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# SECTION 7.0: GRADING AND DRAINAGE

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## 7.1 GENERAL

The grading and drainage design, whether it is being prepared for an individual lot, small site, or entire development, should be completed with the following objectives:

a) to provide positive drainage and maximize the use of land while minimizing maintenance requirements;
b) to complement the land and suit the type of structure that is to be constructed;
c) to accommodate runoff from adjacent lands and to ensure that the adjacent and downstream properties are not adversely affected;
d) to minimize the perimeter disturbance and preserve existing trees, where required; and
e) to minimize the use of rear lot catchbasins and retaining walls.

Where the overall grading of an area, such as a park or townhouse block, cannot be completed until after the area is fully developed, for example in the case of a phased development, the designer will be required to develop an interim grading and drainage design for that area, to the satisfaction of the Town.

## 7.2 GENERAL GRADING

For residential lots and blocks, it is preferable to have one consistent slope of between 2% - 5% for the entire rear yard area; however, where this is not possible, lots are to be provided with a rear yard amenity area in which a slope of between 2% - 5% is provided for a minimum of 5.0 m or 75% of the average rear yard length from the rear of the house, whichever is greater. Slopes from the end of the rear yard amenity area to the rear lot line shall not exceed 3:1. All exceptions must receive written approval from the Town.

All other areas shall have a minimum slope of 2% and a maximum slope of 3:1, if sufficient space is available.

Any lot with a 10% average grade may require a split-level dwelling and cross sections may be required.

## 7.3 SWALES

All swales are to be designed with a minimum slope equal to or exceeding 2.0% and a maximum slope of 5.0% with maximum side slopes of 3:1. If a slope equal to or exceeding 2.0% cannot be met due to grading constraints, a minimum of 1.5% can be considered if a perforated subdrain of 100mm in diameter covered in 19mm clear stone and wrapped in filter cloth is provided beneath the swale to reduce surface ponding. The subdrain must outlet to grade or a catchbasin.

All swales shall have a minimum depth of 0.15 m. Trapezoidal swales shall have a minimum bottom width of 0.30m. Drainage swales will require a Section 119 Restriction registered on title to prohibit the owners from restricting the drainage. The maximum depth for side yard and rear yard swales shall be 0.3 m and 0.4 m respectively.

The maximum contributing area to a side yard swale shall be 500 $m^2$. For rear yard swales, the maximum contributing area shall be 1,000 $m^2$ and the maximum length shall be 60 m. The flows from the contributing areas should be calculated and the capacity of the swale confirmed to ensure adequate conveyance.

Swales shall not drain from one lot to another where the property lines are offset by more than 1.0 metre or drainage swale alignment deviates by more than 45 degrees. In these cases, catchbasins are required.

## 7.4 REAR YARD CATCHBASINS

Rear yard catchbasins are discouraged and will only be considered where necessary and where all structures are protected from flooding if the inlet is blocked or surcharged by a major storm event.

Where the rear yard catchbasin lead extends between houses, the rear yard catchbasin shall be placed on a 3.0 m wide easement. The easement shall extend 1.8 m onto the lot which includes the catchbasin storm piping and 1.2 m onto the adjacent lot. The catchbasin lateral shall be placed such that the centre is 0.5 m off the common lot line. The catchbasin shall be placed such that the centre is 1.5 m offset from the rear lot line.

Where the rear yard catchbasin lead extends across the rear yard of a corner lot, the rear yard catchbasin shall be placed on a 3.0 m wide easement with the catchbasin placed such that the centre is 1.5 m offset from the rear lot line.

Rear yard catchbasin leads are to be PVC. The minimum size of the connection shall be 300 mm in diameter. Minimum slope shall be 0.5%. No inlet control devices are to be used in locations where the rear lot catchbasin is connected to the road catchbasin or the maintenance hole.

Where the lead goes between the houses, catchbasin leads shall be concrete encased between the front building line and rear building line.

Maintenance holes on the mainline sewer shall be placed, where possible and applicable, at the intersection of rear lot catchbasin leads and the mainline to facilitate access to the rear lot catchbasin pipe. For locations where placement of maintenance hole at the inlet of rear yard catchbasin lead is not possible or feasible, such lead must be connected to road catchbasin which connects to a main line (without maintenance hole). The pipe connecting the road catchbasin with the main line must be of a diameter accommodating flows from the rear yard and the road surface.

Rear yard catchbasins shall not have sumps;
The proposed lowest adjacent opening elevation (i.e. basement window sill) shall always be above the maximum ponding level above the catchbasin, at which point there would be overland relief;
Maximum ponding level above a rear lot catchbasin is 0.15m unless otherwise directed by the Town.

## 7.5 RETAINING WALLS

Retaining walls considered “Designated Structures” within the scope of the Ontario Building Code (OBC) will require a building permit from the Town of Innisfil’s Community Development Standards Branch. All other structures shall require engineering drawings stamped by a licensed professional engineer and shall conform to the following requirements:

For the purposes of this section, the height (h) of a retaining wall shall be measured from the finished ground level to the highest point of the wall and, if the height on one end of the wall is different from the height on the other end, the greater of the two shall apply.

a) Retaining walls are to be constructed entirely on the upper lot so that the tiebacks, backfill, or wall system does not cross property boundaries of the lower graded lot.

b) Retaining walls greater than 1.0 m in height are discouraged and will be reviewed by the Town only when the overall grading design warrants such grading differentials.

c) If a retaining wall is required, a detailed drawing indicating the design, location, property line, height, tiebacks, etc. shall be submitted for approval. Construction details of retaining walls, including filter fabric and subdrain or alternative drainage, must be noted on both grading control and individual lot grading drawings and approved by the Town. Subject to detailed design and review at the building permit stage retaining walls may be either removed or added to the Lot Grading Plan.

d) Retaining walls are not to be constructed of wood materials and must be stone with stackable connection blocks to provide an acceptable structural design.

e) A minimum setback of 500 mm should be maintained from retaining wall tiebacks to the foundation of any structure. If the grading does not permit this setback, a Professional Engineer, licensed in the province of Ontario, shall provide a detailed design for Town consideration.

f) All retaining walls with an exposed face height of 1.0 m or greater shall be designed and certified by a Professional Engineer, licensed in the province of Ontario specializing in structural engineering. The design must be accompanied by calculations clearly demonstrating that it is structurally satisfactory for the particular location and soil type.

g) Any and all retaining walls shall have their construction certified by the Design Engineer prior to the release of grading securities and to commence the maintenance period.

h) All retaining walls with an exposed face height of 1.0 m or greater shall incorporate a 1.5m high chain link fence or approved equivalent at the top. The structural stability of the retaining wall in use must be able to withstand any extra forces exerted by the fence as well as the earth loads.

i) The detailed drawing shall include the following notes and illustrate:

    i. Note 1: The walls have been designed in accordance with accepted engineering principles;

    ii. Note 2: That the wall is suitable for the geotechnical condition of the site and for the loading type;

    iii. Weeping tile must be directed to a positive outlet;

    iv. A filter cloth envelope surrounding the compacted free draining granular material;

    v. Sufficient top of wall and bottom of wall elevations;

    vi. Type and material of wall;

vii. A cross-section for the length, type, and location of any tiebacks;

viii. Surcharge load used and appropriate design calculation;

ix. A swale at the top of wall, if drainage directs to the wall.

j) Retaining walls equal or higher than 1.0 m shall additionally include the following:

i. Must be set back from the nearest property line or adjacent retaining wall a minimum distance of 0.6m;

ii. The Design Engineer shall be responsible for ensuring all set-back and zone of influence issues are resolved to the satisfaction of the Town;

iii. If adjacent to a public property access to a building, or private property to which the public is admitted, a building permit shall be required (refer to Article 1.1.2.2. (2) of the Ontario Building Code);

iv. Shall be designed inspected during construction and certified by a Structural Engineer and a Geotechnical Engineer. Certification is to be submitted to the Town prior to the release of any financial securities;

v. The location, type, and fastening of the 1.5m chain link fence, or approved equivalent, must meet the manufacturer's recommendations; and

vi. It is advised that Town Staff be contacted regarding the required retaining wall set-backs.

k) Retaining walls that are maintained, repaired, and replaced by the Town shall require a minimum 2.0m easement for Town's access.

Shop drawings will be required for the retaining walls and appurtenances prior to construction. The retaining wall manufacturer and designer shall provide structural approval by a Professional Engineer licensed in Ontario to the satisfaction of the Town.

The safety fencing required for the retaining walls shall be designed with a top and bottom rail and be structurally designed by a Professional Engineer licensed in Ontario for placement on top of the retaining wall as per the retaining wall manufacturer's specifications. Material, post spacing, brace posts, and wire mesh shall be designed and approved by a structural engineer, to the satisfaction of the Town, to meet industry standards for strength and safety requirements applicable to the Development location.

The Town of Innisfil shall be notified forty-eight (48) hours prior to the construction of all retaining walls in order to arrange for an inspection.

## 7.6 DRIVEWAYS

The minimum slope on any driveway shall be 2%. For residential lots, this minimum shall be measured from the garage to the property line as well as on the driveway apron, which is the area within the

municipal road allowance. The preferred maximum slope for any driveway is 5%; however, an absolute maximum of 7% may be permitted where necessary.

## 7.7 PARKS AND OPEN SPACE

In parks or other open space areas, slopes of 2% shall be applied to provide a usable area for recreation purposes. Grading designs employing steeper slopes must be approved by the Town on a case by case basis.

Temporary topsoil stockpiles are not to be in open space or park areas.

## 7.8 PARKING LOTS

The desirable surface grade for an asphalt parking lot is 1.0%; the minimum grade shall be no less than 0.5% and no greater than 5.0%.

## 7.9 TOPSOIL AND SOD

The requirements in OPSS 802 & OPSS 803 shall apply except as amended herein;

### 7.9.1 Topsoil Materials

OPSS 802.05 - All topsoil shall be screened using 35mm (1 ½") size screen. This applies to all topsoil whether acquired from the jobsite or imported from offsite. The topsoil shall be a fertile, friable natural loam containing not less than 4% of organic matter for clay loams and not less than 2% for sandy loams. Topsoil shall have an acidity value ranging from PH 6.0 to 7.5, and capable of sustaining vigorous plant growth. It shall be free of any admixtures of subsoil, clay lumps and free of stones, roots and other extraneous matter. If this is not attainable from the topsoil on site, then either this topsoil shall not be used, or it shall be mixed with imported material to attain the above-mentioned specification.

### 7.9.2 Placing Topsoil

Subsection 802.07.03 – Topsoil shall be placed to a uniform depth of 150mm for local/collector residential areas, and 150mm on arterial roads and in commercial/industrial collector roads.

The topsoil shall be rolled with a 50kg roller for compaction. The finished topsoil surface shall be smooth and firm against footprints.

### 7.9.3 Stockpiling Topsoil

Subsection 802.07.01 is hereby amended by the addition of the following:

Topsoil shall be salvaged and stockpiled on-site at a location approved by the Contract Administrator. Stockpiled topsoil shall be stored in mounds not greater than 6.0m in height, with the side slopes graded no steeper than 2H:1V.

Topsoil stockpiles should be stabilized by covering with geotextile material to prevent soil erosion and contamination by weeds during storage. Where stockpiles are intended to store topsoil for periods longer than one-year, temporary ground cover vegetation composed of a non-invasive stabilizing ground cover (such as annual rye grass) will be requested.

The Contractor shall supply and install erosion and sediment control fencing as per TOISD 503 around all stockpiles. If deemed necessary by the Town, additional erosion and sediment control measures may be requested.

### 7.9.4 Sod

OPSS 803.05.01 is hereby amended by the following:

Sod shall be rolls of No. 1 premium grade nursery cultivated turf-grass sod, Kentucky Blue Grass/Fine Fescue.

### 7.9.5 Scheduling

Turf-grass sod shall be installed within 24 hours of delivery, and within 36 hours of harvest, unless otherwise authorized by the Town, and a suitable preservation method is approved prior to delivery.

Sod not installed within 36 hours of harvesting or within 24 hours of delivery may be rejected by the Town of Innisfil if there is any evidence of deterioration

### 7.9.6 Placement of Sod

OPSS 803.07.04 is hereby amended with the addition of the following:

Sod shall be placed in boulevards between the sidewalk and curbs, adjacent to concrete sidewalk abutting commercial or residential buildings, driveways and walkways, the bottom of swales and ditches, or as directed by the Contract Administrator.

Placement of sod shall include supply and placement of No. 1 premium grade nursery cultivated turf-grass sod, pegging, rolling, watering, and maintenance as necessary. Topsoil shall be included in the item for sod.

### 7.9.7 Staking Sod

OPSS 803.07.04 is hereby amended by the addition of following:

Sod shall be staked on slopes steeper than 2.5H:1V and in the bottom of all swales or ditches. Sod shall be laid at right angles to slopes or the flow of water. Sodding shall start at the bottom of the slope and shall be laid crosswise and staggered on the slope. Every row shall be pegged with wooden lath pegs, of sufficient length to ensure satisfactory anchorage of the sod, and at intervals of not more than 0.5m (1.5ft.). Pegs shall be driven flush with the sod.

Before pedestrian traffic is permitted on any staked turf, and after the turf is well rooted into the growing medium, pegs or stakes shall be removed or driven at least 5cm (2in.) below the sod surface.

### 7.9.8 Maintenance of Completed Sod

OPSS 803.07.05 is hereby amended by the following:

Sod shall be maintained for 60 Days following completion of placement. During this period, the placed sod shall be kept healthy, actively growing, and green in leaf colour. This requirement shall be suspended during the winter dormant period defined as November 1 to April 30 inclusive for Southern Ontario.

### 7.9.9 Performance Measure

OPSS 803.08.01 is hereby amended by the following:

At the end of the 60-Day maintenance period, the Contract Administrator shall make an inspection of all placed sod. The condition of the sod shall be as specified in the Maintenance of Completed Sodding subsection. The sod shall be in the same location as originally placed and shall not have moved, eroded, slipped, or sloughed. Sod shall show evidence of rooting into the underlying soil. The sod shall be of sufficient density that no surface soil is visible and there shall be no competitive growth, beyond that specified in the Sod subsection, emerging from the sod or from between the sod joints.