Harrisburg Design Standards

Adopted January 16, 2018

Table of Contents

Chapter 1: General Provisions

Chapter 2: Pollution Prevention

Chapter 3: Standard Locations & Easements

Chapter 4: Sanitary Sewer Collection

Chapter 5: Water Distribution

Chapter 6: Stormwater Management

Chapter 7: Roadway Design

Chapter 8: Subdivisions

Chapter 9: Submittals

Chapter 1

General Provisions

Chapter 1

General Provisions

Section	Topic	Page
1.1	Title	1
1.2	Purpose	1
1.3	Jurisdiction	1
1.4	City Engineer's Authority	1
1.5	Technical Theory	1
1.6	Designer's Responsibility	1
1.7	Variances	2
1.8	Comprehensive Plan	2

Chapter 1

General Provisions

1.1 Title

This Manual shall be known as The City of Harrisburg Design Standards, hereinafter called "Design Standards".

1.2 Purpose

The purpose of this Manual is to establish a uniform standard for the design of public improvements that encourages sustainable infrastructure and safeguards the life, health, safety, welfare, and property of the public within the City's jurisdiction.

1.3 Jurisdiction

This Manual shall govern public improvements made within the incorporated area of the city except where superseded by federal or state requirements. Should special districts impose conflicting requirements, the more stringent standard, as determined by the City Engineer, shall govern.

1.4 City Engineer's Authority

This Manual includes the minimum regulations for the design of public infrastructure. The City Engineer may require more stringent or restrictive standards as deemed necessary to uphold the purpose of this document. Additional engineering analysis or study may be required by the City Engineer to aid in his or her evaluation.

1.5 Technical Theory

It is presumed the users of this Manual have certain minimum qualifications and proficiencies and are knowledgeable in the practices of engineering and design. Therefore, the technical theory supporting the practices referenced within this Manual was excluded. Designers shall reference technical standards as necessary to support their design in an effort to uphold the purpose of this Manual.

1.6 Designer's Responsibility

The Designer shall maintain interest in the public welfare and apply their special knowledge, skill and training for the use and benefit of the public. Practices presented in this Manual shall not waive the Designer's obligation to the public. Each project shall be considered unique. The Designer shall, insofar as possible, follow the practices presented within this Manual to the extent allowed by their professional code of conduct.

1.7 Variances

The Designer shall adhere to this Manual whenever feasible. In the event conformance isn't possible or practical, the Designer shall notify the City Engineer and request a variance. The City Engineer shall consider variances individually to ensure conformance with the general purpose of this Manual.

1.8 Comprehensive Plan

1.8.1 The Designer shall be familiar with the city's comprehensive plan for improvements to public infrastructure and develop their design in conformance with the city's overall plans. Design professionals shall consult with the City Engineer for information regarding planning.

Chapter 2

Pollution Prevention

Chapter 2

Pollution Prevention

Section	Topic	Page
2.1	Reference Standards	1
2.2	General	1
2.3	Permitting	1
2.4	Storm Water Pollution Prevention Plan (SWPPP):	2

Chapter 2

Pollution Prevention

2.1 Reference Standards

2.1.1 Federal Water Pollution Control Act (Clean Water Act)

2.2 General

The Clean Water Act established a set of requirements called the National Pollutant Discharge Elimination System (NPDES). The NPDES regulates stormwater discharges associated with industrial activities, municipal storm sewer systems, and construction sites. The purpose of these regulations is to reduce pollution of the nation's waterways. At the present time there are specific loss monitoring requirements. Uses of Best Management Practices (BMP) identified in an approved Stormwater Pollution Prevention Plan (SWPPP) have been identified as the means and methods to meet the NPDES requirements.

The intent of this section is to describe the regulations and permitting requirements of the NPDES as they relate to construction sites. Refer to Chapter 6 – Storm Water Management - for additional information.

2.3 Permitting

A NPDES permit from the South Dakota DENR is required for any site that disturbs one acre of land or more. For most projects, coverage under the NPDES program will be obtained from the South Dakota DENR through the general construction permit. Steps required to obtain coverage under this permit are administered by the DENR. The Designer shall be familiar with the State's permit procedures and develop their design documents accordingly. Several steps to consider are listed below.

2.3.1 Storm Water Pollution Prevention Plan (SWPPP): A SWPPP describes the site and identifies potential sources of pollution. This plan details the best management practices a facility will use to ensure that storm water from a site will not impact downstream surface waters. The SWPPP must be prepared prior to submittal of the Notice of Intent.

2.3.2 Notice of Intent: A notice of intent must be signed by an authorized individual and submitted to the DENR for approval.

2.3.3 Notice of Termination: A notice of termination must be submitted once the site has been established and a discharge permit is no longer necessary.

2.4 Storm Water Pollution Prevention Plan (SWPPP):

The Storm Water Pollution Prevention Plan shall be developed to comply with DENR regulations. A template is available on the DENR's website for general guidance. The SWPPP must clearly identify all potential sources of stormwater pollution and describe the methods to be used to reduce or remove contaminants from stormwater runoff. The SWPPP is not intended to be a static document; rather it must be updated as necessary to account for changing conditions of the site and to effectively mitigate contamination.

The individual preparing the SWPPP should have a thorough understanding of the project and of best practices to contain pollutants on site. Erosion and sediment control measures should be selected based on effectiveness. The Designer shall convey their decisions to City staff and reference support data at the request of the City Engineer. A list of erosion and sediment control measures are listed below as defined by various local DOT's and municipalities.

1. Filter Berms
2. Filter Socks
3. Erosion Control Blanket
4. Wattles
5. Check Dams
6. Temporary Earth Diversion Structures
7. Level Spreaders
8. Rip Rap
9. Temporary Pipe Slope Drains
10. Sediment Basin
11. Sediment Traps
12. Silt Fence
13. Vehicle Tracking Station
14. Dust Control
15. Mulching
16. Surface Roughening
17. Inlet Protection
18. Turf Establishment

Chapter 3

Standard Locations & Easements

Chapter 3

Standard Locations & Easements

Section	Topic	Page
3.1	Standard Locations	1
3.2	Separation	1
3.3	Easements	2

Chapter 3

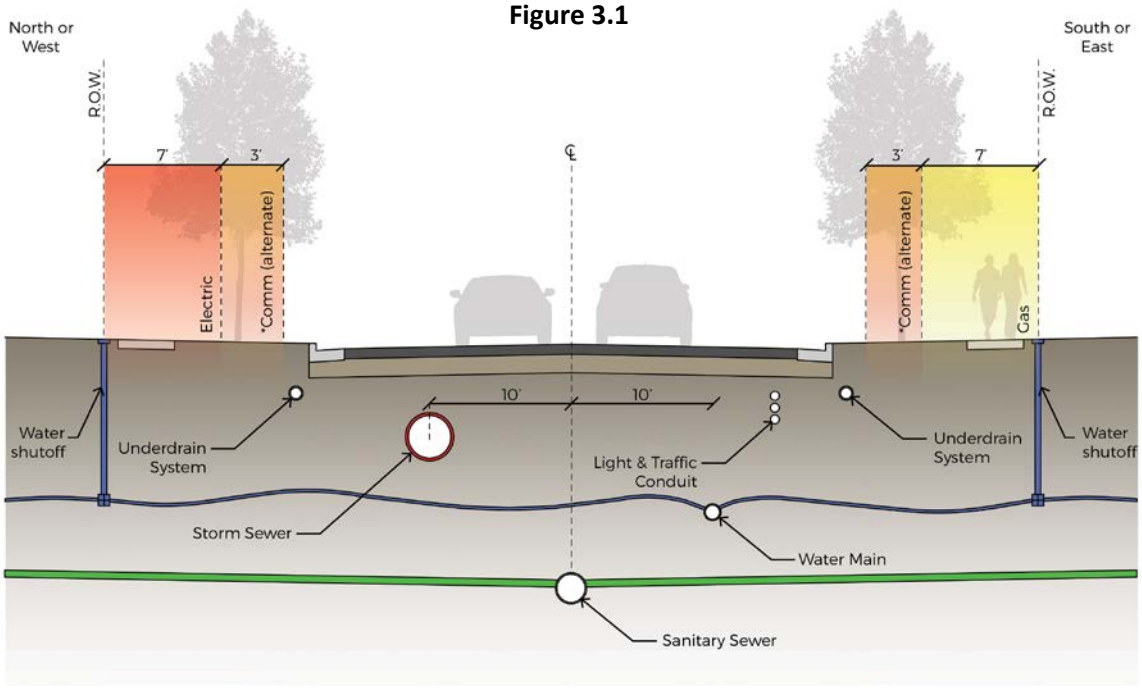
Standard Locations & Easements

3.1 Standard Locations

Figure 3.1 illustrates the typical locations for public and private utilities within right of way. The Designer shall adhere to this standard whenever feasible. It is not the intent to adjust locations of existing facilities for the sake of conformance. Conformance should be considered whenever practical.

In the event of conflict or if a particular utility requires infrastructure on both sides of the ROW, alternate locations may be considered.

Figure 3.1



*Communication facilities shall be restricted to the rear yard of properties whenever feasible.

3.2 Separation

The Designer shall ensure proper separation is provided for each utility to allow sufficient access and maintenance. Projects shall adhere to minimum separation standards as required by the DENR. The minimum horizontal distance of separation between city owned utilities shall be 10-ft.

3.3 Easements

Permanent easements shall be provided for all city maintained or operated facilities located outside of public property or Right of Way. Easements shall be wide enough to ensure proper access for maintenance equipment. A description of different types of easements and design constraints are provided in the paragraphs that follow.

3.3.1 **Underground Utilities:** Easements shall be mutually exclusive and centered on the alignment of the underground facility. Table 3.1 lists the minimum easement widths for utilities with a pipe diameter of 30-inches or less. Easements for utilities larger than 30-inches shall be evaluated and approved by the City Engineer. Easements widths may be required to be wider depending upon specific site conditions.

Table 3.1
Minimum Required Easement Widths for Underground Utilities 30-in or less

*Depth of Pipe (feet)	4	6	8	10	12	14	16	18	20
Min Width Required (feet)	20	20	20	20	24	30	36	42	48

* measured from finished grade to invert of pipe

3.3.2 **Drainage Easements:** Drainage easements shall be provided as required in Chapter 6 – Stormwater Management. Drainage easements shall be a minimum of 20 feet wide and shall encompass the anticipated spread as calculated by the major storm event. Drainage facilities and appurtenances such as earthen berms, swales, open channels, detention ponds or structures that are required to establish or direct drainage shall be included within an easement.

3.3.3 **Access Easements:** Where access easements are required, the width shall be dependent upon the expected use and approved by the City Engineer. The minimum width for an access easement shall be 20 feet.

3.3.4 **Private Utilities:** A 10-ft utility easement shall be provided along all right of way frontages and rear yards; except when the setback is equal to or less than twenty feet, then the utility easement shall be equal to half the distance of the required setback per the zoning district.

Chapter 4

Sanitary Sewer Collection

Chapter 4

Sanitary Sewer Collection

Section	Topic	Page
4.1	Reference Standards	1
4.2	Comprehensive Plan	1
4.3	Intent	1
4.4	Design Capacity and Flow	1
4.5	Pipe Design	2
4.6	Manholes	3
4.7	Services	3
4.8	Force Mains	4
4.9	Sewage Lift Stations	4
4.10	Access	5
4.11	Flood Hazard Considerations	5

Chapter 4

Sanitary Sewer Collection

4.1 Reference Standards

4.1.1 Requirements and standards of the South Dakota Department of Environment and Natural Resources.

4.1.2 Recommended Standards for Wastewater Facilities Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers (Ten State Standards)

4.1.3 South Dakota Plumbing Code

4.1.4 International Plumbing Code

4.1.5 City of Harrisburg Standard Specification for Sanitary Sewer Construction, Section 100.

4.1.6 City of Harrisburg Standard Details.

4.2 Comprehensive Plan

4.2.1 The Designer shall be familiar with the city's comprehensive plan for improvements to wastewater facilities and propose designs that are in conformance with the city's overall plans. Designers should contact the City Engineer's office for guidance.

4.3 Intent

4.3.1 Sanitary sewer systems shall be designed to collect and convey wastewater to treatment facilities. The overall objective of the design engineer shall be to accomplish all of the following:

1. Collect and convey wastewater in a responsible manner.
2. Provide sewer service to each individual lot.
3. Reduce the amount of inflow and infiltration into the collection system

4.4 Design Capacity and Flow

4.4.1 In general, sewer capacities shall be designed for the estimated ultimate tributary population. Consideration should be given to the maximum anticipated capacity of institutions, industrial parks, etc. Collection systems shall be designed on the basis of an average daily per capita flow of wastewater. The Design Engineer shall estimate the anticipated flows according to Table 4.1.

Design capacity for laterals and trunk mains shall not be less than 4 and 2.5 times greater, respectively, than the average daily flow.

Table 4.1: Average Daily Flow Table

Zoning District	A_D Area Density (unit/acre)	U_D Unit Density (People/Unit)	R Rate (gpcd)	F Avg Daily Flow (gal/acre)
Natural Resource Conservation	1	3	100	300
Single Family Residential	4	3	100	1,200
Multi-Family Residential	12	2	100	2,400
Manufactured Housing Residential	6	3	100	1,800
Central Business	Design Engineer to estimate flow			
General Business	Design Engineer to estimate flow			
Light Industrial	Design Engineer to estimate flow			
Heavy Industrial	Design Engineer to estimate flow			
Planned Development	Design Engineer to estimate flow			

4.5 Pipe Design

4.5.1 **Slope & Velocity:** Sewers shall be designed as to give a mean velocity of 2.0-ft per second when flowing full based on Manning's formula. Sewers shall be designed with uniform slope between manholes. Where velocities greater than 15-ft per second are anticipated, the design engineer shall develop a secure manner to anchor and protect against displacement. Table 4.2 gives a list of minimum slopes for varying sizes of pipe.

Table 4.2: Minimum Slopes of Main Line Pipes

Pipe Size (Inch)	8	10	12	14	15	16	18	21	24
Minimum Slope (ft/100-ft)	0.40	0.28	0.22	0.17	0.15	0.14	0.12	0.10	0.08

4.5.2 **Minimum Pipe Sizes:** No public gravity sewer conveying raw wastewater shall be less than 8 inches in diameter.

4.5.3 **Maximum Pipe Length:** Sewer mains shall terminate at manholes. The maximum length of a main shall be 400 feet.

4.5.4 **Depth:** In general, sewers shall be sufficiently deep to receive wastewater from basements and to prevent freezing. Gravity sewers shall have a minimum depth of 8 feet measured from the finished ground to the invert of the pipe.

4.1.1 **Alignment:** Sewers shall be designed with straight alignments between manholes whenever feasible. Curvilinear alignments shall not be allowed except under special circumstances. Where curved sewers are permitted, the radius of curvature shall not exceed the manufacturer's recommended maximum.

4.5.5 **Separation:** Storm sewers shall maintain adequate separation from water mains and other sewers as required by the DENR.

4.6 Manholes

4.6.1 **Minimum Diameters:** Sanitary sewer manholes shall have a minimum inside diameter of 48 inches. Manholes with influent pipes greater than or equal to 18-inches shall be 60 inches diameter.

4.6.2 **Locations:** Manholes shall be designed at the following locations:

1. Ends of sewer mains
2. Changes in pipe size, grade or alignment
3. Intersections of sewer mains
4. Maximum spacing 400 feet

4.6.3 **Invert Elevations:** The minimum drop from upstream inverts to the outlet invert shall be 0.10 feet. Where feasible, inverts shall be aligned to maintain the same energy gradient through the manhole. Drop sections shall be designed for inverts exceeding 1.5 feet in elevation above the outlet.

4.6.4 **Manhole Covers:** Manholes outside of paved areas shall be considered non typical and may require bolt-down covers at the City Engineer's discretion.

4.6.5 **Manhole Markers:** Manhole markers shall be designed for manholes located outside of paved areas.

4.6.6 **Lined Manholes:** Manholes along trunk sewers of 10 inches or larger shall be PVC lined.

4.7 Services

4.7.1 **Alignment:** Sanitary sewer services shall connect to lateral mains through use of a wye. Direct connections to manholes are prohibited. Sewer services shall extend perpendicular to the lateral main whenever feasible. All platted lots are to have a separate sewer service without crossing adjacent properties. Single family attached housing is required to have separate sewer services for each unit.

4.7.2 **Minimum Pipe Sizes:** Sanitary sewer services shall have a minimum diameter of 6 inches with the exception of single family residential units. Single family residential units shall be a minimum of 4 inches.

4.7.3 **Minimum Slope:** Sewer services shall have a minimum slope of 2%

4.8 Force Mains

4.8.1 **Pipe Size:** Force Mains shall be no smaller than 4 inches in diameter.

4.8.2 **Velocity:** At design average flow, a minimum cleansing velocity of at least two feet per second shall be maintained. A velocity of eight feet per second shall not be exceeded.

4.8.3 **Valves:** Air release valves and blow offs shall be designed as necessary to prevent air locking and accumulation within the pipe.

4.8.4 **Termination:** Force mains shall enter the gravity sewer system at a manhole and shall be designed as to prevent turbulence and deterioration of the structure. The invert of the entering force main shall be designed no more than two feet above the invert elevation of the outlet pipe.

4.9 Sewage Lift Stations

4.9.1 Sewage Lift stations and force mains shall be designed in accordance with the DENR's Recommended Design Criteria Manual for Wastewater Collection and Treatment Facilities.

1. Pumps and pump systems shall comply with the following additional requirements

    a. Pumps shall alternate operation with the lag pump as backup for the lead pump
    b. Maximum pump speed shall be 1,800 rpm
    c. Submersible pumps are not allowed.

2. Wet wells shall comply with the following additional requirements

    a. Structure walls shall be PVC lined
    b. Separate aluminum entrance hatches shall be provided for pump removal and for trash basket removal.
    c. Minimum 4" diameter ductile iron "goose-neck" vent with screened opening in a blind flange.
    d. Transducer with two floats and backup system.

3. An electric generator is required and shall comply with the following additional requirements.

    a. The engine shall be four-cycle, water cooled
    b. An automatic transfer switch shall be included
    c. The generator shall be sized to start and operate both pumps simultaneously.

4.9.2 Hydrant: a fire hydrant shall be located within 100 – ft of any lift station for the purposes of routine and emergency maintenance.

4.10 Access

4.10.1 The design engineer shall allow for adequate access to manholes, lift stations, and other facilities of the sanitary sewer system. Access routes constructed of asphalt, or concrete shall be provided to allow access to facilities. Access routes constructed of gravel require approval from the waste water superintendent. Access routes shall be designed to shed water yet provide a level driving surface. Sufficient width shall be provided for maintenance vehicles to travel and turn around where necessary.

4.11 Flood Hazard Considerations

4.11.1 Sewer facilities proposed within a flood zone or any other runoff inundation area shall be designed to be readily accessible and fully operational during major flood events. Manholes shall be designed such that the rim elevation of the manhole is 1’ above the high water elevation for the major storm event. Lift stations shall be designed such that the lowest point of entry is 2-ft above the high-water elevation for the major storm event. Electrical and mechanical equipment shall be protected from physical damage. Manholes and lift stations within the floodway shall be prohibited.

Chapter 5

Water Distribution

Chapter 5

Water Distribution

Section	Topic	Page
5.1	Reference Standards	1
5.2	Comprehensive Plan	1
5.3	Intent	1
5.4	Design Criteria	1
5.5	Water Main Design	2
5.6	Fire Hydrants	2
5.7	Valves	3
5.8	Services	3

Chapter 5

Water Distribution

5.1 Reference Standards

5.1.1 Requirements and standards of the South Dakota Department of Environment and Natural Resources.

5.1.2 Recommended Standards for Water Works Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers (Ten State Standards)

5.1.3 American Water Works Association

5.1.4 South Dakota Plumbing Code

5.1.5 International Plumbing Code

5.1.6 International Fire Code

5.2 Comprehensive Plan

5.2.1 The design professional shall be familiar with the city's comprehensive plan for improvements to water distribution facilities and propose designs that are in conformance with the city's overall plans. Designers should contact the City Engineer's office for guidance.

5.3 Intent

5.3.1 Water distribution systems shall be designed to convey water for the purpose of domestic consumption and fire protection. The overall objective of the design engineer shall be to accomplish all of the following:

1. Distribute water in a responsible manner.
2. Provide domestic water service and fire protection to all platted lots.

5.4 Design Criteria

5.4.1 **General:** "Water distribution systems shall be designed to maintain treated water quality and provide fire protection. Special consideration shall be given to distribution main sizing, providing for design of multidirectional flow, adequate valving for distribution system control, and provisions for adequate flushing. Systems should be designed to maximize turnover and to

minimize residual times while delivering acceptable pressures and flows." *[10 State Standards, 8.0]*

5.4.2 **Water Pressure:** "Piping systems shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system shall be at least 35 psi and should be approximately 60 to 80 psi." *[10 State Standards, 8.2.1]* Water pressures exceeding 85 psi shall have pressure reduction in accordance with plumbing code.

5.5 Water Main Design

5.5.1 **Minimum Pipe Size:** Water mains shall be designed to a minimum diameter of 8 inches with the exception of dead end mains , which may be designed to 6 inches.

5.5.2 **Alignment:** Water mains shall be designed with straight alignments whenever feasible. Curvilinear alignments shall be allowed where necessary. Where curved water mains are necessary, the radius of curvature shall not exceed the manufacture's recommended maximum.

5.5.3 **Dead-end Mains:** Dead-end mains shall be discouraged. Water mains shall be looped whenever feasible. The maximum length of a dead-end main shall be 500-ft

5.5.4 **Separation:** Water mains shall maintain adequate separation from sewers as required by the DENR. Water mains shall be at least 20 feet away from building foundations and shall not extend underneath a building.

5.5.5 **Depth:** Water mains shall be designed to a minimum depth of cover of 6 feet.

5.5.6 **Casing Pipe:** Water main shall be sleeved through a casing pipe at crossings of the following type:

1. Railroad Crossings
2. Floodway Crossings
3. State & Federal Highways

5.6 Fire Hydrants

5.6.1 **Spacing:** Fire hydrants shall be spaced as required by the International Fire Code. Within street corridors, hydrants shall be spaced a maximum of 500 feet as measured along the center line of the street. Along arterial streets, fire hydrants shall be staggered on both sides of the street.

5.6.2 **Transportation Hazards:** "Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards." *[International Fire Code, Table C102.1, footnote a].*

5.6.3 **Proximity to Structures**: Hydrants shall be spaced in accordance with 507.5.1 of the International Fire Code. All portions of a building shall be within 400-ft of a hydrant as measured around the exterior of the structure. For buildings equipped with an approved automatic sprinkler system, the maximum distance to a hydrant shall be 600-ft.

5.6.4 **Location:** Hydrants shall be located in alignment with lot lines whenever feasible and 3 feet behind the back of curb. In areas where curb side sidewalk is proposed, hydrants shall be placed 2 feet behind sidewalk.

5.6.5 **Dead-End Mains:** Hydrants shall be located at the end of dead-end mains.

5.6.6 **Clearance:** "A 3-foot clear space shall be maintained around the circumference of fire hydrants." *[International Fire Code, 507.5.5]*

5.7 Valves

5.7.1 **Isolation Valves:** In general, isolation valves shall be located where water mains intersect each other and configured in a manner so no more than 1,000 feet of water main is out of service or a maximum of 20 users can be isolated.

5.7.2 **Air Relief:** "At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur." *[10 State Standards, 8.5.1]*

5.8 Services

5.8.1 **General:** All water services shall connect to a public water main. Each platted lot shall have a dedicated domestic water service.

5.8.2 **Alignment:** Services shall extend perpendicular to the water main whenever feasible and shall not cross adjacent properties.

5.8.3 **Attached Single Family:** Each dwelling unit of a single family attached structure shall have a dedicated water service.

5.8.4 **Curb Stop:** A curb stop shall be provided for each individual water meter within a structure. Curb stops shall be located outside the structures and accessible to city staff.

5.8.5 **Minimum Pipe Sizes:** Water services shall have a minimum diameter of 2 inches with the exception of single family residential units. Single family residential units shall be a minimum of 1 inch diameter.

5.8.6 **Fire Service:** Fire services shall meet the requirements of the International Fire Code. The minimum fire service size shall be 6 inches in diameter.

Chapter 6

Storm Water Management

Chapter 6

Storm Water Management

Section	Topic	Page
6.1	Reference Standards	1
6.2	Comprehensive Plan	1
6.3	Intent	1
6.4	Design Storms:	1
6.5	Design Calculations:	2
6.6	Roadway Drainage	2
6.7	Storm Sewer Design	2
6.8	Storm Sewer Appurtenances	3
6.9	Open Channels	4
6.10	Culverts	4
6.11	Detention	5
6.12	Flood Considerations	5
6.13	Easements	5
6.14	Access	6
6.15	Water Quality	6

Chapter 6

Storm Water Management

6.1 Reference Standards

6.1.1 Federal Water Pollution Control Act (Clean Water Act)

6.1.2 Title 44 CFR – National Flood Insurance Program

6.2 Comprehensive Plan

6.2.1 The design engineer shall be familiar with the City's comprehensive plan for improvements to drainage facilities and design in conformance with the City's overall plans. Designers should contact the City Engineer's office for guidance.

6.3 Intent

6.3.1 Drainage systems shall be designed to mitigate adverse effects of storm runoff. The overall objective of the design engineer shall be to accomplish all of the following.

1. Prevent the uncontrolled or irresponsible discharge of storm water onto adjoining properties.
2. Prevent major property damage or loss of life resulting from storm runoff.
3. Provide an effective means of transportation and emergency vehicular access during storms.
4. Prevent stormwater pollution and maintain the highest feasible level of water quality.

6.4 Design Storms:

6.4.1 The design engineer shall consider the effects of both minor and major storms and the flood patterns associated with each scenario. The minor storm drainage system shall be designed to protect against regularly recurring damage and to reduce routine maintenance. The major storm drainage system shall be designed to prevent major property damage or loss of life.

1. **Minor Storm:** A 24-hour flood event that has a 20% probability of occurring in any given year.
2. **Major Storm:** A 24-hour flood event that has a 1% probability of occurring in any given year.

6.5 Design Calculations:

6.5.1 The design engineer shall convey their calculations to the City Engineer and reference support data as necessary. Approved methods of calculation include the Rational Method and the Soil Conservation Service (SCS) Method. The rational method may be used for basins that are simple and have less than 80 acres. Estimations of design criteria such as time of concentration, rainfall intensity, runoff coefficients, etc. shall be sited and well documented.

6.5.2 **Hydraulic Models:** Computer aided modeling software shall be used for complex systems. A hydraulic model shall be submitted for review at the request of the City Engineer.

6.6 Roadway Drainage

6.6.1 Roadways shall be designed to consider the effects of the minor and major storm events separately. The design engineer shall satisfy conditions for each as listed below.

6.6.2 **Minor Storm Conditions:** During a minor storm event, the following conditions shall be met.

1. Depth of runoff shall not exceed 6-inches at any location within a roadway.
2. Spread shall be restricted to the roadway surface.
3. Crossflow between inlets shall be prevented.
4. Collector and Arterial roadways shall maintain 10-ft and 20-ft respectively of clear driving surface.

6.6.3 **Major Storm Conditions:** During a major storm event, the following conditions shall be met.

1. Depth of runoff shall not exceed 12-inches at any location within a roadway.
2. Spread shall be restricted to public Right of Way or drainage easements.
3. Crossflow is allowable between inlets.
4. Collector roadways shall maintain a 10’ driving lane for emergency vehicle access that shall not be inundated more than 12-inches deep.
5. Arterial roadways shall maintain a 20’ driving lane with inundation less than 6-inches deep.

6.6.4 **Spread & Gutter Flow:** The carrying capacity and spread along a roadway shall be calculated by the design engineer to document the conditions above are satisfied. Approved methods of calculation include those described in the City of Sioux Falls Engineering Design Standards.

6.7 Storm Sewer Design

6.7.1 **Capacity:** Storm sewers shall be designed to satisfy the roadway conditions of Section 6.6 as well as convey a minimum of the minor storm event. Storm sewers shall maintain a hydraulic gradient lower than the crown of the pipe during the minor storm event.

6.7.2 **Velocity:** Storm sewers shall be designed as to give a mean velocity of 3.0-ft per second when flowing full based on Manning's formula. Where velocities greater than 15-ft per second are anticipated, the design engineer shall develop a secure manner to anchor and protect against displacement.

6.7.3 **Slope:** Sewers shall be designed with uniform slope between manholes. Minimum slope for storm sewer pipes shall be 0.20%

6.7.4 **Pipe Size:** Storm sewers shall not be less than 12 inches in diameter. Trunk sewers shall be a minimum of 18 inches.

6.7.5 **Pipe Length:** Pipes shall terminate at inlets or junction boxes. The maximum length of a pipe shall be 400 feet.

6.7.6 **Depth:** Storm sewers shall be designed to a minimum depth of 4-feet as measured from finished grade to the invert of the pipe. The minimum cover above pipes shall be 18 inches.

6.7.7 **Alignment:** Sewers shall be designed with straight alignments between access structures whenever feasible. Curvilinear alignments shall not be allowed except under special circumstances. Where curved sewers are permitted, the radius of curvature shall not exceed the manufacturer's recommendations. Bends are prohibited.

6.7.8 **Separation:** Storm sewers shall maintain adequate separation from water mains and other sewers as required by the DENR.

6.8 Storm Sewer Appurtenances

6.8.1 Junction Boxes

1. **Size:** Junction boxes shall have a minimum inside dimension of 4-feet and be rectangular in shape.
2. **Locations:** Junction Boxes shall be designed at locations that allow direct access by maintenance vehicles and at the following situations. Preformed tee fittings may be substituted at locations approved by the City Engineer.

    a. Ends of sewer mains
    b. Changes in pipe size, grade or alignment
    c. Intersections of sewer mains

3. **Invert Elevations:** The minimum drop from upstream inverts to the outlet invert shall be 0.10 feet. Where feasible, inverts shall be aligned to maintain the same energy gradient through the manhole.
4. **Junction Box Covers:** Junction boxes outside of paved areas shall be considered non typical and may require bolt-down covers at the City Engineer's discretion.

6.8.2 Inlets

1. **Capacity:** Inlets shall be designed to accept runoff and not restrict flow of the minor event into the storm sewer system. The design engineer shall provide capacity calculations to support their design.
2. **Location:** Inlets shall be located at low points and spaced as necessary along street sections to control spread.

6.8.3 **Outlets**

1. **Location:** Wherever a storm sewer discharges, an outlet structure shall be provided to dissipate energy, prevent erosion, and control discharges.

6.9 Open Channels

6.9.1 **Critical Flows:** Channels shall be designed to prevent super critical flows and hydraulic jumps.

6.9.2 **Freeboard:** Open channels shall be designed to convey the major event and maintain 1-ft of freeboard.

6.9.3 **Sideslopes:** Sideslopes shall not be steeper than 4:1.

6.9.4 **Lining:** Channels shall be lined as necessary to prevent erosion. The design engineer shall evaluate using the Tractive Force Procedure as described in Chapter 11 of the Sioux Falls Engineering Design Standards.

6.10 Culverts

6.10.1 **Conveyance:** At a minimum, culverts shall be designed to convey the minor storm event. Culverts within a major drainageway, as identified in the City's comprehensive plans, shall be designed with sufficient capacity to convey the major storm event. Culverts under 48-in diameter shall assume the inlet is 20 percent plugged.

6.10.2 **Overtopping:** When crossing roadways and railroads, culverts shall be designed to prevent overtopping and maintain 2-ft of freeboard during the major storm event.

6.10.3 **Headwater:** Headwaters resulting from the major storm event shall maintain a minimum of 1-ft of free board. Maximum allowable headwater shall not exceed 3-ft above the top of culvert during the major storm event.

6.10.4 **Size:** Round or arch culverts shall not be less than 18 inches in height. Box culverts shall not be less than 3-feet in height.

6.10.5 **Velocity:** The minimum velocity through a culvert shall be 2-ft per second. Excessive velocities shall be avoided to reduce scour.

6.10.6 **Inlets & Outlets:** Inlets and outlets shall be designed to minimize erosion, friction and entrance losses. Flared ends, headwalls or wingwalls shall be designed where appropriate. Projecting ends are not acceptable. Where excessively high discharge volumes are anticipated, additional outlet control, such as rip rap, channel shaping or dissipation structure, may be required.

6.10.7 **Buoyancy Protection:** Proper anchorage shall be considered to protect larger structures from hydrostatic uplift forces.

6.10.8 **Debris Control:** Debris control devices may be required at the direction of the City Engineer.

6.11 Detention

6.11.1 **General:** The design engineer shall ensure that all runoff is contained on site and provide a method to control the release of storm water downstream. Discharge for any site shall not exceed the theoretical flow rates prior to development as estimated by the design engineer.

6.11.2 **Exceptions:** Sites that consist of an individual single family lot that meet the permitted use of the City's zoning regulations and are less than 1 acre in size shall not be required to detain storm water.

6.11.3 **Outlets:** Outlets shall be designed to control the release of storm water and ensure pre - developed flow rates are not exceeded. The design engineer shall provide calculations to support their design. A stage versus release rate curve will be required for outlet structures within ponds.

6.11.4 **Ponds:** Detention ponds shall be designed to maintain 1-ft of freeboard during the major event and to drain feely without holding water.

6.12 Flood Considerations

6.12.1 **Structures:** Structures shall be designed so that the lowest point of water entry is at least 2-ft above the high water mark for the major event. Where ponding occurs, structures shall be designed 2-ft above the overflow elevation. In situations where an overflow does not exist, the lowest point of water entry shall be 4-ft above the major event's high water elevation or above an elevation that provides an additional 50% of pond storage for the major event.

6.12.2 **Parking Lots:** Parking lots shall not become inundated more than 12-inches during the major event. Signage shall be required where parking lots encroach into the major event's high water elevation.

6.13 Easements

6.13.1 Drainage easements shall be provided under any of the following circumstances

1. Where ponding occurs and the high-water elevation for the major event encroaches onto private property.
2. Along open channels where the spread of the major event exceeds 10-ft.
3. Where runoff from public property or right of way is conveyed.
4. Where underground facilities encroach onto private property.

6.14 Access

6.14.1 **General:** The design engineer shall allow for adequate access to storm sewers, Inlets, open channels, detention ponds and other facilities of the storm sewer system. Access routes shall be designed as necessary to shed water yet provide a level driving surface. Surfacing shall be constructed of asphalt, concrete, or gravel and provide sufficient width for maintenance vehicles to travel and turn around where necessary.

6.14.2 **Maintenance Bench:** Open channels along major drainageways as well as detention ponds larger than 2-acres shall be accessible for maintenance. Earthen benches shall be designed measuring a minimum of 12-ft wide, with a maximum cross slope of 10% and have a hard surface.

6.15 Water Quality

6.15.1 **General:** The City of Harrisburg is classified by the South Dakota DENR as a regulated, small municipal separate storm sewer system (MS4). All projects within the city limits are required to implement Best Management Practices (BMP) with the exception of sites less than 2-acre and having less than 1-acre of new impervious area.

6.15.2 **Reference:** Those areas where BMP's are required, the City has adopted the policies of the City of Sioux Falls. The design engineer shall reference Chapter 11, Section 8 of the City of Sioux Falls Engineering Design Standards for Public Improvements for design criteria.

Chapter 7

Roadway Design

Chapter 7

Roadway Design

Section	Topic	Page
7.1	Reference Standards	1
7.2	Comprehensive Plan	1
7.3	Intent	1
7.4	Traffic Impact Study	2
7.5	Roadway Classifications	2
7.6	Geometrics	2
7.7	Access Management	3
7.8	Intersections	4
7.9	Cul-de-sacs:	5
7.10	Alleys	5
7.11	Medians	5
7.12	Typical Sections	5
7.13	Horizontal and Vertical Design	6
7.14	Sidewalks	6
7.15	Fire Code	6

Chapter 7

Roadway Design

7.1 Reference Standards

7.1.1 The American Association of State Highway and Transportation Officials' (AASHTO) Geometric Design of Highways and Streets

7.1.2 Federal Highway Adminstration (FHWA), Roundabouts: an Informational Guide, Publication No. FHWA-RD-00-067

7.1.3 The Transportation Research Board's Access Management Manual

7.1.4 Americans with Disabilities Act

7.1.5 International Fire Code

7.2 Comprehensive Plan

7.2.1 The design engineer shall be familiar with the City's comprehensive plan for improvements to roadway systems and design in conformance with the City's overall plans. Designers should contact the City Engineer's office for guidance.

7.3 Intent

7.3.1 Roadway systems shall be designed to provide access to adjacent lands. The overall objective of the design engineer shall be to accomplish all of the following.

1. Provide vehicular access in a manner that preserves the safety and efficiency of the transportation system
2. Reduce the crash rate along roadways while maintaining sufficient traffic flow.
3. Provide access for emergency response vehicles.
4. Provide safe and accessible routes to pedestrians.

7.4 Traffic Impact Study

7.4.1 The design engineer shall convey their design to the City Engineer and reference support data as necessary. The City Engineer may require a traffic impact study to aid in his or her evaluation.

7.5 Roadway Classifications

7.5.1 Roadways shall be classified in conformance with AASHTO's Policy on Geometric Design of Highways and Streets. The design engineer shall reference the City's major street plan for current roadway classifications.

7.6 Geometrics

7.6.1 **Fire Lane:** All roadways shall be designed to provide at least 20-ft of unobstructed access for emergency vehicles.

7.6.2 **Drive Lanes:** Roadways shall be designed with a minimum of two drive lanes. Widths of drive lanes shall be as listed in Table 7.1.

7.6.3 **Bike Lanes:** Bike lanes shall be considered on arterial and collector roadways where posted speed limits exceed 25-mph.

7.6.4 **On Street Parking:** On street parking is allowed along all roadways except principal arterials. Parking shall be parallel with the roadway. Angled or perpendicular parking is allowed where the posted speed limit does not exceed 20-mph. Table 7.1 lists minimum dimensions for on street parallel parking.

7.6.5 **Curb and Gutter:** All roadways shall be designed with curb and gutter to direct drainage and assist snow plow operations.

7.6.6 **Boulevards:** Boulevard width shall be measured from the back of curb to the edge of right of way. Minimum widths are listed in Table 7.1.

7.6.7 **Sidewalks:** Sidewalks shall be designed along all public roadways. Minimum widths are listed in Table 7.1. Sidewalks shall typically be located 1-ft from the edge of right of way. Curbside sidewalks shall be discouraged.

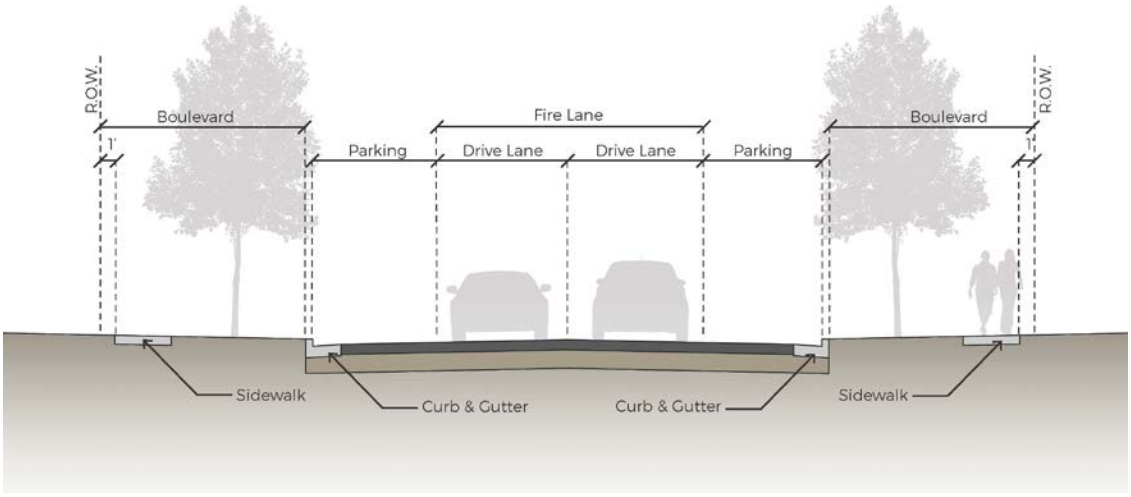
7.6.8 **Half Streets:** Half streets are prohibited

7.6.9 **Exceptions:** Arterial roadways classified as rural within the City's comprehensive plan shall be designed without curb and gutter or sidewalks. Ditches or open channels shall be designed to convey drainage. Right of way shall be wide enough to contain the limits of the ditch.

Table 7.1: Minimum Roadway Geometrics

	Local Residential	Local Commercial	Local Industrial	Collector	Arterial
Fire Lane	20	20	20	20	20
Drive Lanes	10	11	12	12	12
Parallel Parking	7	7	8	7	8
Boulevards	15.5	14.5	14.5	15.5	19.5
Sidewalks	5	5	5	6	8

Figure 7.1: Geometrics



7.7 Access Management

7.7.1 **Access Defined:** Access is defined as any connection, driveway, street, turnout or other means of providing for the movement of vehicles to or from the public roadway system. Access is further defined as any full movement access, right in right out movement, or partial movement access.

7.7.2 **Restricted Access at intersections:** Access shall be restricted for a given distance leading into an intersection. Measurement shall be from the center line of the intersection. The table below specifies the minimum distances by street classification

	Intersecting with: Principal Arterial	Minor Arterial	Collector	Local
Principal Arterial	660			
Minor Arterial	300	300		
Collector	300	300	200	
Local	-	-	150	50

7.8 Intersections

7.8.1 **Spacing:** 4-way Intersections shall be spaced a minimum of 300-ft apart measured from the centerlines of the ROW. T-intersections shall be spaced a minimum of 150-ft apart.

7.8.2 **Angle:** Roadways shall intersect at 90 degrees.

7.8.3 **Turning Movements:** Intersections shall be designed to accommodate expected turning movements. The table below lists minimum radii by street classification

	Intersecting with: Principal Arterial	Minor Arterial	Collector	Local Industrial	Local Commercial	Local Residential
Principal Arterial	35					
Minor Arterial	35	35				
Collector	30	30	25			
Local Industrial	35	35	35	35		
Local Commercial	25	25	20	20	20	
Local Residential	20	20	15	15	15	13.5

7.8.4 **Valley Gutters:** Concrete valley gutters shall be a minimum of 6-ft wide for local street, 8ft wide for all other classifications.

7.8.5 **Roundabouts:** Roundabouts shall be designed in accordance with the Federal Highway Adminstration (FHWA), Roundabouts: an Informational Guide, Publication No. FHWA-RD-00-067, or other design criteria approved by the City Engineer.

7.9 Cul-de-sacs:

7.9.1 **Dead ends:** Dead-end roadways are prohibited. Roadways shall end with adequate turning space by means of a cul-de-sac.

7.9.2 **Cul-de-sacs:** For residential and nonresidential cul-de-sacs, the minimum back of curb radius shall be 40.5-ft and 50.5-ft respectively. The maximum length of a cul-de-sac shall be 500-ft measured from the centerline of the intersection to the radius point of the turnaround.

7.10 Alleys

7.10.1 Alleys shall be designed to meet the minimum access requirements for fire code.

7.10.2 Alleys shall be designed with curb and gutter and asphalt or concrete surfacing to direct drainage.

7.11 Medians

7.11.1 Medians shall be designed where necessary to control access or create separation between opposing traffic.

7.11.2 Full median breaks shall not be allowed within 660-ft of intersecting arterial roadways.

7.11.3 Minimum width of a median shall be 4-ft measured from the back of curb.

7.12 Typical Sections

7.12.1 **Pavement Depth**: Roadway pavements shall be designed to the minimum depths listed below, unless otherwise certified by a geotechnical professional, and approved by the City Engineer. Additional depth may be required depending on soil conditions. Pavements within arterial roadways shall be designed in accordance with the California Bearing Ratio (CBR). All roadways, except local residential, shall include a geotextile fabric separator.

Table 7.2: Minimum Roadway Depths

Roadway Classification	Asphalt : Base (inches)	Concrete : Base (inches)
Local - Residential	4:12	6:6
Local - Commercial	6:12	9:8
Local - Industrial	6:12	9:12
Collector	6:12	9:8

Arterial	Engineer to Provide Design

7.12.2 **Crown:** Roadways shall be crowned along the center of the street section with a typical cross slope of 2%.

7.13 Horizontal and Vertical Design

7.13.1 Roadways shall be designed in compliance with AASHTO standards for alignment and profile. To promote drainage, the minimum slope of curb and gutter shall be 0.50%.

7.14 Sidewalks

7.14.1 Sidewalks and shared use paths shall be designed in compliance with ADA standards. AASHTO's "Guide for the Development of Bicycle Facilities" shall be used as a design guide for bicycle paths.

7.15 Fire Code

7.15.1 All roadways shall conform to the International Fire Code. Signage restricting parking shall be implemented where required under Section D103.6 of the Fire Code

Chapter 8

Subdivisions

Chapter 8

Subdivisions

Section	Topic	Page
8.1	Reference Standards	1
8.2	Comprehensive Plan	1
8.3	Intent	1
8.4	Right of Way	1
8.5	Lot and Block Layout	2
8.6	Street names:	2
8.7	Open Space	3
8.8	Walkways and Shared Use Paths	3

Chapter 8

Subdivisions

8.1 Reference Standards

8.1.1 City of Sioux Falls Engineering Design Standards, Chapter 8

8.1.2 The American Association of State Highway and Transportation Officials' (AASHTO) Geometric Design of Highways and Streets

8.1.3 The Transportation Research Board's Access Management Manual

8.1.4 Americans with Disabilities Act

8.1.5 International Fire Code

8.1.6 City of Harrisburg Standard Details

8.2 Comprehensive Plan

8.2.1 The design engineer shall be familiar with the City's comprehensive plans for land use as well as plans for city services. Designers should contact the City Engineer's office for guidance.

8.3 Intent

8.3.1 Subdivisions shall be designed to provide for the continuation of infrastructure to adjoining lands. The overall objective of the design professional shall be to accomplish all of the following:

1. Prevent hardships to adjoining properties and promote fluent connectivity.
2. Promote convenient connectivity to public facilities
3. Promote recreation
4. Intertwine natural features

8.4 Right of Way

8.4.1 Right of way shall be wide enough to accommodate the ultimate planned roadway, including median, shoulder, boulevard, sidewalks, bicycle facilities, utilities and other public infrastructure. Right of way shall not be less than as follows:

Principal Arterial	120-ft
Minor Arterial	100-ft
Collector	70-ft
Industrial	70-ft
Local Commercial	66-ft
Local Residential	66-ft
Alley	30-ft

8.4.2 Where a collector roadway meets an arterial, the ROW shall be 80-ft wide for a distance of 300 feet measured from the centerlines of the roadways.

8.4.3 **Cul-de-sacs:** For residential and nonresidential cul-de-sacs, the minimum right of way radius shall be 55-ft and 65-ft respectively.

8.4.4 **Half ROW:** Where an existing half ROW is adjacent to a tract of land being subdivided, the other half of ROW shall be platted within said subdivision. The design professional may propose half a ROW along adjoining property which has not been subdivided. Building permits will not be issued for lots fronting a half ROW.

8.5 Lot and Block Layout

8.5.1 Blocks shall not exceed 1000-ft in length.

8.5.2 Lot sizes shall be appropriate for the land use and conform to the City's zoning ordinance.

8.5.3 Each lot shall abut a dedicated right of way or mutual access easement.

8.5.4 Consideration should be given to residential lots larger than 1-acre. The City reserves the right to restrict the subdivision of such parcels.

8.5.5 Provide collector streets generally at every half mile.

8.5.6 Interior lot lines shall be straight and perpendicular to the right of way whenever feasible. Curved interior lot lines shall be prohibited.

8.6 Street names:

8.6.1 Roadways in alignment with existing roadways shall bear the same name. No road name shall be duplicated or alike in pronunciation with any other existing road. Names of roads shall be limited in length to 10 characters. Suffixes shall be applied as follows:

1. **Street** – A road primarily running east and west.
2. **Avenue** – A road primarily running north and south.
3. **Lane** – A road running northeast to southwest.

4. **Drive** – A road running northwest to southeast.
5. **Trail** – A local roadway which wanders in different directions.
6. **Circle** – All cul-de-sacs.
7. **Court** – A road with two openings which enters and exits on the same street.
8. **Place** – All private roads.
9. **Road** – A collector or arterial roadway running both east and west or north and south for a significant length.
10. **Parkway** – A collector or arterial roadway that is divided by a median.
11. **Boulevard** – A local roadway divided by a median.

8.7 Open Space

8.7.1 The Designer shall incorporate open space for recreation as required in the City's subdivision regulations. In general, 5% of the land within the subdivision shall be reserved for parks, green space, trails, or other recreational use.

8.8 Walkways and Shared Use Paths

8.8.1 Walkways of an appropriate width shall be required throughout a subdivision to provide pedestrian circulation and access. All lots shall be accessible to pedestrians by means of a walkway or shared use path. Paths for recreation shall be designed to promote recreational activity and connect community facilities.

Chapter 9

Submittals

Chapter 9

Submittals

Section	Topic	Page
9.1	General	1
9.2	Preliminary Subdivision Plan	1
9.3	Engineering Submittals for Subdivisions	3
9.4	Plats	5
9.5	Construction Plans	5
9.6	Shop Drawings	6
9.7	Record Drawings	6

Chapter 9

Submittals

9.1 General

9.1.1 Detailed reproducible plans, prepared by or under the direct supervision with the signature, seal, and date of the licensed professional engineer in the State of South Dakota, shall be filed with the City Engineer for all work involved in public improvement contracts or private subdivisions resulting in public right-of-way dedication. Plans shall conform to the City's Engineering Design Standards and to the following requirements.

9.1.2 The City will review all submittals for compliance with this Manual. Acceptance by the City does not relieve the Owner, Design Professional, or Contractor from responsibility for ensuring conformance.

9.2 Preliminary Subdivision Plan

9.2.1 Preliminary plans for subdivisions shall be submitted in conformance with the City's subdivision regulations. The plan shall conform to all chapters of the Engineering Design Standards and include the information that follows. The developer may include other sections and more information as they feel pertinent. The plan shall be prepared and certified by a registered Engineer of the State of South Dakota.

9.2.2 Title Page

1. Proposed Name of Subdivision
2. Vicinity Map
3. Map of Subdivision - property lines, street names, and north arrow overlaid on aerial photograph
4. Contact Information - name, address, phone number and email address of developer, engineer and surveyor
5. Engineer's Certificate
6. Index of Sheets
7. Total Acres of Subdivision
8. Benchmarks
9. Certificates of approval
10. Submittal Date
11. Legal Description

9.2.3 General Notes

1. Note any supplemental provisions to city standards
2. Expectations for city reimbursements

3. Intensions for Ownership and Maintenance of Improvements - streets, utilities, drainage ways, BMP's, etc
4. Anticipated plans for mitigation
5. Impacts to Flood Plain
6. Intent for Open Space Contributions
7. Special notes pertaining to the subdivision

9.2.4 Typical Sections

1. Illustrate Proposed Sections - streets, pedestrian paths, utilities, etc.

9.2.5 Existing Conditions | max scale 1:300 | underlay existing property lines, street names and aerial photography

1. Significant Natural Features - tree masses, water ways, etc.
2. Existing Contours - NAVD 88 with intervals sufficient to determine the character and topography of the land.
3. Potential Wetlands
4. Flood Plain Boundaries

9.2.6 Land Use Layout | max scale 1:300 | underlay property lines, lot numbers, street names and aerial photography

1. Highlight proposed zoning districts
2. Label special use facilities - schools, libraries, fire stations, parks, waterways, churches or other significant uses
3. Notate properties to be dedicated for public use.
4. Table of minimum setback requirements.
5. Parks and Recreational Facilities

9.2.7 Phasing Layout | max scale 1:300 | underlay property lines, lot numbers and street names

1. Indicate proposed phasing

9.2.8 Lot Layout | max scale 1:200 | underlay existing property lines and street names

1. Lot and block layout - systematic numbering pattern with lot dimensions, ROW widths, acreages, etc
2. Layout of adjoining subdivisions
3. Label street names
4. Easements – location, width and type

9.2.9 Drainage Layout | max scale 1:200 | underlay lot layout and existing drainage facilities

1. Connections to Existing Systems
2. Drainage Facilities - location of culverts, storm sewers, detention ponds, etc.
3. Drainage Arrows
4. Anticipated Wetlands to be Mitigated
5. Flood Plain Boundaries

9.2.10 Sanitary Sewer Layout | max scale 1:200 | underlay lot layout, street names and existing sewer facilities

1. Connections to Existing System
2. Alignments of Sewer and Force Mains
3. Lift Stations
4. Flow Arrows

9.2.11 Water Distribution Layout | max scale 1:200 | underlay lot layout, street names and existing water facilities

1. Connections to Existing System
2. Alignments of Water Mains
3. Booster Stations

9.2.12 Street Lighting Layout | max scale 1:200 | underlay lot layout and street names

1. Connections to existing system
2. Location of street lights
3. Alignment of conduits.

9.2.13 Access Layout | max scale 1:200 | underlay lot layout, street names and ROW widths

1. Geometrics - illustrate curb and gutter alignments, valley gutters, fillets, pedestrian paths, etc
2. Street Classification
3. Street Widths

9.3 Engineering Submittals for Subdivisions

9.3.1 Engineering submittals for subdivisions shall be submitted in conformance with the City's subdivision regulations. Submittals shall conform to all chapters of the Engineering Design Standards and shall include at a minimum all of the information from the preliminary plan as well as the information that follows. The developer may include other sections and more information as they feel pertinent. Plans shall be prepared and certified by a registered Engineer of the State of South Dakota.

9.3.2 Grading Plan |max scale 1:200 | underlay preliminary drainage layout and add following:

1. Typical Sections - of roadways, drainage channels and other critical locations
2. Drainage Appurtenances - location and size of culverts, storm sewers, detention ponds, channels, control structures, etc
3. Proposed Contours - NAVD 88 with intervals sufficient to determine the character and topography of the land
4. Systematic Numbering System - for inlets and other structures
5. Invert and Rim Elevations - for inlets, outlets, junction boxes, and other drainage appurtenances.
6. Slope of Storm Sewers and Culverts

7. Label the lowest point of water entry elevation on each lot.
8. BMP Facilities
9. Jurisdictional Wetlands
10. Wetlands to be Mitigated
11. Flood Plain Boundaries

9.3.3 Erosion Control Plan |max scale 1:200 | underlay the grading plan and add following:

1. Sediment Control Measures - silt fence, tracking control, inlet protection, etc.

9.3.4 Storm Water Management Plan |max scale 1:200 | underlay existing conditions and proposed grading plan respectively

Illustrative Comparison of Historic vs Developed Conditions - to include

1. Drainage Arrows and Watershed Boundaries
2. Locations of Inflow and Discharge - label peak flow rates for minor and major storm event at each location
3. Critical Overtopping Elevations - for major storm event
4. Areas of Ponding - for major storm event
5. Hydraulic Data Tables - for each watershed to include

    a. Watershed Acreages
    b. time of concentration.
    c. Rainfall intensity.
    d. Runoff coefficients.
    e. Manning's "n" values.
    f. Storm duration.
    g. Runoff calculations for the minor and major storm events.

9.3.5 Sanitary Sewer Plan | max scale 1:200 | underlay preliminary sanitary sewer layout and add following:

1. Sewer Appurtenances - location, elevation, and size of main lines, force mains, manholes, lift stations, etc.
2. Invert & Rim Elevations – for sewers, manholes, lift stations, etc.
3. Systematic Numbering System for Manholes
4. Slope of Sewers
5. Type and Capacity of Lift Stations.
6. Estimated peak and average daily flows in proposed trunk sewers.
7. Identify Major Contributors - include type of sewage and volume produced

9.3.6 Water Distribution Plan | max scale 1:200 | underlay preliminary water layout and add following:

1. Water Appurtenances - location and size of water mains, valves, fire hydrants, pumps, etc.
2. Type and Capacity of Booster Stations
3. Identify Major Users - include volume of water consumed

9.3.7 Street Lighting Plan | max scale 1:200 | Underlay preliminary light layout and add following

1. Light Levels and photometrics

9.3.8 Access Plan | max scale 1:200 | underlay preliminary access layout and add following:

1. Identify Significant Impacts to Traffic
2. Dimension Curb Radii
3. Illustrate Turning Movements at critical locations
4. Access Easements - Location and width

9.3.9 Final Lot & Block Plan | max scale 1:200 | underlay preliminary lot layout and add following:

1. Easements – location and widths

9.3.10 Private Utility Plan | max scale 1:200 | underlay final lot layout and street names and add following

1. Alignments of private utilities – gas, power, fiber, etc.

9.4 Plats

9.4.1 Plats shall be submitted in accordance with the city's Subdivision Regulations.

9.5 Construction Plans

9.5.1 Construction Plans shall be submitted to the City to be distributed for review. Five (5) copies on 11"x17" paper and one electronic PDF file shall be submitted. Plans shall conform to all chapters of the Engineering Design Standards and the Standard Specifications for Public Improvements. Plans shall include detailed information necessary for the safe and responsible construction of public infrastructure.

9.5.2 Plans shall include the sections that follow. The design engineer may include additional sections and more information as they feel pertinent.

9.5.3 Sections as listed shall include general notes, standard plates and special details as deemed pertinent by the design engineer. The City Engineer shall review construction plans to verify the proposed improvements conform to City standards. The City Engineer may request additional information or revisions to the construction plans to aid in his or her review.

1. Title Page

    a. Name of Project
    b. Vicinity Map
    c. Contact Information - name, address, phone number and email address of developer, engineer, and surveyor
    d. Engineer's Certificate

e. Index of Sheets
f. City Engineer's Certificate

2. General Notes

    a. Supplemental provisions to city standards
    b. Special notes pertaining to project

3. Typical Sections
4. Traffic Control Plan
5. Existing Conditions, Removals & Work by Others
6. Erosion Control Plan
7. Grading Plan
8. Utility Plan
9. Surfacing Plan
10. Traffic Signals Plan
11. Striping & Permanent Signs
12. Lighting Plan
13. Cross Sections

9.6 Shop Drawings

9.6.1 Shop drawings shall be submitted for all materials to be constructed within public right-of-way to the City Engineer. Drawings shall be reviewed, corrected, and stamped by the design engineer prior to submittal to the City Engineer. The City Engineer's review will be for concurrence only. The design engineer, with the City's Engineer's concurrence, shall process the drawings with the Contractor. Four (4) complete sets of original drawings plus any number the design engineer wishes to maintain shall be submitted. One complete set of approved shop drawings including all submittals for the project shall be provided to the City Engineer upon completion of the project. The set shall be bound into a single document with a cover page attached listing the following data:

1. Project Name.
2. Submittal Date.
3. Contact Information for Design Engineer and Contractor

9.7 Record Drawings

9.7.1 Record drawings shall be submitted for all improvements made within public right-of-way and shall illustrate the project as constructed in the field. On projects where city maintained utilities are to be installed, utility drawings shall be submitted within 30 days of their installation. Once construction is complete, all drawings shall be combined into a final set of record drawings and submitted to the City Engineer's Office for archiving. Five (5) copies on 11"x17" paper, one electronic PDF file and one electronic DWG file shall be submitted no later than 30 days after construction is substantially complete.

9.7.2 In general, record drawings shall document significant changes from the construction plans in the form of revision clouds and strike outs. The Design Engineer shall coordinate field data with the Contractor as well as City staff to ensure completeness and accuracy. All sheets shall be labeled with a clearly visible record drawing stamp and date of completion. Record drawings shall include all information from the construction plan as well as the following information:

9.7.3 Title Page

1. Add name, address, and telephone number of the contractor.

9.7.4 Sanitary Sewer Plan

1. Spatially correct, as-built locations of constructed gravity sewers, force mains, manholes, lift stations, services and other sanitary sewer appurtenances.
2. As-built elevations for manhole rims and inverts.
3. Distance labels for all services from the downstream manhole to the connection point at the main line.
4. Dimension distances between mainline fittings and service fittings.

9.7.5 Water Plan

1. Spatially correct, as-built locations of constructed valves, fire hydrants, services and other water main appurtenances.
2. Dimension distances between mainline fittings and service fittings.

9.7.6 Storm Sewer Plan

1. Spatially correct, as-built locations of constructed open channels, bridges, culverts, storm sewers, ponding structures and other storm sewer appurtenances.
2. As-built elevations for manhole rims and inverts, flared end sections, ponding structures, and overtopping elevations at critical locations.

9.7.7 Surfacing Plan

1. Significant modifications to the street layout or surfacing plan.
2. Modifications to typical sections. Note locations where geotextile fabric was installed.

9.7.8 Electronic Submittals

1. CAD files composed of line work and symbols used to generate record drawings shall be submitted to the City Engineer. Data provided shall be spatially correct and verified in the field by survey.