

# Engineering Standards



**ROCHESTER**

**PUBLIC WORKS**



1001 SCOPE	1
1001.1 Description	1
1001.2 Engineering Requirement	1
1001.3 Definition of Terms	2
1001.4 Reference Documentation	2
1002 ROADWAY DESIGN	4
1002.1 Right of Way & Street Widths	4
1002.2 Traffic Impact Studies	5
1002.3 Speed Limits	11
1002.4 Complete Streets	12
1002.5 Design Standards by Speed Limit	12
1002.6 Intersections	14
1002.7 Acceleration, Deceleration and Turning Lanes	14
1002.8 Islands	14
1002.9 Typical Cross-Section	14
1002.10 Curbing	15
1002.11 Vertical and Longitudinal Controls	15
1002.12 Geotechnical Report	16
1002.13 Pavement Design	17
1002.14 Future Side Streets	18
1002.15 Temporary Street Ends	18
1002.16 Temporary Secondary Access	19
1002.17 Location of Utilities	19
1002.18 Utility Conduit Crossings	20
1002.19 Utility Easements	20
1002.20 Pedestrian and Bicycle Facilities	21
1002.21 Bituminous Paving	21
1003 Sanitary Sewer Design	23
1003.1 Sizing Sanitary Sewers	23
1003.2 Pipe Material	23
1003.3 Manhole Structures	23
1003.4 Spacing and Alignment	24

1004 Watermain Design _____	25
1004.1 Sizing Watermains _____	25
1004.2 Pipe Material _____	25
1004.3 Spacing and Alignment _____	25
1005 Stormwater Management _____	29
1005.1 Stormwater Management Plan _____	29
1005.2 Storm Sewer Design _____	30
1005.3 Pipe Material _____	30
1005.4 Manhole and Catch Basin Structures _____	31
1005.5 Storm Sewer and Culvert Appurtenances _____	31
1005.6 Storm Sewer Inlet Spacing and Trunk Alignment _____	32
1005.7 Open Channel Design and Sizing _____	32
1005.8 Permanent Stormwater Management Facilities _____	33
1005.9 Grading Plan Checklist _____	35
1005.10 Subsurface Edge Drains _____	35
1005.11 Future Storm Laterals, Stubs _____	36
1005.12 Stormwater Discharges _____	36
1006 Service Connections _____	37
1006.1 Sizing Service Connections _____	37
1006.2 Pipe Material _____	37
1007 Pumping Station _____	39
1007.1 Lift Station Design _____	39
1007.2 Forcemain Design _____	40
1007.3 Coatings and Materials _____	40
1007.4 Site Layout _____	40
1007.5 Power _____	40
1007.6 Instrumentation _____	41
1008 Erosion and Sediment Control _____	42
1008.1 Required Documentation _____	42
1008.2 Construction Requirements _____	42
1008.3 Temporary Erosion and Sediment Control _____	43
1008.4 Permanent Erosion and Sediment Control _____	43
1009 Decorah Edge Areas _____	44

1009.1 General	44
1009.2 Roadway Plans	44
1009.3 Underground Utilities	44
1010 Tree Planting, Preservation, and Protection	46
1010.1 Description	46
1010.2 Definition of Terms	46
1010.3 Engineering Requirement	48
1010.4 Construction Requirement	48
1011 Project Development	50
1011.1 General	50
1011.2 Predesign Submittal	50
1011.3 Pre-submittal meeting	51
1012 Standard Plans	52
1012.1 General	52
1012.2 Modifications to the Mn/DOT Sample Plan	52
1013 Submission of Plans	55
1013.1 Plans and Specifications	55
1013.2 Estimates	55
1013.3 City-Owner Contracts	55
1013.4 Electronic Drawings	55
1013.5 Record Drawings	56
1014 Construction Supervision	57
1014.1 Pre-Construction Conference	57
1014.2 Construction Progress Meetings	58
1013.3 Notice to Proceed	60
1014.4 Surveying	60
1014.5 Inspection	60
1014.6 Utility Testing	62
1014.7 Detailed Stage Inspections	62
1014.8 Pavement Quality Assurance using Cores	63
1014.9 Acceptance	63
1015 Schedule of Materials Control	65
1015.1 General	65



# 1001 SCOPE

## 1001.1 Description

In order to standardize engineering requirements for Developers and Engineers performing work within the City of Rochester, it is important that certain standards be followed.

These standards state certain requirements, materials, and standards that shall be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, stormwater best management practices (BMPs), watermains, service connections, pedestrian facilities, street construction, and associated erosion control within the Rochester Urban Service Area, unless otherwise authorized by the City Engineer.

Compliance with these standards will help provide quality projects and assure uniform performance standards for the citizens of Rochester.

## 1001.2 Engineering Requirement

As set forth in various sections of City ordinances, developers of property within the City are required to submit certain professionally prepared and signed plans and specifications for review and approval by the City. These include such items as civil construction plans and specifications, which include (but are not limited to) site surveys, demolition plans, site plans, grading plans, drainage plans, storm sewer plans, street and utility plans, erosion and sediment control plans, and stormwater management plans.

All plans and specifications for construction of public works shall be prepared by or under the direction of a Professional Engineer (herein after “Engineer”) licensed under the laws of the State of Minnesota.

The Engineer of Record shall be responsible for the accuracy and completeness of the plans and specifications and the thoroughness and quality of the field inspections. The Engineer of Record shall annotate on the civil plan set and record drawings *all location and elevations of storm and sanitary infrastructure have been verified*. The Engineer of Record shall be familiar with all of the reference documents listed herein.

The City Engineer will review the plans for compliance with regulatory requirements, Rochester Engineering Standards, and accepted department practices and policies. Approval of the civil plans, specifications, and stormwater management plans by the City does not relieve the Engineer of Record of full responsibility for the adequacy of design, accuracy of the field survey, and accuracy and reliability of computations and details.

Engineering obligations include preparation of plans and specifications (including site survey and the stormwater management plan), field staking, and inspection to assure the City that the completed project is in conformance with the approved plans and specifications. Engineering obligations also include submission of record drawings.

## 1001.3 Definition of Terms

### A. Public Works

Public Works as used herein are defined as those facilities for transportation, conveyance of sanitary and storm flows and potable water that are constructed within the public right-of-way or on public easements for the use of the general public. The Public Works Department is that department of the City of Rochester responsible for the management and oversight of Public Works facilities.

### B. Community Development

Community Development is about public and private sectors working together to build a strong community that is economically, socially, and environmentally healthy and resilient.

Development review for applications within the Rochester city limits is initiated with the Community Development Department, located at 4001 West River Parkway NW, Suite 100.

### C. Olmsted County Planning Department

The Olmsted County Planning Department administers the land use controls for Eyota Township, Marion Township, Oronoco Township, and Quincy Township. Development review for applications outside of the Rochester city limits is located at 2122 Campus Drive SE.

### D. Engineer (and/or Engineer of Record)

Engineer (or Engineer of Record) as used herein is defined as Professional Engineer licensed under the laws of the State of Minnesota. That professional engineer who has signed the civil construction plans and the stormwater management plan.

### E. City Engineer

City Engineer as used herein is defined as the Rochester City Engineer or their designee.

### F. Developer

Developer as used herein is defined as a person, company, corporation, or limited partnership that develops property within the City of Rochester that is served by Public Works facilities.

### G. Contractor

Contractor as used herein is defined as a company that performs construction activities for the public infrastructure facilities.

## 1001.4 Reference Documentation

The following reference documentation shall be the latest edition, including amendments and published updates.

- 1 Minnesota Department of Transportation (Mn/DOT)
  - a Standard Specifications for Construction
  - b Standard Detail Plates

- 2 Great Lakes-Upper Mississippi River Board of State and Provincial Health and Environmental Managers
  - a Recommended Standards for Wastewater Facilities
  - b Recommended Standards for Water Works
- 3 Minnesota Department of Health;
  - a Chapter 4714 Plumbing Code
  - b Chapter 4720 Public Water Supplies
  - c Chapter 4725 Wells & Borings
  - d Chapter 4727 Explorers & Exploratory Borings
- 4 City of Rochester
  - a Standard Specifications for Street and Utility Construction
  - b Standard Detail Plates
  - c Checklist for:
    - Subdivision and Non-Residential Lot Grading Plans
    - Single Residential Lot Grading Plans
    - Permanent Stormwater Management Plans
    - City Owner Contract Program Documentation
    - Construction Plan Review
  - d Building and Fire Prevention Code
  - e Ordinances
  - f Rochester Unified Development Code (UDC)
- 5 Rochester Public Utilities Water Service Rules and Regulations
- 6 Planning 2 Succeed Rochester Comprehensive Plan 2040 “Right of Way Guidelines for Local Streets”
- 7 Minnesota Pollution Control Agency (MPCA) Minnesota Stormwater Manual

# 1002 ROADWAY DESIGN

## 1002.1 Right of Way & Street Widths

Table 1002.1-1 Local Collector Streets

SUBCLASS	WHEN TO USE	ROADWAY WIDTH (FT.)*	RIGHT OF WAY WIDTH (FT.**)
INDUSTRIAL	INDUSTRIALLY ZONED AREA WHERE ADT > 1000 VEHICLES PER DAY	38	66
COMMERCIAL	COMMERCIAL ZONED AREA WHERE ADT > 2500 PER DAY	38	80
RESIDENTIAL	STREETS DESIGNATED AS RESIDENTIAL COLLECTOR WITH PARKING ON BOTH SIDES.	36	62
RESIDENTIAL	STREETS DESIGNATED AS RESIDENTIAL COLLECTOR WITH PARKING ON ONE SIDE.	30	60
RESIDENTIAL	STREETS DESIGNATED AS RESIDENTIAL COLLECTOR WITH NO ON-STREET PARKING.	26	60

Table 1002.1-2 Local Streets Non-Residential

SUBCLASS	WHEN TO USE	ROADWAY WIDTH (FT.)*	RIGHT OF WAY WIDTH (FT.**)
INDUSTRIAL	MINOR STREET IN INDUSTRIALLY ZONED AREA WITH C&G DRAINAGE.	34	66
COMMERCIAL	MINOR STREET IN COMMERCIAL ZONED AREA WITH C&G DRAINAGE AND PARALLEL PARKING ON BOTH SIDES.	36	66
COMMERCIAL	MINOR STREET IN COMMERCIAL ZONED AREA WITH C&G DRAINAGE AND ANGLE PARKING ON BOTH SIDES.	60	85

Table 1002.1-3 Local Streets Residential

<b>URBAN CONDITION</b>	<b>ROADWAY WIDTH (FT.)*</b>	<b>RIGHT OF WAY WIDTH (FT.**)</b>
<b>LOCAL RESIDENTIAL 2-WAY STREET WITH C&amp;G AND PARKING ON BOTH SIDES</b>	<b>32</b>	<b>60</b>
<b>LOCAL RESIDENTIAL 2-WAY STREET WITH C&amp;G AND PARKING ON ONE SIDE</b>	<b>28</b>	<b>60</b>
<b>LOCAL RESIDENTIAL 2-WAY STREET WITH C&amp; AND NO ON-STREET PARKING</b>	<b>24</b>	<b>52</b>
<b>LOCAL RESIDENTIAL LIMITED LOCAL: 2-WAY TRAFFIC WITH C&amp;G; NO PARKING AND ADT &lt; 300</b>	<b>22</b>	<b>50</b>
<b>LOCAL RESIDENTIAL 1-WAY STREET WITH C&amp;G AND PARKING ON ONE SIDE</b>	<b>20</b>	<b>44</b>
<b>LOCAL RESIDENTIAL 1-WAY STREET WITH C&amp;G; NO ON-STREET PARKING &lt; 500 FT</b>	<b>16</b>	<b>40</b>
<b>RESIDENTIAL 2 LANE PARKWAY WITH LANDSCAPED MEDIAN &amp; PARKING</b>	<b>13 EACH SIDE</b>	<b>64</b>
<b>ALLEY WITH C&amp;G AND NO PARKING</b>	<b>18.66</b>	<b>20</b>

\*Roadway width is the amount of space available for driving and parking, measured 8" from inside back of curb.

\*\*City Engineer may approve right of way width reduction if detail plate minimums are met and may require additional right of way where bicycle facilities or wider pedestrian facilities are present.

The City of Rochester Standard Detail Plate shows typical cross-section information. Private streets must conform to the same City of Rochester design standards as public streets.

On cul-de-sacs (without parking) the minimum radius to back of curb shall be 48.67 feet.

## **1002.2 Traffic Impact Studies**

The intent of this section is to provide the information necessary to allow decision makers to assess the transportation impacts of site-generated traffic associated with a proposed development. The goal is to address the transportation related issues associated with development proposals that may be of concern to neighboring residents, business owners, and property owners, and to provide a basis for negotiation regarding improvements and funding participation in conjunction with an application for development. The isolated and cumulative impact of proposed development needs to be understood in relation to the existing and proposed capacity of the street system, to ensure that traffic congestion will be maintained at reasonable levels so as not to hinder the passage of public safety vehicles, degrade the quality

of life, or contribute to hazardous traffic conditions. This section establishes requirements for the analysis and evaluation of transportation impacts associated with proposed developments.

## A. Purpose

The purpose of the Traffic Impact Study is to identify the impacts on capacity, level of service, and safety which are likely to be created by a proposed development. Traffic studies should identify what improvements, if any, are needed to:

- 1 Ensure safe ingress to and egress from a site;
- 2 Maintain adequate street capacity on public streets serving the development;
- 3 Ensure safe and reasonable traffic operating conditions on streets and at intersections in the vicinity of a proposed development;
- 4 Avoid creation of or mitigate existing hazardous traffic conditions;
- 5 Minimize the impact of non-residential traffic on residential neighborhoods in the community; and
- 6 Protect the substantial public investment in the existing street system.

## B. Types of Studies

Traffic Impact Studies may be required at several stages in the development process. No application for development will be accepted without an appropriate traffic study prepared by a qualified professional engineer unless a waiver has been obtained from the City Engineer. The types of traffic studies required under the ordinance are:

- 1 A Rezoning Traffic Analysis will be required for certain Rezoning and Land Use Plan amendment requests. The purpose of these studies will be to evaluate whether adequate transportation capacity exists or will be available within a reasonable time period to safely and conveniently accommodate proposed uses permitted under the requested land use or zoning classification. For purposes of this subsection, the Analysis shall address those standards listed at Section 1002.2(C) (1), (3) and (4), assuming the area is fully developed.
- 2 A Traffic Impact Report will be required for certain permitted and Conditional Uses, Land Subdivisions and General Development Plans exceeding specific trip generation thresholds. The purpose of a Traffic Impact Report will be to supplement the rezoning traffic analysis as necessary to:
  - a Evaluate traffic operations and impacts at site access points under projected traffic loads;
  - b Evaluate the impact of site-generated traffic on affected intersections in the vicinity of the development site;
  - c Evaluate the impact of site-generated traffic on the quality of traffic flow on public streets located in the vicinity of the site;
  - d Evaluate the impact of the proposed development on residential streets in the vicinity of the site;
  - e ensure that site access and other improvements needed to mitigate the traffic impact of the development meet commonly accepted engineering design standards and access management criteria;

- f Ensure that adequate facilities for pedestrians, transit users and bicyclists have been provided;
  - g Identify transportation infrastructure needs and related costs created by the development
- 3 All Land Subdivisions and General Development Plans which do not require a Traffic Impact Report will be required to complete a Traffic Design Analysis. The purpose of a Traffic Design Analysis will be to:
- a Ensure that the proposed street layout is consistent with the Engineering Design Standards and Typical Sections, roadway spacing guidelines listed in the Rochester-Olmsted Council of Governments Long Range Transportation Plan, and traffic volume and right of way guidelines listed in the City's Comprehensive Plan;
  - b Ensure the proper design and spacing of site access points and identify where limitations on access should be established;
  - c Ensure that potential safety problems have been properly evaluated and addressed;
  - d Ensure that internal circulation patterns will not interfere with traffic flow on existing public streets;
  - e Ensure that appropriate facilities for pedestrians, transit users and bicyclists have been provided in plans for the development; and
  - f Identify the transportation infrastructure needs and related costs created by the development.

### C. Traffic Service Standards

The standards for traffic service that shall be used to evaluate the findings of traffic impact studies are:

- 1 Capacity: A volume to capacity (V/C) ratio of 0.80 shall not be consistently exceeded on any strategic arterials as designated on the Comprehensive Plan and a V/C ratio of 0.90 shall not be consistently exceeded on any other arterial or any collector street as designated on the Comprehensive Plan. Consistently means that the V/C ratios are exceeded based on average daily peak hour traffic counts, projections or estimates.
- 2 Level of Service: For corridors including mainline, merging areas and ramp junctions, a Level of Service C shall be maintained on any strategic arterial and a Level of Service D on any other designated non-local street on the Comprehensive Plan. At all intersections, a Level of Service C shall be maintained on any arterial or higher order street and a Level of Service D on any other non-residential street. Individual movements within any intersection shall be maintained at or above a Level of Service E. Where the existing Level of Service is below these standards, a traffic impact study shall identify those improvements needed to maintain the existing level of service, and what additional improvements would be needed to raise the level of service to the standards indicated.
- 3 Number of Access Points: The number of access points provided shall be the minimum needed to provide adequate access capacity for the site. Evidence of Level of Service F

operations for individual public street movements at access locations is a primary indication of the need for additional access points. However, the spacing and geometric design of all access points shall be consistent with the access management criteria of the Unified Development Code Section 60.400.040.

- 4 Residential Street Impact: Average Daily Traffic (ADT) on residential streets shall be within the ranges spelled out in the Comprehensive Plan for the class of street involved. No non-residential development shall increase the traffic on a residential street with at least 300 average daily trips by more than 25%, and shall contribute no more than 20% of the traffic on any street segment providing residential access.
- 5 Traffic Flow and Progression: The location of new traffic signals or proposed changes to cycle lengths or timing patterns of existing signals to meet Level of Service standards shall not interfere with the goal of achieving adequate traffic progression on major public streets in the vicinity of the development.
- 6 Vehicle Storage: The capacity of storage bays and auxiliary lanes for turning traffic shall be adequate to store 95<sup>th</sup> percentile queues and ensure turning traffic will not interfere with through traffic flows on any public street.
- 7 Internal Circulation: On-site vehicle circulation and parking patterns shall be designed so as not to interfere with the flow of traffic on any public street and shall accommodate all anticipated types of site traffic.
- 8 Safety: Access points shall be designed to provide for adequate sight distance and appropriate facilities to accommodate acceleration and deceleration of site traffic. Where traffic from the proposed development will impact any location with an incidence of high crash frequency, defined as one of the 5 to 10 highest crash locations in the area, the crash history should be evaluated and a determination made that the proposed site access or additional site traffic will not further aggravate the situation. It is understood that the correction of an existing off-site safety deficiency is not typically the responsibility of the developer.

## D. Contents

A Traffic Rezoning Analysis or Traffic Impact Report shall contain information addressing the factors listed below. For a Traffic Design Analysis, the City Engineer, the Rochester-Olmsted Council of Governments (ROCOG) Transportation planner and the traffic engineer(s) of the applicable road authority shall be consulted to establish the scope of the study. In general, the Traffic Design Analysis should address the standards of Section 1002.2(B) (3).

- 1 Site Description: The report shall contain illustrations and narrative that describe the characteristics of the site and adjacent land uses as well as expected development in the vicinity which will influence future traffic conditions. For a Rezoning Traffic Analysis, a description of potential uses and traffic generation to be evaluated shall be provided. For a Traffic Impact Report, a description of the proposed development including access plans, staging plans and an indication of land use and intensity, shall be provided.
- 2 Study Area: The report shall identify the geographic area under study and identify the roadway segments, critical intersections and access points to be analyzed. The focus shall be on intersections and access points adjacent to the site. Roadways or

intersections within ½ mile of the site, where at least 5 percent of the existing peak hour capacity will be composed of trips generated by the proposed development shall be included in the analysis.

- 3 Existing Traffic Conditions: The report shall contain a summary of the data utilized in the study and an analysis of existing traffic conditions, including:
  - a traffic count and turning movement information, including the source of and date when traffic count information was collected;
  - b correction factors that were used to convert collected traffic data into representative design hour traffic volumes;
  - c roadway characteristics, including the design configuration of existing or proposed roadways, existing traffic control measures (speed limits, traffic signals, etc.) and existing driveways and turning movement conflicts in the vicinity of the site; and
  - d identification of the existing Level of Service for roadways and intersections without project development traffic using methods documented in the Highway Capacity Manual, published by the Transportation Research Board, or comparable accepted methods of evaluation. Level of Service should be calculated for the weekday peak hour and, in the case of uses generating high levels of weekend traffic, the Saturday peak hour.
- 4 Horizon Year(s) and Background Traffic Growth: The report shall identify the horizon year(s) that were analyzed in the study, the background traffic growth factors for each horizon year, and the method and assumptions used to develop the background traffic growth. Unless otherwise approved by the City Engineer, the impact of development shall be analyzed for the year after the development is completed and 10 years after the development is completed, with background traffic growth determined as directed by ROCOG.
- 5 Time Periods to be Analyzed: For each defined horizon year, specific time periods are to be analyzed. For most land uses, this time period will be the weekday peak hours. However, certain uses, such as major retail centers, schools or recreational uses, will have characteristic peak hours different than that found for adjacent streets, and these unique peak hours may need to be analyzed to determine factors such as proper site access and turn lane storage requirements. The City Engineer shall be consulted for determination of what peak hours are to be studied.
- 6 Trip Generation, Reduction and Distribution: The report shall summarize the projected peak hour and average daily generation for the proposed development and illustrate the projected distribution of trips to and from the site and should identify the basis of the trip generation, reduction and distribution factors used in the study.
- 7 Traffic Assignment: The report shall identify projected design hour traffic volumes for roadway segments, intersections or driveways in the study area, with and without the proposed development, for the horizon year(s) of the study.
- 8 Impact Analysis: The report shall address the impact of projected horizon year(s) traffic volumes relative to each of the applicable traffic service standards listed in 1002.2(C) and shall identify the methodology utilized to evaluate the impact. The weekday peak

hour impact shall be evaluated as well as the Saturday peak hour for those uses exhibiting high levels of weekend traffic generation.

- 9 Mitigation/Alternatives: In situations where the traffic level of service standards are exceeded, the report shall evaluate each of the following alternatives for achieving the traffic service standards listed in Section 1002.2(C):
- 10 Identify where additional right of way is needed to implement mitigation strategies;
- 11 Identify suggested phasing of improvements where needed to maintain compliance with traffic service standards; and
- 12 Identify the anticipated cost of recommended improvements

## E. Process for the Review and Preparation of a Traffic Impact Study

This section provides an outline of the steps to be included in the preparation and review of a Traffic Impact Study:

- 1 The City Engineer and Zoning Administrator shall be consulted for assistance in determining whether a traffic impact study needs to be prepared for a proposed development application;
- 2 The City Engineer and Zoning Administrator shall meet with applicants to identify study issues, assumptions, horizon years and time periods to be analyzed, analysis procedures, available sources of data, past and related studies, report requirements and other topics relevant to study requirements;
- 3 Following initial completion of a traffic impact study report, it shall be submitted to the Zoning Administrator for distribution to the staff of all roadway jurisdictions involved in the construction and maintenance of public roadways serving the development;
- 4 Within ten working days, staff shall complete an initial review to determine the completeness of the study and shall provide a written summary to the applicant outlining the need for any supplemental study or analysis to adequately address the purposes listed in Section 1002.2(B) and the Traffic Service Standards of Section 1002.2(C). A meeting to discuss the contents and findings of the study and the need for additional study may be requested by the applicant;
- 5 Following a determination that the technical analysis is complete, staff will prepare a report outlining recommendations that have been developed to address the findings and conclusions included in the study regarding the proposed development's access needs and impacts on the transportation system. Depending on the type of traffic study, presentation of recommendations to the Planning Commission and/or City Council may proceed as follows:
  - a For a Traffic Rezoning Analysis, staff recommendations will be presented as part of staff report to the Planning Commission and City Council as part of the proceedings on a rezoning or land use plan application;
  - b For a Traffic Impact Report, a separate report will be forwarded to the City Council for consideration of the recommendations;
  - c For a Traffic Design Analysis, staff recommendations will be presented as part of the staff report to the Planning Commission or City Council for any Land Subdivision or General Development Plan.

- 6 Negotiations based on the conclusions and findings resulting from the traffic study shall be held with the City Council. A Development Agreement, detailing the applicant's responsibilities and the City's responsibilities for implementing identified mitigation measures, shall be prepared following the negotiations for action by both parties.

## F. Report Findings

If staff finds that the proposed development will not meet applicable service level standards, staff shall recommend one or more of the following actions by the public or the applicant:

- 1 Reduce the size, scale, scope or density of the development to reduce traffic generation;
- 2 Divide the project into phases and authorize only one phase at a time until traffic capacity is adequate for the next phase of development;
- 3 Dedicate right-of-way for street improvements;
- 4 Construct new streets;
- 5 Expand the capacity of existing streets;
- 6 Redesign ingress and egress to the project to reduce traffic conflicts;
- 7 Alter the use and type of development to reduce peak hour traffic;
- 8 Reduce background (existing) traffic;
- 9 Eliminate the potential for additional traffic generation from undeveloped properties in the vicinity of the proposed development;
- 10 Integrate design components (e.g., pedestrian and bicycle paths or transit improvements) to reduce vehicular trip generation;
- 11 Implement traffic demand management strategies (e.g. car or van pool programs, flex time, staggered work hours, tele-commuting, etc.) to reduce vehicular trip generation;
- 12 Recommend denial of the application for development for which the traffic study is submitted.

## 1002.3 Speed Limits

Speed limits shall be equal to the following design speeds for all new and reconstructed streets, unless otherwise approved by the City Engineer.

- Local Streets: 20 mph
- Local Collectors within the Urban Core\*: 20 mph
- Local Collectors outside the Urban Core\*: 25 mph

\*The Urban Core is defined in the current Rochester-Olmsted Council of Governments Metropolitan Transportation Plan

- Primary Collectors and Secondary Arterials: 25 mph
- Primary/Major Arterials and Strategic Arterials: 30 mph
- All streets within the downtown business district\*\*: 20 mph

\*\*The downtown business district is defined in the City of Rochester Code of Ordinance [Section 11-3-2](#).

- Alleys: 10 mph.

## 1002.4 Complete Streets

The City of Rochester Department of Public Works “Complete Streets Policy”, adopted by City Council, are incorporated herein by reference.

## 1002.5 Design Standards by Speed Limit

Tables 1002.5-1 through 1002.5-6 identify street typical design standards to be utilized as a guide for establishing the layout of a street. Modifications to these standards may be approved by the City Engineer. The City Engineer may require stricter design standards be applied where it can be shown such higher standards are necessary to protect the public safety. See Table 1002.5-7 for design standards of narrow streets (28-32’ roadways). Preliminary utility spacing design plans for roadway designs 28’ or less shall be submitted to and approved by the City Engineer.

*TABLE 1002.5-1 Maximum Grade*

<b>DESIGN SPEED (mph)</b>	<b>GRADE</b>
10	10%
20	10%
25	8%
30	6%

*TABLE 1002.5-2 Maximum Grade Within 25’ of Intersection Measured from the Curb Return*

<b>DESIGN SPEED (mph)</b>	<b>GRADE</b>
10	2%
20	2%
25	2%
30	2%

*TABLE 1002.5-3 Minimum Horizontal Centerline Curve Radius\**

<b>DESIGN SPEED (mph)</b>	<b>RADIUS (FT.)</b>
10	100
20	100
25	200
30	350

TABLE 1002.5-4 Minimum Tangent Between Curves\*

<b>DESIGN SPEED (mph)</b>	<b>LENGTH (FT.)</b>
10	50
20	100
25	100
30	100

TABLE 1002.5-5 Minimum Stopping Sight Distance

<b>DESIGN SPEED (mph)</b>	<b>LENGTH (FT.)</b>
10	50
20	115
25	155
30	200

TABLE 1002.5-6 Minimum Intersection Radius at Back of Curb\*\*

<b>DESIGN SPEED (mph)</b>	<b>RADIUS (FT.)</b>
10	5
20	15
25	15
30	20

\*Refer to table 1002.5-7 for narrow street requirements.

\*\*The effective turning radius along truck routes may require additional turning movement analysis. One-way streets be reduced to 5' where turning movements do not occur.

TABLE 1002.5-7 Narrow Street Design Standards Modifications

<b>ROADWAY WIDTH (FT.)</b>	<b>MINIMUM HORIZONTAL CENTERLINE CURVE RADIUS (FT.)</b>	<b>MINIMUM TANGENT BETWEEN CURVES (FT.)</b>
28	400	200
32	250	200

## 1002.6 Intersections

Streets shall intersect at an angle of 90 degrees for a minimum of 50 feet measured from the point of tangency of the curb return. In no case shall the angle be less than 70 degrees unless the Engineer submits a special intersection design for approval by the City Engineer.

Intersections having more than four (4) corners are prohibited.

Proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other. The offset between intersections shall be a minimum of 200 feet measured from centerline to centerline on through street and as determined by the City Engineer on major streets.

## 1002.7 Acceleration, Deceleration and Turning Lanes

Acceleration, deceleration, and turning lanes may be required along existing or proposed streets when indicated as needed by a Traffic Impact Report or by the City Engineer. The design of such facilities shall be based on the recommendation of the City Engineer

## 1002.8 Islands

When approved by the City Engineer, islands are permitted within the roadway of a public right-of-way subject to the following considerations: Islands shall be a minimum of 75 square feet in size;

- 1 Islands shall be designed so as to create a natural vehicle path within the travel lane.
- 2 Structures, permanent materials or plantings within the island shall not obscure the visibility of cars entering a cross street for a distance of 20 feet back from the curb face of the cross street, unless a larger setback is needed due to inadequate site distance created by horizontal or vertical curve alignment.
- 3 In designing islands consideration should be given to providing adequate illumination and reflectorization, provision of pedestrian and bicycle needs, provision of adequate access for adjacent properties, and the potential of future signalization of turning lane improvements.
- 4 Public and private maintenance obligations are clearly defined and consistent with City policy.

## 1002.9 Typical Cross-Section

Cross-slope – desired 2% on driving lanes (maximum with variance request 3%), 2% to 5% on parking lanes, and 3% to 5% on boulevards with batterface curb and 5% to 7% with driveover curb.

A two (2) foot clear zone area shall be provided from the face of curb to the face of any obstruction.

Sidewalk shall be located (one) 1 foot from property line.

Bituminous roadways that are less than or equal to 32 feet from lip of curb to lip of curb should be paved in a maximum of two passes, resulting in one seam at the roadway centerline. Any additional passes, offset crowns, or other grade breaks shall be approved by the City Engineer.

Residential streets shall be designed for parking on one side, or traffic calming features required (spacing shall not exceed 500 feet between features).

## **1002.10 Curbing**

All urban streets and alleys shall be constructed with concrete curb and gutter on both sides. Concrete alleys may be designed with an inverted crown in lieu of the curb and gutter.

Curb and gutter shall be design B624 in all commercial/industrial streets, all multi-family residential (more than two (2) families per dwelling unit), all streets centerline grade of 8% or steeper, all intersection radii, at drainage structures, and on residential streets that are platted as 'Controlled Access' (or similar restriction).

Minimum longitudinal slope on curbing is 0.4%. Minimum longitudinal slope on curbing for streets leading to a cul-de-sac is 0.5%. The minimum longitudinal slope on curbing for the radial portion of a cul-de-sac is 1%.

Four (4) inch driveover concrete curb and gutter will be permitted at one and two family residential areas where driveway locations have not been established and street grades are less than 8%.

Pedestrian ramps, conforming to current ADA and Mn/DOT requirements, shall be placed at all intersection corners.

Where sidewalk or concrete median abuts curb, the curb shall be modified to include a sill on the back on which the walk will rest.

Expansion joints shall be placed at the ends of all curved sections, at the ends of the curved portions of street returns, at drainage structures and where abutting other concrete. The spacing of expansion joints shall not exceed 300 feet.

Where new concrete curb and gutter abuts existing concrete curb and gutter provide a tied joint. Drill and grout 2 - No. 4 x 18" long epoxy coated rebar a minimum of 3 inches from the edge of concrete. New saw cuts should be a minimum of 3' from an existing joint. If the 3' minimum cannot be maintained, place the saw cut over the existing joint.

## **1002.11 Vertical and Longitudinal Controls**

Two (2) percent maximum longitudinal grade through intersections to within 25' of assumed stop condition or the right of way line extended whichever is greater. Intersection cross-slope crown rollover shall be three (3) percent maximum.

## 1002.12 Geotechnical Report

City Owner contracts, shall include a Geotechnical Report prepared and signed by a geotechnical professional. On City led projects, a condensed version may be accepted at the discretion of the City Engineer.

The report must contain the following:

- 1 The purpose and goals of the report.
- 2 The methodology used of field investigation/observation and laboratory analysis.
- 3 Description of soils and geological setting.
- 4 Maps showing field observation locations and finding.
- 5 Soil boring log and test pit profiles.
- 6 Ground water level presence and indication of past ground water.
- 7 Laboratory test results and conclusions.
- 8 Special/unique observations.
- 9 Descriptions of rock locations and characteristics.
- 10 Descriptions of unsuitable soil locations and characteristics.
- 11 Descriptions of manmade features/pavements, locations and characteristics.
- 12 Data shall be provided using the city soil boring collection template.

Geotechnical Report must contain the following conclusions and recommendations as appropriate for the project:

- 1 Material management
  - a Topsoil thickness and appropriate ultimate placement.
  - b Soils that are not suitable for placement in street and disposition of those materials.
  - c Shot rock maximum size to be suitable for placement in street and disposition of oversized rocks.
  - d Existing pavement rubble and rubble from manmade structures.
- 2 Soil placement recommendations related to structures.
- 3 Utility installation geotechnical recommendations.
- 4 Fill and backfill recommendations.
- 5 Soil placement/compaction/maximum moisture recommendations.
- 6 Slope stability recommendations.
- 7 Recommendations related to retaining walls and other special structures.
- 8 Trench sloping recommendations.
- 9 Drainage and subsurface edge drain recommendations. Detailed justification must be included for any project requesting waiver of subsurface edge drain requirement along both curbs.
- 10 Likelihood of Karst or similar conditions and recommended actions should conditions be found.
- 11 Materials testing, proof roll, etc. recommendation greater than those required for normal projects.
- 12 Pavement Design soil factor (R-value) and explanation for recommendation.

### 13 Other recommendations.

The report may include the following:

- 1 Pavement Design Report, as a separate section.
- 2 Conclusions and recommendations related to the installation of public utilities and other infrastructure.
- 3 Information related to the mass grading of the site, for the preparation of building pads and footings and foundations, and for the placement and compaction of private streets and parking lots.

## 1002.13 Pavement Design

All rigid and flexible pavements shall be designed in accordance with the procedures set forth in the Pavement Manual of the Minnesota Department of Transportation.

City Owner contracts, that include street pavements, shall include a Pavement Design Report prepared and signed by a licensed professional engineer. The report shall utilize the conclusions and recommendations of the Geotechnical Report.

The report must contain the following:

- 1 The purpose and goals of the report.
- 2 The Mn/DOT methodology used for the analysis.
- 3 Soils factor or R-value used. Recommended measures shall be provided for special conditions such as excess moisture or highly expansive soils.
- 4 Equivalent Single Axle Load Traffic Forecasting with volume and vehicle type distribution (6% trucks minimum) used for the recommendations. Indicate the source of the projections.
- 5 Consideration of pavement materials concrete and bit options.
- 6 50-year pavement life, including maintenance preservation schedule for overlay, seal coat, or rehabilitation.
- 7 Summary of calculations containing layer thickness of pavement, aggregate base and granular subbase or geotextile fabric.

Unless otherwise directed by the City Engineer the minimum structural sections are as follows:

- Flexible pavements include four (4) inches bituminous surfacing, eight (8) inches Aggregate Base, 12 inches Select Granular and Geotextile Fabric.
- Rigid pavements include seven (7) inches concrete surfacing, five (5) inches Aggregate Base, 12 inches Select Granular and Geotextile Fabric.
- Select Granular shall comply with Mn/DOT section 3149.2B Table 3149.2-1, line 4, Select Granular Material Modified 10 percent.
- Geotextile Fabric should be chosen based on subgrade properties. The following table provides guidance based on soil descriptions:

Soil Description	R-Value	CBR (USACE, 1992)	DPI (DCP) mm	Recommended Geotextile	Minimum Overlap
Good to marginal dry soils	Greater than 25	Greater than 6	Less than 20	MnDOT Type 7	12"
Weak dry/damp soils	15-25	3-6	20-60	MnDOT Types 5 or 9	24"
Very Weak and/or wet soils	Less than 15	Less than 3	Greater than 60	MnDOT Types 10 - 13	36"

Stabilizing Aggregate for subgrade correction shall include either, 1-1/2 inch crushed limestone (dust free) or Breaker Run.

“Breaker Run” shall be defined as a 100% crushed carbonate quarry rock meeting the gradation requirements of the following table:

Sieve Size	% Passing
4"	100
1"	35-75
#4	10-40
#200	0-5

“Pit Run” shall be an unmanufactured gravel which is dug out of the bank. It has rocks up to 12 inches, but typically six (6) inches and less.

## 1002.14 Future Side Streets

Where access to future subdivision of adjacent land are shown on the plans, right of ways and all roadway improvements including pavement, curb and gutter, and utilities on the side street, shall be constructed and extended to the end of the side lot or the boundary of the development whichever is greater. Projected profiles and alignments of the future street shall be shown on the plans.

## 1002.15 Temporary Street Ends

All temporary street ends shall be closed with two OM4-3 end of roadway object markers and are to be fully reflectorized and properly maintained until the street is extended. Temporary street ends or cul-de-sacs shall include the following items, unless waived by the City Engineer:

- 1 Minimum temporary surface section shall include six (6) inches of Aggregate Base and three (3) inches bituminous.
- 2 Paved surface shall be as shown on the City of Rochester Detail Plate 3-05 or the equivalent minimum radius according to the requirements for a cul-de-sac.
- 3 Erosion and sediment control measures shall be taken to prevent soil erosion. They shall be properly maintained, according to the schedule submitted to and approved by the City, until the permanent street is constructed or another permit holder assumes responsibility.
- 4 Taper down concrete curb to zero height at all temporary street ends. Tapered curb section shall be concrete.

## **1002.16 Temporary Secondary Access**

Where Temporary Secondary Access to subdivisions are shown on the plans, right of ways and all roadway improvements shall include:

- 1 Minimum driving surface width of 20 feet.
- 2 Minimum design Alignment and Profile of 20 mph.
- 3 Minimum surface section eight (8) inches of Aggregate Base.
- 4 The surface shall be paved within 200 feet of any public roadway.
- 5 Erosion and sediment control measures shall be taken to prevent soil erosion. They shall be properly maintained, according to the schedule submitted to and approved by the City, until the permanent street is constructed or another permit holder assumes responsibility.
- 6 Routine roadway maintenance shall be performed to ensure it remains passable throughout the year, until the permanent street is constructed.

## **1002.17 Location of Utilities**

The table below outlines the general criteria for placement of utilities within the right of way:

<b>Material</b>	<b>Horizontal Alignment</b>	<b>Vertical Depth</b>
<b>Sanitary Sewer*</b>	<b>Center of Street or, maximum 2 feet from center on curvilinear streets</b>	<b>6 feet over top</b>
<b>Watermain*</b>	<b>10 feet Clear and Parallel, north and east, to Sanitary sewers and 10 feet Clear and Parallel, south and west, to Storm sewers</b>	<b>7 feet over top</b>
<b>Storm Sewer*</b>	<b>5 feet – 10 feet Clear and Parallel, south and west, to Sanitary Sewer.</b>	<b>2 feet over top</b>
<b>Subsurface Edge Drain</b>	<b>Both sides of street behind curbs</b>	<b>3.5 feet over top</b>
<b>Electric Telephone Cable TV, Gas</b>	<b>Easement adjacent to R/W</b>	<b>3 feet</b>

\* Sanitary sewer, watermains, and storm sewer are generally to be kept within the paved street area. In no case shall the sewer or watermain be placed within 3 feet of the lip of gutter. Public sewer and watermains outside the public right of way are to be located in dedicated public easements. When narrow roadway width cannot accommodate alignment spacing, the storm sewer may be placed closer to the curb or utilities may need to be run in dedicated utility easements. Landscaping features should be kept outside utility easement areas in order to facilitate future utility maintenance activity. Features including, but not limited to; trees, large shrubs, light poles, bollard lighting, flag poles, and anything with a footing/foundation.

Rochester Public Utilities (RPU) shall have the final decision as to whether any service pipe(s) shall be connected at any proposed location.

A plumbing permit is required for any utility manhole structure located within 10 feet of a building.

## **1002.18 Utility Conduit Crossings**

Utility ducts shall be constructed according to the City of Rochester Detail Plates and placed across streets at locations provided by the Rochester Public Utility Electric, Telephone, Gas, and Cable TV companies. The Engineer shall include the ducts on the plans and special provisions. The utility shall make arrangements with the developer to cover the costs of the ductwork.

## **1002.19 Utility Easements**

Where public sanitary sewer, watermain, storm sewer, or subsurface edge drain is outside of platted R/W, the horizontal distance from the pipe to the edge of the easement shall be at least

10 feet or at least equal to the depth of the pipe, whichever is greater. The minimum easement width shall be 20 feet.

Public watermain(s) and hydrant(s) require its own minimum 20' watermain utility easement (WMUE). Public sanitary sewer(s) require its own minimum 30' sanitary easement. Deeper infrastructure may require a wider easement as determined by City Engineer.

The slope of the utility easement to not exceed 7% unless approved by the City Engineer.

## **1002.20 Pedestrian and Bicycle Facilities**

### **A. Sidewalks**

Sidewalks shall conform to the FHWA “Accessible Sidewalks and Street Crossings” information guide, City of Rochester Detail Plate, and Mn/DOT Curb Ramp Details Standard Plan and the following:

All streets shall be finish graded to provide for future boulevard and sidewalk on both sides. Pedestrian curb ramps shall be constructed at all quadrants of intersections. All driveways are constructed with a sidewalk section. Where sidewalks do not allow for sufficient boulevard width to maintain vegetation, boulevards shall be paved with materials approved by the City Engineer.

Sidewalks are to be five (5) feet wide with one (1) foot recovery area on both sides, and sloped to drain toward the drainage way or gutter.

### **B. Bicycle Facilities**

Bicycle facilities shall conform to the AASHTO “Guide for the Development of Bicycle Facilities”.

Bicycle facility types shall conform to Minnesota Department of Transportation “MnDOT Bicycle Facility Design Manual” and State Aid Standards.

Multi-Use Path Curb Ramps shall conform to the City of Rochester Detail Plate.

Shared-use paths or sidepaths are to be 10 feet wide with a two (2) foot recovery area on both sides and sloped to drain toward the drainage way or gutter.

## **1002.21 Bituminous Paving**

Reference MnDOT Standard Specifications – Table 2360.3-5 (Surface Requirements) for all bituminous paving requirements and tolerances. Final lift wear course out of tolerance, per Table 2360.3-5, will require a mill and overlay to centerline of roadway. Minimum length of patch is 25' and minimum depth is depth of final wear course. If greater than or equal to 25% of the final lift wear is out of tolerance, per Table 2360.3-5, contractor must complete a full-width mill and overlay of the final wear course. Final corrective action for bituminous paving out of tolerance shall be at the discretion of the City Engineer.

The following tables provide guidance in selecting a bituminous mix for each lift. However, pavement design will remain the responsibility of the Geotechnical Engineer:

*TABLE 1002.21-1 Trails*

<b>Lift</b>	<b>Lift Thickness</b>	<b>Mix Design</b>
<b>1st</b>	<b>3"</b>	<b>SPWEA230B</b>

*TABLE 1002.21-2 Local Streets\* (<2,300 AADT)*

<b>Lift</b>	<b>Lift Thickness</b>	<b>Mix Design</b>
<b>1st</b>	<b>1 1/2"</b>	<b>SPWEA230C</b>
<b>2nd</b>	<b>2 1/2"-3"</b>	<b>SPWEB230C</b>

\*Use 3.0% Air Voids for Low-Volume Wear Courses. Wear is defined as the top 3 inches.

*TABLE 1002.21-3 Minor Collectors (2300<AADT<6000)*

<b>Lift</b>	<b>Lift Thickness</b>	<b>Mix Design</b>
<b>1st</b>	<b>1 1/2" - 2"</b>	<b>SPWEA340C</b>
<b>2nd</b>	<b>2" - 2 1/2"</b>	<b>SPWEB340C</b>
<b>3rd</b>	<b>2" - 3"</b>	<b>SPNWB330B</b>

# 1003 Sanitary Sewer Design

## 1003.1 Sizing Sanitary Sewers

Sizing of sanitary sewers shall be eight (8) inches minimum.

All sewers shall be designed to have sufficient slope to provide mean velocities of not less than two (2) fps based on Manning's formula using an N factor of 0.013. Sizing to be reviewed by the City Engineer prior to final plans preparation. Private sanitary sewers must be reviewed by the City of Rochester, Building Safety Department.

The City shall reimburse the Owner/Developer for the incremental cost of the materials to increase the size of the sanitary sewer above an eight (8) inch diameter pipe if requested by the City Engineer. The City shall also reimburse the required incremental cost of the increase in the width of the manhole size if it is solely required for the oversize sanitary trunk sewer pipe. The Public Works Department shall establish the reimbursement amount for each item concurrent with the adjustments in the City's standard rates, which occur August 1<sup>st</sup> of each year. Invoices for such reimbursements, together with supporting information, are to be submitted to Rochester Public Works for processing, verification and payment. Sanitary sewer mains are to be extended to the end limits of new subdivisions where practical to facilitate future sanitary sewer system extensions.

The Engineer shall verify elevations downstream and upstream prior to any connection and notify the City of any inconsistencies in the system.

## 1003.2 Pipe Material

Watermain quality pipe shall be used in all common trench installations.

Sanitary sewers passing over or less than 18 inches separation under watermains shall be constructed of materials equal to watermain standards of construction for a distance of nine (9) feet on either side of the watermain.

Sanitary sewers crossing watermains or storm sewers shall be constructed with adequate structural support to prevent excessive deflection of joints, or settling on the watermains or storm sewer.

## 1003.3 Manhole Structures

Manholes and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, manholes shall be constructed on a precast or cast-in-place concrete base and the barrel riser sections, and cone section shall all be of precast concrete. All units shall be properly fitted and sealed to form a completely watertight structure.

All sanitary structures shall include the design requirements of the City of Rochester Manhole Waterproofing Detail Plate 1-07.

All structures located as parts of forcemain systems and immediately downstream and other specific areas subject to high concentrations of corrosive materials (i.e. hydrogen sulfide) shall be fully lined with a protective coating, by a Licensed or Certified Contractor performing the special work.

## **1003.4 Spacing and Alignment**

Sanitary sewers shall be placed on tangent alignment with manholes at changes in pipe size, horizontal alignment and/or vertical alignment. Spacing of manholes shall not exceed 400 feet for pipelines 8-15 inches in diameter, 500 feet for pipelines 18-30 inches in diameter, and 800 feet for pipelines 36-84 inches in diameter (unless approved by the City Engineer).

Outside drop manholes shall be constructed at locations where the difference in inlet and outlet elevations exceeds one (1) foot.

Changes in flow direction at manholes shall not exceed 90 degrees.

Four (4) inch and six (6) inch service connections to the sewer main shall only be considered at locations in-between two manholes. Eight (8) inch or larger services should be connected at a manhole. Lamp holes shall not be installed at the end of sanitary sewers and shall only be used temporarily for maintenance access on sanitary sewer mains for projects with phases lasting more than one (1) construction season

# 1004 Watermain Design

## 1004.1 Sizing Watermains

Standard watermain size for water distribution system design is eight (8) inch diameter.

Looping of watermains is required in all cul-de-sacs and dead-end streets unless topographic conditions make it impractical. Watermains are to be extended to the end limits of new subdivisions, and other developments, to facilitate future water system extensions and looping, unless Rochester Public Utilities determines otherwise. Six (6) inch diameter watermains may be allowed for short (less than 150 feet long) unavoidable dead-ends or short looped areas if the design will provide minimum required fire flows at minimum allowable pressure.

Twelve (12) inch or larger diameter watermains or redundant feed may be required by the City Engineer based on watermain hydraulic capacity requirements to serve future adjacent portions of the water distribution system. Proposed watermain sizing is to be reviewed with Rochester Public Utilities prior to final plan and specification preparation.

Rochester Public Utilities will reimburse the Owner/Developer the incremental cost for constructing over-sized mains, valves and fittings larger than eight (8) inches in diameter if requested by the City Engineer. Rochester Public Utilities will annually establish the maximum allowable oversize reimbursement amount for oversize items invoiced for such reimbursements, together with supporting information, are to be submitted to Rochester Public Utilities for processing, verification and payment.

## 1004.2 Pipe Material

Watermain shall be ductile-iron pipe complying with (W200) "Watermain Specifications", Standard Specifications for Street and Utility Construction, Rochester, Minnesota.

Polyethylene encasement shall be required on all ductile iron pipe.

## 1004.3 Spacing and Alignment

Watermains designed for connection to the Rochester municipal water system must comply with Minnesota Department of Health (MDH) standards. All such watermain plans and specifications are to be reviewed and approved by the MDH prior to construction. Review and approval of these plans and specifications by Rochester Public Utilities Water Division is also required (before plan submission to the MHD).

The description of the MDH watermain, sanitary sewer and storm sewer separation requirements, which follows, is to be considered an aid to watermain designers to explain current requirements. The description is in no way intended to relieve the designer from meeting the MDH separation requirements.

- 1 Horizontal Alignment: Watermains are generally to be aligned parallel with sanitary sewers with a 10 foot minimum edge-to-edge separation from any storm or sanitary gravity sewer or force main. As noted in Section 1002 of these standards, a three (3)

foot minimum edge-to-edge distance is to be maintained from the front lip of the concrete curb and gutter.

- a Conditions permitting separation exceptions from gravity sewers: (No exceptions allowed from sanitary force mains)
    - Solid rock in trench
    - Narrow street pavement with multiple utilities
  - b Exception Procedure: The Engineer must submit to the MDH supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.
  - c Exception Details:
    - Watermain quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.
    - Watermains are preferred to be located above the sanitary sewer with a minimum vertical edge-to-edge separation of 18 inches. Where this is not possible when passing a manhole structure, one full length of water main pipe shall be located so that both joints will be as far as possible away from the manhole structure. No contact with the manhole is allowed.
- 2 Vertical Alignment: Generally seven (7) foot minimum and 10 foot maximum bury from finished grade. A six (6) foot bury may be allowed in certain unpaved areas such as stream crossings, narrow ditch crossings, etc. Future finished grade lines in unimproved areas must be determined and shown on the construction plans.
- 3 Sewer Crossings: Watermains crossing sewers shall be kept to a minimum. The crossings shall be aligned to be as nearly perpendicular as possible but in no case less than 45 degrees. Watermains are preferred to be located over the sanitary sewer with a minimum vertical edge-to-edge separation of 18 inches. If the vertical edge-to-edge separation is 18-24 inches between watermain and storm sewer pipes, call out to furnish and install 4 inches polystyrene insulation per City of Rochester detail plate 6-19 between the pipes. One (1) full length of watermain pipe shall be located so that both joints of the watermain will be as far as possible away from the storm or sanitary sewer crossing.
- a Allowed Exceptions From Gravity Sewers: (No Exceptions Allowed From Sanitary Force Mains). Only where deemed impossible to maintain vertical separation and or full pipe length restriction.
  - b Exception Procedure: The Engineer must submit to the MDH supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.
  - c Exception Details: Watermain quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.
- 4 Surface Water Crossings: Watermains crossing under surface waters greater than 15 feet in width must be provided with fused HDPE or restrained joints from top of bank to top of bank. The restrained joints are to be called out on the plan sheet and are to be considered an incidental pay item. Valves shall be located at both sides of the crossing within an accessible area above the water table not subject to flooding. No service connections are allowed between the isolation valves. A fire hydrant shall be located

between the isolation valves in an accessible area to allow for pressure testing of the crossing to determine leakage.

- 5 Structure (Tunnel) and Large Pipe Crossings: Water mains crossing under a structure (tunnel or large pipe) greater than 15 feet in width must be installed within a steel casing in accordance with the provisions in Specification T100. The casing shall extend a minimum of 5' beyond the structure and valves shall be located at both sides of the crossing. No service connections are allowed between the isolation valves. The valves shall be located and restrained such that they can effectively isolate the crossing in the event that the water main within the casing needs to be removed or maintained.
- 6 Roadway Classification "Arterial" Crossings: Water mains crossing under a roadway classified as an "arterial" must be installed within a steel casing in accordance with the provisions in Specification T100. The casing shall extend a minimum of 5' beyond the back-of-curb or bottom of ditch slope and valves shall be located at both sides of the crossing. No service connections are allowed between the isolation valves. The valves shall be located and restrained such that they can effectively isolate the crossing in the event that the water main within the casing needs to be removed or maintained.
- 7 Fire Hydrants: The Rochester Fire Prevention Bureau must approve all fire hydrant locations. Fire hydrants must be located at all street intersections, at the sides of all cul-de-sacs, at the end of all temporary or permanent dead-ends that include service connections, at the end of all dead-ends that are longer than 150 feet that do not have service connections and at all dead-ends created between water system pressure zones.
  - In residential areas with usable frontage, fire hydrants shall be spaced a maximum of 400 feet apart. Commercial and multi-family areas usually require closer hydrant spacing depending on lot width, lot depth and the location of the buildings to provide adequate fire protection to all sides of the buildings. In non-developed areas fire hydrants shall be placed at major high points to allow for air release and at intervals to allow for proper flushing and testing of the main.
- 8 System Valves: Valves must be located at all temporary dead-ends past the last service and a minimum distance of 20 feet before the temporary hydrant or if the end hydrant is permanent just past the hydrant tee. Valves shall also be located on all stub outs 3' from the connection point. Valves shall be located at both ends of a looping water main 3' from the connection points.
  - At the split between pressure zones a valve shall be placed at both sides of the flushing hydrant to allow flushing from both directions.
  - Generally valves shall be located at intersections in line with the right of way lines, but outside of crosswalks and 4' minimum clear of conduit crossings, for safer operation and located to allow a maximum 4-valve shutdown to isolate water main sections. Valves located mid-block shall be near a fire hydrant tee for reference and adequate flushing of the main. In residential areas valves shall be located such that no more than 24 customers would be isolated at a time in a shut down. In commercial areas fewer customers should be isolated depending on the size of the facility. Larger commercial/industrial facilities will require the installation of isolation valves on both sides of the service connection for improved reliability. In non-developed areas, valves

shall be located at anticipated intersections and or at 800' intervals to allow for proper flushing, testing, and locating of the main. Sixteen (16)-inch and larger valves shall be butterfly valves. Twelve (12)-inch and smaller valves shall be gate valves.

# 1005 Stormwater Management

## 1005.1 Stormwater Management Plan

A stormwater management plan shall accompany a land development application and each civil plan set in accordance with the Rochester Comprehensive Surface Water Management Plan, adopted stormwater management policies, and as required by Unified Development Code Section 60.400.050G.4. The stormwater management plan shall present all engineering calculations performed, and assumptions used to design the site including but not limited to site grading, best management practices, storm sewer, etc. for the development. The stormwater management plan shall clearly demonstrate compliance with all applicable federal, state, and local rules, regulations, and standards.

The stormwater management plan shall include but not be limited to the following items along with all associated design computations:

- 1 Current/existing and future/proposed flows entering and leaving the site
- 2 Location and inlet capacity of all catch basins
- 3 Size of the storm sewer system and conveyance infrastructure
- 4 Design of temporary and permanent stormwater management facilities
- 5 Capacity of downstream stormwater conveyance systems
- 6 Depiction of all existing and proposed drainage areas referenced in the plan and in hydrologic and hydraulic modeling
- 7 Map showing drainage areas for each catch basin or other collector prepared at 1-inch = 100 feet or larger with finished contours at 2-foot intervals
- 8 Labels and numbering for all storm sewer pipe sizes, ownership (public/private), structures that correspond to design computations and models
- 9 Map showing treatment areas for all stormwater management facilities
- 10 Summary of all hydrologic and hydraulic modeling input and results

The stormwater Management Plan shall be signed by a qualified Professional Engineer.

The following hydrologic and hydraulic modeling guidelines shall apply for the development of stormwater management plans:

- 1 All stormwater runoff calculations shall be according to the methodology described in the Natural Resources Conservation Service's Technical Release 55 (TR-55), "Urban Hydrology for Small Watersheds". Acceptable hydrologic and hydraulic modeling software includes HydroCAD, EPA SWMM, and proprietary versions thereof, and HEC-HMS. Other models and/or methodology may be used with prior approval by the City.
- 2 Pre-development hydrologic soil group curve numbers (CNs) for each land use shall be chosen based on TR-55, review of USDA Soil Survey Geographic Database (SSURGO) data, available soil borings, and anecdotal evidence of stormwater runoff potential. Where conflicting information is present, the lower hydrologic soil group curve numbers shall govern.

- 3 Post-development hydrologic soil group CNs for each land use shall be increased one hydrologic soil group class to account of compaction of disturbed soils. For example, if hydrologic soil group B soils were present for open space with a CN of 61 for pre-development conditions the CN must be increased to 74 for post-development conditions.
- 4 Distributed CNs shall be utilized for all calculations, i.e., calculations of runoff shall involve separation of impervious and pervious surface areas instead of being lumped or determined as a composite CN.
- 5 A MSE 3, 24-hour distributed rainfall event based on Atlas 14, Volume 8 (including subsequent updates) shall be utilized for runoff calculations. Longer or shorter duration storms may be required for the determination of critical events.
- 6 MnDOT's Atlas 14 Intensity-Duration-Frequency Regionalization for the Southeast Region shall be utilized for rainfall input used with the Rational Method.

## 1005.2 Storm Sewer Design

Storm sewer systems shall be designed to convey the 10-year return frequency rainfall event without surcharge of the storm sewer system, i.e., open channel (non-pressurized) flow conditions must be maintained. The Rational Method shall be utilized for peak stormwater runoff rate estimates with pipe capacity determined using Manning's Equation. Storm sewer sizing shall include anticipated future flows and flows from off site. If a permanent stormwater management facility, e.g., wet sedimentation pond, underground detention chamber, etc., is routed through a trunk storm sewer system, the trunk storm sewer system must convey both the 100-year peak discharge from the permanent stormwater management facility and the 10-year design discharge of the trunk storm sewer system. The minimum storm sewer diameter shall be 12 inches. To prevent the buildup of sediment within storm sewer, a minimum flow velocity of three feet per second (3 fps) shall be maintained. The crowns of upstream and downstream storm sewer pipes running through a structure shall match where the downstream storm sewer increases in size or have a minimum drop of 0.1 feet across the structure for storm sewer pipes of the same size where feasible as determined by the City Engineer.

## 1005.3 Pipe Material

Storm sewers and culverts shall be constructed of reinforced concrete pipe (RCP) within any paved roadway section and in locations subject to heavy vehicle loading during construction, maintenance activities, and/or expected regular use. At the direction of the City Engineer, special circumstances may allow storm sewers and culverts in other areas to be constructed of:

- 1 Polyvinyl Chloride
- 2 Corrugated Steel
- 3 Ductile Iron

in accordance with the City of Rochester Sewer Specifications S100, Section 2.

Storm sewers and culverts crossing watermains and/or sanitary sewers shall be constructed with adequate structural support to prevent excessive deflection of joints or settling.

Storm sewers and culverts within 10 feet of a building and at crossings with water supply pipes outside of public easements and right-of-way (ROW) must meet the requirements of Table 701.2 Materials for Drain, Waste, Vent Pipe, and Fittings in Chapter 7 of the Minnesota Plumbing Code. Reinforced concrete pipe is not an approved pipe material for water crossings outside of a ROW or public easements. Within ROW and public easements, pipe material and specifications for storm sewers and/or culverts shall meet the City of Rochester Sewer Specifications S100, Section 2.

## **1005.4 Manhole and Catch Basin Structures**

Manholes, catch basins, and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, manholes and catch basins shall be constructed on a precast or cast-in-place concrete base. The barrel riser section(s) and cone section shall all be of precast concrete. All structures shall be properly fitted and sealed to form a completely watertight unit.

In circumstances where installation of a precast manhole or catch basin structure is not possible, an alternate means of construction with materials such as cast-in-place concrete, mortared solid sewer block or brick, etc. are acceptable. These structures shall be further reinforced to prevent grout degradation and structural deformation. Details for the alternate structures shall be submitted to the City for review and approval by the City Engineer.

## **1005.5 Storm Sewer and Culvert Appurtenances**

Storm sewer inlet aprons 48 inches or less in circular equivalency shall have trash guards. Storm sewer inlet aprons greater than 48 inches in circular equivalency shall have trash guards only if the outlet is required to have one. Storm sewer inlets and outlets located within a roadway clear zone shall have a safety apron and/or grate in accordance with MNDOT Road Design Manual – 8-4.03.02 Safety Guidelines for Culverts. Storm sewer and culvert inlets located outside of a roadway clear zone are not required to have trash guards if daylight is visible from end to end.

Outlet protection shall be evaluated and implemented in accordance with design discharges and associated outlet velocities. Energy dissipation devices including, but not limited to, riprap basins, ring dissipators, stilling basins, etc. shall be utilized to decrease outlet velocities prior to entering erodible drainage channels and/or natural waterways. The energy dissipation device design frequency shall match the design frequency of the storm sewer, e.g., a typical energy dissipation device for a storm sewer outfall requires a 10-year design frequency and the energy dissipation device for a pond outlet control structure requires a 100-year design frequency. Newly constructed stormwater outfalls to public waters shall provide for filtering or

settling of suspended solids and skimming of surface debris before discharge and must be consistent with Minnesota Rules, part 6115.0231.

## **1005.6 Storm Sewer Inlet Spacing and Trunk Alignment**

Storm sewers shall be placed on alignments parallel with sanitary sewer, as detailed in Section 1002.17, with manholes at changes in horizontal and/or vertical alignment. Manhole spacing shall not exceed 400 feet for 12- through 15-inch pipes and 500 feet for 18- through 30-inch pipes. Change in flow direction at structures shall not exceed 90 degrees. For narrow street widths typically 32 feet or less measured from back-of-curb to back-of-curb, an alternate trunk storm sewer alignment is acceptable where it can run beneath the curb and gutter but outside of the boulevard to the maximum extent practicable. Details for the alternate alignment demonstrating the constructability of the storm sewer along with other utilities, i.e., edge drain, light poles, etc., shall be submitted to the City for review and approval by the City Engineer.

Local, local collector, and private streets shall provide for containment of stormwater spread for the 10-year return frequency rainfall event such that the center 6 feet remains clear of ponded water at the roadway low-point. In addition, the 100-year return frequency rainfall event shall be contained within the roadway right-of-way (ROW). All low-points shall have an emergency overflow route. An analysis for the 100-year event at all low points shall be performed to determine the anticipated ponding levels.

All roadways that exceed local and local collector classifications shall be designed in accordance with MnDOT spread requirements for the 10-year return frequency rainfall event per the latest edition of the MnDOT Drainage Manual. Additionally, a minimum of six (6) feet shall remain clear in each driving lane.

Spacing of catch basins shall be as necessary to meet the stormwater spread restrictions above, but in no case shall catch basin spacing exceed 500 feet.

Catch basins shall be located at intersections to prevent stormwater from flowing across the roadway (no valley gutters are allowed). Catch basins shall also be placed at pedestrian ramps such that no more than 0.3 cfs of stormwater passes by the pedestrian ramp during the 10-year return frequency rainfall event.

## **1005.7 Open Channel Design and Sizing**

The design discharge for permanent channel conveyance (e.g. ditches, swales, etc.) linings shall have a 25-year design frequency while temporary linings shall be designed for a two-year frequency discharge based on allowable shear stresses as defined in the MnDOT Drainage Manual. The 100-year frequency discharge shall be contained within an easement or right-of-way.

Channel freeboard shall be the larger of one foot or two velocity heads for a 10-year frequency discharge; the channel shall contain the 25-year frequency discharge.

Where shear stress exceeds allowable limits as defined in the MnDOT Drainage Manual for vegetated channels, storm sewer or concrete-lined channels shall be utilized. Riprap lined

channels and turf reinforcement mat (TRM) lined channels are not allowed. At the discretion of the City Engineer, TRMs may be used as a substitute for storm sewer piping if the swale is to be contained within a City-owned outlot.

Where substantial intermittent, seasonal, or continuous discharges are possible based on, but not limited to, prevailing hydrologic/geologic conditions, e.g., Decorah shale, anecdotal evidence from adjacent development, inputs created from sump pump discharges, etc. vegetated channels shall not be allowed. In these instances, storm sewer or concrete-lined channels shall be utilized. Riprap lined channels are not allowed.

Vegetated channels shall not be allowed where the longitudinal slope is less than two percent. In these instances, storm sewer or concrete-lined channels shall be utilized. Riprap lined channels and TRM lined channels are not allowed.

For residential developments where four (4) or more lots and/or one (1) acre or more drain to a common point, a catch basin and storm sewer is required.

## **1005.8 Permanent Stormwater Management Facilities**

The design of permanent constructed stormwater management facilities shall conform to 1) City of Rochester Department of Public Works Checklist(s), and 2) the City of Rochester Comprehensive Surface Water Management Plan.

When the constructed stormwater management facility being designed is a stormwater wet sedimentation pond (pond), the following apply:

- 1 Ponds shall incorporate multi-stage outlets as necessary to limit the two-, 10-, and 100-year peak discharge rates to less than the pre-development peak discharge rates. Outlet control structures shall provide skimming of at least the 10-year event.
- 2 Ponds shall provide an instantaneous water quality volume greater than or equal to the volume of one inch of runoff from the impervious surface area within the developed watershed it serves. The water quality volume shall be above the pond normal water level. When the pond water level is at the water quality volume elevation, the discharge shall not exceed 5.66 cfs/acre of pond surface area. The discharge rate shall be adequate to draw down the water quality volume, i.e., the extended detention volume, within 48 hours or less to prevent vegetation kill.
- 3 Ponds shall be designed to National Urban Runoff Program (NURP) standards and thereby include a permanent pool (dead storage) volume below the normal water level greater than or equal to the runoff volume from a two and a one-half inch (2.5-inch) rainfall event over the contributing drainage area where impervious runoff volume is calculated separately from pervious runoff volume. The minimum depth of the permanent pool is four feet measured from the normal water level.
- 4 All city-owned wet sedimentation ponds shall be designed to meet Design Level 3 standards as detailed in the Minnesota Stormwater Manual with the exception of the greater water quality volume requirement, i.e., a one and one-half inch (1.5-inch) water quality volume will not be required.

- 5 Ponds shall include a minimum of one-foot of freeboard from the 100-year high water level (HWL) to top of berm. The emergency overflow (EO) shall have one-half foot (0.5 foot) of freeboard from the 100-year HWL and thus require the pond to contain the 100-year event.
- 6 All city-owned wet sedimentation ponds shall have a maximum bounce for the 100-year design storm of no more than five (5) feet
- 7 Pond liners required according to the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit, Section 18.10 must be designed per the Minnesota Stormwater Manual, Level 2 liner specifications unless a Level 1 liner is required.
- 8 Storm sewer discharges to ponds shall be consolidated such that the number of outfalls is minimized to the maximum extent practicable. Furthermore, the storm sewer outfall(s) to the pond shall be located away from the outlet control structure to prevent short-circuiting.
- 9 All requirements and recommendations provided in the Minnesota Stormwater Manual.
- 10 All permanent stormwater management facilities that are contained within 100-year FEMA mapped floodplains, require a minimum separation (by physical barrier or otherwise) up to the 10-year elevation of the adjacent waterbody.
- 11 All requirements of the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit, Section 18.

When the constructed stormwater management facility being designed is a volume reduction practice (e.g. infiltration basin) the following apply:

- 1 All requirements and recommendations provided in the Minnesota Stormwater Manual.
- 2 All requirements of the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit, Section 16.

When the constructed stormwater management facility being designed is a filtration practice, the following apply:

- 1 All requirements and recommendations provided in the Minnesota Stormwater Manual.
- 2 All requirements of the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit, Section 17.

The stormwater management plan must provide a table of design data for all permanent stormwater management facilities. The permanent stormwater management facility design data table shall include the following items (and other items as deemed important and useful by the City Engineer):

- 1 BMP Type (MPCA Classification)
- 2 Total Watershed Area (ac)
- 3 Required Water Quality Volume (WQV)
- 4 Provided Water Quality Volume
- 5 Allowable Impervious Area in Watershed (WQV divided by 1 inch)
- 6 Elevation of Normal Water Level (NWL)

- 7 Surface Area at NWL Elevation
- 8 Storage Volume Below the NWL
- 9 Elevation of Max WQV
- 10 Surface area at Max WQV Elevation
- 11 Storage Volume Below Max WQV
- 12 Total Storage Volume from Downstream Toe to Top of Embankment\*
- 13 Total Embankment Height from Downstream Toe to Top
- 14 100-Year HWL
- 15 Emergency Overflow Elevation

*\*does not include volume below the elevation of the downstream toe of the embankment\**

Permanent stormwater management facilities shall be designed according to the requirements and recommendations of the Minnesota Stormwater Manual, unless specified otherwise herein. Other available references for pond design include:

- 1 "Protecting Water Quality in Urban Areas – Best Management Practices" published by the MPCA available at: <http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html>
- 2 NRCS Conservation Practice Standard 378, "Pond" available at: [Natural Resources Conservation Service](#)

## 1005.9 Grading Plan Checklist

The City of Rochester checklists listed in section 1001.4.4.C of this document are incorporated herein by reference.

## 1005.10 Subsurface Edge Drains

Edge drains shall be constructed on both sides of all urban street sections, unless otherwise approved by the City.

Pipe shall be a minimum of six (6) inches in diameter and shall be constructed of perforated PVC Mn/DOT Spec 3245. The pipe shall be completely wrapped with a geotextile fabric meeting Mn/DOT Spec 3733 Type 1 and bedded according to the City of Rochester Detail Plate 1-08.

Pipe slopes in subsurface drainage should be as appropriate for the design, with a minimum of 0.4%. Curved alignment of the subsurface edge drain is acceptable where the deflection angle of the alignment is not greater than 22.5 degrees, with no more than 2 - 22.5-degree fittings between structures.

Downstream outlet connections shall be made at elevations 0.5 feet higher than the lowest invert of the Storm Sewer Structure (typically a Catch Basin). Access spacing shall not exceed 400 feet, if no structure is available, a cleanout shall be installed at the upstream end, consisting of two (2) - 45-degree risers and enough length of pipe to raise the invert to finish grade. The cleanout shall be capped with a detectable PVC cap screwed to the pipe end.

A subsurface edge drain service shall be installed to a property requiring a water and sanitary sewer service. Subsurface edge drain services shall be a minimum of four (4) inch solid wall PVC, extended to the edge of the utility easement. Schedule 40 PVC is required if installed in a common trench with the water and sanitary sewer services. SDR 35 PVC can be used if installed outside of the common trench with the water and sanitary sewer services. A minimum pipe slope of 0.5% is required for this subsurface edge drain service. The subsurface edge drain service shall be plugged at the property line or at the building site with a four (4) inch detectable PVC cap.

## **1005.11 Future Storm Laterals, Stubs**

On-site collection of stormwater runoff is required before it flows across public sidewalks. Where the general topography indicates that drainage will flow to the public right-of-way, on each multifamily, commercial or industrial lot, a storm sewer lateral “stub” shall be extended to the property line.

## **1005.12 Stormwater Discharges**

In addition to meeting predevelopment discharge rates for the two-, 10-, and 100-year rainfall events, new stormwater discharges from site developments, roadway construction, etc. that are directed into ravines, natural drainageways, vegetated swales, etc. must be evaluated for downstream capacity and resilience to degradation due to erosion and nuisance conditions resulting from extended stormwater discharges such that there will be no adverse impacts to downstream properties. Where the downstream stormwater conveyance is found to be inadequate, mitigation measures must be implemented per the direction of the City Engineer.

# 1006 Service Connections

## 1006.1 Sizing Service Connections

### A. Sanitary Sewer

Sanitary sewer services shall be a minimum of four (4) inches in diameter. Single-family residences shall use four (4) inch services. All other uses, including multi-family, commercial, industrial, and institutional, shall use six (6) inch services unless otherwise approved by the City Engineer.

All sanitary sewers shall be designed to have sufficient slope to provide mean velocities of two (2) fps based on Manning's formula using an N factor of 0.013.

The minimum elevation of the service shall be established by using the elevation at the top of the main, or riser plus a 2% slope to a point behind the outside edge of the sidewalk in the area of the 10 foot utility easement. Maintain a minimum depth of 7.5 feet below boulevard elevation. The maximum slope of a service shall be 5%. If the service is anticipated to exceed 5% the contractor shall install a riser.

### B. Water

Small water services are to be one (1) inch, one and one half (1-1/2) inch or two (2) inch inside diameters only. For common trench installation a vertical separation of 12 inch (minimum) is required. Water services are to be sized to provide the design flow rate while maintaining a minimum 15 psi residual pressure at the last plumbing or process fixture connected to the service line. Rochester Public Utilities will provide static pressure and fire flow capacity information from a water distribution system computer model as an aid to water service line, interior plumbing, and fire sprinkler system designers. Designers are to anticipate water meter and required backflow preventer head losses in sizing water services.

If a water service is sized to serve a fire sprinkler system and domestic water consumption is anticipated to be small, construction of a separate small water service to provide for the domestic water service needs is recommended.

Domestic water usage must be enough to be able to turn-over the water within the combined water service pipe within 24 hours to avoid water quality issues.

## 1006.2 Pipe Material

### A. Sewer Service Pipe shall conform to the following:

- 1 Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 3034 (not permitted within one (1) foot of footing or within 10 feet of the water).
- 2 Cast iron soil pipe and fittings shall be the "Service Weight, Centrifugally Spun" grade and shall conform to ASTM A74-75.
- 3 Ductile iron pipe shall conform to ANSI 21.51.

## B. Water Service Pipe shall conform to the following:

Pipe two (2) inches in diameter or smaller is to conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper. Water services larger than two (2) inches in diameter are to be ductile iron.

# 1007 Pumping Station

## 1007.1 Lift Station Design

- 1 The lift station shall be designed as a packaged system from one supplier incorporating components from multiple manufacturers.
- 2 Wet well shall be designed to equalize flow to minimize pump starts per hour to less than two (2) for average future design flows. There shall be minimum of one (1) foot clearance from high water level to lowest sewer discharge line.
- 3 Pumps shall be submersible solids handling pumps designed for raw sewerage service.
  - a Manufacturers shall be Flygt, KSB, Sulzer, or approved equal.
  - b Pumps shall have non clog type impellers and be capable of passing at minimum a 3 inch solid.
  - c Lift Station shall have one (1) duty, one (1) standby pump and each pump shall be designed to independently handle future peak wet weather flow.
  - d A guiderail system shall be used to allow easy pump removal from service without requiring physical entry into the wet well by maintenance personal. Lockable service access hatch covers shall be provided to allow pump removal without removal of wet well top.
- 4 Check valve vault shall be separate from wet well.
  - a One check valve shall be dedicated to each pump. Each check valve discharge shall have plug valve installed for isolation.
  - b Check valve vault shall have a three (3) inch drain from vault discharging to wet well with rubber flapper on end of drain pipe to prevent off gas and routed to bottom of wet well to maintain submergence.
  - c Check valve vault shall have lockable hatch for access and removal of valves.
- 5 A vent shall be installed on top of the wet well and check valve vault with opening facing downward and insect screen covering the opening.
- 6 All pipe penetrations shall be sealed with link seal.
- 7 All structures shall be designed by structural engineer registered in the state of Minnesota.
- 8 Lift Station design shall, at a minimum, follow the most recently published Ten State Standards in addition to listed requirements. Where this document overlaps Ten State Standards, this document shall apply.
- 9 AutoCAD files of electrical and lift station drawings shall be submitted to the Water Reclamation Plant for record. One set of operation and maintenance manuals shall also be submitted to the Water Reclamation Plant for record.
- 10 Two sets of operation and maintenance manuals shall be submitted to Owner/Operator of lift station.

## 1007.2 Forcemain Design

- 1 The forcemain shall be sized with a maximum diameter to assure flow greater than two (2) ft/s when operating. Velocities less than five (5) ft/s are desirable for energy efficiency goals. Discharge piping shall be sized, wherever possible, with a minimum diameter of the largest spherical solid passed through the pumps. Minimum forcemain pipe diameter of three (3) inches.
- 2 An air/vacuum valve suitable for use in wastewater shall be installed with an isolation valve located at the high point of the discharge piping of the forcemain inside a valve vault.

## 1007.3 Coatings and Materials

- 1 All miscellaneous hardware, nuts and bolts, pump guiderails, hatches, control panels, and conduit shall be 316 stainless steel.
- 2 All piping shall be cement mortar lined ductile iron pipe primed at the factory.
- 3 Interior walls, floor, and ceiling of wet well and check valve vault shall be coal tar epoxy or polyurethane coated or approved coating as submitted by contractor and approved by engineer.
- 4 All piping and valves shall be final field coated.
- 5 Stainless steel materials shall not be coated with exceptions to bolts connecting coated piping and valves.

## 1007.4 Site Layout

- 1 Where potable water supply is located within 300 feet of lift station, install fire hydrant within 100 feet of lift station wet well and outside of any fenced area.
- 2 All structures and equipment pads shall have top of concrete at same elevation and shall be located above 100 year flood elevation.
- 3 Soil shall come up to two (2) inches below top of concrete and slope away from structures.
- 4 Four (4) inches of Class 5 aggregate surfacing shall be placed on the subgrade within lift station area.
- 5 All vaults, panels, hatches, or other access to equipment or electronics shall be designed to accept a pad lock.
- 6 Fencing is not required. Coordinate fence design with developer where fence is desired. Fence gate shall include 12 foot wide opening with two-6 foot gates. Structures and entrance shall be situated to allow one (1) ton pickup access to lift station and valve vault. Coordinate access acceptability with contracted maintenance provider or maintenance staff.

## 1007.5 Power

- 1 One (1) electrical primary power source is required with backup power.

- 2 Natural gas, diesel, or propane backup engine generator with automatic transfer switch shall be provided. Generator shall rest on concrete pad.
- 3 Nema 4 electrical cabinets and stainless steel hardware. Control and power cabinets shall be mounted above grade to concrete pads.
- 4 Pump power cable shall be continuous cable without splices from motor to electrical junction located just outside of wet well. Another cable shall be routed from junction cabinet to electrical cabinet where drive is located and have a seal off located nearest the junction cabinet.
- 5 When variable speed drives are required, ABB Drives shall be used without exception.
- 6 Lift station shall have 120V receptacle located on cabinet and working light with switch located on exterior of cabinet or remotely on a pole.

## 1007.6 Instrumentation

- 1 All instrumentation cables shall be continuous from instrument to junction box located outside of the wet well and include seal offs for cables routed from junction box to control cabinet.
- 2 Controls shall rotate duty and standby pumps.
- 3 Power and control wire conduits shall be separate.
- 4 Telemetry shall be supplied with panel, coordinate with proposed service contractor for appropriate system
- 5 Floats are required for wet well level and alarms.
  - a Flygt ENM-10 floats shall be used. No alternates allowed.
  - b High Level Alarm float and Low Level Alarm float.
  - c Low All Off float.
  - d Lead Pump Start float.
  - e Lag Pump Start float.
  - f Other floats deemed necessary by Engineer.
- 6 Check valve lever arms proximity switches to verify pump is pumping wastewater or mag meter.
- 7 Pump On/Off
- 8 Pump Faults

# 1008 Erosion and Sediment Control

## 1008.1 Required Documentation

- 1 A “Stormwater Pollution Prevention Plan” (SWPPP) shall be incorporated into the construction plans & specifications and/or grading plan. The plan shall conform to the Department of Public Works “Grading Plan Checklist”, applicable Minnesota Pollution Control Agency (MPCA) permit requirements, and “Best Management Practices” as published by the MPCA. The plan shall include adequate temporary and permanent erosion and sediment control measures.
- 2 The following statement shall be placed on all plans for projects with excavation “Erosion and sediment control measures shown are minimum and additional measures must be installed as needed to control erosion and sediment.”
- 3 The Owner and Contractor shall obtain a MPCA Construction Stormwater permit, and any other permits required. The designated Erosion Control Supervisor shall coordinate project information and complete inspection and maintenance information on the City’s erosion and sediment control website (MS4Front).

## 1008.2 Construction Requirements

- 1 The construction shall comply with the project SWPPP and applicable MPCA permit requirements, as necessary to prevent off-site erosion and/or sedimentation and tracking, and shall include final stabilization.
- 2 Best Management Practices (BMPs) for erosion and sediment control shall be established on all down-gradient perimeters before grading is commenced, and shall be regularly maintained and remain in place until final stabilization.
- 3 The NPDES Permit Holder shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives stormwater from the subdivision. If erosion and sediment control measures taken are not adequate and result in downstream sediment, the NPDES Permit Holder shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary, including associated restoration. The NPDES Permit Holder shall follow all instructions it receives from the City Engineer concerning the cleaning and maintenance of the storm sewer system. The NPDES Permit Holder and/or the Developer’s obligations under this paragraph shall end two (2) years after the public improvements in the subdivision have been accepted by the City Engineer, or after the NPDES Notice of Termination (NOT) whichever is greater.
- 4 The NPDES Permit Holder shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from silt and dirt from the subdivision for a period of two (2) years ending when the streets have been completed and accepted by the City Engineer, or after the NPDES Notice of Termination (NOT) whichever is greater.

- 5 After the site has been finally stabilized, all permanent stormwater ponds shall be cleaned to original plan cross-section, all temporary sediment control measures (such as silt fence) shall be removed, temporary sediment basins shall be re-graded and stabilized, prior to final acceptance by the City Engineer and the NPDES Notice of Termination (NOT).

### **1008.3 Temporary Erosion and Sediment Control**

Temporary erosion and sediment control shall conform to the requirements in the SWPPP to prevent soils and sediment from entering public waters, sewers, streets and adjacent properties. These temporary control measures include their eventual removal after conditions stabilize.

Contract pay items shall be provided for temporary erosion and sediment control items to facilitate immediate implementation by the NPDES Permit Holder, or as directed by the Local Regulatory Unit or MPCA's acting agent.

### **1008.4 Permanent Erosion and Sediment Control**

Permanent erosion and sediment control shall conform to the requirements in the SWPPP to prevent soils and sediment from entering the public waters, sewers, streets and adjacent properties.

Contract pay items shall be provided for permanent erosion and sediment control items to, if encountered, facilitate modifications to the original SWPPP by the NPDES Permit Holder, or as directed by the Local Regulatory Unit or MPCA's acting agent.

# 1009 Decorah Edge Areas

## 1009.1 General

The objective of this section is to define elements of treatment of public infrastructure systems that traverse through “Decorah Edge” areas. Decorah Edge areas defined in City of Rochester [Unified Development Code \(UDC\)](#). Primary features of the protection measures in this section include:

- 1 Avoiding “Decorah Edge” areas to the maximum extent practicable.
- 2 Allowing only Collector or higher classification roadways to transverse across these areas.
- 3 Allowing only large diameter underground trunk main public infrastructure with appropriate treatment elements to transverse across these areas.
- 4 For Roadways, require a subsurface drainage collection system. Require the subsurface system to discharge into the surface water storm sewer system, not reentering or infiltrating back into the subsurface system.

The following standards were developed to protect our surface/subsurface groundwater migration and hydrology by ensuring their proper care and protection and to ensure its compatibility with an efficient and dependable infrastructure system.

## 1009.2 Roadway Plans

Roadways across the Decorah Edge areas should be avoided, if at all possible. Only streets classified as Collectors or higher shall be constructed across the Decorah Edge areas. Lower classification streets may be allowed when they serve as the secondary emergency access. Roadways through the Decorah areas shall be installed according to the City of Rochester Detail Plate to mitigate these subsurface flows.

Subsurface edge drains shall be constructed through the entire Decorah Edge area for roadway sections, unless otherwise approved by the City.

Edge drains shall be a minimum of six (6) inches in diameter. The pipe shall be completely wrapped with a geotextile fabric and bedded according to the detail plate.

Pipe slopes in subsurface drainage should be as appropriate for the design, with a minimum of 0.4 percent. Curved alignment of the sub drain is acceptable where the deflection angle of the alignment is not greater than 22.5 degrees, with not more than 2-22.5 degree fittings between structures.

The alignment of the street shall be perpendicular to the contours to the maximum extent practicable to minimize the Decorah area impacted.

## 1009.3 Underground Utilities

Public Utilities through the Decorah areas shall be installed according to the detail plates.

Underground utilities such as storm sewer, sanitary sewer and watermain shall not allow the subsurface water to flow along the pipe.

Anti-seep collars shall be installed according to the detail plate to mitigate subsurface flows.

# 1010 Tree Planting, Preservation, and Protection

## 1010.1 Description

The City of Rochester acknowledges the importance of trees to the community's health, safety, welfare, and tranquility. Trees increase property values, provide visual continuity, provide shade and cooling, decrease wind velocities, control erosion, conserve energy, reduce stormwater runoff, filter airborne pollutants, reduce noise, provide privacy, provide habitat and food value, and release oxygen.

## 1010.2 Definition of Terms

### A. Tree Protection Zone:

A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

Tree Protection Zone by type shall be determined by the City Forester.

Minimum area specified shall be 4 times the diameter, measured 4'-6" above the ground.

### B. Hand Work Zone:

A circumscribed square area around the Tree Protection Zone in which only hand held operating tools shall be used for removal or construction activities.

### C. Structural Soils:

Special soil mixture used in tree planting pits as indicated on SDP 5-02. Structural soil is required in the Central Business District. Soil mixture should consist of crushed rock, topsoil, soil binder and water.

*TABLE 1010.2-1 Structural Soils Mix Proportions for 1 CY*

<b>Material</b>	<b>Quantity</b>
<b>Crushed Rock*</b>	<b>23.2 Cubic Feet</b>
<b>Loam/Organic Topsoil</b>	<b>5.9 Cubic Feet</b>
<b>Soil Binder</b>	<b>13.7 oz</b>
<b>Water</b>	<b>1.6 gallon</b>

\*Crushed Rock gradation shall be as follows: 100 % passing 1.25 inch, maximum 30% passing 0.75 inch

### Proportions of Materials:

The major components of the structural soil mixture are crushed rock and topsoil. Since when mixed together some of the topsoil fills in the voids of the crushed rock material, the sum of the rock and topsoil volumes does not equal the volume of the structural soil material. There is approximately a ten percent (10%) volume reduction due to mixing the materials together.

The target moisture content is twenty percent (20%) by weight of the topsoil weight. The above water contents assume the top is dry. The amount of water that will need to be added will be dependent on the moisture content of the raw materials. Actual amounts of water used will be determined during mixing.

### Structural Soils Mixing:

- 1 Mix structural soil in batches of an appropriate size for the equipment being used. The end result is to be a material that is uniformly blended together. Do not batch in quantities that will not allow the equipment to completely mix the material. Determine batch size and quantities of each material needed for the batch.
- 2 Start with half of the crushed rock material.
- 3 Add all of the topsoil material.
- 4 Add the soil binder.
- 5 Add half of the estimated water.
- 6 Add the other half of the crushed rock material.
- 7 Mix the material together.
- 8 Slowly add water to the mixture and continue to mix. The final amount of water will vary with moisture content of the crushed rock and topsoil. Add water in incremental amounts and mix the material between the additions of water.
- 9 Stop adding water and mixing when there is a minute amount of free topsoil remaining. The topsoil will coat the crushed rock and not fall out of the material. All of the crushed rock should be uniformly coated with topsoil. There should be no clumps of topsoil or uncovered crushed rock in the mixture.
- 10 If too much water is added to the mixture water will drain out of the material and the topsoil will wash off of the crushed rock. If this occurs this batch of material is to be discarded and shall not be incorporated into the completed work.

### Soil Placement:

- 1 Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain or aerate to optimum compaction moisture content.
- 2 All areas to receive structural soil mixture shall be inspected by the city before starting placement of mixture. All defects such as incorrect grading, compaction, and inadequate drainage, etc. shall be corrected prior to beginning placement of structural soil.

- 3 Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade. Clear the excavation of all construction debris, trash, rubble, and foreign material. Fill any over-excavation with approved fill and compact to the required subgrade compaction.
- 4 Install structural soil in 6-inch lifts and spread uniformly over the area. Delay placement 24 hours if moisture content exceeds maximum allowable and protect structural soil with plastic or plywood during delay.
- 5 Bring structural soils to finished grades as shown in the plan detail. Immediately protect the structural soil material from contamination by water by covering with plastic or plywood.
  - The contractor shall refer to the tree planting detail for depth and volume of structural soils at tree planting locations.

### **1010.3 Engineering Requirement**

Trees and other vegetation worth preserving are to be protected and preserved to the maximum extent feasible during construction. Only those trees and other vegetation that have been evaluated as being necessary to be removed to allow for new construction will be removed. Trees and other vegetation that have been evaluated as worth saving and designated to remain will be properly protected during construction to maximize their survival rate. In order to achieve an appropriate balance between protecting trees and allowing necessary construction, the practices that follow will be employed.

All trees to be preserved on the property and all trees adjacent to the property shall be protected and maintained against damage during construction. The Engineer and Owner are to survey the job site before work is scheduled. Limits of disturbance are to be determined by the Engineer and Owner before work begins. Storage sites for soil, sand, pipe, hardware and equipment are to be determined by the Owner. Vehicle access routes are to be determined. All workers on the site shall be educated in tree preservation practices. Tree protection devices shall be placed before material deliveries, excavation, or grading begins and is to be maintained in good repair for the duration of the construction work, unless otherwise directed. Tree protection shall remain until the landscape restoration work begins

### **1010.4 Construction Requirement**

Protection of trees during construction (including remodeling and demolition): Prior to any site work, all trees to be preserved must be protected, signed, and maintained, in accordance with the Tree Preservation and Protection Standards. The level of tree protection by type will be as determined by the City Forester.

#### **A. Tree Protection**

Trees in the area of disturbance and in the vehicle access route are to be protected by fencing in the following manner:

No material shall be stored or construction operation shall be carried on within the tree protection fencing.

No protective devices, signs, utility boxes or other objects shall be nailed to the trees to be retained on the site.

Tree protection fencing shall be erected and approved by the Engineer at least 24 hours before construction begins.

## B. Grade Changes

Grade cuts of 6" or more, shall be reduced or eliminated within the drip line and no cuts are allowed in the tree protection zone.

When fill of 4" or more is necessary within the drip line of a tree, a tree well shall be required and no fills are allowed in the tree protection zone.

Areas under tree drip lines disturbed by construction activity shall be mulched with a 2-3" deep layer of shredded bark mulch. Mulching shall be done within 4 hours of disturbance.

## C. Trenching and Tunneling

Trenching shall be done outside the tree protection zone. Trenchless techniques shall be employed within the tree protection zone.

## D. Pruning

Pruning of branches shall be done under the requirements and direction of the City Forester.

## E. Boulevard Trees

Reference the following City of Rochester Approved Boulevard Trees document: [Approved Boulevard Trees](#)

# 1011 Project Development

## 1011.1 General

Public Works and the City-Owner Contract process require specific milestone submittals and meetings to improve communication and coordination through the project development. They are intended to facilitate the design of infrastructure and do not replace the development meetings hosted by the Community Development Department or any other city department.

The City-Owner Contract process includes:

- 1 Predesign Submittal
- 2 Submittal of Plans
- 3 Request City Owner Contract & City Council Approval
- 4 Preconstruction Meeting
- 5 Construction Progress Meetings

## 1011.2 Predesign Submittal

The predesign submittal does not require a face-to-face or formal meeting, but one may be requested by either party after Public Works has reviewed the documents therein. This submittal includes a 30% plan for preliminary plan review. Submit the predesign submittal package to the City Owner Engineering Technician.

- 1 Required engineering documents to be included:
  - a Most advanced Civil Plan Set available. Civil plans may include the following sheets:
    - Site Survey (showing existing conditions, existing utilities, etc.)
    - Demolition Plan
    - Site Plan
    - Grading and Drainage Plan
    - Utility Plan
    - Others as determined by the Engineer
  - b Preliminary stormwater management plan
  - c Proposed details (street section, special features, etc.)
  - d Geotechnical information
- 2 Recommended engineering information to be included:
  - a Hydrology and Hydraulics
  - b Pavement Design
  - c Utility service loading estimates
  - d Preliminary utility layouts
  - e Site challenges (Groundwater, unsuitable soils, rock excavation, wetland protection, grading, drainage and stormwater management challenges, etc.)
  - f Preliminary traffic control plan

- g Project timeline/schedule
  - h Private utilities coordination (gas, communications, etc.)
- 3 Discussion topics during review by public works: If no meeting is requested, Public Works will provide comments electronically to the design team that include, but are not limited to, the following:
- a Plan format and content
  - b Development goals related to infrastructure
  - c Site layout challenges, engineering challenges, and other special challenges
  - d Utility extension though property to next property
  - e Construction traffic management and public traffic control
  - f “Public or Private” designation of utilities
  - g City-Owner vs. Permit work
  - h Construction noise and dust control concerns
  - i Granting of a City J-Number

### **1011.3 Pre-submittal meeting**

A pre-submittal meeting may be scheduled with Public Works to review the contents of the civil plan and stormwater management plan submittals prior to acceptance for full review by Public Works. The expectation is that the civil plan set, stormwater management plan, and all required plans and documents are fully complete and the plans and documents meet all City requirements and standards.

# 1012 Standard Plans

## 1012.1 General

In order for the City to have standardized construction plans and record drawings, the City requires drawings be submitted in AutoCAD file format, utilizing Civil 3D elements and Adobe PDF.

The information shown on plans should follow the Mn/DOT Sample Plan format to depict what the end product will look like and provides guidance to those roadway designers preparing the individual plan sheets for roadway construction projects. City Survey and CAD deliverables to be used shall be obtained at the start of a project to ensure current standards and formats are followed correctly.

Complete civil plans must be uncluttered and legible. They should consist of multiple sheets with surface grading, drainage, utilities, stormwater management facilities, etc. separated, as described in Section 1011.2.A.1.

## 1012.2 Modifications to the Mn/DOT Sample Plan

In addition to the standards set forth by the Sample Plan, the standards listed below shall be followed:

### A. General

All sheets shall be reproducible on standard D-size sheets (22" x 34"). Scale 1" = 20' where there are more than two underground facilities (i.e. sewers, watermains, subsurface edge drains) or sheets that are otherwise crowded due to curvature, etc. On large simple detail plans a scale of 1" = 40' can be used.

All parcels shall be properly labeled with lot and block numbers and plat name, or Parcel Identification Number (PIN) in unplatted areas. Developed parcels shall have their address shown on the plan.

Existing utilities shall be shown in both plan and profile, labeled with stationing as existing.

All match-like breaks shall be clean with reference points clearly marked. All plans, which are broken by a match line, shall be on the same or consecutive sheets.

All sewer (sanitary, storm and subsurface edge drain) and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.

### B. Title sheets

Provide signature block for RPU-Water Division (if plans include watermain) and City Engineer.

### C. Grading and Paving Plans

Provide elevations at 25' intervals for property lines, top of curb, centerline, all lot corners on property line, all curb returns and mid points, and intersection layouts.

Plot top of curb profiles.

Typical sections including structural section to be shown on the Title Sheet, Detail Sheet or Plan View.

## D. Sewer, water, and service connection plans.

Identify fittings and structures on the plan view as follows:

- 1 Sanitary Sewer: S-1, S-2, etc.
- 2 Watermain: W-1, W-2, etc.
- 3 Storm Sewer Manholes: ST-1, ST-2, etc.
- 4 Catch Basins: CB-1, CB-2, etc.
- 5 Cleanouts: C-1, C-2, etc.

Notes for fittings and structures shall include the station and relationship to centerline. For structures, also provide the structure type, diameter, casting type, ring and center of invert elevation for inlets and outlets in the notes. Provide the center invert grades on the profile, along with pipeline grades at 25 foot intervals. For watermain, provide grades at 50 foot intervals and label as w/m invert elevations (No top of pipe elevations). Also provide all crossing information at crossings with watermain (top of pipe elevations of lower pipe, invert elevation of higher pipe, actual vertical separation dimension, and station of crossing points). Crossing information to be shown / located on the plan & profile sheet in which the crossing is shown / located.

All hydrants are to be at required height (see City of Rochester Detail Plates) after lawns, boulevards, etc. are finished (sod, seed, etc.) This will be the contractor's responsibility. Provide break-off elevations on hydrants and invert elevations at each pipeline bend, deflection, crossing, connection, stub/end, etc.

All sanitary sewer services shall be drawn on the plan to the intended location. The station of the wye, the station and invert elevation of all sanitary sewer services at the end of the service in the 10 foot utility easement area and, and the elevation at the service shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile.

The size and type of all sanitary sewer and water services shall be noted on the plans. Service connections shall be centered on the lots and shall terminate beyond the 10 foot utility easement area behind the sidewalk. A curb stop and box shall be at the right-of-way/property line (typically 1' behind sidewalk, property side) for the water service. The linear dimension from the property line to the service connection shall be shown on the record drawings, as well as GPS coordinates.

## E. Sidewalk and Shared-Use Path, or Side path Plans

Show sidewalk, shared-use path, or side path as construct or future, with widths and distance from property lines on plan views.

Sidewalks with accessible ramps shall be placed within the curb return area at all intersections, except roundabouts / traffic circles.

# 1013 Submission of Plans

## 1013.1 Plans and Specifications

- 1 Submit for review and comment, in pdf format, the pavement and geotechnical report, civil plans and specifications, and stormwater management plan to the Public Works City Owner Engineering Technician using the email address [LDSubmittals](#).
- 2 The Consultant shall obtain a Minnesota Department of Health permit for new or replacement watermain of 100' or more and a Minnesota Pollution Control Agency permit for sanitary sewer extensions.
- 3 After approval by the City Engineer, submit the electronic files, including CAD files not containing Pipe Networks, together with signed title sheet to the City of Rochester Public Works (RPW) and/or Public Utilities (RPU) Water Division who will forward on to the appropriate City agencies.

## 1013.2 Estimates

Enter and use standard bid items from the City's OneOffice Construction Project Management internet site for all publicly let contracts. As Built quantities shall be provided with the record drawings.

## 1013.3 City-Owner Contracts

- 1 Submit the City-Owner Contract Request form to the Public Works Land Development Section. The Public Works Department staff will prepare and return a Contract for execution within 7 business days.
- 2 Submit: the Contract executed by the Owner, Contractor, and Engineer; the bond; and certificate of insurance; to the Public Works Land Development Section at least 10 business days before the City Council meeting at which the Contract will be considered (meetings are normally every 1<sup>st</sup> & 3<sup>rd</sup> Monday of the month).
- 3 Not later than the Monday of the week preceding the City Council meeting,
  - a The plans & specifications must be approved.
  - b Any associated grading, drainage and stormwater management plan must be approved.
  - c The Owner must have signed a Development Agreement, if required, for the project, and
  - d The Owner must have filed the Final Plat or Site Plan with the Planning Dept.

## 1013.4 Electronic Drawings

The Consultant shall verify and submit an electronic drawing file for the entire plan set, and shall contain an overall plan view drawing containing control point coordinate information accurately referenced to Olmsted County Project Coordinates (NAD83 coordinate base).

For projects with watermains, in addition to providing the required information to Public Works Department, a copy of this file shall be provided directly to Rochester Public Utilities.

The drawing set shall consist of all related support files required to reproduce the electronic drawing file, as a hard copy, in the current City Civil 3D, AutoCAD format. Support files required by the City will include any font files (\*.shx) not supported by AutoCAD, external reference drawings (AutoCAD Xref), sheet set manager, and plot configuration files (\*.pcp, \*.pc2, \*.pc3...etc.). If software license agreements do not allow distribution of third party support files, then an AutoCAD supported equivalent shall be substituted prior to delivery to the City.

It is required that all files be in AutoCAD format. Formats, translations, etc., and the accuracy of data contained therein will be the total responsibility of the contracted source. The files delivered under contract must work in the AutoCAD environment as described above with no adjustments, modifications, translations or alterations while retaining all required element properties.

## **1013.5 Record Drawings**

All record drawings shall be submitted in electronic (Civil 3D, AutoCAD and PDF) format. The plans shall be clearly legible drawings with unnecessary construction information removed (contours, trees, shrubs, fences, etc.). Place proper notes and statements, (i.e. type of alternate pipe used) on all sheets. All hydrants shall have benchmarks on them.

Record drawings on all public and private constructed stormwater management facilities and drainage conveyance facilities are required. Plans shall indicate finished contours at two (2) foot intervals, normal water elevation, high water elevation, and the acre-feet of storage for each ponding area along with the final storm sewer plans.

The record drawing plans shall be submitted to the City Engineer within one (1) month of the initial acceptance/commencement of the warranty period. Failure to submit the record drawings within the required one (1) month period may result in an extension of the project warranty period for a length of time equal to the delinquency in plan submittal.

# 1014 Construction Supervision

## 1014.1 Pre-Construction Conference

As soon as possible after the project has been approved, the Engineer should arrange a meeting for the purpose of reviewing contract requirements, construction details, work schedules and any items peculiar to the project. The meeting should be face-to-face conference. For projects where the City-Owner construction is minor in scope (less than \$25,000), the preconstruction meeting may be held on-site.

Prior to this meeting the attendees should study the plans and become familiar with the project site to be well informed as to the requirements and existing conditions.

- 1 Required attendees
  - a City Engineering staff - City Owner Engineering Technician
  - b Owner or their representative
  - c Construction phase consulting engineer
  - d Project inspector(s)
  - e Geotechnical professional
  - f Contractor –project superintendent and on-site foremen
- 2 Recommended attendees
  - a City staff -RPU representative and County Engineer representative for county road work
  - b Contractor’s safety officer, ESC supervisor, others as appropriate for the specific project
  - c Utility company representatives (invitation required, attendance optional)
  - d Subcontractor representatives
  - e Other stakeholders with whom construction coordination would benefit the project.
- 3 Material available for the meeting
  - a Required
    - Approved construction plans and specifications
    - Permits; DNR, NPDES, MPCA, MDH, others appropriate for the project.
    - Geotechnical report
    - Pavement design report
    - List of subcontractors and material suppliers
    - Traffic control plan.
  - b Recommended
    - Shop drawings
    - Other materials appropriate for the project
  - c Discussion Topics
    - Project Staging & Schedule; Proposed Starting Date; Completion Date; Working Hours & Days

- Construction Observation / inspection requirements for each phase of work
- Geotech / Materials Testing
- Traffic control
- Plug sanitary sewer.
- Installation of underground utilities
- Trench backfill and compaction
- Street grading, base, aggregate, and pavement operations
- NPDES requirements and construction sequencing; Erosion & Sediment Control / Restoration
- Special Provisions
- Execution of work
- Required stage inspection; attendees, schedule, responsibilities, methodologies,
- Supplemental Agreements
- Utility conflicts and accommodations
- Weekly Construction Meeting Day/Time
- One Office documentation requirements
- Clean-up / trash removal
- Construction workforce private vehicle parking
- Respect for others
- Work site safety
- Security
- Hazardous materials
- Noise Ordinance
- Shop Drawings
- Project close out requirement; materials certifications, testing results, record drawings

## 1014.2 Construction Progress Meetings

The meeting should be held on-site. A common schedule for the meeting is weekly during the full time construction activity. During intermittent construction and during winter project shut-down, less frequent meeting are appropriate.

### A. Required attendees

- 1 City Engineering staff - City Owner Engineering Tech
- 2 Construction phase consulting engineer
- 3 Project inspector(s)
- 4 Contractor –project superintendent and on-site foremen

## B. Recommended attendees

- 1 Geotechnical professional – when appropriate for work being conducted
- 2 If the project work indicates the need, additional city staff, RPU representative, County Engineer representative for county road work
- 3 Contractor's safety officer, ESC supervisor, others as appropriate for the specific project
- 4 Utility company representatives (invitation required, attendance optional)
- 5 Owners representative
- 6 Subcontractor representatives
- 7 Other stakeholders with whom construction coordination would benefit the project

## C. Material available for the meeting

- 1 Required
  - a Approved construction plans and specifications
  - b SWPPP and MS4Front reports.
  - c Shop drawings
  - d Field diary records.
- 2 Recommended
  - a Other materials appropriate for the project
- 3 Discussion Topics for phase of work under way or planned for the near future
  - a Project Staging & Schedule; Proposed Starting Date; Completion Date; Working Hours & Days
  - b Construction Observation / inspection requirements for each phase of work
  - c Geotech / Materials Testing
  - d Traffic control
  - e Installation of underground utilities
  - f Trench backfill and compaction
  - g Street grading, base, aggregate, and pavement operations
  - h NPDES requirements and construction sequencing; Erosion & Sediment Control / Restoration
  - i Special Provisions
  - j Execution of work
  - k Required stage inspection; attendees, schedule, responsibilities, methodologies,
  - l Supplemental Agreements.
  - m Utility conflicts and accommodations
  - n Weekly Construction Meeting Day/Time
  - o OneOffice Construction Project Management documentation requirements
  - p Clean-up / trash removal
  - q Work site safety
  - r Construction workforce private vehicle parking
  - s Respect for others
  - t Security
  - u Hazardous materials

- v Project close out requirements; materials certifications, testing results, record drawings

## 1013.3 Notice to Proceed

The City Engineer will issue a “Notice to Proceed” after the City has executed the City-Owner Contract (for privately let contracts) or the construction contract (for publicly let projects).

## 1014.4 Surveying

Surveying work includes: complete staking during construction, diaries and survey notes, final benchmarks on hydrants, etc. Survey notes and diaries will be made available to Public Works upon request.

## 1014.5 Inspection

Engineering supervision ensures completion of construction contracts according to contract requirements; provides technical supervision for construction projects; conducts or provides oversight of all testing; coordinates the activities of public utilities, contractors, and other governmental agencies on construction projects; documents contract work progress for payment of the contractors; keeps property owners, news media, other governmental agencies, and the public informed of construction operations within the area; provides requested technical assistance to other governmental agencies on their construction projects; and advises contractor of traffic safety and control measures. Maintains field records for record drawings. Inspection records, notes, and diaries will be made available to Public Works upon request.

The following qualifications and expectations are required on City-Owner Contracts:

### A. Inspector Qualifications

- 1 Experience (must meet the following)
  - a Must have a minimum of 2 years of civil engineering technician education and 2 years of infrastructure installation field experience (or a combination that is equivalent).
  - b May be graduates from an accredited college engineering program (engineering, construction management, landscape architecture, or similar program). Must have Mn/DOT certifications within 2 years. Required to work under a mentor (with them at least 20% of the time) during this interim time. Mentors must possess all requirements of a fully qualified / certified construction observer / inspector.
- 2 Required Certifications (must meet all the following)
  - a Must have Mn/DOT Certifications (Aggregate Production, Grading & Base Inspector, Bituminous Street Inspector, Concrete Field Tester and Concrete Field Inspector). If coming from another state, must show equivalent course work and

will be allowed to serve as qualified / certified construction observer without mentor, but must take all Mn/DOT certifications within 3 years.

- b Must have Erosion & Stormwater Management – Construction Site Management certification from University of Minnesota (or comparable training).
- c If performing construction observation / inspection of underground construction activities (i.e. sewer and water), must have the Minnesota Pipe Layers Card certification (or equivalent).
- d Documentation Filed with Public Works - Consulting Engineering firms are required to submit to Public Works the records for each individual construction observer / inspector annually, but no later than 2 weeks prior to performing any field construction observation / inspection tasks performed by that individual.

## B. Inspection Expectation

For projects with normal levels of complexity and site condition challenges, the following on-site field inspection table is the required minimum expectation:

<b>Activity</b>	<b>Level of Inspection</b>	<b>Time (%)</b>
<b>Site Clearing &amp; Grubbing</b>	<b>Part Time</b>	<b>25%</b>
<b>General site grading &amp; excavation</b>	<b>Part Time</b>	<b>25%</b>
<b>Underground utility work &amp; trench compaction</b>	<b>Full Time</b>	<b>100%</b>
<b>Street subgrade preparation / compaction</b>	<b>Full Time</b>	<b>100%</b>
<b>Aggregate Base placement</b>	<b>Part Time</b>	<b>50%</b>
<b>Aggregate Base compaction / proof roll test</b>	<b>Full Time</b>	<b>100%</b>
<b>Curb &amp; Gutter preparation</b>	<b>Part Time</b>	<b>50%</b>
<b>Curb / Gutter string line check / verification</b>	<b>Full Time</b>	<b>100%</b>
<b>Curb / Gutter pouring</b>	<b>Full Time</b>	<b>100%</b>
<b>Bituminous non-wear</b>	<b>Full Time</b>	<b>100%</b>
<b>Bituminous non-wear prior to wear</b>	<b>Full Time</b>	<b>100%</b>
<b>Bituminous wear placement</b>	<b>Full Time</b>	<b>100%</b>
<b>Concrete street placement</b>	<b>Full Time</b>	<b>100%</b>
<b>All required Stage testing of piping, subgrade, base and paving</b>	<b>Full Time</b>	<b>100%</b>
<b>Other activities as directed by Engineer or City</b>	<b>As required</b>	

Part Time: means construction observer / inspector is onsite during critical times (as outlined above and in consultation with the Project Engineer), and may not be on site during all work performed by the contractor for that task item. Part time is a percentage comparison to the preliminary schedule supplied by the contractor at the pre-construction meeting and is used in preparing the construction observation budget.

Full Time: means construction observer / inspector is on site during the time the contractor is actually putting work in place. Includes daily site visits. Construction observation / inspection will be documented and recorded using the One Office program.

## **1014.6 Utility Testing**

### **A. Watermain Testing**

Coordinate watermain loading, pressure testing, conductivity test, bacteria testing, and visual inspection on valves and hydrants with the Rochester Public Utilities (RPU) Water Division. Only RPU personnel shall operate valves and hydrants and perform visual inspection on valves and hydrants.

### **B. Sanitary Sewer Testing**

City Representative is required to be notified and present on-site for sanitary sewer testing. Consultant Inspector shall observe the test(s) and submit the certification of sanitary sewer air and deflection testing, along with request for televising to the City Engineer. The City Engineer will schedule televising by City forces. Sanitary sewers will generally not be televised until the bituminous base has been placed and the castings are set to final grade.

## **1014.7 Detailed Stage Inspections**

The Engineer shall notify the City Engineer 48 hours prior to “stage inspections.” The inspections will be performed in the presence of the Contractor, the project Consulting Engineer, and Public Works Department personnel. Inspections shall be performed at the following construction stages, unless otherwise indicated in the Contract. Submit the required material test reports to the City Engineer prior to or at the respective “stage inspection.” Any areas failing the stage inspection must be corrected and re-tested for compliance prior to re-inspection.

- 1 Subgrade Preparation: Visual inspection of soils and conditions. Test rolling – one pass of a 7 ton per axle vehicle in each travel lane and parking lanes; one wheel shall be within the curb section during the parking lane pass. Prior to the inspection, submit test results to the City Engineer for utility trench compaction, embankment compaction, and subgrade compaction.
- 2 Aggregate Base: Test roll according to Mn/DOT 2111. Prior to the inspection, submit test results for aggregate quality, aggregate gradation, and aggregate compaction. Submit bituminous trial mix design to the City Engineer prior to paving.
  - Yield calculations are required for aggregate base. Use 135 pounds per cubic foot for aggregate base. Calculations must be submitted to Public Works prior to placing bituminous base.
- 3 Prior to Paving: Visual inspection or survey verification that catch basins and other underground utilities are placed in the correct location such that castings are within City of Rochester’s allowed horizontal and vertical tolerances. All necessary adjustments should be completed prior to paving.

- 4 Bituminous Base and Concrete Curb & Gutter: Visual inspection for settling and cracking. Prior to the inspection, submit test results for concrete tests of the curb, bituminous mix design (prior to paving), aggregate quality, and compaction.
  - Bituminous pavement material shall be tested in accordance with the Mn/DOT Schedule of Materials Control. Except, bituminous pavement shall be cored for all projects with bituminous quantities exceeding 100 tons
- 5 Grading: Visual inspection of site grading, consistent with provisions of City of Rochester Code of Ordinances, Section 4-1-3. - Additional provisions. Prior to inspection submit lot elevations at property corners for Public Works review of vertical and horizontal elevations.

The City's approval of various stages of the project work shall not constitute an acceptance of the work or the project, and the contractor shall be liable for defects due to faulty construction until the entire work under the Contract or City-Owner Contract is finally accepted by the City as stipulated in the Contract or City-Owner Contract. The Engineer / Inspector shall document all inspections. These documents shall be made available to Public Works upon request.

## **1014.8 Pavement Quality Assurance using Cores**

The Engineer shall notify the City Engineer 48 hours prior to "coring." The work will be performed in the presence of the Contractor, the project Consulting Engineer, and Public Works Department personnel. Samples shall be taken on all Collector and Arterial Streets, and Commercial Subdivisions at a rate of 1 / 500 ft Block. Core measurements shall be reported for each pavement design material.

If any core thickness measurement shows a thickness deficiency greater than plan thickness minus 1/2 inch, consider the pavement defective and must be corrected, as determined by the City Engineer, between acceptable cores and re-tested for compliance. Submit the required test reports to the City Engineer.

## **1014.9 Acceptance**

### **A. Project Construction Record**

Submit to the City Engineer the Project Construction Record, the material (e.g. pipe) certifications, material test results for bituminous wear course, and any other items listed in the Project Construction Record not previously submitted.

### **B. Engineer's Certification of Acceptance**

After all Contract construction is complete including corrective work identified by the Engineer, submit the Engineer's Certification of Acceptance, with Part 1 complete, to the City Engineer. The City will schedule with the Engineer a joint inspection of the project and either:

- process the initial acceptance and commencement of the warranty period (Part 2 of the form), or
- return the Engineer's Certification with instructions for corrections in the work.

- 

## C. Record Drawings

Electronic record drawings shall be submitted as outlined in section 1013.

## D. Warranty Work

Prior to the end of the two-year warranty, the City Engineer will inspect the project and provide instructions for corrections, if any. Notify the City Engineer when all corrections have been made.

## E. Final Acceptance

Upon expiration of the warranty and completion of all corrections, the City Engineer will process Final Acceptance (Part 3 of the Engineer's Certificate of Acceptance) and provide a copy to the Owner, Contractor, and Engineer.

# 1015 Schedule of Materials Control

## 1015.1 General

The table below outlines the minimum required rate of sampling and testing for major construction items:

<b>Material</b>	<b>Spec. No.</b>	<b>Minimum Required acceptance Testing</b>	<b>Test Taken</b>
<b>Backfill Materials</b>	<b>T100, C150</b>	<b>1 / Source</b>	<b>Gradation</b>
<b>Embankment</b>	<b>2106</b>	<b>1 / 1000 cu yds (CV)</b>	<b>Moisture, Relative Density</b>
<b>Subgrade</b>	<b>2112</b>	<b>1 / 500' Block</b>	<b>Moisture, Relative Density</b>
<b>Longitudinal Trenching</b>	<b>T100, C150</b>	<b>1 / 300 ft/ 2' depth</b>	<b>Moisture, Relative Density</b>
<b>Transverse Trenching</b>	<b>T100, C150</b>	<b>1 / 2 trenches / 2' depth</b>	<b>Moisture, Relative Density</b>
<b>Aggregate Base</b>	<b>2211, 3138</b>	<b>1 / Source</b>	<b>Quality (LAR, Insoluble Residue)</b>
<b>Mixtures</b>	<b>2211, 3138</b>	<b>1 / 1000 ton or 500 cu yd (CV)</b>	<b>Gradation</b>
<b>Compaction</b>	<b>2211, 3138</b>	<b>1 / 500 ft Block</b>	<b>Relative Density</b>
<b>Bituminous Materials</b>	<b>2360(current version)</b>	<b>Use Mn/DOT Job-Mix-Formula</b>	<b>Proof roll prior to placement</b>
<b>Aggregates</b>		<b>1 / Mixture Blend</b>	<b>Gradation</b>
<b>Aggregates</b>		<b>1 / Aggregate Type</b>	<b>Quality (LAR, Mag. Sulfate, Insoluble Residue)</b>
<b>Mixtures</b>		<b>1 / Mixture Blend/Day</b>	<b>Extraction/Gradation</b>
<b>Mixtures</b>		<b>1 / Mixture Blend/Day</b>	<b>(% Air Voids)</b>
<b>Compaction</b>		<b>1 / 500 ft Block</b>	<b>Modified Specified Density</b>
<b>Concrete</b>		<b>Use Mn/DOT Mix-Proportions</b>	<b>Proof roll prior to placement</b>
<b>Aggregates</b>	<b>3126, 3137</b>	<b>1 / Source / Day1 / Source</b>	<b>Gradation, Quality (LAR), Mag. Sulfate</b>
<b>Air Content</b>		<b>1 / 100 cu yd/ Day</b>	<b>(% Air Voids)</b>
<b>Slump</b>		<b>1 / 100 cu yd/ Day</b>	<b>Inches</b>

<b>Cylinders</b>		<b>3 per 300 cu yd/day</b>	<b>Compression (psi)</b>
------------------	--	----------------------------	--------------------------

All test reports are to be delivered to the City of Rochester Public Works Department.