

SITING AND GRADING PLAN

RESIDENTIAL INFILL GRADING AND SERVICING-RIGS-

LOT GRADING PLAN - CITY OF MARKHAM

In Compliance with Sentence [B-9.14.6.1 of the Ontario Building Code](#), every lot is to be graded so that stormwater will not accumulate at or near the building under construction and will not adversely affect any adjacent lots. The lot grading criteria has been primarily developed to provide guidance to residential development in subdivisions in the City of Markham. The basic principles do however apply to lots under site plan development.

It should be noted that the lot grading design for any residential buildings containing three or more dwelling units and for any development other than residential, in the City of Markham shall be performed by a licensed professional engineer in Ontario. Our licensed professional engineers prepare stamped engineering Siting and Grading Plan, [Residential Infill Grading and Servicing \(RIGS\) Plan](#), and [Lot Grading Plan](#) that would fulfill all engineering requirements for [site plan approval](#) and [building permits](#) by the City of Markham. Having vast experience in municipal engineering design, we offer effective, innovative and cost-efficient stamped engineering Siting and [Grading Plan](#), Residential Infill Grading and [Servicing](#) (RIGS) Plan, and Lot Grading Plan to our clients in the City of Markham.

Our licensed professional engineers' proficiency in conceptualizing Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading in accordance with our clients' requirements has made us very successful. Our licensed professional engineers prepare thorough, detailed, and clear Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading Plan to suit our client's needs while also adhering to engineering design requirements of the City of Markham and submit to the City of Markham for review and approval to obtain site plan approvals and building permits.

Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, and Lot Grading Plan incorporating Erosion & Sediment/Siltation Control Plan, as per applicable the City of Markham guidelines/requirements prepared and stamped by our Licensed Professional Engineers would be ready in 10 business days upon receipt of all the required information and documents. It is important to note that many assumptions, methodologies require varying degrees of engineering judgement that may, or may not, be easily adopted by the reviewing public agencies through their critical review of our reports, plans and drawings. No additional charges for required revisions & changes to our drawings and plans due to the comments from the authorities upon reviewing the drawings prepared by our licensed professional engineers.

Following supporting documents may be required to prepare the required Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, and Lot Grading Plan:

- CAD drawing of the site plan showing the following details:
 - Proposed building location, including porches and steps/stairs
 - Proposed/existing road layout including curbs, sidewalks
 - Proposed /existing fencing including acoustical, privacy and flankage fencing

- CAD drawing of the topographic survey showing the elevations of the following:
 - Spot elevations within the project site, minimum 5 m outside the property boundaries including curbs, sidewalks and centre line of the road and at reasonable intervals within the property and along the boundaries including driveway, lot corners, intermediate points of grade change, the door step elevation and finished floor elevations of adjacent properties
 - Lateral invert elevations of water, sanitary, storm service connections at the street line.
 - Grate and invert elevations of all catchbasins
 - Elevations of any existing swales, ditches, culverts, creeks, watercourses, ravines, and drainage easements/routes complete with inverts.

- Architectural & Structural Drawings showing
 - Proposed elevations including finished first floor, basement floor, top of foundation wall, underside of footing and garage entrance.
 - Engineered fill and extended footing information, where required
 - Sill elevations at side entrances where elevation differs from the finished first floor
 - The number of risers at each entrance
 - Proposed roof downspout locations
 - Proposed Retaining Walls

- Arborist Report & [Landscape Architect Drawings](#) Showing
 - Existing trees to be preserved
 - Proposed locations for all tree protection zones

- Plan-profile drawings of municipal Sanitary Sewers, Storm Sewers and Watermains

- Record of locates from [Ontario One Call \(On1Call\)](#) for existing utilities.

- If municipal services are not available, location of well(s) and septic system(s) with offsets from the proposed development.

- If applicable, locations of any regulatory flood lines or development limit lines (i.e. setback and slope stability limits from the Conservation Authority).

Where there is a landscape plan proposed as part of the site plan application, the professional engineer designing the Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading Plan shall review the landscape plan and shall provide the City of Markham with a declaration advising that the proposed landscape works are in conformance with the Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading Plan. Once construction is completed, the professional engineer designing the Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading Plan shall provide the City of Markham with a Final Lot Grading Certificate and any required Retaining Wall Certificates.

Prior to a Siting and Grading Plan, Residential Infill Grading and Servicing (RIGS) Plan, or Lot Grading Plan submission, contact the following external authorities for specific design criteria should the subject properties abut or contain:

- A watercourse/valley/creek block regulated by the [Conservation Authority](#)
- Ontario Hydro property
- CNR, CPR, GO –(Any proposed alterations to the existing drainage pattern affecting CNR, CPR, or GO railway property must receive prior concurrence from the CNR, CPR, or GO and be substantiated by a drainage report to the satisfaction of the CNR, CPR, or GO.)
- Pipelines or pipeline easements
- If a driveway is proposed on a municipal road within 180m of an intersection with a Provincial Highway
- Frontage or access to Regional Roads

For any further information please contact

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Principal Municipal Engineer

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Call Any Time 24/7 (416) 332 1743

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City of Markham - Requirements and Guidelines for Site Servicing Connections & Lot Grading

WATER SERVICE CONECTIONS

Water service connections shall not be allowed on 450 mm diameter or larger watermain, unless accepted by the City of Markham's Director of Engineering. Water service connections shall be in accordance with the City of Markham's Standards. Only single water service connections are permitted per lot/block. Dual water service connections shall be provided only for looping purpose to ensure supply redundancy. For multiple Institutional, Commercial, Industrial, Condominium blocks which will split into different ownerships, additional water service connections may be permitted subject to detail approval based on submission of Application to the City of Markham's Planning Department for dividing the land parcel into different ownership within the subject site and Application for Site Plan approval.

Residential water service connections shall be 19mm in diameter minimum except when the length of the connection from the main to the building setback exceeds 30m, then the minimum size shall be 25mm diameter. Residential water service connections shall be installed at a depth of 1.75m at the streetline and shall be offset within the ROW at 0.10m from the streetline. Water service connections shall be terminated at the streetline for each unit. Waterboxes shall be installed on the street side of the streetline. Waterboxes shall not be located in the sidewalk. Water service connections shall be placed as indicated on the City of Markham's Standard Drawings. Water service connections shall not be located under a driveway. Minimum separation between the water service connections and sewer connections shall be 2.5m. Water service connections shall be located at a minimum of 0.5m from the property line.

In addition to the above requirements for the water service connection for residential, the following conditions need to be satisfied for residential originally serviced on well system and converting to municipal water system:

- Well shall be abandoned and decommissioned in accordance with the latest Ministry of Environment regulations.
- The original well water connection shall be fully and properly disconnected from the building, as per the Ontario Building Code Requirements.
- Arrangements shall be made through the City of Markham's Waterworks Department to follow for the installation of a water meter.
- A reduced pressure principle (RP) type backflow prevention device, as approved by the City of Markham's Building Department (Plumbing Inspector), shall be installed after the water meter if there is no proof of proper decommission and abandon of the well system at the time of connecting to the municipal water system.

All disconnection and plumbing works shall be fully inspected and approved by the City of Markham's Building Department and City of Markham's Waterworks Department prior to authorization of any water turn-on requests.

Water service connections to Institutional, Commercial, Industrial and Other Non-residential Uses shall include a domestic line and a fire line sized in accordance with the latest edition of the Code and Guide to Part 7 (Plumbing) of the Ontario Building Code and City of Markham's Standards.

All domestic water service connections to Institutional, Commercial, Industrial and other Non-residential Uses shall have mainstops installed at the watermain equal to the water service connection diameter and in accordance with the City of Markham's Waterworks Material Specification.

The 19mm and 25mm diameter curb stops to be ball valve type. All service connections below 100mm diameter shall have curb stops and boxes installed at an accepted location. Valves for Institutional, Commercial, Industrial and Other Non-residential Use service connections 100mm diameter and greater shall be anchored to the tee on the watermain and valve boxes installed at an accepted location. Blow-off for water service connections 100mm to 300mm in size shall be a 25mm copper pipe connection, complete with service box and rod, with copper pipe blow-off into top section of valve box. All water services 100mm diameter or greater shall be constructed with isolation valve at the main and control shut off valve at the property line. No water service connections shall be made to watermains greater than 450mm diameter.

Water service connections to Institutional, Commercial, Industrial and other Non-residential Uses shall not become operational until documentation, including acceptance of laboratory test results from an accredited laboratory, are provided to the City of Markham's Director of Engineering, verifying that the water system pipes on the private property have been chlorinated, flushed and pressure tested according to City of Markham and Ministry of Environment requirements.

The 50mm x 100mm wood markers shall be placed adjacent to the invert of each water service connection. Markers shall extend 0.6m above the ground. The exposed end shall be painted blue.

Water service connections (19mm and 25mm) shall be abandoned by plugging / capping at the main and removal of curb box at the property line. For cases where removal of the water service connections is required (50mm and larger), the water service connections shall be plugged/capped at the main and the water service connections shall be removed from the ground including removal of curb box at the property line.

All zero lot line developments shall provide drops within the basement foundation to accommodate the property line valve boxes with minimum 300mm off-set.

SEWER CONNECTION

The class of sewer pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Storm and sanitary service connections underneath driveways shall be avoided.

SANITARY SEWER CONNECTION

All sanitary sewers shall conform to the requirements of the Canadian Standards Association and ASTM Standards. Only single service sanitary connections are permitted per lot/block. For multiple Institutional, Commercial, Industrial and Condominium blocks which will split into different ownerships, additional service connections may be permitted subject to detail approval based on submission of Application to the Planning Department of City of Markham for dividing the land parcel into different ownership within the subject site and Application for Site Plan approval from the City of Markham.

A 125mm diameter single sanitary [SDR 28 PVC](#) connection shall be installed at a 2% minimum grade for each residential unit. In general, residential sanitary sewer bedding shall be as per [OPSD-802.010](#) for flexible pipes unless otherwise specified by the Geotechnical Engineer. The class of sanitary sewer pipe shall be selected to suit this bedding detail. Residential sanitary service connections between the sanitary sewer and the streetline shall have a minimum of 2.75m cover at the streetline. If sanitary connections have less cover, it may be necessary to raise basement elevations to accommodate residential sanitary connections.

Residential sanitary service connections shall be terminated at the property line or optionally, 1.5m to 3m inside the lot. A separate plumbing permit and inspection shall be required from the City of Markham's Building Department for construction within the residential lot. Residential sanitary service connections shall be located in conformance with City of Markham's Standards.

Sanitary service connections for institutional, commercial, industrial and other non-residential land uses shall be sized in accordance with the "Code and Guide to Part 7 (Plumbing) of the Ontario Building Code".

Sanitary service connections for institutional, commercial, industrial and other non-residential land uses shall be a minimum of 150mm in diameter with a minimum grade of 1.0%. Inspection manholes shall be installed adjacent to the streetline on private property. The connection obverts shall be matched with the main sewer obverts.

For other unit types, the type of sanitary service connection shall be accepted by the City of Markham's Director of Engineering. Licensed Professional Engineers shall be responsible for sizing sanitary service connections in accordance with the Code and Guide to Part 7 (Plumbing) of the Ontario Building Code. Sanitary service connections shall be a minimum of 125mm in diameter.

- The 50mm x 100mm wood markers shall be placed adjacent to the invert of each sanitary service connection. Markers shall extend 0.6m above the ground. The exposed end shall be painted red.
- Sanitary service connections shall be connected to the sanitary sewer by means of a manufactured tee.
- Minimum low flow velocity = 0.6m/s.
- Roof drains and foundation drains shall not be connected to the sanitary sewer system.
- PVC sanitary service connections shall be of any colour other than white or blue.
- All service connections for new developments shall be made with pre-manufactured tees and wyes. Service connections including tees and wyes shall conform to CSA B 182.1 and B 182.2 (ASTM Specification D 3034).
- PVC pipe with maximum dimension ratio of 28 (SDR-28) shall be used.

Sanitary service connections shall be abandoned by capping the service lateral at the property line and by disconnecting the service lateral at the sanitary sewermain and by capping at the mainline Tee. Abandoned service connection shall be grouted. Video evidence of abandonment shall be provided to the City of Markham. Sanitary manholes shall be abandoned by removing the top 1.0m of the manhole and filling the remaining manhole with sand. For manholes under the City of Markham's right of way, U-fill shall be used to fill the manhole.

All zero lot line developments shall provide drops within the basement foundation to accommodate the property line manholes with minimum 300mm off-set.

STORM SEWER CONNECTION

All storm sewers shall conform to the requirements of the Canadian Standards Association and ASTM Standards. Foundation drains shall be connected to the storm service connection.

Residential storm connections for single and double residential units shall be installed with a minimum 125mm and 150mm diameters SDR 28 PVC, respectively, at 2% minimum grade. Double storm sewer connections may be acceptable in residential areas where all other utilities can be accommodated and where the difference in the two connecting basement elevations does not exceed 600mm. Storm service connections between the storm sewer and the streetline shall have a minimum of 2.5m cover at the streetline. If storm service connections have less than 2.5m cover at the streetline, it may be necessary to raise the basement elevations to accommodate the residential storm service connections. Risers shall be used when the obvert depth of the main storm sewer exceeds 4.5m. The riser connection shall not exceed 3m in depth. Residential storm service connections shall be terminated with accepted test tee at the property line or optionally, 1.5m to 3m inside the lot. A separate plumbing permit and inspection shall be required from the City of Markham's Building Department for construction within the lot. Roof drainage shall discharge onto the ground surface via splash pads unless otherwise accepted by Director of Engineering of City of Markham.

Storm sewer connections for Institutional, Commercial, Industrial and other non-residential uses shall be a minimum 300mm diameter at 2% minimum grade. Institutional, Commercial, Industrial and other non-residential storm sewer connections shall be designed to accommodate surface, roof and weeping tile drainage. An inspection manhole for the Institutional, Commercial, Industrial and other non-residential storm sewer connection shall be installed adjacent to the streetline within private property. Joints and Bedding for Institutional, Commercial, Industrial and other non-residential storm sewer connections shall be equivalent to joints and bedding as specified for storm sewers. In general, sewer bedding shall be as per OPSD-802.010 for flexible pipes unless otherwise specified by the Geotechnical Engineer. The class of sewer pipe shall be selected to suit this bedding detail.

The manufacture of service tees at the main sewer shall be as follows:

For main storm sewers sizes 600mm or smaller, pre-fabricated tees from the plant shall be utilized.

For main storm sewer sizes 675mm to 900mm, tees shall be manufactured or cored in the field on top of the trench with the proper saddles or inserts and shall be inspected by a licensed professional engineer (P. Eng.) prior to installation.

For main storm sewer sizes 975mm and larger, tees shall be manufactured in the trench with proper saddles or inserts, and shall be inspected by a licensed professional engineer, prior to installation. In the cases above, the storm sewer shall be drilled at site or scribed at the plant rather than breaking through the pipe wall on-site. The 50 mm x 100 mm wooden markers placed from the invert of the service to 600 mm above ground level shall be placed at the ends of each residential connection at the streetline. The top 600 mm of the markers shall be painted green.

All zero lot line developments shall provide drops within the basement foundation to accommodate the property line manholes with minimum 300 mm off-set.

Storm service connections shall be abandoned by capping the service lateral at the property line and by disconnecting the service lateral at the storm sewermain and by capping at the mainline Tee. Abandoned service connection shall be grouted.

Video evidence of abandonment shall be provided to the City of Markham. Storm manholes shall be abandoned by removing the top 1.0m of the manhole and filling the remaining manhole with sand. For manholes under the City of Markham's right of way, U-fill shall be used to fill the manhole.

REUSE OF EXISTING SERVICE CONNECTIONS FOR INFILL RESIDENTIAL DEVELOPMENTS

For infill residential redevelopment, existing service connections can only be reused if the owner/proponent satisfies and complies with the following requirements:

Reuse Existing Water Service Connections

- a) Comply with the City of Markham's latest design criteria.
- b) Provide calculation from a licensed professional engineer, based on the proposed house fixture unit water demand to demonstrate that the existing water service connection can provide adequate supply and pressure to the development in accordance with the Ontario Building Code requirements.
- c) Verify with the City of Markham's existing hydraulic characteristic at the site to ensure any existing hydraulic issue(s) will be addressed in the servicing design. Any non-compliant existing water service connections must be disconnected and abandoned in accordance to the City of Markham's Design Criteria and new water service connections install for the developments. For the road restoration requirements of the construction trenches, follow the "Backfill and Road Restoration Details" of the "Municipal Inspection and Construction Guidelines".

Reuse of Existing Sanitary Service Connections

- a) Comply with the City of Markham's latest Design Criteria and meet all current City of Markham's Standards and Specifications. The existing municipal sanitary sewer connection shall be free of any structural or operational defects as determined by and at the sole discretion of City of Markham's Director of Engineering and shall have no record of any sewer backups or any other recorded operational deficiencies.

b) Before demolishing the existing building, the owner/proponent shall perform a CCTV inspection from the cleanout inside the building to determine whether the condition of the existing service lateral within the City of Markham's Right-of-Way is acceptable for reuse.

c) Verify by a licensed professional engineer (P. Eng.) and indicate on the Engineering Drawings that the existing sanitary service lateral elevation at the property line can service the proposed basement by gravity. The Engineering Drawings must show the elevation of both the existing sanitary service lateral at property line and the underside of the footing verified by an Ontario Land Surveyor (OLS).

d) If the designed basement elevation is too low to be serviced by gravity from the building to the mainline sanitary sewer, the following design options shall be considered:

i) Pump the main floor and basement using a grinder pump, to the sanitary service lateral (provided the existing sanitary service lateral satisfies a, b, and c above).

ii) Drain the main floor by gravity to the sanitary service lateral (provided the existing sanitary service lateral satisfies a, b, and c above) and pump the basement by a grinder pump. Note that pumping via grinder pump is only permitted where a gravity outlet to the main sewer cannot be achieved.

Reuse of Storm Sewer Service Connections:

a) Comply with the City of Markham's latest Design Criteria and meet all current City of Markham's Standards and Specifications. The existing municipal storm sewer connection shall be free of any structural or operational defects as determined by and at the sole discretion of the City of Markham's Director of Engineering and shall have no record of any sewer backups or any other recorded operational deficiencies.

b) Before demolishing the existing building, the owner/proponent shall perform a CCTV inspection from the cleanout inside the building to determine whether the condition of the existing service lateral within the City of Markham's Right-of-Way is acceptable for reuse.

c) Verify by a licensed professional engineer (P. Eng.) and indicate on the Engineering Drawings that the existing storm service lateral elevation at the property line can service the proposed basement by gravity. The Engineering Drawings must show the elevation of both the existing storm service lateral at property line and the underside of the footing verified by an Ontario Land Surveyor (OLS).

d) If the designed basement elevation is too low to be serviced by gravity from the building to the mainline storm sewer, a sump pump is required to be installed in the basement to drain the foundation drain to the existing storm service lateral (provided the existing storm service lateral satisfies a, b, and c above).

LOT GRADING Plan - Siting & Grading Plans – City of Markham

SUBDIVISION LOT GRADING PLAN

General lot grading design for a subdivision shall provide for proper surface drainage and maximize usable land area, in accordance with the City of Markham's Engineering Standards for lot grading. Overall lot grading must account for and accommodate external drainage tributary to the subdivision. Lot grading must direct storm runoff to major and/or minor system. Road's right of way major drainage route must be designed to safely convey flows above minor storm to an accepted outlet. Any other overland drainage routes (eg swale) must be designed to safely convey drainage to an accepted outlet system. Drainage shall be directed away from structures. Drainage must be contained within the lot boundaries and directed to an accepted outlet, Proposed lot grading shall match the existing ground elevations at the limit of the Subdivision. Existing trees shall be preserved, where identified, as per the Tree Preservation Plan. A minimum of 0.6m undisturbed strip shall be required where abutting existing lots. Lot drainage for each phase of the Subdivision shall be self-contained.

The lot grading design for residential lots on the Subdivision Grading Plans shall be as follows:

- Lots including drainage ditches, swales and boulevards shall be completely top-soiled and sodded with a minimum depth of 200mm of topsoil and Number #1 grade Turfgrass Nursery Sod; quality and source to comply with standards outlined in Canadian Nursery Landscape Association–Canadian Standards for Nursery Stock–latest edition.
- A minimum depth of 750 mm of topsoil shall be provided in designated tree planting trenches
- Minimum yard slope = 2%
- Maximum yard slope = 5%
- Minimum driveway slope = 2%; all driveways must slope away from the dwelling units
- Maximum driveway slope = 8%
- Front yards and driveways of residential lots shall be graded to drain towards the street
- Maximum grade between houses in any direction shall be 3 horizontal: 1 vertical
- Any required 3:1 slope shall commence at least 5m from the rear wall of any dwelling unit
- To provide access to rear yards, a minimum 0.6m wide flat access strip (at 2%) shall be provided along at least one side of the building where side yard setback permits (usually along the garage side or side door entrance). This may not be possible for some walkouts in which case 3:1 slope, as per City of Markham's criteria shall be used.
- A minimum of 0.15 m shall be provided between the highest lot grade adjacent to the house and the top of the foundation wall.
- Clear stone, rather than topsoil and sod, shall be required for combined side yards between two buildings that are 1.20m or less. For side yards greater than 1.2m, clear stone may be required at the discretion of the City of Markham's Director of Engineering

Rear yards which drain through abutting lower back-to-front type lots are permitted where:

- A maximum of four rear yards or 0.1ha may drain to a single swale
- Sufficient fall shall be available between the adjacent streets to achieve desired grades for swales and yards
- Cut-off swales along the rear lot lines shall direct drainage from the upper lots into the lower lot side yard swales
- Proposed and existing elevations shall be shown at all lot corners as a minimum.
- Additional lot grading information shall be provided as per the City of Markham's Engineering Standards.

The lot grading design for blocks on the Subdivision Grading Plans shall be as follows:

- Minimum slope = 2%
- Maximum slope = 5%
- Block drainage shall be self-contained, with drainage directed to adjacent roads or other outlet as accepted by the City of Markham's Director of Engineering.

The lot grading design for park blocks on the Subdivision Grading Plans shall be as follows:

- Minimum slope = 2%
- Maximum slope = 5%
- Park drainage shall be self-contained, with drainage directed to adjacent roads or other outlets as accepted by the City of Markham's Director of Engineering
- Where parks abut residential or commercial lots, cut-off swale shall be constructed on the parklands to intercept any drainage and to drain it to the accepted outlet.
- A minimum depth of 300 mm of topsoil shall be provided in a park block.
- A minimum depth of 750 mm of topsoil shall be provided in designated tree planting trenches in a park block.

Park grading and grading of lots adjacent to parks shall be reviewed by the City of Markham's Urban Design Department.

Drainage Route

- Maximum flow depth on road's right of way shall be 250mm.
- Maximum flow depth on other drainage routes (eg through an easement) shall be 250mm with at least 50mm freeboard

Drainage Swales

- Minimum Longitudinal slope= 2%
- Maximum Longitudinal slope = 5%
- Side slopes = maximum 3 horizontal to 1 vertical
- Location of swales as per the City of Markham's Engineering Standards

Rear Yard Swale To Rear Lot Catch Basin:

- Maximum swale depth = 300mm
- Minimum swale depth = 150mm
- Maximum length of rear yard swale shall be 4 lots width or 50m which ever is less

Minimum Side Yard Swale Depth=150mm

Maximum Side Yard Swale Depth=250mm

Driveways are not permitted as outlets for drainage swales.

Retaining Walls

The use of retaining walls shall be avoided, wherever possible. Where required, retaining walls shall conform to the following requirements:

- Retaining walls are generally required where 3:1 slope cannot be achieved
- Details of retaining walls over 0.9m shall be submitted with the Lot Grading Plans and stamped by a Professional Structural Engineer
- Retaining walls over 0.9m are subject to peer review at Owner's expense.
- Letter of Credit is required for retaining walls over 0.9m.

- All retaining walls shall be constructed from dry stone (interlocking, stacking type no tiebacks), when adjacent to public property. Construction materials shall be acceptable to Engineering, Operations and Urban Design departments of the City of Markham.
- Timber retaining walls are permitted only for internal grading of blocks or lots and between properties and shall be constructed of pressure treated lumber only
- A minimum setback of 1.0m shall be maintained from the tiebacks to the foundation of any structure and underground services
- Certification by a licensed professional engineer (P. Eng.) stating that the retaining wall is designed and constructed to meet the most recent City of Markham's design standards as to granular backfill, structural integrity, materials, tie backs, line and grade is required.

All structural drawings shall be signed and stamped by a Professional Structural Engineer (P. Eng.) for the design and structural stability of the retaining walls. A 1.5m high fence shall be required where a retaining wall height exceeds 0.9m. Details of the fence and its installation on or adjacent to the wall shall be provided on the Engineering Drawings for the retaining wall.

Retaining walls, in INFILL areas, shall be constructed completely on the higher property, adjacent to the property line and in such a manner not to block the property line drainage. Retaining walls, in NEW Subdivision areas, shall be constructed completely on the lower property, adjacent to the property line.

Drainage swale shall be constructed along top and bottom of retaining wall to divert flows to an acceptable outlet. All retaining walls shall be constructed with a minimum setback of 150mm from the property line.

SITING & LOT GRADING DESIGN, PLANS AND CERTIFICATION

A Siting & Lot Grading Plan shall be prepared for each individual housing unit, or group of units, in order to confirm conformance with the general lot grading concept as shown on the Subdivision Lot Grading Plan. Each Siting and Lot Grading Plan shall be certified by a licensed professional engineer (P. Eng.) for conformance with the Subdivision Lot Grading Plan. All elevations shall be relative to the benchmarks provided on the Subdivision Lot Grading Plans.

Information to be Shown on Siting & Lot Grading Plans

Siting & Lot Grading Plans shall generally be prepared at a scale of 1:250 unless clarity of presentation dictates otherwise. The following information shall be shown on each Siting & Lot Grading Plan:

- Road layout including curbs, sidewalks and centre line road elevations
- Above ground services including curbs, sidewalks, catchbasins, valves, hydrants, light poles, transformers, utility pedestals and other street furniture
- House connections (Water, Sanitary, Storm) lateral invert elevations at the street line
- First floor elevations of adjacent units and adjacent land uses/grading
- Existing trees to be preserved
- Proposed elevations for lot corners, swale inverts and intermediate points of grade change at reasonable intervals along the boundaries of the lot to illustrate the drainage of the lot in relation to the surrounding lands and buildings
- Side yard swale inverts opposite each corner of the unit
- For front draining lots, the rear yard swale invert elevation shall also be shown at the high point. This elevation shall be a minimum of 0.15m below the grade adjacent to the rear entrance
- Direction of surface drainage shall be shown by an arrow
- Grate and invert elevations of all rear yard catchbasins
- Proposed fencing including acoustical, privacy and flankage fencing

- Proposed building location, including porches and steps/stairs
- House elevations including finished first floor, basement slab and underside of footing
- Engineered fill and extended footing information, where required
- Sill elevations at side entrances where elevation differs from the finished first floor
- The number of risers at each entrance to the dwelling
- Elevation at the centre of driveway at the street line as well as the garage entrance elevation
- Proposed retaining walls with proposed spot elevations indicated at top and bottom of wall
- Driveway grades

Lot Grading Certification

Three (3) copies of the Siting & Lot Grading Plan, certified by a licensed professional engineer (P. Eng.), shall be submitted to the City of Markham's Director of Engineering prior to issuance of a building permit. The lot grading shall be inspected by a licensed professional engineer (P. Eng.) prior to final grading and for final lot grading certification after the lot is sodded. Final Siting & Lot Grading Certification shall be completed by a licensed professional engineer (P. Eng.) and the final lot grading certificates shall be provided to the City of Markham's Director of Engineering.

FENCING

Fencing, in general, shall be in accordance with the City of Markham-Fence By-law and the most recent requirements and specifications of the City of Markham's Urban Design (Community Design Plan, Architectural Controls etc.). All fencing (acoustic, privacy, etc.) shall be shown in General Plans, Siting and Lot Grading Plans and Composite Utility Plans. The acoustic fence shall be of heavy wood, solid with no gaps along its length and having a minimum face density of 20kg/m²(4 lb/ft²) or equivalent material accepted by the City of Markham' Director of Engineering.

Any access gates shall be of the same material as the acoustic fence and should seal reasonably, when closed.

INFILL RESIDENTIAL SITING & LOT GRADING PLAN

Infill residential development and construction are typically not governed by a current Subdivision/Construction Agreement. The objectives of infill residential siting and lot grading plan as follows:

- To ensure that positive storm drainage is achieved on infill sites according to the City of Markham's Standards
- To ensure that proposed lot grading and drainage plan will not adversely affect abutting properties or cause stormwater to accumulate around the proposed dwelling unit
- To ensure tree preservation is achieved as may be required

Siting & Lot Grading Design

Siting & Grading design for infill residential developments shall conform to the following:

- The existing and proposed elevations shall relate to a geodetic benchmark
- Lot grading shall be performed so as to preserve existing trees, where possible
- A 0.6m minimum undisturbed strip shall be maintained along all sides and rear property boundaries
- During infill construction, erosion/sediment/siltation control methods shall be undertaken around the lot perimeter to prevent erosion and sedimentation on adjacent properties
- Lot Grades shall be compatible with adjacent road grades, abutting properties and any proposed local improvements
- The capacity and alignment of boundary swales shall not adversely affect adjacent properties

- The builder must perform all necessary works to ensure that no surface drainage problems are created on or adjacent to private or public lands because of their development

Additional information to be shown on the Infill Siting & Lot Grading Plans shall include the following:

- Proposed culverts and curb cuts
- Existing and proposed elevations shall be indicated minimum 5m beyond property boundaries to illustrate the drainage of the lot in relation to the surrounding lands and buildings
- First floor elevations of adjacent units and adjacent land uses/grading

Certification of Final Lot Grading

The Owner shall be required to submit an "As-Constructed" land survey prepared by an Ontario Land Surveyor indicating both proposed and as-constructed elevations prior to the release of the Lot Grading Deposit. The Owner shall provide final lot grading certification from a licensed professional engineer / Landscape Architect / Ontario Land Surveyor (OLS), certifying that lot grading is in accordance with the accepted grading plans and function as designed, prior to release of the Lot Grading Deposit by the City of Markham. The Owner shall be responsible for notifying the City of Markham's Engineering Department upon completion of the final lot grading and all other construction to arrange for inspection and the release of the Lot Grading Deposit pertaining to lot grading.

RESIDENTIAL INFILL GRADING AND SERVICING (RIGS) PLAN REQUIREMENTS

- Title block (including address of property, name of Owner/Applicant, name and address of the engineering firm preparing the siting, lot grading and servicing plan, legal description of property, scale, date of submission, and revision box with all revision dates, Residential Infill Grading and Servicing (RIGS) Application number (after first submission).
- Plan is prepared and printed to metric scale 1:200 minimum on appropriate paper size

- Key plan showing site location in respect to the City of Markham street network
- North arrow
- Legend for existing and proposed information as required
- Clear identification of property lines and ROW limits, including any proposed road widening, sight triangles and 0.30m reserve blocks adjacent to the subject property, along with existing lot corner elevations
- Any easement(s) within the property and of whom the easements are in favor
- Abutting roads including the location of all existing surface features (walkways, edges of pavement and shoulders, curbs, traffic islands, utility poles and pedestals, transformers, streetlight poles, hydrants, bus shelters, mail boxes, sidewalks, watercourses, ditches, culverts, catch basins and embankments and overhead utilities)
- All existing access/driveway entrances to the subject property and the adjacent properties including widths and slopes as well as their building locations
- Existing and proposed buildings, structures, fences, trees and bushes, all above ground features, etc.
- All drawings stamped, signed, and dated.
- Digital seals must be of the same size and shape as original rubber stamp issued by the associated authority

Required Lot Grading Information.

- Geodetic survey datum derived from City of Markham benchmarks. City of Markham benchmark used must be identified on the Residential Infill Grading and Servicing (RIGS) plan - Contact City of Markham [Asset Management Department](#) – Mr. Benjamin Kihara at 905-477-7000 ext. 2657)
- Topographic Survey of existing elevations, features, trees, etc.
- Existing house boundary on the subject property and adjacent property(s).

- Existing spot elevations within the project site, minimum 5m outside the property boundaries, on abutting public streets, and at a minimum of 10m intervals within the property. Include the door step elevation and finished floor elevations of adjacent properties
- Existing spot elevations (every 10m) and slope gradients at all critical locations, including road centerlines; vehicle accesses and driveways; ramps; parking lots; edges of pavement, curb lines or sidewalks; swales; ditches; grassed areas within the ROW
- Identification of any existing swales, ditches, culverts (including size), creeks, watercourses, ravines, and drainage easements/routes complete with elevations, inverts and arrows indicating the surface drainage direction. Indicate on Residential Infill Grading and Servicing (RIGS) plan that new culverts are to be installed by owner at owner's expense under City of Markham supervision.
- Arrows indicating the direction of surface drainage on all proposed paved, granular, and grassed areas and the slope (between 2 - 5%)
- Must maintain a minimum 0.6m undisturbed strip around perimeter of the site wherever it abuts adjacent properties
- Proposed spot elevations at all high/low points of side yard swales, top and bottom of slopes, all changes in gradient, top and bottom of retaining walls (to be a minimum of 0.6m away from the property line), building corners, etc.
- Basement slab elevation(s), garage slab elevation(s), finished floor elevation of the ground floor and entrances to all buildings, as well as the elevations of any underside of footings and top of foundation elevation
- A minimum of 0.15m shall be provided between the highest lot grade adjacent to the house and the top of foundation wall
- Cross section details of swales, if different from the standard 0.15m depth with 3:1 slopes on both sides. Longitudinal slope of swale to be minimum 2%.

- Proposed roof downspout locations and direction of flow. Downspouts must be directed to the front or rear of the property and away from dwelling of neighbouring properties.
- Erosion and sediment/siltation control measures to be used during and after construction ([include standard drawing MP11](#)). Silt fence shall be placed at the limit of construction and not within the 0.6m undisturbed strip. Silt fence not required at locations where tree protection fence is required.
- Locations of any regulatory flood lines or development limit lines (i.e. setback and slope stability limits). Properties within the TRCA Regional Storm Limit, Engineering Floodline, or Screen Zone 166-06 require TRCA clearance prior to Residential Infill Grading and Servicing (RIGS) acceptance.
- For rural sites: location of septic tanks, outline of tile beds, wells, and holding tanks for fire-fighting shall be shown
- Proposed locations for all [tree protection zones \(TPZ\)](#), if applicable. Show tree protection fence at limit of tree protection zones TPZ. Residential Infill Grading and Servicing (RIGS) plan shall include Markham's [tree preservation standard drawing MP12](#), if applicable.
- Details on proposed vehicular entrances to the residence (including elevations at the garage and property line, driveway slope between 2-8%). Driveway elevation at property line must match existing elevation. Show limit of garage door opening. Identify the size of garage (1-, 2- or 3-car). Provide dimension of driveway apron. Ensure minimum offset of 1.2 m to boulevard furniture (light and utility poles, pedestals, transformers, hydrants, mailboxes, trees, bus shelters) in existing development along ROW to remain unchanged.
- Proposed curb locations and re-installation of curb. Indicate on Residential Infill Grading and Servicing (RIGS) plan that curb modifications are to be carried out by the City of Markham at the expense of the owner.

- [Catchbasin sediment trap standard detail MP5](#) if there are catch basins within 50m of site. Note on Residential Infill Grading and Servicing (RIGS) plan that catchbasins are to be fitted with sediment trap.
- Show location of temporary gravel access pad (mud mat) at entrance of house construction activities as per [standard drawing MP7](#). Include standard drawing MP7 on the Residential Infill Grading and Servicing (RIGS).

REQUIRED LOT SERVICING INFORMATION FOR RESIDENTIAL INFILL GRADING AND SERVICING (RIGS) PLAN

Existing and proposed above ground servicing infrastructure within the road allowance, including but not limited to the following: manholes, storm and sanitary sewers, watermains (include identification of all pipe material, diameter, slopes, direction of flow and manhole inverts), catchbasins, valve boxes and chambers, existing above and underground utility features within the boulevard, including but not limited to gas meters, light poles, hydro/Bell/Cable TV poles, pedestals, transformers, and all underground and overhead utility lines (hydro, gas, bell, cable). Plan and Profile Drawings and As-Built Drawings can be used as reference and requested from the Assessment Management Department on City of Markham's website.

Provide record of locates for existing utilities. Locate records to include sketches of all utilities and connections on both sides of the road within the frontage of the subject property. Requests for locates can be applied from Ontario One Call website. Alternatively, applicant may submit locate records prepared by qualified private consultants retained by the applicant.

Provide record of locates from City of Markham's Water Works Department for existing service connections. Locate records to include sketches of all service connections on both sides of the road within the frontage of the subject property, with tie-in distances, material and size of service connections. Locate requests via On1Call usually includes servicing locates from City of Markham Waterworks, but may not be as thorough. Applicants may submit requests via City of Markham's Contact Centre (905-477-7000 ext5530) or email to waterworks.locates@markham.ca.

Specify in request the purpose of locates is for Residential Infill Grading and Servicing (RIGS) Applications with the City Markham's Engineering Department.

Location and details of any existing service connections to City of Markham infrastructure and indication of whether they will be decommissioned. If the existing sanitary and/or storm service connections are proposed to be re-used, existing invert at property line must be obtained and shown, along with size and type of material. CCTV inspection video of the existing sanitary and/or storm service connection is also required to be submitted with the Residential Infill Grading and Servicing (RIGS) Application for condition assessment. Video inspection of existing municipal services is to be free of any structural or operational defects and in conjunction with the elevations at property line. The re-usability of the existing sanitary and storm service connections is determined at the sole discretion of the City of Markham.

- Proposed service connections, including the mainline invert and obvert, invert of service connection at property line, identification of pipe length from mainline to property line, material, diameter and slope. Invert of proposed service connection shall match the obvert of the existing mainline sewer.
- A minimum 2.5m horizontal offset between water service connections / hydrants and sanitary or storm service connections.
- Water box must be located outside the driveway
- A standard new residential water service connection is to be 25mm. For sizes larger than 25mm, a Hydraulic Report prepared by the Applicant's engineer demonstrating the need for the larger size connection must be submitted with the application. The necessity to install a new residential water service connection greater than 25mm is at the sole discretion of the City of Markham.
- Minimum 1.0m horizontal offset between proposed and existing service connections.
- A 0.5m horizontal separation between proposed storm and sanitary service connections in common trench.

- A storm service connection with sufficient frost cover must be provided if a storm sewer exists in the road. Storm connections shall not be connected to private or City of Markham catchbasins.
- A schematic detail drawing of sump and/or ejector pumps, if required, for storm and/or sanitary, respectively. An ejector pump must discharge into a sanitary service connection. Where there is no storm sewer in the road, the sump pump shall be discharged at grade at the rear of the house.

Once Engineering, Operations Roads, and Tree Preservation deem the plan acceptable, if service connection works are required, a Quotation to carry out the service connection works by a City of Markham Contractor will be sent to the Owner and Applicant. Payment for the service connection works must be made to the City of Markham prior to issuance of Final Residential Infill Grading and Servicing (RIGS) Acceptance.

The Owner and/or Applicant will receive two email notifications:

- a. A Residential Infill Grading and Servicing RIGS accepted email with a copy of Accepted Plan attached.
- b. A Residential Infill Grading and Servicing RIGS Undertaking Deposit email with a copy of the Undertaking Document attached.

The Final Residential Infill Grading and Servicing RIGS Acceptance and payment of the Lot Grading Undertaking Deposit are required prior to issuance of Building Permit by the City of Markham. For more details regarding Building Permit Applications, please contact the City of Markham's Building Standards Department.

If revision to the grading and servicing design are required after the Final Residential Infill Grading and Servicing RIGS Acceptance is issued, a re-submission is required for review and re-acceptance. A review fee is required by the City of Markham upon submission of the revised plan.

The City of Markham's Service Connection Installation Contract is awarded using an Open Tender Process managed by the City of Markham's Procurement Department. All qualified contractors are eligible to bid. The contract is awarded to the lowest bidder.

The Service Connection works to be carried out by the City of Markham Contractor include installation of new service connections from the mainline in the road up to the front property line, disconnection of existing service connections, and all related restoration works.

Upon receipt of the Service Connection payment, the works are scheduled and prioritized based on the Residential Infill Grading and Servicing RIGS Acceptance Date.

The Construction Season of service connection works takes place between May 1st and October 31st of each year. Any work that is not completed prior to the end of the Construction Season is to be complete in the following year. Upon receipt of payment, the installation of services will be completed in 10-12 weeks.

The City of Markham will contact the homeowner, or representative, prior to installation advising of the approximate installation date.

Preliminary works to prepare for construction begins immediately after payment is received. If the homeowner wishes to postpone the works, the homeowner must contact the City of Markham's Engineering Department in writing. The cost of any preliminary works completed prior to the homeowner's notification to postpone work is to be paid for by the homeowner. Please note that a Demolition (or Building) Permit must be obtained from the City of Markham prior to start of any service connection works.

Quotations for service connection works expire at the end of each construction season. Adjustment in cost may apply if work is postponed past the said construction season.

Hook up of service connections from the private side of the property to the public service connections at streetline is to be carried out by the homeowner's contractor under the supervision of the City of Markham's Buildings Department Inspector. The homeowner's contractor shall have the service connections installed from the house to the streetline, ready for hook up, prior to contacting the City of Markham for supervision of the hook up.

When a new water meter is required, the homeowner shall contact City of Markham Waterworks - Mario Rogue 905-477-7000 Ext. 2053.

For any further information please contact

Edgar Labuac, P.Eng

Principal Municipal Engineer

Joo Min Park, M.Eng

Senior Municipal Engineer

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