Design Standard

Stormwater

January 2021

City of Regina | REGINA *Infinite Horizons*

Contents

1. General

1.1. Introduction

1.1.1. The stormwater drainage program's long-term goal is to provide a reasonable, safe and cost-effective stormwater drainage system. The drainage system shall minimize property flood damage by reducing the frequency and degree of flooding and controlling surface flooding in such a manner as to provide safety for road traffic, pedestrians and children.

1.1.2. This design standard should be used in conjunction with the general design standard and the reference documents listed in section 1.2.

1.1.3. Where acts, bylaws, regulations and standards are referred to, they shall be the most current.

1.1.4. It shall be the designers' responsibility to be aware of the statutory requirements governing such work and comply with those requirements.

1.1.5. Proposed drainage plans may require regulatory approval of other agencies and the approval of the City of Regina.

1.2. Reference Documents

1.2.1. City Reference Documents

1.2.1.1. Design Regina: Official Community Plan

1.2.1.2. Drainage Plans:

1.2.1.2.1. Approved Secondary Plan (Neighbourhood Plan)

1.2.1.2.2. Approved Concept Plan

1.2.1.2.3. Sector Serviceability Studies

1.2.1.2.4. Regina Drainage Master Plan Report, 2009.

1.2.1.3. Regina Zoning Bylaw,2019

1.2.1.4. The Building Bylaw

1.2.1.5. Subdivision Bylaw

1.2.1.6. The Wastewater and Storm Water Bylaw,2016

1.2.1.7. City of Regina Standard Construction Specifications and Standard Drawings.

1.2.1.8. City of Regina Wastewater Lift Station Design Manual

1.2.1.9. All other City of Regina Design Standards.

1.2.2. Design References

1.2.2.1. The Saskatchewan Environmental Code.

1.2.2.2. Saskatchewan Plumbing and Drainage Regulations Saskatchewan Plumbing and Drainage Regulations

1.2.2.3. Stormwater Guidelines EPB 322 Jan 2014 published by the Water Security Agency (WSA)

1.2.2.4. Environment Canada historical climate records

1.3. Definitions

1.3.1. *Design Rainfall Event* - The storm event is used to design the drainage system and its elements.

1.3.2. *Forcemain* - Force mains are pipelines that convey stormwater or wastewater under pressure from the discharge side in a lift station to a discharge point.

1.3.3. *Linear Stormwater Detention Facility* – An open space system that supports stormwater detention, stormwater conveyance, and passive and active recreational infrastructure.

1.3.4. *Major Drainage System* - A major drainage system is comprised of overland flow routes, ditches, roadways, watercourses, storage facilities and outfalls into storage or watercourses. These elements are planned, designed and incorporated as part of the urban infrastructure to convey runoff from major rainfall events.

1.3.5. *Minor Drainage System* - A minor drainage system is a network of sewers, inlets, swales, and street gutters designed to convey storm runoff from minor rainfall events. The minor drainage system conveys stormwater flows from the road surface during minor rainfall events. All runoff over the minor system capacity is considered part of the major drainage system.

1.3.6. *Node* - A node represents either a maintenance hole or catch basin in stormwater modelling.

1.3.7. *Pump/Lift Stations* - Storm pump or lift stations are hydraulic devices and structures used to convey stormwater mechanically.

1.3.8. *Receiving Body* - The receiving bodies for drainage in Regina are Wascana Lake, Wascana Creek, Pilot Butte Creek, Chuka Creek, Cottonwood Creek, human-made channels, detention and retention facilities.

1.3.9. *Release Point* - A release point (or discharge point) is where overland stormwater flows from private property to the public system.

1.3.10. *Return Period* - The return period of a rainfall event is the inverse of the statistical chance that a given size storm will occur in any given year based on historical data.

1.3.11. *Storm Channel* - A receiving stream constructed to convey stormwater and a Major Drainage System element.

1.3.12. *Storm Ditch* - A ditch is a moderate depression created to channel water. It is a major system element.

1.3.13. *Storm Outfalls* - Storm outfalls are storm sewers that outlet into the receiving bodies such as detention/retention facilities, channels and creeks.

1.3.14. *Storm Sewer Service Connections* - A connection from a proposed or existing lot or parcel to the storm sewer system.

1.3.15. *Storm Swale* - A swale is a small to moderate depression created to channel water. This is a minor system element.

1.3.16. *Stormwater Detention Facility* - A stormwater detention facility does not permanently retain a portion of its stormwater runoff. Water is contained in the facility for only a short period. The facility's storage attenuates the total calculated runoff and then releases the stored runoff at the rate equal to or less than the predevelopment flow rate. This is referred to as a dry facility. This is a major system element.

1.3.17. *Stormwater Retention Facility* - A stormwater retention facility retains a portion of the stormwater runoff permanently in the facility. This is referred to as a wet facility. This is a major system element.

1.3.18. *Siphon (Inverted Siphon or Depressed Sewer)* - A siphon is a piping component that allows flows to be conveyed under an obstruction with a downstream outlet to a gravity sewer or trunk.

2. Preliminary Design

2.1. Design Considerations

2.1.1. Drainage water shall not be contaminated by any component of domestic sewage, commercial or industrial effluent.

2.1.2. New drainage systems are not permitted to connect to the wastewater system per *The Wastewater and Storm Water Bylaw,2016*.

2.1.3. New drainage systems must accommodate the upstream predevelopment release rate.

2.1.4. New drainage systems minor system post-development runoff rates shall not exceed predevelopment runoff rates unless the excess is accommodated in ponds. This rate shall take precedence over all other standards.

2.1.5. Predevelopment flow rate shall be calculated based on the percent impervious (Table1) of the land use type for the undeveloped lands. Corresponding values for *C* are determined as per section 2.4.7.1.

2.1.6. Infill drainage systems shall be designed to prevent impact on neighbouring drainage systems from major system blockage.

2.2. General Modelling

2.2.1. Models should simulate both minor and major stormwater systems.

2.2.2. Models should show the catchment area for each node.

Table 1: Percent Impervious Ratios

Percent Impervious Ratios	
Land Use Type	**Ratio**
Commercial	95%
Industrial Development	80%
Prestige Industrial Lands	75%
Residential (High Density)	90%
Residential (Medium Density)	75%
Residential (Low Density)	50%
Gravel Parking lots/lanes	100%
Paved Surface/roofs/storm channel	100%
Green Space	10%
Undeveloped/Agriculture	0%

Table 2: Infiltration Parameters

Infiltration Parameters		
Parameter	**Description**	**Value**
Impervious Area Runoff	Depression Storage (millimetres)	6.0
	Manning's n	0.013
Pervious Area Runoff	Depression Storage (millimetres)	12.0
	Manning's n	0.25
Horton Equation	Maximum Infiltration Rate (Fe) (millimetres per hour)	43.94
	Minimum Infiltration Rate (Fe) (millimetres per hour)	7.62
	Decay Rate of Infiltration (k) (1/seconds)	0.00115

Table 3: Chicago Distribution Constants

Chicago Distribution Constants								
Constant	**Return Period**							
	1:2	**1:5**	**1:10**	**1:15**	**1:20**	**1:25**	**1:50**	**1:100**
a	591.641	1080.652	1412.529	1566.66	1717.578	1805.11	2126.465	2457.394
b	6.656	8.418	9.039	8.997	9.326	9.326	9.674	10.002
c	0.802	0.827	0.836	0.836	0.84	0.841	0.845	0.85

2.3. Computer Modelling

2.3.1. Computer simulation methods are required for the design of drainage elements for areas larger than 65 hectares.

2.3.2. The modelling software Infoworks ICM is the City's preference for analysis and design of drainage elements.

2.3.3. PCSWMM and XPSWMM are approved as alternative modelling software. These alternatives shall comply with the requirements of section 2.3.4.

2.3.3.1. Data from the City's Infoworks model will be provided as requested to support proper analysis.

2.3.4. The City will consider other alternative computer models. If approved, these models must simulate minor systems under surcharge and major system conditions for Regina applications.

2.3.5. All developments are required to use Chicago storm distribution for 24 hours.

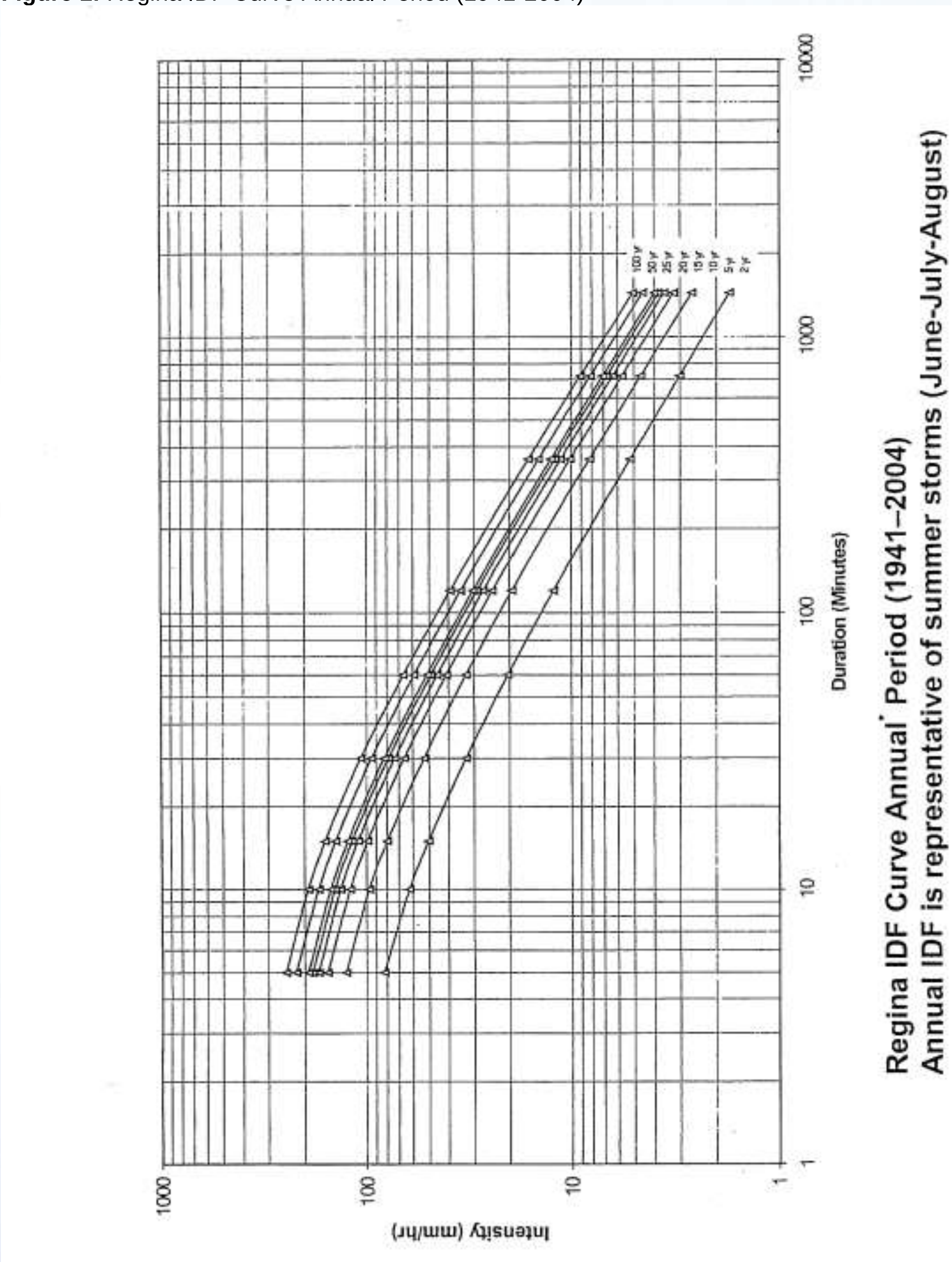
2.4. Hand Calculation

2.4.1. Hand calculation methods shall be used for design areas ≤ 65 hectares.

2.4.2. The standard Rational Method must be used.

2.4.3. Figure 1 must be used for hand calculations.

Figure 1: Regina IDF Curve Annual Period (1941-2004)



2.4.4. The Rational Method calculates peak runoff flows as follows:

$$Q = \frac{CIA}{K}$$

Q = the design flow rate (cubic metres per second).
C = the runoff coefficient (dimensionless).
I = the rainfall intensity (millimetres per hour) for a storm of duration T.
A = the effective area of the drainage basin (hectares) and
K = constant of proportionality (360).

2.4.5. The runoff coefficient, C, shall be consistent with the respective land-use's imperviousness in Table 1. Deviation from Table 1 may be considered when site-specific detail is provided.

2.4.6. The derivation of the Chicago distribution hyetograph using the updated intensity duration frequency (IDF) relationship developed for the City of Regina is given below.

$$i = \frac{a}{(t_d + b)^c}$$

i = average rainfall intensity (millimetres per hour).
t_d = storm duration (minutes).
a,b,c = constants, which define the shape of the IDF curve for the return period.

2.4.7. For storms up to the 1:5 year return period, considering the flat nature of the City of Regina and typical Regina clays, the best correlation of imperviousness with c should be calculated as follows:

2.4.7.1. c = 0.95 (Imperviousness) + 0.1 (1.0 - Imperviousness).

Table 4: Runoff Coefficient (C) Increase by Return Period

Runoff Coefficient (C) Increase by Return Period	
Return Period	**Percent Increase of C**
1:25	10
1:50	20
1:100	25
Note: The purpose of the increase in C value is to increase the design flow rate.	

2.4.8. The value of the Design Rainfall Intensity (I) for the Rational Method is selected from the Regina IDF curves (Figure 1) with a chosen duration matching the Time of Concentration (t)

2.4.9. The Time of Concentration (t) for runoff is when the basin is at maximum contribution to the design location and is required for runoff to reach the design point from the furthest point within the contributing catchment area. The time of concentration has two components, inlet and travel time, where:

2.4.9.1. Inlet time is the travel time for flow from the basin extremity to reach the system's first inflow point.

2.4.9.2. Inlet time is site-specific and is dependant upon criteria such as imperviousness and slope.

2.4.9.3. The minimum inlet time is to be set at 15 minutes.

2.4.9.4. Travel time describes the time of travel from the first inflow point to the point of the design.

2.4.9.5. Travel time is the length of time it takes the peak flow to travel the sewer's length using the pipe specific characteristics of diameter, slope and roughness coefficient as applied to the Manning equation.

2.5. Design Storm Events

Table 5: Design Storm Events

Design Storm Events		
Type of Development	**Drainage System Classification**	**Design Event**
Infill	Major	1:25
Infill	Minor	1:5
New Greenfield	Major	1:100
New Greenfield	Minor	1:5

2.6. Major System - Storm Channels

2.6.1. Side slopes shall be designed to 5:1 where possible and not be steeper than 4:1.

2.6.2. Storm channels shall have a continuous longitudinal slope.

2.6.3. Maintenance benches must be provided as per typical drawings SW-1 and SW-2.

2.6.3.1. The maintenance bench shall have a maximum cross slope of 3%.

2.6.3.2. Storm channels shall have a maintenance access ramp with a maximum slope of 6%.

The maintenance ramp shall provide for 6.0 metres traffic width

2.7. Major System - Stormwater Detention Facilities

2.7.1. Water Security Agency Stormwater Guidelines (current edition) best management practices must be addressed by design for the facility.

2.7.2. Stormwater facilities located on Municipal Reserves next to schools shall be dry bottom detention facilities. They shall be designed with reasonable safety measures with consideration to the proximity of the school site.

2.7.3. Stormwater facilities placed in Municipal Reserve of less than 4 hectares meet the requirements outlined in section 3.5.

2.7.4. When the design storm event is surpassed, the design must provide an overflow route for the pond catchment area's major system. If no overflow route is available, the stormwater facility shall be designed to a 1:500 and approved by the City of Regina.

2.7.5. For new development areas, the major system shall be designed to handle storms up to 1:100 year return period. The minor system shall be designed to handle runoff for a 1:5 year return period within the proposed development area.

2.7.6. The maximum depth of peak flow and ponding along major system conveyance shall be a minimum of 0.35 m below the basement floor level (walkout) or below the main floor level of non-walkouts in adjacent housing.

2.8. Major System – Stormwater Retention Facilities

2.8.1. Retention facilities are not a preferred option for attenuating major flows. If there are existing naturalized sloughs within the proposed development sites, and the designer intends to utilize the existing sloughs, the City may consider a proposal for a naturalized retention area on a case-by-case basis.
2.8.2. Water Security Agency Stormwater Guidelines (current edition) best management practices must be addressed by design for the facility.
2.8.3. Stormwater retention facilities should not be located in Municipal Reserves next to elementary schools. If the location is unavoidable, the design will require safety implementations specific to minimizing risks related to the school site's normal operation.
2.8.4. The permanent body of water in a wet facility shall have a depth of no less than 1.8 metres to maintain water quality.
2.8.5. The minimum water surface area at normal water level shall not be less than 2 hectares and fluctuate no more than 1 meter during a 1:25 year return period.
2.8.6. When the design storm event is surpassed, the design must provide an overflow route for the pond catchment area's major system. If no overflow route is available, the stormwater facility shall be designed for a 1:500 event and approved by the City of Regina.
2.8.7. The design storm event shall require no freeboard; however, the full-service level (FSL) should be more than 0.35 metres below the basement floor level (walkout) or below the main floor level of non-walkouts in adjacent housing.
2.8.8. The retention facility's location should be situated with a suitably sized upstream contributing area that provides adequate runoff volumes that will meet water demands, from quality (water turnover) and quantity (water supply) considerations.
2.8.9. Water balance modelling shall use the rainfall and evaporation data available from Prairie Farm Rehabilitation Administration (PFRA) reports and is required to ensure adequate water supply for the facility.
2.8.10. The retention facilities are project-specific and involve not only stormwater quantity but quality considerations.
2.8.11. City domestic water addition shall not be required, except for severe drought conditions.

2.9. Major System - Pump/Lift Station Design

2.9.1. Storm systems shall be designed by gravity where possible.
2.9.2. Pump or lift station designs shall include site selection, accessibility, equipment access, power requirements, soil conditions, aesthetics, design flows, wet well/dry well pump design, emergency operation, monitor and alarms.
2.9.3. All pump or lift stations shall have a building enclosure
2.9.4. The design of any pump or lift stations shall generally follow the design standards in the Pump/Lift Station section until a specific standard is produced for stormwater.

2.10. Major System - Forcemain Design

2.10.1. Forcemains shall be designed to avoid high points, which may cause airlocks.
2.10.2. The forcemain shall drain by gravity when the pumps are shut off.
2.10.3. The forcemain shall be suitably outfitted with backflow check valves to prevent backflow through the pumps. A gate valve shall be installed to isolate the check valve for repairs.
2.10.4. Water hammer shall be considered in the design only where necessary.

3. Detailed Design

3.1. Design Considerations

3.1.1. Trenchless Construction:

- 3.1.1.1. Trenchless installation is site-specific, and the methodology shall require the City of Regina's approval.
- 3.1.1.2. Trenchless methods shall be used to cross existing highways, expressways, arterials and collectors except where otherwise approved.
- 3.1.2. Every storm sewer system shall have a maintenance hole or a maintenance hole/catch basin at the upper end of the system for maintenance purposes.
- 3.1.3. Stubs shall be provided as needed for future phasing and development.

3.2. Major System - Trunk Storm Sewer Pipes

- 3.2.1. Trunk storm sewer pipes are part of the major system but shall design a minor system element.
- 3.2.2. The minimum slope allowed for trunk storm sewer design using the Manning flow equation shall provide a minimum cleansing velocity of 0.9 metres per second at full flow.
- 3.2.3. Trunk storm sewers pipes shall have a minimum of 1.8 metres cover to the top of the pipe and shall be situated at an elevation above the adjacent watermain and lower than the adjacent gas line.
- 3.2.4. Trunk storm sewer pipes and collectors shall be strategically located to minimize length and depth and shall generally be located in the road right of way.
- 3.2.5. Residential service connections to trunk storm sewer pipes are not permitted.

3.3. Major System – Stormwater Facilities

- 3.3.1. Side slopes shall be no steeper than 4:1.
- 3.3.2. The facility's bottom shall be graded with longitudinal and laterals slopes of a minimum of 2 percent.

3.4. Major System - Stormwater Facilities in Municipal Reserve General

- 3.4.1. The design of stormwater facilities located in municipal reserve shall be based on the park programming and design needs.
- 3.4.2. The design elevations of the programed space shall be elevated to accommodate the 1:25 year hydraulic grade line.
- 3.4.3. See Drawing OS-1 for Municipal Reserve Stormwater Facility Typical Section.
- 3.4.4. Side slope of the stormwater facility shall not exceed 4:1.
- 3.4.5. The stormwater facility's maximum depth shall not exceed 2 metres measured from the maintenance apron's outer limit.
- 3.4.6. A 1:100 storm event shall drawdown within 48 hours but not exceed predevelopment peak runoff flows.
- 3.4.7. Emergency overflow route shall not contain above-ground park infrastructure and shall be considered part of the stormwater facility.
- 3.4.8. Stormwater facility within municipal reserves shall include a maintenance apron:
- 3.4.8.1. The apron will form the perimeter of the facility.
- 3.4.8.2. The apron must have a minimum width of 5 metres.
- 3.4.8.3. The apron shall have a slope no greater than 2 percent toward the facility.
- 3.4.9. The bottom and sides shall be sodded or have erosion protection suitable and collaborated with the Municipal Reserve design.
- 3.4.10. For inlets/outlets, see the City of Regina Standard Construction Specifications Sewer Standard Drawings, Storm Sewer Outlet.
- 3.4.11. Supervisory Control and Data Acquisition (SCADA) systems may be required for facilities near schools. Refer to the City of Regina Electrical Design Standard for SCADA.

3.5. Major System – Stormwater Facilities in Municipal Reserve with Multipurpose Athletic Fields

- 3.5.1. A 1:25 storm event volume shall not encroach on the field of play.
- 3.5.2. Maximum draw downtime for 1:25 storm event shall not exceed 24 hours.

3.5.3. Access to the field must be provided for maintenance vehicles along a designated route of no greater than 8 percent slope.

3.6. Major System - Roadways

3.6.1. The maximum depth of depression storage ponding on roadways shall not exceed 0.45 metres.

3.7. Minor System - Storm Sewer Pipes

3.7.1. The minimum slope allowed for storm sewer design using the Manning flow equation shall provide a minimum cleansing velocity of 0.9 metres per second at full flow.

3.7.2. Storm sewer pipes shall have a minimum of 1.8 metres cover to the top of the pipe and shall be situated at an elevation above the adjacent watermain and lower than the adjacent gas line.

3.7.3. Storm sewer pipes shall be located:

3.7.3.1. In the center of roadways and alleys, if no water or wastewater pipes are within the street right of way.

3.7.3.2. If there are water or wastewater pipes, they shall be offset a minimum of 3.0m from the outer edge of the pipe.

3.7.3.3. Whenever possible, the wastewater pipe shall separate the water and stormwater sewer pipes.

3.7.4. Large storm sewers may have to be buried at a greater depth to avoid conflict with the watermain.

3.7.5. The minimum size of storm sewer and catch basin leads shall be 250 mm.

3.8. Minor System – Catch Basins

3.8.1. Catch basins in roadways shall connect to storm sewer pipes at maintenance holes.

3.8.2. The spacing of catch basins or release points for stormwater drainage shall be within the range of 90 to 150 metres, except for rear lot drainage, which shall be a maximum of 75 metres.

3.9. Minor System - Storm Sewer Service Connections

3.9.1. All institutional, commercial, industrial, and RH zoned residential dwellings shall be serviced by connecting to the storm sewer system.

3.9.2. A separate service connection to the storm system is required for each lot with distinct certificates of title unless a shared services agreement for on-site stormwater ponding is registered on the title.

3.9.3. The minimum storm connection size shall be 200 millimetres and shall enter the storm system at a maintenance hole.

3.9.4. Service connections shall have a minimum of 1.8-metre cover from the top of the pipe while maintaining the lot's serviceability. Cover shall be increased when necessary to meet the grade.

3.9.5. Service connections are to connect at 90 degrees or greater to the direction of flow.

3.9.6. Changes in direction are to be avoided.

3.9.7. Where changes in direction are unavoidable, a maintenance hole is required. Refer to Saskatchewan Plumbing and Drainage Regulations.

3.9.8. Where services require slopes of greater than 3 percent for cleaning and maintenance purposes, a drop structure shall be used to connect to the sewer main.

3.9.9. All redundant or unused storm service connections shall be disconnected and capped at the property line.

3.9.10. No building shall be erected over a service connection, nor shall a service connection be installed under a building.

3.9.11. Storm service connections are not permitted to traverse any private property other than the buildings that the piping serves are located unless a legal easement and permission from the City of Regina have been obtained.

3.10. Minor System – Lot Grading

3.10.1. The rear of lot grades provides for the conveyance of runoff from the contributing area of split drainage lots (approximately mid-lot to the rear of the lot) to catch basins or release points to roadways and land easements. It is a major system component but cannot be used as a major overland flow route for runoff from other contributing areas.

3.10.2. Drainage from residential development, except those zoned RH, is permitted to be graded towards and drain onto the public right of way. The developments listed in section 3.9.1 shall be required to design an on-site drainage plan to manage drainage.

3.10.3. RH zoned residential dwellings are required to design for on-site detention.

3.10.4. Lot grading will conform to Table 6: Lot Grading.

Table 6: Lot Grading

Lot Grading		
Description	**Min**	**Max**
Building grade above curb	0.3 metres	1.0 metres
Building grade above the back lot	0.3 metres	1.0 metres
Building grade to the side lot	0.06 metres	0.3 metres
Grade at the back of the lot	0.6 percent	6.0 percent
Note: Where side yard grades cannot be maintained, terracing or a retaining wall is required		

3.11. Minor System – Swales

3.11.1. The rear of lot drainage swales shall match the minimum and maximum grading requirements at the back of the lot, as noted in Table 6: Lot Grading.

3.11.2. Swales backing green spaces shall be a minimum 0.6 percent slope.

3.11.3. Drainage swales should be designed with an interior angle of turn no less than 135 degrees. If turns are less than 135 degrees, a catch basin is required.

3.12. Maintenance Hole Spacing

3.12.1. Maintenance hole spacing for pipes larger than 600 millimetres in diameter shall be maximized as much as possible but shall not exceed 150 metres.

3.12.2. Maintenance hole spacing for pipes smaller than 600 millimetres in diameter shall be maximized as much as possible but shall not exceed 100 metres.

4. Site Design

4.1. Introduction

4.1.1. Site Drainage systems shall be reviewed with development permits and applicable building permits.

4.1.2. Site Drainage systems shall be provided for all institutional, commercial, industrial, and RH zoned residential dwellings.

4.2. Design Criteria and Methodology

4.2.1. Design Rainfall: 50 millimetres or 0.05 metres (equivalent to a once in 5 years ~ 24-hour rainfall)

4.2.2. Assumed Runoff from Single Family Residential Area: 50 percent (i.e. 50% of the design rainfall is to be considered the fraction of runoff or maximum pre-development off-site drainage)

4.2.3. The volume of Rainfall on Development Site (V): V = Area of the development site in square metres times 0.05 metres

4.2.4. Assumed Runoff Fraction from Impervious Areas: 100 percent. (i.e. runoff coefficient is 1.0)

4.2.4.1. Areas that are Considered Impervious include: roofs, pavement, gravel, concrete, bricks, drives and walks.

4.2.5. Maximum unadjusted runoff per unit length of Development Site Perimeter (X):

4.2.5.1. X = 50 percent of the volume of 50 millimetres rainfall on the development site divided by total development site perimeter

4.2.5.2. X = cubic metres per metre length of the perimeter.

4.2.6. Maximum Area of Impervious Surface Per Unit Length of Perimeter (A):

4.2.6.1. A = 20 times X

4.2.6.2. A = Square metres of impervious area per metre length of the perimeter

4.2.7. Maximum Impervious Area of Proposed Development Permitted to Drain Overland to Street and Lane (MIA):

4.2.7.1. MIA = A times the actual length of a paved street without sidewalk + A times the actual length of paved lane + 1/2 A times the actual length of unpaved street + 1/2 A times the actual length of the unpaved lane

4.2.7.2. MIA = Square metres

4.2.8. The volume of On-Site Storage Required (S)

4.2.8.1. S = Actual impervious area of the development in square metres minus maximum impervious area permitted to streets and lanes in square metres times the design rainfall.

4.2.8.2. S = (Actual Impervious Area — MIA) times 0.05

4.2.8.3. S = Cubic metres

4.2.9. Storage Release Time: Size Storage Outlet to release storage volume over a 24-hour period (minimum pipe size for connection to a storm sewer is 200 mm) unless otherwise approved.

4.3. Water Quality Improvement/Protection Measures

4.3.1. Developments 0.2 hectares or greater incorporating surface parking for uses such as high-density residential, commercial shopping malls, salvage yards, or heavy industrial/manufacturing shall incorporate stormwater quality improvement measures. These water quality measures must be provided within the on-site minor system before connecting to the City-owned minor system. For stormwater interceptor details, refer to the Standard Construction Specification for Stormwater Oil and Sedimentation Separator Construction plan 1380.

4.3.2. Developments incorporating fuel or chemical storage shall install shut-off valve(s) in the on-site minor system at the location(s), preventing migration of potential contaminants into the City of Regina storm sewer system.

4.4. Development Sites and Parking Lot Development Drainage

4.4.1. Overland drainage directed off-site shall be no greater than that equivalent to single-family residential development areas.

4.4.2. Overland drainage to any unpaved street or lane shall be one-half allowed to a paved street or lane.

4.4.3. On-site collection and storage shall be provided for drainage above that permitted to streets and lanes abutting the development.

4.4.4. Release of on-site Storage to public storm sewer shall not be greater than the predevelopment flow rate.

4.5. Parking Lots Adjacent to and Serving Open Space Parks/Athletic Fields

4.5.1. This section applies only to parking lots adjacent to and serving open space parks or athletic fields. Open space is defined as a park or athletic field that does not have non-seasonal buildings on site.

4.5.2. Drainage from open space parking lots adjacent to parks or athletic fields shall not cross the sidewalk or drain onto the street.

4.5.3. Drainage from open space or athletic field parking lots smaller than 2000 square metres may drain onto a lane provided the lane has a catch basin.
4.5.4. Paved or gravelled open space parking lots may drain onto a grassed park or athletic field areas provided that the park area has a drainage design acceptable to the City.
4.5.5. Any drainage plan proposed for an Open space or athletic field parking lot-must meet-the approval of the City of Regina.
4.5.6. All grading designs or grade changes to the open space park or athletic field shall be submitted to the City for approval.
4.5.7. Slag aggregate shall not be used for open space parking lot surfaces except when used as a base material under asphalt.
4.5.8. The Development Site Drainage Standard criteria/methodology for design drainage quantity shall apply to open space or athletic field parking lots.

Tables

Charts

None

Figures

Appendices

Revisions		
Description	**Notes**	**Date**
Conversion from Development Standards Manual and Update	See List of Specific Changes for 2021	January 2021