H1 GENERAL REQUIREMENTS

The following is an outline of procedures and requirements for preparation and submission of Grading Plans, Site Alteration Plans (Erosion and Sediment Control Plans), Site Servicing Plans (Engineering Drawings) and Stormwater Management Report to the Engineering Department prior to the issuance of a Building Permit. Depending on the complexity of the site Storm Drainage Plans may also be required.

Engineering Drawings shall be prepared to the satisfaction of the Director of Engineering to show the location of all underground and aboveground services/utilities, including watermains, sanitary and storm sewers, hydro, telecommunications, gas, etc., together with the location of all roadways, sidewalks and boulevards, etc. certified and stamped by a registered Professional Engineer of the Province of Ontario.

Driveways/entrances shall not be considered to form any part of the required parking.

Paved parking lots may be light duty asphalt. Fire routes, entrances and truck routes shall be heavy duty asphalt. Geotechnical report shall confirm the required pavement structure specifications in all cases.

Designated fire access routes shall be provided throughout the development to the standards and satisfaction of the Fire Department and in accordance with good engineering practice.

Waste collection areas shall be provided throughout the development so that the waste haulers' vehicles can enter the development and collect waste efficiently and safely.

For buildings with an underground structure, Hydrogeological and Geotechnical Reports shall be submitted to the Director of Engineering to determine the groundwater level and if temporary dewatering for construction and permanent dewatering after building construction are required.

The City has a mandate from the Region of York not to allow dewatering discharge in sanitary sewers. Dewatering discharge to City's storm sewers may be allowed subject to acceptance by the relevant authorities having jurisdictions (City, TRCA, MNR, MECP, etc.) and capacity confirmation to accommodate the proposed discharge. A 'Permit to Take Water' (PTTW), if applicable, shall be required from MECP prior to any construction. For temporary or permanent dewatering requirements, refer to Section E11.

Any temporary or permanent encroachment, including but not limited to shoring, hording, dewatering, equipment etc., onto the City's ROW or City owned lands shall require a detailed plan to show the proposed encroachment and all proposed and existing watermains, storm and sanitary sewers and underground utilities within the ROW. An encroachment agreement shall also be required.

H2 SITE SERVICING DESIGN

H2.1 Watermains, Storm and Sanitary Sewers, Drains and Appurtenances

Watermains, storm and sanitary sewers, drains and appurtenances shall be designed and constructed in accordance with the Engineering Standards, Ontario Building Code and in accordance with appropriate Municipal By-laws.

Trench backfill for the watermains, storm and sanitary sewer and drain installations shall consist of native or granular material, as approved by the Geotechnical Engineer, free of organics and contaminants, placed and compacted in lifts as required to achieve a minimum compaction of 95% of the Standard Proctor Density or as required by the Geotechnical Engineer.
Watermains and storm and sanitary sewers shall not be constructed under any building/structure except in special circumstances as permitted in the Ontario Building Code.

If a bulk water meter is required, it shall be located in a chamber of appropriate size upstream from the property line valve and shall include provision for a conduit and post for installation of a remote meter reader.

H2.2 City's Facility ID Numbers

Prior to the 1st Engineering Drawings submission, the Consulting Engineer shall request the City for City's Facility ID numbers (only for external and control manholes and not for private ones) and include the same in all Engineering Drawings and Design Sheets, for the following:

- Sanitary Manholes (including Control MHs at the property line)
- Storm Manholes (including Control MHs at the property line)
- Hydrants (except within a site plan)
- Valves (including valves in chambers but excluding V&B at the property line)
- Chambers

H3 DRAWING REQUIREMENTS

H3.1 General

The Applicant shall submit full sets of Grading Plans, Site Alteration Plans and Site Servicing Plans (plus Storm Drainage Plans, if required) including all other related drawings and Stormwater Management Report through ePLAN to the City for review and acceptance.
All Engineering Drawings shall:

- Be prepared in metric scale
- Be drawn to a minimum scale of 1 : 500
- Indicate existing underground and aboveground utilities and trees across the frontage of site
- Be consistently detailed among the Grading Plan, Site Alteration Plan and the Site Servicing Plan in terms of elevations, building and servicing/utility locations
- Be folded to 200 mm x 300 mm size with the title blocks visible

All Engineering Drawings shall include the following:

- Key plan, north arrow and legend
- Street name and number, lot number and registered plan number
- City's Standard signature block
- All related City standard digital stamps
- Widths of driveways and size of curb radii being provided at the street
- Any easement widths and pipe offsets

H3.2 Grading and Storm Drainage Plans Requirements

The Grading Plans shall include the following information:

The location and elevation of the City of Markham bench mark shall be noted on the plan and based on the City's Geodetic Bench Mark systems:

- Indicate existing and proposed grades in the legend and the drawings
- Boulevard grades shall be 2% minimum and 4% maximum
- Asphalt grades shall be 2% minimum and 8% maximum

- Ramp to underground garage shall be 15% maximum
- Landscaped area and berms grades shall be 1% minimum and 3 (horizontal): 1 (vertical) maximum slope grade
- Cross-sections as required to clarify the proposed grading, particularly in relation to the adjacent lands

Entrance Access Requirements:

- Entrance/driveway grades shall be 2% minimum to 8% maximum (as per OBC fire route requirements)
- All entrance curve radii and curb cut shall be dimensioned and shall conform to the City's Curb Cut By-law 158-93 and Engineering Standards
- All existing driveways adjacent or across the street shall be shown

The following elevations shall be shown on the Grading Plans:

- Building first floor
- Existing road centre line at 30 m intervals and corresponding elevations at property line
- Existing and proposed grades shall be indicated at the corners of the site and at 20 m intervals, along the street lines and on adjacent lands sufficient to indicate the effect of the proposal on adjacent lands
- Any elevations necessary to determine the grading and drainage patterns
- Top of curb on fronting street
- Top of catchbasin and manholes
- Drainage swales
- Lowest basement elevation for underground parking garage

Storm Drainage and Grading Requirements:

- The proposed drainage of a site shall not adversely affect the drainage of the abutting lands as well as the subject property
- An on-site stormwater management system is required for all sites
- Grading of the site shall be such that the perimeter elevations are compatible with those of the adjacent lands
- The site drainage shall be self-contained and the proposed elevations along all property lines shall be compatible with the existing or proposed elevations
- All existing ground elevations for 5 m to 10 m outside of the property line at 20 m intervals shall be shown on the plan to illustrate the direction of drainage on the adjacent lands

H3.3 Retaining Walls Requirements

Refer to Design Criteria (F2.7) for details regarding retaining walls requirements.

H3.4 Site Servicing Plan Requirements

The Site Servicing Plan shall include the following information:

- Submit design sheets to verify sanitary and storm sewers capacity for the site
- All underground engineering services such as sanitary and storm sewers, watermains and their appurtenances
- Sanitary and storm sewers shall show sewer lengths, sizes, slopes, direction of the flow and manhole numbers including pipe material, class and bedding type
- All catchbasins and manholes shall show top and invert elevations including size and OPSD

- All sewer and watermain pipe crossings shall show crossing elevations
- Minimum ground cover on pipes shall be 1.2 m from pipe obvert
- Pipe shall be insulated where cover is less than 1.2 m from the pipe obvert to the top of the grade
- Only one City water meter is permitted per property or as accepted by the Waterworks Department
- Install watertight sanitary manhole covers when located within a ponding area or overland flow route
- Consulting Engineer shall contact Fire Department for fire routes, hydrants and Siamese location at the Site Plan application stage
- Show all underground utilities within the boulevard
- Only one sanitary control manhole is permitted per property unless otherwise accepted by the Director of Engineering
- Only one storm control manhole is permitted per property unless otherwise accepted by the Director of Engineering

H3.5 Service Connections within the Regional or the City ROW

- Provide inspection manhole where sanitary or storm sewers intersects the ROW or easement line. All inspection manholes shall have City's assigned numbers provided by the Engineering Department
- Minimum storm sewer connection on ROW is 300 mm diameter
- Minimum sanitary sewer connection on ROW is 200 mm diameter
- Water service connection shall be in accordance with the Engineering Standards. All valve and chamber manholes shall have City's assigned numbers provided by the Engineering Department
- Ensure that buildings located on separate properties are connected to the public sewers and watermain separately as per the building code requirement
- Ensure restoration details and notes are provided on the plan
- A profile shall be provided for service connections within the ROW
- All relevant details within the profile are required such as:
  - property line location
  - existing and proposed grades
  - utility locations and depth
  - curb location
  - all existing services
  - connection details including invert at the connection
  - road centre line
  - for connections to a manhole, a benching detail is required, size of manhole and the size of all pipes connecting to the manhole
- In rural cross sections, the minimum depth of cover for service/hydrant connections shall be measured from the top of connection to the bottom of the ditch. If a service connection is crossing a ditch, provide a cross section of the proposed connection to the City mains to ensure that there is no risk of frost damage to the service connections.

H3.6 Connection to Existing Mainline Sewer

- Factory-made tees or wyes, strap-on-saddles or other approved saddles should be used for the service connection to the main sewer.
- When the service has a size greater than half the diameter of the mainline sewer, for example, 300mm service into 500 mm sewer, a maintenance hole must be installed at the intersection of the service connection and sewer on the mainline sewer.

- If the service connection diameter is less than or equal to half the diameter of the mainline sewer and the invert of the service connection is above the spring line of the main sewer, then no maintenance hole is required.

Exceptions:
- In the case of a 150 mm service connection to a 250mm mainline sewer, if a manufactured tee is installed and the invert of the service connection is above the spring line of the main sewer, a maintenance hole is not required.
- A 100 mm, diameter service connection will be permitted to an existing 200 mm diameter mainline sewer with the strap and saddle.

H3.7 Stormwater Management Drawings

Ensure drawing shows implementation of all proposed drainage elements as detailed in the report and shall include the following:

- Sub-catchment boundaries for major and minor systems
- 100-Year surface ponding elevation and contour shall be shown on the drawings.
- Spill point location and elevation (where flow spills offsite) for 100-Year and greater than 100-Year storm events flows and emergency spillways flows
- Sub-catchment runoff or impervious coefficient
- Required and provided storage volume for detention of storm runoff
- Parking lot or landscaping storage area and elevations for 100-Year storm
- Complete direction of overland flow path
- Supporting calculations and drawing details
- Show details of orifice control pipe and control manhole. Refer to City's Standards.
- Accepted Oil/Grit Separator (OGS) such as Stormceptor, Vortechs Storm Treatment System and CDS units shall be located upstream of the property line control manhole and downstream of flow control manhole

H3.8 Site Alteration Plans

- Preparation of Site Alteration Plans shall follow the requirements specified in Section L (Site Alterations)
- Ensure the erosion and sediment controls measures details are shown on the plans in accordance with the Engineering Standards
- Depending on the complexity of the site, an Erosion and Sediment Control report may also be required

H4 STORMWATER MANAGEMENT REPORT

H4.1 General

- Stormwater Management Report shall be submitted for all industrial, commercial and residential/condominium developments in accordance with the City of Markham's "Stormwater Management Guidelines"
- The Modified Rational Formula is a preferred method for Stormwater Management design. Computations of storage and flows using VISUAL OTTHYMO, SWM HYMO and MIDUSS models are acceptable. Refer to Submission Requirements for SWM reports in Stormwater Management Guidelines (Annex 2)
- The Consulting Engineering shall confirm with the Engineering Department for the total property allowable stormwater release rate

- The City to confirm site allowable release rate to be based on 2-Year, 5-Year, or as per the Subdivision stormwater drainage requirements
- Sewer design sheets shall be accompanied with the site plan submission for sites over one (1) hectare
- Report shall identify drainage structures and their capacity (such as swales) located on the flow path of major system flows
- Sizing calculations and figures for Oil/Grit Separation (OGS) shall be provided in the report and the drawings
- The SWM report shall be signed, dated and stamped by a Professional Engineer registered in Ontario

H4.2 Stormwater Quality Control Requirements

- Stormwater quality control shall be provided in accordance with the City of Markham's "Stormwater Management Guidelines". Ensure on-site water quality control measures are addressed in the report and details shown on the plans
- Accepted Oil/Grit Separator (OGS) such as Stormceptor, Vortechs Storm Treatment System and CDS units shall be located upstream of the property line control manhole and downstream of flow control manhole

H4.3 Stormwater Quantity Requirements

- The site shall be designed for 100-Year storm event
- No Inlet Control Devices (ICD) are allowed on-site except one at the control manhole
- On-site SWM control shall use orifice pipe, surface and ground storage and roof-top storage, if applicable
- On-site controls shall be provided using restrictor pipes (orifice tubes) at flow control manhole close to the property line control manhole only
- Minimum orifice control pipe shall be 100 mm diameter
- Foundation drains for buildings with basements shall **not** be connected to storm sewers with stormwater management control and/or with elevated Hydraulic Grade Line (HGL). In such cases, foundation drains shall be connected to storm sewers without stormwater management controls or pumped to the surface
- Ponding is not allowed on top of an underground parking structure
- Finished first floor elevation(s) shall be shown on the plan and shall be a minimum 300 mm higher than maximum surface ponding depth
- Ensure ponding depth areas are shown on the Grading Plan and shall not exceed the following City's criteria:
  - maximum 250 mm at parking area
  - maximum 500 mm at loading dock
  - maximum 150 mm on roofs
- Report shall identify all external drainage areas under existing and future development conditions and their impact on the storm drainage system proposed on the subject site
- Hydraulic calculations and detail of orifice control pipe (orifice tube shall be 1.0 m long and shall have a discharge coefficient of 0.82) shall be provided in the Report. If the orifice tube length is over 1.0 m, then the discharge coefficient shall be calculated using the discharge coefficient formula given in "Handbook of Hydraulics" by Brater et al.
- A summary table of all relevant information, $Q_{allowable}$ versus Q_{actual}, storage required versus storage provided, orifice size, orifice invert and 100-Year high water elevations shall be provided in the report
- A statement shall be included in the report, confirming that there are no impacts to footing sub-drains from potential surcharging of the minor system and the overland flow route will not impact the building first floor elevation

- Roof Stormwater Management Design Requirements
  - Minimum roof release shall be 42 l/s/ha or per specific site design requirements acceptable to the Director of Engineering
  - Type of roof control devices, commercial specifications and maximum release rate
  - Depth and volume of ponding at roof hoppers

H5 PAVING REQUIREMENTS

All types of site plan applications, including urban and rural, new and infill areas, parking lot upgrades and building additions, are generally required to be asphalt paved or interlocking stone pavers, with poured concrete curb and gutter, in consideration of the following factors:

- Nuisance to adjacent properties due to noise and dust raising
- Acceptable property standards
- Drainage and runoff in accordance with good engineering practice
- Storm water quantity and quality treatment requirements

Other types of surface treatments, such as recycled asphalt, may be considered at the discretion of the Director of Engineering in areas which are:

- Solely industrial
- For temporary parking purposes
- Located where infiltration is a factor
- Are determined not to be subject to the factors listed above

H6 DRIVE-THROUGH REQUIREMENTS

Providing adequate stacking lanes is a critical element of avoiding on-site circulation and safety issues. Stacking lanes shall be designed to achieve maximum efficiency of the functioning of the stacking lane as well as the overall site.

Drive-through restaurant facilities require more spaces than others, such as financial institutions.

Drive-through on proposed site plans shall be designed to avoid any impact upon vehicle movements on adjacent municipal roadways and in accordance with the following stacking requirements, unless otherwise determined by a queuing study:

- For restaurants, a minimum total of 10 vehicle stacking spaces
- For financial institutions and pharmacies, a minimum total of four (4) vehicle stacking spaces
- Stacking lanes shall be linear and straight as far as possible
- Where appropriate, provide an escape lane
- Provide satisfactory on-site vehicle movements with adequate turning radii and avoidance of conflicts with parking or through vehicle movements
- Provide for safe pedestrian movements, avoiding conflicts

These are the minimum requirements only. The Applicant is responsible to identify and accommodate higher stacking needs on-site according to a particular drive-through operator's requirements. Drive-through shall also be designed to address the above requirements to the satisfaction of the Director of Engineering.