ENGINEERING DESIGN STANDARDS
for
CITY OF LAKE ELMO

STREET DESIGN AND GEOMETRICS

- **Geometric Design, Local Residential Street**
  -Minimum Street Width, back of curb to back of curb……28-feet
  -Minimum Street Width, one-way lanes with center median……19-feet
  -Center Crown……2.5%
  -Minimum Longitudinal Grade……0.5%
  -Maximum Longitudinal Grade……8%
  -Maximum Intersection Approach Grade, First 50-feet……2.0%
  -Minimum Vertical Curve Length, Crest (including stop conditions)……K=19
  -Minimum Vertical Curve Length, Sag (including stop conditions)……K=37
  -Minimum Horizontal Curve Radius……90-feet
  -Intersection Angles……90 degrees
  -Minimum Intersecting Street Offset, from Centerlines……150-feet
  -Curb Radius, Minimum Local to Local……20-feet
  -Curb Radius, Minimum Local to Collector……25-feet
  -Minimum Diameter of Cul-de-sac……90-feet
  -Minimum Grade around Cul-de-sac……0.5%
  -Maximum Cul-de-sac Street Length (lots less than 2.5 acres)……600-feet
  -Maximum Cul-de-sac Street Length (lots equal or greater than 2.5 acres)……1,320-feet
  -Temporary Cul-de-sac at plat line……Required

- **Geometric Design, Collector Street**
  -Design Standards……Meeting State-Aid for minimum design speed
  -Minimum Street Width, back of curb to back of curb……Varies (36-feet min)
  -Maximum Longitudinal Grade……6%
  -Intersection Angles……90 degrees
  -Tangent Length at Intersection from Curb Line, Local Streets……50 feet
  -Tangent Length at Intersection from Curb Line, Higher Class Streets……100 feet
  -Tangent Minimum between curves……50 feet
  -Minimum Vertical Curve Length, Crest……Meeting State-Aid for minimum design speed
  -Minimum Vertical Curve Length, Sag……Meeting State-Aid for minimum design speed
  -Minimum Horizontal Curve Radius……Meeting State-Aid for minimum design speed
  -Minimum Intersecting Street Offset, if allowed, from Centerlines……250-feet
  -Street/Roadway Access……Per City Access Management Spacing Guidelines
  -Driveway Access, Residential……Prohibited
  -Driveway Access, Commercial……Per City Access Management Spacing Guidelines
  -Curb Radius……25-feet

- **Pavement Section Design** *(Pavement sections below are minimum allowed. Additional pavement section may be required based on Geotechnical Report of the subgrade soils).*

  -Local Residential Street…….Minimum 7-Ton Design
  -Subbase, Select Granular Borrow (SPEC 3149.2B)……Minimum 12-inches
  -Subsurface Drainage System…….Required
  -Base, Aggregate Base, Cl. 6 100% Crushed Stone Aggregate……..Minimum 6-inches
  - *Note: Class 6 Recycled Material Substitute by City Engineer Approval*

  -Non-Wearing Course, MnDOT 2360 Type SP 12.5, Mixture 2B……..2-inches
  -Wearing Course, MnDOT 2360 Type SP 9.5, Mixture 2B……1½-inches

  -Collector Street and Above……Minimum 10-Ton Design
  -Subbase, Select Granular Borrow (SPEC 3149.2B)……Minimum 12-inches
  -Subsurface Drainage System…….Required
  -Base, Aggregate Base, Cl. 6 100% Crushed Stone Aggregate……..Minimum 8-inches
  - *Note: Class 6 Recycled Material Substitute by City Engineer Approval*

  -Non-Wearing Course, MnDOT 2360 Type SP 12.5, Mixture 3C……..2-inches
  -Wearing Course, MnDOT 2360 Type SP 9.5, Mixture 3C……2-inches

- **Draintile/Street Subsurface Drainage**

  -Type……Rigid PVC Perforated
  -Size……4-inch
  -Sock……MnDOT SPEC 3733
  -Location……All Low Points in both directions; at 350 foot intervals, and Project Specific Design
  -Length……Minimum 100-foot runs; 100 feet in both directions from low points
  -Clean Outs……Every 150 feet and at all dead ends

- **Curb and Gutter**

  -Material, All Purposes……Concrete
  -Strength, Minimum Requirements……3,900 PSI
  -Type: New Developments, Single Family Residential……Surmountable
  -Type: Multifamily, Commercial, Collector Roads, Medians, Reconstruction……B618

- **Utility Conduit**

  -Type……PVC Schedule 40
  -Location/Depth……..Perpendicular to Street and minimum 1-foot below Street Subgrade

- **Entrances/Driveways**

  -Maximum Driveway Width at Right-of-way……Varies by Zoning District
  -Bituminous Driveway Minimum Thickness, Section……Match Street
  -Residential Concrete Driveway Minimum Thickness……6-inches
  -Commercial Concrete Driveway Minimum Thickness……8-inches

- **Signing**

  -Design Standards……MMUTCD
  -Sheathing Type……High Intensity Diamond Grade DG3
  -Sign Posts, green powdered painted galvanized metal……3.0 LBS/ft

RIGHT-OF-WAY AND BOULEVARD LAYOUT

- **Right of Way Widths**
  -Local Residential Street Minimum Width……60-feet
  -Cul-de-sacs……60-foot radius
  -Collector Street Minimum Width……Varies (80 feet Minimum)

- **Boulevard, Local Residential Street**
  -Width……16-feet
  -Slope, Typical and Maximum……4% and 4:1
  -Topsoil Minimum……6-inch
  -Turf Treatment……Lawn Sod
  -Tree Location without Sidewalk or Trail……8-feet back of curb
  -Tree Location with Sidewalk or Trail……5-feet back of curb
  -Street Light Location……5-feet back of curb
  -Street Light Type……15-foot California Acorn
  -Hydrant Location……5-feet back of curb

- **Sidewalks**
  -Collector Street……Required on both sides
  -Local Residential Street……Required on one side
  -Cul-de-sac Street……Required for trail connection
  -Width……6-feet
  -Sidewalk Maximum Longitudinal Grade……6%
  -Pavement Section……5-inch Concrete; 4-inch Select Granular

- **Trails**
  -Locations……Per City trail plan and as directed
  -Width, Local Trail……8-feet
  -Pavement Section, Local Trail……2.25-inch Bituminous; 8-inch minimum Class 5
  -Maximum Longitudinal Grade……8%

- **Berm Construction in Boulevard**
  -Maximum Side Slope with Maintenance Requirements……3:1
  -Maximum Side Slope with Natural Vegetation……2:1

SANITARY SEWER

- **Force Main**
  -Material……..PVC or HDPE
  -PVC, 2-inch–24-inch…… C900/C905
  -HDPE Class, 1-inch……SDR 9
  -HDPE Class, 2-inch–24-inch……..SDR 11
  -Minimum Cover……8-Feet
  -Location of main in Street……Project Specific
  -Tracer Wire……8 AWG solid, PRO-TRACE HDD-CCS PE45
  -Air Relief Valve and Manhole Locations……All High Points
  -Clean Outs……All Low Points

- **Gravity main**
  -Material……PVC
  -Minimum Diameter……..8-inch
  -Class, up to 20-feet in depth……SDR 35
  -Class, 20-25 feet in depth……SDR 26
  -Class and Material, over 25 feet in depth……..Project Specific
  -Minimum cover over pipe……5.5-feet
  -Maximum depth of pipe……30-feet
  -Slope……Ten States Standards
  -Tracer Wire……12 AWG solid, PRO-TRACE HF-CCS PE45
  -Location of main in Street……..Centerline

- **Sanitary Sewer Manholes**
  -Type……Precast Concrete
  -Maximum inlet/outlet elevation difference……..2-feet
  -Minimum depth of Manhole……6-feet
  -Type of Casting……R-1642-B
  -Joints and Assembly……..Per City Details
  -Location……Street Centerline
  -Maximum Spacing……400-feet
  -Flow Line Match Required……8/10ths Rule
  -Drop Across All Manholes Required……0.1-feet
  -Connections to Existing Manholes……Core Drill with Boot
  -Outside drop minimum……2-feet
  -Outside drop Material……..Ductile Iron

- **Service Pipe**
  -Material……PVC
  -Minimum Diameter……4-inch
  -Class……SCH 40
  -Tracer Wire……12 AWG solid, PRO-TRACE HF-CCS PE45

WATERMAIN

- **Water Service Pressures**
  -Individual Booster Pumps required…….development specific

- **Main Pipe**
  -Material……..DIP
  -Class……CL. 52
  -Minimum Diameter – Mainline……..8-inch
  -Minimum Diameter – Unlooped Cul-de-sac……8-inch
  -Minimum Diameter – Hydrant Lead……6-inch
  -Minimum Cover……7½-feet
  -Maximum Length of Dead Ends……600-feet
  -Air Release measures……MH, Hydrant
  -Tracer Wire……8 AWG solid, PRO-TRACE HF-CCS PE45
  -Location of main in Street……North or West

- **Hydrants**
  -Type……Waterous Pacer WB-67
  -Depth of Bury……8½-feet
  -Maximum Coverage Radius, Residential……500-feet
  -Maximum Coverage Radius, Commercial……300-feet
  -Gate valve on Hydrant leads……Yes-at Tee
  -Hydrant Nozzel……4-inch Storz with Pentagon Nut end cap
  -Temporary dead end lines……Hydrant required (no air bleed valves)

- **Valves**
  -Resilient Seat Gate Valve, for 12-inch pipe & smaller……American Flow Control 2500 Series
  -Butterfly Valve, for pipe over 12-inch……Mueller Lineseal III
  -Valve Box……Tyler G-Box6860
  -Maximum area isolated by valving……20 services
  -Maximum distance between valves on Trunk Mains……800-feet

- **Service Pipe**
  -Service Material……Type “K” copper
  -Corporation Stop……A.Y. McDonald 74701B
  -Curb Stop ……A.Y. McDonald 76104
  -Curb Box ……A.Y. McDonald 5614 w/rod & Mpls. top

STORM SEWER

- **Design**
  -Design Frequency for Storm Sewer……..10-year
  -Minimum storm sewer design velocity……3-fps
  -Maximum storm sewer design velocity……..15-fps
  -Maximum storm sewer outlet velocity……5-fps
  -Minimum Outfall Pipe Slope…….Verify positive grade at completion (no reverse grade)

- **Main Pipe**
  -Storm Sewer Pipe Material……RCP
  -Minimum Cover Depth……...3-feet
  -Minimum Pipe Diameter, Main……...15-inch
  -Minimum Catch Basin Lead……..12-inch
  -Location of main in Street……South or East

- **Culvert pipe**
  -Culvert Material, urban road or crossing public road……RCP
  -Culvert Material, rural road private driveway……..CMP
  -Minimum Culvert Size……...15-inch
  -Apron and Trash Guard Required……..Yes

- **Manholes**
  -Type……Precast Concrete
  -Sump Depth and Location……...N/A
  -Minimum Structure Depth……...4-feet
  -Casting……..R-1642-B
  -Minimum Adjustment Rings……2
  -Maximum Adjustment Rings……...1-foot

- **Catch Basins**
  -Type……Precast Concrete
  -Minimum Structure Depth……...4-feet
  -Maximum run to Catch Basin……..350-feet
  -Casting, Curb & Gutter, B Style Curb……..R-3067V
  -Casting, Area Drain……R-4342

STORMWATER MANAGEMENT AND STORMWATER BMPs

Note: Stormwater facilities shall be in accordance with the Requirements listed herein; in accordance with the Requirements of the applicable watershed district; and in accordance with the Minnesota Pollution Control Agency NPDES Construction Storm Water Permit. In addition, all "Recommended" and "Highly Recommended" provisions of the Minnesota Stormwater Manual should be considered requirements by the City of Lake Elmo unless specifically approved otherwise by the City Engineer.

- **Site Design**
  -Facility locations…….Outlots deeded to City
  -Location and Size……..……above 100-year HWL
  -Building Lowest Floor above 100-year HWL…….2-feet
  -Building Lowest Opening above EOF……1-foot
  -Minimum access road width (located in Outlot)……..20-feet
  -Maximum grade for maintenance access roads……..10%
  -Setback from building foundations……35-feet
  -Flood Protection……Overland Emergency Overflows Required (No landlocked basins)

- **Stormwater Ponds (Detention Basins)**
  -Design Frequency (DF)……..2, 10, and 100-year, and 100-year 10-day snowmelt
  -Minimum Basin Depth to HWL……3-feet
  -Maximum Pond Depth to HWL……..10-feet
  -Average Permanent Pool Depth……4-feet to 6-feet
  -Permanent Pool Length-to-Width Ratio……...3:1 or greater
  -Maintenance Bench Maximum side slope, first ten feet above Permanent Pool……10:1
  -Aquatic Bench Maximum side slope, first ten feet into Permanent Pool……10:1
  -Maximum side slope, beyond first ten feet……3:1
  -Pretreatment Sediment Forebay……Required 10% Pond Area
  -Required freeboard……..2-feet above HWL

- **Drainage Swales**
  -Maximum side slopes on Swales (maximum slopes allowed only when necessary)……3:1
  -Maximum side slopes on Right-of-Way Swales……..4:1
  -Minimum longitudinal Swale grade……2%
  -Minimum Swale depth within Right-of-Way……..18-inches
  -Minimum Bottom Width……..4-feet

- **Infiltration Facilities (Bioretention Areas and Rain Gardens)**
  -Inlet control from Streets……Use Neenah R-3067-V casting on Catch Basin (no curb cuts)
  -Maintenance Agreement for public right-of-way……..Required
  -Maintenance Access Easement……..Required
  -Minimum distance from septic system or drainfield……35-feet
  -Minimum distance from public or private well……50-feet
  -Maximum Site Slope……5%
  -Minimum depth to Bedrock……5-feet
  -Minimum depth to Seasonally High Water Table……..5-feet
  -Located in "hotspot" drainage shed (i.e. gas stations)……..Prohibited
  -Located in Hydrologic Soil Group D Soils……..Prohibited

-Underdrain, Group C Soils (filtration)……Required
-Soil infiltration rates……*By Field Testing at Facility Location
-Minimum In-situ Permeability……..1-inch per hour
-Maximum side slope……4:1
-Maximum drain dry time……48 hours
-Soil medium……MnDOT 3877 E Rooting Topsoil Borrow
-Plantings……Seed per MnDOT 3876 Specifications with Type 33-261
……Seed to be enhanced with 1 plug per 4 Square Feet
……Infiltration areas 10,000 sqft or greater requires 3 grass mixes for variety
……Native Shrubs to be planted in conformance with City approved landscape plan

** Soil borings are required to verify infiltration rates. Borings must be taken to a depth of 20 feet below proposed infiltration basin elevation.*

- **Other Stormwater BMPs:** *The City of Lake Elmo has adopted the following additional BMPs and Low Impact Development practices for the City and promotes their use in accordance with these Engineering Design Standards and the applicable City Code.*

  - **Open Space Developments in applicable Zoning Districts.**
  - **Narrow Streets through minimized street width standards.**
  - **Stormwater Reuse.**
  - **Filtration Facilities.**
  - **Vegetated Swales (Ribbon Curbs and Curbless Streets in applicable Zoning Districts).**
  - **Temporary Erosion and Sedimentation Control using Engineering Standards Manual.**
  - **Stormwater Site Design.**
    -Conservation of open spaces to protect a site's natural areas.
    -Impervious lot coverage credits for Stormwater BMPs.
    -Use of Pervious Pavements.
    -Reproduce predevelopment hydrology.
    -Incorporation of Landscaping and use of Native Vegetation.

DETAIL PLATE NUMBERS AND PLAN NOTES

• Pipe Installation	101,103,105
• Watermain	200A,201,203,204,206,207A,207B,210,211
• Sanitary Sewer	300A,301,302,303,305,306,311,313,314
• Storm Sewer	400A,402,404,405,406,407,408,409,410, 411,412,416,417,419,420,421
• Pavements, Curbs, Walks	500A,501,502,504,505,506,507,508,509 510,511,512,513
• Erosion Control	600A,600B,600C,600D,601,603,604,605
• Miscellaneous	700A,706,712,713
• Typical Sections and Right-of-Way	801,804,805,806
• Landscaping	900,901A,901B,902A,902B,903A,903B,904