosion on the development site and to prevent damage to lands abutting the development.
7. The stormwater management system, and in particular the lot level controls, shall be designed to enhance infiltration of surface runoff back into the ground as the soil conditions permit.
8. The stormwater management system shall be designed so that the maintenance work associated with the facility can be minimized, but easily done by the Town, when required. The maintenance activities include, but are not necessarily limited to:
 - a) Removing silt and other sediments from the facility;

- b) Cutting any grass around the top of the facility which the Town determines is necessary for the level of service it intends to provide; and
- c) Being able to maintain the plant materials that are proposed as part of the vegetative cover on the facility.

Design Criteria

- 9. The stormwater management facilities shall be designed to provide a quality control function.
- 10. Quantity control shall be provided in the stormwater management facilities, as necessary, to meet the requirements of the Grand River Conservation Authority.
- 11. An appropriately sized sediment drying area shall be incorporated into the design of the stormwater management facilities.
- 12. The size, shape, and orientation of the water quality pond shall meet the requirements set out in the MOE Stormwater Management Planning and Design Manual.
- 13. The maximum slopes on the pond embankments below the permanent pool water level shall be 5:1.
- 14. The maximum slope on the pond embankments above the permanent pool water level shall be 5:1.
- 15. To provide small equipment access for maintenance, a 5.0 metre wide working platform shall be provided around top of the pond embankments, to the berms between or in the ponds, and to any drainage structures that service the ponds. The crossfall on the working platform shall be a maximum 4%. A 300 mm deep Granular B base shall be provided for the working platforms. The surface cover on the working platforms shall be consistent with the landscaping elsewhere in the facility, not prone to washouts, and appropriate as a surface material for a walking trail.
- 16. Concrete and armor stone retaining walls shall be designed in accordance with good engineering practice, and the recommendations of the geotechnical report. Handrails and fall protection barriers shall be provided at all structures and headwalls to meet the requirements of the Ontario Building Code.
- 17. The screens and orifices used on any inlet or outlet structure shall be:
 - a) structurally adequate to resist the forces generated by the anticipated flows;
 - b) secured so as to preclude unauthorized access, and

- c) constructed so that accumulated debris can be easily removed.
18. Systems shall be provided so that water can be drained from the components of the stormwater management facility for maintenance.
 19. Leakage out of the stormwater management facilities shall be controlled in accordance with the MOE Stormwater Management Planning and Design Manual, the requirements of the Grand River Conservation Authority, and the recommendations of the geotechnical consultant for the development.
 20. The landscaping design for the stormwater management facility shall be done by a qualified landscape design professional, and shall be shown on a comprehensive landscaping plan(s).
 21. The landscape design shall be such that it is aesthetically pleasing, compatible with the surrounding property, uses materials that are native to the area, and requires minimal maintenance.
 22. Fencing will be required around a stormwater management facility when the Town determines it is in the interest of public safety to provide fencing. If fencing is required, gates shall be installed were directed by the Town.
 23. Non-intrusive, dark sky lighting, shall be installed around stormwater management facilities when the Town deems it is in the interest of public safety, or in the interest of property owners abutting the facility, to provide such lighting.
 24. An Operations and Maintenance Manual shall be provided for the facility which is:
 - a) written in non-technical language;
 - b) describes how the system works;
 - c) includes a schematic of how surface water flows through the system;
 - d) outlines the recommended inspection and maintenance procedures; and
 - e) sets out a recommended method for carrying out those maintenance procedures.

Materials

1. The following specifies the materials that shall be used for the construction of stormwater management facilities.
2. Earth embankment, granular, and pond liner materials shall be suitable for the use intended and shall be as recommended by the geotechnical report.
3. Storm sewer pipe, maintenance holes, frames and covers shall be as specified in Section 4, Storm Sewers, of these engineering standards.

4. Materials used for concrete headwalls and outlet structures shall conform to the applicable OPS Specification or the requirements of the structural engineering design.
5. Valves on outlet pipes that are intended to be opened to drain the facility, or a part of the facility, for maintenance shall be knife edge gate valves, counter clockwise opening with non-rising stems, and installed so they can be operated from the surface manually, or with a hydraulic valve operator.
6. The topsoil used on the stormwater management facility shall be of a quality recommended by the landscape architect, but at a minimum, shall meet the requirements of the applicable OPS Specification.
7. The vegetative cover and plantings used for the landscaping of the stormwater management facilities shall be as recommended by the landscape architect. The types and quantity of plant material that is provided shall also be to the satisfaction of the Town.
8. Fencing, as the Town may direct be installed, shall be black, vinyl coated, chain link fence, with a 1.8 metre constructed height, conforming to the applicable OPS Specification.
9. Gates, as the Town may direct be installed, shall be compatible with the fence material and conform to the applicable OPS Specification.

Construction

1. Prior to any earthworks commencing on a site, adequate erosion and sedimentation control devices shall be installed.
2. Temporary sedimentation ponds shall be constructed as part of the surface runoff erosion control measures, as required. Generally, these ponds will be:
 - a) separate from the permanent stormwater management facility;
 - b) constructed in such a way that they can be conveniently cleaned and maintained, as required; and
 - c) located such that they can remain in place until approximately 90% of the area they serve has been vegetated.
3. Storm sewer pipe, maintenance holes, frames and covers shall be constructed and installed as specified in Section 4, Storm Sewers, of these engineering standards.

4. Concrete headwalls, complete with grates, shall be installed and constructed on the inlet storm sewers to the stormwater management facilities in accordance with the applicable OPS Drawings.
5. Concrete outlet structures that are specific to the facility shall be constructed in accordance with the approved engineering drawings and good engineering practice.
6. The pond embankments, berms, working platforms, pond liners, and granular layers shall be constructed to the design grades and in accordance with the recommendations of the geotechnical report. Compaction tests shall be done in accordance with a schedule recommended by the geotechnical consultant.
7. When used, Hickenbottom drains shall be installed in accordance with the manufacturer's recommendations, and in such a way that the potential for plugging is minimized.
8. The topsoil and vegetative cover shall be installed, fertilized, and watered in accordance with the recommendations of the landscape architect.
9. Chain link fencing and gates, when required by the Town, shall be constructed in accordance with the applicable OPS Specification and Drawings.

GRAND VALLEY ENGINEERING STANDARDS

Section 7 - Grading and Surface Drainage

Design Criteria

The overall grading of, and surface drainage on, a development site is very important to the Town as a properly designed and implemented grading plan will minimize the complaints and concerns the Town receives from new and existing residents. The engineering drawings that are submitted for approval shall include an overall grading and surface drainage plan.

Lot specific grading plans, showing the lot grading details, will be required with the application for a building permit for the house or structure that is to be built on the subject lot. The grading plans shall conform to the approved overall grading and surface drainage plan for the development.

General

1. Overall grading and surface drainage plans shall be at a minimum scale of 1:500. Individual lot grading plans submitted with an application for a building permit shall be at a scale sufficient to show all relevant grading details.
2. The Town recognizes that the grading and surface drainage design will attempt to achieve an overall cut and fill balance for the site. However, it is important to the Town that the grading is done so as to minimize, and preferably eliminate, the impact on abutting lands.
3. Generally, the grading in a development shall be constructed so that the surface drainage is collected and carried to an outlet within the site or to municipal property so that there is no additional runoff onto abutting lands.
4. House elevations shall be set so that:
 - a) There is minimal opportunity for flooding above the top of the foundation during the 1:100 year or Regional Storm, whichever is greater;
 - b) the side yard swales can be easily constructed during the grading process and at a grade that prevents water from ponding in them, while maximizing the amount of infiltration; and
 - c) the side yards of two abutting lots are useable and provide reasonable access from the front yard to the rear yard on both lots.
5. Rear lot catch basins, with connecting storm sewers and catch basin leads, are permitted, but will be subject to a minimum 5m easement, in favour of the Town, that is registered on the title of the property to ensure that they function as intended, and that the integrity of the grading and drainage system is not compromised.

Design Criteria

6. House elevations shall be set so that the top of the foundation is 300 mm above the highest expected water level in the right-of-way in front of the property during the Regional Storm and such that the profile of the house elevations along the street is relatively uniform.
7. The slope on the municipal boulevard between the street line and the curb shall range from 2% to 4%.
8. The minimum grade on a driveway from the curb cut at the street to the garage floor shall be 2%. The maximum grade shall be 6%.
9. The top of the finished grade at the house shall be a minimum 150 mm below the top of the foundation.
10. All swales shall have a minimum 2% grade and shall generally be designed using a gentle “U” shape cross-section.
11. All side yard swales shall be constructed on the common property line between the two abutting lots in such a way that there is positive drainage and no standing water
12. Front yards shall be graded so they drain to the street.
13. The slope from the finished grade at the house to the bottom of the side yard swale shall be 2% minimum, or the elevation of the side yard swale shall 150 mm lower than the finished grade at the house, whichever is greater.
14. For back to front drainage patterns, the rear yard cut-off swale shall be a minimum 3.0 metres from the rear foundation wall of the house, with an elevation at its high point, that is a minimum 150 mm lower than the finished grade at the house.
15. The maximum slope on a terrace shall be 4:1. Terraces shall not be more than 1.0 metre high.
16. The use of retaining walls between lots to accommodate grade changes is discouraged, but if they are used, shall be constructed entirely on one lot so that the ultimate maintenance of the wall is the responsibility of the owner of the lot on which the wall is built.
17. All retaining walls shall be constructed to meet the requirements of the Ontario Building Code, and among other things, may require a building permit and railing or barrier.

18. The maximum length of a rear yard swale that collects water from more than one lot, and conveys it to an outlet, shall be 75 metres. The maximum depth of that rear yard swale at the outlet shall not exceed 0.75 metres.
19. Rear yard catch basins are to be located entirely on one lot and shall be located 1.0 metre from the lot line(s), as measured to the outside edge of the catch basin.
20. Where rear lot catch basin leads run to the road between houses:
 - a) the side yard setback of the foundation walls of the two houses which the lead runs between will each be set at 2.5 metres minimum through the site specific zoning bylaw,
 - b) the pipe shall be constructed with a setback of 2.0 metres from one of the foundation walls or 0.5 metres from the property line; and
 - c) a bend shall be used at the catch basin to change the pipe alignment to connect the lead to the catch basin
21. The Town will take easements over the land on which rear lot catch basins, and the associated leads, are installed to enable it to inspect and maintain the catch basins and leads. The Town will also take an easement over the abutting lands so as to provide an adequate total working width. The easement on each lot shall be 2.5 metres wide. Restrictions that may be imposed on the easements with respect to the construction or installation of air conditioning units, meters, structures, landscaping, etc. will be set out in the easement document.
22. Drainage swales shall not discharge onto the Town road allowance in such a way that water can run across a sidewalk and create an icing problem. If necessary, catch basins shall be installed behind the sidewalk to capture the drainage before it crosses the sidewalk.
23. A minimum 0.6 metre wide strip, constructed at the existing grade, shall be maintained along the property line where the development abuts existing lands.
24. The grading design shall consider the location of the eavestrough downspouts, and wherever possible, the discharges of those eavestrough downspouts shall be located so that the runoff is contained within the swales that carry the surface water runoff from that lot.

Materials

1. The materials used for rear lot catch basins and catch basin leads shall be as set out in Section 4, Storm Sewers, of these Engineering Standards.

Construction

1. The rear lot catch basins and catch basin leads shall be installed as set out in Section 4, Storm Sewers, of these Engineering Standards.
2. The difference in offset from the side yard property line at the rear of the lot to the centre of the catch basin and from the centre of the catch basin lead that runs between houses of approximately 0.9 metres, shall be picked up using a prefabricated bend on the pipe close to the catch basin.
3. Rear lot catch basin leads shall be installed in such a way that the bearing capacity of the fill under the catch basin lead, or the bearing capacity of the soil under the house footing, is not affected.
4. Two closed circuit television camera inspections shall be done on all rear lot catch basin leads that are installed; the first after the lead and abutting houses have been constructed, and the second prior to final acceptance of the services in the development by the Town. Final acceptance shall be as defined in the applicable development agreement.

GRAND VALLEY ENGINEERING STANDARDS

Section 8 - Trails

Design Criteria

The following is the design criteria to be used for a trail that the Town has determined it wants constructed in new developments that will be maintained by the Town.

General

1. There are provisions in the Town's Official Plan that contemplate the development of a trail system in the Town.
2. The Town may request Developers to build trails in new developments on blocks of lands that will be conveyed to the Town as part of the development process, and where the construction of a trail will provide a pedestrian link and connectivity between existing sidewalks or other naturally formed pedestrian routes that have been developed.

Design Criteria

3. The required walking/riding surface width of the trail shall range from 1.5 to 3.0 metres, depending on the location and the anticipated use of the trail.
4. The surface material shall be asphalt, stone chips, granular, or wood chips as determined by the Town, and will be based on:
 - a) the slope and grade of the trail;
 - b) the anticipated use; and
 - c) the projected number of people who will walk or ride on the trail.
5. The trail base shall be a minimum 300 mm deep granular material. The type and total depth of granular material will be determined by the Town, with the assistance of a geotechnical consultant as needed, and will be dependent on the location and intended use of the trail.
6. Non-intrusive, dark sky lighting, shall be installed on trails when the Town deems it is in the interest of public safety, or in the interest of property owners abutting the trail, to provide such lighting.

Materials

1. The following specifies the materials that shall be used for the construction of trails.

2. When specified by the Town, the granular and asphalt materials used to construct trails shall conform to the requirements of the applicable OPS Specifications. Granular B, if specified, shall comply with the gradation requirements for Granular B in Appendix B of these standards.

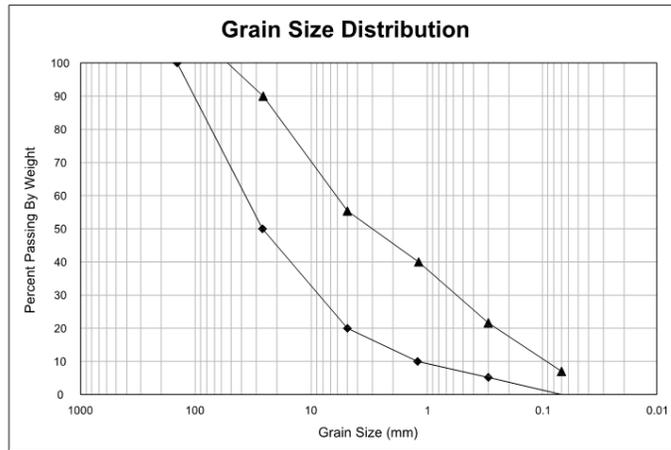
Construction

1. The detail specifications for the construction of a trail will be established on a case-by-case basis.
2. Generally, trails shall be constructed to the cross section, and with the surface material, established by the Town for each specific location.
3. Surface drainage adjacent to, or crossing, a trail shall be controlled in such a way that it does not damage/erode the trail, flow onto or cross over the trail, or affect the use of the trail.

ENGINEERING STANDARDS - TOWN OF GRAND VALLEY

Appendix B – Grain Size Distribution for Modified Granular B

Revision Date: November, 2013



MODIFIED GRANULAR "B" SPECIFICATION

PERCENT PASSING

| SIEVE SIZE mm | MINIMUM | MAXIMUM |
|------------------|---------|---------|
| 150 | 100 | - |
| 53 | - | 100 |
| 26.5 | 50 | 90 |
| 4.75 | 20 | 55 |
| 1.18 | 10 | 20 |
| 0.3 | 5 | 22 |
| 0.075 | 0 | 8 |

NOTE: ALL MATERIAL MUST BE SCREENED

| | |
|---|-------------------|
| TOWN OF GRAND VALLEY ENGINEERING STANDARDS | |
| MODIFIED GRANULAR "B" SPECIFICATIONS | |
| DRAFTED BY: VAN HARTEN SURVEYING INC. | |
| REVISION NO.: 0 | DATE: AUGUST 2013 |

Granular Specification.dwg

ENGINEERING STANDARDS - TOWN OF GRAND VALLEY

Appendix C – Storm Sewer Connections

Amended by Resolution 2015-05-09

