Engineering Guidelines

SANITARY SEWER

Gravity Main

Material ..... PVC

Minimum Diameter 8-inch

Class:

Less than 18 feet depth SDR-35

Less than 28 feet depth SDR-26

Greater than 28 feet depth ..... Designed by Engineer

Minimum Cover ..... 10-ft minimum depth

Note: Maintain minimum cover unless approved by City Engineer

Grade ..... Ten States Standards (2 fps), n=0.013

Location ..... Center of street

Note: Manhole is required at stub if line is to be active

Structures

Type ..... Precast, See City Standard Specification

Minimum Diameter 48-inch

Maximum Spacing 400-feet

Inside Drop ..... See City Detail Plate

Location ..... Street Centerline

Services

Material ..... PVC

Wye (class) ..... Match Sewer Main

Service Pipe ..... SCH 40

Minimum Diameter:

Single Family ..... 4-inch @ 2.0%

Multi-Unit Residential ..... 6-inch @ 1.0%

Commercial – Industrial ..... Determined by Engineer

Note: Comply with Minnesota Plumbing Code

Cleanout ..... If service length exceeds 100-feet

WATER MAIN

Main Pipe

Material ..... DIP

Minimum Diameter ..... 8-inch unless approved by City Engineer

Class:

< 20-Inch Diameter ..... CL 52

20-Inch or Greater Diameter ..... CL 51

Standard Cover ..... 7.5 feet

Location ..... 10-feet from sewers

Note: North or west of street centerline

Encasement ..... Polyethelene

Bends ..... Avoid use of 90 degree bends

Joint Restraint ..... See City Standard Specification

Hydrants

Type ..... See City Standard Specification

Maximum Coverage Radius:

Single Family Lot 300-feet

Commercial, Industrial, Multi-Family Building 250-feet

Valve ..... Required on hydrant lead, 6-inch

Hydrant Pad ..... See City Detail Plate

Placement ..... At lot lines, 5-feet behind back of curb

Desired Location .....Intersections, end of cul-de-sac

Valves

Type:

< 12-Inch Diameter .....Gate Valve

12-Inch Diameter and Greater ..... Butterfly Valve

Note: See City Standard Specification for Product Information

Maximum area isolated ..... 20-25 homes

Desired Location ..... Intersections or every 800-feet

Services

Material:

Single Family ..... Type K copper

Other .....DIP

Minimum Diameter.....1-inch (single family)

Curb Stop Location..... At right-of-way, see City Detail Plate when sidewalk is present

STORM SEWER

Design

Design frequency for storm sewers 5-year

Design frequency for stormwater basins.....100-year

Trunk pipe:

Design to carry both the 100-yr pond discharge and 5-yr design flow for directly connected areas

Pipe diameter change in profile..... Match crown of pipe

Note: In cases where not possible, submit calculations to demonstrate excessive surcharging does not occur

Methodology..... Rational method, gravity flow

Manning n-value 0.013

Minimum Velocity (pipe) 3-fps

Maximum Velocity (pipe)..... 10-fps

Maximum Velocity at Pond Inlets 6-fps

Maximum Velocity (overland discharge) 4-fps

Catch Basin Spacing .....400' maximum street flow (local roads)

Note: On State Aid routes, spread calculations are required

Rear Yard Storm Sewer ..... Maximum 3-4 lots overland drainage

Note: 300-ft maximum length of run for jetting

Pond inlets ..... Invert to match outlet elevation

Note: Submerged pipes not allowed

Main Pipe

Material .....RCP

Minimum Diameter..... 12-inch

Class .....Use Concrete Pipe Association Fill Height Tables

Minimum Cover .....3-feet within street, 2-feet in greenspace

Location..... South or east side of street (within street)

Note: Avoid running behind curb as that location typically conflicts with streetlight bases, signs, and boulevard tree plantings

Structures

Type ..... Precast, See City Standard Specification

Minimum Diameter..... 48-inch

Maximum Spacing..... 400-feet

Note: Also required at all pipe connection points

Catch Basin Location .....See City Detail STR-28

Note: Avoid mid-radius placement when possible

Sumps..... Last structure in street prior to pond

Skimmer Structures..... Placed prior to infiltration feature and at pond outlet

Castings ..... See City Standard Specification

Miscellaneous

Pond Benching ..... See City Detail Plate STO-15

Minimum Freeboard:

100-yr HWL .....3-feet below low adjacent grade of building

Basin EOF .....2-feet below low adjacent grade of building

Note: For backyard and side-yard conveyance and temporary ponding areas, provide 1-foot freeboard to the overland EOF

Pond Requirements ..... See Surface Water Plan

Wet Ponds.....12" min. clay liner

1. Place liner along pond bottom to an elevation 1 vertical foot above NWL.
2. Liner shall have a maximum permeability of $1x10^{-6}$ cm/s with a minimum 15% passing the #200 sieve.

Infiltration Basin..... 12" min. media

1. The City recommends providing a Filter Topsoil Borrow (MnDOT 3877.2.G) consisting of 70% sand (meeting the gradation requirements of 3126) and 30% Grade 2 Compost (MnDOT 3890).

Pond 100-yr HWL .....Contained entirely in Outlot

Minimum basin & pond access:

Access Width ..... 20-foot wide Outlot

Slope .....1:6 Maximum

Note: Need ability to access structures around basin with 10' maintenance bench

Minimum greenspace grade for drainage 2%

PUBLIC STREETS

Geometric Design, Local Residential

Minimum Street Width (face of curb to face of curb) 28-feet

Typical Crown..... 2.4%

Curb Type ..... Surmountable D428

Minimum Longitudinal Grade 0.75%

Maximum Longitudinal Grade 5.0%

Note: Maximum 8% is allowed only if existing topography prohibits 5.0% grade

Maximum Intersection Approach Grade ..... 2.0% for first 100-feet

Intersection Angles ..... 90 degrees

Minimum Horizontal Curve Radius 100-feet

Minimum Vertical Curve Length ..... Minimum K=19 (crest) and K=37 (sag)

Minimum Curb Radius 20-feet

Cul-de-sacs ..... See City Detail Plates

Note: Temporary cul-de-sac with bit curb is required at phased plat boundary of dead-end street

Geometric Design, Collector or Commercial

Minimum Street Width (back of curb to back of curb) ..... Varies

Typical Crown 2.0%

Curb Type ..... B618 (design speed < 45 mph)

Minimum Longitudinal Grade 0.75%

Maximum Longitudinal Grade 5.0%

Maximum Intersection Approach Grade ..... 2.0% for first 100-feet

Intersection Angles ..... 90 degrees

Minimum Horizontal Curve Radius ..... State Aid Tables

Minimum Vertical Curve Length ..... State Aid Tables

Tangent length at intersection from curb line 100-feet

Minimum Curb Radius 30-feet

Pavement Design

Minimum Structural Design ..... 10-ton R-value, MnDOT Flex Pave (collectors)

Note: For local roads, see City Detail Plate

Bituminous Mix Types:

Residential ..... C-oil

Collector ..... F-oil

Trail ..... C-oil

Note: See City Standard Specification

Minimum Bituminous & Aggregate Base ..... See City Detail Plate

Sub-base ..... In-place granular or as determined by Engineer

Signing & Striping

Design Standards ..... Follow MMUTCD

Signs ..... Follow City Sign Policy

Sign Panels ..... Diamond Grade DG3

Epoxy ..... Collector road lane striping

Latex ..... Parking lot striping, temporary markings

Thermoplastic (ground in) ..... Pavement messages, stop bars, crosswalks

Typical Widths:

Stop Bar 24-inches

Note: Required on all collector and arterial intersections

Crosswalk 12-inches

Note: Required on collector and arterial intersections; not required on controlled residential streets

Mid-Block Crossings ..... Marked crosswalk required

Entrances & Driveways

Commercial Apron ..... See City Detail Plate

Maximum Driveway Grade (residential) 10.0%

Private Streets ..... Max. approach to match boulevard grade

Boulevard

Typical Slope 3.0%

Minimum Topsoil Depth 6.0-inches

Street Light Pole/Conduit Location ..... 3-feet behind curb

Hydrant Location ..... 5-feet behind curb

Tree Location (with sidewalk) ..... 5-feet behind curb

Tree Location (without sidewalk) ..... 10-feet behind

Sign Post ..... 6-feet behind curb

Sidewalks & Trails

Typical Section ..... See City Detail Plates

Locations ..... As directed

Maximum Longitudinal Grade ..... See current ADA standards

Maximum Cross Slope ..... See current ADA standards

Pedestrian Ramps ..... See current ADA standards & MnDOT details

Note: Concrete flares on sidewalk; Graded flare on 8' wide or greater bituminous trails, unless adjacent to walkable surface

Clear Zone 2-feet

Intersecting Trails ..... Provide a 10' min. radius for plowing and manuverability

Street Lighting

Spacing, Residential ..... Approx. 200-250-feet at lot lines

Spacing, Commercial/Collector Streets ..... IES Standards

Note: Or as directed by Engineer

Location ..... Place along trail or sidewalk side of road

Note: Place poles at intersections, mid-block pedestrian crossings, at lot lines, and end of cul-de-sacs when possible

Lights per circuit and length of run ..... Designed by Engineer

Feed Point Cabinet ..... See City Standard Specification

Conduit ..... 1.5-inch minimum NMC

Note: Required for all underground wiring

Pole Types ..... See City Detail Plates

Landscaping

Planting Restrictions:

1. Deciduous trees should be located a minimum of 5’ off any utility pipe
2. Coniferous trees should be located a minimum of 15’ off any utility pipe
3. No tree should be located within 10’ of a hydrant or 15’ from a streetlight
4. No trees should be located within a storm pond HWL
5. No trees should be located within a storm pond’s 20’ access route, and no coniferous tree within 5’ of the 20’ pond access route
6. No coniferous trees within 20’ of a proposed sidewalk/trail
7. No deciduous trees within 5’ of a sidewalk/trail
8. For trees within public right-of-way or public outlot, trees shall conform to the current list of approved species

Boulevard Tree Planting List 2022

Overstory

Northern Pin Oak- *Quercus ellipsoidalis*
Red Oak- *Quercus rubra*
White Oak- *Quercus alba*
Swamp White Oak- *Quercus bicolor*
St. Croix Elm- *Ulmus americana ‘St. Croix’*
New Horizon Elm- *Ulmus ‘New Horizon’*
Accolade Elm- *Ulmus davidiana var. japonica 'Morton'*
Skyline Honeylocust- *Gleditsia tricanthos var. inermis ‘Skycole’*
Hackberry- *Celtis occidentalis*
River Birch- *Betula nigra* (SINGLE STEM ONLY)
Yellowwood- *Cladrastis kentuckea*
Kentucky Coffeetree- *Gymnocladus dioicus*
London Planetree- *Platanus × acerifolia*
Tuliptree- *Liriodendron tulipifera*

Understory

Japanese Tree Lilac- Syringa reticulata 'Ivory Silk'
Spring Snow Crabapple- Malus ‘Spring Snow’
Ironwood- Carpinus caroliniana