Design Guidelines for Development Site Servicing Plans

TERMS OF USE

The 2014 *Design Guidelines for Development Site Servicing Plans* is made available for use in the City of Calgary effective as of the date below.

January 1st, 2015

It is intended to provide information to architects, engineers, contractors and developers who require knowledge of the design requirements for Development Site Servicing Plans (DSSPs).

It is important to recognize that DSSP approval does not constitute Development Permit (DP) approval. Clearance by the City of Calgary reviewers is only one requirement within the overall DP and as such the approval of the DSSP must ***not*** be construed as a clearance to commence work on a project. Final Approval and Building Permit (BP) issuance will be given by Development & Building Approvals (DBA).

The manual does not attempt to set rigid solutions to particular design problems but rather provides a guide to the City of Calgary's design requirements by indicating the business unit standards which will apply. Where questionable or complicated design situations arise, engineering judgement should prevail and it is the responsibility of the applicant to confirm the applicability of any or all of the business unit conditions with the appropriate City staff. The manual should be used in conjunction with the various Engineering and City of Calgary Standards and Specifications for roads, water, sanitary, and storm infrastructure construction.

The manual incorporates metric standards. When designing in metric the following point must be remembered:

- All elevations in metric are **GEODETIC DATUM**. When an elevation is converted from imperial datum to metric datum **35.56 feet** must be added to the imperial elevation (City Datum) prior to multiplying by 0.3048 to convert to the metric elevation (Geodetic Datum).

Where reference is made to City By-laws, policies, standards, specifications, etc. the most current version, during the development process, is to be used.

It is our hope that this manual will become a useful tool for the construction industry.

Preface:

Reference is made to various divisions of the Utilities & Environmental Protection and Development & Building Approvals departments throughout the "Design Guidelines for Development Site Servicing Plans". To familiarize the developer with the various Divisions, a list of these departments with typical contacts is provided below.

Utilities & Environmental Protection

Estimators	
Roads	
Environmental & Safety Management	
Waste & Recycling Services	
Infrastructure & Asset Management	
Team Leader	(403) 268-8491
Water Services	
Inspections	(403) 268-5006
Water Resources	
Reception	(403) 268-5721
Cross Connection Control	(403) 268-2706
Erosion and Sediment Control	
Erosion Control Coordinator	(403) 268-2655
Development Approvals	
Team Leader	(403) 268-2855

Development & Building Approvals

Planning	
Building Regulations	
Plumbing & Gas	(403) 268-2138
Urban Development	
Development Site Servicing	DevelopmentServicing2@calgary.ca

Community Services & Protective Services

Fire Prevention Bureau	
Technical Services Officer	(403) 863-6876

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1 General

The Building Permit (BP) approval system within the City of Calgary requires a review of a Development Site Servicing Plan (DSSP) for all proposed developments where the existing water service, metering, or on-site sewers will be changed. It is also required in situations where the proposed development will increase the stormwater release from site or where there are significant changes to the site grading. These changes must be reviewed by the Utility and Environment Protection Department. The prime reason is to ensure that any new or altered utility service systems are designed and installed to meet the requirements of all applicable codes and design standards. As the locations and elevations of both the buildings and utilities are critical to the success and function of the project, it is imperative that approval from Water Resources be obtained prior to the release of any permits.

Water Resources, Development Approvals Department provides quality assurance for the design of the Water, Sanitary and Storm systems, ensuring developments of all kinds meet or exceed the City's design requirements. This process involves working with Urban Development to review Development Permit (DP) applications and DSSP Circulations. Development Approvals also reviews Stormwater Management Reports (SWMR) that support these developments to ensure that the design of the overland flow system will meet current standards.

For links to various bylaws, standards, and guidelines see Appendix 'C'. Please note that the most up-to-date regulations shall prevail.

The approval of the project's DSSP is only one element of the BP approval process. This approval must not be construed as a clearance to commence work on a project. The final approval and BP is issued by the Development & Building Approvals Department.

1.1 DSSP Requirements

DSSPs are to be submitted to the City of Calgary, Development Servicing Section. Prior to submission of the DSSP the Developer must have an approved DP. Some DPs will also require a stamped Fire Prevention plan and/or an approved SWMR prior to DSSP submission.

A high level of quality assurance by the developer's consultant is important to the plan circulation process to ensure submission acceptance and help minimize review times.

The Development Servicing Section will review all legal information and service connection inverts within the public Right-of-way (ROW). The plans are then circulated to specialists in Water Resources for their review and comment on the plans, approving or rejecting the application. The specialist may at their discretion, request any additional information to be supplied which may be necessary to check the proposed work. The amount of information required will depend on the complexity of the project and the area topography. All plans should be legible and drawn to a suitable scale to qualify for circulation.

The Development Servicing Technician is not responsible for grades or inverts for connections being made in subdivisions which are not under City control (subdivisions for which Final Acceptance Certificates have not been issued). This information must be obtained from the consultant responsible for the subdivision design.

Grade slips will be issued from the Development Servicing section shortly after plans have completed the Engineering Circulation and have been stamped "Approved". In no case shall City Surveyors set grades for a project until approval has been granted and the Grade Fee has been paid (where applicable). DSSP submission fee's are indicated in the Utility Site Servicing Bylaw which is linked in Appendix 'B'.

All DSSP's must comply with these guidelines and also any other relevant City of Calgary Bylaws, Guidelines, and Specifications, as well as any relevant Provincial safety regulations.

1.2 DSSP Complete Application Requirement List (CARL)

The DSSP CARL outlines all of the information necessary to evaluate and provide a timely decision on your application.

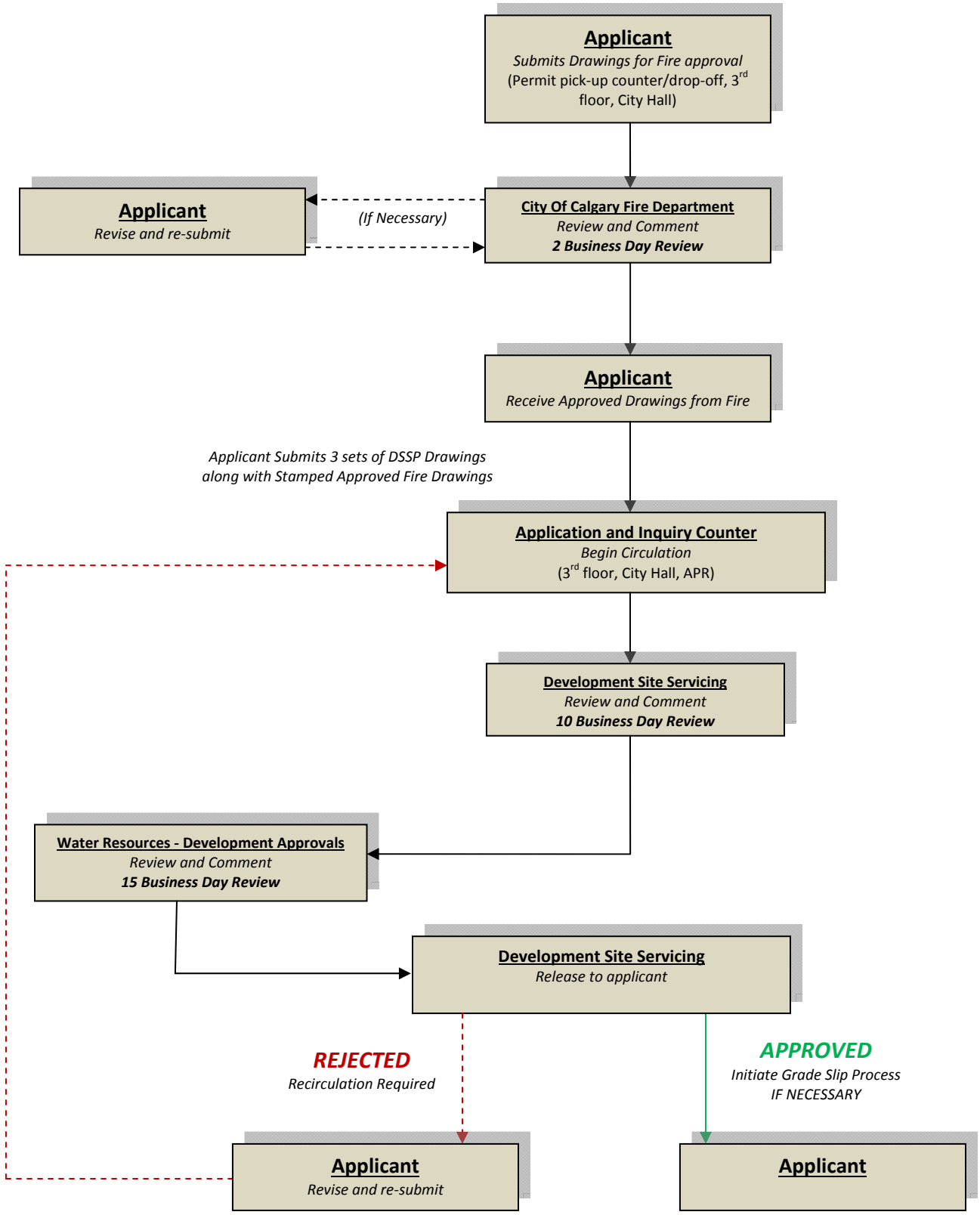
Only applications that are complete will be accepted. Applications and materials submitted must be clear, legible and precise. Plans submitted should be to a professional drafting standard. We are currently unable to accept digital applications.

On the DSSP CARL that must be submitted with all applications, please identify and provide justification for items that do not comply with Council approved policies, bylaw standards, or technical guidelines. Attach a separate sheet, if necessary to explain.

For the current edition of the DSSP CARL refer to the Urban Development Publications library on the City of Calgary Website.

http://www.calgary.ca/PDA/pd/Pages/Urban-Development/Urban-Development-publications.aspx

1.3 DSSP Mechanical Drawings – Circulation Chart



1.4 Circulation Block

As of January 1, 2013 every submission will require the following Circulation Block to be included on the front sheet of all DSSP submissions. The block template is available on the Urban Development website for download.

CITY OF CALGARY DEVELOPMENT SITE SERVICING PLAN			
Date Received _____			
CIRCULATION TO:		INITIAL	DATE
DEVELOPMENT SERVICING			
WATER RESOURCES			

IT IS THE RESPONSIBILITY OF THE CONSULTANT TO LOCATE AND IDENTIFY ANY CONFLICTS INTERFERING WITH SERVICE CONNECTIONS. THE CITY OF CALGARY IS NOT RESPONSIBLE FOR DELAYS OR COSTS INCURRED AS A RESULT OF ANY UNIDENTIFED OBSTRUCTIONS.

ALL INFORMATION MARKED ON THE SITE SERVICING PLANS MUST BE INCLUDED ON ANY RESUBMISSIONS OR THE PLANS WILL BE REJECTED

IT IS THE OWNER'S RESPONSIBILITY TO CHECK PERIMETER GRADES TO INSURE COMPATIBILITY OF ADJACENT PROPERTIES

1.5 Small Format Review

After acceptance of a DSSP and during deep service installation a stop in construction may occur due to field conditions generating a change in the design. In such a circumstance submission of a Small Format Review may be considered. This process allows construction to continue on the site simultaneous to the review of the proposed design change.

The Small Format Review must be initiated by the applicant if both of the following conditions have been met:

a) Inspection fees for the parcel have been paid for
b) An initial inspection appointment has been booked though a development servicing technician.

In either case, the change in design must then be pre-discussed with the Water Resources file manager. Only at this stage will the small format submission be allowed.

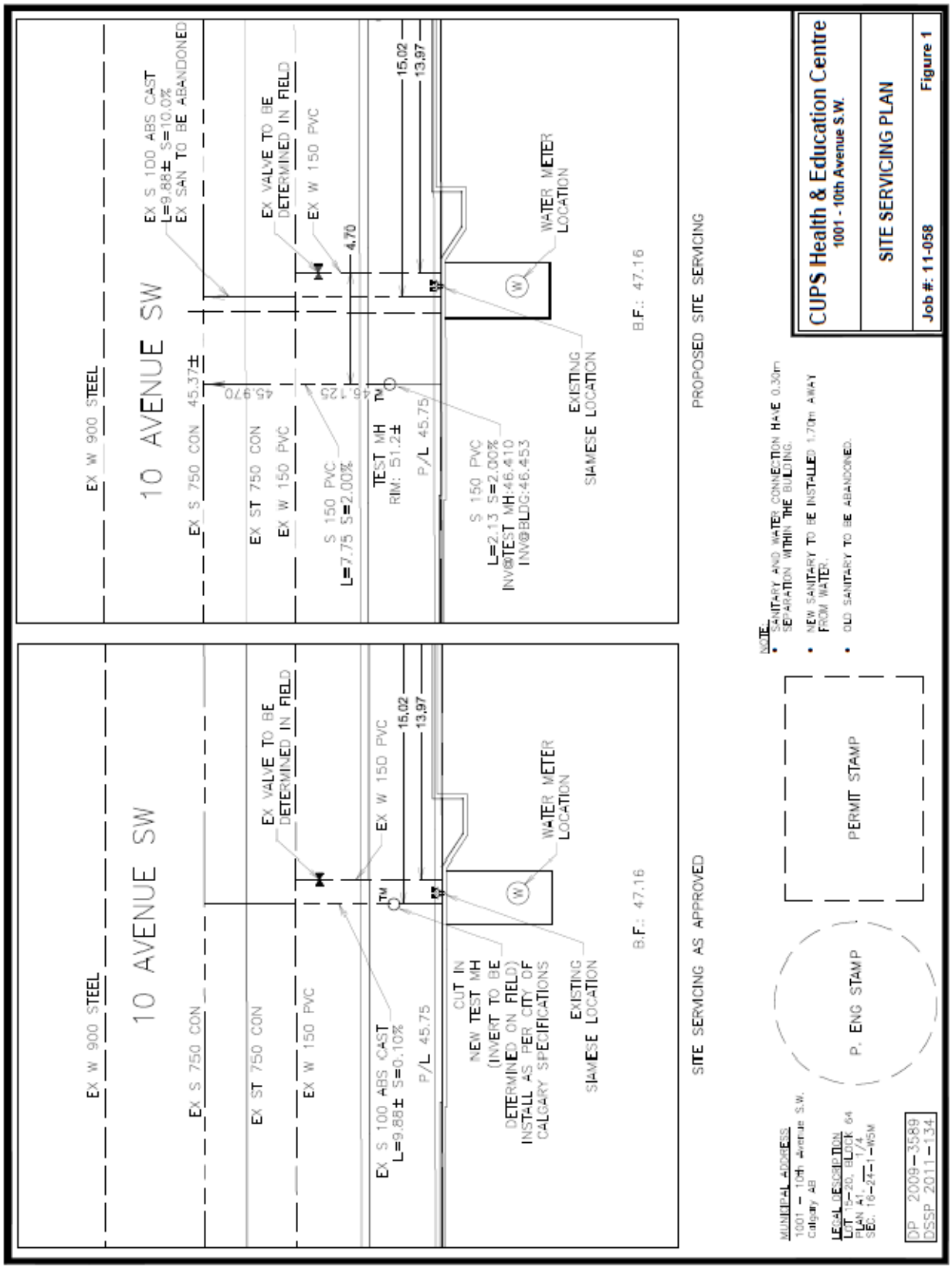
A Small Format Review must meet ALL of the criteria stated below:

- Be scaled and readable on 8 ½ x 11" sized paper
- Show previously approved design as well as proposed changes
- Able to be scaled
- Be stamped by a Professional Engineer
- Show the Municipal Address
- Show the legal information including the section number
- Show the DSSP circulation number

The change must be submitted in person complete with all relevant information to the DSSP counter. Small Formats are considered a full review and subject to the appropriate fees. A maximum of 3 consecutive small reviews will be allowed. After which time a complete submission showing all previous changes must occur.
No further reviews are allowed once inspections on a site are complete and the file has been closed. Any revisions to a site after this time must be completed as a new DSSP submission.

Refer to the Figure 1 on the next page for an example of a typical small format revision drawing.

Figure 1: Typical Small Format Revision Drawing



2 Drafting Standards

2.1 Drafting Requirements

For standard line weights, line types, symbols, abbreviations, etc. refer to the current edition of the “Standard Block Profile Specifications for CAD and Manual Formats”.

2.2 Drawing Requirements

a) Development Site Servicing Plan submissions must include three (3) copies of the full drawing set including:

    a. Title blocks.
    b. Plans that are to metric scale, minimum 1:100 (Maximum 1:1000), all elevations
    c. A north arrow on the right side of the page that points to the top or left of the page.
    d. The size of the parcel (Ha).
    e. All elements of the plan labelled as existing or proposed.
    f. The municipal address (i.e.: street address) and legal description (i.e.: plan/block/lot).
    g. Uses, project name, applicant name and contact information.
    h. The name of the consultant and an original signed professional engineer’s stamp and legible permit to practice number.
    i. Clear of any previous approval stamps and/or notations.
    j. A relevant DP number and any previous DSSP numbers for the site indicated on the coversheet.

b) All plans must be sorted into sets and shall be:

    a. Rolled and not folded.
    b. Stapled together, NOT bound by tape.
    c. On the same sized paper.
    d. Clear and legible with no colours.
    e. No larger than the maximum drawing size of 0.600m x 0.900m.

Try to maintain the following drawing order; Sheet 1 = Site Plan, Sheet 2 = Grading Plan, Sheet 3 = Stormwater Management Plan, and Sheet 4 = Details. Where more drawings are required, ensure the first sheet is always the site plan.

2.3 Required Details

a) Ensure the following required information is provided on all plans:

    a. Dimensioned property lines:
        i. Indicate elevations at back of sidewalk – at property line corners and VPIs
        ii. Indicate lane grade design elevations – at property line corners and VPIs
    b. Adjacent to parcel:
        i. City streets – Label street names

ii. Sidewalks – City and public paths (Regional Pathway System)
iii. Curb cuts – Medians and breaks in medians
iv. Road widening setbacks and corner cuts – dimensioned and labelled

c. Easements, Utility Rights-of-Way, etc:
i. Dimension (width and location)
ii. Label type of easement and registration number

b) Show all utilities on and adjoining the parcel (deep, shallow and overhead):
a. Water, storm and sanitary sewer
i. locations and full dimensions for mains, services, manholes, catch basins, hydrants and valves to property lines, buildings, and other utilities
ii. show pipe size, type, class, material, length, slope, and bedding material
iii. pipe inverts and rim elevations at all manholes and catch basins
iv. proposed sanitary/storm inverts at property lines and buildings
v. horizontal and vertical clearances at all utility crossings
vi. locations of sanitary test manholes with details of easement if located on private property, if applicable
vii. pipe capacity for large developments
b. Gas
c. Electrical (poles, fixtures, guy wires/pole anchors, transformer boxes, etc.)
d. Cable, telephone

c) Indicate the location of all:
a. Retaining walls and fences.
b. Landscaping, berms, swales, slopes and other physical features which could affect utility servicing both on the site and adjoining boulevards.

d) If trees are existing on public lands adjacent to the site:
a. Specify species and diameter of each tree
b. Location of the centre point of the trunk of each tree
c. Is tree is to be retained or removed? (At owner's expense)

e) Water servicing:
a. Location of on-site water meter (indicated by M)
b. Total residential unit count
c. Complete water meter details including all internal pipes at the meter, pressure reducing valves, backflow prevention devices, valves, and anchor details for master control valve (if applicable)
d. Irrigation meter details
e. Pipe support details

f) Surface Drainage:
a. Plot existing and proposed surface grades along property lines and on site
b. Drainage pattern indicated by boundary lines and arrows
c. Storm drainage calculations including discharge to minor systems, ponding, and catchment boundaries
d. Location and elevation of emergency escape routes
e. ICD and HYDROVEX details (include all HYDROVEX details with application)

   f. Stormwater features such as storm ponds, trap lows, ICDs, oil/grit separators, BMPs, or Low Impact Development Practices

g) Floodway, Flood Fringe and Overflow:
   a. Show Floodway/Flood Fringe/Overland Flow Zone lines on the plans complete with all step elevations and labels
   b. Dimension distance to buildings and structures

h) Outline and dimension buildings:
   a. Detached buildings and structures (sheds, garages, etc.)
   b. Main floor elevations
   c. Principal entrance to building

i) Driveways & parking areas:
   a. Label surface material
   b. Label curb cuts to be removed and rehabilitated
   c. Major grade changes and ramps

3 Servicing

3.1 Approvals

A contractor must be issued a copy of an engineer-stamped drawing, which has been authenticated and approved by The City prior to installation of any sewer or water service pipes or construction of any drainage features.

3.2 Regulatory Documents

a) Installation of sewer and water pipes shall, in all cases, follow the requirements and guidelines as contained in this manual and in the Current Editions of:
   - City of Calgary Bylaws,
   - The National Plumbing Code of Canada,
   - Standard Specifications: Waterworks Construction,
   - Standard Specifications: Sewer Construction,
   - Design Guidelines for Subdivision Servicing,
   - Stormwater Management & Design Manual, and
   - Any relevant Provincial regulations.

   Links are provided in Appendix ‘C’ for these regulatory documents and other relevant reference materials.

3.3 Developer and Representatives' Responsibilities

The developer or his representative is responsible to ensure that the location for the service pipes do not conflict with power poles, pole anchors, transformers, trees, catch basins, underground chambers or other facilities which may exist within the public right-of-way. No service connections shall be granted where such obstructions exist

3.4 Developer Controlled Subdivision

Contact the Area Developer for all sewer and water service pipe installations in the public rights-of-way, which are in a developer controlled subdivision, for which Final Acceptance Certificates have not been granted. Installations shall be done in full accordance with current City of Calgary "Standard Specifications Waterworks Construction", "Standard Specifications Sewer Construction", and the “Stormwater Management Design Manual”. Any such installations shall be carried out only under the supervision of a City Inspector.

3.5 New Service Quotation

Service connection quotations are prepared from approved Development Site Servicing Plans (DSSP) by an Indemnified Contractor for all projects. A copy of the most recently Approved Indemnified Contractors can be found by contacting Inspection Services at (403) 268-1203.

3.6 Service Connections

a) All new service connections are at developer's expense.

b) Once the private service pipe has been installed to the property line in accordance with the approved Development Site Servicing Plan and Building Grade Slip (and all other requirements), the developer or a contractor must contact an Indemnified Contractor to request the installation of the City portion of the service pipe.

3.7 Setting Service Inverts at Property Line

When setting the service connection inverts at the property line;

- Determine invert elevation of the main
- Match crowns of pipe or add 0.06m whichever is greater
- Determine the distance from the main to property line and calculate the rise in elevation required from the minimum slope table
- Add vertical increase based on slope of pipe
- Add 0.15m to grade at property line to allow for 'construction and datum error'
- Allow more grade if there is a possible conflict with other utilities.
- Some sanitary sewers require a test manhole. These are usually noted on the Development Site Servicing Plan circulation by the architect or by Water Resources technicians. A minimum 150 millimetres drop is required through a test manhole. Because the test manhole is usually set outside of the property line, an additional 150 millimetres to a maximum of 600 millimetres must be added onto an invert at the property line

3.8 Service Disconnection

a) The developer must make a deposit to The City to disconnect the water service pipe from the public water main prior to receiving a building permit. Contact Construction Services for the cost estimate through 3-1-1.

b) The minimum deposit amount of a water service pipe disconnect varies according to the location and size of pipe, and is adjusted annually.

c) Once the disconnect deposit has been placed at the City of Calgary cashiers, the applicant may book an appointment with the Water Meters Department (3-1-1) to have the water turned off and the meter pulled. It is the responsibility of the applicant to have a representative present at the time of the scheduled appointment.

d) Where the developer is approved to use the existing water service pipes, the deposit for the service pipe disconnect will be refunded upon request, after the developer receives the occupancy permit.

e) Where the developer is required to install new services, the deposit for the service pipe disconnect will be refunded upon request only after the developer completes installation

of the services under the approved design and obtains Construction Completion Certification.

3.9 Reuse of Service Pipes

a) Where the existing structure is demolished and replaced with a new structure; a new water service (minimum 25mm PEX), and new sanitary & storm services that meet the current Water and Sewer Standard Specifications and the sizing requirements of the Canadian Plumbing Code (Current edition) must be installed.

b) To verify if the existing water service pipes are acceptable for the proposed development contact:

- Development Site Servicing for the portion of the service pipes within the public road right-of-way.
- Plumbing and Gas for the portion of the service pipes within the developer's property.

c) The condition of the existing sewer service pipe is based on video camera inspections and/or maintenance records. To verify if the existing service pipes are acceptable for the proposed development contact:

- Field Services (3-1-1, sewer re-use inspections) for the portion of the service pipes within the public road ROW.
- Plumbing and Gas for the portion of the service pipes within the developer's property.

d) Where the services are found to be unacceptable for re-use, replacement of the complete service is required as per item 'a' of this section.

e) All the sewer and water service pipes within the same trench must be replaced if one cannot be reused.

f) Once it is determined that the existing services pipes may be reused, the developer must ensure the following conditions are met prior to the refund of the service disconnect fee:

- The City Inspectors are notified prior to the backfilling of the service pipes at the property line. This notification is essential to allow the City to record the location and verify the size of the existing services. Failure to provide this notification will result in the developer's contractor having to re-excavate the service pipes at the property line.
- The existing service pipes are reused within one (1) year from the date of the payment for the service disconnect. The City shall disconnect the existing

service if the developer does not connect within this one (1) year period. Consequently, the developer shall be responsible for the cost of all new service connections.

- The City may disconnect any existing service pipes before the one (1) year time period has elapsed if the pipe is leaking. Accordingly, the developer will not be entitled to a refund.

4 Main Extension Requirements

4.1 General

a) Where there is no public water, sanitary or storm main adjacent to the proposed development and it is the opinion of Water Resources that it is required or where the adjacent mains are undersized for the proposed development, the Developer, at their expense, shall:
   - o install all required mains and appurtenances,
   - o extend the required mains along the total frontage and/or flankage of the proposed development on the approved line assignment for the appropriate utility, and
   - o arrange for an Indemnification Agreement through Urban Development (See section 4.2)

b) All work done by a Contractor in the City rights-of-way, must be made in writing and requires either a Subdivision Development Agreement or an Indemnification Agreement with The City prior to commencement of work.

4.2 Indemnification Agreements

a) Where extensions of City mains are required, an indemnification agreement must be entered into to undertake the work.

b) Urban Development Generalists administer Indemnification Agreements for the construction of public infrastructure within the City right-of-way. Comments are typically provided at the DP stage and will indicate the required information and drawings prior to the preparation of the agreement.

c) Indemnification agreements, cost estimates and construction drawing submissions must include all of the service connections (Sanitary, Storm and Water) to the site as well as the main extension itself.

4.3 Construction Drawing Submission

a) The **Preliminary Drawing** submission through Urban Development must consist of:

   a. Cover letter with development name and DP number including an $8^{1/2}$" x 11" plan indicating the construction boundaries
   b. Contact information of who will be party to the agreement
   c. Corporate registry search and a certificate of title for adjacent lands associated with the construction of the infrastructure
   d. Detailed description of the work that will form part of the agreement (cubic metres of asphalt and/or concrete, pipe diameters for sanitary, storm, and watermains and their respective lengths in lineal metres, etc.) within the City right-of-way
   e. Detailed cost estimate for the construction
   f. An electronic set of drawings in DWF format submitted to Urban Development that contains:

i. Coversheets
ii. Drawing List/Index
iii. Key Plan
iv. Legal Plan
v. Erosion & Sediment Control Drawing
vi. All affected Block profiles prepared according to the current edition of the "Standard block profile specifications for CAD and manual formats".
vii. Copy of approved DP site plan stamped "For location purposes only"

g. All drawings must be date stamped to reflect the date submitted.

b) The **Final Drawing** submission through Urban Development must consist of:

a. Cover letter with development name and DP number including details of all concerns identified on the **Preliminary Drawing** submission and how they were addressed or resolved sorted by the City division that made the comments.
b. Detailed cost estimate for the construction highlighting changes, if any, from the preliminary submission.
c. An electronic set of drawings in DWF format submitted to Urban Development that contains:
   i. Coversheets
   ii. Drawing List/Index
   iii. Key Plan
   iv. Legal Plan
   v. Erosion & Sediment Control Drawing
   vi. All affected Block profiles
   vii. Copy of approved DP site plan stamped "For location purposes only"
d. All drawings must be stamped and signed by a professional Engineer.
e. All drawings must be date stamped to reflect the date submitted.

Please follow instructions on Urban Development's website for more information on electronic drawing submission standards:

http://www.calgary.ca/PDA/DBA/Pages/Urban-Development/Urban-Development-Online-Services.aspx for detailed instructions regarding submission of electronic Construction Drawings, setting up an online VISTA account (View Information Specific To Account),The complete Application Requirement List, eConstruction Drawings Training Manual, FAQ's, etc.

4.4 Execution of the Indemnification Agreement

Once the final drawings and accompanying information are approved, the Urban Development Generalist will forward the crafted Indemnification Agreement to the developer under cover letter for execution. The agreement must then be properly executed in one of two ways:

a) **If it's by a company,** than the agreement must be signed under corporate seal.

b) **If it's by an individual,** the individual's signature must be accompanied by a Corporate Signing Affidavit, and witnessed and accompanied by an Affidavit of Execution worn by the witness in the presence of a Commissioner of Oaths.

4.5 Final Submission by Developer

After the Indemnification Agreement has been executed, the developer will forward the following to the Urban Development Generalist for processing:

a) **Four (4)** executed copies of the Agreement
b) Certificate of insurance with:
    a. Commercial general liability insurance amount of not less than 2 million dollars
    b. The City included as an additional insured under the policy
    c. Expiry date no less than one year from the date of issue
c) Performance security (Letter of credit, bank draft, or certified cheque)
d) Inspection fees (certified cheque)

Once the as-builts have been accepted, the performance securities will be returned to the developer.

4.6 Deferred Servicing Agreements

Where there is no public water or sanitary mains adjacent to the proposed development and it is the opinion of Water Resources that a private potable water supply system or a septic system may be used, a Deferred Services Agreement must be executed by the Developer and registered on title. The permit is required from Alberta Environment at 403-297-7166 and testing of water quality is required by the Alberta Health Services at 403-943-1111.

5 Water Infrastructure

5.1 General

a) Valves, fire hydrants, and all other appurtenances shall conform to and be designed as per the current version of the City of Calgary "Standard Specifications Waterworks Construction".

b) Information and requirements for fire protection systems contained in codes other than this manual can be obtained by contacting the Building Services Section of Regulations Division and the Fire Prevention Bureau.

c) Provide block profiles for all existing utility rights-of-way showing the existing and proposed grades.

d) Backflow protection shall be provided in accordance with the following codes and manuals:

- National Plumbing Code of Canada (Current Edition)
- CAN/CSA - B64.10 "Manual of the Selection and Installation of Backflow Prevention Devices" published by:

  Canadian Standards Association (CSA)
  Suite 100
  5060 Spectrum Way
  Mississauga, ON L4W 5N6
  Tel: (416) 747-4000
  Toll Free: 1-800-463-6727 or (416) 747-2661
  Fax: (416) 747-2473
  Web Address: http://www.csa-international.org

- Cross Connection Control Manual published by:

  Western Canada Section AWWA
  P.O. Box 1708
  Cochrane, AB T4E 1 B6
  Phone: 1-877-283-2003 Fax: 1-877-283-2007
  Web Address: http://www.wcsawwa.net/

e) Where approved, non-potable water (reclaimed water) systems shall comply with the “Standard Specifications: Waterworks Construction” (Section 504.04.01).

5.2 Crossing Water Feedermain

To ensure the safety of the public and to protect the feedermain (500mm and larger) any construction within 3.0m of these mains must be reviewed and approved by Water Resources, Infrastructure Delivery. Hydrovacing is required to determine the alignment, elevation, pipe diameter, pipe support, backfill and clearances. A detail of this information is required on the

Development Site Servicing Plan with respect to working in the proximity of this feeder main. Contact Project Engineering Underground Inspections at 268-5752 for approval, notification shut down periods, and tunnelling and augering options

5.3 Service Connections

a) Water service pipes must connect to the public water main at right angles.

b) Only one connection to a public water main is permitted for each lot with distinct certificates of title, unless dual mains are required for the development.

c) Check-valve looped watermains are required for multi-family sites with 60 units or more (i.e.: townhouses). Dual services are required to service high-rise apartment style residences with 80 units or more with a minimum separation of 1.3m. Refer to the "Standard Specifications Waterworks Construction" Drawing 453.1026.001, Sheet 27.

d) Water service pipes are not permitted to cross one property and enter into another or reside on any other premises as per the National Plumbing Code of Canada (Current Edition) Section #2.1.2.4.

e) Pipes are not permitted to extend from building to building on the same property except for an ancillary building. Refer to the National Plumbing Code of Canada (Current Edition) Section #2.1.2.4.

f) Each condominium building shall have separate service connections to the public watermain. Condominium units are serviced from a private water main within the building, similar to the servicing within an apartment building.

g) In the case of a Bareland Condominium, separate service connections are made to a private water main. The private water main shall have a single connection to the public watermain, except where looping is required.

h) A strata subdivision is used to subdivide the commercial portion of a mixed use building from the residential portion. A strata is not the equivalent of a condominium. It is the description of volumetric space under section 86 of the Land Titles Act. The Commercial space and residential space shall each have a separate water and sewer from the main and may share a common meter room where city access is permitted. A strata requires a detailed and restrictive covenant agreement - each subdivided parcel must be individually serviced directly to the public water main. The water service pipe shall enter an exterior wall, directly into a mechanical room. Each subdivided parcel shall have their own separate valves and meter assemblies.

i) Pre-servicing is not permitted unless there is a certainty of location of building (meter room), fire protection requirements, and service size. (Approved with DP Plans)

5.4 Service Marking

Private water services shall be installed to the property line and the location marked with a 2X4 vertically placed to the pipe invert and showing one (1) metre above ground level. The letters "WI" shall be painted on the 2X4 to specify water.

5.5 Piping Material

a) Water service pipes 20 mm, 25 mm, 40 mm, and 50 mm in diameter are to be copper or PEX pipe (Cross-linked Polyethylene Pipe). See Standard Specification Waterworks Construction Section 503.02.18.

b) Water service pipes 100 mm, 150 mm, 200 mm, 250 mm, 300 mm, and 400 mm in diameter are to be ductile iron or PVC DR 18 AWWA C 900. See “Standard Specifications: Waterworks Construction” (Sections 503.01.00.1, 503.02.03 and 503.02.04). For PVC pipes installed in industrial areas, NBR gaskets shall be supplied as per 504.04.01.

c) All 100 mm and larger diameter service pipes passing through the exterior foundation wall or floor slab up to the master control valve shall be approved ductile iron pipe. Refer to “Standard Specifications Waterworks Construction” (Drawing 453.1009.009 part 2).

d) Metallic water pipes and fittings c/w NBR (nitrile) gaskets are to be used on-site in areas contaminated or potentially contaminated with organic compounds (organic solvents or petroleum products). See Standard Specifications Waterworks Construction, Sections 504.05.01 and 503.02.12.

5.6 Arrangement of Piping

a) All dual water service pipes installed in a common trench shall have a separation of 1.3 metres.

b) Water service pipes must cross public easements at right angles or as otherwise approved, but are not permitted to extend lengthways within the easement.

c) There shall be a minimum vertical separation of 300mm between water, sanitary and storm mains at crossings.

d) A water service pipe located between two buildings must have a minimum clearance of 3.0m from the foundation of each building.

e) See Figure 2 for the minimum horizontal separation between a water service pipe and other utilities and infrastructure.

Figure 2: Horizontal Separation Chart

Utilities and Infrastructure	≤ 50 mm diameter water service pipe	≥100 mm diameter water service pipe
Foundation wall or piles which support a building	3.0 m	4.0 m
Foundation wall or piles extending vertically a min. of 2 meters below the invert of the water pipe.	2.0 m	2.0 m
Property line	2.0 m	3.0 m
Storm pipe	2.0 m	2.0 m
Sanitary pipe	0.3 m (same trench)	
Shallow utility pipe	2.0 m	2.0 m
Telus Cable pedestal, power pole, or streetlight std.	2.5 m	2.5 m
Edge of transformer or pull box/junction terminal	3.0m	3.0 m
Catch basin	3.0 m	3.0 m

f) Service valves shall be located on the approved line assignment as specified in "Section II, C" of the "Design Guidelines for Subdivision Servicing".

g) On-site distribution systems shall have the appropriate number and location of valves to provide a separation between fire hydrants and to limit the number of dwelling units affected by a shutdown to a maximum of 60 units.

h) Water services 50 mm and smaller are to be installed in the same trench as the sanitary sewer, except where prohibited by code (hospitals, chemical plants, etc.) and are to be shown in the same trench.

i) It is the responsibility of the developer to ensure that the location for the water service pipe within the public right-of-way does not conflict with power poles, pole anchors, transformers, trees, catch basins, underground chambers or other facilities which may exist within the public right-of-way.

j) Location of foundation piling in relation to the water service pipe must be shown on the Development Site Servicing Plan and must have a minimum separation of;
   a. 4.0m (100mm service or larger),
   b. 3.0m (50mm service or smaller),
   c. 2.0m (any service size) when the foundation wall or piles extend vertically a minimum of 2.0m below the invert of the water pipe.

k) Water service pipes shall be provided with a master control valve immediately where the pipe enters the building. All branched water supply shall be downstream of this valve. Refer to the “Standard Specifications Waterworks Construction” (Drawing 453.1009.008 and 453.1009.009 part 2).

5.7 Piping Support

a) For buildings with deep foundation walls or adjacent to the property line (exceeding the depth of the water invert), the developer shall provide adequate pipe support from the building to undisturbed soil within the public right-of-way. A Structural design drawing showing the details of this pipe support shall be shown on the Development Site Servicing Plan and must be signed and stamped by a Professional Engineer. Refer to Sheet #39 of the “Standard Specifications: Waterworks Construction” for more details.

b) The developer shall install the service pipe in conjunction with the support grade beam through the wall to a point 250 mm beyond the end of the support beam. The pipe may be supported with lean concrete placed between the pipe and the original undisturbed soil.

5.8 Size and Capacity

a) Water service pipes with private fire hydrants shall not be less than 150 mm in diameter, and no leg shall be greater than 180 meters in length to the fire hydrant otherwise it is required to be looped.

b) A water service pipe shall be sized according to the peak demand flow and shall not be less than 25mm size. Refer to the National Plumbing Code of Canada (Current Edition) Section 2.6.3.4.

c) Where static pressure exceeds 550 kpa, a pressure reducing valve must be installed as per the “Standard Specifications: Waterworks Construction” (Sheets 30A, 31, and 32). In addition, refer to the National Plumbing Code of Canada (Current Edition) Section 2.6.3.3, and the “Design Guidelines for Subdivision Servicing” (Section III, B - 3) for pressure zone maps and details.

d) Where installations are required in the top of the pressure zone a minimum 25mm service is required. See the “Design Guidelines for Subdivision Servicing” (Section III, B - 3) for pressure zone maps and details.

e) No new water service pipes shall be larger in diameter than the water main in which it connects.

5.9 Protection of Service Pipes and Public Water Mains

a) On-site water service pipes shall be installed with a minimum cover of 2.7 metres below final grade in clay, and 3.3 metres when the strata is gravel. Refer to the “Standard Specifications: Waterworks Construction – Section 504.04.13.

b) It is the responsibility of the developer to repair, at their expense, any damage to public water mains adjacent to their site during their construction. All repairs will be congruent with the current "Standard Waterworks Construction" manual.

5.10 Fire Protection & Hydrants

a) All codes and regulations of the Fire Prevention Bureau and the Insurance Underwriters Organization must be complied with in designing the private water supply system.

b) All piping and private fire hydrants must be shown on the Development Site Servicing Plan.

c) A separate service connection is not permitted for private fire hydrants. Hydrants must be connected to a service pipe where there is a constant draw of water.

d) Siamese connections require the nearest Fire Hydrant to be located within 45m.

e) Public hydrants are not permitted to be connected to private service lines.

f) Hydrant pumper ports shall face the carriageway and set to grade as per the “Standard Specifications: Waterworks Construction” Drawing 453.1002.001.

g) Hydrants shall be located a maximum distance of 2.0 meters from the curb or edge of asphalt carriageway as per the Fire Prevention Bureau requirements.

h) The minimum separation between a hydrant and a Telus and cable pedestal, power pole, or street light standard shall be 2.5 meters. The minimum separation between a hydrant and the edge of a transformer or pullbox/junction terminal shall be 3.0 meters.

i) The Developer must receive approval from the Fire Prevention Bureau for on-site hydrant requirements as per Alberta Building Code 1997, Section 3.2.5.5, and submit the approved plan to Water Resources with the Development Site Servicing Plan submission.

j) The Developer shall ensure public fire hydrants servicing the development shall be equipped with a pumper port.

k) Two hydrants are not permitted on a dead-end main. A looped connection will be required.

5.11 Public Water Mains on Private Property

a) All grade changes within a public water main right-of-way must be approved. The developer must provide a profile showing the existing and proposed grades prior to approval of the Development Site Servicing Plan.

b) Buildings are not permitted over existing public water mains which have registered easements.

5.12 Cross Connection Control

a) No private water supply system shall be interconnected with the public water supply system. See National Plumbing Code of Canada (Current Edition) Section #2.6.2.5.

b) If a municipal water supply is required as a backup supply to an auxiliary or private water supply then an approved air gap separation of two pipe diameters shall be provided between municipal water outlet and the flood level rim of the vessel into which the outlet discharges and never less than 25mm.

c) The premises-isolating backflow preventer installed on a fire system shall be located as close as possible to the branch tee.

d) Multi-family Residential, Industrial, Commercial and Institutional facilities are required to have a cross connection control device installed on their incoming water service pipe immediately after the water meter outlet valve. A parallel cross connection arrangement is required for installations with more than 12 residential units or for services that require a 24 hour uninterrupted water supply. See the "Standard Specifications: Waterworks Construction" for further design details.

e) The cross connection control device must be shown as a detail on the Development Site Servicing Plan with the meter assembly.

5.13 Metering

a) All consumers must make provisions for the installation of water meters in accordance with the "Standard Specifications: Waterworks Construction" manual.

b) Each unit must be individually metered.

c) Water meters shall be installed at the point of entry into the building and shall be installed in accordance with the applicable City of Calgary Meter Standard.

d) Water meters shall be installed in mechanical rooms or meter rooms with a floor drain. In no case shall a meter be installed in a bathroom, bedroom, or under a stairwell.

e) A water meter room is required adjacent to an exterior wall where water service pipes 100 mm and larger enter the building. This applies to buildings that have levels below ground. A service pipe may enter the building under the slab for a single level underground parkade; otherwise the service must enter the building through an exterior wall.

f) A water meter room is required to be located where water service pipes 50 mm and smaller enter a building. The water service pipe may enter through an exterior wall or from under the slab of the building. The water pipe must be joint-free when entering the building from under the slab.

g) All water meters which are used exclusively for irrigation water shall be shown and noted on the Development Site Servicing Plan and shall be labelled on the meter piping as "Irrigation Meter". A City Parks irrigation meter cannot be used for a private site.

h) All water service pipes shall be metered except those pipes dedicated for fire protection.

i) A minimum of 2.0 metres of headroom is required at the meter location.

j) When a meter cannot be installed in a building, the owner must provide a meter building or a meter vault located 2 metres inside the property line in accordance with the "Standard Specifications Waterworks Construction" manual.

k) Pressure reducing valves are required to be installed downstream of the meter or meter assembly on all domestic supplies when the static pressure exceeds 80 psi. The valves shall be shown and identified on the Development Site Servicing Plan.

l) The City shall supply and install all water meters. Contact the Water Services Meter Section to make arrangements.

6 Sewer Infrastructure

6.1 General

a) Sewer infrastructure includes sanitary & storm sewer pipes as well as the drainage or stormwater management system. Sewer design should be based on the “Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage System” published by Alberta Environment. For information on storm sewer and drainage (major system) design refer to City of Calgary “Stormwater Management & Design Manual” (Sections 3.0 and 4.0).Refer to the current edition of the following additional City of Calgary manuals for further Information on pipe materials, design criterion and installation standards (See appendix ‘C’ for links to current editions):

- Standard Specifications: Sewer Construction
- Standard Block Profile Specifications for CAD and Manual Formats
- Guidelines for Erosion & Sediment Control
- Design Guidelines for Subdivision Servicing

b) Manholes, catch basins, and any other appurtenances shall conform to and be constructed as per The City of Calgary "Standard Specifications Sewer Construction".

c) Provide block profiles with the DSSP submission for all existing utility rights-of-way showing the existing and proposed grades.

d) Where outfalls to waterways or drainage courses are required, the consultant will supply an outfall design on a standard City of Calgary block profile to Water Resources for submission to the Provincial Government for approval and permits.

e) Where storm ponds are required, the consultant will supply design drawings to Water Resources and complete the required check sheet(s). Contact Water Resources for more information.

f) No portions of private sewer systems are permitted in bylaw setback areas except for service connections.

g) Extensive and/or complicated external sewer systems shall be installed with the surveyor's grade sheets as per the approved design. For inspection purposes Development Site Servicing Plans will be stamped as such whenever this applies.

6.2 Pipe Sizes

The following minimum pipe sizes will be considered provided they have adequate capacities as verified by the applicants' engineer:

a) Minimum size of sanitary sewer for the site is 100mm diameter.

b) Minimum size of storm sewer for the site is 75mm diameter.

c) Minimum size of catch basin leads is 250mm diameter with the following exceptions:

- Where the pipe is directly involved in a storm water retention system or is upstream of the ICD (Inlet Control Device) a minimum size of 150 millimetres diameter is acceptable.
- Where the public mains are less than 525 millimetres in diameter, pipe sizes 150 millimetres to 250 millimetres in diameter are considered for connection.

d) Minimum size of area drain leads is 100mm and they must be designed to accommodate maintenance and cleaning by the owner.

The capacity and the size of the service leaving the building shall meet the National Plumbing Code of Canada (Current Edition) requirements. Sanitary service sizing is the responsibility of the developer.

6.3 Cover

a) Sanitary

- The minimum cover for sanitary sewers shall be 2.5 meters from pipe crown to finished grade. Where minimum cover cannot be achieved, an adequate insulation design must be submitted with the DSSP for approval.

b) Storm

- The minimum cover for storm sewers shall be 1.2 meters from pipe crown to finish grade. Where minimum cover cannot be achieved, an adequate insulation design must be submitted with the DSSP for approval.

Note: If cover is less than minimum then concrete encasement and frost protection may be required at the discretion of Water Resources. Concrete encasement is to be the entire length of pipe, from manhole to manhole. See Stormwater Management & Design Manual (Section 3.0)

c) There shall be a minimum vertical separation of 300mm between water, sanitary and storm mains at crossings.

6.4 Line Assignments

a) Maintain 3.0m minimum clearance from the centre of sewer lines to all property lines and buildings. Manholes must also be installed maintaining the 3.0m minimum clearance. Sanitary and storm may be permitted in common trench when vertical separation is less than 1.0m for the entire length of the trench.

b) Maintain 1.8m minimum separation between centre lines of sanitary and storm sewers and other utilities, 3.0m clearance to poles. Refer to the Water Infrastructure section of this manual (Section 5.0) for separation between watermains and other services.

6.5 Slopes

See Figure 3 for minimum slopes for small diameter sewer lines or refer to the latest edition of the City of Calgary "Design Guidelines for Subdivision Servicing".

Figure 3: Minimum Design Slopes for Sewers

Diameter of Service	Sanitary Sewers Minimum Design Slope (%)		Storm Sewers Minimum Design Slope (%)	
	Concrete (n = 0.013)	PVC (n = 0.013)	Concrete (n = 0.013)	PVC (n = 0.011)
75mm Weeping Tile	-	-	2.00	2.00
100mm Weeping Tile	-	-	1.00	1.00
150mm Weeping Tile	-	-	0.48	0.35
200mm Weeping Tile	-	-	0.32	0.24
250mm Weeping Tile	-	-	0.24	0.18
100mm	2.00	2.00	2.00	2.00
150mm	1.00	1.00	1.00	1.00
200mm	0.80	0.80	0.80	0.60
250mm	0.40	0.40	0.56	0.40
300mm	0.32	0.32	0.44	0.32
375mm	0.24	0.24	0.32	0.24
450mm	0.18	0.18	0.26	0.18
525mm	0.16	0.16	0.22	0.16
600mm	0.12	0.12	0.18	0.12
675mm	0.10	0.10	0.15	0.11
750mm	0.10	0.10	0.13	0.10
900mm and Greater	0.10	0.10	0.10	0.10

All concrete pipe, manholes and appurtenances shall be manufactured using type HS (type 50) sulphate resistant cement. Anchoring is required when pipe slope is greater than 33% or where velocities exceed 3.0 m/s

6.6 Service Connections

For storm sewer service connections to public mains please refer to the City of Calgary "Stormwater Management & Design Manual" (Section 4.0) for information on:

- Servicing,
- Location, and
- Grades.

A manhole is required on a main for a sewer connection when:

- The diameter of the connection line is greater than one half the diameter of the main, or

- The length of the service connection from the building to the main is greater than 30m.

When tying to an existing manhole, indicate the size and type of the manhole.

Service connections shall not be installed to sewer mains deeper than 6m. A secondary sewer may have to be installed to allow for servicing.

7 Sanitary Sewer Design

7.1 Peak Flows

Since peak sewage flows vary greatly with type and density of development, each case must be considered on an individual basis. Contact Water Resources/Development Approvals for more information.

When calculating sanitary peak flows, use table 5.1(2) of the most recent version of the "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems" by Alberta Environment and refer to the "Sanitary Servicing Study Guidelines" to estimate the average volume of sanitary sewer flow per day for a specific type of development/land use.

7.2 Capacity

The capacity and the size of the service leaving the building shall meet the National Plumbing Code of Canada (Current edition) requirements. Sizing of the sanitary service is the responsibility of the developer.

7.3 Sanitary Servicing Studies

A sanitary servicing study may be required to demonstrate the adequacy of the existing and proposed sanitary sewer systems to satisfy the demands of a proposed development or redevelopment. This requirement will be applied to the applicants Development Permit comments by Water Resources. For more information refer to the following "Sanitary Servicing Study Guidelines":

http://www.calgary.ca/PDA/pd/Documents/development/west-memorial-sanitary-servicing-study-guidelines.pdf

7.4 Servicing

Sanitary servicing from building to building is not permitted except for auxiliary buildings that are required and form an integral part of the development. Show the invert elevation at building and site elevation at or near the location where the sanitary sewer enters the building.

7.5 Test Manholes and Drop Manholes

a) Test Manhole

   a. A Sanitary Sewer Test Manhole is required to service proposed industrial and commercial developments, as per Section 7 of the Sewer Service Bylaw 24M96, unless it falls into an exempt use. In general, test manholes are required for: restaurants, grocery stores and wholesalers (with meat or deli departments), commercial bakeries, rendering and meat by-product processing, beverages manufacturing, fluid milk manufacturing, beer and liquor manufacturing, laboratories, industrial parcels, car washes, service stations (with a car wash),

and, laundries). Contact Water Resources for more information or to determine if an exemption is applicable.

b. On sites encompassing more than one business, a separate sanitary test manhole is required on those businesses that require one.

c. The sanitary test manhole is to be located outside the property line on public property (off driveways and streets) and must be accessible to City staff, otherwise an easement access is required. The easement access is to be a minimum 5m x 5m surrounding the test manhole and include a standard access right of way for City forces to legally access the manhole. Contact Corporate Properties for an easement access.

d. Provide a minimum of 150 millimetres to a maximum of 600 millimetres fall through a test manhole. (See current edition of "Standard Specifications Sewer Construction").

e. The sanitary test manhole must be located on the private service line and not on a public main to allow for an uncontaminated test.

b) Interior/Exterior Drop Manhole

a. Where the difference in elevation between the incoming pipe invert and the outgoing pipe centreline is greater than 760 millimetres an interior/exterior drop manhole must be provided. No interior drop manholes will be allowed when the incoming pipe exceeds 300 millimetres in diameter. current edition of "Standard Specifications Sewer Construction"

Note: Sanitary manholes should be located outside of trap lows. For any sanitary sewer manholes located in trap lows, sanitary seals are required to reduce infiltration. Sanitary manholes within stormwater ponds are not permitted.

8 Storm Sewer Design

All designs are to be in accordance with the current edition of the "Standard Specifications: Sewer Construction" and the "Stormwater Management & Design Manual". See Sections 3.0 and 4.0.

8.1 Catch Basins

a) City standards recognize four types of inlet structures for private use.

   a. Type "C" catch basin with storm back
   b. Type "K2" catch basin
   c. Type "K3" catch basin
   d. Grated top (GT) manhole

b) Use grated top manholes instead of catch basins when:

   a. The depth from the rim to pipe invert exceeds 2.5 meters,
   b. A 3 or 4 way junction occurs,
   c. The total sum of incoming pipe diameters is > 600 mm, or
   d. The CB lead is longer than 30m.

The use of a manhole is required instead of a catch basin barrel in this situation

8.2 Weeping Tile

a) Refer to City of Calgary "Stormwater Management & Design Manual"

b) Surface drainage is not permitted to drain to a weeping tile system by any means other than infiltration from the surface. Window wells and area drains must not have a direct connection to the weeping tile system.

c) Weeping tile drain is NOT permitted to tie to the sanitary sewer.

8.3 Storm Redevelopment Area

a) As per the Storm Redevelopment Bylaw (#8320), a storm redevelopment fee ($84/m frontage) will be required at the service connection stage.

b) If the subject property requires a storm sewer connection where no storm mains are available (main extension), is within the storm redevelopment levy area, and **the parcel is smaller than 700m^2**; the applicant may:

   a. Provide a drywell design at the Development Site Servicing Plan (DSSP) stage sized to store the 1:100 year 24 hr storm event in the gravel drainage rock. The volume must be restored within 72 hours through infiltration and/or re-use.

b. Submit payment for the storm redevelopment fee ($84 / m frontage) at the DSSP stage, and
c. Provide block profiles that conform to the "Standard Block Profile Specifications for CAD and Manual Formats" for the proposed storm sewer extension as a part of the DSSP submission for approval by Water Resources. Onsite storm service must be stubbed by the Developer to the property line adjacent to the proposed main extension. The main extension and service to the stub will be done by the City of Calgary.

If the applicant would like to pursue a main extension at their expense, they must enter into an indemnification agreement for work within the City Right-of-way. This must be completed prior to the DSSP application.

c) If the subject property requires a storm sewer connection where no storm mains are available (main extension), is within the storm re-development levy area, and **the parcel is larger than 700m^2** the applicant has the following options:

a. Enter into Indemnification Agreement for the storm sewer extension.
b. Provide documentation that extension is completed and the storm redevelopment fee ($84 / m frontage) will be waived.
c. The subject property is required to control the stormwater to the specified release rate and volume targets.

OR, if the applicant believes that they can prove a temporary drywell system can adequately handle the flows from site **(Note: Water Resources does not recommend this option as previous tests on very small sites have shown that the calculations cannot be proved)**, they may:

a. Conduct a percolation test and provide results to Water Resources for review and approval (contact Water Resources for testing protocols 403-268-6449)
b. If the percolation test confirms that a drywell system is adequate to service the site in the interim then refer to 8.3 b) for site requirements.

If the percolation test proves that a drywell system is inadequate to service the site in the interim, the storm main extension must be done at the applicant's expense or a water reuse system for toilet flushing, irrigation or other forms of low impact developments may be used to restore 1:100 year storage volume. Details are to be provided at the DSSP stage, and are subject to approval by Water Resources.

9 Stormwater Management

Stormwater retention and management requirements must be designed in accordance with the current edition of the "Stormwater Management & Design Manual". See Sections 3.0 and 4.0 for technical requirements. All sites must adhere to City of Calgary “Guidelines for Erosion & Sediment Control”.

As-built information for grading must be submitted as per Lot Grading Bylaw 32M2004. An operation and maintenance manual for all Best Management Practices (BMP’s), sample BMP maintenance log, as-built drawings and sign off by the Design Engineer that the drainage infrastructure was installed as per the approved design, shall be provided to the property owner for all sites.

9.1 Stormwater Retention

On-site stormwater retention is generally required on all sites (normally indicated at the time of the Development Permit circulation). When stormwater retention is required, the DSSP submission should indicate the method of retention, along with drainage area plans and stormwater retention design calculations. Plans should delineate drainage boundaries and ponding areas. Provide all calculations for stormwater storage including trap lows, stormwater ponds, and roof control flow data. Design for the storm system must include the total site area and account for future development

9.2 Stormwater Retention Calculations

a) A Stormwater Management Report (SWMR) is required for:

   a. All sites greater than 2 ha.
   b. Sites smaller than or equal to 2 ha, and without servicing by a storm sewer system.
   c. Sites smaller than or equal to 2 ha, and where Best Management Practices (BMPs) and Source Control Practices (SCPs) are proposed to reduce on-site storage requirements, control runoff volume, and/or enhance water quality.
   d. Re-development of sites smaller than or equal to 2 ha that are part of a larger private site.

b) Stormwater Management Reports (SWMR) must be submitted to Water Resources (2 copies) for review. Approval of the SWMR is required prior to submitting the DSSP.

c) Sites that require a Stormwater Management Report must indicate the report name on the first drawing of their DSSP submission.

d) Sites using the Rational Method for storage calculations should refer to Appendix B, Storm Retention Calculations Based on Rational Method Design, of the current edition of the "Stormwater Management & Design Manual" as guidance. See Figure 4 for an example of typical stormwater management calculations for a DSSP submission.

Figure 4: Rational Method Calculations for DSSPs

STORM CALCULATIONS

Catchment Area #_____

Input Variables

C1 = X.XXX (Coefficient of runoff to main)

I = 82.55 mm/hr. (Intensity)

= 168 mm/hr. (For Free Flow Areas)

100 yr. Storm runoff

Ar = X.XXX ha. (Area of Roof)

Ap = X.XXX ha. (Area of Paving)

Ag = X.XXX ha. (Area of Gravel)

Al = X.XXX ha. (Area of Landscaping)

A = X.XXX ha. (Total Site Area)

Allowable Discharge to Main

Q1 = C1 x I x A x 2.78

= XX.XX l/s

Actual Run-off From Site

$$C2 = \frac{(Ar \times 1) + (Ap \times 0.9) + (Ag \times 0.5) + (Al \times 0.3)}{\text{ENTIRE SITE AREA}}$$

= XX.XX l/s

Q2 = C2 x I x A x 2.78

= XX.XX l/s

Hydraulic Slope Calculation

H1 = XXXX.XXX m (Pipe obvert @ lower end)

H2 = XXXX.XXX m (Top of Pond)

L = XX.XX m (Length of pipe)

$$HS = \frac{H2 - H1}{L}$$

= XX.XX % (Hydraulic Slope)

Manning's Formula

Ø = XXX mm (Diameter of pipe)

n = X.XX % (Conc. = 0.013%, PVC = 0.011%)

$Qa = [(1/n) \times (Ø/4)^{2/3} \times HS^{1/2} \times (\pi(Ø)^2/4)] \times 1000$

= XX.XX l/s

Determine ICD from Sect. 3.3.5 of the SWMR Manual

H = XX.XX m (Head on ICD)

Qaf = XX.XX l/s (ICD Discharge rate)

Storage Volume Requirement Calculation

$$C1' = \frac{Qaf}{82.55 \times A \times 2.78}$$

= X.XX (Runoff coefficient of discharge)

C2/C1' = X.XX

SVF = X.XX (From Storage Volume Factors Chart)

V100 = SVF x A x C1' x 100

= XXX.XX m^3

e) Zero discharge sites require a stormwater model to be provided with the DSSP submission. Sites with inlet control devices (ICD'S) in series require a dynamic hydraulic model. Refer to the "Stormwater Management and Design Manual" for more information. DSSP submissions that include a model of any kind to be reviewed require up to an additional ten business days to review.

f) Where the public storm sewer system is surcharged, ensure that the flow control is sized for freeflow conditions, and the HGL and trap low storage requirements within the site are sized based on the HGL of the public storm sewer system.

g) For a custom Inlet Control Device (ICD) refer to section 5.4.1 of the "Stormwater Management and Design manual" to calculate the flow and provide a detail with the DSSP submission.

h) For sites where volume control targets must be met, provide a completed Water Balance Spreadsheet or an approved equivalent with the DSSP submission. Refer to the "Development Approvals Submissions" link in Appendix C and the "Water Resources Interim Stormwater Targets 2014" Bulletin (http://www.calgary.ca/PDA/DBA/Documents/urban_development/bulletins/ud-bulletin-water-resources-interim-stormwater-targets-2014.pdf)

i) Surcharging of the weeping tile system is not permitted.

j) Trap Lows are to be clearly outlined with the 1:100 year elevation and the spill elevation clearly labelled on the drawing.

k) Emergency escape routes for trap lows are to be directed away from buildings and towards public roadways with grading clearly shown to demonstrate such.

9.3 Western Headworks Canal Catchment

Areas located in the Western Headworks (WH) Canal Catchment fall under the 1980 Moratorium of Stormwater Discharges into the WH Canal. Any development is required to implement BMPS to yield, at a minimum, a net-zero increase in run-off rate, runoff volume and pollutant loading to the WH Canal. Refer to section 4.7.3 of the "Stormwater Management and Design Manual" for guidance.

9.4 Precautionary Measures that must be taken

a) Ensure elevations of building slab and/or any building openings are 0.3m minimum above critical trap low spill elevations or the 100 year elevation, whichever is higher for all trap lows located within the subject parcel or adjacent to it.

b) Ensure the hydraulic grade elevations are taken into account.

c) Ensure pipe sizes are not less than 100 millimetres in diameter for area drains.

d) Ensure building structural design accounts for water loading where roof retention is used.

e) Ensure the on-site pipe system has adequate capacity to convey the 1 in 5 year peak flow rate.

9.5 Drainage and Grading Requirements

a) All on-site grading and drainage must be in accordance with Lot Grading Bylaw 32M2004 and the "Stormwater Management & Design Manual".

b) All open areas shall drain to the storm sewer. When storm sewers are not available, a temporary drywell system may be required. (See current edition of "Standard Specifications Sewer Construction" and "Stormwater Management & Design Manual").

c) Drainage from roof areas shall be contained on-site. Control flow roof drain specifications (Us) as well as location of roof drains shall be shown. Drainage boundaries for roof shall be shown where the roof encompasses a large area. All roof drain locations and roof top storage provisions must match the approved Development Permit plans.

d) Where roof top storage is provided, the following information should be provided on the drawings or plans:

   - Roof boundary and any drainage boundaries where the roof encompasses a large area.
   - Roof top storage volume(s).
   - Location of roof drain(s).
   - Number and type of roof drains.
   - Type of inlet control and flow per roof drain (L/s and L/s/ha).
   - Total flow from drain (L/s and L/s/ha).
   - Nature and elevation of emergency overflow drains and/or scuppers.

e) On-site grading must be shown with spot elevations and grade arrows with % grade shown (adhering to minimum grades for surface materials used as per City design guidelines). All building and parking lot corners must have design spot elevations shown. Contours are not acceptable for site grading.

f) For commercial and Industrial sites where storm sewers are not available a zero discharge pond is required. (See Section 4.7.2.2 of the "Stormwater Management & Design Manual")

9.6 Water Quality

Water Quality is to be in accordance with the most recent edition of the City of Calgary "Stormwater Management & Design Manual".

9.7 Best Management Practices (BMP'S) - Oil/Grit Separators

Use of BMP's (See Section 4.13 of the "Stormwater Management & Design Manual") is recommended for all sites; however they are required for the following:

- Sites over 0.4 ha this requirement needs to be provided regardless of the inclusion of a storm pond in the downstream.
- Sites with petroleum products on-site
- Heavy industrial and manufacturing sites
- Sites discharging runoff to City owned ditches
- Sites subject to runoff volume targets

9.8 Stormwater Ponds

Where stormwater ponds are required (dry ponds, wet ponds, wetlands, and zero discharge ponds), they are to be designed in accordance with the City of Calgary "Stormwater Management & Design Manual" and a Stormwater Management Report will be required. All ponds (including all impoundments deeper than 0.5m) need to be registered by the property owner with Environment Sustainable Resource Development with the Province of Alberta, following approval by Water Resources.

9.9 Best Management Practices

Refer to the City of Calgary "Stormwater Management & Design Manual" for more information.

10 Floodway, Flood Fringe and Overland Flow Zones

Developments in the Floodway, Flood Fringe and Overland Flow Zone areas are subject to the regulations described in City of Calgary Land Use Bylaw 2P80 Section 19.1 which was amended by Bylaw 5P85. Refer to Bylaws 2P80 and 5P85, and the "Stormwater Management & Design Manual" (Section 3.5) for more information.

Please note that the most up-to-date regulations shall prevail.

a) Flood Regulations or Advisory Guidelines shall be followed by all landowners or developers proposing construction within the Floodway, Flood Fringe, or Overland Flow Zones of the Bow and Elbow Rivers, Nose Creek, and West Nose Creek drainage basins.
b) Copies of the Floodway, Flood Fringe, and Overland Flow Zone maps approved by Council are available at online at www.calgary.ca through a search for “flood maps”.
c) Under the land use bylaw, rules on building design and alterations shall apply to all buildings; however some exemptions apply which are described in the Land Use Bylaw. Special provisions apply to Roxboro Road SW, Erlton, Quarry Park, and Inglewood.
d) The City of Calgary may recommend a higher designated flood elevation based on information gathered in the 2013 flood event, and analysis contained in the “Bow and Elbow Hydraulic Model Update” (2012, City of Calgary and Alberta Environment & Water).

10.1 Flood Fringe

If the subject property is within the 1:100 year Flood Fringe it is mandatory that the following Special Regulations be adhered to:

- The minimum first floor elevation shall be constructed at or above the designated flood elevation. All electrical and mechanical equipment shall be located at or above this elevation as well.
- The building shall be designed so as to prevent structural damage by floodwaters, which includes damages due to elevated groundwater levels.
- Onsite access roads shall be constructed at or above the designated flood level.
- For the development or redevelopment of single detached, semi-detached or duplex dwellings in the Flood Fringe that are infill or existing, Council has approved advisory guidelines. These were approved under the “Calgary River Valleys Plan (1984)” and must be followed.
- Proposed drive down garages must indicate a gravity connection to the storm sewer system complete with a backflow prevention valve located in a separate manhole on public property. Note that no sump pumps are allowed (drainage should be by gravity) and it is recommended that the first two feet in front of the garage slopes at 2.0% away from the garage door towards the drainage swale.
  Note: Roads should be contacted to ensure that existing and future road grades are compatible with on-site grades.
- Minimum building openings should be above the designated 1:20 year flood elevation.

- Foundation dewatering should be discharged to ground above the designated 1:100 year flood elevation. The system should account for high groundwater that may accompany floods.

10.2 Floodway

If the subject property is within the 1:100 year Floodway it is mandatory that the following Special Regulations be adhered to:

- No alterations shall be made and no structures including, but not limited to, rip-rap, berms, fences, walls, gates, patios, docks, decks shall be constructed on, in or under a Floodway unless in the opinion of the Approving Authority there will be no obstruction to floodwaters and no detrimental effect on the hydrological system or water quality, including the natural interface of the riparian and aquatic habitats.
- No replacement of, external alterations or additions to existing buildings that might increase the obstruction to flood waters on that site, or have a detrimental effect on the hydrological system or water quality, shall be allowed.
- No new building or other new structures shall be allowed except for the replacement of existing single family, semi-detached, duplex dwellings and accessory buildings on the same footprint.
- No outside storage is permitted.

10.3 Overland Flow Zone

If the subject property is within the 1:100 year Overland Flow Zone it is mandatory that the following Special Regulations be adhered to:

- The first floor elevation and all electrical and mechanical equipment shall be 0.3m minimum above the highest adjacent street centre line grade for all buildings.
- Indicate that the access to the underground parkade is 0.3m above the highest adjacent street centre line grade or the critical downstream spill elevation, whichever is higher.

10.4 Calgary River Valleys Plan (July 1984)

The following advisory guidelines from the “Calgary River Valleys Plan” will be provided to all landowners or developers proposing construction in the Flood Fringe areas in the City of Calgary.

10.4.1 General

- Where it is desirable to have a single detached, semi-detached or duplex family dwelling with a basement below the designated flood level, this floor should not contain any bedrooms.
- Basements should not be utilized for storage of immovable or hazardous materials that are flammable, explosive or toxic.
- Footings and foundation walls should be cast-in-place concrete.
- The top of the basement walls should be a minimum of 0.3m above the designated flood level.

- Basement walls should be provided with at least two open-able windows located on opposite sides of the building. The windows should be at least 0.15m above the designated flood level.
- Where applicable, stable fill material may be used to raise the lowest portion of the building above the designated flood level, provided the building is not raised to a height which is not in keeping with surrounding buildings or conflict with the current Land Use Bylaw.
- Where possible, buildings should be constructed with the longitudinal axis paralleled to the direction of flow.

10.4.2 Anchorage

In order to resist floatation and lateral movement, the basement floor joists should either have the ends embedded in the basement concrete wall or the header joist mechanically fastened to the required anchor bolts for the sill plate, or any other system providing similar protection.

10.4.3 Basement Drainage System

- A sump pump must be provided in the basement.
- The outflow pipe should be looped and discharge above the designated flood level.
- A separate electrical circuit should be provided for the sump pump with the operating switch located above the designated flood level.
- Basement walls should be made water tight through the use of paints, membranes and mortars to minimize seepage.
- Installation of cut-off valves on sewer lines or the elimination of gravity flow basement drains.

11 Grade Calculations

11.1 Building Grades or Lot Grades

a) If a curb or sidewalk exists in front of lot, then the 'building' or 'lot' grade is the elevation of curb or back of walk, plus a 2% slope rise to the property line. The existing curb or sidewalk elevation should be within 25 to 50 millimetres of the design elevation shown on block or sidewalk profiles.

b) If the curb or sidewalk does not exist, then the design elevation of future curb must be calculated from block, Sidewalk, or paper profiles, usually opposite the corners of a small lot or every 15.0 metres in the case of a large lot. To this top of curb elevation a figure must be added, calculated at 2% up, to arrive at property line elevation. Therefore, the proposed distance from face of curb to property line must be known.

c) In some cases, a setback grade is required. These are given where street widening is proposed. It is important to know whether the curb and walk remains on its existing line assignment or if it will be moved back. If the curb and walk are to be moved, it is usually back from existing and at the same elevation (except for major roads). The setback grade is given on the setback line 2% up from the design on profiles or, in some cases, from existing.

11.2 Lane Grades

a) Dished Lanes: From the lane or block profile, the centre line elevation is calculated. The property line elevation is higher depending on the width and cross section on the lane in a specific area. Dished lanes rise from centre line to edge at 2% for concrete and paved lanes and 4%, 6% and 8% for gravel lanes (depending on the area).(1975 standard 3.5%)

b) Flat Lanes: Centre Line elevation is calculated, and to this, add 75 millimetres for property line elevation on a 6.1 metre wide lane and 150 millimetres for property line elevation on a 9.0 metre wide lane. Variations may arise where an odd width lane is encountered.

c) Some existing flat lanes which are to be paved or poured concrete, will require the addition of 61 mm to the centre line elevation to obtain property line elevation for a 6.1 metre wide lane and 91 mm in the case of a 9.1 meter wide lane.

Ensure lanes conform to City of Calgary "Standard Specifications Roads Construction"

12 Erosion & Sediment Control

If Erosion and Sediment Control (ESC) report and/or drawings are requested for review and acceptance by Water Resources, the developer or project manager, and their site designates, shall ensure a timely and complete implementation, inspection and maintenance of all practices specified in the erosion and sediment control report and/or drawings. Any amendments to the ESC documents must be reviewed and approved by Water Resources in advance by contacting the ESC inspector that reviewed the documents or by contacting the Water Resources Erosion Control Coordinator at 403-268-2655. Documents submitted shall conform to the requirements detailed in the "The City of Calgary Guidelines for Erosion and Sediment Control" (Current Edition, http://www.calgary.ca/waterservices/esc) and shall be prepared, signed and stamped by a qualified consultant specializing in erosion and sediment control, and holding current professional accreditation as a Professional Engineer (P. Eng.), Professional Agrologist (P. Ag.) or Certified Professional in Erosion and Sediment Control (CPESC).

For each stage of work where soil is disturbed or exposed, documents must clearly specify the location, installation, inspection, maintenance and removal details and requirements for all temporary and permanent controls and practices.

For other projects where an erosion and sediment control report and/or drawings have not been required at the Prior to Release stage, the developer, or their designates, shall, as a minimum, develop an erosion and sediment control drawing and implement good housekeeping practices. These practices will protect onsite and offsite storm drains and prevent or mitigate the offsite transport of sediment by the forces of water, wind and construction traffic (mud-tracking) in accordance with the "The City of Calgary Guidelines for Erosion and Sediment Control" (Current Edition, www.calgary.ca/waterservices/esc). Some examples of good housekeeping include stabilization of stockpiles, stabilized and designated construction entrances and exits, lot logs and perimeter controls, dust control and onsite storm inlet protection. Written approval is required, from Water Resources, to install any storm inlet protection on City property. Prior to installation contact the Erosion Control Coordinator at (403) 268-2655 to obtain approval for offsite storm inlet protection on good housekeeping sites.

For all soil disturbing projects, the developer, or their representative, shall designate a person to inspect all erosion and sediment control practices a minimum of every seven (7) days and during, or within 24 hours of, the onset of significant precipitation (> 12 mm of rain in 24 hours, or rain on wet or thawing soils) or snowmelt events. Note that some practices may require daily or more frequent inspection. Erosion and sediment control practices shall be adjusted to meet changing site and winter conditions.

Refer to Appendix 'B' below for links to the Erosion & Sediment Control guidelines and other relevant documentation.

13 Encroachments

All expenses, costs, liabilities, or other risk associated with an authorized Encroachment shall be borne by the owner. Furthermore, an authorized encroachment agreement does not release an applicant from the responsibility to comply with other Provincial or Federal requirements or municipal bylaws.

The Encroachment Guidelines can be found on:

http://www.calgary.ca/CS/CPB/Pages/Real-Estate/Encroachments/Encroachments.aspx

14 Waste & Recycling Requirements

Waste & Recycling Requirements are looked at under the Development Permit Submission. To obtain all the detailed specifications as set out by Development Building Approvals or review the Complete Applications Requirement List (CARL) for Waste & Recycling go to:

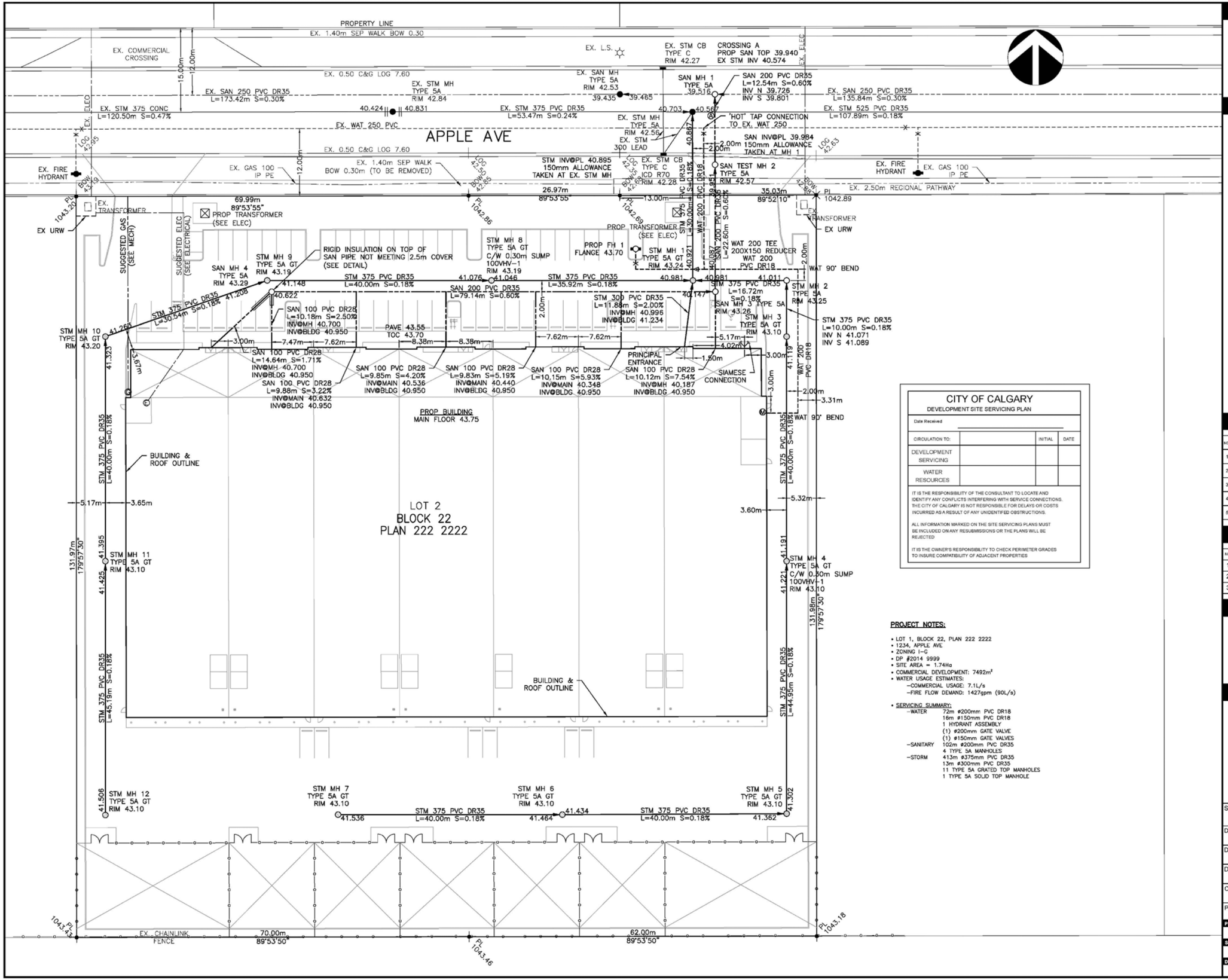
http://www.calgary.ca/UEP/WRS/Pages/Development-permit-review-and-requirements/Development-Permit-Review-and-Requirements.aspx

Appendix ‘A’ – Development Site Servicing Plan Example

The following drawings are intended to form an example DSSP submission, title blocks and site specific information have been removed. This example submission consists of the following;

Sheet 1 – Site Servicing Plan
Sheet 2 – Grading Plan
Sheet 2 – Stormwater Management Plan
Sheet 3 – Details Sheet

Note: The intent of the example that follows is to provide applicants with a clear understanding of what a typical submission package looks like. The details included are for illustration purposes only.



CITY OF CALGARY
DEVELOPMENT SITE SERVICING PLAN

Date Received

CIRCULATION TO:		INITIAL	DATE
DEVELOPMENT SERVICING			
WATER RESOURCES			

IT IS THE RESPONSIBILITY OF THE CONSULTANT TO LOCATE AND IDENTIFY ANY CONFLICTS INTERFERING WITH SERVICE CONNECTIONS. THE CITY OF CALGARY IS NOT RESPONSIBLE FOR DELAYS OR COSTS INCURRED AS A RESULT OF ANY UNIDENTIFIED OBSTRUCTIONS.

ALL INFORMATION MARKED ON THE SITE SERVICING PLANS MUST BE INCLUDED ON ANY RESUBMISSIONS OR THE PLANS WILL BE REJECTED

IT IS THE OWNER'S RESPONSIBILITY TO CHECK PERIMETER GRADES TO INSURE COMPATIBILITY OF ADJACENT PROPERTIES

PROJECT NOTES:

- LOT 1, BLOCK 22, PLAN 222 2222
- 1234, APPLE AVE
- ZONING I-G
- DP #2014 9999
- SITE AREA = 1.74Ha
- COMMERCIAL DEVELOPMENT: 7492m²
- WATER USAGE ESTIMATES:
  - –COMMERCIAL USAGE: 7.1L/s
  - –FIRE FLOW DEMAND: 1427gpm (90L/s)
- SERVICING SUMMARY:
  - –WATER: 72m ø200mm PVC DR18; 16m ø150mm PVC DR18; 1 HYDRANT ASSEMBLY; (1) ø200mm GATE VALVE; (1) ø150mm GATE VALVES
  - –SANITARY: 102m ø200mm PVC DR35; 4 TYPE 5A MANHOLES
  - –STORM: 413m ø375mm PVC DR35; 13m ø300mm PVC DR35; 11 TYPE 5A GRATED TOP MANHOLES; 1 TYPE 5A SOLID TOP MANHOLE

EXISTING UTILITIES
- SANITARY SEWER
- STORM SEWER
- WATER LINE
- CHAIN LINK FENCE
- TYPE 5A MANHOLE
- TYPE 1S MANHOLE
- CATCH BASIN
- HYDRANT
- WATER VALVE
- U/G ELECTRICAL
- GAS

PROPOSED UTILITIES
- SANITARY SEWER
- STORM SEWER
- WATER LINE
- CHAIN LINK FENCE
- TYPE 5A MANHOLE
- CATCHBASIN/MANHOLE
- TYPE 1S MANHOLE
- CATCH BASIN
- HYDRANT
- WATER VALVE
- WATER METER LOCATION
- CONCRETE SWALE
- ELECTRICAL METER LOCATION
- GAS METER LOCATION

REVISIONS

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SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE
1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-9999

DEVELOPMENT SITE SERVICING PLAN

SCALE: NTS

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PROJECT No. -

SHEET - OF -

DRAWING NAME -

DESTROY ALL PRINTS PRIOR TO

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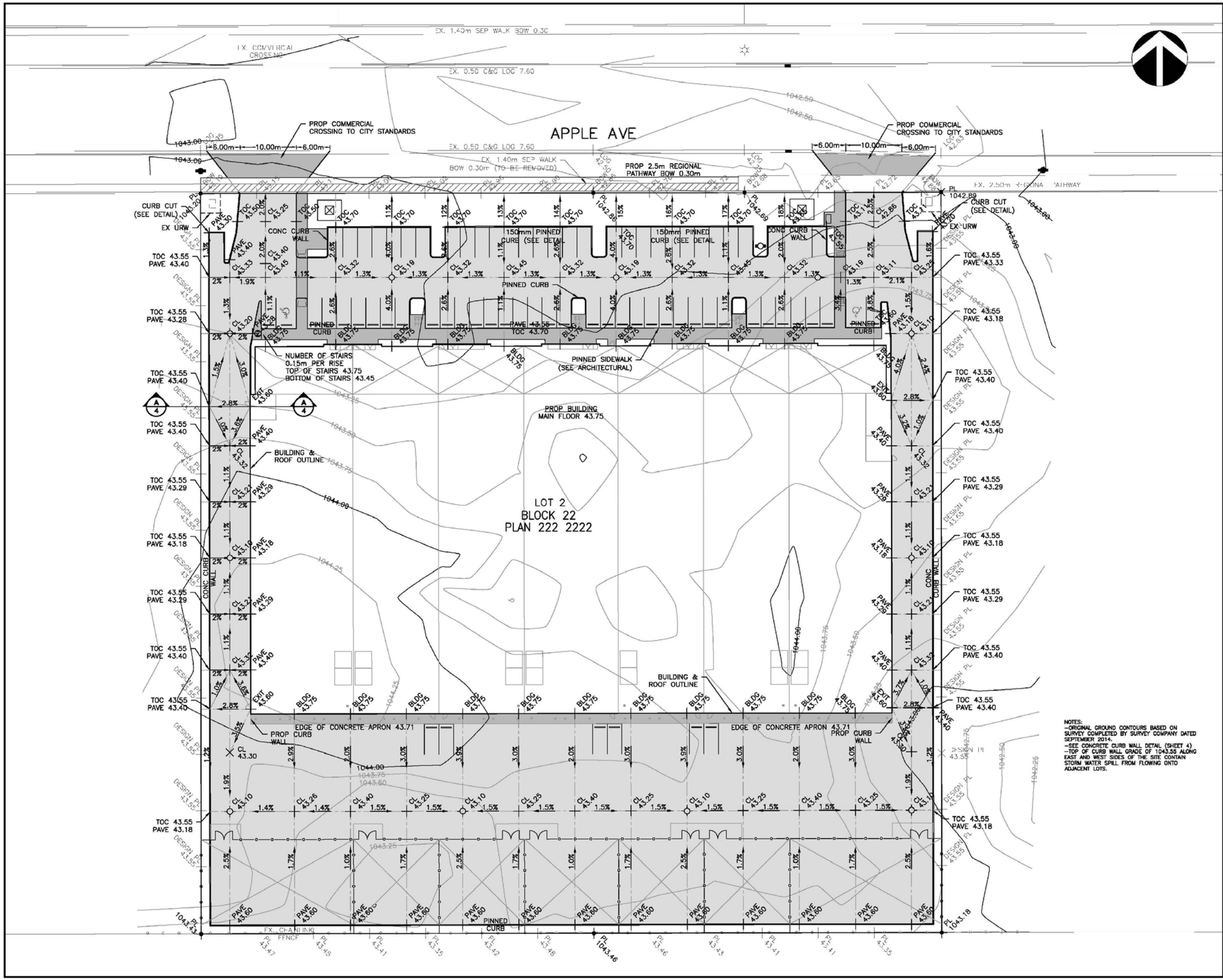

NOTES:
--ORIGINAL GROUND CONTOURS BASED ON SURVEY COMPLETED BY SURVEY COMPANY DATED SEPTEMBER 2014.
--SEE CONCRETE CURB WALL DETAIL (SHEET 4)
--TOP OF CURB WALL GRADE OF 1043.55 ALONG EAST AND WEST SIDES OF THE SITE CONTAIN STORM WATER SPILL FROM FLOWING ONTO ADJACENT LOTS.

GRADING FEATURES

- PROPOSED CONCRETE SWALE
- PROPOSED CATCH BASIN
- PROPOSED MANHOLE
- PROPOSED CB/MANHOLE
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE
- PROPOSED RETAINING WALL
- PROPOSED GRASS SWALE
- PROPOSED CHAINLINK FENCE
- PROPOSED POST & CABLE FENCE
- PROPOSED SCREEN FENCE
- PROPOSED FINISHED GRADE
- EXISTING PL GRADE

REVISIONS

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SUBMISSIONS

NO.	DESCRIPTION	DATE (d/m/y)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE

1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-9999

SITE GRADING PLAN W/ OG CONTOURS

SCALE: NTS

DES: - STAMP:
DWN: -
DATE: -
CHK: -
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SHEET - OF -

DRAWING NAME -

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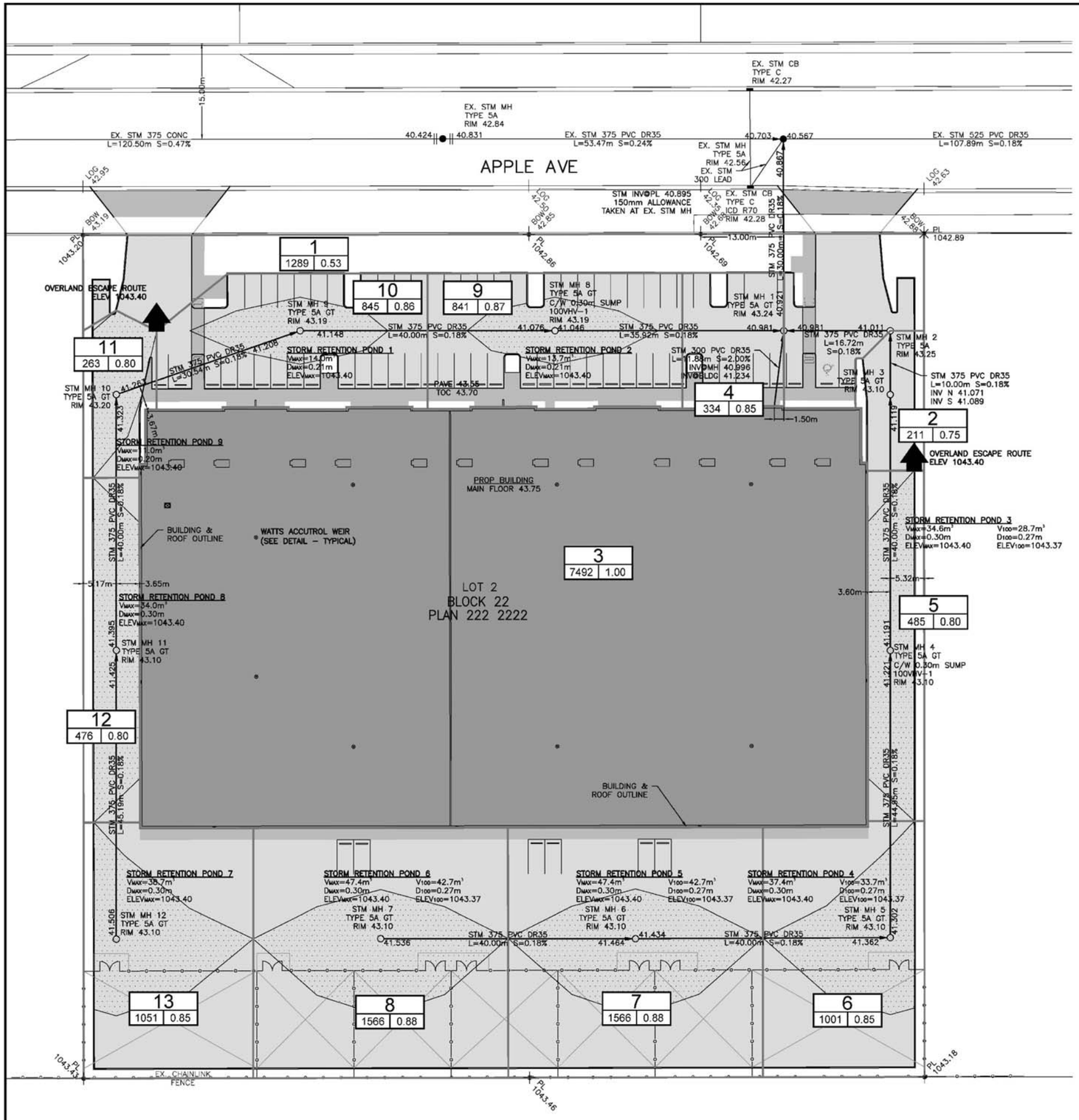


STORMWATER MANAGEMENT CALCULATIONS

OVERALL SITE CONDITIONS

SURFACE	AREA (m²)	C FACTOR
BUILDING	7492	1.00
PAVEMENT	8439	0.90
LANDSCAPE	1489	0.30
TOTAL	17420	0.89

ALLOWABLE FLOW = 45L/s/Ha
(FROM STORM DRAINAGE PLAN FOR STARFIELD INDUSTRIAL PREPARED BY THE CITY OF CALGARY)
Q = 45L/s (1.7419Ha)
= 78.4/s

UNRESTRICTED FLOW FROM SITE:

– CATCHMENT AREA 1
– OVERLAND FLOW TO 61ST AVENUE SE DUE TO GRADING.

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	496	0.90
LANDSCAPE	811	0.30
TOTAL	1307	0.53

CATCHMENT AREA 1
$Q_1 = 2.78CiA$
$= 2.78(0.53)(168.00)(0.1307) = 32.4L/s$

– CATCHMENT AREA 2 AND 4 FLOWS ARE INTERCEPTED BY MANHOLES, ALTHOUGH NOT RESTRICTED

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	464	0.90
LANDSCAPE	81	0.30
TOTAL	545	0.81

CATCHMENT AREA 2 AND 4
$Q_1 = 2.78(0.81)(82.55)(0.0545) = 10.1L/s$

ALLOWABLE RESTRICTED FLOW FROM SITE:

ALLOWABLE FLOW – UNRESTRICTED FLOW
78.4L/s – (32.4 + 10.1)L/s = 35.9L/s

STORM RETENTION CALCULATIONS:

CATCHMENT AREAS 5–8

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	4336	0.90
LANDSCAPE	282	0.30
TOTAL	4618	0.86

VHV100–1 IN STM MH 3 RESTRICTS FLOW

ACTUAL DISCHARGE FROM AREAS 5–8:

EMERGENCY ESCAPE ROUTE – NEAR NORTHEAST ENTRANCE @ ELEVATION 1043.40

MAX HEAD – SPILL ELEVATION = 1043.40
– CENTER OF ORIFICE @ OUTLET
1041.089 (INVERT AT OUTLET)
0.188
1041.28
MAX HEAD = 1043.40 – 1041.28 = 2.12m

$C_1 = \frac{10.8}{2.78(82.55)(0.4618)} = 0.10$

$\frac{C_2}{C_1} = \frac{0.86}{0.10} = 8.60$

FROM CITY OF CALGARY FIGURE 3.1 UNIT RELEASE RATE VS. ONSITE STORAGE

MAXIMUM STORAGE (m^3/Ha) = 320m^3/Ha
STORAGE VOLUME REQUIRED = (320m^3)(0.4618) = 147.8m^3

TOTAL SURFACE RETENTION PONDS PROVIDED = 166.8m^3
(SEE POND CALCULATIONS ON THIS PLAN)

STORM RETENTION CALCULATIONS:

CATCHMENT AREA 2 (BUILDING ROOF)

SURFACE	AREA (m²)	C FACTOR
BUILDING	7492	1.00
PAVEMENT	0	0.90
LANDSCAPE	0	0.30
TOTAL	7492	1.00

ROOF DRAIN WEIRS RESTRICT FLOW

ACTUAL DISCHARGE FROM AREA 2:

–ROOF DRAINAGE (FLOW RESTRICTORS ON ROOF DRAINS)
–CONNECTED INTERNALLY TO 300mm BUILDING SERVICE AT NORTH SIDE OF BUILDING
–WATTS FLOW RESTRICTING WEIRS (5USgpm/INCH DEPTH)
–150mm MAXIMUM DEPTH AT DRAINS

8 ROOF DRAINS @ 1.89L/s EACH = 15.1L/s

$C_1 = \frac{15.1}{2.78(82.55)(0.7492)} = 0.09$

C_2 (ABOVE) = 1.00

$\frac{C_2}{C_1} = \frac{1.00}{0.09} = 11.1$

FROM CITY OF CALGARY FIGURE 3.1 UNIT RELEASE RATE VS. ONSITE STORAGE

MAXIMUM STORAGE (m^3/Ha) = 310m^3/Ha
STORAGE VOLUME REQUIRED = (310m^3)(0.7492) = 232.3m^3

STORAGE VOLUME PROVIDED ON THE ROOF:
MAXIMUM DEPTH = 150mm
(OVERFLOW PROTECTION – OVERFLOW SCUPPERS, SEE ARCHITECT PLANS)
MAXIMUM STORAGE PROVIDED = 374.6m^3
AVERAGE DEPTH 232.3m^3/7492m^2 = 31.0mm

STORM RETENTION CALCULATIONS:

CATCHMENT AREAS 9–13

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	1353	0.90
LANDSCAPE	174	0.30
TOTAL	3476	0.85

100VHV–1 IN STM MH 8 RESTRICTS FLOW

ACTUAL DISCHARGE FROM AREAS 9–13:

EMERGENCY ESCAPE ROUTE – NORTHWEST ENTRANCE @ ELEVATION 1043.40

MAX HEAD – SPILL ELEVATION = 1043.40
– CENTER OF ORIFICE @ OUTLET
1041.046 (INVERT AT OUTLET)
0.188
1041.23
MAX HEAD = 1043.40 – 1041.23 = 2.17m

$C_1 = \frac{10.0}{2.78(82.55)(0.3476)} = 0.13$

$\frac{C_2}{C_1} = \frac{0.85}{0.13} = 6.54$

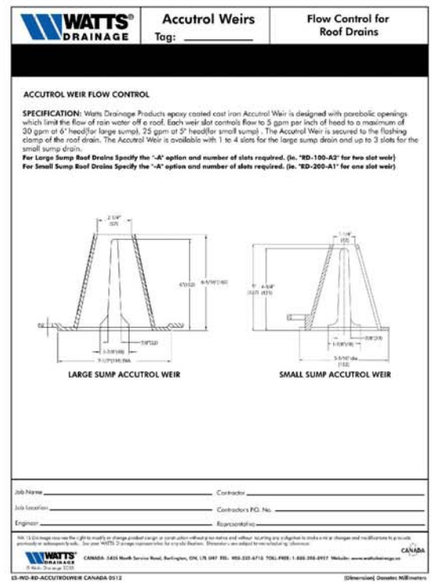
FROM CITY OF CALGARY FIGURE 3.1 UNIT RELEASE RATE VS. ONSITE STORAGE

MAXIMUM STORAGE (m^3/Ha) = 320m^3/Ha
STORAGE VOLUME REQUIRED = (320m^3)(0.3476) = 111.2m^3

TOTAL SURFACE RETENTION PONDS PROVIDED = 111.4m^3
(SEE POND CALCULATIONS THIS SHEET)

ALLOWABLE FLOW FROM SITE:

UNRESTRICTED FLOW + RESTRICTED FLOW (ROOF + PIPE)
(32.4 + 10.1)L/s + (15.1 + 10.8 + 10.0)L/s = 78.4L/s
ALLOWABLE FLOW = 78.4L/s



STORMWATER FEATURES

- PROPOSED CONCRETE SWALE
- EXISTING CATCH BASIN
- EXISTING MANHOLE
- PROPOSED MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED STORM
- PROPOSED GRASS SWALE
- PROPOSED CATCHMENT AREA
- PROPOSED PONDING AREA
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE
- PROPOSED BUILDING AREA
- PROPOSED OVERLAND ESCAPE ROUTE
- PROPOSED FLOW DIRECTION
- 2 — CATCHMENT NUMBER
- 1242 | 0.431 — 'C' FACTOR
- AREA (m^2)

REVISIONS

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SUBMISSIONS

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3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE
1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-9999

STORMWATER MANAGEMENT PLAN

SCALE: NTS

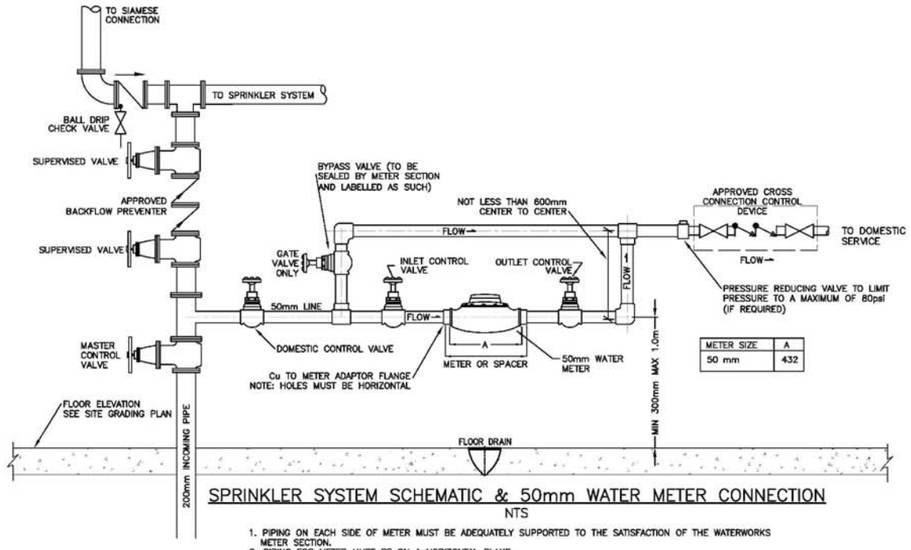
DES: - STAMP:
DWN: -
DATE: -
CHK: -
P. ENG: -

PROJECT No. -

SHEET - OF -

DRAWING NAME -

DESTROY ALL PRINTS PRIOR TO R -



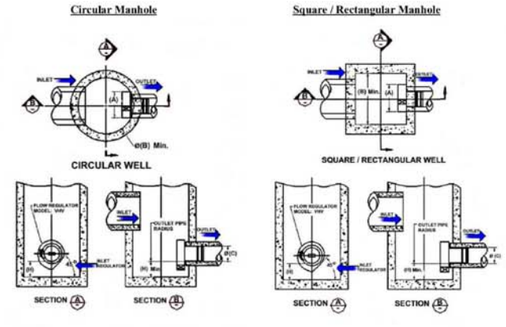
SPRINKLER SYSTEM SCHEMATIC & 50mm WATER METER CONNECTION

NTS

1. PIPING ON EACH SIDE OF METER MUST BE ADEQUATELY SUPPORTED TO THE SATISFACTION OF THE WATERWORKS METER SECTION.
2. PIPING FOR METER MUST BE ON A HORIZONTAL PLANE.
3. MINIMUM DISTANCE OF 300mm BETWEEN ANY WALL AND METER OR METER TREE.
4. VALVES ARE REQUIRED ADJACENT TO METERS (INLET AND OUTLET SIDE).
5. ALTERNATE ARRANGEMENT OF PIPING AND VALVING MUST HAVE THE APPROVAL OF THE WATERWORKS METER SECTION PRIOR TO INSTALLATION.
6. THE AREA FOR 600mm IN FRONT OF THE METER SHALL BE FREE OF OBSTRUCTION TO ALLOW FOR CONVENIENT READING AND SERVICING OF THE METER. 2 METER HEADROOM MUST BE PROVIDED IN THIS AREA.
7. METERS MUST BE INSTALLED IN THE MECHANICAL ROOM AND WITHIN REASONABLE DISTANCE OF A FLOOR DRAIN. IN NO CASE SHALL A METER BE INSTALLED IN A BATHROOM, BEDROOM, CRAWL SPACE, GARAGE OR UNDER A STAIRWELL. METER LOCATIONS MUST BE APPROVED BY WATERWORKS.
8. METER SPACERS WILL BE SUPPLIED THE CITY OF CALGARY (FOR USE WITHIN CITY LIMITS ONLY) PHONE 311.
9. ALL FITTINGS AND PIPE ARE TO BE BRASS, OR SOLDERED COPPER.
10. SERVICE VALVES. MAIN VALVES OR ANY OTHER CITY OWNED WATERWORKS APPURTENANCES SHALL BE OPERATED BY WATER SERVICES PERSONNEL ONLY.
11. THE BYPASS VALVE SHALL BE A FULL PORT GATE VALVE (A BALL VALVE IS NOT ACCEPTABLE). ALL OTHER VALVES SHALL BE FULL PORT OR BALL VALVES.
12. AN APPROVED PREMISE ISOLATING CROSS CONNECTION CONTROL DEVICE SHALL BE INSTALLED IMMEDIATELY AFTER THE WATER METER SETTING ON ALL COMMERCIAL, INDUSTRIAL AND MULTI-FAMILY RESIDENTIAL (3 UNITS OR MORE) SERVICES.

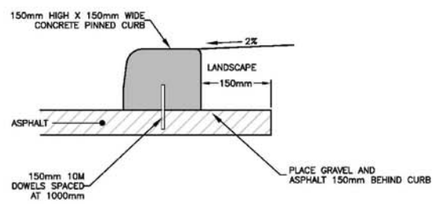
    FOR DOMESTIC SERVICES THAT REQUIRE 24 HOUR UNINTERUPTED WATER SUPPLY, A PARALLEL CROSS CONNECTION CONTROL DEVICE ARRANGEMENT (SEE SHEET NO. 27, CITY OF CALGARY WATERWORKS CONSTRUCTION SPECIFICATIONS) MUST BE INSTALLED TO FACILITATE ANNUAL TESTING & ROUTINE MAINTENANCE OF THE CROSS CONNECTION CONTROL DEVICE (S).

13. A BYPASS LINE THE SAME SIZE AS THE MAIN PIPE IS REQUIRED. BYPASS NOT REQUIRED FOR IRRIGATION METERS.
14. WATER CONNECTIONS (IE. DRAIN DOWN VALVE OR HOSE BIB ETC.) SHALL NOT BE PERMITTED BEFORE THE APPROVED CROSS CONNECTION CONTROL DEVICE. FOR INQUIRY CALL 311.
15. AN APPROVED PREMISES-ISOLATING CROSS CONNECTION CONTROL DEVICE SHALL BE INSTALLED IMMEDIATELY AFTER THE WATER METER OUTLET VALVE ON ALL IRRIGATION SERVICES.



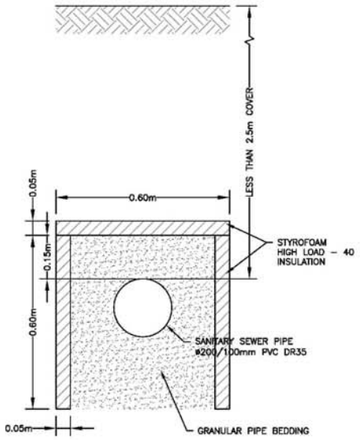
TYPICAL HYDROVEX DETAIL

SCALE NTS



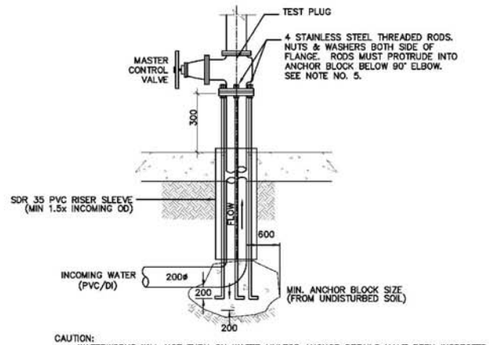
0.15m PINNED CURB

NTS



RIGID INSULATION

SCALE 1:10

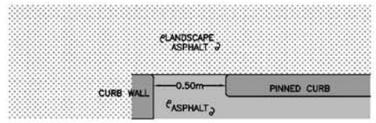


CAUTION:
WATERWORKS WILL NOT TURN ON WATER UNLESS ANCHOR DETAILS HAVE BEEN INSPECTED BY THE WATERWORKS INSPECTOR PRIOR TO PLACEMENT OF CONCRETE AND/OR BACKFILL.

ANCHOR DETAIL THROUGH FLOOR

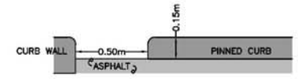
NTS

1. THE MASTER CONTROL VALE SHALL BE ONE OF THE FOLLOWING:
   a) RESILIENT SEATED RISING SPINDLE (OS&Y) FLANGED GATE VALVE (UL OR ULC LISTED) FOR FIRE LINES AND CSA APPROVED FOR DOMESTIC LINES.
   b) SHORT BODY RUBBER SEATED FLANGED OR LUG WATER TYPE BUTTERFLY VALVE C/W HAND WHEEL, REDUCTION GEAR OPERATOR, POSITION INDICATOR (UL OR ULC LISTED) PROVIDED THEY ARE NOT IN SUCTION LINE FOR FIRE PUMP(S).
2. ENTRANCE PIPE MATERIAL THROUGH THE OUTSIDE WALL AND THROUGH THE FLOOR SHALL BE DUCTILE IRON PIPE AWWA C151 (LATEST EDITION) CLASS 53 OR APPROVED EQUAL. BURIED FITTINGS (90° ELBOW) SHALL BE CAST OR DUCTILE IRON CONFORMING TO AWWA C110 (LATEST EDITION) OR APPROVED EQUAL. SERVICE ENTRIES THROUGH THE FLOOR (INCLUDING) ANCHOR DETAILS) SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER AND DETAILED ON THE MECHANICAL SITE PLAN. (ANCHOR RODS SHALL BE 18-8 STAINLESS STEEL, WHERE A STANDARD 3m LENGTH OF ROD REQUIRES EXTENSION. AN APPROVED STAINLESS HEXAGON NUT COUPLING SHALL BE INSTALLED AT THE UPPER END OF THE ROD).
3. PROVIDE ADEQUATE PIPE SUPPORT. REFER TO DEVELOPMENT SITE SERVICING PLAN (DSSP) GUIDELINES (2.8.8.3 PIPING SUPPORT)
4. INTERNAL PLUMBING TO STUB TO TERMINATE A MINIMUM 2.0m OUT FROM EXTERIOR WALL OR FOOTING. ENTRANCE OF PIPE THROUGH WALL SHALL BE PERPENDICULAR (90°) TO WALL.
5. ANCHOR RODS TO BE ¾" FOR 100mm – 200mm SERVICE, ⅞" FOR 250mm – 300mm SERVICE AND 1" FOR 350mm – 400mm SERVICE.
6. A RESTRAINED FLANGE ADAPTOR MAY BE USED TO CONNECT THE RISER OR WALL ENTRY PIPE TO THE MASTER CONTROL VALVE. RESTRAINED FLANGE ADAPTOR SHALL BE EBAA SERIES 2100 MEGA OR APPROVED EQUAL.



CURB CUT DETAIL (PLAN VIEW)

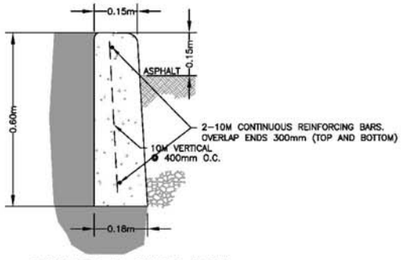
SCALE 1:20



CURB CUT DETAIL (SECTION VIEW)

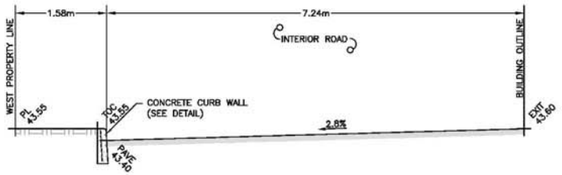
SCALE 1:20

REFER TO GEOTECHNICAL EVALUATION FOR PAVEMENT DESIGN AND TYPE OF CEMENT PRIOR TO PLACING ANY CONCRETE. REFER TO ARCHITECTURAL PLANS FOR LOCATION OF HEAVY AND LIGHT DUTY ASPHALT AREAS.



CONCRETE CURB WALL

SCALE 1:10



WEST CROSS SECTION AA

SCALE 1:50

REVISIONS

NO.	day yy/mm	DESCRIPTION	BY	APP'D
1	- -	-	-	-
2	- -	-	-	-
3	- -	-	-	-
4	- -	-	-	-
5	- -	-	-	-

SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE
1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-9999

DETAIL SHEET

SCALE: AS NOTED
DES: - STAMP:
DWN: -
DATE: -
CHK: -
P. ENG: -
PROJECT No. -
SHEET - OF -
DRAWING NAME -
DESTROY ALL PRINTS PRIOR TO R -

Appendix ‘B’ – References & Links

Refer to the following links for more information and reference material.

Relevant Bylaws:

Calgary Land Use Bylaw 1P2007
http://www.calgary.ca/PDA/DBA/Pages/Calgary-Land-Use-bylaw-1P2007/Calgary-Land-Use-Bylaw-1P2007.aspx

Calgary Land Use Bylaw 2P80
http://www.calgary.ca/PDA/LUPP/Documents/Publications/bylaw.pdf

Utility Site Servicing Bylaw 33M2005
http://www.calgary.ca/_layouts/cocis/DirectDownload.aspx?target=http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/33m2005-UtilitySiteServicing.pdf&noredirect=1&sf=1

Water Utility Bylaw 40M2006
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/40M2006-WaterUtility.pdf

Wastewater Bylaw 14M2012
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/14M2012-Wastewater.pdf

Drainage Bylaw 37M2005
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/37m2005-Drainage.pdf

Lot Grading Bylaw 32M2004
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/32m2004-LotGradingBylaw.pdf

Waste and Recycling Bylaw 20M2001
http://www.calgary.ca/_layouts/cocis/DirectDownload.aspx?target=http%3a%2f%2fwww.calgary.ca%2fCA%2fcity-clerks%2fDocuments%2fLegislative-services%2fBylaws%2f20M2001-WasteAndRecycling.pdf&noredirect=1&sf=1

Water Resources Links:

Development Site Servicing Plan (DSSP) Complete Applications Requirement List (CARL)
http://www.calgary.ca/PDA/DBA/Documents/carls/DSSP-CARL.pdf

Stormwater Management and Design Manual
http://www.calgary.ca/PDA/DBA/Documents/urban_development/bulletins/2011-stormwater-management-and-Design.pdf

Standard Specifications for Waterworks Constructions
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/Waterworks2012.pdf

Standard Specifications for Sewer Construction
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/Waterworks2012.pdf

Design Guidelines for Subdivision Servicing
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/design-guidelines-for-subdivision-servicing-2012.pdf

Development Approval Submissions (Stormwater Reports, Construction Drawings, & Ponds)
http://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Development-Approvals-Submissions.aspx

Sanitary Servicing Study Guidelines
http://www.calgary.ca/PDA/DBA/Documents/development/west-memorial-sanitary-servicing-study-guidelines.pdf

Floodway, Flood Fringe and Overland Flow Zone Maps
http://www.calgary.ca/PDA/DBA/Pages/Calgary-Land-Use-bylaw-1P2007/Maps/Floodway-Flood-Fringe-Maps.aspx

National Plumbing Code of Canada (Can be purchased at the following link)
http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-plumbing-code.html

Calgary River Valleys Plan – July 1984 (Can be purchased at the following link)
http://www.calgary.ca/PDA/DBA/Pages/Planning-policy-information/Printed-documents/Environment.aspx

Water Services Information Page
http://www.calgary.ca/UEP/Water/Pages/Water-Services.aspx

PVC Main Break Study – Cause Analysis
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/PVC_Failure_Presentation_Sept_-202010.pdf

Design and Construction of Flexible Thermoplastic Pipe
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/standard-practice-for-design-and-construction-flexible-pipe.pdf

Erosion and Sediment Control:

Guidelines for Erosion and Sediment Control
http://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Submission-for-Approval.aspx

Field Manual for Erosion and Sediment Control
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/ESC-field-manual-2011.pdf

Environmental Regulatory Review and Responsibilities: Calgary Construction Sites
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/esc_regulatory_review_responsibilities.pdf

General Links:

Urban Development Bulletins
http://www.calgary.ca/PDA/DBA/Pages/Urban-Development/Urban-Development.aspx

Urban Development Bulletin – Archive
http://www.calgary.ca/PDA/DBA/Pages/Urban-Development/Urban-Development-archived-bulletins.aspx

Servicing Guidelines for new Single Family/Semi-detached/Duplex dwellings in the Developed Area
http://www.calgary.ca/PDA/DBA/Documents/carls/residential-grades.pdf

Standard Specification for Roads Construction
http://www.calgary.ca/Transportation/Roads/Documents/Contractors-and-Consultants/Roads-Construction-2012-Standard-Specifications.pdf

Standard Specifications for Landscape Construction
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/Landscape2012.pdf

Standard Block Profile Specifications for CAD and manual formats
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/BlockProfile2008.pdf

Consulting Engineers Field Services Guidelines
http://www.calgary.ca/PDA/DBA/Documents/urban_development/CEFSG/Consulting-Engineers-Field-Services-Guidelines-6th-edition.pdf

Standard Specifications for Street Lighting Construction
http://www.calgary.ca/PDA/DBA/Documents/urban_development/publications/Streetlighting2006.pdf