Adopted by the Forest Lake City Council on April 13, 2020.

It is the intent that these Engineering Standards supersede any prior standards adopted by the City of Forest Lake.
The purpose of these Public Works / Engineering Standards is to provide consistency in the level of detail required for the submittal of plans for preliminary plat approval, plan preparation guidelines for public improvements, and to provide the applicant detailed product material and construction requirements.

The City Council reviews and adopts these standards on an annual basis, and the City of Forest Lake reserves the right to amend the requirements herein, as it may apply to various site conditions.
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Sanitary Sewer and Water Works Rates/Charges

1. Water System Area Charges include distribution system expansion and related costs associated with the extension of the trunk water distribution system required for community growth. The charges are determined from the comprehensive water system plan adopted by the City.

2. Sanitary Sewer Area Charges include facilities and related costs associated with the expansion of the sanitary sewer system due to community growth. The charges are determined from the comprehensive Sanitary Sewer plan adopted by the City. The area charges have been established to recover costs associated with extension of trunk sanitary sewer, 12” in diameter and larger.

3. Metropolitan Council Sewer Availably Charge (SAC) is a one-time fee to customers for each new connection or increase in capacity demand of the Metropolitan Disposal System.

4. City Water Availability Charge (WAC) is a water system connection charge established to recover costs associated with the construction, reconstruction, maintenance or expansion of the water supply, treatment, distribution and storage facilities required to provide water service. The fee is determined from the Comprehensive water system plan adopted by the City.

5. City Sanitary Sewer Core Fee (SAC) is a sanitary sewer system connection charge established to recover costs associated with the maintenance, construction, reconstruction and expansion, of sanitary sewer system including but not limited to lift stations, SCADA system expansion, stand-by power systems, pump upgrades, and related improvements.
Project Acceptance Forms
Project Acceptance Form

Project Name: ______________________________

CITY OF FOREST LAKE

Project No.________________________

Recommendation for Acceptance

This project included sanitary sewer, water main, storm sewer and street improvements. The improvements were installed as a private [public] improvement project based on plans and specifications prepared by the Owner’s [City’s] Engineer. The majority of the work was completed in 20(xx)

This project was constructed in general conformance with standard policy and procedures of the City of Forest Lake. The work is complete and in general conformance with the plans and specifications. Therefore this project is recommended for formal acceptance by the City Council for perpetual maintenance.

_________________________________________ Date:_____________

City Engineer

_________________________________________ Date:_____________

Public Works Director

_________________________________________ Date:_____________

Finance Director

_________________________________________ Date:_____________

Zoning Administrator

_________________________________________ Date:_____________

City Administrator

_________________________________________ Date:_____________

Parks & Recreation Coordinator

_________________________________________ Date:_____________

Resident Project Representative

City Council Acceptance Date:_______________
Project Acceptance Form

Project Name: ________________________________

CITY OF FOREST LAKE
Project No. ____________________

Recommendation for Acceptance

This project included a building, sanitary sewer service, water main service, storm sewer and street improvements. The improvements were installed as a private improvement project based on plans and specifications prepared by the Owner’s Engineer. The majority of the work was completed in 20(xx).

This project was constructed in general conformance with standard policy and procedures of the City of Forest Lake. The work is complete and in general conformance with the plans and specifications. Therefore this project is recommended for formal acceptance by the City Council for perpetual maintenance.

City Engineer/Resident Project Representative  Date:______________

Public Works Director  Date:______________

Finance Director  Date:______________

Zoning Administrator  Date:______________

City Administrator  Date:______________

Building Official  Date:______________

Fire Inspector  Date:______________

Parks & Recreation Coordinator  Date:______________

City Council Acceptance Date:______________
Engineering Design Standards

General Requirements

As set forth in various sections of the City ordinances, Developers of property within the City of Forest Lake are required to submit certain plans and specifications for review and approval by the City. These include, but are not limited to items such as grading plans, drainage plans, topographic surveys, plats, street and utility plans and specifications. Competent licensed professionals shall prepare these plans and specifications.

The professional services required of the Developer might include an architect, land surveyor, planner, wetland specialist and engineer. “Project Engineer” in this document refers to a Professional Engineer registered in the State of Minnesota hired by the Developer. The Project Engineer responsibilities include not only preparation of plans and specifications, but also construction coordination with the City’s Resident Project Representative.

Whenever public improvements or other conditions of approval are required with an approved development, a contract (Development Contract) is required between the Developer/property owner and the City. This contract guarantees the City that all requirements will be satisfactorily completed by the Developer. Within the development contract, the Developer has a choice in determining how the required improvements will be handled. The Developer can either construct and finance the improvements or request that they be installed under a public improvement project, if approved by the City Council.

Developer Installed Public Improvements

If the Developer chooses to install required public improvements within the development, the following procedures shall be followed:

a. The Developer shall submit plans, specifications and copies of all design calculations to the City for review and approval. The developer shall submit 5 paper copies and an electronic copy in AutoCAD’s DWG file format and PDF format, of the approved plans/construction documents. These plans are to be prepared by a Registered Professional Engineer and shall be in accordance with City standards as outlined herein.

b. The City’s comprehensive plans for sanitary sewer, water, storm drainage and thoroughfare plans shall be adhered to in design considerations. All sanitary sewer and water main testing shall be completed and copies of service ties submitted to the City prior to issuance of any service connection permits.

c. The Developer shall submit a Grading, Drainage and Erosion/Sediment Control Plan to the City for review and approval. No work is to begin until all erosion and sediment control methods are in place and approved by the City. All project operations must comply with the City’s Erosion Control Ordinance and all applicable permits.
d. The Developer shall provide proper notification of improvements to the responsible governmental agencies, watershed districts, etc. affected by said construction. All necessary permits shall be obtained by the Developer and copies provided to the City prior to commencing any work. All special requirements of the responsible agencies shall be complied with.

e. The contractor shall submit a list of suppliers as well as all certification tests of materials that will be used on the project to the City at the “Pre-construction” meeting.

f. Any changes to the approved plans and specifications shall be approved by the City in writing before changes are made in the field.

g. The City will provide inspections of public improvement work and shall be notified 24 hours in advance of all scheduled tests so its representatives can be present at the time tests are performed. The required tests will cover the sanitary sewer, water main, storm sewer, street subgrade, bituminous base course, bituminous wear course, concrete sidewalk, bituminous trail and curb and gutter.

h. Upon completion of all the utility and road work required on both the public and private portions of the project, the City will make the required final inspections of all work. This includes a final inspection of all site grading and approval by the City before any building permits will be issued. Before the final payment is made to the contractor by the Developer, the City shall be satisfied that all work is satisfactorily completed in accordance with the approved plans and specifications, and the Project Engineer submit a written statement attesting to same.

i. Acceptance of said work shall be made by the City and the project acceptance for signed by all parties.

**Private Improvements**

If private drives or utilities are included in a development the following procedures are required.

a. The design cross section of private drives shall be in accordance with the public street design requirements or approved by the City.

b. Whenever practical, public sewer and water lines shall not be placed under private drives. A twenty (20) foot utility and drainage easement will be required for any public utilities that are not constructed within the public street right-of-way.
c. Private utility installation requires a permit from the City and will be required to meet all applicable City Standards as determined by the City and/or Building Official.

d. The entrance to each private drive must include design features that clearly differentiate it from a public street such as concrete apron.

e. Private small utilities shall be installed per standard details GEN-1 of the City Standard Details. Junction boxes shall not be installed on property lines that have public utilities installed under them.
**Product/Material Requirements**

The following list of items provides product material requirements for development projects in the City of Forest Lake. The product material requirements have been established and adopted by the City to provide consistency in the materials installed for sanitary sewer, water main, storm sewer, and streets. Consistent material product requirements identify items that are consistent with today’s engineering and construction practices, and provide for consistent maintenance practices.

**Sanitary Sewer Materials**

- **Main Pipe**
  - Material .......................................................... PVC
  - Class
    - Depth to 18 feet .............................................. SDR 35
    - Depth 18 feet to 26 feet ..................................... SDR 26
    - Depth > 26 feet .............................................. as required by Engineer

- **Manhole**
  - Type .......................................................... Precast Concrete conforming to ASTM C478
  - Install rubber gasket joint forming watertight seal conforming to ASTM C443
  - Wrap each MH barrel joint with 12” mastic seal or ram-tek in barrel joint
  - Type of Casting .............................................. R-1642-B Stamped “Sanitary Sewer”
    - With two concealed pick holes and self-sealing lids
  - Outside drop Material ....................................... PVC DR 18
  - HDPE adjustment rings ..................................... 2 minimum, 8” height maximum
    - Set bottom ring in mortar, glue remaining rings
    - Wrap exterior of rings with geotextile fabric

- **Service Pipe**
  - Residential
    - Size .......................................................... 4 inch
    - Material .......................................................... PVC
    - Class .......................................................... Schedule 40
  - Commercial .................................................. 6 inch (connect to manhole)
    - Size .......................................................... 6 inch
    - Material .......................................................... PVC
    - Class .......................................................... SDR 26, 150 psi pressure rating ASTM 2241
  - Risers. .......................................................... same requirements as service pipe

- **Cleanout**
  - Material .......................................................... PVC
  - Class .......................................................... SDR 26 or schedule 40, 150 psi pressure rating ASTM 2241
**Water Main Materials**

- **Main Pipe**
  - Material ................................................................. PVC C-900 (4” to 12”), DR-18
  - Directional Drill ......................................................... Fusible C900 (4” to 12”), DR-18
  - Fittings ................................................................. DIP, Epoxy Coated, U.S. Manufacture
  - Valve ................................................................. Cor-Blue
  - Restraints ................................................................. Mega-Lug
  - Tracer wire........... Copperhead 12 gauge copper clad steel – 30V rating, insulated

- **Hydrant**
  - Type ................................................................. Waterous Pacer WB-67
  - Operating Rod ......................................................... Heavy Duty
  - Body bolts ............................................................. Stainless Steel
  - Tracer Wire Access Box ........................................ Magnetized Tracer Box
    - Snake Pit Magnetized Tracer Box by Copperhead Industries,
      Concrete/Driveway Tracer Box Model, or approved equal

- **Valves**
  - Type 12” or less ........................................ Resilient Wedge Gate Valve (AWWA C515)
    14” or greater ................................................... Butterfly Valve (AWWA C504)
  - Manufacturer: Waterous, American Flow Control 2500 Series or approved equal
  - Valve Box .......... 4” through 12” – Ductile Iron Star VBGHD-DI or approved equal
  - Bottom Bell section .......... 4” through 12” Power Seal Ductile Iron Box
  - Gate Valve Box Adaptor Plate .......................... ¾” Steel w/protective coating
    by Adaptor, Inc. or approved equal
  - Valve Body Bolts ................................................... Stainless Steel
  - Extension Rod (single piece steel) .... Top Nut – 12”-18” below finished surface

- **Residential Service Pipe**
  - Service Size ................................................................. 1” Diameter
  - Service Material......Type “K” Copper or Polyethylene Plastic pipe (CTS-SDR-11)
  - Service Saddles ......................................................... Smith-Blair 372 or approved equal
  - Fused saddles for HDPE water main
  - Type of Corporation Stop ....... Mueller ball valve. H-25000 or approved equal
  - Type of Curb Stop ...................... Mueller ball valve H-25154 or approved equal
  - Type of Curb Box............................... Mueller H-10300 or approved equal
  - Pigtail Length ................................................................. 10 feet with crimped end
  - Tracer wire........... Copperhead 1230 copper clad steel – 30V rating, insulated, blue
  - Casting for curb box in paved area ........... Neenah R-1914-A or approved equal

- **Irrigation Service Pipe**
  - Service size ................................................................. 4” Diameter extending to the property line
  - Service Material..................................................... Class 52 DIP (poly wrapped), or PVC C-900
  - Standard City Gate Valve at lateral main tee connection
**Storm Sewer Materials**

- **Main Pipe**
  - Material .......................................................... RCP Only
  - Depth and Class .................................................. Varies
  - Culvert Material ............................................. CMP (rural driveway only) / RCP (street crossing)

- **Manhole**
  - Type ............................................................ Precast Concrete conforming to ASTM C478
  - HDPE Adjustment Rings .................................. 2 minimum, 8” height maximum
  - ............................................................. Set bottom ring in mortar, glue remaining rings
  - ............................................................. Wrap exterior of rings with geotextile fabric
  - Minimum MH depth ........................................ 4 feet
  - Sump Depth .................................................... 4 feet
  - Type of Casting .............................................. R-1642-B, Stamped “Storm Sewer”

- **Catch Basin**
  - Type ............................................................ Precast Concrete conforming to ASTM C478
  - HDPE Adjustment Rings .................................. 2 minimum, 8” height maximum
  - ............................................................. Set bottom ring in mortar, glue remaining rings
  - ............................................................. Wrap exterior of rings with geotextile fabric
  - Minimum CB Depth to Invert ............................ 3.5 feet
  - Sump Depth .................................................... 4’ in CB upstream of pond
  - Type of Casting – Curb Inlet ............................. Neenah R-3067-V
  - Type of Casting – off-street drop inlet ............. Neenah R-4342

**Street Materials**

- **Street Section (Residential)**
  - Geotextile Fabric ........................................... Mn/DOT Type V, Non-Woven
  - Subbase ......................................................... 20” Select Granular - Modified
  - Base ............................................................... 10” Aggregate Base, Cl. 5
  - Bit. Wear Course .. 4 inches – 2” SPWEA330C Wearing Course Mixture (Final Lift)
  - 2” SPWEB330C Wearing Course Mixture (Initial Lift)
  - Draintile ......................................................... 4” HDPE perforated with filter sock

- **Street Section (Commercial)**
  - Geotextile Fabric ........................................... Mn/DOT Type V, Non-Woven
  - Subbase ......................................................... 20” Select Granular - Modified
  - Base ............................................................... 10” Aggregate Base, Cl. 5
  - Bit. Wear Course ........................................... SPWEA330C Wearing Course Mixture (Final Lift)
  - Bit Base Course ............................................. SPNWB330C Wearing Course Mixture (Initial Lift)
  - Draintile ......................................................... 4” HDPE perforated with filter sock
  - Commercial Pavement. Thickness ................. varies

- **Shoulder**
  - Material ......................................................... 4”, Cl. 2 or Cl. 5 – recycled
• Boulevard
  - Sod ..............................................................salt resistant, type lawn
  - Seed ..........................................................MNDOT 3876 for appropriate application
  - Topsoil .......................................................... Residential ................................ Boulevard Topsoil Borrow (MnDOT 3877-F)
...............Commercial ................................ Boulevard Topsoil Borrow (MnDOT 3877-F)
...............Rural .............................................Loam Topsoil Borrow (MnDOT 3877-B)
  - Fertilizer ..........................................................Type 3 (MnDOT 3884)

• Curb
  - Mix Design (machine/hand formed).......................... MnDOT 3F32C / 3F52C
  - Type – Residential Reconstruction ........................ Surmountable/B618
  - Type – New Residential Developments ...................... Surmountable/ B618
  - Type – Commercial ................................................

• Street Name Signs
  Multi lane – Speed limits 40mph and greater ..................12” plates
  - Lettering ........................................................ 8” upper case, 6” lower case
  Multi lane – Speed limits less than 40 mph and all 2-Lane ............9” plates
  - Lettering ........................................................ 6” upper case, 4” lower case
  Private Streets ................................................. White lettering on blue background
  Public Streets ................................................... White lettering on green background
  No Outlet ......................................................... Black lettering on yellow background
  Reflective sheeting ............................................. Diamond grade DG3

Sidewalk / Trail / Fire Department Access Lane Materials

• Sidewalk Section
  - Base .........................................................6 inch Aggregate, Cl. 5 (7 feet min. width)
  - Concrete ..........................................................6 inch – Mn/DOT 3F52A
  - Width (min) ......................................................6 feet

• Detectable Warning Plates ......................................Gray Iron, ASTM A-48, Class 30B
  - Thickness (min) ..................................................5/16”
  - Color ..............................................................Unpainted

• Trail Section
  - Base .........................................................6 inch Aggregate, Cl. 5 (12 feet min. width)
  - Bituminous Wear Course .....................................3” – SPWEA230B Wearing Course
  - Width (min) ......................................................10 feet

• Fire Department Access Lane Section
  - Min. 85,000 lb load carrying capacity (Design approval req’d by City Engineer)
  - Subgrade and aggregate base compaction testing required
  - Geotextile Fabric (as required by engineer) ...............Mn/DOT Type V, Non-Woven
  - Subbase ........................................................minimum 12” Select Granular Modified
(or as required by the soils engineer)
- Base (bituminous section) .................................................. 10” Aggregate Cl. 5
  (option: gravel shoulder section) ................................. 14” Aggregate Cl. 5
- Bituminous Wear Course (SPWEA330C) (Final Lift) ......................... 2”
- Bituminous Wear Course (SPWEB330C) (Initial Lift) ........................... 2”
- Option: Gravel Shoulders (in addition to Base Aggregate) .................... 4”
Design Requirements

The following list of items provides engineering design requirements for development projects in the City of Forest Lake. The requirements have been established and adopted by the City to provide consistency with today’s engineering and construction practices.

Sanitary Sewer Design Requirements

- Manhole
  - Maximum Manhole Spacing ................................................................. 400 feet
  - Maximum inlet/outlet elevation difference ........................................... 2 feet
  - Minimum depth of Manhole.............................................................. 10 feet
  - Outside drop .................................................................................. 2.0 feet minimum

- Service
  - Extend from mainline pipe to 10 feet past property line

- Cleanout (BY PLUMBER)
  - 8’ bury at property line
  - Maximum length between cleanouts ............................................... 75 feet

Water Main Design Requirements

- Main Pipe
  - Minimum diameter ........................................................................... 8”
  - Maximum Length of Dead Ends ....................................................... 600 feet
  - Air Release measures ...................................................................... Hydrant
  - Minimum Cover.................................................................................. 8 feet
  - Side of Street................................................................................... North and East side of centerline preferred

- Hydrant
  - Depth ............................................................................................... 8’-6” Bury (8 feet cover)
  - Spacing ............................................................................................ 250’R to cover Building Pad
  - Gate valve on 6” Hydrant leads (distance from center of hydrant)......... 3 feet
  - Supply two (2) Spring Mounted snow flags per hydrant. Install one on hydrant and deliver the other one to the City.

- Valves
  - Maximum distance between Valves on Trunk Mains ......................... 600 feet
  - Maximum No. house services between Valves on Lateral Mains......... 20

- Residential Service Pipe
  - No splices in services are allowed

- Irrigation Service Pipe
  - Minimum diameter ........................................................................... 4”
**Storm Sewer Design Requirements**

- **Main Pipe**
  - Minimum pipe diameter ................................................................. 12”
  - Minimum culvert size ................................................................. 15”
  - Minimum culvert length .................................................................. 24 feet
  - Maximum culvert length .............................................................. (residential) 30 feet
  - Apron and Trash Guard requirements ............................................ Aprons on All Culverts
    .............................................................. Trash guards on 24” and greater aprons

- **Manhole**
  - Must meet storm design criteria for specific project

- **Catch Basin**
  - Minimum pipe cover ................................................................. 2 feet
  - Sumps ........................................................................ 3’ in last CB in street upstream of pond

- **Design**
  - Design frequency of storms ....................................................... 10 yr.
  - Minimum storm sewer design velocity ....................................... 3 fps
  - Design frequency for detention basins ........................................ 100 yr.
  - Low Opening elevation .............................................................. 2.0 feet higher than 100yr. HWL
  - Emergency overflow swale below building openings ..................... 1.0 foot
  - Maximum basin side slope ......................................................... 3:1
  - Minimum detention basin depth ............................................... 4.0 feet
  - Maximum detention basin depth .................................................. 10.0 feet
  - Minimum swale grade ............................................................... 2.0%

**Street Design Requirements**

- **Street Width and Rights-of-way**


Street Width shall be as indicated on the Street Comprehensive Plan, Capital Improvement Plan, and Municipal State Aid Needs Report.

- **Collector Streets** – 70 foot Rights-of-way
  - Width ................... face to face 44’ (two 12’ through lanes with 10’ shoulders)
  - Width can increase to accommodate four through lanes upon traffic analysis.

- **Residential Public (Minor) Streets** – 60 foot Rights-of-way
  - Width
    - face to face ........................................................................ 32’ (Residential)
    - face to face .................................................. 30’ (on approved cul-de-sacs and low volume streets)
    - face to face ....................................................................... varies (Commercial)
**Streets with Medians** – 80 foot Rights-of-way
- 10 foot maximum median width
- 20 foot minimum lane width

**Cul-de-sac**
Radius ..........................................................60 foot rights-of-way
-face to face.............................................................. 50’ (Residential)
-face to face.............................................................. varies (Commercial)

**Private Streets**
-Width
- face to face.........................................................32’ with parking on both sides (Residential)
- face to face.........................................................28’ with parking on one side (Residential)

**Private Drives** - Shared
-face to face.............................................................. 22’ with no parking (Residential)
-Maximum Length ......................................................... 225 feet

- Street Section (Residential)

  The Standard Street Section shall meet the requirements of City Detail STR-22A for urban streets
  Drainage is required behind curb, for a minimum of 50’ each way from Catch Basins

- Street Section (Rural)

  The Standard Street Section shall meet the requirements of City Detail STR-22 for rural streets

- Street Section (Commercial)

  The Standard Street Sections will vary

- Boulevard
  -Width .varies
  -Sidewalk Width ......................................................... 6 feet
  -Bituminous Trail Width ........................................... 10 feet

- Entrances (Single family residential)
  -Driveway – Width......................................................... Minimum – 12 feet
  ................................................................. Maximum – 30 feet
  ......................................................... Cul-de-sac widths to be reviewed by City Staff for approval
  ..................................... ....All driveways are to meet minimum side yard setbacks - 5 feet
  - Driveway location......................... 50 feet from the curb of an intersecting street
  - One access per Residential Property
  - Maximum driveway slope 10%
- Secondary Access (if approved by City)
  - A secondary access may be allowed, as determined by the City, for the
    purpose of accessing a detached accessory structure used for storing
    a vehicle, camper, boat, or similar.
  - Secondary access at the public right-of-way is restricted to a width of
    12 feet (minimum and maximum width).
  - A concrete driveway apron per Engineering Standards is required at all
    secondary access points.
  - Secondary access must be setback a minimum of 5 feet from side or
    rear property line.
  - Secondary access must be located at least 50 feet from the curb of an
    intersecting street.
  - The City reserves the right to restrict a secondary access because of
    safety issues.
  - Each secondary access request will be reviewed on an individual basis
    and Engineering and City Staff will grant final approval.

• Commercial Entrances
  - Driveway width ................................................................. 32 feet
  - Driveway widths greater than 32 feet requires engineering approval
  - Driveway location requires engineering approval
  - Maximum driveway slope 10%

• Fire Department Access Lane (Buildings up to 24’ high)
  - Width ................................................................. (option: 10’ bituminous with 5’ gravel shoulders)  20 feet
  - Minimum inner radius .......................................................... 30 feet
  - Minimum outer radius .......................................................... 50 feet
  - Crown ................................................................. maximum 2.0%
  - Minimum percent of grade .......................................................... 0.5%
  - Maximum percent of grade .......................................................... 5.0%
  - Distance from building to centerline of Access Lane
    - Minimum ................................................................. 25 feet
    - Maximum ................................................................. 150 feet
  - Unobstructed Vertical Clearance .......................................................... 13’-6”
  - Maximum length dead end Access Lane .................................................. 150 feet
    (City approved turn around required if length exceeds 150 feet)
  - The alignment of the Access Lane must be approved by the City and may be
    modified to match the circumstances and capabilities of the fire department.
  - Signage (Fire Dept. approval required)........................................ within 20’ of every entrance

• Fire Department Access Lane (Buildings over 24’ high)
  - Width ................................................................. Option: 10’ bituminous with 5’ gravel shoulders)  20 feet
  - Minimum inner radius .......................................................... 30 feet
  - Minimum outer radius .......................................................... 50 feet
  - Crown ................................................................. maximum 2.0%
- Minimum percent of grade ........................................................... 0.5%
- Maximum percent of grade ......................................................... 5.0%
- Distance from building to centerline of Access Lane ....................
  - Minimum ................................................................. 25 feet
  - Maximum ................................................................. 65 feet
- Unobstructed Vertical Clearance .............................................. 13’-6”
- Maximum length dead end Access Lane .................................... 150 feet
  ..........(City approved turn around required if length exceeds 150 feet)
- The alignment of the Access Lane must be approved by the City and may be
  modified to match the circumstances and capabilities of the fire department.
- At least one Access Lane must be positioned parallel to the building along the
  entire length of the building.
- Overhead power and utility lines are not allowed within the Access Lane.
- Signage (Fire Dept. approval required)..................................within 20’ of every entrance

• Street Miscellaneous
  - Crown ............................................................... 2.5% Urban sections and 3.0% on Rural sections
  - Minimum percent of grade .................................................. 0.5%
  - Maximum approach grade at intersection for 50’ distance .............. 2.0%
  - Maximum percent of grade .................................................. 6.0%
  - Diameter of Cul-de-sac (no islands allowed) ................................ 100 feet
  - Minimum % of grade around Cul-de-sac Curb Flow line ................. 0.5%
  - Minimum intersection radii for local and Arterial streets .............. 20 feet
  - Maximum length of Cul-de-sac ........................................... 600 feet Urban Development
  ............................................................................................................ Varies for Rural Development
  - Minimum Radius for Cul-de-sac return required .......................... 30 feet
  - Temporary Cul-de-sac at plat line ........................................... yes

• Horizontal Street Alignment

  When a horizontal street centerline deflection at any one point is more than
  10 degrees, a horizontal curve shall be introduced into the alignment with radius no
  less than 100 feet in length.

  Street “jogs” or offsets shall be spaced at least 250 feet, centerline of street to
  centerline of street for minor streets. Collector street intersections shall not be offset.

  Intersecting streets shall have centerlines that intersect at a single point, with the
  angle between the intersecting street centerlines of no less than 80 degrees and no
  more than 100 degrees. 90 degree intersections are preferred.

• Vertical Street Alignment

  Vertical street centerline alignment with different connecting gradients shall be
  connected with vertical curves. Minimum length, in feet, of these vertical curves shall
  be thirty (30) times the algebraic difference in the percent of grade of the two
  adjacent slopes.
• Sign requirements

• Mailbox requirements ........................................ Cluster Mailboxes, 8 to 16 per location
  - 4” thick concrete slab at each cluster mailbox location
  - Swing away post as per detail Gen-2 for single boxes
  - COORDINATE LOCATIONS AND BOX ACCEPTABLITY WITH THE POSTMASTER

• Private Utilities
  All private utilities, including gas, electric, telephone, and cable television are to be constructed in a joint trench in accordance with City Detail GEN-1. All street crossings by private utilities shall be made in 4” – 6” PVC conduits installed prior to street construction per City Detail GEN-2.
**Plan Requirements**

The following provides the project plan requirements for development projects in the Forest Lake, Minnesota. The requirements have been established and adopted by the City to provide consistency with today’s engineering and construction practices.

**General Plan Requirements:**

1. The maximum plan sheet size shall be 22” x 34”.
2. The electronic files must be submitted in both AutoCAD.DWG and PDF format.
3. The electronic AutoCAD file must have layered designations for various items and text as indicated by the table named Minimum Layering Requirements.
4. The intent of the layering requirements is to separate various items of the drawing. The general concept of the layering is to separate:
   a. Proposed features from existing features
   b. Proposed text labeling from existing text labeling
   c. Different utilities of the construction project
   d. Proposed lateral and trunk features from utility services
5. Additional layering from that indicated by the Minimum Layering Requirements may be needed, and can be completed based on specific project needs.
6. All electronic files must be accompanied by a “layer description list” that clearly identifies the elements of each layer or level.
7. Horizontal control of the plans must be on Washington County Coordinate System.
8. Vertical control of the Plans must be on the City’s Benchmark System.
9. All sheets shall include bar scale(s), north arrows, headings, and sheet numbers, match lines and text, and sheet references.
10. Where practical, north shall be orientated up and to the right or somewhere in between the two on the plan sheet.

<table>
<thead>
<tr>
<th>Minimum Layering Requirements</th>
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<td>Individual layers shall be used to differentiate between existing, proposed and future, if applicable, for elements noted.</td>
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<tr>
<td>Annotation</td>
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<tr>
<td>Topographic Survey</td>
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<tr>
<td>- Each individual differential element shall have its own layer (i.e. curb back, curb face, curb lip, bituminous edge, gravel edge, top of slope, bottom of slope, existing utilities, etc.)</td>
</tr>
</tbody>
</table>
- Line types shall be used to differentiate between linear elements

**Removals**
- Hatching, Shading
- Removal Pipe (separate into different utilities)
- Removal Structures (separate into different utilities)

**Grading Elements**
- Contours
- Contour Labels
- Slope Labels and Spot Elevations
- Annotation relating to grading elements

**Sanitary Sewer**
- Structures (Manholes and clean outs)
- Pipe
- Services
- Annotation relating to sanitary sewer elements

**Water Main**
- Water Main
- Hydrants
- Valves
- Services
- Annotation relating to water main elements

**Storm Sewer**
- Structures (Catch Basins, Manholes, Outlet Structures, Flared End Sections)
- Pipe
- Draintile
- Annotation relating to storm sewer elements

**Streets**
- Street Centerline
- Curb
- Surface edges (concrete, bituminous, gravel, etc.)
- Annotation relating to street elements

As noted previously, additional layering is encouraged. However, placing similar items on multiple layers is not acceptable.

**Construction Plans:**

**Base Drawings**: Individual base drawings shall be utilized at a minimum to differentiate between the existing and proposed elements to a project. The base drawing shall be in Washington County coordinates and referenced into the individual construction plan sheets. The base drawings should NOT include annotation relating to the project work and should be put into the individual plan sheets where it is most appropriate.
Title Sheet – Includes a vicinity map, a plan sheet index, and identifies type of improvement.

Legend, Typical Section Plan - Standard symbology, linework, and hatching to be used throughout the plan. Storm sewer schedule and general notes can be located on this plan sheet. Typical Sections shall be drawn to scale.

Location Plan – The location plan shall include all right-of-way lines, property lines, and easements. All existing and proposed sanitary, water, storm lines, and structures. Structure labels shall be included on this sheet. Street names, addresses, lot and block numbers, and adjacent subdivision names (if applicable) shall be labeled.

Demolition Plan – Clearly show all existing sewer, water, storm sewer lines, manholes and valves, curb lines, pavement, sidewalks and pathways. Limits of removals shall be clearly noted. Provide a legend if necessary.

Site Grading And Drainage Plan - Show and label existing and proposed contours. Label slopes, provide spot elevations, and provide dimensions necessary for construction. Show building pads with building location. Define location of house and garage. Indicate NWL and 100-year HWL, low floor elevations, and emergency overflow elevations.

Erosion Control Plans – These plans shall address both temporary and permanent erosion control needs for the project. Where sufficient both can be addressed on one sheet. The plan shall be adequate to represent a Stormwater Pollution Prevention Plan (SWPPP) as required by the NPDES Construction Permit. Show proposed storm sewer, grading and ponding improvements and indicate locations of concentrated surface flow. A legend shall be provided identified the proposed BMP’s.

Sanitary Sewer And Water Main Plan - This sheet is required for the construction of sanitary sewer, water main and services. Provide only relevant information to these utilities on these sheets. Plan and profile sheets shall contain both sanitary sewer and water main. All sanitary sewer and water main must be shown on both plan and profile views at 1”=50’ horizontal and 1”=10’ vertical scales. All storm sewer on the same streets should be shown in shaded line work on the sanitary sewer/water main plan and profiles. The plan view for these sheets should also indicate locations of the existing utilities, public and private.

Sanitary Sewer:

Plan View

Include lot and block numbers, street names, addresses, adjoining development names, structure labels, size of sanitary sewer main (proposed and existing), pipe stationing, wye stationing, sewer service invert elevation, riser lengths, easement dimensions and all construction notes. Direction of flow shall be shown in plan view, typically with the line type. Match points shall reference the proper sheets.

Profile View

Structure labels, manhole sewer station*, rim and pipe invert elevations to the nearest hundredth of a foot, length of pipe between manholes, diameter of pipe, material or class of pipe, slope of pipe labeled in percent of grade, length of riser pipe for any drop
manholes and service riser. All pipes that cross the sanitary sewer should be shown. Existing and design profile over the pipe shall be labeled.

Subsurface information pertinent to construction should also be shown, such as top of bedrock and ground water elevations, if known.

* Sewer baseline stationing shall begin at the downstream manhole and be continuous from manhole to manhole following the centerline of the pipe.

**Water Main:**

* **Plan View**

Lot, block numbers, street names, addresses, easement dimensions and adjoining development names. The water main size shall be labeled (example 6” WM, 12” WM). The water main should be dimensioned if located anywhere but on a lot line or parallel to the sanitary sewer. Each hydrant, valve, fitting, and special structure shall be labeled. The elevation to the top nut of the hydrants should be shown to the nearest tenth of a foot. The depth of cover over the water main should be shown. All match points should be referenced to the proper sheet or location on the same sheet.

* **Profile View**

The water main should be drawn at the appropriate depth, top and bottom of pipe. The size, material and class of pipe should be labeled. Any variations from the standard depth shall be noted. All other pipe crossings should be shown. Existing and design profile over the pipe shall be labeled.

**Services:**

For single-family residential areas, where the services are to be of a uniform size, a general note stating the size and material should be shown on each sheet. If the service sizes vary, each service must be noted with the proper size and location. The wye station, top of curb box, sewer service invert and top of riser elevation, if applicable, should be noted on the appropriate lot. Both the sanitary and water service lines should be shown on the plan from the main to the end of the service. Show and identify all irrigation services.

**Storm Sewer Plan** - The purpose of these sheets is for bidding, construction and record drawings of the storm sewer. Only information related to this utility is shown on these sheets. Sanitary sewer, water main and streets shall be shown as background in these sheets. Storm sewer pipes and structures are drawn in a base drawing. Sheets should reference in the base drawing and any other necessary sheets. The sheets should have annotation in them to include the following:

* **Plan View:**

Lot and block numbers, street names, addresses, adjoining development names, structure numbers, bends, aprons, rip rap, easement dimensions, and construction notes. Show and identify all storm sewer services. Show drainage arrows at all intersections. All match points should be referenced to the proper sheet or location on the same sheet.
Profile View:
Structure numbers, structure sewer station*, rim, pipe and sump invert elevations to the nearest hundredth of a foot, length of pipe between manholes or bends, diameter of pipe, material or class of pipe, slope of pipe labeled in percent of grade. All critical pipes that cross the storm sewer should be shown. Profiles need to be shown for all pipes, including catch basin leads. Sheets containing profiles only should be avoided. Plan/Profile sheets are preferred for ease of use. Subsurface information pertinent to construction should also be shown, such as top of bedrock and ground water elevations, if known.

*Sewer baseline stationing shall begin at the downstream structure and be continuous from structure to structure following the centerline of the pipe.

Street Plans - The purpose of these sheets is for bidding, construction and record drawings of the street improvements. Only information related to curb and gutter and street design is shown on these sheets. Sanitary manholes, water main valves, hydrants and storm sewer structures shall be shown on these sheets, but not the pipes. If private utility conduits are to be installed they will be shown on these sheets. Curb lines, sidewalks, trails and all other line work should be drawn in the base drawing. Sheets should reference in the base drawing or any other necessary sheets. The street sheets should have annotation in them, to include the following:

Plan View:
Lot and block numbers, street names, addresses, and adjoining development names. All match points should be referenced to the proper sheet or location on the same sheet. The centerline of each street should be stationed with a tick mark at every 50-foot station and stations labeled every 100 feet using a text height of 0.08”. Show the type of curb and gutter. Streets with curb and gutter should be labeled face-to-face (F-F). Sidewalks and or trails should be labeled indicating width and type. Radii at intersections need to be labeled. Top of curb elevations, along with the street stations, shall be shown at each begin and end radius at street intersections and around cul-de-sacs at 30° intervals. Show drainage arrows at all intersections. Include construction notes. Separate sheets for the cul-de-sac and intersections are necessary to include more detailed information.

Profile View:
The centerline stationing and elevation of each intersecting street should be shown on the profile. Finished centerline should be labeled every 50-foot station at a minimum. Existing centerline grades should be shown when the grading is part of the contract. Vertical curve information to include at a minimum the PVI station and elevation, high and low point station and elevation, and length of curve. Tangents should be labeled in percent of grade to the nearest one-hundredth of a percent.

Cul-De-Sac Street Improvements:
Include additional sheets for cul-de-sac streets. Label centerline, right-of-way, lot lines, easements, street stationing at beginning, end, PC, PT and even 100’ elevations. Label the size of radii, street and pathway width and type, lot and block numbers, intersecting streets. Show all of the utility structures, but not the pipes.
**Intersection Street Improvements:**

Create intersection details for all intersections. Label all begin and end radius points, mid radius if high or low point, show arrow indicating flow direction. Please note spot elevations should be edge of pavement/lip of curb.

**Cross Sections:**

Show right-of-way, centerline and any easement lines on each section. Show finished and existing ground lines, including finished and existing centerline grade. Sections are typically plotted at 50-foot stations and any critical station. Grading slopes (3:1, 4:1, etc.) and dimensions should be labeled on each section when they vary from the typical section. Cumulative average end area excavation and embankment volumes should be shown. Use a 1"=10' horizontal and 1"=5' vertical scale when plotting cross sections (This will present them at a 1"=20' H and 1"=10' V at half scale). When earthwork quantities are shown, specify if a shrinkage factor was used and if so, identify it.

**Standard Details** - The purpose of these sheets is to show the standard details that are pertinent to the construction of the project.

**Traffic Signs And Pavement Markings** - The purpose of these sheets is for bidding, construction and record drawings of the traffic signs and pavement markings. Only information related to these items is shown on these sheets.

Blocks representing traffic signs, street name signs and traffic markings should be placed in the traffic base drawing(s) along with line work for traffic paint striping. Reference in this base drawing(s) and other necessary base drawings to show curb, property lines and any other relative features. The plan sheets should have annotation in them, to include the following:

**Traffic Signs**

Sign number as described in *Minnesota Manual on Uniform Traffic Control Devices*, the size of sign in inches and a block representing the image of the sign. Show each sign location along with sign symbol noting the type and size.

**Traffic Markings**

A circled reference number and leader referencing the pavement stripe or marking along with a legend including the reference number and description.

**Street Light Plan** - Standard street lights are “Traditional Coach Lantern” (Connexus Energy) and “Traditional” (Xcel Energy) Luminaires. The Developer can upgrade street lights to an “Acorn” (Xcel and Connexus) style. All street lights are to be furnished, paid, and installed by the Developer, with the City taking over the maintenance and repair costs after the system is approved by the Engineer and accepted by the City.

**As-Built/Record Drawings:**

After construction is completed, two printed sets of as-built construction record drawings are to be prepared and provided to the City by the Developer. The final record drawings must also be submitted in electronic format in accordance with the Plan Requirements. The record drawings shall indicated all changes from the as-bid plans. The contractor and construction year shall also
be noted on the record plan drawings. The following are specific requirements for each element constructed with the project.

**Sanitary Sewer:**

As-built elevations of the rim and invert of each structure must be surveyed. The elevations shall be recorded and revised to the nearest 0.01’. If pipe elevations change more than 1 foot, the changed portion of the profile should be redrawn. The percentage of grade between manholes should be changed accordingly and recorded to the nearest 0.01%. Distance between manholes should be changed on both the plan and profile. The distance shall be measured from center of casting to the nearest 1’. Length of service risers shall be revised to the nearest 1’.

**Water Main:**

Any change in elevation of more than 1-foot should be noted on the profile. Any change in location of a main, hydrant, valve, etc. should be corrected on the plan as well as any additions. Each gate valve must have two or more ties recorded on the record plan recorded to the nearest 0.1’. The location of water main fittings shall be noted on the record plans. All top of hydrant elevations shall be recorded to the nearest 0.01’. The manufacturer, type, size, and class of piping, fittings, valves and boxes, brass, stop boxes shall be noted on the record drawings.

**Services:**

Service wye locations accurate to the nearest foot. The end of the service must be located with two or more ties. If a water service is installed in the same trench with the sanitary sewer the ties should be to the curb box. Service ties shall be recorded to the nearest 0.1’. Ties to drain tile service stub and clean-outs, recorded to the nearest 0.1’. Service invert elevations at R/W line, recorded to the nearest 0.1’.

**Storm Sewer:**

As-built elevations of the rim and invert of each structure must be surveyed, which includes storm sewer manhole and catch basin casting/inlet tops and invert, flared end section invert, and any other structure elevations shown on the as-bid plan. The elevations shall be recorded and revised to the nearest 0.01’. If pipe elevations change more than 1 foot, the changed portion of the profile should be redrawn. The percentage of grade between structures shall be changed accordingly and recorded to the nearest 0.01%. Any change in distance between structures or changes in bends or aprons must be changed on the plan sheet and profile. The distance shall be measured from center of casting/end section to the nearest 1’.

**Streets:**

Drawings should reflect any changes made. Any subgrade corrections that were made in addition to what is noted in the construction documents shall be noted.
Special Structures:
Record plans on special structures such as lift stations, pump houses, treatment plans, etc. should be include as-built elevations of critical piping, slabs, etc. as well as any changes which may have occurred during construction.
**Building Permit Requirements & Policy on Rear Yard Drainage**

**Issuance of Building Permits**

Building Permits, in a platted subdivision, will not be issued until the public improvements are completed, including public sanitary sewer, water main, services, private utilities (gas, electric, telephone, and cable television), concrete curb and gutter, aggregate base, bituminous base, and storm water management basins are constructed, street signs installed, and street lights installed.

Building permits will not be issued until the developer has installed silt fence along the back of curb on all streets and along the back property lines for all lots. Side lot line silt fence is required adjacent to lots that have been finished graded, and have established turf.

The individual builders shall maintain silt fence throughout home/building construction.

Street sweeping is to be performed on a weekly basis, at the developer’s cost, until 75% of the homes in the subdivision are constructed, or for a period of two years after the placement of the bituminous base course.

The bituminous wearing course is to be constructed after a minimum of one frost cycle season and 75% of the homes are constructed, or two years after placement of the bituminous base course.

**Policy on Rear Yard Drainage**

The City’s rear yard drainage policy allows property owners to petition for improvements to a correct a problem drainage area. The City will provide property owners with technical assistance regarding the problem; however, the City will not assist with the cost of any improvements, as it is only responsible for the drainage from the roadways and respective right-of-way. All costs associated with any improvements performed as a City project are assessed to each property contributing flow to the problem area.
Standard Detail Plates
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<tr>
<td>WAT-11</td>
<td>MULTIPLE UNITS USING MAIN WATER METER</td>
</tr>
<tr>
<td>WAT-12</td>
<td>MULTIPLE UNITS USING INDIVIDUAL WATER METERS</td>
</tr>
</tbody>
</table>
PIPE FOUNDATION & BEDDING

GOOD SOILS

IMPROVED PIPE FOUNDATION MATERIAL (3149.2H MOD.)
Considered incidental to the specified granular
borrow material (3149.2B1 MOD.) in this area

IMPROVED PIPE FOUNDATION 6"
Pay depth
increments typ.

POOR SOILS

IMPROVED PIPE FOUNDATION MATERIAL

"DIA" DENOTES OUTSIDE DIAMETER OF PIPE

12"

6"

DIA+12" MIN.

COMPACTED BACKFILL

GRANULAR BORROW
MNDOT SPEC.
3149.2B1

"DIA" DENOTES OUTSIDE DIAMETER OF PIPE

COARSE FILTER
AGGR. MNDOT SPEC.
3149.2H

CENTRAL PLATE NO.
LAST REVISION:
APR 2016

FOREST LAKE, MINNESOTA
"DIA" DENOTES OUTSIDE DIAMETER OF PIPE

12"

DIA/4 BUT NOT LESS THAN 6"

DIA+12" MIN.

COMPACTED BACKFILL

COARSE FILTER AGGREGATE
MNDOT SPEC. 3149.2H

LOAD FACTOR 1.9
CLASS B
HAND SHAPED FROM ANGULAR BEDDING MATERIAL.

6"

6"

DIA

0.5DIA

DIA+12" MIN.

COMPACTED BACKFILL

"DIA" DENOTES OUTSIDE DIAMETER OF PIPE

LOAD FACTOR 1.5
CLASS C-1
HAND SHAPED FROM FIRM UNDISTURBED SOIL.

6"

DIA

0.5DIA

DIA+12" MIN.

COMPACTED BACKFILL

COARSE FILTER AGGREGATE
MNDOT SPEC. 3149.2H

LOAD FACTOR 1.5
CLASS C-2
HAND SHAPED FROM ANGULAR BEDDING MATERIAL.

STANDARD DETAILS
BEDDING METHODS FOR RCP OR DIP
FOREST LAKE, MINNESOTA

LAST REVISION:
APRIL 2016

CITY PLATE NO.
BED-2
MATERIAL IN THIS AREA SHALL BE CONSIDERED INCIDENTAL FOR PIPE SPECIFIED WITH CLASS B BEDDING.

IMPROVED PIPE FOUNDATION 6" PAY DEPTH INCREMENTS TYP.

DIA+12" MIN.

"DIA" DENOTES OUTSIDE DIAMETER OF PIPE

0.5 DIA.

COMPACTED BACKFILL

COARSE FILTER AGGR. MNDOT SPEC. 3149.2H

DIA
NOTE:
The MACHINE SLICED METHOD (THIS DETAIL) IS THE STANDARD SILT FENCE INSTALLATION METHOD. HEAVY-DUTY (ERO-1B) OR STANDARD (ERO-1C) SILT FENCE INSTALLATION METHODS SHOULD ONLY BE USED WHEN APPROVED OR DIRECTED BY THE CITY.

COMPACTION:
AFTER "SLICING" IN THE FABRIC AND BEFORE INSTALLATION OF STEEL POSTS, DRIVE INSTALLATION EQUIPMENT OVER THE "SLICE" WHILE FABRIC IS LAYING ON THE GROUND. THEN INSTALL STEEL POSTS AND PULL UP FABRIC TO ATTACH AT A UNIFORM HEIGHT.
STEEL FENCE POST (T-POST), MINIMUM 5' LONG, 6' MAXIMUM SPACING.

Lay fabric/wire mesh in the trench, backfill with natural soil, and compact with light equipment prior to placement of the posts.

Geotextile fabric per MnDOT Table 3886-1 (heavy duty) - overlap top 6" of fabric and fasten to wire mesh at 2' intervals with rings or wire ties.

Attach fabric to posts with minimum 3 U-shaped wire fasteners per post.

Attach wire mesh to posts with minimum 3 U-shaped wire fasteners per post.

Wire mesh reinforcement, std. field fence, min 30" high, max mesh spacing 6" and min 14 1/2 gauge wire.

NOTE: heavy duty silt fence for curb protection require posts to be installed on house side of fabric.

Post notches to face away from fabric.

Attach fabric to post with minimum 3 zip ties (50 lb. tensile) per post in top 8" of fabric.

Direction of surface flow

Extend wire mesh into trench

24" minimum post embedment

NOTE: dual purpose use of heavy duty fence for perimeter control and curb protection require steel posts alternating on both sides of fabric with 4' spacing. See land disturbance permit.
STEEL FENCE POST (T-POST), MINIMUM 5' LONG, 6' MAXIMUM SPACING.

LAY FABRIC IN THE TRENCH, BACKFILL WITH NATURAL SOIL, AND COMPACT WITH LIGHT EQUIPMENT PRIOR TO PLACEMENT OF THE POSTS.

MONOFILAMENT GEOTEXTILE FABRIC PER MNDOT TABLE 3886-1 (MACHINE SLICED).

ATTACH FABRIC TO POST WITH MINIMUM 3 ZIP TIES (50 LB. TENSILE) PER POST IN TOP 8" OF FABRIC.

POST NOTCHES TO FACE AWAY FROM FABRIC.

24" MINIMUM POST EMBEDMENT

DIRECTION OF SURFACE FLOW

6"

6"

FOREST LAKE, MINNESOTA

STANDARD DETAILS
SILT FENCE STANDARD

LAST REVISION: APR 2016
CITY PLATE NO. ERO-1C
I. SPACING REQUIREMENTS

NOTE: SPACING DISTANCES WILL VARY, BUT ARE NOT TO EXCEED 100 FEET.

II. SIZING REQUIREMENTS: J15, J25

J15 - FOR CATCHMENT AREA <0.25 ACRES

J25 - FOR CATCHMENT AREA >0.25 ACRES

NOTE:
J-HOOKS SHALL BE USED WHEN THE SILT FENCE IS INSTALLED AT AN ANGLE OF 30 DEGREES OR GREATER FROM PARALLEL TO THE CONTOURS.
OVERLAP LONGITUDINAL JOINTS MINIMUM OF 6"

OVERLAP END JOINTS MINIMUM OF 6" AND STAPLE OVERLAP AT 1.5' INTERVALS.

STAPLE DENSITY SHALL BE A MINIMUM OF 3 U-SHAPED 8", 11 GAUGE METAL STAPLES PER SQUARE YARD (THIS MAY VARY AS DIRECTED BY THE CITY).

ANCHOR TRENCH
1. DIG 6" X 6" TRENCH
2. LAY BLANKET IN TRENCH
3. STAPLE AT 1.5' INTERVALS
4. BACKFILL WITH NATURAL SOIL AND COMPACT
5. BLANKET LENGTH SHALL NOT EXCEED 100' WITHOUT AN ANCHOR TRENCH

DIRECTION OF SURFACE FLOW

EROSION CONTROL BLANKET INSTALLATION
FOREST LAKE, MINNESOTA
- Double silt curtains should be spaced 10’ apart.
- Curtain length to match bottom profile as closely as possible.

NOTES:

ANCHOR- 1-24LB ANCHOR PER 100’ OF CURTAIN

CURTAIN WEIGHT- 1.1 LBS PER FOOT OF CURTAIN HEIGHT

VARIABLE HEIGHT IN 2’ INCREMENTS PER 50’ LENGTH OF SILT CURTAIN (SEE SPECIFICATIONS)

MAXIMUM INTERVAL FOR SPACING OF WEIGHT IS 15’
NOTES:
CONTRACTOR SHALL CONSTRUCT SILT BOX TO FIT AROUND THE INLET STRUCTURE WITH 6" MINIMUM CLEARANCE TO EDGES OF STRUCTURE. SILT BOX TO BE PLACED ON AN EVEN SURFACE 6" BELOW STRUCTURE OPENING. TOP OF SILT BOX TO EXTEND 18" MINIMUM ABOVE EXISTING GRADE.

WOODEN LATH SHALL BE NAILED SECURELY TO THE POST MEMBER TO SECURE FILTER FABRIC.

2" X 4" X 2.5' LONG WOOD POSTS, 8 REQ'D.

2" X 4" HORIZONTAL MEMBERS CONTINUOUS AROUND TOP AND BOTTOM. FASTENED TO EACH POST USING 2-20D COMMON NAILS

MONOFILAMENT GEOTEXTILE FABRIC AS PER MNDOT TABLE 3886-1 (MACHINE SLICED). ADDITIONAL 8-10" OF FABRIC FLAP AT BOTTOM OF BOX

8-10" FABRIC FLAP EXTENDING BEYOND BOTTOM 2"x4" - BURY UNDER ROCK TO PREVENT UNDERWASHING

1 1/2" WASHED ROCK 1' DEEP X 1' WIDE

STANDARD DETAILS
INLET PROTECTION SILT BOX FOR CATCH BASIN BEFORE CONSTRUCTION

FOREST LAKE, MINNESOTA

Last Revision: Mar 2007
City Plate No. ERO-4A
PROPOSED CURB = DIRECTION OF SURFACE FLOW

8-12" MINIMUM DEPTH

1 1/2" WASHED GRAVEL FILTER

AGGREGATE BASE

AGGREGATE BACKFILL

IN PLACE CATCHBASIN

STEEL PLATE

INLET PROTECTION ROCK FILTER FOR CATCH BASIN DURING ROAD CONSTRUCTION

FOREST LAKE, MINNESOTA
WIMCO ROAD DRAIN CG-23* HIGH FLOW
INLET PROTECTION CURB AND GUTTER MODEL
OR CITY APPROVED EQUAL.

* FOR THE NEW R-3067-VB STANDARD CASTING,
INSTALL WIMCO ROAD DRAIN
CG-3290 OR CITY APPROVED EQUAL.
NOTES:
CONTRACTOR SHALL CONSTRUCT SILT BOX TO FIT AROUND THE INLET STRUCTURE WITH 6" MINIMUM CLEARANCE TO EDGES OF STRUCTURE. SILT BOX TO BE PLACED ON AN EVEN SURFACE 6" BELOW STRUCTURE OPENING. TOP OF SILT BOX TO EXTEND 18" MINIMUM ABOVE EXISTING GRADE.

WOODEN LATH SHALL BE NAILED SECURELY TO THE POST MEMBER TO SECURE FILTER FABRIC.

2" X 4" X 2.5' LONG WOOD POSTS, 8 REQ'D.

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MONOFILAMENT GEOTEXTILE FABRIC AS PER MNDOT TABLE 3886-1 (MACHINE SLICED). ADDITIONAL 8-10" OF FABRIC FLAP AT BOTTOM OF BOX

8-10" FABRIC FLAP EXTENDING BEYOND BOTTOM 2"x4" - BURY UNDER ROCK TO PREVENT UNDERWASHING

1 1/2" WASHED ROCK 1' DEEP X 1' WIDE

STANDARD DETAILS
INLET PROTECTION
SILT BOX FOR BEEHIVE CASTING
FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2007
CITY PLATE NO. ERO-4D
6" X 6" TRENCH WITH LEADING EDGE OF TYPE IV GEOTEXTILE FABRIC STAPLED AT 4' INTERVALS AND BACKFILLED WITH NATURAL SOIL

NOTE:
POINT 1 MUST BE A MINIMUM OF 6" HIGHER THAN POINT 2 TO ENSURE THAT WATER FLOWS OVER THE DITCH CHECK AND NOT AROUND THE ENDS.

DITCH CHECK SPACING
(USE FOR DETAILS ERO-5B, 5C, 5D, AND 5E)

<table>
<thead>
<tr>
<th>DITCH GRADE</th>
<th>INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>(%)</td>
<td>(FT)</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>10+</td>
<td>25</td>
</tr>
</tbody>
</table>

STANDARD DETAILS
DITCH CHECK
3D VIEW FOR 5B, 5C SPACING
FOREST LAKE, MINNESOTA
I. ROCK WEEPER

MNDOT TYPE 9 MULCH (1 1/2" WASHED ROCK)

DIRECTION OF SURFACE FLOW

TYPE IV GEOTEXTILE FABRIC ANCHORED IN 6" X 6" TRENCH WITH 6", 11 GAUGE METAL STAPLES AT 1' INTERVALS.

STAPLE DOWNSTREAM SIDE OF FABRIC AT 2' INTERVALS

II. BIO WEEPER

MNDOT TYPE 9 MULCH (1 1/2" WASHED ROCK)

DIRECTION OF SURFACE FLOW

TYPE IV GEOTEXTILE FABRIC ANCHORED IN 6" X 6" TRENCH WITH 6", 11 GAUGE METAL STAPLES AT 1' INTERVALS.

6" DIA. WATTLE WITH MINIMUM 24" SURVEY LATH STAKED 2' O.C. ALONG WATTLE LENGTH.
I. SMALL CHECK DAM

MNDOT CLASS II
RIP RAP

DIRECTION OF SURFACE FLOW

TYPE IV GEOTEXTILE FABRIC
ANCHORED IN 6" X 6" TRENCH
WITH 6", 11 GAUGE METAL
STAPLES AT 4' INTERVALS.

STAPLE DOWNSTREAM
SIDE OF FABRIC AT 2' INTERVALS

II. LARGE CHECK DAM

MNDOT CLASS III
RIP RAP

DIRECTION OF SURFACE FLOW

TYPE IV GEOTEXTILE FABRIC
ANCHORED IN 6" X 6" TRENCH
WITH 6", 11 GAUGE METAL
STAPLES AT 4' INTERVALS.

STAPLE DOWNSTREAM
SIDE OF FABRIC AT 2' INTERVALS
NOTE:
POINT 1 MUST BE A MINIMUM 6" HIGHER THAN
POINT 2 TO ENSURE THAT WATER FLOWS
OVER THE SILT FENCE AND NOTAROUND
THE ENDS.

INSTALL SILT
FENCE AS SHOWN BELOW

STEEL FENCE POST (T-POST),
MINIMUM 5' LONG,
4' MAXIMUM SPACING.

POST NOTCHES
TO FACE AWAY
FROM FABRIC.

DIRECTION OF SURFACE FLOW

ATTACH FABRIC TO POSTS
WITH MINIMUM 3 ZIP TIES
(50 LB. TENSILE) PER POST
IN TOP 8" OF FABRIC.

MONOFILAMENT GEOTEXTILE
FABRIC PER MNDOT TABLE
3886-1 (MACHINE SLICED).

MACHINE SLICE
8"-12" DEPTH (PLUS 6" FLAP)

24" MINIMUM
POST EMBEDMENT

STANDARD DETAILS
DITCH CHECK
MACHINE SLICED SILT FENCE

FOREST LAKE, MINNESOTA

A) COMPACATION:
AFTER "SLICING" IN THE FABRIC AND
BEFORE INSTALLATION OF STEEL POSTS, DRIVE INSTALLATION
EQUIPMENT OVER THE "SLICE" WHILE FABRIC IS LAYING ON THE
GROUND. THEN INSTALL STEEL POSTS AND PULL UP FABRIC TO
ATTACH AT A UNIFORM HEIGHT.
NOTE:
POINT 1 MUST BE A MINIMUM OF 6"
HIGHER THAN POINT 2 TO ENSURE
THAT WATER FLOWS OVER THE DIKE
AND NOT AROUND THE ENDS.

6" X 6" TRENCH WITH LEADING EDGE OF
GEOTEXTILE FABRIC STAPLED AT 1'
INTERVALS BACKFILLED OVER EROSION
CONTROL BLANKET

10" TRIANGULAR SILT DIKE PER
MNDOT 3889, TYPE 6

6" 11 GAUGE METAL
STAPLES SPACED 1'
O.C. AND WHERE
UNITS OVERLAP

GEOTEXTILE FABRIC
1/2" x 2" x 16" LONG WOODEN STAKES AT 1'-0" SPACING MINIMUM. STAKES SHALL BE DRIVEN THROUGH THE BACK HALF OF THE COMPOST LOG AT AN ANGLE OF 45° WITH THE TOP OF THE STAKE POINTING UPSTREAM.

NOTE: POINT 1 MUST BE A MINIMUM OF 6" HIGHER THAN POINT 2 TO ENSURE THAT WATER FLOWS OVER THE DIKE AND NOT AROUND THE ENDS.

STRAW OR WOOD FIBER 6" TO 7" DIA. ROLL ENCLOSED IN PLASTIC OR POLYESTER NETTING.
WOODEN WEIR

MOUNT BOARD WITH LAG BOLTS TROUGH TRASH GUARD MOUNTING HOLES.

LENGTH OF NOTCH NOT TO EXCEED 33% OF PIPE DIAMETER AND NEVER MORE THAN 12".

WEIR (2" x VARIABLE HEIGHT) NOT MORE THAN 33% OF PIPE DIAMETER AND NEVER MORE THAN 12".

NOTE:
1" NOTCH FOR WEIRS 4"-6" HIGH
2" NOTCH FOR WEIRS 6"-12" HIGH
BIOROLL OR ROCK WEIR

6" OR 12" BIOROLL INSIDE TRASH GUARD

INVERT OF FES

TRASH GUARD

FASTEN FABRIC TO TRASH GUARD

6"-12" OF 1 1/2" WASHED ROCK OVER MONOFILAMENT GEOTEXTILE FABRIC INSIDE TRASH GUARD

FOREST LAKE, MINNESOTA
WASHED ROCK OR WOOD CHIPS PER SPECIFICATIONS

18" MINIMUM CUT OFF BERM TO MINIMIZE RUNOFF FROM SITE

NOTES:
1. FILTER FABRIC SHALL BE PLACED UNDER ROCK OR MULCH TO STOP MUD MIGRATION THROUGH ROCK. FILTER FABRIC IS NOT REQUIRED UNDER WOOD CHIPS.
2. 80% OF WOOD CHIPS USED FOR CONSTRUCTION ENTRANCES MUST BE BETWEEN 2 INCHES AND 5 INCHES. NO CHIPPED-UP MANUFACTURED WOOD AND / OR CHEMICALLY TREATED WOOD IS ALLOWED.
3. ENTRANCE MUST BE MAINTAINED REGULARLY TO PREVENT SEDIMENTATION ON PUBLIC ROADWAYS. FUGITIVE ROCK OR WOOD CHIPS WILL BE REMOVED FROM ADJACENT ROADWAYS DAILY OR MORE FREQUENTLY AS NECESSARY.
I. PLAN VIEW

II. SECTION A-A

III. BASIN EMERGENCY OVERFLOW

NOTES:
- BASIN USED FOR 10 ACRES DRAINAGE AREA OR MORE.
- DESIGN RUNOFF VOLUME IS FROM A 2-YR, 24-HR STORM PER ACRE DRAINED TO THE BASIN. BASIN VOLUME MUST BE A MIN. OF 1800 CUBIC FEET/ACRE.
- SEE PLANS/SPECIFICATIONS FOR BASIN DIMENSIONS AND PIPE SIZE AND SLOPE.
I. PLAN VIEW

NOTES:
- BASIN USED FOR 10 ACRES DRAINAGE AREA OR MORE.
- DESIGN RUNOFF VOLUME IS FROM A 2-YR, 24-HR STORM PER ACRE DRAINED TO THE BASIN. BASIN VOLUME MUST BE A MIN. OF 1800 CUBIC FEET/ACRE.
- SEE PLANS/SPECIFICATIONS FOR BASIN DIMENSIONS AND PIPE SIZE AND SLOPE.

II. SECTION A-A

III. BASIN STANDPIPE AND EMERGENCY OVERFLOW

- MONOFILAMENT GEOTEXTILE FABRIC PER MNDOT TABLE 3886-1 (MACHINE SLICED)
- 1"-2" DIAM. ROCK, CONE EQUAL TO 1/2 Z

NOTE:
- PIPE MATERIAL SHOULD BE RIGID

D = DIAMETER OF STANDPIPE EQUAL TO DIAMETER OF PIPE

EMERGENCY OVERFLOW

Standard Details
TEMPORARY SEDIMENTATION BASIN STANDPIPE OUTLET
FOREST LAKE, MINNESOTA
I. PLAN VIEW

II. SECTION A-A

DIRECTION OF SURFACE FLOW

CLASS II RIP RAP PIPE, MAX. 6" DIA.

NOTE:
D=3' MIN., 5' MAX.
W=10' MIN., 25' MAX.
W(FT.)= 10 X DRAINAGE AREA (AC.)

L = 2W

6' MIN.

D/3

D/2

1% MIN. REVERSE GRADIENT

GEOTEXTILE FABRIC

FOREST LAKE, MINNESOTA
NOTE:
PIPE SHALL BE ANCHORED SECURELY WITH HOLD-DOWN GROMMETS SPACED 8' ON CENTER

PER ENGINEER'S APPROVAL

10" MIN. DIAM. PIPE

22 1/2° BEND

SLOPE 3% OR STEEPER

WATERTIGHT CONNECTING BAND

NOTE:
PIPE SHALL BE ANCHORED SECURELY WITH HOLD-DOWN GROMMETS SPACED 8' ON CENTER

1.5' MIN.

FLARED END SECTION

10" MIN. DIAM. PIPE

PER ENGINEER'S APPROVAL

2' MIN.

RIP RAP APRON

4' MIN.

@ LESS THAN 1% SLOPE

4' MIN.

@ LESS THAN 1% SLOPE

RIP RAP APRON PLAN

PLAN VIEW

D= PIPE DIAMETER

6D

3D

DIVERSION MOUND

PIPE

RIP RAP APRON

ENSURE FLOW INTO PIPE

FLOW

DIVERSION MOUND

TEMPORARY PIPE DOWNDRAIN

STANDARD DETAILS

FOREST LAKE, MINNESOTA

Forest Lake
AS GOOD AS IT SOUNDS

CITY PLATE NO.
ERO-10

LAST REVISION:
MAR 2007

STANDARD DETAILS
DIVERSION MOUND AND TEMPORARY PIPE DOWNDRAIN

FOREST LAKE, MINNESOTA
SLOPES WITH A GRADE EQUAL TO OR STEEPER THAN 3:1 REQUIRE SLOPE TRACKING.

SLOPES WITH A GRADE MORE GRADUAL THAN 3:1 REQUIRE SLOPE TRACKING IF THE STABILIZATION METHOD IS EROSION CONTROL BLANKET OR HYDROMULCH.
SUPER DUTY PERIMETER CONTROL
SILT FENCE/CONCRETE BARRIER SYSTEM

STANDARD DETAILS
FOREST LAKE, MINNESOTA

BARRIER WITHOUT CABLE RINGS

REBAR BETWEEN ANCHOR RINGS OR METAL FENCE POST IN ABSENCE OF RINGS

BARRIER WITH CABLE RINGS
SILT FENCE, SUPER DUTY
TYPICAL UTILITY LOCATIONS
(PUBLIC AND PRIVATE)

NOTE:
UTILITIES PLACED IN JOINT 3’ TRENCH WITH 12” MIN. SEPARATION. JOINT TRENCH TO BE 0'-5' BEHIND R.O.W.

NOTE:
UTILITY CONDUIT PLACED BEFORE STREET CONSTRUCTION.

FOREST LAKE, MINNESOTA
(NOTE: ALL UTILITIES IN SAME TRENCH)
TRENCH WIDTH VARIES, MAXIMUM OF 5'

10' DRAINAGE AND UTILITY EASEMENT

VARIABLE RIGHT-OF-WAY LINE

STREET CENTERLINE

CURB & GUTTER (TYPICAL)

TYPICAL PRIVATE UTILITY PLACEMENT

CROSS SECTION

*EXTEND CONDUITS 3' PAST ANY FUTURE SIDEWALK OR PATHWAY

TYPICAL 4" PVC SCHEDULE 40

PVC END CAPS

EXISTING FINISH GRADE

GAS CONDUIT

VARIABLE MINIMUM 4' DEPTH

TYP. 4" OR 6" PVC SCHEDULE 40 CONDUIT

LOCATION CITY CONDUIT (FUTURE USE)

TYPICAL 12" SEPARATION PER EACH CONDUIT

TRENCH CROSS SECTION AT CONDUIT CROSSING

**TYPICAL MULTI-CONDUIT CROSSING

**TYPICAL SINGLE CONDUIT CROSSING

PLAN VIEW

STANDARD DETAILS
PRIVATE UTILITY CONDUIT CROSSING
FOREST LAKE, MINNESOTA

FOREST LAKE
AS GOOD AS IT SOUND

LAST REVISION: MAR 2019
CITY PLATE NO. GEN-2
Wetland Buffer

Per City Ordinance
No disturbance (mowing, grading, filling, or structures) in the wetland or buffer area allowed.

This sign marks the upslope edge of a wetland buffer. The plantings downslope of this sign contain native trees, flowers, shrubs and grasses that provide food and shelter for birds, fish and other native wildlife.

The plants also help to hold soil to prevent erosion and filter nutrients form adjacent lawns to improve the quality of the water entering the wetlands.

1. THE SIGN MUST BE:
   a. 0.063 ALUMINUM BLANK,
   b. BACKGROUND PANTONE: 155 (TAN)
   c. BLACK VERBIAGE AND LOGO PRINTED ONE SIDE
   d. PRE-DRILL HOLES IN MIDDLE TOP AND BOTTOM (AVOID VERBIAGE)
   e. TRIM TO BORDER AS SHOWN ON SIGN ARTWORK TO INSURE ROUNDED CORNERS
2. THE MARKER SHALL CONSIST OF A FOUR INCH SQUARE TREATED, OR CEDAR POST, OR GREEN STEEL POST INSTALLED TO A HEIGHT OF FOUR FEET ABOVE GRADE, AND SET AT LEAST 42” INTO GROUND.
3. BOLT OR SCREW SIGN TO POST.
5. ARTWORK AND VERBIAGE SHALL FACE PROPOSED HOME (STRUCTURE).
6. CONTACT CITY FOR POTENTIAL SIGN SOURCES.
This sign marks the edge of a wetland. Filling, draining, or excavating beyond this point is prohibited without written authorization from the Watershed District.

Per City Ordinance, no disturbance (mowing, grading, filling, or structures) in the wetland or buffer area allowed.

1. THE SIGN MUST BE:
   a. 0.063 ALUMINUM BLANK,
   b. BACKGROUND PANTONE: 155 (TAN)
   c. BLACK VERBIAGE AND LOGO PRINTED ONE SIDE
   d. PRE-DRILL Holes IN MIDDLE TOP AND BOTTOM (AVOID VERBIAGE)
   e. TRIM TO BORDER AS SHOWN ON SIGN ARTWORK TO INSURE ROUNDED CORNERS

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3. BOLT OR SCREW SIGN TO POST.


5. ARTWORK AND VERBIAGE SHALL FACE PROPOSED HOME (STRUCTURE).

6. CONTACT CITY FOR POTENTIAL SIGN SOURCES.

STANDARD DETAILS
WETLAND BOUNDARY SIGN
FOREST LAKE, MINNESOTA
NOTE:
INSTALL STRUCTURE MARKERS AT ALL GREEN SPACE STRUCTURE LOCATIONS

0.063" THICK ALUMINUM SIGN.
WHITE LETTERS ON BLUE HIGH INTENSITY REFLECTORIZED BACKGROUND.

0.063" THICK ALUMINUM SIGN.
WHITE LETTERS ON GREEN HIGH INTENSITY REFLECTORIZED BACKGROUND.

0.063" THICK ALUMINUM SIGN.
BLACK LETTERS ON WHITE HIGH INTENSITY REFLECTORIZED BACKGROUND.

U-CHANNEL POST, MINIMUM 3 LB./FT. 6'-6" LONG, PAINTED GREEN.

STANDARD DETAILS
STRUCTURE MARKER SIGNS

FOREST LAKE, MINNESOTA
NOTES:
DIMENSIONS AS PER U.S. POSTAL SERVICE

ADDRESS MUST BE ON SIDE OF BOX FROM WHICH CARRIER APPROACHES IN LETTERS ABOUT ONE INCH HIGH (OR ON FRONT WHERE BOXES ARE GROUPED).

URBAN STREET

RURAL STREET

STANDARD DETAILS
MAIL BOX INSTALLATION
FOREST LAKE, MINNESOTA  

LAST REVISION: MAR 2019  
CITY PLATE NO. GEN-6
PRECAST INVERT MUST BE 1/2 DIAMETER OF THE PIPE AND BENCHES SLOPED 2" TOWARD THE INVERT.

MANHOLE STEPS SHALL BE PLACED SO THAT OFFSET VERTICAL PORTION OF CONE IS FACING DOWNSTREAM.

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER.

ALL JOINTS IN MANHOLE SHALL CONFORMING TO ASTM 443.

WRAP EACH MANHOLE BARREL JOINT WITH 12" MASTIC SEAL, OR RING JOINTS W/ 3/4" RAM - NEK BITUMINOUS ROPE.

PIPE SHALL BE CUT 2" INSIDE FACE OF WALL AT MID-POINT OF PIPE AND HAVE A WATER TIGHT SEAL. NOTE: KOR-N-SEAL OR PSX DIRECT DRIVE MANHOLE CONNECTOR CONSIDERED ACCEPTABLE ALTERNATES.

ALL DOG HOUSES SHALL BE GROUTED ON INSIDE AND OUTSIDE.

MINIMUM THICKNESS OF INTEGRAL PRECAST BASE IS 6" FOR 14' DEEP OR LESS, AND INCREASES 1" IN THICKNESS FOR EVERY 4' OF DEPTH GREATER THAN 14'.

STANDARD DETAILS
SANITARY SEWER MANHOLE
FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019
CITY PLATE NO. SAN-1
PRECAST INVERT MUST BE 1/2 DIAMETER OF PIPE AND BENCHES SHOULD BE SLOPED 2" TOWARD INVERT.

MANHOLE STEPS SHALL BE PLACED SO THAT OFFSET VERTICAL PORTION OF CONE IS FACING DOWNSTREAM.

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER.

ALL JOINTS IN MANHOLE SHALL CONFORM TO ASTM 443.

WRAP EACH MANHOLE BARREL JOINT WITH 12" MASTIC SEAL, OR RING JOINTS W/ 3/4" RAM - NEK BITUMINOUS ROPE.

PIPE SHALL BE CUT 2" INSIDE FACE OF WALL AT MID-POINT OF PIPE AND HAVE A WATER TIGHT SEAL.. NOTE: KOR-N-SEAL OR PSX DIRECT DRIVE MANHOLE CONNECTOR CONSIDERED ACCEPTABLE ALTERNATES.

ALL DOG HOUSES SHALL BE GROUTED ON INSIDE AND OUTSIDE.

MINIMUM THICKNESS OF INTEGRAL PRECAST BASE IS 6" FOR 14' DEEP OR LESS, AND INCREASES 1" IN THICKNESS FOR EVERY 4' OF DEPTH GREATER THAN 14'.

STANDARD DETAILS
SANITARY SEWER JUNCTION MANHOLE
FOREST LAKE, MINNESOTA
HORSESHOE DETAILS

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER. MANHOLE STEPS SHALL BE PLACED SO THAT OFFSET VERTICAL PORTION OF CONE IS FACING DOWNSTREAM.

ALL JOINTS IN MANHOLE SHALL CONFORM TO ASTM 443

WRAP EACH MANHOLE BARREL JOINT WITH 12" MASTIC SEAL, OR RING JOINTS W/ 3/4" RAM - NEK BITUMINOUS ROPE.

Pipe shall be cut 2" inside face of wall at mid-point of the pipe and have a water tight seal.

NOTE: KOR-N-SEAL MANHOLE OR EQUAL CONSIDERED ACCEPTABLE ALTERNATE.

ALL DOG HOUSES SHALL BE GROUTED ON INSIDE AND OUTSIDE.

PRECAST INVERT SHOULD BE 1/2 DIAMETER OF PIPE AND BENCHES SLOPED 2" TOWARD INVERT.

MINIMUM THICKNESS OF INTEGRAL PRECAST BASE IS 6" FOR 14' DEEP OR LESS, AND INCREASES 1" IN THICKNESS FOR EVERY 4' OF DEPTHER GREATER THAN 14'.
CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

NOTES:
1. WHEN THE MANHOLE OR CATCH BASIN STRUCTURE IS CONSTRUCTED OUTSIDE THE TRAVELED ROADWAY, A WITNESS POST AND SIGN SHALL BE INSTALLED NEXT TO THE MANHOLE PER DETAIL PLATE GEN-5.

PLAN

6" PRECAST REINFORCEMENT MANHOLE SLAB.
2 BEADS OF RAMNEK OR EQUAL.
CRISPIN PRESSURE SEWER VALVE WITH BACK FLUSHING EQUIPMENT AND VALVES, 2" S20b AND S20AB OR EQUAL.
PROVIDE 2" FLANGE, TEE, (2) 90° BENDS, AND 2" DIA. TAP AND NIPPLE WITH SADDLE. DOUBLE STRAP REQUIRED ON 10" DIA. AND LARGER PIPE. SMITH BLAIR 313 OR EQUAL.

SECTION A-A

FROSTMISE
72"X 6" PRECAST REINFORCED CONCRETE BASE SLAB.

CONCRETE COVE

4" HANDLE

26 GAUGE ALUMINUM

3/8"x 1/4" BOLTS

2" STYROFOAM

BOLT ALUMINUM THROUGH INSULATION MANHOLE FROSTMISE

FOREST LAKE, MINNESOTA

STANDARD DETAILS
AIR RELEASE MANHOLE

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019
CITY PLATE NO. SAN-4
SAN-5
MAR 2019

SUMP PUMP DISCHARGE TO BACK OR FRONT YARD. MAY BE CONNECTED TO CITY DRAINTILE. (WHERE AVAILABLE, AIR GAP REQUIRED)

3' MIN.

FIRST FLOOR

90° PVC BEND

1 1/2" OUTLET PIPE

TO BACK OR FRONT YARD. MAY BE CONNECTED TO CITY DRAINTILE. (WHERE AVAILABLE, AIR GAP REQUIRED)

3' MIN.

1 1/2" PVC PIPE

FOUNDATION WALL

1 1/2" PVC PIPE

1 1/2" FLEXIBLE COUPLING

1 1/2" CHECK VALVE

1 1/2" FLEXIBLE COUPLING

1 1/2" PVC PIPE

BASEMENT FLOOR

SUMP PUMP

1 1/2" MALE COUPLING

SUMP BASKET

FOREST LAKE, MINNESOTA

STANDARD DETAILS

SUMP PUMP DISCHARGE

LAST REVISION:
MAR 2019

CITY PLATE NO.
SAN-5
WEHD1500 GREASE INTERCEPTER
TANK SPECIFICATIONS:

DIMENSIONS:
- WALL: 3.5"
- BOTTOM: 5"
- COVER: 6"
- MANHOLE: 24" I.D.
- HEIGHT: 95.5" O.D.
- OUTSIDE DIA.: 86.5"
- BELOW INLET: 78"
- LIQUID LEVEL: 70"

SPECIAL FEATURE:
- "POSITIVE SEAL"
- V-SHAPED JOINT CONNECTION BETWEEN TANK AND COVER.

INLET AND OUTLET BAFFLES:
- AS SHOWN

LIQUID CAPACITY:
- 21.48 GAL/IN

LOADING DESIGN: 12'-0"
- UNSATURATED SOIL

WEIGHT:
- COVER 3,000 LBS
- TANK 9,535 LBS

FLOATATION:
- WITH SATURATED SOIL TO TOP OF COVER: 1.5" OF SOIL OVER COVER—NO FLOATATION 3' OVER COVER OFFERS 1.4 + SAFETY FACTOR.

CUSTOMIZED TANKS:
- TANKS CAN BE CUSTOMIZED.
- CONTACT WEISER CONCRETE.

Standard Details
GREASE INTERCEPTOR
FOREST LAKE, MINNESOTA
SERVICE RISER
4" DIP OR PVC SCH. 40

MINIMUM 4" THICK CONCRETE ENCASEMENT

SEWER MAIN

PAYMENT

STANDARD DETAILS
SERVICE RISER

FOREST LAKE, MINNESOTA
MAX. 45°

NOTE:
SERVICE PIPE TO BE PRESSURE RATED AT 150 PSI (MIN.)

2"x 2" WOOD MARKER
PAINTED GREEN

10' DRAINAGE
AND UTILITY EASEMENT

SLOPE 2% MIN.

GRANULAR BEDDING MATERIAL

AIRtight PLUG

SERVICE WYE

2"x 2" WOOD MARKER
SERVICE STUB

WITHOUT RISER

2"x 2" WOOD MARKER
PAINTED GREEN

2"x 2" WOOD MARKER
SERVICE STUB

MAX. 45°

SERVICE WYE

MIN. 4" THICK CONCRETE ENCASEMENT

GRANULAR BEDDING MATERIAL

NOTE:
SERVICE PIPE TO BE PRESSURE RATED AT 150 PSI (MIN.)

SERVICE WYE TO BE SUPPORTED IN CONCRETE WITH RISER

DEPTHS UP TO 14'

DEPTHS GREATER THAN 14' WHERE RISER APPROVED BY ENGINEER.

10' DRAINAGE AND UTILITY EASEMENT

45° BEND

30' DRAINAGE AND UTILITY EASEMENT

SLOPE 2% MIN.

FOREST LAKE, MINNESOTA

STANDARD DETAILS
SANITARY SEWER SERVICE

FOREST LAKE, MINNESOTA

AS GOOD AS IT SOUNDS

LAST REVISION: MAR 2019
CITY PLATE NO. SER-3
NOTE:
6" HUB WITH THREADED PVC PLUG - DO NOT GLUE

NOTE:
ENCLOSE LONG SWEEP BEND OR COMBINATION WYE IN CONCRETE AS SHOWN.

ONE PIECE 6" PVC SCH. 40 CLEANOUT RISER

10'

PVC LONG SWEEP BEND SCH. 40

ENCASE PVC BEND IN CONCRETE MIN. 1/3 CU. YDS.

LONG TURN T-Y SCH. 40

ENCASE PVC WYE IN CONCRETE MIN. 1/3 CU. YDS.

END OF LINE CLEANOUT

IN LINE CLEANOUT

* HOMEOWNER MAY CUT OFF FLUSH WITH GROUND AFTER LANDSCAPING IS COMPLETED

STANDARD DETAILS

PVC SERVICE LINE CLEANOUTS

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019

CITY PLATE NO. SER-4
WORK BY PRIVATE CONTRACTOR

WORK BY CITY

VARIABLE
SEE PLAN

VARIABLE
SEE PLAN

CONCRETE CURB & GUTTER

4" PVC W/ TRACER WIRE OR DIP WATER SERVICE

1"-2" DIA. PIPE (BRASS PREFERRED)

END MINIMUM CITY REQUIREMENTS

PROVIDE SLEEVES IF PIPES PASS THROUGH CONCRETE SLAB.

1"-2" DIA. TYPE K COPPER OR POLYETHYLENE PLASTIC WATER SERVICE BY PRIVATE CONTRACTOR.

4" GATE VALVE & BOX W/ EXTENSION ROD. REFER TO DETAIL WAT-4.

4" x 1" OR 4" x 2" ADAPTER

FULL FLOW BALL VALVE (PREFERRED)
(RISING STEM GV ACCEPTABLE)

PRESSURE REDUCING VALVE REQ'D WHEN PRESSURE EXCEEDS 80 PSI.

BACKFLOW PREVENTER AS PER MINNESOTA PLUMBING CODE.

METER

90° I.P.T. BEND

1"-2" DIA. PIPE OR DIP WATER SERVICE

WORK BY CITY

WORK BY PRIVATE CONTRACTOR

9" x 4" TEE OR CORRECT SIZE TO MATCH MAINLINE.

WATER MAIN

8" x 4" TEE OR CORRECT SIZE TO MATCH MAINLINE.

CURVED SEGMANTAL MANHOLE BLOCK

NOTES:
1. CITY WATER SERVICE & PLUMBING PERMITS REQUIRED FOR WORK BY PRIVATE CONTRACTORS.
2. ANNUAL TESTING OF RPZ REQUIRED.
3. REQUIRED EQUIPMENT MUST BE ENCLOSED AND SUPPORTED.
4. SLEEVES FOR PIPES IN CONCRETE SLABS SHALL BE 4" DIAMETER PVC OR SIMILAR.

STANDARD DETAILS
IRRIGATION SERVICE
BY PRIVATE CONTRACTOR

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019
CITY PLATE NO. SER-5
NOTES:
1. WATER SERVICE SHUTOFF TO BE LOCATED A MINIMUM OF 5' OUTSIDE OF THE DRIVEWAY EDGE, OR A MINIMUM OF 3' INSIDE OF THE DRIVEWAY EDGE.
2. SHUT OFFS LOCATED IN THE DRIVEWAY WILL REQUIRE A NEENAH R-1914-A CASTING WITH A LOCKING COVER OR APPROVED EQUAL.
MANHOLE STEPS SHALL BE PLACED SO THAT OFFSET HOLE IN TOP SLAB IS FACING DOWNSTREAM.

PRECAST INVERT SHOULD BE 1/2 DIAMETER OF PIPE AND BENCHES SLOPED 2" TOWARD INVERT.

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

PRECAST REINFORCED CONCRETE MANHOLE AND SLAB SHALL CONFORM TO ASTM C478 AND C497

TOP OF BARREL SECTION BELOW TOP SLAB TO HAVE FLAT TOP EDGE SEALED WITH 2 BEADS OF RAMNEK OR EQUAL.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER.

ALL JOINTS IN MANHOLE SHALL CONFORM TO ASTM 443

DOGHOUSES MUST BE GROUTED BOTH INSIDE AND OUTSIDE.

PIPE SHALL BE CUT 2" INSIDE OF FACE OF WALL AT MID-POINT OF PIPE.

BASE SLAB SHALL CONFORM TO ASTM C478 AND C497

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.
PLAN

PRECAST INVERT SHOULD BE 1/2 DIAMETER OF PIPE AND BENCHES SLOPED 2" TOWARD INVERT.

MANHOLE STEPS SHALL BE PLACED SO THAT OFFSET HOLE IN TOP SLAB IS FACEING DOWNSTREAM.

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

PRECAST REINFORCED CONCRETE MANHOLE AND SLAB SHALL CONFORM TO ASTM C478 AND C497

TOP OF BARREL SECTION BELOW TOP SLAB TO HAVE FLAT TOP EDGE SEALED WITH 2 BEADS OF RAMNEK OR EQUAL.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER.

ALL JOINTS IN MANHOLE SHALL CONFORM TO ASTM 443

DOGHOUSES MUST BE GROUTED BOTH INSIDE AND OUTSIDE.

PIPE SHALL BE CUT 2" INSIDE OF FACE OF WALL AT MID-POINT OF PIPE.

BASE SLAB SHALL CONFORM TO ASTM C478 AND C497

SECTION

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.

STANDARD DETAILS
STORM SEWER JUNCTION MANHOLE WITH REINFORCED TOP SLAB & SUMP

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019
CITY PLATE NO. STO-4
PLAN

24"X36" SLAB OPENING FOR NEENAH R3067V OR ESS. BROS. 330 HIGH CAPACITY OR EQUAL. INSTALL R3501-TB FOR DRIVEWAYS AND R3290-A FOR VALLEY GUTTERS. (VANE GRATE SHOWN)

DIMENSION FROM BACK OF CURB TO CENTER OF PIPE.
4' DIA. MH - 9" IN FROM BACK OF CURB
5' DIA. MH - 3" IN FROM BACK OF CURB
6' DIA. MH - 3" BEHIND BACK OF CURB
7' DIA. MH - 9" BEHIND BACK OF CURB
8' DIA. MH - 15" BEHIND BACK OF CURB

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

PRECAST REINFORCED CONCRETE MANHOLE AND SLAB SHALL CONFORM TO ASTM C478 AND C497

TOP OF BARREL SECTION BELOW TOP SLAB TO HAVE FLAT TOP EDGE SEALED WITH 2 BEADS OF RAMNEK OR EQUAL.

ALL JOINTS IN MANHOLE CONFORM TO ASTM 443.

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER. PLACED BELOW THE DOWNSTREAM CORNER OF THE OPENING NEAREST THE STREET.

DOGHOUSES MUST BE GROUTED BOTH INSIDE AND OUTSIDE.

BASE SLAB SHALL CONFORM TO ASTM C478 AND C497

SECTION

STANDARD DETAILS
TYPE II
CATCHBASIN MANHOLE

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019
CITY PLATE NO. STO-5
PLAN

SECTION

24"X36" SLAB OPENING FOR CASTING AS SPECIFIED.

DIMENSION FROM BACK OF CURB TO CENTER OF PIPE.
4' DIA. MH - 9" IN FROM BACK OF CURB
5' DIA. MH - 3" IN FROM BACK OF CURB
6' DIA. MH - 3" BEHIND BACK OF CURB
7' DIA. MH - 9" BEHIND BACK OF CURB
8' DIA. MH - 15" BEHIND BACK OF CURB

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

PRECAST REINFORCED CONCRETE MANHOLE AND SLAB SHALL CONFORM TO ASTM C478 AND C497

TOP OF BARREL SECTION BELOW TOP SLAB TO HAVE FLAT TOP EDGE SEALED WITH 2 BEADS OF RAMNEK OR EQUAL.

ALL JOINTS IN MANHOLE SHALL CONFORM TO ASTM 443.

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.

MANHOLE STEPS, NEENAH R1981J OR EQUAL, 16" ON CENTER.

DOGHOUSES MUST BE GROUTED BOTH INSIDE AND OUTSIDE.

BASE SLAB SHALL CONFORM TO ASTM C478 AND C497

NO DRAIN HOLES

STANDARD DETAILS
CATCHBASIN MANHOLE WITH SUMP
FOREST LAKE, MINNESOTA
PLAN

PRECAST REINFORCED CONCRETE CATCH BASIN AND SLAB SHALL CONFORM TO ASTM C478 AND C497

CASTING AND ADJUSTMENT RINGS AS SPECIFIED.

GRATE TO BE 2" BELOW GUTTER GRADE. 10' TRANSITION EACH SIDE OF CATCH BASIN.

DOGHouses SHALL BE GROUTED ON BOTH THE INSIDE AND OUTSIDE.

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.

SECTION

NO DRAIN HOLES

STANDARD DETAILS

2' X 3' CATCHBASIN

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2019

CITY PLATE NO. STO-9
SEE CITY PLATE NO. STO-13 FOR RIPRAP PLACEMENT.

ANCHOR CLIP

24” MAX

6"

ANCHOR BOTH SIDES.

TIE LAST 3 PIPE JOINTS. USE 2 TIE BOLT FASTENERS PER JOINT. INSTALL ON OUTSIDE OF PIPE AT 60° FROM TOP OR BOTTOM OF PIPE.

PROVIDE 3 ANCHOR CLIPS TO FASTEN TRASH GUARD TO FLARED END SECTION. HOT DIP GALVANIZE AFTER FABRICATION.

ISOMETRIC

TRASH GUARD SIZING

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>BARS</th>
<th>&quot;H&quot;</th>
<th>BOLTS</th>
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<tbody>
<tr>
<td>24”-42”</td>
<td>1”Ø</td>
<td>6”</td>
<td>3/4”</td>
</tr>
<tr>
<td>48”-72”</td>
<td>1 1/4”Ø</td>
<td>12”</td>
<td>1”</td>
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STANDARD DETAILS
FLARED END SECTION AND TRASH GUARD

FOREST LAKE, MINNESOTA
### Riprap Requirements

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<thead>
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<th>D</th>
<th>CY</th>
<th>Class</th>
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<tbody>
<tr>
<td>12” TO 24”</td>
<td>8 TO 12</td>
<td>CL.3</td>
</tr>
<tr>
<td>27” TO 33”</td>
<td>14 TO 20</td>
<td>CL.3</td>
</tr>
<tr>
<td>36” TO 48”</td>
<td>23 TO 38</td>
<td>CL.3</td>
</tr>
<tr>
<td>54” AND UP</td>
<td>62 AND UP</td>
<td>CL.4</td>
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*(One cubic yard is approximately 2,800 lbs.)*

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**SECTION A-A**

- Extend Fabric and Riprap under flared end section
- Riprap
- Geotextile filter fabric type IV or V

**SECTION B-B**

- Riprap
- Geotextile filter fabric type IV or V
4" HDPE PERFORATED DRAINTILE
WITH FILTER SOCK

Curb as specified

Select granular modified

4" HDPE with geotextile
wrap Mirafi 140s filter sock or equal.

Geotextile fabric, type V, non-woven

Trench detail

1/4" 0/ Hole (hyp.)

4" HDPE with geotextile
wrap Mirafi 140s filter sock or equal.

Pipe detail

Standard details
4" HDPE perforated dRAINTILE
with filter sock

Forest lake, minnesota

Last revision: apr 2016
City plate no.
Sto-20
STANDARD DETAILS
PRECAST 27" SHALLOW DEPTH BEEHIVE

FOREST LAKE, MINNESOTA

STO-28

NO BLOCK STRUCTURES OR PRECAST INVERTS ARE ALLOWED.

PRECAST REINFORCED CONCRETE CATCH BASIN AND SLAB SHALL CONFORM TO ASTM C478 AND C497

PRECAST CONCRETE STRUCTURE

DOGHOUSE SHALL BE GROUTED ON BOTH THE INSIDE AND OUTSIDE.

REINFORCED CONCRETE PIPE

40" DIA. x 5" THICK PRECAST REINFORCED CONCRETE BASE SLAB.

BEEHIVE CASTING AS SPECIFIED
POND OUTLET SKIMMER STRUCTURE

**STANDARD DETAILS**

**FOREST LAKE, MINNESOTA**

LAST REVISION: MAR 2019

CITY PLATE NO. STO-31
Hole for xx" Dia. outlet pipe.

5' Dia. (Typ.) Manhole

6" aggregate backfill (MnDOT Spec. 3149H Mod.)

6" CLEARANCE

Storm Water Pond

10:1 Bench

Ele.=xxx.x

6" CLEARANCE

1 1/2" x 3/8" outer ring

1 1/2" x 3/8" steel bars @ 4" O.C.

Provide 6 1/2" SS anchor bolts w/ clips.

Hot-dipped galvanized grate in 2 sections.

Simmer opening

SKIMMER GRATE

When feasible, set invert for outlet pipe below NWL to improve pipe cover and minimize slope around skimmer.

6" Min. integral slab thickness

1 1/2" x 3/8" steel bars @ 4" O.C.

1" x 1/4" steel bar, weld to each member.

6" aggregate backfill (MnDOT Spec. 3149H Mod.)

8" Min. integral slab thickness

When feasible, set invert for outlet pipe below NWL to improve pipe cover and minimize slope around skimmer.

See Grate Detail

CL. II Rip Rap 12" Depth With Geotextile Separator Fabric
NOTE: DESIGNER TO ACCOUNT FOR OVERTURNING FORCES IN DESIGN

PROPERTY/OUTLOT LINE AT HWL

MAINTENANCE BENCH

SKIMMER

OUTLET PIPE

TYPICAL BENCH DETAIL WITHIN 10' OF SKIMMER OUTLET

TYPICAL BENCH DETAIL

SAFETY/AQUATIC VEGETATION BENCH

SIDE SLOPE PROFILE WITHIN 10' OF SKIMMER

TYPICAL SIDE SLOPE PROFILE

POND NWL

POND BOTTOM

PROPERTY/OUTLOT LINE AT HWL

MAINTENANCE BENCH

SAFETY/AQUATIC VEGETATION BENCH

POND NWL

POND BOTTOM

STANDARD DETAILS

TYPICAL BENCH DETAIL

FOREST LAKE, MINNESOTA

STO-32

LAST REVISION: APR 2016

CITY PLATE NO.
MNDOT B618

DISTANCE TO \(\epsilon\) VARIABLE

SLOPE 3/4" PER FT

FACE OF CURB

TOP BITUMINOUS MATERIAL

SURMOUNTABLE

DRIVEWAY

BITUMINOUS SURFACE

6" SHOE FORMED

STANDARD DETAILS
CURB AND GUTTER

FOREST LAKE, MINNESOTA
B618 CURB & GUTTER

CATCH BASIN AT P.C. OR P.T.

P.C. 5' 10'

Transition

SURMOUNTABLE Curb & Gutter

CATCH BASIN IN RADIUS

P.C. 10'

Transition

SURMOUNTABLE Curb & Gutter

DOUBLE CATCH BASIN

P.C. 5' 6' 10'

Transition

SURMOUNTABLE Curb & Gutter

SECTION A-A

MNDOT B618 CONC. C & G

SURMOUNTABLE C & G

STANDARD DETAILS

CONCRETE CURB & GUTTER

FOREST LAKE, MINNESOTA

LAST REVISION: APR 2000

CITY PLATE NO. STR-2
NOTE:
SURMOUNTABLE CURB & GUTTER
TO BE FORMED INTO A B618 TYPE
AT CATCH BASIN.

CATCHBASIN FRAME & COVER
NEENAH R-3067 OR EQUAL
WITH VANE GRATE.

A

10' MIN. TRANSITION

FLOW

10' MIN. TRANSITION

3' - 0"

NOTES:
CATCHBASIN TO BE DEPRESSED 2"
BELOW DESIGN GUTTER LINE GRADE.

SURMOUNTABLE CONCRETE
CURB & GUTTER

2 - #4 REBARS
EACH WAY

TOP OF CURB

DESIGN GUTTER LINE GRADE

FRAME & CASTING

SECTION A-A

NO SCALE

STANDARD DETAILS
SURMOUNTABLE CURB & GUTTER
CONSTRUCTION AT CATCHBASIN

FOREST LAKE, MINNESOTA

LAST REVISION:
MAR 1996

CITY PLATE NO.
STR-3
1. PANEL WIDTH SHALL NOT EXCEED 10 FEET WITHOUT A CONTRACTION JOINT.
2. DRIVEWAY TO BE ONE COURSE CONCRETE PAVEMENT.
3. 7" THICK FOR RESIDENTIAL, 8" THICK FOR COMMERCIAL, AND ALLEY OR AS SPECIFIED.
4. DRIVEWAY WIDTH IS 24' UNLESS OTHERWISE NOTED.
5. MINIMUM DISTANCE FROM LOT LINE IS 5'.
6. NEENAH R-1914-A CASTING IS REQUIRED FOR CURBSTOPS LOCATED IN DRIVEWAYS.
7. MAX. CROSS SLOPE OF SIDEWALK THROUGH DRIVEWAY IS 0.02 FT/FT. ADJUST APRON RUNNING SLOPE AS NEEDED.

NOTE:
CONTROL JOINTS IN CONCRETE CURB NOT TO EXCEED 10' SPACING THROUGH DRIVEWAY SECTION.
CONCRETE CURB REPLACEMENT IN EXISTING PAVEMENT LOCATIONS

EXISTING YARD

CONTRACTION JOINT (TYP.)

GUTTER LINE

EXISTING WEAR BITUMINOUS SURFACE

EXISTING ROADWAY

EXISTING CONCRETE CURB & GUTTER

SAWCUT

REMOVE AND REPLACE EXISTING WEARING COURSE

4" TOPSOIL AND SOD/SEED AND MULCH

2.00% MIN.

SECTION

STANDARD DETAILS
CONCRETE CURB REPLACEMENT IN EXISTING PAVEMENT LOCATIONS
FOREST LAKE, MINNESOTA
DETECTABLE WARNING SURFACE SHALL BE CAST IRON UNPAINTED PER MNDOT STANDARDS. USE RADIAL CURB LINES. WARNING SURFACES SHOULD BE PLACED AT THE BACK OF CURB WHEN THE WARNING SURFACE AND CURB ARE NOT PARALLEL. IN THIS CASE, HAND FORM THE CURB TO FILL THE GAP.

MAX. SLOPE 0.02 FT/FT ALL DIRECTIONS FOR LANDING.

MAX CROSS SLOPE 0.02 FT/FT FOR RAMP.

ROUND ALL SLOPED INTERSECTIONS

MAX. SLOPE 0.10' FT/FT.

SECTION B-B

CONCRETE CURB & GUTTER MATCH TOP OF CURB FOR SURMOUNTABLE CURB

SECTION A-A

1/4" MAX. VERTICAL LIP AT FLOW LINE

STANDARD DETAILS

PEDESTRIAN CURB RAMP

FOREST LAKE, MINNESOTA
CONCRETE CURB AND GUTTER (SEE PLATE STR-1)

EXPANSION JT.

CONCRETE OR BITUMINOUS PAVEMENT SURFACE
CLASS 5 OR SUITABLE GRANULAR BORROW BASE

SECTION
NO SCALE

PROPERTY LINE, SIDEWALK OR EXISTING DRIVEWAY

EXISTING DRIVEWAY

CONCRETE PAVEMENT TO MATCH BACK OF CONCRETE CURB AT THIS POINT

CL OF DRIVEWAY VARIES

CONTROL JOINT

5' 5'

12' MIN.

CONTROL JOINT

5' 5'

ISOMETRIC
NO SCALE

NOTE:
1. CONTROL JOINTS IN CONCRETE CURB NOT TO EXCEED 10' SPACING THROUGH DRIVEWAY SECTION.
2. ALL DRIVEWAYS MUST BE AT LEAST 5 FEET FROM THE PROPERTY LINE AND AT LEAST 30 FEET FROM A STREET RIGHT -OF-WAY.
3. ONLY ONE DRIVEWAY ENTRANCE PER PARCEL UNLESS OTHERWISE APPROVED BY CITY.
4. NEENAH R-1914-A CASTING IS REQUIRED FOR CURB STOPS LOCATED IN DRIVEWAYS.
5. MAX. CROSS SLOPE OF SIDEWALK THROUGH DRIVEWAY IS 0.02 FT/FT. ADJUST APRON RUNNING SLOPE AS NEEDED.
MEASUREMENT FOR PAYMENT

METHOD OF PAYMENT BY SQUARE YARD

INTEGRAL CAST
EXPANSION JOINT

SECTION A-A THRU
B618 C & G

SECTION B-B
THRU CONCRETE GUTTER

3/4" PER FT.

6" MIN. AGGREGATE BASE
NO. 4 REBAR (TYP)
1. The barricade face surfaces shall be fully reflectorized in alternate silver-white and red striping, using a reflective sheeting conforming to the requirements of Spec 3352.2.A2.

2. The placement of the barricades shall be 10'-0" from the end of the bituminous road with the barricade centered on the roadway facing the of traffic.

3. Place future road extension sign STR-12 on one barricade if required.
NOTES:
1. SIGN SIZE SHALL BE 24"x30".
2. LETTERS TO BE BLACK ON A WHITE BACKGROUND.
3. THE CITY LOGO SHALL BE IN COLOR AS SHOWN.
4. THE SIGN IS TO BE MOUNTED ON THE PERMANENT BARRICADE, TOP INSIDE POST.
TOP OF CASTING OR VALVE BOX BELOW WEAR COURSE AS SPECIFIED

BITUMINOUS PAVEMENT

GRAVEL BASE

SECTION A-A

SAW CUT LIMITS

GATE VALVE

MORE THAN 2'

LESS THAN 2'

EDGE OF GUTTER

BACK OF CURB

REMOVE & REPLACE PAVEMENT

SAW CUT LIMITS

MANHOLE

STANDARD DETAILS

MANHOLE AND GATE VALVE ADJUSTMENT IN PAVEMENT

FOREST LAKE, MINNESOTA

LAST REVISION: MAR 2020

CITY PLATE NO. STR-13
NEENAH R-3067V CATCH BASIN FRAME AND GRATE SHALL BE FURNISHED WITH CURB INLET BOX AND 3" DIA. FRONT FACE AND 4" MAXIMUM OPENING.

HIGH DENSITY POLYETHYLENE (HDPE) ADJUSTMENT RINGS. MIN. OF 4", MAX. OF 8". SET BOTTOM RING IN MORTAR AND GLUE REMAINING RINGS WITH APPROVED SEALANT.

CATCH BASIN STRUCTURE WITH TOP SLAB OR 2' X 3' BOX.

NON-WOVEN FILTER FABRIC

NEENAH R-1642B MANHOLE FRAME AND COVER SHALL BE FURNISHED WITH 2 CONCEALED PICK HOLES AND STAMPED "SANITARY SEWER" OR "STORM SEWER".

MANHOLE STRUCTURE WITH TOP SLAB OR CONE SECTION.

HIGH DENSITY POLYETHYLENE (HDPE) ADJUSTMENT RINGS. MIN. OF 4", MAX. OF 8". SET BOTTOM RING IN MORTAR AND GLUE REMAINING RINGS WITH APPROVED SEALANT.
SIGN PANELS AS SPECIFIED OR AS SHOWN ON THE PLANS OR SIGN LEGEND.

STREET SIGNS

2" x 2" x 12 ga. TELESPAR GALVANIZED SIGN POST

1 $\frac{3}{4}$" x 3' x 12 ga. INTERIOR SLEEVE

SURFACE MOUNT ANCHOR BASE

$\frac{1}{2}$" ALLOWABLE SHIM

CONCRETE

KLEEN BREAK SURFACE MOUNT ANCHOR MODEL NO. 425
Flanged Channel Post Specifications

Driven Steel Channel Posts shall be 7' long and weigh 3lb./ft.
Riser Steel Channel Posts shall be 7' long and weigh 2.5 lb./ft.
Posts shall be of the 4-rib design, galvanized and punched on 1" centers.

Traffic Sign Panel as Specified or as shown on plans or sign legend.
Mount street signs on top where shown on plans.

Traffic Sign in Ground

Standard Details

Forest Lake, Minnesota

Last Revision: Mar 2019
City Plate No. STR-18
STANDARD CONSTRUCTION NOTES FOR STREET NAME SIGNS:

1. ALL STREET SIGNS SHALL BE DIAMOND GRADE DG3, DOUBLE-FACED EXTRUDED BLADES.
2. ADDRESS NUMBERS FOR STREET NAME BLADES WILL BE PROVIDED AT A LATER DATE.
3. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR STREET NAME BLADES PRIOR TO FABRICATION.
4. STREET SIGN POSTS SHALL BE PER DETAIL PLATE STR-18
5. SIGN LOCATIONS SHALL BE STAKED BY THE ENGINEER AT THE TIME OF CONSTRUCTION.
6. ALL NAME BLADES SHALL BE "GREEN" IN COLOR. LETTERING ON ALL STREET NAME BLADES SHALL BE DIAMOND GRADE DG3, "WHITE" IN COLOR.
7. ALL NO OUTLETS SHALL BE DIAMOND GRADE DG3, "YELLOW" IN COLOR. LETTERING ON ALL NO OUTLET BLADES SHALL BE "BLACK" IN COLOR.
STANDARD CONSTRUCTION NOTES FOR STREET NAME SIGNS:

1. ALL STREET SIGNS SHALL BE DIAMOND GRADE DG3, DOUBLE-FACED EXTRUDED BLADES.
2. ADDRESS NUMBER FOR STREET NAME BLADES TO BE SUPPLIED AT A LATER DATE.
3. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR STREET NAME BLADES PRIOR TO FABRICATION.
4. STREET SIGN POSTS SHALL BE 12 FEET LONG, 4 FEET DRIVEN INTO THE GROUND.
5. STREET SIGN POSTS SHALL BE PER DETAIL PLATE STR-18.
6. SIGN LOCATIONS SHALL BE STAKED BY THE ENGINEER AT THE TIME OF CONSTRUCTION.
7. ALL PRIVATE STREET NAME BLADES SHALL BE "BLUE" IN COLOR. LETTERING ON ALL STREET NAME BLADES SHALL BE DIAMOND GRADE DG3, "WHITE" IN COLOR.
NOTES:
1. DRIVEWAY WIDTH (W): 12' MIN., 22' MAX.
2. RADIUS AT CONNECTION TO STREET (R): 5' MIN., 15' MAX.
3. CULVERT UNDER DRIVEWAY: MIN. 15" DIA., CMP OR RCP
4. DRIVEWAY SLOPES GREATER THAN 6% SHALL BE PAVED TO PREVENT EROSION.
5. MAINTAIN 60' MIN. CLEARANCE FROM EDGE OF DRIVEWAY TO R/W LINE OF ADJACENT STREET INTERSECTION.
6. CULVERT FLARED ENDS ARE REQUIRED.
7. MINIMUM 1% GRADE ON CULVERTS.
8. HOMEOWNER IS RESPONSIBLE FOR CULVERT INSTALLATION AND ESTABLISHMENT OF VEGETATION ALONG DRIVEWAY.
NOTES:
1. ALL ORGANIC OR OTHER UNSUITABLE MATERIAL SHALL BE REMOVED FROM BENEATH THE ROADWAY.
2. A TEST ROLL OF THE PREPARED SUBGRADE SHALL BE PERFORMED IN THE PRESENCE OF A CITY INSPECTOR. THE CITY HAS THE AUTHORITY TO REQUIRE ADDITIONAL SUBGRADE CORRECTION AND GRANULAR BORROW, OR ELIMINATE THE STABILIZATION FABRIC AND GRANULAR BORROW.
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3. DRAINTILE IS REQUIRED BEHIND CURB, MINIMUM 50' EACH WAY FROM CATCH BASINS.
TYPICAL STREET TURNAROUND
RURAL SECTION

NOTE:
1. NO DRIVEWAYS TO CONNECT TO ENDS OF EITHER LEG.
2. ALL TURNAROUNDS SHALL BE TO THE LEFT, AS SHOWN.

2' WIDE GRAVEL SHOULDER
BITUMINOUS PAVEMENT
3" BITUMINOUS WEAR - SPWEA230B
6" CL. 5 AGGREGATE BASE

FINISHED TRAIL TO BE 1" ABOVE FINISHED SOD

10'

0.02'/FT (MAX.)

3" BITUMINOUS WEAR - SPWEA230B
6" CL. 5 AGGREGATE BASE

TYPICAL TRAIL SECTION

FINISHED WALK TO BE 1" ABOVE FINISHED SOD

7'

0.02'/FT (MAX.)

6" CONCRETE - 3F52A
6" CL. 5 AGGREGATE BASE

NOTE:
INSIDE EDGE OF WALK TO BE 0.4 FEET ABOVE TOP OF CURB. OUTSIDE EDGE TO BE 0.52 FEET ABOVE TOP OF CURB.

CONCRETE SIDEWALK

STANDARD DETAILS
TYPICAL BITUMINOUS TRAIL
AND CONCRETE SIDEWALK

FOREST LAKE, MINNESOTA

FOREST LAKE
AS GOOD AS IT SOUNDS

LAST REVISION:
APR 2016

CITY PLATE NO.
STR-24
18" SURMOUNTABLE CURB EDGING

GRASS

4"-6" TOPSOIL

6" SELECT GRANULAR - MNDOT 3149

3" HOLD DOWN

6" SHREDDED RUBBER

4" ROCK FILTER

GEOTEXTILE FABRIC
MIRAFI 140 NSL OR APPROVED EQUAL.

4" HDPE PERFORATED DRAIN TILE WITH GEOTEXTILE WRAP MIRAFI 140s FILTER SOCK OR APPROVED EQUAL.
20' BITUMINOUS

5"*  10"*  5"*

MAX. 0.02'/FT.

4" BITUMINOUS WEAR COURSE - SPWEA240C (2 LIFTS)
10" CLASS 5 AGGREGATE BASE
12" SELECT GRANULAR BORROW - MODIFIED
(OR AS RECOMMENDED BY SOILS ENGINEER)
GEOTEXTILE FABRIC, TYPE V, NON-WOVEN
(AS RECOMMENDED BY SOILS ENGINEER)
APPROVED COMPACTED SUBGRADE

* OPTION: 10' WIDE BITUMINOUS, WITH 5' WIDE GRAVEL SHOULDERS.
GRAVEL SECTION MUST BE INCREASED 4" UNDER SHOULDERS TO PROVIDE EQUIVALENT STRUCTURAL SUPPORT FOR SHOULDERS.

NOTES:
1. DEAD END ACCESS LANES OVER 150' IN LENGTH NEED AN APPROVED TURNAROUND.
2. UNOBSERVED VERTICAL CLEARANCE OF 13'-6" REQUIRED ABOVE ACCESS LANE.
3. PROVIDE FIRE DEPARTMENT APPROVED SIGNS WITHIN 20' OF EVERY ENTRANCE POINT.

STANDARD DETAILS
FIRE DEPARTMENT ACCESS LANE
BUILDINGS UP TO 24' HIGH

FOREST LAKE, MINNESOTA
STR-27
APR 2016
FIRE DEPARTMENT ACCESS LANE
BUILDINGS OVER 24' HIGH

10'*
4" BITUMINOUS WEAR COURSE - SPWEA240C (2 LIFTS)
10" CLASS 5 AGGREGATE BASE
12" SELECT GRANULAR BORROW - MODIFIED
(OR AS RECOMMENDED BY SOILS ENGINEER)
GEOTEXTILE FABRIC, TYPE V, NON-WOVEN
(AS RECOMMENDED BY SOILS ENGINEER)
APPROVED COMPACTED SUBGRADE

* OPTION: 10' WIDE BITUMINOUS, WITH 8' WIDE GRAVEL SHOULDERS.
GRAVEL SECTION MUST BE INCREASED 4" UNDER SHOULDERS TO
PROVIDE EQUIVALENT STRUCTURAL SUPPORT FOR SHOULDERS.

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TYPICAL SECTION

PLAN VIEW

FIRE DEPARTMENT ACCESS LANE
MIN. 25' R
MAX. 65'
MIN. 25' R

MIN. 50' R
MIN. 30' R

PROPOSED BUILDING
PARKING LOT

STANDARD DETAILS
FIRE DEPARTMENT ACCESS LANE
BUILDINGS OVER 24' HIGH

FOREST LAKE, MINNESOTA

LAST REVISION:
APR 2016
CITY PLATE NO.
STR-27
NOTES:
1. ALL ORGANIC OR OTHER UNSUITABLE MATERIAL SHALL BE REMOVED FROM BENEATH THE ROADWAY.
2. A TEST ROLL OF THE PREPARED SUBGRADE SHALL BE PERFORMED IN THE PRESENCE OF A CITY INSPECTOR. THE CITY HAS THE AUTHORITY TO REQUIRE ADDITIONAL SUBGRADE CORRECTION AND GRANULAR BORROW, OR ELIMINATE THE STABILIZATION FABRIC AND GRANULAR BORROW.
3. DRAINTILE IS REQUIRED BEHIND CURB, MINIMUM 50' EACH WAY FROM CATCH BASINS.
NOTES:
1. VALVE BOX SHALL BE 3-PIECE DUCTILE IRON SCREW-TYPE.
2. 8' MINIMUM COVER REQUIRED OVER TOP OF WATER MAIN.

GRADE

ADJUST TOP TO 1/2" BELOW GRADE. BOX TO BE SET TO PROVIDE 12" OF ADJUSTMENT.

EXTENSION ROD-TOP WITHIN 12-18" OF GRADE.

1/4" STEEL GATE VALVE ADAPTOR W/ PROTECTIVE COATING MANUFACTURED BY ADAPTOR, INC. OR EQUAL.

RESILIENT WEDGE VALVE CONFORMING TO AWWA C-509-80 STANDARDS.
NOTES:
1. SHAPE OF BACK OF BUTTRESS MAY VERY AS LONG AS POURED AGAINST FIRM UNDISTURBED EARTH.
2. DIMENSION C1,C2,C3 SHOULD BE LARGE ENOUGH TO MAKE ANGLE $\phi$ EQUAL TO OR LARGER THAN 45°.
3. DIMENSION A1,A2,A3 SHOULD BE AS LARGE AS POSSIBLE WITHOUT INTERFERING WITH MJ BOLTS.
4. $\phi = 45°$ MINIMUM.
5. PLACE POLYETHYLENE BETWEEN CONCRETE & PIPE.

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STANDARD DETAILS
CONCRETE THRUST BLOCKING
FOREST LAKE, MINNESOTA

FOREST LAKE
AS GOOD AS IT SOUNDS
1 CUBIC YARD MIN. 1 1/2" WASHED ROCK. COVER WITH POLYETHYLENE.

HYDRANT FLAG AS SPECIFIED

CONNECT TRACER WIRE TO SNAKE PIT MAGNETIZED TRACER BOX - CONCRETE DRIVEWAY BOX BY COPPERHEAD INDUSTRIES, OR EQUAL.

BREAKOFF FLANGE WITH BREAKABLE RED COUPLINGS

BACKFILL TO BE TAMPERED

8" CONCRETE BLOCK

TRACER WIRE:
#12 AWG COPPER CLAD STEEL
MINIMUM 30 MIL HDPE INSULATION
MINIMUM BREAK LOAD:
450 LB (OPEN TRENCH)
1,150 LB (DIRECTIONAL DRILL)

TIE ALL JOINTS WITH MEGALUGS (MIN. 4 REQ.)

GATE VALVE AND BOX WITH EXTENSION ROD GATE VALVE ADAPTOR AND 1 1/2" ROCK (SEE WAT - 4)

CONNECT TRACER WIRE TO MAIN TRACER WIRE

WATEROUS IMPROVED PACER SYTLE WB67-250
2-2.5" HOSE CONNECTION
1-4.5" STEAMER CONNECTION

HYDRANT GATE VALVE AND BOX WITH EXTENSION ROD GATE VALVE ADAPTOR AND 1 1/2" ROCK (SEE WAT - 4)
NOTE:
1. ALL FITTINGS SHALL BE FUSION BONDED EPOXY COATED DUCTILE IRON TO MEET OR EXCEED ANSI/AWWA C550 AND C116/A21.16 REQUIREMENTS.

2. MEGALUGS WILL NOT BE ALLOWED ON ANY CIP WATER MAIN.

3. SELECT GRANULAR WILL BE REQUIRED BETWEEN INSULATION, WATER MAIN, AND OBSTRUCTION.

4. ALL BENDS SHALL HAVE MEGALUGS OR TIE RODS WITH BLOCKING IN ACCORDANCE WITH STANDARD PLATE WAT-03.

5. COPPER TRACER WIRER SHALL BE USED ON PVC WATER MAIN.

6. ALL WATER MAIN BOLTS SHALL BE CORE-BLUE OR APPROVED EQUAL.
ONE MAIN METER
BILLING GOES TO MANAGEMENT
COMPANY INDIVIDUAL METERS
MAY BE ADDED FOR EACH UNIT
FOR MANAGEMENT BILLING
BREAK DOWN.

NOTE: ALL METERS MUST BE LOCATED IN A
CENTRAL ROOM AT POINT WHERE
WATER SERVICE ENTERS BUILDING.
IRRIGATION LINES MUST ALSO HAVE
SEPARATE METER IF LINE IS
CONNECTED PRIOR TO MAIN.

STANDARD DETAILS
MULTIPLE UNITS
USING MAIN WATER METER

FOREST LAKE, MINNESOTA

CITY PLATE NO.
WAT-11

LAST REVISION:
OCT 2007
INDIVIDUAL METERS PER UNIT AND EACH UNIT IS BILLED SEPARATELY.

NOTE: ALL METERS MUST BE LOCATED IN A CENTRAL ROOM AT POINT WHERE WATER SERVICE ENTERS BUILDING. IRRIGATION LINES MUST ALSO HAVE SEPARATE METER IF LINE IS CONNECTED PRIOR TO MAIN.

STANDARD DETAILS
MULTIPLE UNITS
INDIVIDUAL WATER METER

FOREST LAKE, MINNESOTA