PUBLIC WORKS ENGINEERING DEPARTMENT

DESIGN STANDARDS

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DESIGN STANDARDS

The design and construction of public infrastructure facilities shall be performed in accordance with the most recent editions of the Minnesota Department of Transportation (MnDOT) **"Standard Specifications for Highway Construction"** and any amendments thereto, and the **"Standard Utilities Specifications for Sanitary Sewer and Storm Sewer Installation"** as published by the City Engineers Association of Minnesota, and the City of Roseville's Standard Specifications and Detail Plates or as modified herein. All designs must incorporate the requirements identified in the City's Comprehensive Plans in effect at the time of the infrastructure design and installation.

A. GRADING/DRAINAGE/EROSION CONTROL/SITE RESTORATION

This work shall be done in accordance with the most recent additions of the **"MnDOT Standard Specifications for Highway Construction"**, the **"Protecting Water Quality in Urban Areas"** (Best Management Practices) prepared by the Minnesota Pollution Control Agency (MPCA), the City's Surface Water Management Plan (SWMP) and the latest City of Roseville Standard Specifications. These planning handbooks will guide the developer and their engineer in protecting the land and water resources of the City during land development.

The City requires the following for submittal of grading, drainage, and erosion control plans in accordance with the Roseville's Zoning Code.

1. The Developer shall obtain all regulatory agency permits and approvals including those from the MPCA for "General Stormwater Permit for Construction Activity" and applicable Watershed District.

2. Show adjacent plats, parcels, property lines, easements of record, section lines, streets, existing storm drains and appurtenances, etc.

3. Signature of professional engineer licensed in the State of Minnesota.

4. Extend existing 2' contour lines a minimum of 100' beyond the property boundary or more as needed to accurately depict the existing drainage patterns.

5. Show the bench mark utilized and the limits of construction.

6. Maximum 3:1 slopes are allowed in "maintained" areas accept as approved by the City Engineer.

7. Show the NWL and HWL for ponds, lakes, wetlands, and rivers based upon the most recent City's Surface Water Management Plan criteria.

8. For each house pad, show the type of proposed house to be built such as R or WO for rambler or walkout. Also, show the garage floor, first floor and basement walkout

elevations. The lowest entry level of affected houses shall be 2' above the HWL of adjacent ponds.

9. If retaining walls are needed, submit detailed plans and specifications that show type and height of retaining wall. Private retaining walls will not be allowed within the City's drainage and utility easements or street right-of-way. Retaining walls that will become public must meet the latest City of Roseville specifications.

10. Show City of Roseville project number on the plan or title page if applicable.

11. Show emergency overflow routes from all low points and show elevation of high point along emergency overflow route. The lowest entry level or opening of affected houses shall be 1' above the emergency overflow elevation.

12. All driveway shall have a minimum grade of 0.5% and/or the garage floor elevation must be a minimum of 1.0 feet above the flowline of the curb. Maximum driveway slopes shall be 10%.

13. Show removal of all trees and brush below the normal water level that will be impacted from existing and newly created ponding areas.

14. Show or define access routes for maintenance purposes to all inlets or outlets at ponding areas (must be maximum of 8% grade, 2% cross slope and 10' wide).

15. Show all existing and proposed grades. Required standard is 2' contours with existing contours shown as dashed or screened and proposed contours shown as solid. Standard scale is 1" = 50' or less depending on the amount of detail required.

16. Upon completion of grading, the developer is required to provide the City with a CADD file "as-built" grading plan certifying the actual grades of the site including house pad and lowest exposed structure elevations of existing and proposed.

17. Provide existing and proposed hydrologic/hydraulic calculations per City Storm Water Management Standards.

18. Provide pre- and post-detailed hydrologic/hydraulic calculations for stormwater ponds and wetlands verifying location and capacity adequacy of all overland drainage routes. Consult the City's Surface Water Management Plan for further detail on design criteria.

19. Show the location of silt fence and all other erosion control devices. Note for all silt fence to be installed by the contractor and inspected by the City prior to any site work. Construction areas adjacent to existing water bodies such as wetlands, creeks, ponds, or lakes shall have Type III erosion control (see details).

20. All drainage plans shall be consistent with the City of Roseville's Comprehensive Surface Water Management Plan (CSWMP).

B. SANITARY SEWER

All sanitary sewer and appurtenances shall be checked for conformance with the design criteria specified in the Recommended Standards for Waste Water Facilities – 1990 edition of the Great Lakes – Upper Mississippi River Board of State Sanitary Engineers (10 State Standards) or latest revision and as modified herein.

1. The Developer shall obtain all regulatory agency permits and approvals including those from the MPCA and Metropolitan Council Environmental Services prior to beginning of construction.

2. The number of capita per dwelling units used in design calculations shall be reviewed and approved by the city engineer.

3. Determination of sanitary sewer services size and design shall be done in accordance with the Department of Health and Minnesota Plumbing Code.

4. Manholes shall be placed on street centerline to the greatest extent possible. Other locations outside the wheel paths (3' and 9' off centerline) may be allowed with City approval.

5. The maximum spacing between manholes is 400' unless approved by the City Engineer.

6. Manholes are required on the terminus end of all stubs if the line will be active.

7. Drop manholes are required when the pipe inverts are greater than 2' apart.

8. Any connections to existing manholes shall be core drilled. If the pipe diameters of the existing and proposed pipes are the same, then the invert elevations shall drop 0.10 feet through the manhole. If the pipe diameters are different, then the 8/10ths line of the two pipes shall match at the manhole.

9. Maintain a minimum of 10' of horizontal separation between sanitary sewer and watermain.

10. The minimum slopes for sanitary sewer shall be as follows:

SIZE OF PIPE	MINIMUM SLOPE
8"	0.40%
10"	0.28%
12"	0.22%
15"	0.15%

11. Show on the plans the existing and proposed sanitary sewer in plan and profile view along with other existing and proposed utilities in the construction zone.

12. Sanitary sewer services shall be installed a minimum of 8 feet in depth below the surface or adequate pipe installation shall be installed.

13. If the sanitary sewer is to be installed less than 10' deep within private property, the utility easement or right of way shall be a minimum of 20' wide with the pipe centered in the easement. If the sanitary sewer is 10' deep or greater, then the easement shall be at least twice as wide as the depth or as required by the City. Show these utility easements on the construction plans and final plat.

14. Trunk sanitary sewers shall be designed to promote a laminar flow through the sewer system. Junction manholes should be designed to limit the hydraulic head increase by matching hydraulic flow lines and by providing smooth transition angles.

15. No manhole shall be located within a designed ponding/flowage easement without City approval. If such location is unavoidable, then the structure may be required to be built to a higher elevation to avoid flooding, constructed to tolerate frost action, and shall be made of water-tight materials.

16. Deflection testing and televising shall be conducted after the final backfill has been in place for 30 days.

17. All materials shall meet the latest City of Roseville specifications. All construction shall meet City of Roseville specifications.

18. Service lines shall be sized in accordance with the Minnesota Plumbing Code – Chapter 4715.

19. The number of capita per dwelling unit used in design calculations shall be approved by the City.

20. The sewer service shall be included in the pressure and leakage testing requirements for the main lines.

21. Minimum grade for sanitary service stubs shall be ⅛ inch per foot (1%).

22. Developers are responsible for constructing services from the mainline pipe to the right-of-way line.

23. Cleanouts are required at 100-foot intervals including the riser on sanitary sewer services. All sanitary sewer cleanouts constructed in paved areas require the installation of a meter box and cover for ease of access to the cleanout.

24. Sewer services shall be connected to a wye on the main and shall not be constructed into manholes unless approved by the City. Approved connections to a manhole

require a KOR-N-SEAL connection or approved equal and must match the manhole invert.

25. All materials shall meet the latest City of Roseville specifications. All construction shall meet City of Roseville specifications.

C. **WATERMAIN**

1. All materials shall meet the latest City of Roseville specifications. All construction shall meet City of Roseville specifications.

2. Hydrants shall be installed at a minimum 600-foot spacing and at every intersection.

3. All watermain and water services shall be installed with an eight (8) foot bury depth.

4. All watermain shall be installed to meet Minnesota Department of Health regulations.

5. If the public watermain is to be installed less than 10' deep within private property, the easement shall be a minimum of 20' wide with the pipe centered in the easement. If the watermain is 10' deep or greater, then the easement shall be twice as wide as the depth or as required by the City.

D. STORM SEWER

1. Stormwater plans for the development shall utilize as a guide the Comprehensive Surface Water Management Plan (CSWMP) for the City of Roseville.

2. Stormwater management plans shall use a 10-year frequency storm for pipe design and a 100-year frequency storm for ponding detention basin design.

3. Stormwater management plans shall use design criteria utilizing a hydrograph method based on sound hydrologic theory to analyze the stormwater runoff and proposed development such as the Soil Conservation Service TR-55 Urban Hydrology for Small Watersheds.

4. Drainage calculations shall be submitted to show the sizing of pipe, ponds, and emergency overflow spillways. Pond calculations should analyze a 2-year, 10-year and 100-year frequency, 24-hour storm event using a modeling program such as HydroCAD or approved alternative. Any assumption used in the design should be included with the calculations. Stormwater ponds shall be designed and constructed in accordance with the City's CSWMP using criteria from the National Urban Runoff Program (NURP).

5. Provide for overflow routes to drain low points along streets or lot lines to ensure a freeboard of 2' from the lowest exposed structure elevation and the calculated 100-year storm HWL elevation. Design criteria verifying the adequacy of the overland drainage route capacity is required. At low points in the street, the catch basin grates

shall be assumed to be 50% plugged for design purposes.

6. The storm sewer alignment shall follow the sanitary sewer and watermain alignment where practical with a minimum of 10' of separation. Storm sewer placed along the curb alignment shall be along the curb opposite the watermain to maintain the 10' separation.

7. Catch basins shall be located on the tangent section of the curb at a point 3' from the radius. Mid-radius catch basins will not be allowed. Also, catch basins shall be designed to collect drainage from the upstream side of the intersection.

8. The maximum spacing between manholes is 400'.

9. Manholes steps will be aligned and over the downstream side of the manhole. Steps within manholes will be:

   1"± horizontal alignment
   1"± vertical alignment with 16" spacing as the standard

10. Any connections to existing manholes or catch basins shall be core drilled or the opening cut out with a concrete saw. No jack hammering or breaking the structures with a maul is permitted. Also, all connections to an existing system will require a manhole for access.

11. To the greatest extent possible, manholes shall be placed in paved surfaces outside of wheel paths (3' and 9' off centerline) or other readily accessible areas.

12. Minimum pipe size shall be 12" in diameter.

13. Type of pipe shall be Reinforced Concrete Pipe (RCP). All storm sewer pipe beneath roadways or pavement shall be Class 5. The table below shows the allowable class of pipe for storm sewer outside of the roadway:

PIPE DIAM.	CLASS 2	CLASS 3	CLASS 4	CLASS 5
12" – 18"				X
21"			X	X
24" – 33"		X	X	X
≥ 36"	X	X	X	X

   Show the class of pipe in the profile view only. For areas outside of the roadway, the City may allow the use of HDPE (High Density Polyethylene) pipe.

14. Aprons or flared-end sections shall be placed at all locations where the storm sewer outlets a ponding area. All outlet flared-end sections above the NWL of the pond shall be furnished with hot dipped galvanized trash guards. All trash guard installations will be subject to approval by the City Engineer.

15. Riprap and filter blanket shall be placed at all outlet flared-end sections. The placement of the riprap shall be hand placed. The minimum class of riprap shall be MnDOT 3601.2 Class III. Design criteria justifying the size and amount of riprap are required. Geotextile material is not allowed for filter aggregate where ice action along the shoreline may tear the geotextile (see Detail Plate).

16. The invert elevations of the pond inlet flared-end sections shall match the NWL of the pond. Submerged outlets will only be allowed with the use of an outlet structure (see Detail Plate).

17. Long radius bends may be used for greater than 24" pipe diameter if necessary and approved by the City Engineer in vertical and horizontal alignment. However, only one series of bends will be allowed, either vertical or horizontal, between structures.

18. If the public storm sewer is to be installed less than 10' deep within private property, the easement shall be a minimum of 20' wide with the pipe centered in the easement. If the storm sewer is 10' deep or greater, then the easement shall be twice as wide as the depth or as required by the City.

19. Show or define access routes for maintenance purposes to all manholes outside the public right-of-way and inlets or outlets at ponding areas (8% maximum grade, 2% cross slope, and 10' wide). Access easements shall be dedicated at the time of final platting to provide this access.

20. Junction manholes should be designed to limit the hydraulic head increase by matching hydraulic flow lines and by providing smooth transition angles.

21. In the development of any subdivision or ponding area, the Developer and/or property owner is responsible for the removal of all significant vegetation (trees, stumps, brush, debris, etc.) from any and all areas which would be inundated by the designated controlled NWL of any required ponding easement as well as the removal of all dead trees, vegetation, etc. to the HWL of the pond.

22. The Developer and/or Engineer upon the completion of the construction of a designated ponding area is required to submit an as-built record plan of the ponding area certifying that the pond constructed meets all design parameters as set forth in the City's respective stormwater management plans.

23. Utilization of existing wetlands for stormwater management is subject to review by the appropriate regulatory agency in accordance with the "Wetlands Conservation Act".

24. Outlet control structures from ponding areas are required as directed by the City. Location and appearance of outlet structures shall be subject to City approval and may require landscape screening.

25. Environmental manholes (three-foot sumps) shall be constructed as the last structure that is road accessible prior to discharge to any water body. Additional protection may be required when outletting to a sensitive water body.

26. For all storm pipes that outlet to a pond or other water body, show the elevation contour of the NWL in the plan view.

27. Provide a storm sewer schedule on the plans using the following format:

STORM SEWER SCHEDULE

STRUCTURE NO.	SIZE	CASTING	BUILD
CBMH 1	48"	R-3290-V	4'

Structures shall be classified as a catch basin (CB), catch basin/manhole (CBMH), or manhole (MH). CB's are inlet structures with a total of one pipe either entering or leaving. CBMH's are inlet structures with more than one pipe either entering or leaving. MH's are all non-inlet structures. Standard inlet castings are: R-3067-BV when in the curb line and R-2560 when outside of paved areas. The standard MH casting is R-1730.

28. A four inch solid drain tile shall be stubbed out of structures at street low points and for lots that are not adjacent to a pond/wetland in accordance with the detail plates. Cleanout risers are required every 100' and at the terminus end of the line (see Detail Plate).

29. All materials shall meet the latest City of Roseville specifications. All construction shall meet City of Roseville specifications.

E. STREETS

1. Flexible pavement design shall be based on design procedures set forth by the Minnesota Department of Transportation. Residential streets shall be designed for a minimum seven-ton pavement design.

2. Soil borings and/or special design considerations may be required by the City Engineer in areas where unstable soils exist.

3. The roadway subgrade shall be constructed per MnDOT Specification 2105 and test rolling per MnDOT Specification 2111 shall be required. The test roller and amount of allowable deflection shall be as specified in the Special Technical Condition Specifications.

4. Street alignment for local streets, both vertical and horizontal, shall be designed for 30 MPH design speed based on the latest edition of the American Association of State Highway and Transportation Officials Manual unless otherwise approved by the City Engineer.

5. Minimum street grade shall be 0.50%. The design maximum shall not exceed 4.0% for arterials and 6.0% for others. Special situations such as saving environmental features may allow limited areas of 10.00% with City approval.

6. Streets shall be designed to intersect at right angles whenever possible. In no case shall the angle of intersection between two streets be less than sixty (60°) degrees.

7. The minimum diameter for a cul-de-sac shall be 100 feet from face of curb to face of curb. Islands may be permitted subject to the review of the City Engineer.

8. Unless approved by the City street intersections and commercial driveway intersections shall match at the centerlines. If the streets or driveways cannot be aligned to match, the intersections shall be offset a minimum of 300 feet or as approved by the City Engineer.

9. Barricades in accordance with the Minnesota Manual on Uniform Traffic Control Devices shall be placed at all dead end streets.

10. At intersections, the street grade shall not exceed 3.00% for the first 30 feet approaching said intersection. The 30 feet is measured from the curb line of the intersected street. In cul-de-sacs, the gutter grade shall not be less than 0.80%. A minimum 0.5 foot crown or minimum 3.00% cross slope grade, whichever is greater, is required of all street cross-sections. The minimum curb return radius shall be 20 feet. The minimum grade around curb returns shall be 0.50%.

11. Private streets and or common driveways shall be a minimum of 24' wide and built to a 7-ton design.

12. Residential properties shall only have one driveway access to City streets unless the City Engineer determines there is a need for a second driveway access.

13. The City requires concrete valley gutters across street and driveway intersections with overland cross drainage having a grade less than 1%.

14. Retaining walls over four (4) feet in height must be designed by a Minnesota Licensed Professional Engineer. The retaining wall is to be located on private property. The construction of any retaining walls within the public right-of-way will need prior approval of the City Engineer. All walls over four (4) feet in height will require an approved fence at the top of the wall. The retaining wall construction will require the submittal of detailed plans and specifications for review by City staff and a permit through the Building Department.

15. The design and construction of sidewalks and trailways shall be in accordance with the City's Standard Plates and City ordinances. Residential sidewalks shall be six (6)-foot wide concrete and trailways shall be a minimum of eight (8)-foot wide bituminous.

16. Horizontal curves on residential streets with concrete curb and gutter shall be designed to ensure a horizontal sight distance of not less than 100 feet. The minimum design speed shall be 30 MPH. The following are other minimum requirements for residential streets:

    a. Horizontal curves shall have a minimum of 180-foot centerline radius. Refer to MnDOT State Aid Manual for more information.

    b. Vertical curves shall be designed as follows:

    L = K A
    Where L = Minimum length of vertical curve in feet
    K = 20
    A = Algebraic difference in grade in percent

17. Vertical curves and horizontal curves on collector streets with concrete curb and gutter shall be designed to ensure a vertical and horizontal sight distance of not less than 300 feet (arterials = 500 feet minimum). The following are other minimum requirements for collector streets:

    a. Horizontal curves shall have a minimum of 300 feet centerline radius without super elevation on 30 MPH design streets and a minimum of 450 feet centerline radius without super-elevation on a 35 MPH design street. Refer to the MnDOT State Aid Manual for more information.

    b. Horizontal curves shall have a minimum tangent of 300 feet between reverse curves.

18. All materials shall meet the latest City of Roseville specifications. All construction shall meet City of Roseville specifications.

F. MISCELLANEOUS

1. All private utility boxes and poles shall be located within property lot lines.

2. All utility disconnects must be done at the main and be mechanically capped. For utility disconnects on major roads, the City Engineer may require the disconnect to occur at the right of way line and a fee be paid in lieu of capping the service at the road.

3. Street lights shall be installed at all intersections and midblock every 600 feet.

4. Street signs in Public Right of Way required as part of the development shall be installed be installed by City of Roseville at Developer's cost.

5. Refer to City Details in Appendix for pathway and sidewalk design standards.

6. Refer to City Details in Appendix for driveway design standards.

APPENDIX – Standard City Detail Plates

Bedding	City Plate Number
Pipe Bedding	BED-1
Erosion Control	**City Plate Number**
Erosion Control Fence	EC-1
Sediment Filter Sack	EC-2
Rock Construction Entrance	EC-3
Inlet Protection Type A	EC-4
Inlet Protection Type B	EC-5
Landscape	**City Plate Number**
Planting Detail	L-1
Miscellaneous	**City Plate Number**
Mailbox	M-1
Construction Sign	M-2
Wood Rail Fence	M-3
Paving / Streets	**City Plate Number**
Driveways and Sidewalks	P-1
Commercial Driveway	P-2
Concrete Sidewalk Joint Pattern	P-3
Transverse Crack Control Joints	P-4
Construction Sign	P-5
Concrete Valley Gutter	P-6
Sanitary Sewer	**City Plate Number**
Sanitary Manhole	S-1
Sanitary Sewer Manhole (27 Inch)	S-2
Sanitary Sewer Service	S-3
Manhole Type B Thru G Sump	S-4
Sanitary Sewer Service with Riser	S-5
Sanitary Sewer Wye Replacement	S-6

Sanitary Sewer Service Replacement	S-7
Sanitary Sewer Service Pipe Replacement	S-8
Sanitary Sewer Service Installation for CIPP	S-9
Sanitary Drop Inlet Manhole	S-10
Inside Drop Manhole Addition	S-11
Storm Sewer	**City Plate Number**
Catch Basin	ST-1
Catch Basin with Sump	ST-2
Baffle Structure	ST-3
Perforated Structure	ST-4
Riprap Placement at Flared End Sections	ST-5
Perforated Pipe Detail	ST-6
Perforated Pipe Trench Detail	ST-7
Rain Guardian Turret	ST-8
Flared End Section	ST-9
Standard Overflow Structure with Grate	ST-10
Raingarden Detail	ST-11
Biofiltration Trench Detail	ST-12
Biofiltration Basin	ST-13
Biofiltration Basin with Liner	ST-14
Draintile Cleanout	ST-15
Draintile Cleanout with Cover	ST-16
Standard Overflow Structure with V-Notch Weir	ST-17
Overflow Structure with Orifice	ST-18
Baffle Structure (Preserver)	ST-19
Porous Pavement Detail	ST-20
Porous Pavement with Underdrain	ST-21
Catch Basin and Manhole Adjustment Rings	ST-22
Drainage Swale and Berm	ST-23

Contaminated Soil Trench Detail	ST-24
Water Main	**City Plate Number**
Hydrant and Gate Valve Installation	W-1
Water Main Service Connection	W-2
Water Main Service Disconnection	W-3
Pipe Insulation Detail	W-4
Gate Valve and Box Installation	W-5
Water Main Wet Tap	W-6
Water Main Offset with Megalugs	W-7
Concrete Thrust Blocking	W-8