City of Helena

Est. 1881

ENGINEERING AND DESIGN STANDARDS

2025 UPDATE

City of Helena
Public Works Department
316 North Park Avenue, Room 417
Helena, MT 59623
(406) 447-8430

ACRONYMS

AASHTO - American Association of State Highway and Transportation Officials

ADA - Americans with Disabilities Act

ADT - Average Daily Traffic

API - American Petroleum Institute

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

BMP - Best Management Practice

CMP - Corrugated Metal Pipe

CPT - Corrugated Polyethylene Tubing

CPE - Corrugated Polyethylene Storm Sewer Pipe

CP - Coalescing Plate

DEQ - Montana Department of Environmental Quality

ESAL - Equivalent Single Axle Load

FHWA - Federal Highway Administration

HDPE - High Density Polyethylene Pipe

IFC – International Fire Code

ITE - Institute of Transportation Engineers

LID - Low Impact Development

LOS - Level of Service

MDT - Montana Department of Transportation

MPWSS - Montana Public Works Standard Specifications

MS4 - Municipal Separate Storm Sewer Systems

MSE - Mechanically Stabilized Earth

MUTCD - Manual on Uniform Traffic Control Devices

NRCS - US Department of Agriculture Natural Resources Conservation Service

PROWAG – Public Rights-Of-Way Accessibility Guidelines

PVC - Polyvinyl Chloride Pipe

RCP - Reinforced Concrete Pipe

ROW- Right-of-Way

SC - Spill Control

SDF - System Development Fee

SWPPP - Storm water Pollution Prevention Plan

Table of Contents

PART 1 GENERAL PROVISIONS 1

1.1 INFRASTRUCTURE ACCEPTANCE POLICY 1

1.1.1 Interim Use 1
1.1.2 Final Acceptance 2

1.2 SYSTEM DEVELOPMENT FEES (WATER, SEWER) 3
1.3 UTILITY REBATE AGREEMENTS 3
1.4 TEMPORARY WATER USE 3
1.5 TEMPORARY SEWER USE 3
1.6 STORM WATER 3
1.7 DEVIATION PROCESS 4
1.8 CONSTRUCTION PLAN REQUIREMENTS 4

PART 2 WATER SYSTEMS 12

2.1 DESIGN REQUIREMENTS 12
2.2 DESIGN REPORT 12
2.3 WATER SERVICE AREA – EXPANSION 13
2.4 WATER MAINS 14

2.4.1 Design Considerations 14
2.4.2 Materials 14
2.4.3 Installation 15
2.4.4 Extension 17
2.4.5 Sewer Line Crossings 17
2.4.6 Tapping City Water 18
2.4.7 Valves 19
2.4.8 Fire Hydrants 19
2.4.9 Water Vaults 20
2.4.10 Abandonment of Existing Water Mains 20

2.5 WATER SERVICE LINES 20

2.5.1 Materials 20
2.5.2 Installation 21
2.5.3 Abandonment of Existing Service Lines 21
2.5.4 Curb Stops and Boxes 22
2.5.5 Service Line Meters 22
2.5.6 Backflow Prevention 23
2.5.7 Fire Sprinkler Systems 24

PART 3 SANITARY SEWER SYSTEMS 26

3.1 DESIGN REQUIREMENTS 26
3.2 DESIGN REPORT 26
3.3 WASTEWATER SERVICE AREA 28

3.4 SANITARY SEWER MAINS 28
3.4.1 Design Considerations 28
3.4.2 Materials 29
3.4.3 Installation 30
3.4.4 Extension 30
3.4.5 Water Line Crossings 30
3.4.6 Abandonment of Existing Sanitary Sewer Mains 31
3.5 SEWER SERVICE LINES 31
3.5.1 Materials 31
3.5.2 Installation 31
3.5.3 Tapping City Sewer 32
3.5.4 Metering when not on City Water 33
3.5.5 Solids Handling/Grinder Pump/Communitor Services 33
3.5.6 Abandonment of Existing Sanitary Sewer Services 33
3.6 LIFT STATIONS 33
3.6.1 Capacity 33
3.6.2 Building 33
3.6.3 Wet Well 34
3.6.4 Piping 34
3.6.5 Valving 34
3.6.6 Safety 34
3.6.7 Pumps 34
3.6.8 Telemetry 34
3.6.9 Pigging Stations 34
3.6.10 Odor Control 34
3.6.11 On Site Generator 35
PART 4 STORM DRAINAGE SYSTEMS 37
4.1 GENERAL REQUIREMENTS AND POLICY 37
4.1.1 Introduction 37
4.1.2 Applicable Policy 39
4.1.3 Overall Design Requirements 39
4.2 DRAINAGE REPORT AND PLAN SUBMITTAL REQUIREMENTS 40
4.3 HYDROLOGIC ANALYSIS AND DESIGN 41
4.3.1 Design Storm Events 41
4.3.2 Rainfall 41
4.3.3 Hydrologic Models 42
4.4 CONVEYANCE DESIGN 42
4.4.1 Open Channels 42
4.4.2 Storm Sewers 44

4.4.3 Manholes 47
4.4.4 Inlets 48
4.4.5 Culverts 48
4.4.6 Streets 48
4.4.7 Floodplains 49

4.5 STORMWATER RUNOFF CONTROL & WATER QUALITY TREATMENT 49

4.5.1 Regional Ponds 51
4.5.2 Above-Ground Detention Ponds 51
4.5.3 Parking Lot Detention Ponds 51
4.5.4 Underground Detention Storage 52
4.5.5 Retention Ponds 53
4.5.6 Water Quality Treatment Ponds 54
4.5.7 Outlet Structures 55
4.5.8 Emergency Spillway 55
4.5.9 Maintenance Access and Restrictions 56
4.5.10 Embankments 56
4.5.11 Vegetation and Landscaping 56

4.6 DRAINAGE EASEMENTS AND TRACTS 57

4.6.1 Storm Sewers and Culverts 58
4.6.2 StormWater Ponds 58
4.6.3 Open Channels and Natural Waterways 59

4.7 CONSTRUCTION EROSION AND SEDIMENT CONTROL 59

4.7.1 General Construction Site Requirements 59
4.7.2 Erosion and Sediment Control Plan Sheet(s) 59
4.7.3 SWPPP Review and Approval 59

4.8 REFERENCES 60

PART 5 TRANSPORTATION STANDARDS 62

5.1 OVERVIEW 62

5.1.1 Purpose 62
5.1.2 Definitions 62
5.1.3 Functional Classifications – Purpose 63
5.1.4 Functional Classifications Urban Roads 63

5.2 TRANSPORTATION DESIGN STANDARDS 64

5.2.1 Roadway Design & Technical Criteria 64
5.2.2 Sidewalks/Curb and Gutters 64
5.2.3 Bicycle Facilities and Multi-Use Paths 65
5.2.4 Driveway Standards – Curb Cut Requirements 66
5.2.5 Horizontal Alignment 66
5.2.6 Vertical Alignment 69

5.2.7 Sight Distance 70
5.2.8 Median/Curb Extensions Treatment 71
5.2.9 Roadway Drainage 71
5.2.10 Roadway Specifications 72
5.2.11 Monumentation 73
5.2.12 Complete Streets 74

5.3 RIGHT-OF-WAY (ROW) STANDARDS 74

5.3.1 Typical Roadway Sections 74
5.3.2 Existing ROW Hierarchy 75

5.4 TRAFFIC CALMING 78
5.5 BRIDGES 78

5.5.1 Bridge Plans Sheet Sequence: 78
5.5.2 Bridge Details & Detail Sheets 79

5.6 UTILITY CORRIDORS WITHIN NEW SUBDIVISIONS OR UNDEVELOPED ANNEXATIONS 79
5.7 LANDSCAPED BOULEVARD REQUIREMENTS 80
5.8 MULTI-MODAL STUDIES 80
5.9 ROUNDABOUT AND TRAFFIC SIGNAL REQUIREMENTS 80

5.9.1 Electrical Plans Sheet Sequence: 81
5.9.2 Electrical Details and Detail Sheets 81

5.10 SIGNING AND PAVEMENT MARKING REQUIREMENTS 82

5.10.1 Street Name Signs 82
5.10.2 Regulatory Signs 83
5.10.3 Pavement Markings 83

5.11 STREET LIGHTING REQUIREMENTS 83
5.12 WORK ZONE TRAFFIC AND PEDESTRAIN CONTROL 84
5.13 GEOTECHNICAL/SLOPE STABILIZATION CONSIDERATIONS 85
5.14 TEMPORARY AND PERMANENT BARRICADES 85
5.15 TRANSPORTATION DESIGN SPECIFICATIONS 86

Appendix A – Checklists/Applications 1

Appendix B – Multi-Modal Traffic Impact Study Requirements 1

Appendix C – Standard Details 1

List of Tables

Table 2-1. Irrigation Water Use For Residential Zoning Districts 13
Table 3-1. Wastewater Load by Development Type 27
Table 4-1. Precipitation Levels for the City of Helena 41
Table 4-2. Precipitation Intensity Values, Inches/Hour 41
Table 4-3. Design Criteria for Man-Made, Grass-Lined Channels 43
Table 4-4. Design Criteria for Storm Sewers 44
Table 4-5. Vertical Clear Distances from Storm Sewers 45
Table 4-6. Horizontal Clear Distances from Storm Sewers 46
Table 4-7. Allowable Drainage Encroachment within Public Streets by Street Classification 49
Table 4-8. Stormwater Management Requirements by Project Activity and Size 50
Table 4-9. Maximum Percolation Rates for Soil Types 55
Table 4-10. Native Area Seeding Mixes by Site Characteristics 56
Table 4-11. Drainage Easement Extent Requirements 58
Table 5-1. Curb Return Radius at Intersections* 67
Table 5-2. Alignment Controls 68
Table 5-3. Allowable Grade Differential 69
Table 5-4. Complete Street Component Matrix (minimum widths) 76

PART 1 – GENERAL PROVISIONS

PART 1 GENERAL PROVISIONS

1.1 INFRASTRUCTURE ACCEPTANCE POLICY

Interim use of the underground public utilities will be considered only after all required information is presented. The City will accept the new utilities for interim use and maintenance after the completion of the preliminary punch list items that affect the use and adequacy of the utility. A letter of acceptance for interim use will then be issued from the City Engineer and sent to the developer/owner and the Community Development Department for their files. The developer/owner will be responsible for the complete installation of all required infrastructure, even though the interim use of the utilities is allowed before final acceptance. A financial guarantee will be required for the punch list items that have not been accepted by the City prior to filing the final plat, annexation, or issuance of the building permit when the property is already within the City limits.

The purpose of this policy is to define the procedures and parameters by which the City of Helena will accept developer/owner-installed publicly owned and maintained infrastructure.

1.1.1 INTERIM USE

If a developer/owner wishes to begin construction of structures in an approved subdivision or any other property that has required infrastructure improvements, the Public Works Department will require the following items be completed prior to the interim or final use of the new facilities:

- The water, sewer, and storm water utilities will be completely installed, inspected, tested, and accessible to City personnel.
- All temporary and permanent BMP’s must be functional and maintained not only at the time of interim acceptance but through final site stabilization.
- A comprehensive walk-through with City Engineering staff, the engineer of record, and the developer.
- The engineer of record will certify that all the utilities have been completed in substantial accordance with the plans and specifications. The engineer’s certification will include a preliminary punch list of items that remain to be completed upon the installation of the finished grade or pavement.
- Copies of the required tests are supplied to the engineering division as well as the affected utility. The tests include the log or tape of the TV sewer inspection, bacteriological tests, pressure tests, hydrant flow tests, and other testing as required.
- Electronic and paper as-built drawings certified by a professional engineer of the underground public utilities to be accepted. The electronic file must be AutoCAD compatible and acceptable to the City Engineering Division.
- Immediate repair or replacement of failures due to problems with materials and/or workmanship.
- A schedule for the completion of the balance of the improvements.
- A copy of the daily field inspection log, including construction progress photographs.

- All easements not included in the public rights-of-way for the water and sewer must be recorded prior to interim acceptance.
- All rights-of-way for the part of the subdivision that is proposed for interim acceptance must be dedicated to the City.
- A bill of sale for the interim water and sewer infrastructure must be provided to the City if required by the City Engineer.
- Roads must be completed to finished grade and accessible to emergency vehicles.

City Staff will respond in writing to a request for interim acceptance within 15 working days from the date that the written request and all the required information have been received by the Engineering Division.

1.1.2 FINAL ACCEPTANCE

Final acceptance of the water, sewer, storm water, and street will occur upon completion and acceptance of all required infrastructure installation. Final acceptance will be granted by the City Engineer upon the completion of the following items:

- A comprehensive walk-through with City staff, the engineer of record and the developer, including flow testing the curb and gutter.
- Completion of the final punch-list items.
- Inspection and repair of the previously accepted facilities found to be out of compliance with the interim acceptance conditions. The City reserves the right to require re-inspection and repair of the conditionally accepted infrastructure if damage from final construction is suspected.
- Final certification from the engineer of record that the entire development has been completed in substantial accordance with the approved plans and specifications.
- Submission of final as-built drawings in an electronic AutoCAD format meeting the requirements of the City of Helena Computer Aided (CAD) Standards. As-built drawings must be stamped and signed by a professional engineer.
- Submission of the complete set of daily field inspection logs and photographs.
- A Bill of Sale for all the infrastructure provided to the City.
- Copies of the required tests supplied to the Engineering Division and the affected utility. The tests include the log or tape of the TV storm sewer main inspection, compaction tests, and other testing as required.

City Staff will respond in writing to a request for final acceptance within 15 working days from the date that the written request and all the required information have been received by the Engineering Division.

Final acceptance of a completed utility system component may be granted prior to completion of the infrastructure development as a whole, if the City of Helena is provided with a financial guarantee (in the form of a bond or irrevocable letter of credit) that the remaining infrastructure

components will be completed within a specific time frame and that the completed infrastructure operates independently of the guaranteed portion.

The required one-year warranty period for the final improvements begins on the date of final written acceptance of the installed infrastructure. Any required repairs to the utilities systems approved for interim use will also have a warranty for a one-year period following the final acceptance. A one-year warranty TV inspection of all storm water and sanitary sewer main will be required 11 months after interim acceptance.

1.2 SYSTEM DEVELOPMENT FEES (WATER, SEWER)

Any party desiring to connect to the City water system or sanitary sewer system or upgrade their water or sewer service shall be subject to a system development fee (SDF) in accordance with Helena City Code, 6-2-9 (Water SDF) and 6-3-7 (Sewer SDF), respectively.

1.3 UTILITY REBATE AGREEMENTS

Any party who has paid for the construction of an extension of a sewer main, or water main including installation of a hydrant, valve, or other appurtenance to a sewer or water main in accordance with Helena City Code is eligible for a proportional rebate from any owner of adjacent property who subsequently applies to directly install a service connection to the extension or the subject water or sewer main.

The conditions under which rebates can be made are included in Helena City Code Sections 6-2-6-C and 6-3-4-B for water mains and sanitary sewer mains, respectively.

1.4 TEMPORARY WATER USE

Any water used from the City of Helena for construction purposes including, but not limited to dust control, soil compaction, hydrostatic testing, masonry, and/or dry wall, shall be metered and costs for water charged at a rate established by the City Commission. No use of temporary water is allowed except with written authorization through the Engineering Division and Utility Maintenance Division Superintendent.

1.5 TEMPORARY SEWER USE

No discharge to the City's wastewater collection system is allowed except through an approved connection, or by special written authorization given by the City Engineer and Utility Maintenance Division Superintendent. Rates for the discharge to the City's system will be at rates established by the City Commission.

1.6 STORM WATER

All on-site storm water facilities must be constructed and operational prior to construction of any impervious area. As-built drawings and a professional engineer's certification must be supplied to the Department of Public Works prior to acceptance or approval of the on-site storm water facilities.

All construction BMPs must remain in-place and maintained in good working order until 70% of the disturbed area has been re-vegetated. The construction BMPs will be for water quality as required in the MS4 permit and protection of the City's storm water system.

1.7 DEVIATION PROCESS

Any proposed deviation from these Engineering Design standards must be requested in writing to the Public Works Department and include the engineer of record's stamp and signature on the deviation form and certifying statement along with the infrastructure submittal for the proposed project. A deviation will only be granted when the minimum standards cannot be met or when the proposed item(s) meets or exceeds minimum standards as determine by the City Engineer and Transportation Engineer.

All deviation requests must contain information sufficient for reviewers to understand the deviation requested, the specific standard(s) to which the deviation applies, and to communicate the hardship or justification for the deviation requested. As a rule, increased cost, "engineering judgement" or "professional opinion" are not valid justifications for a deviation request.

Any deviation request will increase the City's review time to allow for time for committee review and decision. Any deviation request that needs an action by the City Commission or a State Agency will increase the review time additionally as needed to accomplish these action(s).

All deviations submitted must contain, at a minimum the following information in the engineer of record's stamped and signed deviation request:

1. **Formal Deviation Request** – A brief statement by the engineer of record outlining the proposed deviation and summarizing the request and its effects on the proposed project and existing infrastructure.
2. **Deviation Form** – A completed City of Helena Deviation Form including engineer of record's signed statement.
3. **Specific Standard(s)** – A list of the specific standards being deviated from and in what manner they will be deviated from.
4. **Specific Justification(s)** – A complete description of the hardships that would occur if the standard(s) were adhered to. Please provide detailed justification, including facts and figures as needed to show hardship for each standard deviated from in detail.
5. **Alternatives Considered –** Please indicate all alternatives, engineering or otherwise considered before the formal deviation request was made.
6. **Engineer of record's Deviation Statement –** Stamped and signed deviation request package must be accompanied with the signed statement on the deviation request form.

DEVIATION REVIEW PROCESS:

All deviations will be reviewed by at least three (3) Engineering Division staff for a recommendation of approval or denial by simple majority and forwarded to the City Engineer. The City Engineer will review the staff recommendations, consult with the Public Works and Transportation Systems Directors, and then approve or deny the deviation based the information provided, staff recommendations, and consultation with the Public Works and Transportation Systems Directors.

1.8 CONSTRUCTION PLAN REQUIREMENTS

No public infrastructure construction shall begin until construction plans have been approved by the City of Helena.

Construction plans and specifications must be signed and stamped by a licensed professional engineer registered in the State of Montana.

Construction plans and specifications shall be prepared in accordance with City of Helena Engineering and Design Standards, City of Helena Computer Aided (CAD) Standards, and Montana Public Works Standard Specifications.

Any deviation from the approved standards shall be requested in accordance with the deviation process (see Section 1.7).

Electronic CAD drawings, PDF's and paper copies of all construction plans and specifications must be submitted to the City of Helena for review.

Minimum Requirements for ALL Civil Plan Sheets

1. Title block – Across the bottom or along the right side:
   a. Owner
   b. Name of the project
   c. Engineering firm information and Engineer's seal – Original signature shall be placed across the seal
   d. Sheet title
   e. Sheet number
   f. Revision(s) table

2. All plans shall be drawn to scale and tied to the City of Helena's survey control for horizontal and vertical datum as provided by the City Engineer.

3. North arrow shall be shown on each plan view sheet. North arrow shall also point either up or to the right.

4. Scale shown on each plan, profile, section, and detail.

5. Legend relevant to each sheet shown all special symbols, line types and hatch used.

6. Plan and profile must be shown on the same sheet, with profiles on the bottom half of the sheet.

7. Accepted sheet sizes are 24" by 36", 22" by 34", and 11" by 17".

8. Rights-of-way labeled and dimensioned.

9. Lot & block numbers and/or ownership information shown for all lots.

10. Easement information with dimensions.

11. Caution notes shown when working next to any existing utilities (public and/or private).

12. Final Grades – shall be shown as a solid line and called out specifically.

13. Existing Grade – shall be shown as a dashed line and called out specifically.

14. Drawing Scales (Selected scale shall be legible and provide appropriate detail.):
    a. Plan View: 1"=10', 20', 30', 40', 50', 60', 100' or 200'.
    b. Profile View – Horizontal: 1"=10', 20' 50' or 100' (or match plan view scale)
    c. Profile View – Vertical: 1"= 1', 2', 5' or 10' (1:1, 2:1, 5:1 or 10:1 exaggeration)
    d. Stationing interval: 100 feet or 50 feet

Minimum Requirements for Individual Civil Plan, Section, and Detail Sheets

1. Cover Sheet:
    a. Project Location
    b. Vicinity map
    c. Client Name
    d. Sheet Index
    e. Statement identifying that the latest edition of MPWSS and City Standards will apply to the project

2. General Notes, Abbreviations and Legend Sheet(s):
    a. General and Construction Notes
    b. Abbreviations
    c. Legend

3. Horizontal Control Sheet:
    a. Existing Site Layout
    b. Horizontal and Vertical Datums
    c. Basis of Bearing
    d. All benchmarks and control elevation points
    e. Property lines, and ownership (where applicable)

4. Typical Road Sections Sheet:
    a. Rights-of-way
    b. Typical sections, including pavement section and relative placement of utilities
    c. Compaction requirements
    d. Backslopes/Cross-slopes
    e. Sidewalks
    f. Curb & Gutter
    g. Non-motorized Facilities – where required
    h. Station limits

5. Erosion Control Plan Sheet(s):
    a. Existing and proposed contours shown/labeled
    b. Existing and proposed storm lines and inlets shown
    c. List the total disturbed acreage, including offsite, and delineate limits of construction
    d. Appropriate BMPs used and identified
    e. Phasing of BMPs with construction activities listed/described

f. BMP details provided shall be per City of Helena and Montana Department of Environmental Quality's Storm Water Management During Construction Field Guide for Best Management Practices
g. Show areas to be sodded or seeded with specified annual and long-term perennial vegetation
h. Show areas of permanent erosion control (other than vegetation)

6. Post-Construction Storm Water and Water Quality Treatment Plan Sheet(s):
   a. Plan view showing horizontal locations of the pond, including existing and proposed contours, locations of low flow or trickle channels, outlet structure, emergency overflow spillway, pipe, or channel inlets, etc. with appropriate horizontal control
   b. All streets, roadways, highways, property lines, ROW lines, existing and proposed easements
   c. Profile along from all the inlet to the outlet structure and pipe with all invert and outlet structure elevations and water surface elevations
   d. Grading details for all pipe and culvert inlets and outlets
   e. Water surface limits for the minor storm, major storm, and emergency overflow conditions
   f. Summary table on plan view with stage-storage-discharge characteristics
   g. Maintenance access improvements
   h. Utilities adjacent to or crossing the detention area
   i. Description of long-term operation and maintenance of BMPs
   j. Standard and additional details and notes, and as required

7. Grading Sheet(s):
   a. Both onsite and offsite existing/proposed contours
   b. Date and name of firm who prepared geotechnical report with corresponding note stating: "Work shall be done in accordance with the Geotechnical Report by _____, dated _____." If required by the City Engineer.
   c. Drainage clarified by flow arrows, high points, low points, ridges, and valley gutters
   d. Show driveway locations for all lots adjacent to storm inlets
   e. Positive overflow provided at all low points; easements dedicated as needed
   f. Cross-sections and flow data for all swales and open channels provided
   g. Street Flow Computation Table provided for all public streets for minor and major events
   h. Inlet Interception Computation Table provided for all public inlets for minor and major events
   i. Pipe Hydraulics Computation Table provided for all public storm sewers for minor and major events
   j. Provide electronic copies of all hydraulic computations on CD or digital media

8. Roadway Sheet(s):
   Plan View
   a. For streets, centerline stationing at a minimum of every 100', bearings and curve data labeled (R, D, L, PC and PT stationing)
   b. Proposed new construction including paving width and limits, curb and gutter, cross pans, sidewalks, and pedestrian ramps

c. Existing and Finished grades with finished grade slopes
d. Existing and proposed utilities
e. Intersection, driveway, and island curb radii labeled
f. All sidewalks and barrier free ramps shown, labeled and dimensioned
g. Existing, proposed, future streets and drives shown and labeled
h. Rights-of-way and sight visibility easements provided if required
i. Storm inlets identified with paving stations and top of curb elevations at center of inlet.
j. Drainage clarified by flow arrows at crests, sags, ridges, intersections, and valley gutters
k. Show driveway locations for all lots adjacent to storm inlets and intersections

Profile View

a. Show and label existing and proposed centerline, left, right curb lines, if not the same
b. Any required utility adjustments
c. Top of curb/pavement elevations labeled at every 50-foot stations
d. Vertical curve stationing and elevations including PVC, PVI, PVT, high point/low point location, curve length, algebraic grade difference, and "K" values shown at a minimum
e. Street grades shown to the nearest hundredth of a percent. Maximum and minimum grades per engineering standards in Section 5.

9. Utility Improvement Plan Sheet(s):
Plan View

a. Show, label and dimension location of all mains, services, manholes (with rim elevations), inlets, meters, fire hydrants, valves, fittings, FDC locations, back-flow preventers, cleanouts, or other proposed infrastructure, and spacing from other utilities
b. Show, label, and dimension location of all private utilities within public right-of-way
c. Dimension location of all mains from other utilities
d. Show and label water line leading to fire sprinkler systems as "fire line" where applicable
e. Show location for all utility services and stub-outs labeled with size, slope, and length
f. Show stationing along centerline of utility or roadway
g. Show and label all easements
h. Curve data and stationing provided as necessary
i. Label valves with paving station near barrier free ramps or ADA routes

10. Storm Sewer and Culverts Sheet(s):
Plan View

a. Show horizontal locations of all pipes, inlets, manholes, junction boxes, and outlet structures with appropriate horizontal control
b. All streets, roadways, highways, property lines, ROW lines, existing and proposed easements
c. Minor and major storm hydraulic grade lines
d. Pipe outlet protection on plan and profile views
e. Utilities adjacent to or crossing storm sewer or culvert alignment
f. Grading details for all pipe and culvert inlets and outlets
g. Maintenance access improvements

h. Standard and additional details and notes, and as required

Profile View

a. Profile all proposed utility mains
b. Existing and proposed ground line at centerline of pipe shown and labeled correctly
c. Laterals, or culverts with all inverts, rim elevations, sizes, lengths, slopes, and type
d. Indicate length, type/class, slope, and size of all lines
e. Indicate the type and diameter for all manholes
f. All utility crossings and parallel sewer/storm lines shown in profile
g. Indicate length, type, and size of encasement, as needed

11. Open Channels, Swales, Channel Stabilization Sheet(s):
    Plan View
    a. Show horizontal locations of all channels and swales, including locations of grade control structures and stabilization measures, such as check structures, drop structures, toe protection, bank stabilization, low flow, or trickle channels, with appropriate horizontal control
    b. All streets, roadways, highways, property lines, ROW lines, existing and proposed easements
    c. Profile along channel alignment with all invert elevation and top of channel bank elevations, and design flow rates
    d. Water surface limits on plan view
    e. Water surface profiles for the minor storm, major storm, and emergency conditions
    f. Maintenance access improvements
    g. Side tributary channels and pipe outlets
    h. Utilities adjacent to or crossing channel alignment
    i. Standard and additional details and notes, and as required.

12. Lighting Sheet(s):
    a. Show all streetlight locations, consideration should be given to electrical layout from utility company
    b. Show all stop signs and traffic related signage locations
    c. Streetlights located on opposite side of street from Stop Sign
    d. Verification of fire hydrant placement relative to streetlights and stop signs (3’ clear zone)
    e. If symbols used in plan, include appropriate legend for clarification

13. Signing and Striping Sheet(s):
    a. Sign installation schedule
        1. Show and dimension all existing and proposed signing and striping
        2. Label all proposed signs and striping with sizes and type
    b. Signing and Striping Notes
    c. Sign Details

14. Traffic Signal Sheet(s) – if applicable:
    a. See Section 5.9

15. Traffic Control Plan Sheet(s):
    a. Design site specific traffic control plan, i.e., MDT standard alone is inadequate
    b. Indicate posted speed limit or design speed
    c. Show all sign designation, sign graphic, and sign size
    d. Show channelization device type, locations, and spacing
    e. Show all traffic barricades and indicate type
    f. Show all detour routes and detour signage
    g. Show flagger locations where applicable
    h. Show message boards with text for two or more phases where applicable
    i. Show flashing arrow boards where applicable
    j. If symbols used in plan, include appropriate legend for clarification

PART 2 – WATER SYSTEMS

PART 2 WATER SYSTEMS

2.1 DESIGN REQUIREMENTS

Water systems shall be designed, constructed, and tested in accordance with the current editions of circular DEQ-1 – *Montana Department of Environmental Quality – Standards for Water Works and the Montana Public Works Standard Specifications* and these standards. The purpose of these standards is to establish the **minimum** requirements for the design and construction of municipal facilities and improvements.

2.2 DESIGN REPORT

All water main extensions will require the Engineer of Record to submit a written, stamped report to the City Engineer addressing the fire, irrigation, and domestic flow requirements. The design report shall demonstrate compliance with these requirements, and provide an overview of the proposed project or development, proposed water system improvements, water service demands, system impact, feasibility and basic design requirements and shall include, at a minimum, the following information:

1. **Water Demands** – Include estimated water demands based on projected land use, occupancy and building type for the following conditions:
   a. Average Daily (gallons-per-minute)
   b. Maximum Hourly (gallons-per-minute)
   c. Fire flow (gallons-per-minute), and;
   d. Irrigation (gallons-per-minute)
2. **System Layout** – Describe and show the proposed distribution system layout, including locations for connections with the existing water distribution system.
3. **Conformance with Master Plan** – Describe how the proposed water utility improvements conform with the adopted Helena Water Facilities Plan.
4. **Network Analysis** – Include a distribution system analysis, performed through appropriate manual calculations or computer simulation, identifying any system impacts based on proposed demands and provide design solutions to ensure future water system growth, while maintaining appropriate system pressures and flow rates. Computer analyses, when required are to be submitted in both hard copy and electronic format. Hydrant test results used for network analysis shall be less than two years old at the time of submission.
5. **Main Sizing** – Indicate the required sizing of the proposed distribution mains based on water demands.
6. **Special Conditions** – Identify any special conditions, such as the presence of contaminated soils, conflicts with other utilities, unusual installation depths, or any requirements that require special provisions for construction.

Estimating water usage for residential developments shall be based on 150 gallons per day per capita per single residence using an average of 2.39 persons per residence.

Estimating irrigation water usage for residential developments shall be based on the application of 1 (one) inch of water per week on irrigated areas and shall be based on the proposed layout of the

development. If the exact layout of the development is unknown at the time of submittal, residential irrigation demand estimated shall be based on zoning district and residential lot coverage requirements of each district as follows:

Table 2-1. Irrigation Water Use For Residential Zoning Districts

Residential Zoning	Maximum Lot Coverage	Estimated Weekly Irrigation
Open Space Residential (OSR)	No Max	1" x 70% of lot area
Residential (R-1 & R-2)	30% Max Coverage	1" x 70% of lot area
Residential (R-3)	40% Max Coverage	1" x 60% of lot area
Residential-Office (R-4/R-O)	60% Max Coverage	1" x 40% of lot area

Estimated water usage for non-residential developments shall be determined on a case-by-case basis by the design engineer based on the projected land use, occupancy and building type, using fixture counts/International Building Code methodology whenever possible. The design engineer shall provide all relevant references, assumptions, and calculations for alternate methods of non-residential water demand estimation within the submitted report. If the design engineer is not able to estimate water usage using these methods, the engineer may use 160% of the approved wastewater generation estimate (112 gallons per day per capita) for the same development as per the City of Helena's Wastewater Collection System Master Plan.

For residential or non-residential developments that will utilize an average daily flow of less than 25,000 gallons at build-out, the report shall include data on test results at the nearest hydrant which shows the static pressure at zero flow from the hydrant and the residual pressure with available flow from the hydrant.

At the discretion of the Public Works Department, the Design Engineer may be required to conduct computer hydraulic modeling to demonstrate compliance with the Section 2.4. of these standards.

For residential or non-residential developments that will utilize an average daily flow of 25,000 gallons or more at build-out, or that require utilization of a pressure booster pump(s) and/or pressure reducing valve(s), the report will be required by the Public Works Department to include computer hydraulic modeling results and a working computer model that shows the adequacy to meet fire and domestic flow requirements and the Section 2.4.1 of these standards. The normal operating range of pressure allowed for water system design is 50-110 psi or as approved by the Public Works Department without the use of booster or fire pumps.

2.3 WATER SERVICE AREA – EXPANSION

The official water service area for the city is that area of the city within the boundaries of the city and currently served by city water, any areas presently served outside the city and any subsequently approved amendments thereto.

Applications for water service area enlargements shall be made on forms prescribed by the city manager and shall be accompanied by all documentation requested by the city. An application

form is included in "Appendix A" of this standards document. The property shall meet the following conditions prior to making application for enlargement of the service area:

- Within the City limits or approved for annexation to the City of Helena
- Contiguous to the boundary of the service area as the same exists;
- Entirely within the City's full service, urban planning area;
- Entirely within the City's facilities planning area; and
- Capable of being adequately served by extension of existing infrastructure.

2.4 WATER MAINS

2.4.1 DESIGN CONSIDERATIONS

Hydraulic Analysis – The design of all water mains shall be based on a hydraulic analysis considering flow demands and pressure requirements. The main must be designed to maintain a minimum normal working pressure of 35 psi and maintain an absolute minimum pressure of 20 psi under all flow conditions. Maximum normal working pressures should not exceed 110 psi. Developments with line pressures in exceedance of 120 psi are required to install pressure reducing valves to reduce pressure to 50-110 psi unless otherwise approved in writing by the Director of Public Works or City Engineer.

Fire flows – All mains shall be designed to provide adequate fire flows unless specifically waived by the City of Helena Public Works Department in writing. The minimum required fire flow shall be 1750 gallons per minute for two hours for residential housing or as determined by the City Fire Marshal at a minimum of twenty pounds per square inch residual pressure at the hydrant during flow.

Diameter – All water main piping shall be at least 8" diameter, unless otherwise authorized by the Director of Public Works in writing. Larger diameters will be required in order to maintain the minimum pressure requirements of Montana Circular DEQ-1 Standards for Water Works. The City also may require over sizing of mains to meet fire flow requirements, and/or overall system requirements as outlined in the most current Helena Water Facilities Plan.

As Constructed Drawings – The professional engineer certifying the work shall submit two (2) copies of stamped, signed as-constructed drawings in hard copy and one electronic copy in AutoCAD .dwg and .pdf format to the Engineering Division prior to final acceptance of the main(s).

2.4.2 MATERIALS

Piping – Acceptable water main pressure pipe shall be as follows.

Water main piping 12" in diameter or smaller shall be Class 52 wall thickness pipe material meeting AWWA C151, American National Standard for Ductile Iron Pipe. All water main piping larger than 12" in diameter shall be Class 51 thickness pipe material meeting AWWA C151 Standards.

Water main piping shall be DR-14 PVC pressure pipe and shall meet AWWA C-900 Standards. Acrylonitrile butadiene (NBR) gaskets will be required for water main installations in areas of known or suspected hydrocarbon contamination.

If specifically allowed in writing by the City of Helena Public Works Department, zinc coated ductile iron pipe meeting AWWA C150 and C151 and with zinc coating system conforming in every respect to ISO 8179-1 "Ductile iron pipes – External zinc-based coating – Part 1:Metallic zinc with finishing layer. Second edition 2004-06-01" can be used. Zinc coating shall be a minimum of 200 g/m^2 surface area coverage. The use of zinc coated ductile Iron pressure pipe will only be allowed in areas of high corrosion potential as determined on a case-by-case basis by the Public Works Department. Acrylonitrile butadiene (NBR) gaskets will be required for water main installations in areas of known or suspected hydrocarbon contamination. Polyethylene wrap is not required on zinc coated ductile iron pipe installations; however, cathodic protection shall still meet the requirements of Section 2.4.3. of these standards.

Requests to use alternate pipe materials shall be made in writing to the City Engineer and shall include justification for doing so by the design engineer prior to submitting plans for review.

Fittings – All water main fittings, including valves, tees, crosses, caps, plugs, reducers and elbows equal to or greater than 11-1/4° shall use mechanical joint restraints. All mechanical joint restraints shall be "Megalug," "Uniflange" or approved equal. Joint restraint use shall be in addition to meeting thrust block requirements in accordance with MPWSS. Flanged fittings are not allowed in buried service.

2.4.3 INSTALLATION

Existing Valve Operation – In order to isolate sections of the existing water system to allow for new construction, it will be necessary to operate existing system valves. The City Utility Maintenance Division (457-8567) shall be notified when existing valves must be operated and shall undertake those operations. No one shall operate city owned valves except City Utility Maintenance Division personnel without express written permission from the Utility Maintenance Division.

New water system valves that have been installed by a contractor or developer and not yet accepted but are connected to the existing City of Helena water distribution system are considered to be part of the City of Helena system and are subject to the operating guidelines of this section. The City Utility Maintenance Division (457-8567) shall be notified when these valves must be operated and shall undertake those operations. No one shall operate water main valves connected to the City water distribution system except City Utility Maintenance Division personnel without express written permission from the Utility Maintenance Division.

Cover – The minimum cover for all water mains from top of pipe to final finished grade shall be 6½' unless otherwise approved in writing by the Director of Public Works or City Engineer.

Encasement – All water main piping, fittings, valves, etc. (excluding PVC and zinc coated ductile iron pipe) shall be encased in polyethylene wrap with a minimum thickness of 8 mils. All encasement shall be in accordance with AWWA C105 Standards.

Electrical Thawing – Conductive brass wedges shall be installed at all joints in ductile iron pipe to provide for electrical thawing and continuity. Electrical continuity shall be provided at all flexible, dresser-type couplings. Bonded jumper wires can be used if needed to provide for electrical continuity.

Tracer – Tracer wire shall be installed along the top of all new water mains Tracer wire for water lines is to be #10 AWG high-strength copper clad steel with a 30-mil HDPE insulation jacket (color blue) and have a 600-pound average tensile break load. Tracer wire may be manufactured by Copperhead Industries or an approved equal.

Tracer wire shall be grounded at all dead ends, except fire hydrant legs, using a 24-inch-long minimum copper clad grounding rod. A grounding clamp approved for direct burial use shall be used to connect the tracer wire to the grounding rod. Direct burial grounding clamps shall be EK17 as manufactured by Erico or approved equal.

Tracer wire shall be securely affixed to the top exterior surface of the pipe using PVC pipe tape at 5-foot intervals. Tracer wire shall be looped around valves, saddles, curb stops, and other appurtenances in such a manner that there is no interference with the operation of the appurtenances. Tracer wire shall be continuous and without splices, breaks, or cuts except for spliced-in connections as approved by the Engineer. Where any approved spliced-in connections occur, 3M DBR watertight connectors, or approved equal, shall be used to provide electrical continuity. All spliced connections must be inspected and approved by the Engineer of Record before being buried.

Tracer wire shall be brought to the surface at all junctions and terminals, including at all valve boxes for water valves and fire hydrant legs. DryConn Waterproof Direct Bury Lugs as manufactured by King Innovation, or approved equal, shall be used to splice into the main line tracer wire. The main line tracer wire shall not be broken or cut. Tracer wire shall be spiral wrapped around the exterior of the valve box riser pipe and brought into the valve box top section. Provide 5 feet minimum of additional wire neatly coiled within each valve box.

Prior to final acceptance, a continuity test shall be performed on tracer wire with the Certifying Engineer present to verify that the trace wire is continuous and allows for the proper tracing of the piping. If the Engineer identifies locations where the trace wire is not continuous, to include all connection points between new and existing water mains, the Contractor, at no additional cost to the City, shall make necessary repairs/corrections. Continuity testing shall be conducted prior to repaving roadways.

Six-inch wide detectable tape marked “WATER” shall be installed two feet below finished grade along the alignment of the new main and attached to all valve box risers.

Cathodic Protection – The City of Helena cathodic protection policy for the protection of water mains is as follows:

A. Cathodic protection, polyethylene wrap and sacrificial anode design/installation are required for all projects including fittings, valves, valve boxes or hydrants if no site-specific soil data is presented in the design report submitted.

B. If soils testing is undertaken at the site for the sake of opting out of cathodic protection, the data will be included in the stamped and signed design report and applied to AWWA C105-10 Table A.1. If the "score" on Table A.1. is less than 10, and justified/documented in the design report, then polyethylene wrap is required but sacrificial anode design is not. Polyethylene wrap is not required for zinc coated ductile iron pressure pipe.

C. If the soil test data indicates a score of 10 or above on AWWA C105-10 Table A.1., then polyethylene wrap and sacrificial anode design are both required.

A cathodic protection plan and accompanying design calculations stamped by a Certified NACE professional or licensed professional engineer in Montana is required with the design submittal. As-constructed drawings shall show the location, size and configuration of sacrificial anodes and testing stations.

If the engineer of record wishes to opt out of the sacrificial anode design and installation, a stamped and signed design report must be submitted including relevant soil testing data, as stated in the policy, above.

Open Trenches – Trenches for the installation of water mains shall be properly backfilled as quickly as possible, but no more than 48 hours after initial digging. (City Ordinances 7-2-8 and 7-2-9).

Protection of Mains – When working near and/or exposing existing City water mains and service lines, workers shall utilize hand-digging within 2' of mains and service lines in order to avoid damage to those pipes. If damage occurs, the cost of repair and penalties in accordance with City Ordinance 7-2-7 can be imposed.

Chlorination - All new water mains shall be chlorinated and tested as per the current edition of the Montana Public Works Standard Specifications (MPWSS) 7th or most recent edition Section 02660 – Water Distribution.

Testing – All new water mains shall be tested in accordance with Montana Public Works Standard Specifications (MPWSS) 7th or most recent edition Section 02660 – Water Distribution. The City reserves the right to perform any and all of these tests prior to acceptance of water infrastructure.

2.4.4 EXTENSION

Any extension of an existing City water main must be extended across the entire frontage of the property to be served, as required by Helena City Code 6-2-6 and these standards. Main extensions shall include all valves, pipe sizes, hydrants and appurtenances deemed necessary by the City. Public mains may be required to be connected, extended, or looped in addition to the proposed extension to provide an adequate and functional water supply and provide for future extensions to adjacent properties.

Cut in tees and/or crosses using mechanical joints and thrust/restraint blocking shall be used for all new water mains branching off of existing water mains whenever possible. Tapping tees for the installation of new water mains shall not be allowed without the written approval of the Director of Public Works or City Engineer.

2.4.5 SEWER LINE CROSSINGS

Crossings - A minimum of 18" vertical separation is required when a water main or service connection crosses above or below a sanitary sewer, measured outside to outside of pipe. Please refer to MPWSS for further information on sewer line crossings.

Less than 18" vertical separation may be allowed when a gravity sewer at the crossing is made from a single 20' length of AWWA pressure pipe and the crossing is approximately 90°. Specific written authorization from the Montana Department of Environmental Quality and the City of Helena Public Works Department is required for a vertical separation of less than 18".

No exception of the minimum 18" vertical separation requirement is permitted when the sewage pipe is a force main.

Parallel – Unless specifically authorized by the Montana Department of Environmental Quality and the City of Helena Public Works Department, a minimum of 10' horizontal separation is required when a water main and sanitary sewer are installed parallel, measured from edge to edge of the mains.

2.4.6 TAPPING CITY WATER

The City of Helena Water Department shall tap all water mains. Preparations for exposing the water main and preparing the water main for tapping, as well as scheduling for the City to make the tap are all responsibilities of the water main installer. The City of Helena Water Department can be contacted at (406) 457-8567. All taps require at least 24-hours' notice to the Utility Maintenance Division of the City of Helena. If taps require main shutdown, 48-hours' notice is required, and the contractor is required to notify the affected water users of the shutdown and provide temporary water supply if needed as per Montana Public Works Standard Specification (MPWSS) Section 01580.

Any person desiring to make connection to the City's water or sewer mains must make application in writing and pay for the cost of tapping and any associated system development fees in accordance with Helena City Code.

Taps of sizes of 1" on all mains require the contractor to provide a properly sized tapping saddle and corporation valve for mains of 6" and larger (currently up to 36"). Special provisions apply for 1" taps on 4" cast iron or ductile mains. For integrity of the main, these taps require the use of a properly sized tapping saddle, which is required to be purchased and supplied by the plumbing contractor.

Taps for sizes 1½" and 2" services on all sizes and types of mains (ductile iron, cast iron, PVC and steel) require a properly sized tapping saddle and corporation valve purchased and supplied by the plumbing contractor.

All taps of sizes 1"-2" shall be made using a Mueller or Ford style FS323 stainless steel saddle or approved equal. Taps on all mains require the contractor to provide and install a properly sized tapping saddle and corporation valve.

Taps of 4" and larger on all mains require a properly sized tapping saddle, tapping valve and a valve box to be purchased and supplied, and installed by the plumbing contractor. All tapping saddles and valves 4" and larger must be air tested prior to tapping.

Bronze or stainless-steel double strap or wide band tapping saddles are required on service lines up to 2" in diameter.

On all taps the plumbing contractor must provide and install the tapping saddle.

Taps must have a minimum of 36" of separation on the same horizontal plane or a minimum of 18" separation when vertical separation is 2" or greater.

PVC and steel mains require special restrictions and requirements as follows:

- All taps 1" through 2" on PVC and steel mains require a tapping saddle and corporation valve. The city will supply corporations for 1" taps. Plumbing contractors are required to purchase and supply tapping saddles for 1"taps. Plumbing contractors must supply properly sized corporation valve and tapping saddle for taps of 1½" and 2".

- Taps of 4" and larger (up to 12") on PVC and steel mains require a tapping saddle, tapping valve and a valve box to be purchased and supplied by the plumbing contractor.
- Taps 4” to 12" on steel mains 20" and larger require a welded-on saddle for tapping.
- When approved, all taps 14" or larger require a contract tapping service or company.

2.4.7 VALVES

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance as determined by the Public Works Department, but in no case shall there be fewer than one valve every 600'. Generally, there shall be two valves on each tee and three valves on each cross.

All Gate Valves shall conform to AWWA C515 Standards and shall open CLOCKWISE.

All Butterfly Valves shall conform to AWWA C504 Standards and shall open CLOCKWISE.

All Tapping Valves shall open COUNTERCLOCKWISE

All valves, including hydrant valves shall be mechanically restrained. All mechanical joint restraints shall be “Megalug,” “Uniflange” or approved equal. Joint restraint use shall be in addition to meeting thrust/restraint block requirements in accordance with MPWSS. Joint restraints must be accessible after installation and shall not be buried in concrete.

All water valve boxes shall have an asphalt collar installed after paving and final grade adjustment. See Standard Drawing 2-1 for asphalt collars.

All water valve boxes shall be aligned to allow a 4" diameter PVC pipe to be inserted in the valve box and centered over the valve nut.

All water valve boxes shall not be extended more than 50%.

2.4.8 FIRE HYDRANTS

Unless otherwise approved by the Fire Marshal, fire hydrants shall be spaced no further apart than one standard City block, which is approximately 400'. The Fire Marshal reserves the right to require additional fire hydrants if the demand of the structure(s) requires more flow than the minimum spacing provides. The placement of all hydrants shall be subject to approval of the City of Helena Fire Marshal.

Fire hydrants shall be 250 psig, 5¼", 3-way, “Kennedy K81A”, or approved equal, conforming to AWWA C502 Standards. All hydrants shall be painted OSHA yellow above the ground line. All hydrants shall be installed with the safety flange 3-6” above finish grade.

All hydrants shall be equipped with a #4 pentagon (1¼") operating stem nut and shall open in a CLOCKWISE direction. The direction of opening shall be indicated by a permanent arrow on the hydrant top.

All hydrants shall be designed for final grade of hydrant safety flanges set at 1½" to 3" above finished grade. Minimum bury depth of hydrant barrel shall be 7' with a maximum bury hydrant of 8.5’ as determined by the elevation of the safety flange. Hydrant barrel may be extended with the use of a single extension not to exceed two feet. Any other extensions will only be allowed with prior approval of the Public Works Department and when no other option exists.

Pipe deflection on hydrant leads shall be minimal and shall not result in finished hydrant more than 1° out of plumb.

The hydrant auxiliary valve shall be located in the street pavement or boulevard with a standard mechanical joint water valve and asphalt collar. No valves or collars shall be located within the curb and gutter. When possible, valves or collars shall not be placed in sidewalks.

All hydrants shall be installed in accordance with City of Helena Standard Drawing 2-2.

2.4.9 WATER VAULTS

All underground vaults and manholes associated with the City's water system shall be constructed of pre-cast concrete sections meeting ASTM C478 or C858.

All water vault manhole covers shall have the word "water" cast into the top surface.

All water vault manhole frames shall have an asphalt collar patch poured after paving and final grade adjustment. See Standard Drawing 3-1.

2.4.10 ABANDONMENT OF EXISTING WATER MAINS

Abandoning existing water mains is only to be done with written permission from the Director of Public Works. Water mains shall be abandoned by excavation and removal whenever possible. If permission is granted by the Director to abandon water mains in place, all valves and valve boxes are to be removed, the main is to be completely filled with flowable fill, non-shrink grout or another approved flowable material and the ends completely plugged with concrete to a watertight condition. All in place abandonments must be inspected and approved by an Engineering Division representative prior to backfilling.

2.5 WATER SERVICE LINES

2.5.1 MATERIALS

All service lines shall be a minimum of 1" in diameter.

All water service lines 3.5" and smaller diameter shall consist of Type K copper pipe meeting ASTM B88-62 from the main to the curb box. Poly pipe or PVC pipe may be considered on a case-by-case basis in corrosive soil with written approval from the Public Works Department.

All water service lines 4" diameter and larger shall consist of ductile iron pipe meeting AWWA C151, American National Standard for Ductile Iron pipe or PVC pressure pipe meeting AWWA C900 Standard.

All water service lines from the curb valve to the use connection shall meet all current plumbing codes as used by the City of Helena Building Division.

Stainless steel inserts are required for all compression-type fittings if the use of poly pipe is approved.

In accordance with Sections 1417 (a) and (b) of the Safe Drinking Water Act amendments of 1986 (Public Law 99-339), the use of solders and flux containing more than 0.2% lead and pipes and fittings containing more than 8% lead is prohibited in the installation and repair of residential or nonresidential plumbing connected to a public water supply system.

2.5.2 INSTALLATION

All water service lines must be so arranged that the supply to each separate house premises or buildings may be controlled by a separate shutoff valve and curb box placed within the right of way near the property to be served. When possible, curb boxes shall not be placed in sidewalks. Curb box shall be placed in the boulevard when one exists, or six inches behind the sidewalk where a curbside sidewalk exists and space inside the right-of-way exists. One singular, identifiable entity will be responsible for all the water used through each service.

Flag lots must have a minimum of 10 horizontal feet of frontage at the public right-of-way. Water service lines installed for a flag lot shall only serve a single platted parcel.

All individual condominiums or separate buildings must be served by individual service line from the main whenever possible. In the cases where individual service lines are not feasible, one service will be allowed with only one master meter that is the responsibility of the condominium associations or one individual for payment. Multiple meters that are read and billed by the City of Helena will not be allowed on a single service. In cases where the street is less than ten years old with a single service to the condominium lot, individual meters may be allowed with manifold and a master shutoff valve along with individual shutoff valves located within City ROW. See Standard Drawing 2-8.

All water service lines shall be installed in accordance with City of Helena Standard Drawing 2-3 with a minimum of 6½' of cover from the top of service pipe to final finished grade or be insulated with “blue board” type Styrofoam insulation.

No portion of any water service line shall be located within a property it does not service.

All water service lines shall be encased in 8 mil polyethylene wrap for a minimum distance of 3' from the main.

All water service line connections to the water main must be made by a licensed plumber (Helena City Code 6-2).

At all locations where water service lines are installed beneath new curb, the face of the curb shall be stamped with a “W” in lettering at least 3" tall, for marking the water service location.

All crossings under existing curbs by tunneling are prohibited.

All services must be connected to a City main. Service lines may not be connected to fire lines or fire hydrant leads.

All service lines must have a tracer wire and it must be installed and tested for all service lines regardless of pipe types. Service line tracer wire shall conform to the requirements set forth in Section 2.4.3 for water mains and be installed from the water main and terminate within the structure or vault. Water service lines shall also be installed with six-inch wide detectable tape marked “WATER” located two feet below finished grade along the alignment of the new service line.

2.5.3 ABANDONMENT OF EXISTING SERVICE LINES

Abandonment of existing water service lines shall be made at the point of connection with the public main by a method approved by the Director of Public Works in writing as per City of Helena City Code.

A street opening permit is required for disconnecting water service lines at the water main in the street right of way. All water service line abandonments shall be inspected and approved by Public Works/Utility Maintenance staff prior to backfilling. The service line shall be disconnected from the corporation stop and the corporation stop shall be in the off position. If the corporation stop or main is leaking, the inspector will advise the utility maintenance division so the leak can be repaired prior to backfilling the ditch.

2.5.4 CURB STOPS AND BOXES

Curb Stops – All curb stops shall be installed in accordance with City of Helena Standard Drawing 2-3 and MPWSS. All curb stops shall have a bronze plug, tee head key with either a Minneapolis top thread or standard no thread, with a copper flare nut or compression fitting on both connections.

Curb Boxes – All curb boxes shall be extension-type having a minimum box length, fully retracted, of 6'. All curb boxes shall consist of a Minneapolis or arch pattern (Buffalo) Style and shall be a Mueller or Ford metal curb box, or equal as approved by the Director of Public Works in writing. All curb boxes shall have screw-on or other type lid, which can be attached to the top of the riser.

Maximum depth of any curb box, measured from top of the operating nut to the face of the curb box lid shall be 8'. Minimum depth of any curb box, measured from the top of the operating nut to the face of the curb box lid shall be 6' - 6". Bending or altering of curb box keys for operation is prohibited. Valve extension rods are not permitted.

Whenever possible, curb boxes shall not be placed in sidewalks. Curb boxes shall be placed in the boulevard, when one exists or 6" behind the sidewalk, where a curbside sidewalk exists and there is ample space within right of way. Top of curb box shall be to grade and located 2' in back of curb line in boulevard at "W" stamp location at all other locations.

All curb boxes shall be installed within 1° of plumb and centered directly over the corporation stop nut. A 1" rigid pipe must be able to pass through the curb box and over the operating nut. Curb boxes shall be installed with a 4" PVC pipe around the cast iron curb box and the annulus filled with masonry sand and a cap or repair lid installed on top. The curb box should be protected and maintained until final occupancy. The curb box will be part of the final occupancy inspection for building permit.

2.5.5 SERVICE LINE METERS

All meters shall remain the property of the City.

Water meters shall be purchased from the City by the water user and shall be installed by the water user/plumber as approved by the City.

All water meters must have valves upstream and downstream of the meter to isolate the meter for servicing. Meter isolation valves are required within 24" of the center line of the meter on the upstream and downstream sides of the meter.

All new and replacement residential water meters shall have a dual check backflow preventer and expansion tank included as supplied by the City of Helena Utility Maintenance Department. Dual check assemblies and expansion tanks shall be retrofitted on to all residential replacement water meters installed in the City of Helena during meter replacement.

All meters shall be located at least 5' away from any electrical devices/equipment.

All meters larger than 2" shall be either turbine, compound or ultrasonic meters and shall be installed in accordance with the manufacturer's recommendations, including a strainer. All bypass assemblies installed must include the same components as the main service with the exception of the meter.

All residential water meters shall be installed within 5' of the crawl space entrance. The area leading to the water meter shall be free of obstructions and easily accessible.

Water meters shall be the same size/diameter as the service line serving the water meter.

Installer must provide a minimum of 4 times pipe diameter of straight run pipe (no fittings, bends etc.) upstream, and a minimum of 2 times pipe diameter of straight run pipe downstream of any commercial meter for proper operation.

Provide a minimum of 18 inches of clearance in all directions from the meter for maintenance purposes.

All equipment shall be properly supported using anchored floor stands or mounted rigidly to the wall with Unistrut or approved equal.

Water Meters shall not be located within any property they do not service.

Meter size and type used shall be specified and shown on project plans (print).

Water service line size(s) shall be specified and shown on project plans (print).

Pressure reducing valve(s) shall be installed downstream of all water meters containing turbine components.

A Neptune strainer shall be provided by the City and are required for each meter containing a turbine component. The strainer is required to be mounted directly to the inlet of the water meter.

On any commercial meter that has a bypass line that bypasses the main line backflow preventer, water meter and pressure reducing valve. The meter bypass line shall be the same size/diameter as the main service line. A locking isolation valve shall be provided on all meter bypass lines.

Meter bypass lines are required to have pressure reducing valves and backflow protection equal to the main line backflow preventers.

All backflow preventers shall be tested by a city approved and licensed backflow tester before final occupancy can be given.

All backflow preventer discharge lines shall be piped directly to a floor drain.

2.5.6 BACKFLOW PREVENTION

"Backflow" is defined as the undesirable reversal of water flow or the reversal of water flow containing other liquids, gases or other substances from a connected source that flows into the distribution pipes of the public water supply.

The City may require, at its discretion, the installation of appropriate backflow protection devices on new or existing service lines when the water user is involved in water use practices that pose a threat to the City's water system. All existing sources for water that are not part of the City of Helena's water system must be disconnected from the City's system.

2.5.7 FIRE SPRINKLER SYSTEMS

All fire sprinkler systems shall be designed to 90% of the maximum operating pressure with a pressure relief valve installed to protect the system from pressure surges. The City of Helena may move the existing Low Malben Pressure Zone to the maximum service elevation of 4009' and create the new Valley Pressure Zone to the maximum service elevation of 3819'. Any new system with a ground elevation that falls within the changing or new pressure zones, must design the system to the calculated design pressure received from the City Engineering Department. A Fire Pressure Zone Map is available in the City Engineering Department**.** A completed copy of Fire Flow Request Form shall accompany sprinkler system plans submitted to the City of Helena Fire Marshal.

Per Uniform Plumbing Code, reduced pressure backflow preventers are required on all systems having a fire department connection.

PART 3 – SANITARY SEWER SYSTEMS

PART 3 SANITARY SEWER SYSTEMS

3.1 DESIGN REQUIREMENTS

Sanitary sewer systems shall be designed, constructed, and tested in accordance with the current editions of Circular DEQ-2 – *Montana Department of Environmental Quality – Design Standards for Wastewater Facilities and the Montana Public Works Standard Specifications* and these standards. The purpose of these standards is to establish the **minimum** requirements for the design and construction of municipal facilities and improvements.

3.2 DESIGN REPORT

All sanitary sewer main extensions shall require the Design Engineer to submit a written, stamped report to the City Engineer which addresses the design requirements listed herein. The design report shall demonstrate compliance with these requirements and provide an overview of the proposed project or development, proposed sanitary sewer system improvements, wastewater flow estimates, system impact, feasibility and basic design requirements and shall include, at a minimum, the following information.

1. **Wastewater Generation:** Include estimated wastewater generation estimates based on projected land use, occupancy and building type for the following conditions:

   a. Average-Day (gallons-per-minute),

   b. Peak Hourly (gallons-per-minute),

   c. Infiltration/Inflow (gallons-per-minute).

2. **System Layout:** Describe and show the proposed collection system layout, including locations for connections with the existing wastewater utility system.

3. **Service Area:** Describe the initial and ultimate area, measured in acres that could be served by the new wastewater facilities.

4. **Population:** Define the initial and ultimate population and population densities that could be served by the new wastewater facilities.

5. **Conformance with Master Plan** - Describe how the proposed wastewater utility improvements conform with the most recent adopted Wastewater Collection System Master Plan.

6. **Industrial Wastes -** Define the estimated quantities and quality of any industrial wastes that could be discharged to the wastewater system.

7. **Collection System Analysis** - Include a collection system impacts analysis, identifying any system impacts based on proposed demands and providing design solutions to ensure perpetuation of future wastewater utility system growth and maintain system capacity and flow rates.

8. **Main Sizing** - Indicate the required sizing of proposed collection mains based on wastewater demands and a capacity analysis. The design report shall demonstrate that all sanitary sewer main extensions have adequate capacity to convey

wastewater from the anticipated service area and meet the minimum flow velocities and/or flow depth requirements in Chapter 30 of MDEQ Circular-2.

9. **Wastewater Effluent Characteristics** – Indicate the makeup of the proposed wastewater discharges. If wastewater to be discharged into the City of Helena's collection system is to be anything other than domestic wastes, the design Engineer shall include information concerning the characteristics of proposed wastewater effluent, including the following:

   (a) Acidity-alkalinity,
   (b) Phosphorus,
   (c) pH,
   (d) Sulfates and sulfides,
   (e) Synthetic and organic compounds,
   (f) Hazardous constituents,
   (g) BOD5 (total and soluble fraction, carbonaceous and nitrogenous demand),
   (h) COD (total and soluble),
   (i) TSS,
   (j) Nitrogen (TNK, NO3, NO4, NH4, organic), and
   (k) Inorganics (salts, metals)

10. **Special Conditions** - Identify any special conditions, such as conflicts with other utilities, unusual installation depths or oversizing requirements that require special provisions for improvements construction.

Estimating wastewater flows for residential developments shall be based on 112 gallons per day per capita for single residence using an average of 2.39 people per residence as shown in Table 3-1.

Estimating wastewater flows for non-residential developments shall be determined on a case-by-case basis by the design engineer based on the projected land use, occupancy and building type, using Circular MT DEQ-4, Tables 5-1 and 5-2 whenever possible. The design engineer shall provide all relevant references, assumptions, and calculations for alternate methods of non-residential wastewater flow estimation used within the submitted report.

If the design engineer is not able to provide detailed wastewater estimation information for non-residential developments, the estimated wastewater flows shall be based on the proposed use of the property as shown in the following table:

Table 3-1. Wastewater Load by Development Type

Development Type	Average Day Wastewater Load
Residential	112 gallons/day/capita
Average Persons per Housing Unit	2.39 Persons
Non-Residential[1]	
Commercial Use[1]	4,000 gallons/acre/day[1]

Development Type	Average Day Wastewater Load
Industrial Use[1]	3,500 gallons/acre/day[1]
Infiltration Allowance[1]	150 gallons/acre/day[1]

[1] Area based on total gross area of the development.

The allowance for inflow and infiltration shall be 150 gallons per acre of coverage area per day or otherwise approved by Public Works Department in writing. Peaking factors do not apply to the irrigation allowance.

The City may require, at its discretion, the capacity of the sewer to be increased.

3.3 WASTEWATER SERVICE AREA

The official wastewater service area for the city is that area of the city within the boundaries of the city and currently served by city sewer, any areas presently served outside the city and any subsequently approved amendments thereto.

Applications for sewer service area enlargements, as specified in City Code 6-5-3, shall be made on forms prescribed by the City Manager, and shall be accompanied by all documentation requested by the city. An application form is included in Appendix A of this standards document.

The property shall meet the following conditions prior to making application for enlargement of the service area:

- Within the City limits or approved for annexation to the City of Helena
- Contiguous to the boundary of the service area as the same exists;
- Entirely within the City's full service, urban planning area;
- Entirely within the City's facilities planning area; and
- Capable of being adequately served by extension of existing or existing infrastructure.

3.4 SANITARY SEWER MAINS

3.4.1 DESIGN CONSIDERATIONS

Slope – Gravity sewer mains shall be installed with slope adequate to maintain flow velocities of at least 2.0 feet per second (fps) when depth of flow is at or below 0.3 of the sewer main inside diameter, based on Manning's equation with an "n" value of 0.013. Recommended minimum pipe slopes listed in Section 33.41 of Circular DEQ-2 will be considered adequate.

Capacity - Public sanitary sewers and appurtenances shall be designed to accommodate peak hourly flows (q), including allowance for infiltration, while flowing no more than half full (q/Q of 0.50) when no additional connections are possible and a quarter full (q/Q of 0.25) when future growth is anticipated. The development must upsize the existing affected downstream mains if the capacity (Q) of the sewer main is calculated to be three quarters full (q/Q of 0.75). The allowance for groundwater infiltration shall be 150 gallons per acre of coverage area per day or otherwise approved by Public Works Department. The City may require, at its discretion, the capacity of the receiving sewer(s) to be increased.

Diameter – Gravity sewer mains shall have a minimum diameter of 8 inches. Increasing the diameter in order to meet the minimum pipe slope requirements will not be allowed.

Manholes- Shall be a minimum of 48" inside diameter for all manholes with a depth less than 13'. All manholes with burial depth equal to or greater than 13' shall be a minimum of 60" internal diameter. Manholes with a burial depth equal to or greater than 15' shall have the design stamped by a professional engineer licensed in the state of Montana.

A drop type manhole must be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Drop manhole use shall be avoided wherever feasible. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches the invert shall be filleted to prevent solids deposition. Drop manholes should be constructed using an inside drop connection whenever possible. Inside drop connections must be secured to the interior wall of the manhole using 316 stainless steel hardware and provide access for cleaning. All interior drop connections shall include a drop bowl and shall be manufactured by Reliner/Duran Inc. Drop holes with a force main connection shall include a drop bowl hood. All drop manholes shall conform to City of Helena Standard Drawing 3-12. Exterior drop manholes shall only be used with prior written approval of the Director of Public Works or City Engineer and shall conform to MT DEQ Circular 2.

Flow Direction – On the infrastructure plans all sewer mains shall be labeled as to the flow direction.

Accessibility - Sewer mains shall be installed in public right-of way wherever possible. Where mains cannot be installed in ROW a 20' wide exclusive City easement with a 14' all weather surface road must be constructed in the easement. Complete easement information must be shown on the submitted plans.

3.4.2 MATERIALS

Gravity Piping – Gravity sewer main piping shall consist of any of the following materials:

- PVC meeting ASTM D3034, SDR-26 (8" to 15")
- PVC meeting ASTM F679 PS115 (18" and larger)
- Concrete meeting ASTM C14, C76 or C655

Other sanitary sewer materials specifically approved by the City of Helena are given following.

Pressure Piping – Pressure sewer mains (force mains) shall consist of PVC Pressure Pipe, ASTM D2241, Class 200 SDR-21, or AWWA C900 Class 235 DR-18.

All pressure sewer mains (force mains) must have a tracer wire installed and tested for all lines regardless of pipe type. Pressure sewer mains tracer wire shall conform to the requirements set forth in Section 2.4.3 for water mains and be installed from the lift station building and terminate at the receiving manhole ring and cover. Pressure sewer mains shall also be installed with six-inch wide detectable tape marked "SEWER" located two feet below finished grade along the alignment of the new pressure sewer main.

Manholes – All manholes shall be constructed using reinforced pre-cast concrete unless specifically allowed by the Public Works Department in writing. Structural strength shall withstand H-20 design load.

All manholes installed at outfall lines must have PVC or polyurea liner installed to protect against H_2S gas.

Manhole Ring and Cover – Manhole cover shall have the City of Helena logo and shall be stamped "SANITARY SEWER" and shall be in compliance with City of Helena Standard Drawing 3-2. Final adjustment ring shall be made with Infra-Riser by East Jordan or approved equal.

3.4.3 INSTALLATION

Alignment and Grade - Public sanitary sewers shall be installed with a straight alignment and grade between manholes as required in MPWSS.

Location - Municipal wastewater system facilities shall be designed and constructed so that all such facilities are readily accessible for maintenance and repair. In addition, such facilities shall be situated to preclude the entrance of surface water into said facilities. All sewer mains shall be centered in the right-of-way or easement to the greatest extent possible. If this is not possible the sewer main shall be installed in the center of the driving lane and manholes kept out of the vehicle wheel lines to prevent damage.

Depth – Sanitary sewers shall be buried to a depth sufficient to prevent freezing and shall have a minimum depth of 4 feet. Shallower depths may be allowed by the Public Works Department if suitable pipe insulating provisions have been made and approved by the Department in writing.

Manholes – All sanitary sewer manholes shall be installed in accordance with City of Helena Standard Drawing 3-3 and applicable MPWSS Drawings. All drop manholes shall conform to City of Helena Standard Drawing 3-12.

Testing – All new sanitary sewer mains and manholes shall be tested in accordance with Montana Public Works Standard Specifications 7th or most recent edition Section 02730 – Sanitary Sewer Collection System. The City reserves the right to perform any and all of these tests prior to acceptance of sewer infrastructure. Pressure sewer mains must be leak tested and documented to1.5 X design pressure prior to acceptance by the City.

3.4.4 EXTENSION

Any extension of an existing City sanitary sewer main must be extended through the entire frontage length of the property to be served, with a standard manhole located at the terminus of the new sewer main as per Helena City Code 6-3-4 and these standards.

Sewer main extensions shall include all manholes, clean-outs and appurtenances deemed necessary by the City.

3.4.5 WATER LINE CROSSINGS

Crossings - A minimum of 18" vertical separation is required when a sanitary sewer main crosses above or below a water main, measured outside to outside of pipe. Please refer to MPWSS for further information on water line crossings.

Less than 18" vertical separation may be allowed when the gravity sewer at the crossing is made using a single 20' length of AWWA pressure pipe and the crossing is approximately 90° and the length of pipe is centered over the crossing. Specific authorization from the Montana Department of Environmental Quality and the Public Works Department in writing is required for a vertical separation of less than 18".

No exception of the minimum 18" vertical separation requirement is permitted when the sewage pipe is a force main.

Parallel – Unless specifically authorized by the Montana Department of Environmental Quality and the Public Works Department in writing, a minimum of 10' horizontal separation (measured edge to edge of mains) is required when a sanitary sewer main and water main are installed parallel.

3.4.6 ABANDONMENT OF EXISTING SANITARY SEWER MAINS

All sanitary sewer mains and manholes to be abandoned shall be excavated, removed, and disposed of whenever possible. The abandonment of existing sanitary sewer mains and manholes in place shall only be allowed with written permission from the Director of Public Works and shall be in accordance with these standards. All sanitary sewer mains and structures abandoned in place shall be inspected and approved by a City Engineering Division representative prior to backfilling. All sanitary sewer mains and structures abandoned in place shall be shown on the project's submitted record drawings.

Manholes – Sanitary sewer manholes shall be abandoned in place by removing all castings and/or entry grates and salvaging them to the City of Helena Utility Maintenance Department. Manhole sections are to be excavated and cone and upper shaft sections removed and disposed of to a minimal depth of five (5) feet below the finished ground surface. The manhole base shall be broken up using jackhammer, concrete core drill or equipment mounted hydraulic or pneumatic hammer, and the remaining manhole sections completely filled with sand, gravel, flowable fill or other approved material. The excavation shall then be backfilled using approved materials and compacted to 95% minimum relative compaction up to finished grade.

Mains - All sewer mains abandoned in place shall be completely filled with flowable fill or non-shrink grout or other material approved in writing by the Director of Public Works. Concrete plugs shall be placed at both ends of the abandoned sanitary sewer main.

3.5 SEWER SERVICE LINES

3.5.1 MATERIALS

Gravity Sewer Service Piping – Gravity sewer service piping shall consist of the following materials for the following situations:

PVC meeting ASTM D3034, SDR-26 or PVC Schedule 40 – Solvent Weld or SBR Gasket Joint for normal installations.

PVC Schedule 40 or Cement Lined Ductile Iron for installations within 2 feet of a building foundation.

PVC Schedule 40 for water main or water service crossing

PVC Schedule 40 with acrylonitrile butadiene (NBR) gaskets for installations in areas of hydrocarbon contamination.

Pressure Sewer Service Piping – Pressure sewer service lines shall consist of PVC Pressure Pipe, ASTM D2241, Class 200 SDR-21.

3.5.2 INSTALLATION

All sanitary sewer service lines must be so arranged that the discharge from each separately owned house premises, or buildings on separate lots is a separate service line that connects to the main.

The owner of each house or premises is liable for the charges for the wastewater service provided by the city to that owner's house or premises.

Flag lots must have a minimum of 10 horizontal feet of frontage at the public right-of-way. Sewer service lines installed for a flag lot shall only serve a single platted parcel.

All sewer service lines shall be installed in accordance with MPWSS with a minimum of 4' of cover from the top of service pipe to final finished grade.

At all locations where sewer service lines are installed beneath new curb, the face of the curb shall be stamped with an “S” in lettering at least 3" tall, for marking the sewer service location.

All service line crossings under existing curbs by tunneling are prohibited.

All sanitary sewer service lines must have a tracer wire installed and tested for all service lines regardless of pipe type. Service line tracer wire shall conform to the requirements set forth in Section 2.4.3 for water mains and be installed from the sewer main and terminate within the structure or vault. Sanitary sewer service lines shall also be installed with six-inch wide detectable tape marked “SEWER” located two feet below finished grade along the alignment of the new sanitary sewer service line.

3.5.3 TAPPING CITY SEWER

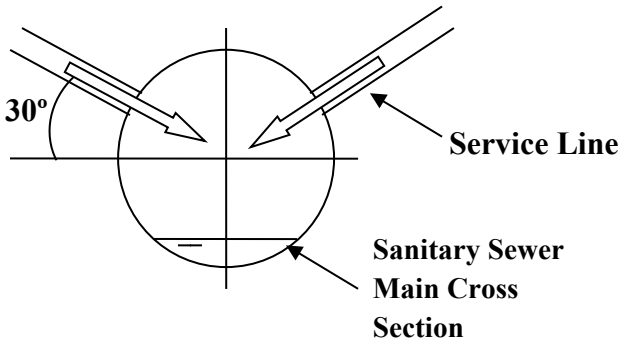
Any person desiring to make connection to the city’s water or sewer mains must make application in writing and pay for the cost of tapping in accordance with Helena City Code 6-2-4.

All applications for service connection to the city's wastewater system must be made at the office of the Building and Safety Division of the Community Development Department on the form for that purpose. Every such application must be made by the owner of the property to be served or the owner's authorized agent and must include the nature of wastewater discharged into the system. All sewer taps shall be inspected and approved by City Staff.

Taps on existing sewer mains to be completed using the properly sized Insert-a-tee.

When tapping a main that has been previously rehabilitated or lined, the original host pipe must be removed from an area sufficient to make tap directly to the new/inner pipe or liner.

Taps on sewer or storm water pipes should be in the upper quadrant of the pipe in the 10 o’clock or 2 o’clock positions with a saddle wye fitting. See the following figure:



Sanitary Sewer Main Tapping Figure

3.5.4 METERING WHEN NOT ON CITY WATER

For new city sewer services which do not use the city water system or whose water consumption or wastewater discharge is not otherwise metered, the Helena Public Works Director shall require the installation of a suitable metering device to determine an equitable charge for sewer services.

3.5.5 SOLIDS HANDLING/GRINDER PUMP/COMMUNITOR SERVICES

If a proposed sewer service is to handle bulk solids or garbage with discharged materials greater than one half inch (1/2”), or organic materials greater than one quarter inch (1/4”) a grinder pump or comminutor must be installed such that all wastewater discharges are capable of passing through a quarter inch screen (1/4”) as per Title 6 of City Code. A communitor or grinder pump service may be required at the discretion of the Director of Public Works based on the proposed use of the property and for pumped sanitary sewer services.

3.5.6 ABANDONMENT OF EXISTING SANITARY SEWER SERVICES

Abandonment of existing sanitary sewer service lines shall be made at the point of connection with the public sanitary sewer main by a method approved by the Director of Public Works in writing as per City of Helena City Code.

A street opening permit is required for permanently disconnecting sanitary sewer service lines at the sanitary sewer main in the street right of way. All sanitary sewer service line abandonments shall be inspected and approved by Public Works/Utility Maintenance staff prior to backfilling. The service line shall be disconnected, truncated and sealed within three (3) feet of the sanitary sewer main.

3.6 LIFT STATIONS

3.6.1 CAPACITY

The design capacity for a lift station shall be designed on a case-by-case basis by the design engineer to a reasonable capacity based on established wastewater flow estimation methodology or as outlined in Section 3.2 of these standards and other applicable standards including MT DEQ Circular 2. The designer shall provide a table in the design report for the design capacity for each non-residential lot. Multi-family lots with a 4-plex or greater are also considered commercial lots. During the building review process a letter from an engineer must be submitted certifying that the sewer capacity is not greater than the original design capacity of the lot. If the capacity for the building is greater, additional capacity may be required.

3.6.2 BUILDING

The building shall be constructed of masonry block and similar to the architectural style of the existing lift stations. The building style must be compatible with the surrounding zoning. The developer must install sidewalk adjacent to all rights-of way, a driveway, and curb cut so maintenance equipment can access the building and wet well.

3.6.2.1 LANDSCAPING

All lift stations must have low water/native vegetation and trees with an irrigation system for the landscape screening.

3.6.2.2 FENCING

All lift stations must be fenced with an 8' high black vinyl coated chain link fence with 2-strand barbed wire top. A minimum of two lockable gates must be provided; one for pedestrian access and one double gate that is able to swing 180° for allowing maintenance vehicles and equipment to access the site.

3.6.3 WET WELL

Must be lined with a spray on PVC or polyurea coating or approved equal by the Public Works Department.

3.6.4 PIPING

All piping must be stainless steel within the wet well and ductile iron in the building. The pipe must also be configured to accommodate bypass pumping with a blind flanged tee and isolation valve after the last check valve.

All fittings must be located out from under the lift station slab or located within a grated trench. All fittings must be accessible without damaging the building.

3.6.5 VALVING

All check valves must have external levers.

A three-way Dezurik plug valve must be installed at the point the two pumping lines join.

3.6.6 SAFETY

The wet well shall have a safety grate that is easily removable and integral to the hatch. The grate must be rated to at least 1000 lb. of loading. In addition to the hatch with a safety grate, removable handrails must also be supplied.

A compressor and two full-face masks with a minimum 50' hoses will be required for a fresh air supply. SCBA will not be acceptable as a fresh air supply.

3.6.7 PUMPS

The pumps shall be Gorman-Rupp, Paco, Flygt or equal as approved in writing by the Public Works Department.

3.6.8 TELEMETRY

The telemetry must be designed in accordance with the City of Helena Telemetry Design Standards.

3.6.9 PIGGING STATIONS

Any lift station with a force main of more than 2000' that does not have an existing flow of 50% of the design capacity at the time of construction must have pigging stations at regular intervals for periodic cleaning of the force main and considerations for lift station bypass during pigging operations.

3.6.10 ODOR CONTROL

All vents from the wet well or force main must be fitted with a carbon filter.

3.6.11 ON SITE GENERATOR

All lift stations must be supplied with an on-site generator. Generator sizing must be based on appropriate load testing and/or manufacturers' requirements. The generator must be a natural gas or diesel fuel unit located in a separate room within the building. An access door big enough to remove the generator for maintenance will be required for all lift station installations.

PART 4 – STORM DRAINAGE SYSTEMS

PART 4 STORM DRAINAGE SYSTEMS

4.1 GENERAL REQUIREMENTS AND POLICY

4.1.1 INTRODUCTION

This Design Manual presents technical requirements for the analysis and design of stormwater systems in the City of Helena. The City of Helena maintains stormwater systems to meet the goals of improving water quality, preventing pollutants from entering our water bodies, and managing flood risk. The Design Manual is intended to streamline design of new stormwater infrastructure for developers, designers, and engineers working into the City of Helena and therefore make it easier to meet the goals of the stormwater system.

The structure of the Design Manual roughly follows the design process. All projects must meet the requirements of Section 4.1 and Section 4.2. Section 4.1 describes general requirements for the overall project. Section 4.2 describes the requirements for the Drainage Report and Drainage Plan submittals. All planned development or proposed construction must have an approved Drainage Report and Plan before construction begins. Appendix A and B include detailed requirements for the Drainage Report and Drainage Plan, respectively. Section 4.3 describes requirements for project hydrology. Section 4.4 describes requirements for the design of any stormwater conveyance features that a project may include. Section 4.5 describes the requirements for design of any stormwater runoff control or water quality treatment that project may require. Section 4.6 describes the requirements for easements for stormwater infrastructure. Section 4.7 describes the requirements for erosion protection and sediment control during construction to protect stormwater quality.

The flowchart shown in Figure 4.1 provides a graphical representation of the requirements and methods presented in the Design Manual. It is intended to provide clarity to the City of Helena standards and this Design Manual but is superseded by those documents in the event of any conflicts.

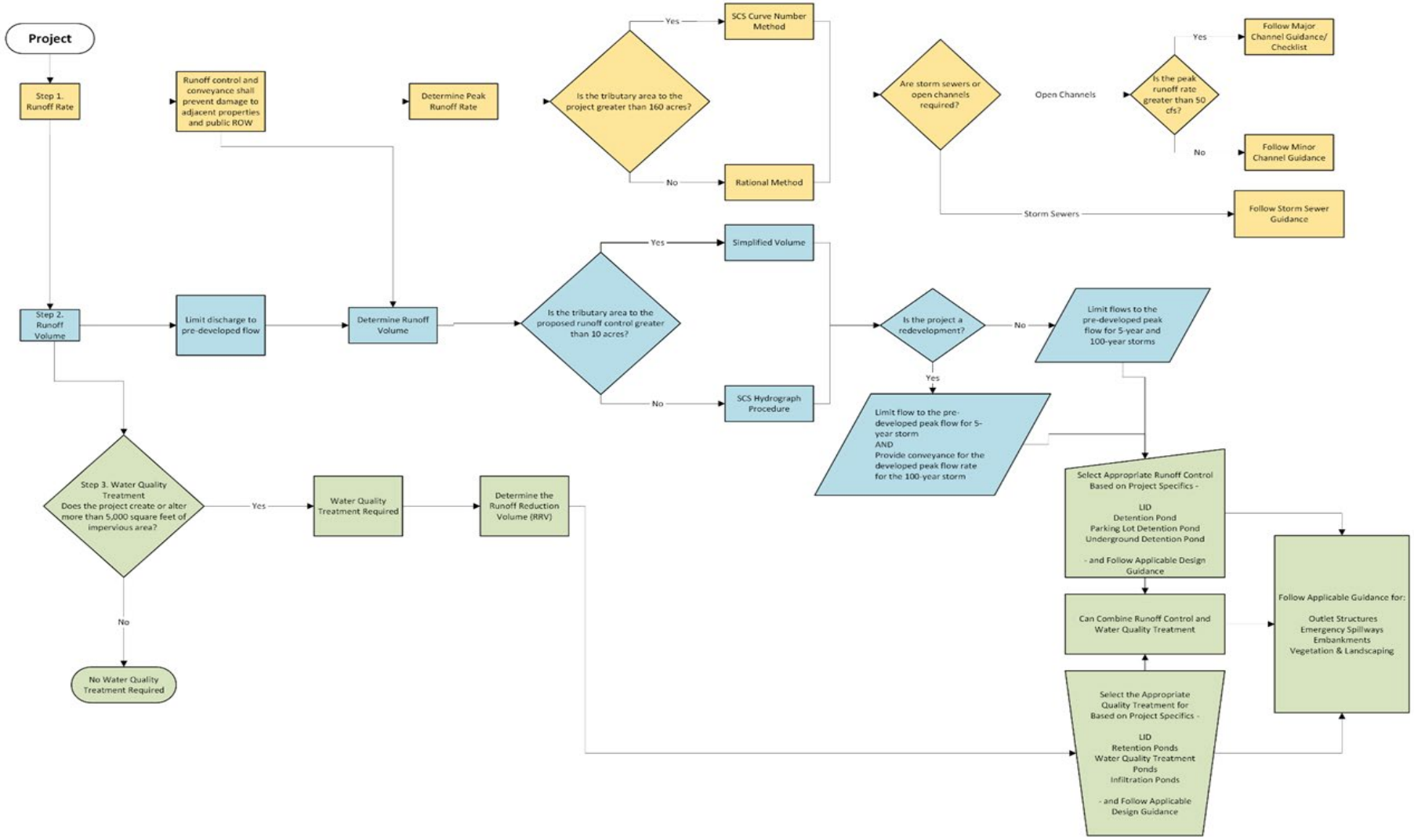


Figure 4-1. City of Helena Stormwater Design Process

4.1.2 APPLICABLE POLICY

Stormwater system design in the City of Helena must meet the following applicable policies:

- Storm drainage must comply with the General Permit for Stormwater Discharges Associated with Small Municipal Separate Storm Sewer Systems (MS4s), Permit Number MTR040000.
- Storm drainage must comply with Helena City Code: Title 6 - Public Works, Chapter 6 - Stormwater Control, and Title 3 - Building Regulations, Chapter 14 - Floodplain Regulations.
- Storm drainage design criteria must be the following in order of priority: City Engineering and Design Standards, Montana Public Works Standard Specifications (MPWSS) 7th Edition, and then the most stringent criteria found in the technical references cited in these standards.
- The current City of Helena Storm Water Master Plan must be evaluated in the context of any site development such that the hydrologic and hydraulic conditions are accounted for and any impacts from or to a development are mitigated. A copy of the City of Helena Storm Water Master Plan is available on request.
- All State and Federal requirements shall be applied to all storm drainage systems. Where applicable, railroad, Montana Department of Transportation (MDT), and airport design specific requirements shall apply.
- Several technical references were utilized to develop these standards and may be referenced for all storm drainage design except as modified by these standards. A full bibliography is provided in Section 4.8.

4.1.3 OVERALL DESIGN REQUIREMENTS

The following general requirements will apply to all regulated construction, development, and redevelopment activities:

- Discharge from any developed site shall not exceed the **pre-developed (historic) flow rate** and discharge at the same location as the pre-developed (historic) conditions.
- All runoff control facilities and conveyance systems shall be installed to **prevent damage or nuisance water** to adjacent properties and the public right-of-way due to the proposed development.
- All site **development** with an **impervious area** of greater than 5,000 square feet or redevelopment altering more than 5,000 square feet must be routed to an on-site stormwater pond or an off-site regional stormwater pond which will contain water quality capacity and stormwater runoff capacity with flow controls to reduce discharges of the 5-year and 100-year 24-hour storm events to the pre-developed (historic) rates. The volume of water requiring water quality treatment is referred to as the Runoff Reduction Volume (RRV) in these standards.

- All site **redevelopment** altering more than 5,000 square feet of impervious area must be routed to an on-site stormwater pond or an off-site regional stormwater pond which will contain water quality capacity and stormwater runoff capacity with flow controls to reduce discharges of the 5-year event to the pre-developed (historic) rates. The stormwater pond serving the redeveloped area, as well as any conveyances routing water to and from the pond, must safely convey the flow from a 100-year event.
- All impacts to **wetlands** must comply with State and Federal regulations. Additionally, wetlands within the City are a limited and valuable resource and must be maintained or otherwise compensated for if they are negatively impacted by a development regardless of their State or Federal standing. If it is determined by the City Engineer that wetlands potentially exist on the site and will be impacted by the development, the owner/developer must hire a professional ecologist to determine the existence and extent of the wetlands.
- Stormwater runoff into the **sanitary sewer system** is prohibited.
- **Public storm drainage systems** serve greater than one parcel, except where a residential parcel conveys runoff from three (3) or fewer off-site residential parcels. Public storm drainage systems will be maintained by the City.
- **Private storm drainage systems** serve one parcel, except where noted above. Private storm drainage systems shall be maintained by the property owner.
- Storm drainage **easements** to the City must be provided for all components of public and private storm drainage systems on private land from the right-of-way, to and including, stormwater runoff control and water quality treatment.
- Storm drainage **easements** shall allow the City the right to enter private land for the purposes of operation and maintenance of public storm drainage systems and when private property owner(s) fail to adequately maintain their private storm drainage system.
- A **professional engineer** certification is required for the design and completed construction of all stormwater facilities.

4.2 DRAINAGE REPORT AND PLAN SUBMITTAL REQUIREMENTS

A Drainage Report and Plan is required for any development or redevelopment that creates or alters more than 5,000 square feet of impervious area or when a public storm sewer system is required. The purpose of the Drainage Report is to identify and provide solutions to the problems that may occur on-site and off-site because of the development.

All reports shall be prepared on 8 ½" by 11" paper and bound as a stand-alone document (Plans, maps, figures and tables may be on 11"x17" sheets folded to 8 ½" by 11"). The drawings, figures and tables shall be bound with the report or included in a pocket attached to the report. The Drainage Report and Plan shall be signed and stamped by a Professional Engineer licensed in Montana. Any reports that are not stamped and signed will be returned without review.

The Drainage Report generally provides details of supporting calculations and other pertinent information. The Drainage Report shall be based on the outline included in Appendix A. The Drainage Plan submittal requirements are detailed in Appendix B.

4.3 HYDROLOGIC ANALYSIS AND DESIGN

4.3.1 DESIGN STORM EVENTS

- Water Quality Storm – 0.5 Inches of Precipitation
- 5-year, 24-hour storm (Runoff Control and Street Conveyance)
- 25-year, 24-hour storm (Channel and Storm Sewer Conveyances)
- 100-year, 24-hour storm (Runoff Control)

4.3.2 RAINFALL

The rainfall depths provided in the following tables are for use with hydrograph analyses to estimate peak rates of runoff and runoff volumes.

Table 4-1. Precipitation Levels for the City of Helena

Design Storm	Rainfall Depth (in.)
Water Quality	0.50
5-year, 24-hour	1.57
25-year, 24-hour	2.05
100-year, 24-hour	2.44

Rainfall intensity-duration-values provided in the following table are for use with the Rational Method for determining peak rates of runoff. Both rainfall depths and rainfall intensities were obtained from Chapter 9 of the Montana Department of Transportation Hydraulics Manual, 2022.

Table 4-2. Precipitation Intensity Values, Inches/Hour

Design Storm	Rainfall Depth (in.)		
	5-year	25-year	100-year
5 minutes	4.26	6.38	8.31
10 minutes	2.82	4.21	5.45
15 minutes	2.15	3.21	4.14
30 minutes	1.31	1.95	2.51
60 minutes	0.74	1.09	1.39

4.3.3 HYDROLOGIC MODELS

4.3.3.1 PEAK FLOWS

There are two methods for allowed estimating storm runoff peak flows: SCS Curve Number Method and the Rational Method. These methods can be implemented using several readily available software packages. The SCS Curve Number method shall be used for all tributary areas greater than 160 acres and the rational method may be used for tributary areas less than 160 acres. Additional technical guidance for the SCS curve number method can be found in TR-55. Additional technical guidance for the Rational Method can be found in Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 22 (HEC-22).

4.3.3.2 RUNOFF VOLUMES

There are two methods allowed for estimating storm runoff volumes: SCS hydrograph procedure and Simplified Volume. The SCS hydrograph procedure and routing can be implemented using readily available software packages. The SCS method shall be used for routing runoff flows through detention ponds with tributary areas greater than 10 acres. The SCS method shall be performed with 24-hour storm events, Type II rainfall distributions, and resolved to 5-minute time intervals. Additional technical guidance on the SCS hydrograph procedure and routing can found in the Natural Resources Conservation Service Technical Release 55 (TR-55) and TR-20. The Simplified Volume method is only allowed for sizing retention stormwater ponds and detention ponds with less than 10 acres of tributary area. The Simplified Volume method is described in Section 4.5.5 Retention Pond.

4.3.3.3 OFFSITE DRAINAGE EVALUATION

Drainage analysis must include an evaluation of all offsite drainage basins impacting the proposed site. Offsite drainage evaluation must include the results of the hydrologic and hydraulic analysis contained in the most current City of Helena Stormwater Master Plan.

Any site discharging developed flows must evaluate the route and downstream capacity of the drainage system and provide adequate capacity from the site to the point where flows are reduced to the pre-developed rates and discharge conditions.

Offsite drainage areas exceeding 25% of the site area or 25 acres, whichever is smaller, must be routed around, to discharge below, the site or regional stormwater pond.

Offsite drainage areas routed to a stormwater pond shall be included in the pond rate, volume, and water quality controls for its existing developed condition or its future developed condition based on zoning, whichever has more impervious area.

4.3.3.4 TIME OF CONCENTRATION

The hydrologic methods require a time of concentration for each drainage area analyzed. The time of concentration shall be calculated using the methods outlined in HEC-22.

4.4 CONVEYANCE DESIGN

4.4.1 OPEN CHANNELS

4.4.1.1 NATURAL CHANNELS

In general, natural channels are limited within the Helena, and as such, these standards do not provide guidance in this regard. Any impacts to a natural waterway will be evaluated with City Engineering on a case-by-case basis.

4.4.1.2 MAN-MADE CHANNELS

Only vegetated man-made channels are allowed in the City. No hard lined, rock or concrete, channels are allowed. Man-made channels must be evaluated for stability during the post-construction (pre-vegetation) and ultimate (vegetated) condition. Design criteria for man-made channels is provided in Table 4-3.

Table 4-3. Design Criteria for Man-Made, Grass-Lined Channels

Design Criteria	Minor Channel	Major Channel
100-year Flow Capacity	Less than 50 cfs	More than 50 cfs
Maximum 100-year Velocity	7 feet per second	5 feet per second
Manning n	0.035	0.035
Maximum Froude Number	0.8	0.5
Maximum Depth	2 feet	5 feet
Maximum Slope	2.5%	0.6%
Maximum Side Slope	3:1	4:1
Maximum Centerline Bend Radius	2 times top width	2 times top width
Minimum Freeboard	0.5 feet	1.0 feet
Minimum Freeboard >2 to 5 feet Depth	1.0 feet	1.0 feet

Additional criteria for man-made channels include:

- Temporary erosion control linings are necessary prior to establishment of vegetation. Temporary erosion control lining must be biodegradable and designed to be stable during the 5-year storm event.
- Any use of riprap shall be mixed with soil at a rate of 1/3 soil to 2/3 riprap and covered with 6 inches of topsoil.

- Major channels must be excavated and not have any above-grade embankments.

Additional technical design guidance for open channels can be found in Open Channel Hydraulics by Ven Te Chow. Grade control structures may be required to meet the maximum longitudinal channel slopes in Table 4-3. Grade control structures shall be designed in accordance with Federal Highway Administration, Hydraulic Design of Energy Dissipaters for Culverts and Channels, Hydraulic Engineering Circular No. 14.

4.4.2 STORM SEWERS

Storm sewer pipes convey stormwater runoff through much of the City of Helena before discharging to existing drainages, open channels, or ponds. Design of storm sewers shall include peak runoff rates, hydraulic capacity, hydraulic grade line, structural considerations, and constructability.

Hydraulic and energy grade line shall be calculated by accounting for all pipe friction losses and structure losses. Hydraulic and energy grade lines shall be shown on all storm sewer plan and profile sheets for public storm sewer systems. Backwater effects of outfalls into channels and stormwater ponds must be accounted for in the design of storm sewers. Additional technical design guidance for the design of closed storm sewers can be found the Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 22 (HEC-22).

Inlet and outlet protection shall be designed in accordance with FHWA HEC-14. All storm sewers should be designed to meet the requirements of Table 4-4.

Table 4-4. Design Criteria for Storm Sewers

Design Criteria	Requirement
Minimum Diameter	12 in
Minimum Design Capacity	
25-year Storm Event	Must have non-pressurized/non-surcharged flow.
100-year Storm Event	Hydraulic grade line may not exceed 1 foot above ground surface.
Maximum Internal Velocity, 25-year	25 feet per second (fps)
Minimum Internal Velocity, Full Flow	2.5 fps
Minimum Slope	
Pipe Diameter > 24 in	0.5%
Pipe Diameter < 24 in.	1%

4.4.2.1 MATERIALS

- Storm sewer pipe, culverts, and appurtenances shall meet the requirements of MPWSS, with the following amendments:
- Reinforced Concrete Pipe (RCP): RCP meeting ASTM C-76 with a joint conformation to ASTM C-443, providing a watertight O-Ring gasket joint. The maximum fill depth is 15' for class III pipe and 25' for class V pipe. Minimum cover is 2' from the top of pipe to the finished grade or as recommended in writing by the manufacturer. For pipes with a fill depth greater than 25', pipe type shall be determined on a case-by-case basis with back up calculations provided by the Developer and pipe manufacture.
- High Density Polyethylene and Metal pipe are not allowed.
- All open ends of storm sewers shall follow the design in City of Helena Standard Drawing 4-6 to have a concrete flared end section and galvanized steel safety rack. All safety racks shall be constructed from smooth steel pipe with a minimum outside diameter of one (1) inch at four (4) inches on-center. The safety rack ends and bracing shall be constructed with steel angle sections.
- Riprap inlet and outlet protection is required at all open ends of storm sewers. Any use of riprap shall be mixed with soil at a rate of 2:1 riprap to soil and covered with six (6) inches of topsoil.
- All storm sewers must be designed for a minimum of H-20 loading unless other circumstances require higher structural loading requirements.

4.4.2.2 VERTICAL ALIGNMENT

Storm sewer vertical alignments shall meet the minimum vertical clearances to buried utilities provided in Table 4-5.

Table 4-5. Vertical Clear Distances from Storm Sewers

Utility Type	Clear Distance
Cable TV	Per Utility Owner, 12 inches minimum
Gas	Per Utility Owner, 12 inches minimum
Power	Per Utility Owner, 12 inches minimum
Sewer main	12 inches
Telephone, Fiber Optics	Per Utility Owner, 12 inches minimum
Water main	18 inches or DEQ Circular 1, whichever is greater

All storm sewer crossings of water mains with less than three (3) feet clear distance shall have two (2) inches of rigid insulation placed between the pipes for a width two (2) feet wider than the storm sewer and for four (4) feet on either side of the water main. If clearance less than 18 inches cannot be achieved, concrete encasement of the water main is required.

Additionally, all storm sewer vertical alignments should meet the following requirements.

- All storm sewers shall be buried a minimum of one (1) foot below the pavement section and 1.5 feet below finished grade in landscaped areas.
- Storm sewer pipe shall not be buried greater than 15 feet deep.
- Open pipe outfalls must discharge a minimum of one (1) foot above the invert of the channel or stormwater pond to which it discharges
- Manhole or inlet access is required at all vertical bends.

4.4.2.3 HORIZONTAL ALIGNMENT

Minimum horizontal clearances to other buried utilities are provided in Table 4-6.

Table 4-6. Horizontal Clear Distances from Storm Sewers

Utility Type	Clear Distance
Cable TV	Per Utility Owner, 5 feet minimum
Gas	Per Utility Owner, 5 feet minimum
Power	Per Utility Owner, 5 feet minimum
Sewer main	5 feet
Telephone, Fiber Optics	Per Utility Owner, 5 feet minimum
Water main	10 feet or DEQ Circular 1, whichever is greater

Additionally, all storm sewer horizontal alignments should meet the following requirements:

- Storm sewers shall not be placed under any structure or building.
- Storm sewers shall be a minimum of 10 feet from any permanent above-ground structure, retaining wall greater than three (3) feet tall, or building, or the same distance as the buried depth of the storm sewer, whichever is greater.
- Storm sewers shall not be placed under landscaped boulevards or medians except to make crossings or when buried greater than three (3) feet from the top of the pipe to finished grade.

- Utility crossing shall occur between 45 degrees and 90 degrees.
- Where storm sewer pipes cross over or below a water main, one full length of pipe shall be used with the pipes centered for maximum joint separation.

4.4.2.4 STORM SEWER SYSTEM CONNECTIONS

Connections to a public storm sewer system must occur at an accessible structure such as a manhole or inlet, or by an open pipe outfall to channel or stormwater pond. Connections must be made by saw cutting or through an existing knockout and sealed to a watertight connection with non-shrink grout. Angle between the inflow pipe and outflow pipe shall be 90 degrees or greater.

Private storm sewer systems must be accessible on the private property through a straight run of pipe, no greater than 400 feet in length, and through a manhole, inlet, or end of an open pipe. No roof drains or underdrains are allowed to be connected to the public storm sewer system.

4.4.2.5 ABANDONING STORM SEWER PIPES AND STRUCTURES

Abandoned pipelines shall either be removed or completely filled with flowable fill.

Structures within the public right-of-way, within a public easement, or which are part of the publicly owned and maintained system must be removed completely or the top 24 inches of the structure must be completely removed and the structure filled with flowable fill, compacted pipe bedding, or trench backfill material. No storm sewer pipes or structures may be abandoned in place if they conflict with existing and future public works infrastructure installation or maintenance.

4.4.3 MANHOLES

Manholes shall be placed at all changes in the direction, slope, pipe diameter, or pipe material. Manholes shall be concrete and meet the requirements of MPWSS. Manhole covers shall be ductile or cast iron and follow the design in City of Helena Standard Drawing 4-9. Manholes in the public right-of-way shall meet the requirements of City of Helena Standard Drawing 3-1. Manholes shall meet the following design and construction requirements.

- Manholes shall be located a maximum distance of 400 feet for pipe diameters up to 36 inches and 600 feet for pipe diameters greater than 36 inches.
- Manhole lids shall not be placed in the wheel travel path.
- The minimum undisturbed wall between openings is 12 inches.
- Where riser bricks (blocks) are used to bring the frame to grade, the maximum height of the brick shall be two rows. If more than two rows of bricks are required, a precast riser section shall be used along with no more than two rows of bricks to complete the adjustment.
- No steps are permitted in a manhole. All manholes shall have a one (1) foot sump below the lowest invert.
- All manholes must be designed for a minimum of H-20 loading unless other circumstances require higher structural loading requirements.

4.4.4 INLETS

Inlets shall be located at sags, at decreases in cross slope to prevent flow across travel planes, and upstream of all pedestrian crossings. Inlets shall be located in the curb line. Inlets shall be concrete with cast or ductile iron grates. Area drains in low points shall be sized assuming 50% of the inlet grate capacity is clogged and ineffective. Inlet capacities and by-pass flow shall be calculated. By-pass flow leaving the site shall be reduced to the historic rate.

Inlets should meet the following design and construction requirements.

- For sub-basins less than one (1) acre, inlets with a curb opening are required at all low points. For drainage sub-basins greater than one (1) acre, double inlets with a curb opening are required at all low points.
- All grates shall have “No Dumping, Drains to Stream” stamped in block letters at least two (2) inches high and recessed to be flush with the surface.
- On-grade inlets shall be vaned. Inlet grates shall be bike and pedestrian safe.
- No steps are permitted in an inlet.
- All inlets shall have a one (1) foot sump below the lowest invert.
- All inlets must be designed for a minimum of H-20 loading unless other circumstances require higher structural loading requirements.

4.4.5 CULVERTS

Culverts shall meet the requirements for storm sewers with the following amendments and exceptions. Hydraulic design of culverts shall be performed in accordance with FHWA Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5 (HDS-5).

- Inlet and outlet protection shall be designed in accordance with FHWA HEC-14.
- The minimum culvert diameter is 18 inches.
- The maximum allowable headwater for purposes of analyzing the 100-year storm event shall be 1.5 times the culvert diameter or culvert rise.

4.4.6 STREETS

All drainage design involving the use of streets for drainage shall meet the standards in the following tables for evaluating allowable encroachments within public streets for conveying runoff. Cross-street flow is not allowed for collector and arterial roads.

Table 4-7. Allowable Drainage Encroachment within Public Streets by Street Classification

Street Classification	Maximum Encroachment for Calculating Theoretical Conveyance Capacity	
	5-year Storm Event	100-year Storm Event
Local	For six (6) inch curb, no curb overtopping and flow may spread to crown of street, whichever is lower depth.	Residential dwellings, public, commercial, and industrial buildings shall not be inundated at the lowest adjacent grade. The depth of water at the gutter flowline shall not exceed 12 inches or the water surface shall not extend past the street right-of-way (or adjacent drainage easement), whichever is more restrictive
Collector	For six (6) inch curb, flow may spread to back of walk and to crown of street, whichever is lower depth. Flow spread must leave at least one 10 foot lane free of water.	
Arterial	For six (6) inch curb, flow may spread to back of walk and to crown of street, whichever is lower depth. Flow spread must leave at least 10-feet free of water for each travel direction.	Residential dwellings, public, commercial, and industrial buildings shall not be inundated at the lowest adjacent grade. To allow for emergency vehicle access, the depth of water shall not exceed six (6) inches at the street crown, 12 inches at the gutter flowline, or the water surface shall not extend past the street right-of-way (or adjacent drainage easement), whichever is more restrictive.

4.4.7 FLOODPLAINS

All work within the Federal Emergency Management Agency (FEMA) flood hazard area shall comply with FEMA regulations, standards, and guidance, Helena City Code: Title 3 Building Regulations, Chapter 14 Floodplain Regulations, and as required by the City Engineer.

4.5 STORMWATER RUNOFF CONTROL & WATER QUALITY TREATMENT

Stormwater runoff control and water quality treatment are required for development and redevelopment projects depending on the amount of impervious area. Development means creating new impervious area on pre-developed land, where pre-developed land is bare ground or ground

covered with vegetation. Redevelopment means the alteration of existing developed areas that modifies the amount impervious area, including replacement of existing impervious area with new impervious area, replacing pervious area with impervious area, or replacing impervious area with pervious area. Table 4-8 shows the requirements for stormwater management, including runoff control and water quality treatment, organized by whether the project activity is development or redevelopment and the size of the project.

Table 4-8. Stormwater Management Requirements by Project Activity and Size

Activity	Up to 5,000 square feet (sf)	Greater than 5,000 square feet (sf)
Development	Project shall provide conveyance and discharge of runoff in a manner that does not adversely impact adjacent property owners.	Project shall provide: • water quality treatment • stormwater retention or detention with release rates at or below the pre-developed peak flow rates for the 5-year and 100-year storm events.
Redevelopment		Project shall provide: • water quality treatment • stormwater retention or detention with a release rate at or below the pre-developed peak flow rate for the 5-year storm event • any conveyances routing water to and from the pond, must safely convey the flow from a 100-year event

Low Impact Development (LID) techniques may be used in lieu of water quality treatment. Runoff volumes must be quantified when using LID techniques. LID design guidance is available using the Montana Post-Construction Stormwater BMP Design Guidance Manual (MTDEQ, 2017) or the Urban Storm Drainage Criteria Manual (UDFCD, 2010). LID techniques shall be designed in coordination with the City Engineering.

All portions of above-ground stormwater ponds must be vegetated. Specific standards for types of runoff control and water quality treatment ponds are provided in Sections 4.5.1 through 4.5.11. The Montana Post-Construction Stormwater BMP Design Guidance Manual (MTDEQ, 2017) or the Urban Storm Drainage Criteria Manual (UDFCD, 2010) can be referenced for additional design guidance and recommendations.

4.5.1 REGIONAL PONDS

Any site proposing to use a regional pond (stormwater pond serving more than one lot) must be design the pond to provide capacity for the fully developed tributary drainage basin. If an existing regional pond is proposed to be used for stormwater runoff control and water quality treatment, that pond must be modified to meet the current standards for its entire tributary area. A schematic design standard for an above ground extended detention basin that could adapted for use as a regional facility is provided in Standard Drawing 4-8.

4.5.2 ABOVE-GROUND DETENTION PONDS

4.5.2.1 DESIGN FREQUENCY, VOLUME, AND RELEASE RATES

Above-ground detention ponds must store excess runoff from the developed condition and release it at the historic (pre-developed) rates to the public stormwater system or an existing drainageway for the 5 year and 100-year, 24-hour storm events. Inflow and outflow hydrographs must be generated to estimate the pre-developed and developed runoff volumes and rates.

4.5.2.2 CONFIGURATION REQUIREMENTS

The following design requirements for above-ground detention ponds must be incorporated into the pond design:

- The maximum capacity is 10 acre-feet
- The maximum water depth is five (5) feet
- The top of any cut slope and the toe of any fill slope shall be 3 horizontal feet or greater from the property boundary
- The length to width ratio shall be 2:1 or greater
- A minimum of one (1) foot of freeboard shall be provided
- Side slopes shall be 4H:1V or flatter
- Inlet and outlet shall be arranged at opposite ends of the pond
- The base shall have a minimum slope of 0.5% from the inlet to the outlet
- A schematic design standard for an extended detention basin meeting the above configuration requirements is provided in Standard Drawing 4-10.
- Retaining walls are not allowed to exceed three (3) feet inside or outside of the pond.
- If groundwater is encountered or expected to be within three (3) feet of the bottom of the stormwater pond, then the stormwater pond shall be designed as a wet bottom pond.
- Outlets shall be design in accordance with Section 4.5.7 Outlet Structures

4.5.3 PARKING LOT DETENTION PONDS

Only detention ponds are allowed in a private parking lot. Parking lot retention ponds are not allowed.

4.5.3.1 DESIGN FREQUENCY, VOLUME, AND RELEASE RATES

Parking lot detention ponds must store excess runoff from the developed condition and release it at the historic (pre-developed) condition rates to the public stormwater system or an existing drainageway for both the 5 year, 24-hour storm event and 100-year, 24-hour storm event.

Parking lot detention ponds may not be used to store either the water quality or the 5-year storm event volume. Inflow and outflow hydrographs must be generated to estimate the pre-developed and developed runoff volumes and rates.

4.5.3.2 CONFIGURATION REQUIREMENTS

In addition to the configuration requirements under Section 4.5.2 Above-Ground Detention Ponds, the following shall apply to parking lot detention ponds:

- Parking lot detention may not exceed 12 inches in depth
- Parking lot detention ponds must be located in the outer portion of the parking lot, a minimum of 40 feet from the building
- Parking lot detention ponds shall not inundate handicap parking spaces

4.5.4 UNDERGROUND DETENTION STORAGE

Only private underground detention storage is allowed. Underground retention storage is not allowed. Prior to discharge to underground detention storage, stormwater must pass through an above-ground water quality treatment pond. The requirements under Section 4.4 CONVEYANCE DESIGN for storm sewers and manholes shall apply to underground detention ponds.

4.5.4.1 DESIGN FREQUENCY, VOLUME, AND RELEASE RATES

The same requirements as in Section 4.5.2 Above-Ground Detention Ponds apply.

4.5.4.2 CONFIGURATION REQUIREMENTS

Sites smaller than one acre must drain to a single underground detention storage facility unless there is a physical impracticability as determined by City Engineering. Sites larger than one (1) acre must drain to a maximum of one (1) pond per acre such that any pond has a minimum tributary area of one (1) acre unless there is a physical impracticability as determined by the City Engineer.

- Underground detention ponds must be located under a parking lot or landscaped area
- The minimum width and height of any underground detention vault shall be 36 inches
- Multiple underground chambers must be connected by a head pipe at the upstream end and a tail pipe at the downstream end. The head and tail pipes must be of similar size as the chambers
- Inlet pipes must be connected to the head pipe
- Only one outlet is allowed which must be connected to the tail pipe
- Access manholes, meeting the requirements under Section 4.4.3 Manholes, are required at the inlet pipe(s), outlet pipe and at 400 foot spacing along each chamber

- Underground detention ponds are not allowed where groundwater is present within five (5) feet of the base of the pond

4.5.5 RETENTION PONDS

Design Frequency, Volume, and Release Rates:

Retention ponds shall be designed to capture the 100-year, 24-hour storm event and infiltrate that volume within 72 hours after the start of rainfall. Inflow outflow hydrographs may be used for retention pond sizing or the Simplified Volume Method outlined below may be used. Infiltration rates shall be based on soil classification or percolation testing as described in Section 4.5.6 Water Quality Treatment Ponds.

Simplified Volume Method

The minimum pond volume shall be the runoff volume less the infiltration volume. The runoff and infiltration volumes must be calculated as indicated below:

$$RV = \frac{C \times P_{100yr,24hr} \times A}{12}$$

Where:

RV =	Runoff Volume (cubic feet)
C =	Composite runoff coefficient
$P_{100yr, 24hr}$ =	100-year, 24-hour precipitation Depth (inches)
A =	Area (square feet)

$$IV = \frac{I \times T \times (A_b + 0.5A_s)}{12}$$

Where:

IV =	Infiltration Volume (cubic feet)
I =	Infiltration rate (inches/hour)
T =	24 (hours)
A_b =	Area of pond base (square feet)
A_s =	Area of pond side slope (square feet)

4.5.5.1 CONFIGURATION REQUIREMENTS

- Include a pretreatment forebay or other pretreatment facility immediately upgradient of the retention pond to preserve infiltration performance and prevent sediment build-up in the main cell of the pond.
- The maximum capacity is 10 acre-feet
- The maximum water depth is five (5) feet
- The top of any cut slope and the toe of any fill slope shall be 10 feet or greater from the property boundary

- The length to width ratio shall be 2:1 or greater
- A minimum of one (1) foot of freeboard shall be provided
- Side slopes shall be 4H:1V or flatter
- Retaining walls are not allowed to exceed three (3) feet inside or outside of the pond.

If groundwater is encountered or expected to be within three (3) feet of the bottom of the stormwater pond, then the stormwater pond shall be designed as a Wet Bottom Pond.

4.5.6 WATER QUALITY TREATMENT PONDS

All site development or redevelopment with an impervious area of greater than 5,000 square feet must be routed to an on-site or regional off-site water quality treatment pond. Water quality ponds for development and redevelopment greater than one (1) acre must be designed in accordance with Infiltration Basins in the Montana Post-Construction Stormwater BMP Design Guidance Manual.

Low Impact Development (LID) techniques may be used in lieu of water quality treatment. LID design guidance is available using the Montana Post-Construction Stormwater BMP Design Guidance Manual (MTDEQ, 2017) or the Urban Storm Drainage Criteria Manual (UDFCD, 2010). LID techniques shall be designed in coordination with the City Engineering.

All motorized (recreational, small engine, passenger, truck and construction) vehicle and equipment fueling stations, and service/repair facilities shall route all parking lot stormwater to an appropriately sized oil/sand and water separator or separate water quality treatment pond.

All dumpster areas shall drain to a separate and adjacent Water Quality Treatment Pond.

4.5.6.1 DESIGN FREQUENCY, VOLUME, AND RELEASE RATES

Water Quality Treatment Ponds shall be designed to capture and infiltrate, evaporate, and/or evapotranspirate runoff volume from 0.5 inches of precipitation from a 24-hour storm over the tributary area. This volume is referred to as the Runoff Reduction Volume (RRV).

- The RRV shall be calculated as shown in the Montana Post-Construction Stormwater BMP Design Guidance Manual. An additional 10% must be included with the RRV for sediment storage. Imperviousness of roofs, pavement and concrete shall be 100%.
- The RRV shall be in addition to the capture volume for detention ponds. No additional volume is required for retention ponds.
- Water quality treatment ponds shall be designed to infiltrate the RRV in less than 48 hours.
- If infiltration within 48 hours is not possible based on geotechnical percolation tests, then the RRV may be released over 48 hours. The maximum tributary area to the water quality treatment pond is 300 acres or when a base flow exceeds 50% of the release rate.

4.5.6.2 CONFIGURATION REQUIREMENTS

- The minimum RRV shall be 250 cubic feet.
- The surface area of the RRV shall encompass no more than half of the area of the base of the stormwater pond.

- The invert of all outlets shall be located above the water surface elevation associated with the RRV.
- The maximum water depth shall be three (3) feet for development or redevelopment projects less than 1 acre.
- Side slopes shall be 2H:1V to 4H:1V.

4.5.6.3 INFILTRATION RATES

Infiltration rates for sizing water quality treatment and retention ponds shall be based on the percolation rate, determined either from the percolation test or the USDA soil texture as required below.

Soil types shall be determined based on grain size distribution by sieve analysis (ASTM D6913) and hydrometer analysis (ASTM D422) for major subdivisions, commercial sites and sites serving more than one (1) acre of imperviousness.

Percolation rates shall be determined by ASTM D 3385 for major subdivisions, commercial sites and sites serving more than one acre of imperviousness. The percolation rate and soil type shall be measured and obtained at a depth equal to the proposed bottom grade of the facility. The location of the soil sample and percolation test shall be shown on a map.

The maximum percolation rates for soil types shall be:

Table 4-9. Maximum Percolation Rates for Soil Types

Soil Texture Class (U.S.D.A.)	Infiltration Rates (Inches per Hour)
Coarse sands, cobbles	20.0
Medium sand	8.0
Fine sand, loamy sand	2.4
Sandy loam	1.0
Loam	0.5

The actual or maximum percolation rates, whichever is less, shall be reduced by one-half for use as the infiltration rate to determine the drain-down time of the RRV. This reduction is to account for sedimentation and silting in of the natural soil profile and subsequent reduced infiltration rate over time.

4.5.7 OUTLET STRUCTURES

Outlet structures shall be designed in accordance with Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volume 3, Chapter 4: Treatment BMPs, Treatment Fact Sheet T-12 Outlet Structures. A simplified outlet structure meeting these standards is provided in Standard Drawings 4-11 and 4-12.

4.5.8 EMERGENCY SPILLWAY

All stormwater ponds must have an emergency spillway with a capacity equal to peak flow from the 100-year, 24-hour storm event for a fully developed condition. The emergency spillway must have non-erosive velocities or include erosion protection. No structures or surface features (e.g. fences, barriers, landscaping) that would divert the overflow are allowed within the flow path of runoff discharged from the emergency spillway flow path.

4.5.9 MAINTENANCE ACCESS AND RESTRICTIONS

A vehicle access shall be provided from a parking lot or road to the base of all stormwater ponds with a minimum width of 12 feet, a maximum slope of 15% and must be surfaced with six (6) inches of road base course.

When safety is a concern or where otherwise required, a gate, removable bollards, and fencing must be included to restrict access to the pond.

4.5.10 EMBANKMENTS

All embankments greater than three (3) feet in height or impounding more than one (1) acre-foot of water shall be compacted to ASTM D1557, have minimum crest width of eight (8) feet, and shall have a permeability of less that 1x10-5 cm/sec.

The maximum embankment height is six (6) feet. The embankment height is measured from the downslope toe to the crest of the embankment.

Anti-seep collars shall be installed on all conveyance pipes within the embankment.

4.5.11 VEGETATION AND LANDSCAPING

All stormwater ponds, except parking lot and under-ground ponds, and channels shall be covered with six (6)-inches of topsoil and be vegetated with seed mixes for native areas in Open Space Areas as shown below or sod if the area is irrigated. Wetland areas must be seeded with a wetland seed mix approved by the City of Helena Open Lands Manager.

Native Areas in City of Open Space shall be seeded with the following seed mixes:

Table 4-10. Native Area Seeding Mixes by Site Characteristics

Droughty Site (south aspects)		Moderately cool sites (north aspects)	
Common Name	**Pounds per Acre**	**Common Name**	**Pounds per Acre**
Slender wheatgrass	4	Slender wheatgrass	4
Mountain Brome	4	Canby bluegrass	2
Idaho Fescue	3	Bluebunch wheatgrass	4
Bluebunch wheatgrass	4	Blue wildrye	4
Prairie Junegrass	2	Mountain Brome	4
		Richardson’s needlegrass	3

All slopes steeper than 5% and longer than 50 feet, or steeper 10% and longer than 20 feet shall be covered with a biodegradable erosion control mat.

All other slopes shall be covered with straw mulch with a tackifier or crimped. Straw mulch shall be placed to a uniform depth of one (1) inch and crimped by impressing into the soil 1-½ inches at eight (8) inches on-center.

4.6 DRAINAGE EASEMENTS AND TRACTS

In general, easements are required for channels, storm sewers, and stormwater ponds and any conveyance which routes runoff from adjacent properties. Structures unrelated to the stormwater drainage system are not allowed in drainage easements or tracts. No landscaping, fences or other surface features which may impede, divert or otherwise alter the flow of runoff or obstruct maintenance are allowed in drainage easements or tracts.

- Storm drainage easements to the City must be provided for all components of public and private storm drainage systems on private land from the right-of-way, to and including, stormwater runoff control and water quality treatment.
- Storm drainage easements shall allow the City the right to enter private land for the purposes of inspection, operation, and maintenance of public storm drainage systems and when private property owner(s) fail to adequately maintain their private storm drainage system.
- Structures unrelated to the stormwater drainage system are not allowed in storm drainage easements.
- No landscaping, fences or other surface features which may impede, divert, or otherwise alter the flow of runoff, or obstruct maintenance are allowed in storm drainage easements.
- All costs associated with restoration of landscaping, fences or other surface features for operation and maintenance of private storm drainage systems shall be the property owners.
- If a property owner has recorded agreement with the City defining maintenance responsibilities of a private storm drainage system, the City shall operate and maintain the private storm drainage system in accordance with the agreement.
- Storm drainage easements for access shall be a minimum of 15 feet wide, unobstructed and have a maximum slope of 15%.
- Storm drainage easements shall be shown on the Drainage Plan, Preliminary and Final Plats, or shall be dedicated and recorded prior to final approval of any project.

The drainage easement requirements for various types of storm infrastructure are summarized for convenience in Table 4-11, but the specific requirements detailed in Sections 4.6.1, 4.6.2, and 4.6.3 shall govern.

Table 4-11. Drainage Easement Extent Requirements

Storm Infrastructure	Easement Extent Requirements
Storm sewers and culverts less than 36 inches wide (in diameter or span)	20 feet wide
Storm sewers and culverts greater than or equal to 36 inches in diameter or span	20 feet wide plus the width of the storm sewer
Stormwater ponds	Must contain the plan view extents of the design storage volume plus freeboard, embankments, spillway, and maintenance access.
Open Channels	15 feet wide or equal to the width of the 100-year water surface elevation plus freeboard, whichever is greater.
Manholes, Catch Basins, and Inlets	Shall be sized to match largest easement width of the storm sewer main to which they connect.

4.6.1 STORM SEWERS AND CULVERTS

Minimum easement width for storm sewers up to 36 inches wide is 20 feet. Minimum easement width for storm sewer 36 inches wide or greater shall be the width of the storm sewer plus 20 feet.

Storm sewers shall be located in the center third of the easement. No trees shall be planted in a storm sewer easement, unless the trees are part of LID techniques used in the project and the rooting characteristics of the trees is compatible with the desired storm sewer design life.

4.6.2 STORMWATER PONDS

Private stormwater ponds and outlet works are required by these criteria for proper functioning of the overall public drainage system, and therefore are required to be placed within drainage easements or tracts.

Drainage tracts are required for any stormwater pond which serves more than one parcel and must abut City right-of-way or provide an access easement from City right-of-way.

Easements or tracts for stormwater ponds shall be as required to contain the design volume, freeboard, embankments, spillway and maintenance access.

4.6.3 OPEN CHANNELS AND NATURAL WATERWAYS

Easements for open channels and natural waterways shall be a minimum of 15 feet wide or equal to the width of the 100-year water surface elevation plus freeboard, whichever is greater.

Maintenance access to the open-channel or natural waterway easement shall be provided at a minimum every 500 feet.

4.7 CONSTRUCTION EROSION AND SEDIMENT CONTROL

4.7.1 GENERAL CONSTRUCTION SITE REQUIREMENTS

Any construction project which disturbs the earth and exposes soil shall implement and maintain effective soil erosion and control measures, also referred to as Construction Best Management Practices (BMPs), which will protect surface water quality and not discharge soil or other pollutants from the project site.

No construction project shall discharge any pollutant off site.

Stormwater runoff from undisturbed tributary areas shall be routed around the areas of disturbance or accounted for in the sizing of erosion and sediment control measures.

Any construction project which pours concrete shall use an excavated concrete washout area or water-tight basin of sufficient size to contain all excess concrete and wash water.

4.7.2 EROSION AND SEDIMENT CONTROL PLAN SHEET(S)

A separate Erosion and Sediment Control Plan sheet(s) is required for all commercial projects and for any residential project with a site disturbance greater than one (1) acre. The minimum requirements for the Erosion and Sediment Control Plan sheet(s) are included in Appendix B.

The Sediment and Erosion Control Plan must reference and include construction details of Best Management Practices as presented in the Stormwater Management during Construction Field Guide for Best Management Practices published by the Montana Department of Environmental Quality.

4.7.3 SWPPP REVIEW AND APPROVAL

Whenever site disturbance exceeds one (1) acre, coverage under the Montana Department of Environmental Quality, General Permit for Stormwater Discharges Associated with Construction Activity is required. Coverage under this permit requires preparation submittal of a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) submitted to Montana Department of Environmental Quality prior to ground disturbance.

Infrastructure and Building Plans and Design Documentation (including the Drainage Report and Plan discussed in these standards) shall be submitted to the City of Helena Engineering and Building Divisions for review and approval. When the City determines that the design documentation and plans meet City standards, the City will issue written approval of the project design.

Prior to beginning earth disturbing activities, the property owner, or the property owner's construction agent must submit copies of the following documents:

- Stormwater Pollution Prevention Plan

- Notice of Intent
- Montana Department of Environmental Quality confirmation of SWPPP and NOI submission

A Building Permit will not be issued until the City of Helena has received, reviewed, and approved the SWPPP, NOI, and DEQ confirmation of submission.

Final stabilization, and release under the Montana Department of Environmental Quality, General Permit for Stormwater Discharges Associated with Construction Activity, shall only occur when soil-disturbing activities at a site have been completed and a vegetative cover has been established with a density of at least 70% of the pre-disturbance levels, or equivalent permanent physical erosion reduction methods have been employed.

4.8 REFERENCES

1. Chow, Ven Te, Open Channel Hydraulics, 1959.
2. Federal Highway Administration, Hydraulic Design of Energy Dissipators for Culverts and Channels, Hydraulic Engineering Circular No. 14, July 2006.
3. Federal Highway Administration, Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5, April 2012.
4. Federal Highway Administration, Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, August 2013.
5. Montana Department of Environmental Quality, Montana Post-Construction Stormwater BMP Design Guidance Manual, September 2017.
6. Montana Department of Environmental Quality, Stormwater Management During Construction Field Guide For Best Management Practices, April 2014.
7. Montana Department of Transportation, Hydraulics Manual, December 2023.
8. United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Engineering Handbook, Part 630: Hydrology, September 1997.
9. Natural Resources Conservation Service (United States Department of Agriculture), Urban Hydrology for Small Watersheds, Technical Release 55, June 1986.
10. Urban Drainage and Flood Control District (UDFCD), Urban Storm Drainage Criteria Manual, Volumes 1 to 3, November 2010.

PART 5 - TRANSPORTATION STANDARDS

PART 5 TRANSPORTATION STANDARDS

5.1 OVERVIEW

5.1.1 PURPOSE

It is the purpose of this section to establish minimum standards for public transportation facilities for vehicles, public transit, pedestrians, and bicycles, hereafter constructed or improved as a condition of City approval of a development, or a transportation project constructed by the City of Helena. These standards are intended to promote the implementation of Helena's Growth Policy, ADA Transition Plan and to minimize total costs over the life of the transportation system.

Implementing these standards requires balancing of several policy concerns, including but not limited to:

- Providing a safe and efficient multi-modal transportation system.
- Implementing the complete streets policy.
- Discouraging excessive speed; and
- Requiring no more right-of-way than necessary

5.1.2 DEFINITIONS

Words and phrases in these standards have the same general meaning as those contained in the City Code, and the MPWSS. If terms are conflicting or unclear, the City Engineer will clarify the meaning and intent. These standards may be modified for exceptional cases if approved by the City Engineer, or if the City Commission authorizes a variance.

Block: A usually rectangular space or area of land in the city that is enclosed, surrounded or bounded by streets.

Curb Extension: Also called bulb-outs, extend the sidewalk into the parking lane or shoulder to narrow the crossing distance and provide additional pedestrian visibility at key locations; they can be used at corners and at mid-block locations (with approval).

Development: Construction, renovation, or installation of a building or structure, a change in use of a building or structure, or a change in the use of land when the construction, installation or other action creates additional demand for public facilities.

Effective Corner Radius: The radius available for the design vehicle to make the vehicle turn, accounting for the presence of parking, bike lanes, medians, or other features.

Multi-modal Transportation Network: All facilities, vehicles, and devices designed to facilitate the mobility of people.

Street: Any roadway, within dedicated public rights-of-way., open to the use of the public for vehicular and/or pedestrian travel.

Streets that provide legal and physical access to lots pursuant to Helena City Code must be dedicated to the City and must be of the width for the designated classification for that zone and traffic impact and meet all aspects of these engineering standards.

Streets that do not provide access to the external boundaries of a lot or parcel and only provide internal access for purposes of accessing building and structures within the lot or parcel are "private streets" and must meet the width requirements of these standards. Such private streets are not open to the public and the maintenance is the responsibility of the property owner.

5.1.3 FUNCTIONAL CLASSIFICATIONS – PURPOSE

The purpose of a functional classification system for city roads is to define varying levels and types of transportation infrastructure and to provide for the safe and efficient movement of people and goods, while at the same time preserving residential areas and maintaining the economic vitality of commercial and industrial areas. Due to the different characteristics regarding land use, network density, and travel patterns, the system classifies transportation facilities as either urban or rural roads. Within urban roads, they are further divided into arterials, collectors, or local roads. Existing and proposed functional classifications are as delineated in the most recent update of the Greater Helena Area Long Range Transportation Plan (LRTP).

5.1.4 FUNCTIONAL CLASSIFICATIONS URBAN ROADS

Urban roads are classified as outlined below:

Principal Arterial: The principal arterial, interstate and non-interstate highway, is a basic element of the City's Road system. All other functional classifications supplement the principal arterial network. Access to a principal arterial is ideally limited to intersections with other principal arterials or to the interstate system. Direct access is minimal and controlled. The main characteristics of principal arterials are they provide high mobility, serve the major centers of activity, carry the highest traffic volumes, and the longest trip distances within an urbanized area. This classification of road carries a high proportion of the total traffic within an urban area. The principal arterial's intended function is to provide for the expedient movement of traffic. Posted speed limits on major arterials generally range from 25 mph to 70 mph and these typically carry greater than 15,000 vehicles per day.

Minor Arterial: The minor arterial interconnects with and augments the principal arterial system. It also provides access to lower classifications of roads on the system and may allow traffic to directly access destinations. They provide for movement within sub-areas of the city, whose boundaries are largely defined by the principal arterial road system. They serve through traffic, while at the same time providing direct access for commercial, industrial, office and multi-family development but, generally, not for single-family residential properties. (Minor Arterials in urban areas provide service to all remaining major traffic generators not served by a Principal Arterial, and they provide adequate area-wide circulation.)

The purpose of minor arterials is to increase traffic mobility by connecting to the principal arterial system and providing access to adjacent land uses. Posted speed limits on minor arterials generally range from 25 mph to 55 mph and they typically carry between 5,000 and 15,000 vehicles per day.

Major Collector: The major collector provides for land access and traffic circulation within and between residential neighborhoods, and commercial and industrial areas. It provides for the equal priority of the movement of traffic, coupled with access to residential, business, and industrial areas. A collector roadway may at times traverse residential neighborhoods. Posted speed limits

on collectors typically range from 25 mph to 45 mph and these typically carry between 3,500 and 5,000 vehicles per day.

Minor Collector: The minor collector provides for land access and traffic circulation within and between residential neighborhoods, and commercial/industrial areas. Future growth of the City outside the subdivision will have limited use of the roadway. It provides for the equal priority of the movement of traffic, coupled with access to residential, business, and industrial areas. Posted speed limits on collectors generally range from 25 mph to 35 mph and these typically carry between 2,500 and 3,500 vehicles per day.

Local Office/Commercial Street: Local Office/Commercial Streets will apply to developments ranging from very pedestrian-oriented retail locations (similar to Main Streets) to business parks. Land uses along Local Office/Commercial Streets include office, commercial, and/or mixed-use developments, which may be either pedestrian- or auto-oriented. Although land uses on these streets may be pedestrian-oriented, auto-oriented, or somewhere in-between, the general intent is that these local streets (and the uses along them) will accommodate travel by a variety of modes. Continuous sidewalks are required along all of these streets. Other treatments include trees, street furniture in pedestrian activity areas, and appropriately scaled signage. Cyclists are expected to operate in mixed traffic, since the traffic volumes and speeds are low. Posted speed limits on Local Office/Commercial Streets generally posted at 25 mph and are designed for 1,500 to 2,500 vehicles per day.

Local Residential: Local roads comprise all facilities not included in the higher systems. Their primary purpose is to permit direct access to abutting lands and to connect to higher classifications. Usually through-traffic movements are intentionally discouraged. Cyclists are expected to operate in mixed traffic, since the traffic volumes and speeds are low. Posted speed limits on local roads are posted at 25 mph and typically carry less than 1,500 vehicles per day.

5.2 TRANSPORTATION DESIGN STANDARDS

It shall be the policy of the City of Helena to review and approve all projects for access management and control measures during the review phase of a project. The City reserves the right to mandate or limit certain access control feature implementation should it be in the best interest of the traveling public or the City's concerns. All streets and publicly dedicated rights of way must comply with these Engineering Standards.

5.2.1 ROADWAY DESIGN & TECHNICAL CRITERIA

This section sets forth the minimum design and technical criteria to be used in the preparation of all roadway plans. All roadway plans should be designed in conformance with these City of Helena Engineering and Design Standards, MPWSS, the Public Right-Of-Way Accessibility Guidelines (PROWAG), and applicable City of Helena ordinances and policies.

5.2.2 SIDEWALKS/CURB AND GUTTERS

Roadway typical sections shall be as shown on the exhibits in Appendix C of this document. Deviations from these typical sections shall be made on a case-by-case basis only after thorough review by the City Engineer, the Transportation Systems Department and may require City Commission approval.

All sidewalks, sidewalk crossings, pedestrian ramps or other pedestrian facilities in the right-of-way shall be constructed in accordance with the current edition of Public Rights-of-Way

Accessibility Guidelines (PROWAG). Sidewalk and ramp cross slopes and ramps shall be a maximum slope of 2.1%. Ramp running slope shall be a minimum of 3% and a maximum of 8.3%.

Concrete sidewalks or an asphalt multi-use path shall be constructed on both sides of all roadways with a boulevard between the sidewalk and curb unless otherwise approved by action of the City Manager. Sidewalks shall be six-inches (6") thick across driveways and four-inches (4") thick elsewhere with a minimum eight inches (8”) or six inches (6”) crushed aggregate base course, respectively.

All sidewalks shall be a minimum width of five feet (5’). All multi-use paths shall be a minimum of ten feet (10') wide.

Integral curb and gutter shall be used on all roadways with a maximum cross-slope of 5% from the lip of the gutter to the flow line of the gutter. For hot plant mix pavements, the pavement must be installed no more than 1/8" above the gutter lip preferrable flush with the lip. Roll or drop curbs, when approved shall be installed with the initial curb and gutter construction.

Pedestrian curb ramps shall be installed at all intersections with all new construction and with the reconstruction of sidewalks.

All pedestrian curb ramps shall be ADA/PROWAG compliant, including cast-iron detectable warning surfaces as approved by the Transportation Systems Department.

Non traversable concrete surfaces shall be stamped with Random Stone pattern.

Guardrail may be required in certain situations adjacent to sidewalk. Guardrail shall be designed and constructed in accordance with the current American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide standards or as directed by the Transportation Systems Department and City Engineer.

Barricades: Wherever sidewalks terminate due to project phasing, subdivision boundaries, etc., barricades are required in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and City standards.

5.2.3 BICYCLE FACILITIES AND MULTI-USE PATHS

The arrangement, type, and location of all bicycle facilities, and multi-use paths, trails, and routes shall conform to the most recent update of the LRTP. All new construction shall conform to the standards for bicycle facilities detailed herein and the AASHTO Guide for the Development of Bicycle Facilities. All new construction of pedestrian facilities shall conform to the AASHTO Guide for Planning, Design, and Operation of Pedestrian Facilities and all applicable ADA and PROWAG guidance or other City policies.

Bike lanes are required upon reconstruction on all collector or higher classified street, as identified in the LRTP or other commission approved non-motorized plan. All other bike lanes identified in the LRTP will be implemented as funding and infrastructure allow or as demand is observed. For minor collector or lesser classified street, bike lanes will be discouraged unless identified by the LRTP.

On-Street Bike Lanes (Without On-Street Parking): Bicycle lanes on streets without on-street parking shall be at least 5' wide, exclusive of the gutter pan. On existing streets where on-street bike lanes are being added and available right-of-way or improvement space is restricted, the width of the bicycle lane may be reduced to at least 5' wide, inclusive of the gutter pan.

On-Street Bike Lanes (With On-Street Parking): Bicycle lanes on new and existing streets shall be at least 5' wide, exclusive of the parking lane.

Multi-Use Paths or Trails: Multi-use paths or trails shall be at least 10' wide with an inside edge radius of at least 15'. The minimum asphalt pavement thickness shall be 3" with a minimum of 6" of high quality untreated aggregate base. Intersections with typical sidewalks or roadways shall have the appropriate signing and sight distance per MUTCD and PROWAG guidance.

5.2.4 DRIVEWAY STANDARDS – CURB CUT REQUIREMENTS

Driveways along public and private roadways shall comply with the existing driveway and curb cut requirements as set forth under Helena City Code. Sidewalks shall be a minimum of 6 inches thick through residential driveway approaches serving 25 parking spaces or less or a minimum of 8 inches thick through commercial/industrial driveway approaches or residential approaches serving more than 25 parking spaces. These increased thicknesses shall be carried through ramp flares when sidewalk is curbside.

Any curb cut that is proposed within the Functional Area of an Intersection as defined in AASHTO Geometric Design of Highways and Streets ("Green Book"), must be reviewed and may be denied by the Transportation Systems Department if deemed hazardous or providing unsafe traffic movements.

The development of frontage roads or shared accesses serving new developments shall be used along collectors and arterials rather than the use of individual driveways or approaches.

For new multi-dwelling, commercial, and industrial driveways, when two or more approaches serve a given property frontage, the total approach width shall not exceed 30% of the frontage. Approaches exceeding 30% of the frontage shall require approval of the Transportation Systems Department.

Alterations to existing curb cuts shall be submitted for permit and approval to the Transportation Systems Department.

Separate permits may be required from the Montana Department of Transportation (MDT) for approaches onto and work occurring within MDT jurisdictional right-of-way.

5.2.5 HORIZONTAL ALIGNMENT

Turning Radius: All roadways shall intersect at right angles as nearly as possible, with no roadways intersecting at an angle less than 75°.

Turning Movements: All roadways shall be designed to accommodate the largest emergency response vehicle without encroaching onto oncoming traffic. The effective corner radius shall be 28' or larger.

Curb Return Radius: Minimum curb returns shall be as shown in Table 5-1 for typical street sections that include a parking lane. A larger radius may be required with the approval of atypical street sections by the Transportation Systems Department.

Table 5-1. Curb Return Radius at Intersections*

Street Classification	Local (ft)	Collector (ft)	Minor Arterial (ft)	Principal Arterial (ft)
Local	15	20	28	28
Collector	20	25	28	28
Minor Arterial	28	28	**	**
Major Arterial	28	28	**	**

*** Measured from top back of curb**

**** Per AASHTO standards**

Design Speed: Design speed shall be as shown in Table 5-2. The design speed is typically higher than or equal to the posted speed limit. The design speed determines various geometric design features of roadways. In an urban area with a gridded transportation system the design speed is not a major factor, because of the closely spaced intersections and mainly determines sight distance and turning radii.

Horizontal Curves: The minimum centerline radius for horizontal curves shall be as shown in Table 5-2. Deviations from the requirements in Table 5-2 may be considered on a case-by-case basis for local streets only.

Intersections: Avoid short gaps between opposing "T" intersections. Two streets meeting a third street from opposite sides shall meet at the same point, or their centerlines shall be off-set a minimum of 150'. Intersection of different roadway classifications will require additional off-set distance to prevent left-turn conflict at peak hour traffic volumes per the City's discretion.

Superelevation: Superelevation may be required for arterial roadways and selected collector roadways. Horizontal curve radius and superelevation shall be in accordance with the recommendations of AASHTO. Superelevation shall not be used on local roadways.

Spiral Curves: Spiral curves shall not be used on roadways within the City of Helena (State Highways excluded).

Railroad Crossing: All railroad crossings on streets shall be concrete for the full width of the roadway or Railroad requirements.

Barricades: Wherever roadways terminate due to project phasing, subdivision boundaries, etc., barricades are required in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and City standards.

Table 5-2. Alignment Controls

Street Type	Arterial		Collector	Local	Alley/Emergency Access Road
Terrain*	Principal	Minor	Ordinary	Ordinary	Ordinary
Horizontal centerline radius on curves (Min.)	**	**	300'	150'	150’
Tangent length between reverse curves	**	**	100'	50'	50'
Stopping sight distance	**	**	360'	155'	80’
Angle at intersection centerline	**	**	>75°	>75°	>75°
Length of tangent at intersection	**	**	150'	100'	80’
Max. cul-de-sac length	N/A	N/A	N/A	600'	***
Cul-de-sac right-of-way radius	N/A	N/A	N/A	56'	***
Max. vertical alignment grade	10%	10%	10%	10%	10%
Min. vertical alignment grade	**	**	0.5%	0.5%	0.5%
Max. vertical alignment grade within 75’ of intersection centerline	**	**	4%	4%	4%
Design speed (mph)	50	45	35	25	15
Min. Vertical Curve K Factor Crest Sag	 ** **	 ** **	 ** **	 ** **	 ** **
Min. Vertical Curve Length Crest Sag	 ** **	 ** **	 90' 70'	 50' 50'	 50' 50'

*** Mountainous terrain is defined as terrain which has a cross slope exceeding 15%.**

**** All design criteria shall be to AASHTO standards.**

***** Must meet turnaround requirements or exits onto public right-of-way per most current International Fire Code.**

5.2.6 VERTICAL ALIGNMENT

Permissible Roadway Grades: The minimum allowable vertical alignment grade for any roadway (or alley) is 0.5%. The maximum allowable grade for any roadway and alley is 10% per Helena City code 12-4-3 and the IFC.

Changing Grades: Continuous grade changes, or "roller-coastering," is not desirable, but may be considered in areas with flat topography in order to improve the drainage performance of a street. Any exception to this requirement will require written approval of the Transportation Systems Department. The use of grade breaks in lieu of vertical curves is not desirable, especially at higher design speeds. The table below sets the allowable difference in grade (A) for a given design speed, above which a vertical curve is required.

Table 5-3. Allowable Grade Differential

Design Speed (mph)	Maximum grade change, % (A)
25	1.85
30	1.30
35	0.95
40	0.75
45	0.55
50	0.45
55	0.40

Vertical Curves: All vertical curves shall be symmetrical. Design criteria for vertical curves are found in Table 5-2. The minimum desirable grade within a sag (sump) vertical curve is 0.5%. However, in areas with flat topography, this may be difficult to achieve, and in that scenario the length of the flattest portion of the vertical curve should be minimized to prevent ponding of surface water runoff. Any exception to this requirement will require written approval of the Transportation Systems Department. All vertical curves shall be labeled, in the profile, with length of curve

(L) and K (=L/A).

Intersections: The following additional criteria shall apply at intersections.

The grade of the "through" street shall take precedence at intersections. At intersections of roadways with the same classifications, the more important roadway, as determined by the Transportation Systems Department, shall have this precedence. Side streets shall be warped to match through streets. Carrying the crown of the side street into the intersecting through street is not permitted.

The elevation at the point of tangency (PT) of the curb return on the through street is always set by the grade of the through street in conjunction with normal pavement cross slope.

At an arterial-arterial intersection, a more detailed review on the entire intersection's drivability shall be performed by the designer and submitted for review and approval.

Curb Returns: All curb returns shall be filleted using 6" thick concrete. The minimum fall around curb returns, when turning water, shall be 1.5%. The maximum flowline slope around a curb return is 4%, subject to meeting ADA and PROWAG requirements at curb ramps. Show and label high point location, elevation, and intersection of flowline in plan view.

Connection with Existing Roadways: Connections with existing roadways shall be smooth transitions conforming to normal vertical curve criteria if the algebraic difference in grade (A) between the existing and proposed grade exceeds 1%. When a vertical curve is used to make this transition, it shall be fully accomplished prior to the connection with the existing improvement. Field-verified slope and elevation of existing roadways shall be shown on the plans.

Offsite Design and Construction: The design grade, and existing ground at that design grade, of all roadways that dead end due to project phasing, subdivision boundaries, etc., shall be continued in the same plan and profile as the proposed design for at least 500' or to its intersection with an arterial roadway. This limit shall be extended to 1000' when arterial roadways are being designed, or as necessary based on sound engineering judgment for the offsite terrain. If the offsite roadway adjacent to the proposed development is not fully improved, the developer is responsible for the design and construction of a transition with a 4' road base shoulder for the safe conveyance of traffic from the improved section to the existing roadway. The following formula shall be applied to the taper or lane change necessary for this transition:

Speed Limit

40 MPH or Less $L = WS^2 / 60$

45 MPH or Greater $L = W \times S$

where:

L = length of transition in feet

W = width of offset in feet

S = speed limit or 85^{th} percentile speed (whichever is greater)

The Transportation Systems Department should be consulted for any unusual transition conditions. Grade breaks greater than 1% are not allowed when matching existing dirt or gravel streets.

The cost of offsite pavement transitions shall be borne by the developer.

5.2.7 SIGHT DISTANCE

Roadways shall comply with the existing sight distance requirements as set forth under Helena City Code. The intent and purpose of this ordinance is to reduce potential traffic accidents by evaluating and maintaining adequate visibility at intersection corners. Sight obstructions at intersections are a major contributing factor to traffic accidents. Sight obstructions are defined as anything that obstructs a driver's clear zone of visibility (i.e., structures, bushes, shrubs, trees, fences, hedges, etc.).

5.2.8 MEDIAN/CURB EXTENSIONS TREATMENT

Median or curb extensions should be integral curb and gutter unless otherwise approved. Medians or curb extensions less than 8' wide should be capped with 4500 psi concrete a minimum of 4" thick. Wider medians should be topsoiled and seeded with an approved seed mix. The minimum median width is 4'. The minimum curb extension width is 6'. All medians, curb extensions or raised islands should be made clearly visible at night through the use of adequate reflectorization and/or overhead illumination. Flexible delineators shall be placed at the beginning and end of all medians or curb extensions, and at the point of any horizontal alignment change. All median curbs or curb extensions shall be painted yellow.

Adequate overhead illumination shall be provided for the nose of any median.

5.2.9 ROADWAY DRAINAGE

Drainage systems shall be designed in accordance with Section 4 of this document. Development plans for the drainage system, including a drainage report, are required for concurrent review with, and shall be considered a part of the roadway design.

Valley Gutter: Valley Gutters (crosspans) shall be constructed in accordance with Appendix B and MPWSS. The minimum width shall be six feet (6') and all crosspans shall include #4 rebar at 16” on center and dowled to adjacent concrete infrastructure. Crosspans are not allowed across collector or arterial roadways. Crosspans may be used parallel with collector or arterial roadways to convey storm runoff across residential roadways. Crosspans are required for storm water control at intersections where a storm water system is not accessible.

Inlets: Inlets shall be located to intercept the major curb flow at the point curb flow capacity is exceeded by the storm runoff. Inlets should be aligned with lot lines wherever possible.

Inlets shall also be installed to intercept cross-pavement flows at points of transition in superelevation (see Section 4.4.4). Due to the presence of pedestrian ramps, inlets are not allowed in the curb return, but will be located at the tangent points of the curb return or upstream of the pedestrian ramps.

Cross Slope: Except at intersections, or where superelevation is required, it is desirable for roadways to be level from top of curb to top of curb and have a 3% crown for all streets with a grade less than or equal to 6%. Any deviation to this requirement will require written approval of the Transportation Systems Department.

On streets where the grade exceeds 6%, a 2% crown will be allowed. The cross slope will be measured from centerline to lip of gutter, or lip of median gutter to lip of outside gutter on roadways with raised center islands. Parabolic or curved crowns are not allowed. Maximum pavement cross slope allowed is 5% at warped intersections, as measured above. In no case shall the pavement cross slope at warped intersections exceed the grade of the through street. When warping side streets at intersections, the crown transition should be completed within 75' horizontally for local streets, 100' horizontally for collector streets, and 150' horizontally for arterial streets.

Temporary Erosion Control: Temporary erosion control is required at the ends of all roadways that are not completed due to project phasing, subdivision boundaries, etc. Prevention of erosion at the roadway terminus shall be by methods approved by the City Engineer.

Sidewalk Chases: Storm water runoff from concentrated points of discharge shall not be allowed to flow over sidewalks but shall drain to the roadway by the use of chase sections. The use of sidewalk chases is discouraged, and their use is limited to situations where it is not possible to use standard storm inlets and piping. Where approved, sidewalk chase covers shall be solid cast iron or aluminum and bolted to the sidewalk to prevent creating a trip hazard.

Chase sections shall not be located within a curb cut of a driveway or pedestrian ramp. Chase sections shall be identified by station and elevation.

5.2.10 ROADWAY SPECIFICATIONS

Pavement Thickness: Pavement thickness design must be completed for all new or reconstructed roadways and shall be based on the current AASHTO Guide for Design of Pavement Structures, or the current Asphalt Institute Manual Series No. 1 (MS-1) for thickness design. The Pavement Design Report, based upon specific site soil data (Proctor & R-Value) and design year traffic loading conditions (ESALs and Traffic Index), shall be prepared by a professional engineer, or other qualified professional approved by the Transportation Systems Department, and submitted to the Transportation Engineer along with the plans and specifications for the project. The design shall be based on at least a 20-year performance period traffic volume; however, the minimum design lane 18,000-lb Equivalent Single Axle Load (ESAL) used in the pavement design shall not be less than 50,000-lb ESAL. The minimum asphalt pavement thickness for any new collector or arterial shall be four inches (4"), which shall be placed in two lifts. The minimum asphalt pavement thickness for any new local road shall be three inches (3"), which shall be placed in two lifts. A minimum of six inches (6") of high quality untreated aggregate base shall be provided for designs utilizing asphalt pavement over untreated aggregate base. Where full depth asphalt is designed, an adequate stabilizer lift shall be included, consistent with unpaved roadway design practices, to provide a suitable sub-base capable of withstanding the traffic required for the initial construction of the roadway. All newly laid asphalt within public right-of-way shall have a chip seal applied within 11 months of completion of the asphalt paving work.

Utility Trenches: Utility trenches cut through asphalt less than ten (10) years old, which may include but are not limited to water and sewer services, shall be saw cut the entire width of the street or closest lane line as approved by the Transportation Systems Department. Saw cutting asphalt older than ten (10) years shall be coordinated with the Transportation Systems Department. If overcut on a street is within twenty-four inches (24”) of the lip of curb, the entire remaining width to the gutter shall be removed and replaced. Consult with the City Streets Division for guidance. Proposed excavation limits must be approved by the Transportation Systems Department. All excavations within collector or arterial roadways shall be backfilled with flowable fill material, complying with the requirements of Flowable Fill containing one and one-half (1.5) sack cement per cubic yard, or other fill materials as approved in writing by the Transportation Systems Department. The intent is to protect the integrity of the roadway, riding surface and eliminate the potential for roadway failure due to settlement of trench backfill material. Documentation of flowable fill or density testing reports shall be required to verify proper placement of fill materials.

Utility trenches in existing collector or higher classified streets shall be backfilled with flowable fill and capped with hot-mix asphalt or temporary concrete slurry (1.5 Sack) on the same day as the completion of the street opening. Temporary concrete slurry caps shall be replaced with hot-mix asphalt as soon as possible.

When flowable fill is required but not available, coordinate with the Transportation Systems Department for proper backfill requirements

Seven days prior to any street opening, an application with a traffic and/or pedestrian control plan shall be submitted to the City Streets Division for review and approval. All street openings shall be for a maximum of 24 hours unless there is written approval from the Transportation Systems Department. On collector or higher classified streets traffic control exceeding one day shall have a traffic control maintainer on call at all times to restore any traffic control devices to the approved plan location as submitted to the Transportation Systems Department. Night work may be considered to facilitate the project or repair.

All asphalt patches, before final paving, shall be overcut by a minimum of twelve inches (12”). Sawcut lines are to be neat and squared off as a square or rectangle, no odd shapes without prior written approval. If the overcut sawcut lies within a striped lane or other longitudinal marking then pavement restoration shall extend to the pavement markings. The Transportation Systems Department can approve or deny a request for reducing pavement restoration dimensions.

All patches shall consist of a minimum of six inches (6") compacted crushed aggregate base (CAB) capped with a minimum of four inches (4”) compacted ¾" hot mix asphalt patch or the existing pavement structure depths whichever is greater.

For temporary patches, when hot mix asphalt is not available, place a minimum of six inches (6") of compacted road mix capped with a minimum of six inches (6") of 1.5 sack concrete slurry. Where flowable fill is used as trench backfill, it may be continued up to the surface level as a temporary patch. Cold mix asphalt may be used on a case-by-case basis as approved by the Transportation Systems Department. All temporary patches shall be maintained until replaced with hot mix asphalt, which shall be placed as soon as hot mix asphalt is available.

All excavated materials (i.e., concrete, asphalt, dirt, rock, etc.) must be removed from the job site by the date of expiration of the permit. In no case shall materials be placed to block access outside of signed closure or remain in the street or public right of way beyond the completion of the excavation work and removal of traffic control.

No tunneling is allowed under sidewalks, or curb and gutters. However, directional boring will be allowed upon approval of the Transportation Systems Department. If the excavation extends under the curb and gutter, and/or sidewalk, it shall be removed at the closest joint past the extent of the trench.

All utilities shall be warrantied by the person or contractor requesting the street opening for **two** (2) years after acceptance by the Transportation Systems Department of the completed restoration. This warranty includes all portions of the right of way disturbed by the opening, including the road surface, curb and gutter, and sidewalk, and boulevard.

5.2.11 MONUMENTATION

Monuments shall be provided in new or reconstructed streets at all section corners, quarter corners, and sixteenth corners.

5.2.12 COMPLETE STREETS

All newly and reconstructed roadways shall be designed to accommodate and coordinate all modes of transportation, both motorized and non-motorized, and people of all ages and abilities. Complete street features may include, but are not limited to, sidewalks, bicycle lanes, motor vehicle lanes, shared-use lanes and path, paved shoulders, street trees, landscaping, vegetative planting strips, curb and gutter, ADA curb ramps, crosswalks, refuge islands, pedestrian and traffic signals, directional signs, street furniture, bicycle parking facilities, public transportation stops and facilities, transit priority signalization, traffic calming devices such as rotary circles and curb bulb-outs, and surface treatments such as paving blocks, textures asphalt, and concrete, narrow vehicle lanes, raised medians, and dedicated transit lanes. All designs must be in compliance with City of Helena "Complete Streets" Resolution No. 19799 and these standards.

Deviations or Variances from Complete Streets Policy:

(a) In considering all deviations or variances, alternatives shall be explored such as the use of the revised travel lane configurations, paved shoulders, signage, traffic calming, education or enforcement to accommodate pedestrians, cyclists, transit and persons with disabilities.

(b) In considering all deviations or variances, future project phasing and improvements should address how complete streets principles will be accommodated.

(c) Deviations or variances shall consider the multi-modal transportation network in the immediate vicinity.

(d) When deviations or variances occur, alternatives and accommodations shall be documented.

5.3 RIGHT-OF-WAY (ROW) STANDARDS

The typical roadway sections shown in Appendix "C" identify the minimum amount of right-of-way that may be necessary to accommodate full build-out of each type of facility. The appropriate classification for new streets will be determined by the multi-modal traffic impact study for the development along with all the relevant planning documents for the City of Helena including but not limited to Helena Zoning Map, the LRTP, Transit Plan, and other Commission adopted plans. The features needed for a street to be considered a complete street are listed in Table 5-4 of this section. Each road classification has a list of complete street features that must be considered and may or may not be required according to the discretion of City staff or the City Commission. The complete street check list, found in Appendix "A," must be completed for each street. All local streets may be considered with one checklist as long as all features included in the typical section, including on-street parking, are the same.

5.3.1 TYPICAL ROADWAY SECTIONS

The typical roadway section shall be as shown on the typical exhibit sections included in Appendix "C." The roadway section used shall be detailed on the construction plans submitted for each new roadway or improvement to an existing roadway. Any deviations from the standard roadway typical section will require approval from the Transportation Systems Department.

The typical section shall show the width of the right-of-way, width of roadway or alleyway, type and compacted depth of surfacing and paving materials, chip seal and such other dimensions as may be necessary or required. The location and width of sidewalks, walkways, boulevards, and curbs or curb and gutter shall also be shown, where applicable.

5.3.2 EXISTING ROW HIERARCHY

Although many existing roads within the City of Helena do not have the necessary right-of-way based on these standards, it shall be the policy of the City of Helena to attain the desired right-of-way (ROW) widths on all new roadway and development projects. For existing ROW, the street shall be designed for a complete street. However, if the ROW (for existing streets only) is narrower than what is required, and additional ROW cannot be obtained, the following list will set the hierarchy of which complete street features may be exempt from installation or the minimum set width:

1. The Boulevard can be narrowed to not less than 4' for a Local Street and 5' for every other classification. In special cases, the boulevard can be completely eliminated. However, City manager approval is required.
2. On-street parking on one or both sides of the street can be eliminated if justified by an approved parking study.
3. For collector and arterial streets, the lane can be narrowed to 10' which includes the center turning lanes.
4. For collector and arterial streets, the bike lane can be eliminated.
5. Sidewalk on one side of the street can be eliminated. City Manager approval is required.
6. The minimum ROW widths for existing street will be evaluated on a case-by-case basis.

Table 5-4. Complete Street Component Matrix (minimum widths)

Street Features	Local Residential	Local Office/ Commercial	Minor Collector	Major Collector	Minor Arterial	Major Arterial
Driving Lanes	20' (2 lanes min.) (10’ each lane)	24’ (2 lanes min.) (12’ each lane)	20' (2 lanes min.) (10’ each lane)	20' (2 lanes min.) (10’ each lane)	22' (2 lanes min.) (11’ each lane)	48' (4 lanes min.) (12’ each lane)
Sidewalk	10' (5' Each Side)	10' (5' Each Side)	10' (5' Each Side)	10' (5' Each Side)	10' (5' Each Side)	10' (5' Each Side)
Bike/Ped Path (can replace sidewalks on one side) if required by the Greater Helena Trans Plan or proposed in the subdivision master plan	10' (5' additional each side of the street that the path replaces the sidewalk)	10' (5' additional each side of the street that the path replaces the sidewalk)	10' (5' additional each side of the street that the path replaces the sidewalk)	10' (5' additional each side of the street that the path replaces the sidewalk)	10' (5' additional each side of the street that the path replaces the sidewalk)	10' (5' additional each side of the street that the path replaces the sidewalk)
Curb and Gutter	4' (2' each side)	4' (2' each side)	4' (2' each side)	4' (2' each side)	4' (2' each side)	4' (2' each side)
Parking Lane	12' (6' each side)	12' (6' each side)	12' (6' each side)	12' (6' each side)	12' (6' each side)	12' (6' each side)
Bike lane				10' (5' each side)	10' (5' each side)	10' (5' each side)
Boulevard	14' (7' each side)	14' (7' each side)	14' (7' each side)	14' (7' each side)	14' (7' each side)	20' (10' each side)

Street Features	Local Residential	Local Office/ Commercial	Minor Collector	Major Collector	Minor Arterial	Major Arterial
Utility Corridor - for electric, phone, and cable- if not placed under sidewalk or street	4'	4'	4'	4'	4'	4'
Bus Lanes					12'	12'
Bus Stops	8'	8'	8'	8'	8'	8'
Center Medians					4' min.	4' min.
Two Way Left Turn Lane (TWLTL)		12’		12’ (if no on-street parking)	11'	12'
Storm water Elements	Varies - if proposed by developer	Varies - if proposed by developer	Varies - if proposed by developer	Varies - if proposed by developer	Varies - if proposed by developer	Varies - if proposed by developer
Traffic Calming	Additional ROW maybe needed	Additional ROW may be needed	Additional ROW maybe needed	Additional ROW maybe needed	Additional ROW maybe needed	Additional ROW maybe needed

At a minimum each side must have at least a sidewalk or Bike/Ped Path

All streets must accommodate the Complete Streets policy and be consistent with the LRTP

** Deviations from the required components may be allowed with sufficient justification.*

5.4 TRAFFIC CALMING

Traffic calming is defined as a "combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users". In simple terms, traffic-calming techniques are typically aimed at lowering vehicle speeds, decreasing truck volumes, and/or reducing the amount of cut-through traffic in a given area. If applied properly, these techniques result in a more pleasant environment for pedestrians and bicyclists.

Traffic calming applied to roadway designs for new development should be evaluated on a case-by-case basis and if utilized should be appropriate for the intended function of each street or street segment. Streets designed to function as part of the major street system should be designed primarily to move traffic in an efficient, convenient, and safe manner. Local streets and residential collectors should be designed to provide access to properties while discouraging through-traffic and higher travel speeds that often accompany it. New street designs and developments should consider traffic calming strategies to reinforce the appropriate functions of the designed streets. These would include layout and connectivity of street systems and pedestrian/bicycle facilities, intersection treatments, and basic design standards for width, curvature, parking, and landscaping. Specific traffic calming features which are easily incorporated into the design phase include: entrance treatments; narrow streets; short block lengths; small corner radii; surface valley gutters; "T" intersections; roundabouts; and landscaping to create a "closed-in" environment. Appropriate traffic calming measures must be used to discourage excess speeds on all local and collector streets.

For existing facilities, the City has adopted a Traffic Calming Program which outlines the steps necessary to install traffic calming techniques, where appropriate, in response to neighborhood requests for assistance with traffic concerns. Refer to the most recent update of the LRTP for areas of improvements that have been identified.

5.5 BRIDGES

The City of Helena requires bridges to be designed in accordance with current Montana Department of Transportation (MDT) standards for "on-system" bridges and the AASHTO Standard Specifications for Highway Bridges for "off-system" bridges. At a minimum, the information to be included in a set of bridge design plans is summarized in this section.

5.5.1 BRIDGE PLANS SHEET SEQUENCE:

1. Title Sheet
2. General Layout of Structure Sheet.
3. Footing Plan Sheet.
4. Bent/Pier Sheet (by Bent Number).
5. Erection Plan Sheet.
6. Slab Detail Sheet.
7. Beam/Girder Sheet.

8. Detail Sheets (Camber, Splice Details, Diaphragm Details, Shoe/Joint Details, Barrier Rail); and
9. Standards Drawing Sheet.

5.5.2 BRIDGE DETAILS & DETAIL SHEETS

A complete set of bridge plans includes sufficient information for the contractor to successfully bid and complete the structural scope of the project. Details which are required to be included on plan sheets for projects within the City of Helena are as found in Chapter 5 of the MDT Structures Manual (Volume I). Any additional details that the bridge designer wants to include to supplement those listed in Chapter 5 of the MDT Structures Manual (Volume I) will be accepted.

All "on-system" bridge plans will be sent to the Montana Department of Transportation Bridge Bureau and Lewis and Clark County Engineering for their concurrent review and approval.

5.6 UTILITY CORRIDORS WITHIN NEW SUBDIVISIONS OR UNDEVELOPED ANNEXATIONS

All new utility installations within the public ROW requires written approval from the City Engineer prior to installation, so as to assure that the new utilities do not incommode or endanger the public in the use of the street in accordance with MCA 69-4-101.

All new utilities shall be placed underground except where underground installation is not feasible as defined in MCA 69-4-102(2). Transformers and junction boxes maybe installed above ground in locations approved by the City.

All new underground utilities installed parallel to City owned utilities within the public street right-of-way shall be located horizontally at least 5' away from the city owned utilities. If 5' cannot be maintained the utility must apply to the City Engineering Division for a deviation.

Utilities shall not be installed in street boulevards except above ground features such as light poles, residential transformers, and secondary pedestals, etc., along with the associated wiring for these features, may be allowed providing that the placement of these features will not interfere with the planting, growth, and care of boulevard trees or impede traffic sight distance. Perpendicular crossings of the boulevard may be allowed if placed in such a manner not to prohibit planting of the boulevard. All utilities that are less than 4.5' in depth are encouraged to be installed in protective conduit whenever possible. The protective conduit will allow for the maintenance and replacement of the utility without damaging any boulevard trees.

All utilities shall be installed at the required depth, as determined by the utility, relative to the finished grade of the finished surface. A minimum of 18 inches depth will be required unless written approval from the Transportation Systems Department.

As part of any subdivision or development involving the extension of City Utilities, the subdivider or developer shall provide engineered plans for all utilities including gas, power, phone, fiber, etc. on the infrastructure plans for review and approval. All applicable laws, rules and regulations of appropriate regulatory authority having jurisdiction over such facilities shall be observed.

For new subdivision or location where the streets are less than 10 years old and television, telephone, power, or natural gas has not been installed, provisions shall be made for installation without the cutting of paved roadways.

Repairs to existing utilities shall follow the street opening process of the City of Helena and all requirements in Section 5.2.9 of this document.

5.7 LANDSCAPED BOULEVARD REQUIREMENTS

Boulevards shall slope from the sidewalk down toward the top back of curb at a minimum of 1.5% and maximum of 5%.

Boulevard landscaping requirements shall comply with the requirements as set forth under the Helena City Code. The intent is to enhance, conserve and stabilize property values and the roadside environment by encouraging pleasant and attractive surroundings; encourage preservation of existing trees on proposed building sites and along roadways; and contribute to the relief of heat, noise, wind, and glare through the proper placement of living plants and trees.

5.8 MULTI-MODAL STUDIES

Private or public developments which increases the peak hour trips per day to the City Street System shall have a Multi-modal Traffic Impact Study (TIS) completed by an Engineer with adequate experience and expertise in transportation engineering.

The Multi-modal Study should present an objective technical analysis in a straightforward and logical manner that leads the reviewer through the analytical process to the resulting conclusions and recommendations. Sufficient detail should be provided so that the reviewer is able to follow the path and methodology of the study. All assumptions should be clearly documented with published sources referenced as necessary. All Multi-modal Studies shall be signed and stamped by a licensed professional engineer registered in the State of Montana.

Multi-modal Studies have been divided into three levels depending on the impact to the City roadway system. Each level has certain requirements to be met. An outline of the three different levels can be found in Appendix “B.”

5.9 ROUNDABOUT AND TRAFFIC SIGNAL REQUIREMENTS

Modern roundabouts are near-circular intersections at grade. All vehicles travel through the intersection in the same counterclockwise direction, reducing the number of conflict points and eliminating left-turn and head-on conflicts. Roundabouts have a traffic-calming effect by reducing vehicle speeds using geometric design rather than relying solely on traffic control devices. This produces both lower overall speeds as well as a narrower range of differing speeds. Lower and more consistent vehicle speeds lead to: more predictable traffic interactions, more decision-making time for all users, and an increased likelihood of drivers yielding to pedestrians. Fewer conflict points and lower speeds, provide for easier decision making than other intersection types. As a result of reducing speeds and aligning traffic in a single direction, crashes are less frequent. Crashes that do occur at roundabouts are typically much less severe than crashes at traditional intersections. Well-designed roundabouts have been found to not only reduce fatal and severe

injury crashes, but also reduce traffic delays, fuel consumption, and air pollution. They also require less maintenance than electronic signals and continue to operate during a power outage.

Any proposed intersection control shall be accompanied by an intersection control evaluation (ICE) study. The ICE study shall at a minimum consider the following: stop control warrants and traffic signal warrants from the most recent MUTCD, the Guide for Roundabouts (NCHRP 1043), and the most recent LRTP.

Roundabouts are the preferred safety alternative for a wide range of intersections. Although they may not be appropriate in all circumstances, they should be considered as an alternative for all proposed new intersections, particularly those with major road volumes less than 90 percent of the total entering volume. Roundabouts should also be considered for all existing intersections that have been identified as needing major safety or operational improvements.

In determining the location of a new roundabout or signal, pedestrian & vehicle safety and traffic circulation & progression will be the primary considerations.

The City of Helena requires traffic signal design and plans to be completed in accordance with current MDT standards. The information to be included on these plans is summarized in this section.

5.9.1 ELECTRICAL PLANS SHEET SEQUENCE:

1. Title Sheet (if stand-alone traffic signal project).
2. Table of Contents (if stand-alone traffic signal project).
3. Electrical Quantity Summary Sheet.
4. Electrical Detail Sheets; and
5. Plans Sheets

5.9.2 ELECTRICAL DETAILS AND DETAIL SHEETS

A complete set of electrical plans includes sufficient information for the contractor to successfully bid and complete the electrical scope of the project. Details which are required to be included on plan sheets for projects within the City of Helena include:

- Schedules for signal and luminaire poles, conduit & wire, and loop detectors.
- Service wiring diagrams for signals, controllers, and luminaries.
- Conduit installation and underground service wiring details.
- Pull box, pole base and watertight connection details.
- Details of photo-electric control installation and wiring.
- Signal and luminaire standard pole base and foundation details.
- Signal head and luminaire mounting and assembly details.
- Controller mounting, assembly, wiring, conversion, and foundation details.

- Details of loop detector installation.
- Phasing detail and diagram; and
- Peak hour volume count diagrams.

All traffic signal plans will be sent to the MDT Traffic Bureau for their concurrent review, regardless of the signal being on an MDT facility or not.

5.10 SIGNING AND PAVEMENT MARKING REQUIREMENTS

All signs and pavement markings shall be approved by the City of Helena Transportation Systems Department and comply with the MUTCD or other City Policies.

5.10.1 STREET NAME SIGNS

Street identification signs shall be installed at all new intersections in accordance with the MUTCD.

For ground-mounted street name signs on roads with speed limits of 25 mph or less, furnish 6-inch double sided extruded aluminum sign plates “street blades” with green High-intensity Prismatic (H.I.P.) sheeting, in lengths between 24” and 42” (in six-inch increments), and comply with the following lettering requirements:

Use 4-inch FHWA 2000 Series C (Series C), white H.I.P. lettering for street names. Name lettering shall be composed of a combination of lower-case letters with initial upper-case letters. If using Series C font causes the text to not fit on a 42” blade, then 4-inch Series B font may be used.

Use 2-inch Series C, white H.I.P., upper-case lettering for street directional prefix (N, S, E, W) where required.

Use 2-inch Series C, white H.I.P. lettering for roadway suffix (street abbreviations: Ave, Blvd, Pl, St, etc.) which shall be composed of a combination of lower-case letters with an initial upper-case letter.

Use 2-inch Series C, white H.I.P. lettering for block numbers and locate above the roadway suffix.

Vertical Spacing:

Directional prefix and street name should be one inch (1”) from the bottom of the sign unless the name contains descending letters such as “g”, “p” or “y”.

Names with descending letters and their prefixes, should be shifted 0.5” toward the top of the sign plate or located 1.5” from the bottom of the sign.

Block numbers (above) and roadway suffixes (below) should be located 0.5” from the top and bottom of the sign respectively.

Horizontal Spacing:

Spacing between the directional prefix, street name and block number/roadway suffix should be 3” but may vary between 2” & 4”.

The block number and suffix should be centered horizontally above and below each other.

Entire text should be centered on the sign plate with a minimum of 2" spacing from each end of the sign plate.

5.10.2 REGULATORY SIGNS

All regulatory traffic control signs will be installed in accordance with the MUTCD.

An engineering study/review shall be performed before installation of any new yield or stop sign. In general, stop signs shall be installed on local streets when they intersect with any collector or arterial streets, but shall not be installed arbitrarily.

5.10.3 PAVEMENT MARKINGS

All pavement markings for crosswalks, stop bars, words, symbols, and intersection striping shall be inlaid thermoplastic (refer to MPWSS) or as approved thermoplastic alternative. Crosswalk markings should not be used indiscriminately. An engineering study should be performed before crosswalks are installed at locations away from traffic signals or stop signs. Mid-block crosswalks are discouraged and must be approved by the Transportation Systems Department.

Roadway centerlines, bike lanes, and outside lane lines, away from major intersections, shall be epoxy paint (refer to MPWSS).

Temporary or final striping shall be installed within 10 business days of the completion of hot plant mix paving operations. For concrete pavement, a minimum of 28 days cure time is required prior to the placement of the final striping.

5.11 STREET LIGHTING REQUIREMENTS

Street lighting along public and private roadways is encouraged and shall comply with the existing lighting requirements as set forth under Helena City Code. The purpose is to encourage lighting practices and systems which will minimize light pollution, glare, and light trespass; conserve energy and resources while maintaining nighttime safety, utility, and security.

The need for lighting shall be considered for all new or reconstructed streets. Design considerations include functional classifications, traffic volumes (vehicular and pedestrian), intersections, turning movements, signalization, channelization, and geometrics. Lighting should be located ahead of intersections and crosswalks to maximize positive contrast and avoid effects of backlighting pedestrians.

Lighting shall be required at the following locations:

- Along arterial streets.
- At trail or midblock crossings of collector or arterial streets.
- At raised medians and curb extensions.

Lighting shall be considered at the following locations:

- Along collector streets.
- At intersections of two collector or arterial streets.

- At intersections of high traffic locations, such as a development's main road and a collector or arterial.
- Along streets with complex geometry.
- At intersections that incorporate channelization.
- At high crash locations attributable to lack of lighting.

All street, pedestrian and pathway lighting shall be operated and maintained through the creation of a new Special Improvement Lighting District (SILD), through the annexation into an existing SILD or through some other equivalent means approved by the City of Helena. The application to create or annex into an existing SILD shall be submitted to the City Finance Department within 2 months of preliminary approval of the development. The approval to create or annex into a SILD shall be granted prior to final plat for a subdivision or Certificate of Occupancy if a final plat is not required.

5.12 WORK ZONE TRAFFIC AND PEDESTRAIN CONTROL

A Traffic and Pedestrian Control Plan must be submitted to the Transportation Systems Department at least seven (7) days before construction begins for all work within the public right-of-way. The location and description of all traffic and pedestrian control devices must be shown on the Traffic and Pedestrian Control Plan. The plan must be approved by the Transportation Systems Department prior to beginning construction. If the required traffic and pedestrian control devices are not in place, the Contractor will not be allowed to begin work on the project.

All traffic and pedestrian control devices shall be kept in place and maintained in good visible condition throughout the project. The Transportation Engineer, or the Engineer's representative, reserves the right to reject any traffic and pedestrian control device observed to be in inferior condition. A traffic and pedestrian control device maintainer shall be on call 24 hours a day to restore the control devices per the approved plan. All traffic control devices intended to be used from sunset to sunrise shall meet the MUTCD's reflectivity requirements. Emergency services access to the work area shall be maintained and given priority at all times. The MUTCD and/or MDT Guidelines for Work Zone Safety shall be followed to provide information for the safety of the public.

All barricades and obstructions shall be protected at night by suitable illumination from sunset to sunrise. Barricades shall be of substantial construction and shall be constructed to increase their visibility at night. Suitable warning signs shall be placed and illuminated at night to show in advance where construction, barricades or detours exist.

When operating a crane, manlift or similar apparatus on or over a public right of way, a Street/Sidewalk Closure permit must be obtained. A traffic control plan must be included with the application for review which shows vehicle and pedestrian control in proximity of the overhead equipment operation meeting MUTCD guidelines. All Pedestrian and Traffic control measures must be maintained throughout the duration of the overhead activities.

5.13 GEOTECHNICAL/SLOPE STABILIZATION CONSIDERATIONS

Due to the varied topography encountered throughout the City of Helena, special geotechnical considerations are often needed in the design of the various roadway projects. Maximum slope requirements for Earth Cut slopes and Earth Fill slopes under normal design conditions are 3:1.

There may be special circumstances where 3:1 slope may not be feasible, such as in areas of limited right-of-way or where extremely mountainous terrain is present. In those cases, alternate means of slope retention may be warranted. In cases where the above referenced standard slopes cannot be met, a geotechnical report will be required if different slopes are being proposed, or conversely if the use of retaining walls are being considered.

All geotechnical reports shall be signed and stamped by a professional engineer registered in the State of Montana. The geotechnical report shall contain the basic information as listed below:

- A description of the soil types encountered at the site in question and their properties.
- An assessment of soil slope stability.
- Recommendations for non-standard slopes, based on properties and information collected during field data collection and subsequent analysis.
- A copy of any boring logs made during the field exploration process; and
- Copies of all design calculations, exhibits, and a description of the design methodology used to arrive at the recommended design.

If the geotechnical report proves that other slope stabilization measures are necessary, such as soil pinning or retaining wall structures, a more detailed analysis shall be submitted for review to the City Engineering office. Possible retaining wall types that can be utilized in the City of Helena are reinforced concrete wall, mechanically stabilized earth (MSE) walls, and timber structure walls. The following shall be included in the geotechnical report:

- Information on settlement characteristics of the soil (i.e., amount of settlement expected time rate of settlement, surcharge or camber if required);
- Information on bearing capacity of the soil.
- Information on expected skin friction of the soil (if piles or drilled shafts will be utilized); and
- Information on soil pressure, stability, and alternates (if a soil retaining wall is being considered).

In areas of excessive fill or steep back slopes, roadside guardrail may be needed. Guardrail needs shall be as determined using AASHTO guidelines.

5.14 TEMPORARY AND PERMANENT BARRICADES

Temporary and permanent barricades shall conform to the standards contained in the MUTCD.

Type I or Type II barricades may be used when traffic is maintained through the area being constructed/reconstructed.

Type III barricades may be used when roadways and/or proposed future roadways are closed to traffic. Type III barricades may extend completely across the roadway (such as a fence) or from curb to curb. Where provision must be made for access of equipment and authorized vehicles, the Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. When job site access is provided through the Type I barricades, the developer/contractor shall assure proper closure at the end of each working day.

In the general case, Type III permanent barricades shall be installed to close arterials or other through streets hazardous to traffic. They shall also be used to close off lanes where tapers are not sufficiently delineated.

Type III barricades shall be used where a local street ends abruptly without cul-de-sac bulb or on temporarily stubbed off streets. Each barricade shall be used together with an applicable MUTCD approved signage.

Barricades on dead-end streets that may be extended in the future will have a sign placed upon them, as approved by the Transportation Systems Department.

5.15 TRANSPORTATION DESIGN SPECIFICATIONS

The standards for the design of City of Helena roads and bridges shall be based on the latest edition of the following references, in addition to items discussed in this document:

Montana Public Works Standard Specifications (MPWSS)

Manual on Uniform Traffic Control Devices (MUTCD)

MDT Guidelines for Work Zone Safety

Public Rights-Of-Way Accessibility Guidelines (PROWAG)

ADA Standards for Accessible Design

City of Helena Subdivision Regulations (City Code Title 12)

City of Helena Zoning Ordinance

Montana Structures Manual

AASHTO Guide for Design of Pavement Structures

Asphalt Institute Manual Series No. 1 (MS-1)

AASHTO Roadside Design Guide

MDT Traffic Engineering Manual

AASHTO Standard Specifications for Highway Bridges

Greater Helena Area Long Range Transportation Plan (LRTP)

AASHTO Geometric Design of Highways and Streets

Helena City Code

International Fire Code (IFC)

National Association of City Transportation Officials (NACTO) Design Guidelines

APPENDIX A
CHECKLISTS/APPLICATIONS

CITY OF HELENA
PUBLIC WORKS DEPARTMENT

Instructions for Completing
Water/Wastewater Service Area Enlargement Application
Within the Existing City Limits

Indicate the name and mailing address of applicant(s) under Items 1 and 2.

Fill in the **COMPLETE** legal description of the property involved in the appropriate space under Item 3. The description used must be complete and be the official legal description. Fill in present zoning and proposed zoning where applicable under Item #5.

If a subdivision, include lot number, block number, name of subdivision; and if applicable, the number of the filing of the subdivision, (**Example**: Lot, 4, Block 14, Bull Run #2, Second Filing).

If unplatted property, include section quarter (smaller portions as applicable) by section number, township, and range. (**Example**: NE1/4 of the NE1/4, Section 33, Township 10 North, Range 3 West).

Indicate the name of the engineer and attorney for applicant(s) under Items 6 and 7.

Attach to the application a plat of the property to be considered in the application. In addition, note the following is to be supplied:

a) Type of development proposed.
b) Land use proposed.
c) Type of building construction proposed (condominiums, townhouse, apartments, single family dwellings, others);
d) Total number of persons to be ultimately served by the proposed development.
e) Estimated average and maximum day water consumption and/or estimated volume of sewage flow. These figures to be supplied on a per person basis and a total basis for proposed development.

Attach to the application a copy of a current Title Memorandum showing **ALL** owners of record for **ALL** property involved (Item #8).

Under Item 9, fill in the date of execution on second page of form and have the forms **SIGNED** and **NOTARIZED** by **ALL** of the proper parties in the spaces provided. The proper parties include **ANY** and **ALL** person(s) having a lawful interest in the property.

In the case of a partnership or other group(s) of persons, one individual may sign for all others PROVIDED the person signing has a current and proper Power of Attorney authorizing such signature. A copy of the power of Attorney must be attached to the executed forms. Otherwise, **ALL** individual person(s) must sign. Please note special place on form applying to corporations.

If the property is being purchased under a Contract for Deed then **ALL** of the contract sellers must sign the document **IN ADDITION** to **ALL** contract buyers signing.

If there are any encumbrances against the property involved, a SUBORDINATION AGREEMENT must also be executed and a model agreement is available from the Public Works Department.

Record the executed documents with the County Clerk and Recorder. The documents are to be **RECORDED** with a book and page reference. They are **NOT** to be filed. Obtain a copy of the recorded documents to be returned to the Public Works Department.

AFTER all documents are recorded, a title report must be presented to the Public Works Department. Such title reports may be obtained by contacting a title insurance company. Obtain from your files a copy of the title insurance policy issued when you purchased the property and then request from the title company a "JUDGEMENT AND LIEN SEARCH SUBSEQUENT TO THE TITLE POLICY." Present both the copy of the title policy and the Judgment and Lien Search document to the Public Works Department. As a minimum, the title policy information presented must show **ALL** fee simple owners as well as **ALL** liens, claims and encumbrances against the property.

Return a **COPY** of the recorded documents, not the original documents, to the Public Works Department for review along with the title policy information requested above.

It is extremely important that all the above steps be followed explicitly. Failure to fully comply with all requirements will necessitate having to repeat the procedure in its entirety. The water or sewer service desired cannot be obtained until the necessary paperwork is submitted and approved.

Assistance with the forms may be obtained by contacting the Public Works Department.

THANK YOU FOR YOUR COOPERATION!

PUBLIC WORKS DEPARTMENT

APPLICATION FOR WATER/WASTEWATER SERVICE AREA ENLARGEMENT WITHIN THE EXISTING CITY LIMITS

SUBMIT ORIGINALS IN DUPLICATE

1. Applicant's Name: _____
2. Mailing Address: _____
3. Legal description of area to be served: _____

_____

_____

_____

4. The total population to be served by the proposed development is _____ and the estimated average and maximum day consumption in gallons per capita required to serve said development is as follows:

   Water: Average Day _____ gpcd Maximum Day _____gpcd

   Wastewater: Average Day _____gpcd Maximum Day _____ gpcd

5. Present Zoning: _____ Proposed Zoning: _____
6. Engineer for Applicant: _____
7. The attached Title Memorandum indicates the "Owner of Record" for all of the property requesting inclusion in the Water Service Area.
8. The (DEDICATED) (PROPOSED) (APPROVED PRELIMINARY) or (RECORDED) attached plat or certificate of survey describes all the property for which this application is submitted, the type of development and land use proposed for the property in question, the type of construction of the buildings and streets to be located on the property in question, the total population to be served by the proposed development, and the estimated average and maximum day consumption in gallons per capita required to serve said development.
9. City of Helena

   Public Works Department

   316 North Park Avenue

   Helena, MT 59623

   Being desirous of obtaining water service from the City of Helena and as a necessary prerequisite thereto, we the owners of the property described in Section 3, above, petition the City Commission to grant and approve an enlargement of the City of Helena Water Service Area so as to include said property within said Water Service Area. It is clearly understood

that consideration of the application shall be governed by Title 6, Chapter 3, Municipal Code and Ordinance #2925.

It is understood to be the fundamental policy of the Public Works Department and the City Commission that the City shall not indefinitely reserve unused water service capacity to the detriment of the City and its existing and prospective customers.

If this application shall be approved, it is understood and agreed that construction of a water system extension to serve the subject property shall be commenced within two (2) years of the date of approval of this application; and said construction shall be prosecuted continuously to completion within a reasonable time. Notwithstanding any prior approval of the approved Water Service Area if construction of the water system extension is not commenced within two (2) years of the date of approval of this application; and if said construction is not prosecuted continuously to completion within a reasonable time, the subject property shall be excluded from the approved Water Service Area.

If the subject property is not within the corporate limits of Helena, Montana and is not required to be annexed into the corporate limits in conjunction with approval of this application, the owners for themselves, their successors, and assigns agree to petition the Lewis and Clark County Commissioners to create a Special Improvement Maintenance District in order to maintain the water main and fire hydrant facilities installed; and further agree that the maintenance district shall be legally constituted and created prior to commencement of water service.

The owners for themselves, their successors, and assigns agree to comply with all Rules, Regulations, Policies, Resolutions and Ordinances of the Helena Public Works Department, the Helena City Commission, the Lewis and Clark County Commissioners, and the Montana Public Service Commission which may govern the extension, use, operation, maintenance and rates, charges, and rentals of the water system of the City of Helena, Montana.

_____ _____

Record Owner's Signature Date

_____ _____

Record Owner's Signature Date

_____ _____

Record Owner's Signature Date

_____ _____

Record Owner's Signature Date

If a Corporate Owner, by _____

(Its Corporate Officer designed as representative for purpose of application)

DATE: _____

10. Submitted to City Commission: _____

Public Hearing Held: _____

Approved by City Commission: _____

Denied by city Commission: _____

11. SUBJECT TO ATTACHED LETTER.

12. By: _____

Public Works Director

CERTIFICATE (TAXES)

The undersigned desires to apply for water and/or sanitary sewer service for the following described property in Lewis and Clark County, Montana:

(Insert or attach legal description)

In order to initiate the application procedure, the undersigned does hereby CERTIFY as follows:

Definitions:

"Interested parties" are defined as lessor, lessee, sub-lessor, sub-lessee, contract buyer, principal, agent, optionee, owner, licensee and developer or assignee of any of the foregoing having any interest in the above described real property whether as an individual, partner (general, special or limited) and/or as a corporation and/or controlling person or persons in a corporation and/or as a trustee or beneficiary of a trust, as a cooperative, non-profit corporation, religious corporation sole or otherwise. (Mortgagees and other lien holders are exempted from this definition of interested parties).

1. That the undersigned and other interested parties in the above-described property have paid and are currently not delinquent with respect to all taxes, special assessments and impositions against this property and any other property situated in Lewis and Clark County, Montana in which said parties are interested.

2. That the undersigned and other interested parties in the above-described property have not protested the payment of any taxes, assessments and impositions with respect to this property and other property situated in Lewis and Clark County, Montana in which said parties are interested parties.

The undersigned further certifies that the following are all the "interested parties" as defined above who have any interest in the above-described real property:

Name	Address	Nature of Interest

(Add additional sheets as needed)

The undersigned hereby certifies all the above information as being full and complete disclosures, UNDER PENALTY OF PERJURY.

DATED	DATED
(WITNESS)	(WITNESS)
(ADDRESS)	(ADDRESS)
(CITY, STATE, ZIP CODE)	(CITY, STATE, ZIP CODE)

TELEPHONE: TELEPHONE:

CITY OF HELENA

COMPLETE STREETS

PLAN & SPECIFICATION SUBMITTAL CHECKLIST

Project Name: _____

Engineering Firm: _____

Engineering Contact: _____

Telephone No.: _____

On 20 December 2010, the City of Helena adopted the Complete Streets Resolution (Resolution #19799). The Resolution implements a Complete Streets policy to require the planning, design, and construction of streets to accommodate all modes of transportation and persons of all abilities, with the goal of optimizing safety, interconnectivity, compatibility, and convenience. In addition to the policy, City planning documents such as the Greater Helena Area Transportation Plan, Helena Transit Plan, and Non-motorized Plans, as well as these standards must be considered when designing a street.

The City of Helena's approach to Complete Streets is a modular approach where each feature has a set minimum width. The pavement and ROW widths are determined by which features are deemed necessary for each particular section. Not all features may be required for every street, but each must be considered. If a feature is not required, the ROW may or may not be reduced.

The following checklist that must be completed for each new street or street section is based on the complete street feature in Table 5-4 that establishes minimum widths for each feature. As stated before, each feature must be considered and justification provided, if the feature is not included in the street section. If a feature is not required, the ROW may or may not be reduced based on future need of the particular feature. City Staff, and ultimately the City Commission, will determine if a feature is needed. Please note that some deviation from the complete streets standards may require commission approval, for instance exemption from installing a sidewalk or boulevard.

The attached plans and specifications for the above-mentioned project are in compliance with City of Helena Complete Street Policy and City Street Standards.

Sections 5.2.12 & 5.3 -— Complete Streets and Right-of Way Standards

A. LOCAL RESIDENTIAL STREETS: ☐ N/A for this proposal

Name of Street/s: _____

Estimated ADT of each street: _____

1. **Are the travel lanes at least 10' wide**? **☐ Yes ☐ No**

   Width of Lanes: _____

   Deviation request: _____

   Justification: _____

   _____

2. **Is parallel parking (6' lane) included on both sides of the street (excluding the gutter pan)?** **☐ Yes ☐ No**

   Deviation request: _____

   Justification: _____

   _____

3. **Are 5' sidewalks included on both sides?** **☐ Yes ☐ No**

   Is a bike/ped path requested in place of one of the sidewalks: **☐ Yes ☐ No**

   Deviation request: Curbside sidewalk and variances to eliminate the sidewalk or Bike/Ped path must be approved by the Commission.

   Justification: _____

   _____

4. **Are 7' Boulevards included on both sides?** **☐ Yes ☐ No**

   Deviation request (All curbside sidewalk requests must be approved by the Commission): _____

   Justification: _____

   _____

5. **Does the Helena Transit Plan identify a Bus Stop in this area?** **☐ Yes ☐ No**

6. **Are any transit stops proposed?** **☐ Yes ☐ No**

   Has the stop been approved by Capital Transit or the Transportation Systems Department? **☐ Yes ☐ No**

   Will the stop have a shelter? **☐ Yes ☐ No**

   Will the stop service Capital Transit or other transit operations? **☐ Yes ☐ No**

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? **☐ Yes ☐ No**

   Can the stop accommodate bike, pedestrians, and ADA users? **☐ Yes ☐ No**

7. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides?** **☐ Yes ☐ No**

Deviation request: _____

Justification: _____

_____

8. **Does the Helena Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off-street paths in area?** ☐ **Yes** ☐ **No**
   Bike lanes are discouraged on Local Street unless identified in a Commission-approved plan.

   Deviation request: _____

   Justification: _____

   _____

9. **Are there any other modes of transportation that need to be considered for this proposal? (i.e., golf cart, horses, light rail, snowmobile, etc.)** ☐ **Yes** ☐ **No**

A brief explanation which additional modes are included with this proposal:

_____

B. <u>LOCAL OFFICE/COMMERCIAL STREETS:</u> ☐ N/A for this proposal

<u>Name of Street/s</u>: _____

Estimated ADT of Each Street: _____

1. **Are the travel lanes at least 12' wide**? ☐ **Yes** ☐ **No**

   Width of Lanes: _____

   Deviation request: _____

   Justification: _____

   _____

2. **Is parallel parking (6' lane) included on both sides of the street (excluding the gutter pan)?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

3. **Are 5' sidewalks included on both sides?** ☐ **Yes** ☐ **No**

   Is a bike/ped path requested in place of one of the sidewalks: ☐ **Yes** ☐ **No**

   Deviation request: Curbside sidewalk and variances to eliminate the sidewalk or Bike/Ped path must be approved by the Commission.

   Justification: _____

   _____

4. **Are 7' boulevards included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request (All curbside sidewalk requests must be approved by the Commission): _____

Justification: _____

_____

5. **Does the Helena Transit Plan identify a Bus Stop in this area? ☐ Yes ☐ No**
6. **Are any transit stops proposed? ☐ Yes ☐ No**

   Has the stop been approved by Capital Transit or the Transportation Systems Department? **☐ Yes ☐ No**

   Will the stop have a shelter? **☐ Yes ☐ No**

   Will the stop service Capital Transit or other transit operations? **☐ Yes ☐ No**

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? **☐ Yes ☐ No**

   Can the stop accommodate bike, pedestrians, and ADA users? **☐ Yes ☐ No**
7. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides? ☐ Yes ☐ No**

   Deviation request: _____

   Justification: _____

   _____
8. **Does the Helena Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off street paths in area? ☐ Yes ☐ No**
   Bike lanes are discouraged on Local Street unless identified in a Commission-approved plan.

   Deviation request: _____

   Justification: _____

   _____
9. **Are there any other modes of transportation that need to be considered for this proposal? (i.e., golf cart, horses, light rail, snowmobile, etc.) ☐ Yes ☐ No**

   A brief explanation which additional modes are included with this proposal:

   _____

C. **MINOR COLLECTOR STREETS: ☐ N/A for this proposal**

Name of Street/s: _____

Estimated ADT of Each Street: _____

1. **Are the travel lanes at least 10'**? **☐ Yes☐ No**

   Width of Lanes _____

   Deviation request: _____

   Justification: _____

   _____
2. **Is parallel parking (6' lanes) included both sides of the street (excluding the gutter pan)? ☐ Yes ☐ No**

Deviation request: _____

Justification: _____

_____

3. **Are 5' sidewalks included on both sides?** ☐ **Yes** ☐ **No**

   Is a bike/ped path requested in place of one of the sidewalks: ☐ **Yes** ☐ **No**

   Deviation request: (All sidewalk variances must be approved by the Commission)

   _____

   Justification: _____

   _____

4. **Are 7' Boulevards included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: (All curbside sidewalk requests must be approved by the Commission) _____

   Justification: _____

   _____

5. **Does the Helena Transit Plan identify a Bus Stop in this area?** ☐ **Yes** ☐ **No**
6. **Are any transit stops proposed?** ☐ **Yes** ☐ **No**

   Will the stop have a shelter? ☐ **Yes** ☐ **No**

   Will the stop service Capital Transit or other transit operations? ☐ **Yes** ☐ **No**

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? ☐ **Yes** ☐ **No**

   Can the stop accommodate bike, pedestrians, and ADA users? ☐ **Yes** ☐ **No**

7. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

8. **Does the Helena Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off-street paths in area?** ☐ **Yes** ☐ **No**
   Bike lanes are discouraged on Minor Collector Street unless identified in a Commission-approved plan

   Deviation request: _____

   Justification: _____

   _____

9. **Are there any other modes of transportation that need to be considered for this proposal? (i.e., golf cart, horses, light rail, snowmobile, etc.)** ☐ **Yes** ☐ **No**

   Explain which additional modes are included with this proposal:

   _____

   _____

D. MAJOR COLLECTOR STREETS: ☐ N/A for this proposal

Name of Street/s: _____

Estimated ADT of Each Street: _____

1. **Are the travel lanes at least 10'**? **☐ Yes ☐ No**

   Width of Lanes _____

   Deviation request: _____

   Justification: _____

   _____

2. **Is a turn lane (10' lane) proposed?** **☐ Yes ☐ No**

   Deviation request: _____

   Justification: _____

   _____

3. **Is parallel parking (6' lanes) included on both sides of the street (excluding the gutter pan)?** **☐ Yes ☐ No**

   Deviation request: _____

   Justification: _____

   _____

4. **Are 5' sidewalks included on both sides?** **☐ Yes ☐ No**

   Is a bike/ped path requested in place of one of the sidewalks: **☐ Yes ☐ No**

   Deviation request: (All sidewalk variances must be approved by the Commission)

   _____

   Justification: _____

   _____

5. **Are 7' Boulevards included on both sides?** **☐ Yes ☐ No**

   Deviation request: (All curbside sidewalk requests must be approved by the Commission) _____

   Justification: _____

   _____

6. **Does the Helena Transit Plan identify a Bus Stop in this area?** **☐ Yes ☐ No**
7. **Are any transit stops proposed?** **☐ Yes ☐ No**

   Will the stop have a shelter? **☐ Yes ☐ No**

   Will the stop service HAT or other transit operations? ☐ Yes ☐ No

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? ☐ Yes ☐ No

   Can the stop accommodate bike, pedestrians, and ADA users? **☐ Yes ☐ No**

8. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

9. **Does the Helena Area Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off-street paths in area?** ☐ **No** ☐ **Yes**

   Deviation request: _____

   Justification: _____

   _____

10. **Are 5' Bike Lanes included on both sides of the street?** ☐ **Yes** ☐ **No**

    (Bike Lanes are required unless specifically excluded by the Greater Helena Transportation Plan or other Commission Approved Non-Motorized Plan)

    Deviation request: _____

    Justification: _____

    _____

11. **Are there any other modes of transportation that need to be considered for this proposal? (**i.e., golf cart, horses, light rail, snowmobile, etc.**)** ☐ **Yes** ☐ **No**

    Explain which additional modes are included with this proposal: _____

    _____

E. <u>MINOR ARTERIAL STREETS: ☐ N/A for this proposal</u>

<u>Name of Street/s:</u> _____

Estimated ADT of Each Street: _____

1. **Are the travel lanes at least 11'**? ☐ **Yes**☐ **No**

   Width of Lanes _____

   Deviation request: _____

   Justification: _____

   _____

2. **Is a turn lane (12' lane) proposed?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

3. **Is parallel parking (6' lanes) included on both sides of the street (excluding the gutter pan)?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

4. **Are 5' sidewalks included on both sides?** ☐ **Yes** ☐ **No**

   Is a bike/ped path requested in place of one of the sidewalks ☐ **Yes** ☐ **No**
   Deviation request: (All sidewalk variances must be approved by the Commission)

   _____

   Justification: _____

   _____

5. **Are 7' Boulevards included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: (All curbside sidewalk requests must be approved by the Commission) _____
   Justification: _____

   _____

6. **Does the Helena Transit Plan identify a Bus Stop in this area?** ☐ **Yes** ☐ **No**
7. **Are any transit stops proposed?** ☐ **Yes** ☐ **No**

   Will the stop have a shelter? ☐ **Yes** ☐ **No**

   Will the stop service HAT or other transit operations? ☐ **Yes** ☐ **No**

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? ☐ **Yes** ☐ **No**

   Can the stop accommodate bike, pedestrians, and ADA users? ☐ **Yes** ☐ **No**

8. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: _____
   Justification: _____

   _____

9. **Does the Helena Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off-street paths in area?** ☐ **No** ☐ **Yes**

   Deviation request: _____
   Justification: _____

   _____

10. **Are 5' Bike Lanes included on both sides of the street?** ☐ **Yes** ☐ **No**

    (Bike Lanes are required unless specifically excluded by the Greater Helena Transportation Plan or other Commission Approved Non-Motorized Plan)

    Deviation request: _____

    Justification: _____

    _____

11. **Are all Medians at least 4'?** ☐ **Yes** ☐ **No** ☐ **N/A**

    Deviation request: _____
    Justification: _____

    _____

12. **Are there any other modes of transportation that need to be considered for this proposal? (i.e., golf cart, horses, light rail, snowmobile, etc.)** ☐ **No** ☐ **Yes**

Explain which additional modes are included with this proposal:

_____

_____

F. MAJOR ARTERIAL STREETS: ☐ **N/A for this proposal**

Name of Street/s: _____

Estimated ADT of Each Street: _____

1. **Are the travel lanes at least 12'?** ☐ **Yes # of lanes_____** ☐ **No**

   Width of Lanes: _____

   Deviation request: _____
   Justification: _____

   _____

2. **Is a turn lane (12' lane) proposed?** ☐ **Yes** ☐ **No**

   Deviation request: _____
   Justification: _____

   _____

3. **Is parallel parking (6' lanes) included on both sides of the street (excluding the gutter pan)?** ☐ **Yes** ☐ **No**

   Deviation request: _____

   Justification: _____

   _____

4. **Are 5' sidewalks included on both sides?** ☐ **Yes** ☐ **No**

   Is a bike/ped path requested in place of one of the sidewalks: ☐ Yes ☐ No

   Deviation request: (All sidewalk variances must be approved by the Commission)

   _____

   Justification: _____

   _____

5. **Are 10' Boulevards included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: (All curbside sidewalk requests must be approved by the Commission) _____
   Justification: _____

6. **Does the Helena Transit Plan identify a Bus Stop in this area?** ☐ **Yes** ☐ **No**
7. **Does the Helena Transit Plan identify a Bus Lane in this area?** ☐ **Yes** ☐ **No**

   Is a bus lanes included as part of the typical section? ☐ Yes ☐ No

   Justification: _____

   _____

8. **Are any transit stops proposed** ☐ **Yes** ☐ **No**

   Will the stop have a shelter? ☐ Yes ☐ No

   Will the stop service HAT or other transit operations? ☐ Yes ☐ No

   Will the stop be near a lobby or other shelter that will generally be available to the public or employees? ☐ Yes ☐ No

   Can the stop accommodate bike, pedestrians, and ADA users? ☐ Yes ☐ No

9. **Is an additional 1' ROW strip included behind the sidewalk or bike/ped path included on both sides?** ☐ **Yes** ☐ **No**

   Deviation request: _____
   Justification: _____
   _____

10. **Does the Helena Transportation Plan or Non-Motorized Plan request or identify any bike lanes or off-street paths in area?** ☐ **Yes** ☐ **No**

    Deviation request: _____
    Justification: _____
    _____

11. **Are 5' Bike Lanes included on both sides of the street?** ☐ **Yes** ☐ **No**

    (Bike Lanes are required unless specifically excluded by the Greater Helena Transportation Plan or other Commission Approved Non-Motorized Plan)

    Deviation request: _____
    Justification: _____
    _____

12. **Are all Medians at least 4'?** ☐ **Yes** ☐ **No** ☐ **N/A**

    Deviation request: _____
    Justification: _____
    _____

13. **Are there any other modes of transportation that need to be considered for this proposal? (**i.e., golf cart, horses, light rail, snowmobile, etc.**)** ☐ **Yes** ☐ **No**

    Explain which additional modes are included with this proposal: _____
    _____

G. <u>Traffic Calming/Stormwater Treatment</u>

1. **Is any traffic calming proposed?** ☐ **Yes** ☐ **No**

   Location of traffic calming: _____

   Type of Traffic Calming Measure Proposed at each location: (Reference Traffic Calming Table in the Transportation Section of Appendix C)

   _____
   _____

   Is addition ROW required? ☐ Yes ☐ No

2. **Are any Storm water treatment elements included within the ROW?**

☐ Yes ☐ No

Location of storm water elements: _____

Type of treatment at each location: _____

Is addition ROW required? ☐ Yes ☐ No

Certified by: _____ (Stamp)

APPENDIX B

MULTI-MODAL TRAFFIC IMPACT STUDY REQUIREMENTS

PURPOSE

The City of Helena requires traffic impact studies (TIS) to assess transportation impacts associated with public or private development projects and provide consistency with City of Helena Growth Policy (HGP), Lewis and Clark County Growth Policy (LCGP), Helena Area Transit Development Plan (HATDP) and Greater Helena Area Long Range Transportation Plan

(LRTP) criteria. The data collection required for these studies shall be the responsibility of the owner/developer/consultant.

GENERAL REQUIREMENTS AND THRESHOLDS FOR TRAFFIC STUDIES

Level I Study - Less than 10 total PM peak hour trips to an intersection or access

Level II Study - 11 to 30 total PM peak hour trips to an intersection or access

Level III Study - Greater than 30 PM total peak hour trips to an intersection or access

Topic		Level I	Level	Level
I.	Introduction	✓	✓	✓
II.	Executive Summary		✓	✓
III.	Proposed Development	✓	✓	✓
IV.	Existing Conditions	✓	✓	✓
V.	Traffic Forecasts			✓
VI.	Traffic Analysis	✓	✓	✓
VII.	Other Items to Address			✓
VIII.	Mitigation Alternatives		✓	✓
IX.	Recommendations and Conclusions		✓	✓
X.	Appendices		✓	✓

Specific safety or capacity issues associated with a site, staff may request those be addressed, regardless of the number of site trips generated.

An outline of City of Helena requirements for a TIS is provided on the following page. A proposal establishing the scope of the traffic study shall be submitted for review to the Transportation Engineer based on guidelines in this document. Prior to or concurrent with the scope proposal, the applicant shall submit a preliminary trip generation and trip distribution analysis.

OUTSIDE AGENCIES AND JURISDICTIONS

There are streets within or adjacent to the City limits that are under the jurisdiction of MDT and/or Lewis and Clark County. Where development will impact their facilities, MDT and/or Lewis and Clark County may have additional requirements for a traffic study. Prior to approval of a final traffic study scope, a meeting with all impacted agencies is required to verify that the proposed scope addresses each agency's concerns.

GENERAL OUTLINE FOR TRAFFIC IMPACT STUDY

I. Introduction
   - A. Cover page (All Levels)
   - B. General project description **(All Levels)**
   - C. Assumptions (Level II and III studies)

II. Executive summary (Level II and III studies)

III. Proposed development **(All levels)**
   - A. Trip Generation and Distribution
   - B. Development Phasing/Schedule
   - C. Access locations, configuration, and sight distance
   - D. Site Circulation and Parking
   - E. Study Area

IV. Existing conditions **(All Levels)**
   - A. Existing street network and street classifications
   - B. Existing traffic volumes and turn movements
   - C. Existing LOS and V/C
   - D. Pedestrian and Bicycle facilities (safety/compliance/connectivity/etc.)
   - E. Existing transit routes and facilities
   - F. Crash History

V. Traffic forecasts (Level III studies)
   - A. Study scenarios
   - B. Non-site traffic
   - C. Site generated traffic

VI. Traffic analysis **(All Levels)**
   - A. Site Access
   - B. Site Circulation and Parking
   - C. Intersections (LOS and V/C)
   - D. Warrants, Turn Lanes, Traffic Signals
   - E. Queuing and Storage
   - F. Sight Distance
   - G. Traffic Calming
   - H. Safety analysis/Crash History analysis (may be combined with *Section IV F*)

VII. Other items to address **(Level III studies)**
   - A. Applicable MDT Criteria
   - B. LRTP identified improvements within the study area
   - C. Any known improvement projects within the study area (City, County, State)

VIII. Mitigation alternatives **(Level III studies)**

IX. Recommendations and conclusions **(Level II and III studies)**

X. Appendices (Level II and III studies)

I. INTRODUCTION

A. Cover page shall include project name, address or location and study consultant. Level II and Level III TIS shall be stamped by a professional engineer registered in the state of Montana.

B. The general description should include any existing and proposed site uses including square footage/acreage; current/proposed zoning and/or any proposed zoning changes. Project phasing, proposed or future, shall be identified. The description of uses shall reflect the uses allowed by City of Helena zoning regulations. In addition to the general site description, the surrounding land uses, and zoning need to be documented. A map showing the site and surrounding area is required.

C. Any assumptions used shall be documented completely with the appropriate justification also documented. Examples of assumptions include but are not limited to trip generation rates, independent variables, study area, trip distribution, any modal splits, worst case scenario, etc.

II. EXECUTIVE SUMMARY

The executive summary provides a clear and concise one- or two-page summary which shall include but is not limited to existing deficiencies, major section findings, mitigation alternatives to address existing deficiencies and those issues resulting from development and preferred alternatives.

III. PROPOSED DEVELOPMENT

A. ITE trip rates are typically used by the City to project traffic. Trip rates and code(s) for the development need to be provided based on the latest version of the ITE Trip Generation Manual and reflect uses identified in the City of Helena zoning regulations. The City of Helena Community Development Department has made available local generation rates that can be used to project traffic. The gross daily trips, in addition to any adjustments for internal site, pass-by, or diverted link trips, shall be documented. Upon approval from the Transportation Engineer, trip generation studies from a similar site may be used instead of the ITE manual. If the development does not fit within an ITE category, alternative trip generation methodology may be required including a separate trip generation study of similar sites. Daily AM and PM peak trip generation shall be provided based on Peak Hour of Generator or Peak Hour of Adjacent Street, whichever is more conservative if the difference in the average rates is greater than or equal to 0.5 and both are available a.

B. Trip distribution for the proposed development shall be addressed both in a narrative and as a diagram in the TIS. Assumptions for the trip distribution shall be included and based on existing count information or a logical explanation of

expected origins and destinations based on the proposed uses. In some instances, it may be appropriate to use origin and destination information upon Transportation Engineer's approval.

C. Timelines for completion of phases is required including years for any subsequent phases. The year of opening should be based on a realistic schedule of when all public improvements and building construction will be complete and ready to occupy. The applicant may provide trip generation and distribution information for each phase and for build-out of the project. Mitigation for impacts shall be done consistent with an approved phasing plan if mitigation based on phasing is clearly identified in the TIS.

D. Specific access locations shall be identified in the TIS. The location of access points shall consider the classification and design standards of the adjacent street, applicable access control requirements, sight distance, number of lanes, vehicle storage and queuing, signage and striping, on-site circulation needs and pedestrian and bicycle facilities. Analysis of access points needs to include existing and proposed driveway locations.

E. On-site circulation and parking facilities shall be explained in adequate detail to document any impacts to adjacent public streets and development sites and compliance with applicable City code and development standards. Particular attention should be provided for applicable delivery, loading and drive-thru facilities.

F. The TIS shall cover the entire area of influence from the proposed development including any intersections or accesses receiving 20 or more new trips during AM or PM peak hours, have trip volumes increase by at least 10% and are within expected routes of travel, access points within 150-feet of any major street and any other item that needs to be considered such as nearby school zones or transportation projects. A map and description/justification of the study area shall be provided.

IV. EXISTING CONDITIONS

A. A description and map of existing conditions in the study area shall include but is not limited to: street classifications, speed limits, ROW and pavement widths, bike lanes, median strips, sidewalks, lane configurations, intersections, traffic control, bicycle, and pedestrian facilities, schools, and transit routes. Also identify any known capacity or functional deficiencies (review the LRTP and any relevant area or corridor studies).

B. Traffic counts shall be taken Tuesday, Wednesday, or Thursday when Helena School District and Helena College is in regular session. Developments with unusual peak hours, an analysis of the peak hour of the traffic generator is also required. For example, schools require analysis of the peak hour during the commencement and let-out for the school day. Depending on the school type there may be significant student or parent traffic. Counts taken during vacations, or any other time when school is not in session will not be accepted. Another area in Helena that requires special consideration is the State Capital area or routes leading to the Capital. Traffic counts shall be adjusted to levels consistent to that of what is observed during a Legislative session. Banquet or church facilities may also need special consideration. Recent counts (within one year) from a governmental agency such as the City or MDT may be used with prior approval. Counts shall accurately reflect the existing intersection or access conditions, including turning movements and bicycle and pedestrian counts and movements. Classification of counts shall be required to identify truck traffic. Cite reference sources and document the date, time of day and location of counts. Please notify the appropriate jurisdiction or utility prior to mounting traffic counting devices on infrastructure. Identify and justify the methods used to quantify non-site generated trips.

C. Existing Level of Service (LOS) and volume to capacity ratio (V/C) shall be provided for each intersection identified for analysis in the traffic study scope. Highway Capacity Manual methodology shall be used for the analysis, which needs to include performance measures for intersection, worst case approach, and critical movements. Location maps shall be used to identify the locations of the intersection and LOS. More information is provided in *Section VI Traffic Analysis.*

D. A summary of existing pedestrian and bicycle facilities shall be provided to document how the development will be served and any connectivity deficiencies to existing facilities. Missing or deficient sections of sidewalks or curb ramps (including ADA best practices requirements) within or adjacent to the site shall be identified.

E. Transit routes serving the site and/or the distance to the closest transit stop or shelter should be documented.

F. Crash history shall be analyzed to document any existing safety conditions that may be aggravated or impacted by the development or development mitigation. Crash analysis shall consider crash history for the most recent five-year period for which data is available.

V. TRAFFIC FORECASTS

Any modal split should be addressed for Sections B and C including documentation and justification. Documentation shall include reference to any standards or prior studies. Any modal split shall be approved prior to initiation of the TIS.

A. The study scenarios for traffic forecasts and analysis should include the following:

- Existing conditions
- Near-term without proposed development
- Near-term with proposed development (each applicable phase and build out)
- Long-term with development (Typical mitigation design life 20-years).

Since improvements are designed for a minimum life of 20-years, analysis of any mitigation for a 20-year horizon is prudent. Variations to the planning horizon may be allowed on a case-by-case basis, depending on the size of the development and the potential need for mitigation. The planning horizon noted in the GHALRTP is 20-years. Growth rates used in the GHALRTP are approximately 0.94% per year compounded annually (p. 52). Past AADT's may be used for growth rates with City staff approval.

For land use actions such as a zone change, conditional use permit, annexation or subdivision, the traffic forecasts and analysis shall include the reasonable worst-case scenario of the area subject to the land use action, i.e., the total acres and max density. A proposed development plan, typically, doesn't provide the worst-case scenario. Per development regulations, a full range of development potential (min. to max.) under current vs. proposed land use designations shall be addressed in the analysis. Reasonable worst-case analysis must have justification and should be based on maximum viable development.

B. Non-site traffic includes existing traffic plus proposed or approved development in the area not accounted for in existing traffic counts. If other traffic studies for surrounding developments are used to estimate non-site traffic, those sources must be adequately documented. In the absence of site-specific traffic impact study reports, non-site growth may be calculated using a percent compound annual growth rate, consistent with the LRTP.

C. ITE trip generation rates are generally used as noted in Section III A above and adjusted by approved growth rates. Explanation of trip distribution and assignment should include any assumptions. Provide a diagram noting percentages and trip numbers from the proposed development and non-site trips. Directional distribution for both the AM and PM peak hours should be included. Trip distributions under different scenarios should be adjusted based on any anticipated improvements or

new street connections associated with the development or identified within the planning horizon in the LRTP or Comprehensive Capital Improvement Program (CCIP). For example, new streets in a phased subdivision may impact the distribution, or a planned CCIP project that occurs five years out could change the distribution between the build out and 20-year scenarios.

VI. TRAFFIC ANALYSIS

A. Traffic analysis including vision clearance/sight distance, proximity to intersections, turn lanes, queuing, existing access spacing and conflicts with pedestrians or bicycles shall be provided for all proposed site accesses. Criteria for minimum access spacing and the number of access points are outlined in the Engineering and Design Standards, development regulations and City Code. Interior site circulation, emergency vehicle and truck traffic shall also be considered in the analysis of access locations.

B. Impacts to site circulation from queuing such as drive through facilities, geometric considerations for emergency vehicular access and trucks needs to be addressed. Any change from the City's Engineering and Design Standards or City Code must be identified.

C. Intersection analysis, including LOS and V/C, shall be provided for all study intersections. Study intersections are defined in *Section IV.C,.* An analysis is required for each study scenario, including each cumulative sequence of phasing through the build-out condition. The analysis needs to clearly show the LOS and V/C of the intersection with and without the development.

Intersection analysis needs to balance signal timing based on the traffic demand. Assumed and proposed signal timing needs to be documented and suggested timing improvements identified. The intersection average LOS, V/C, critical movements, and worst case approach should be identified. Evaluation of the intersections needs to document the expected queue lengths and available vehicle storage. Deficiencies in existing storage and lane configuration need to be identified. This would include but not limited to lane widths and curb radii where truck traffic is expected.

D. Applicable warrants for turn lanes and traffic signals should be identified. Where it is expected that a signal may be needed based on a failing level of service, applicable warrants shall be evaluated to justify the need for a signal.

E. Queuing analysis should include both the average queue length and the 95th percentile queue length. The 95th percentile shall be used for design and for

determining the required storage. Conflicts with queued vehicles should be addressed, such as, street or driveway accesses, adjacent vehicle lanes, RR tracks, etc.

F. Sight Distance for new intersections, streets and access points needs to meet the requirements of the City's Sight Distance Triangle (City Code 7-3-7). Deficiencies in site distance with the proposed development plan shall be identified and discussed. This should also address sight distance to crosswalks and traffic control devices such as proposed signals, stop signs and road signs. The tree planting plan must be reviewed for conflicts with proposed traffic control devices/signs.

G. Analysis should be consistent with City of Helena Engineering and Design Standards – Traffic Calming Section 5.4. There may or may not be a need for traffic calming with the development. The minimum thresholds of vehicle counts and speeds should be identified to determine if traffic calming is consistent with City policy and would provide a significant benefit. Potential locations and types of traffic calming should be evaluated.

H. This Section may be combined with *Section IV F*. Current crash data for the past five years, and any other safety issues, should be identified and evaluated within the study area for potential impacts to the study scenarios. Crash history shall be analyzed to document if there are any existing safety conditions that may be impacted or aggravated by the development or development mitigation.

Graphics including tables, lane configurations and turning movements should be included to supplement and summarize the traffic analysis.

In summary, the traffic analysis should encompass the evaluation of intersection and access LOS, queuing, traffic signals, additional travel lanes, turn lanes, intersection functional areas, access control, bicycle movements, pedestrian movements, signal coordination, transit facilities, acceleration and deceleration lanes, merge lanes, weaving sections, future extension of transportation facilities through surrounding properties, etc.

VII. OTHER ITEMS TO ADDRESS

Other items that should be addressed include: nearby school zones, pending improvements from either nearby developments or nearby State, County, and City identified improvement projects or project identified in the GHALRTP or CCIP.

VIII. MITIGATION ALTERNATIVES

Possible mitigation identified in the above analysis sections should be discussed here. If the TIS identifies safety concerns as a whole or per movement of a LOS of "D" or worse, improvements and funding strategies shall be considered concurrent with a development proposal. Mitigation should be addressed for each phase of a development. Any ROW required for mitigation also needs to be identified.

Adequate capacity should be provided and maintained on arterial and collector streets to accommodate intersection LOS standards and to avoid traffic diversion to local streets. The LOS standards shall be:

- V/C less than 0.85
- LOS D or better during morning (7:00-9:00 am) and evening (4:00-6:00 pm) peak hours of operation for all intersections with arterial or collector streets
- LOS C for all other times of the day

Examples of mitigation to be addressed include, but are not limited to:

- Site access lane configuration, access restrictions / right in, right out
- Center turn lanes / dedicated turn lanes
- Additional vehicular lanes / left turn lanes / revised lane configurations
- Queuing lengths and storage capacity
- Geometric changes such as vertical or horizontal curves
- Speed limit investigations
- Bike lanes, ADA facilities, sidewalks, and multi-use paths
- Traffic control devices and signage
- Traffic signals, signal timing, phasing and coordination
- Traffic calming
- Transit facilities

IX. RECOMMENDATIONS AND CONCLUSIONS

This should be a list of recommendations by the Engineer and include key findings of the study. Any required improvements must be identified. When a phasing plan is proposed, improvements should be clearly identified by phase and the expected year for completion of mitigation and non-construction years. Additionally, any improvements that are not required of the development, but

recommended to mitigate traffic issues in the study area, should be identified for City consideration and transportation planning purposes.

X. APPENDICES

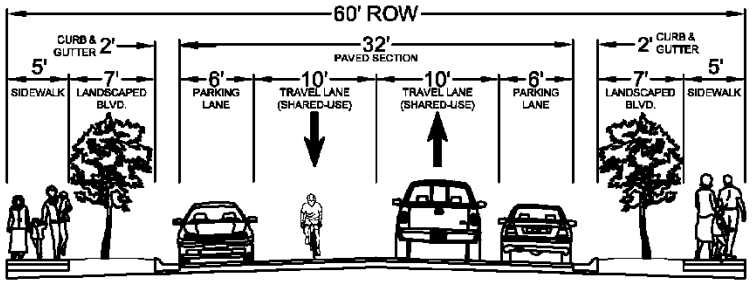
Appendices to the TIS should include but are not limited to:

- Definitions, applicable references, and standards
- Traffic count data (including other traffic studies cited or used)
- Maps
- Warrant worksheets
- Signal progression worksheets, where applicable
- Analysis software printouts

Software analysis printouts shall be clearly labeled with consistent background/phasing nomenclature and applicable time period. Printout lane numbers, geometries and vehicular volumes shall all be consistent with other sections of the TIS and the land use application

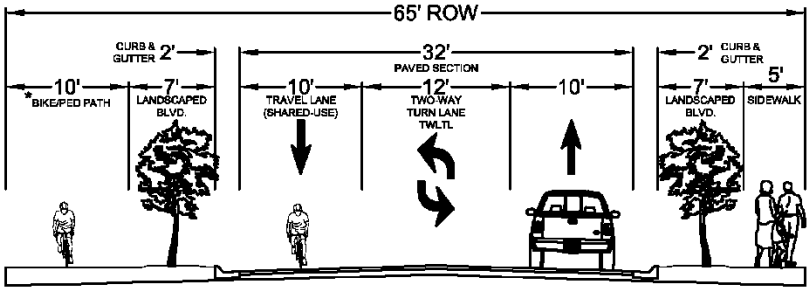
APPENDIX C

STANDARD DETAIL DRAWINGS



LOCAL ROAD/PRIVATE ROAD (w/On-Street Parking)

(NON-MOTORIZED VEHICLES SHARE THE ROAD)

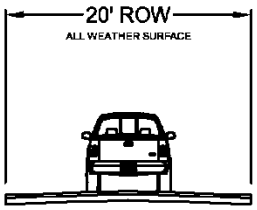


LOCAL COMMERCIAL

NO ON-STREET PARKING

STRIPE TWO-WAY LEFT TURN LANE

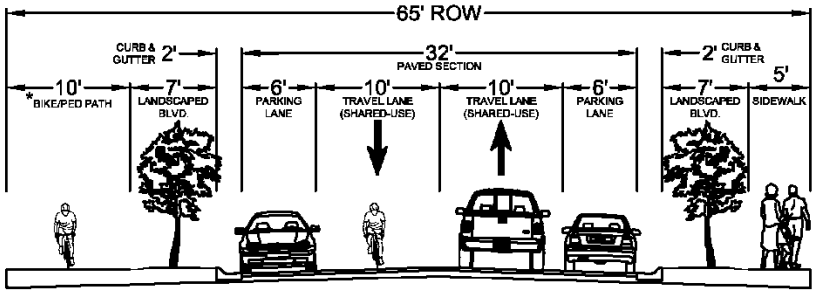
** 10' BIKE/PED PATH ON BIKE ROUTES OR 5' SIDEWALK*



ALLEY/EMERGENCY ACCESS ROAD

(NON-MOTORIZED VEHICLES SHARE THE ROAD)

CITY OF HELENA ENGINEERING STANDARDS		***LOCAL ROAD/PRIVATE ROAD***	***STANDARD DRAWING:*** **5-1**
REVISED: 12-30-2024	***SCALE:*** NONE		

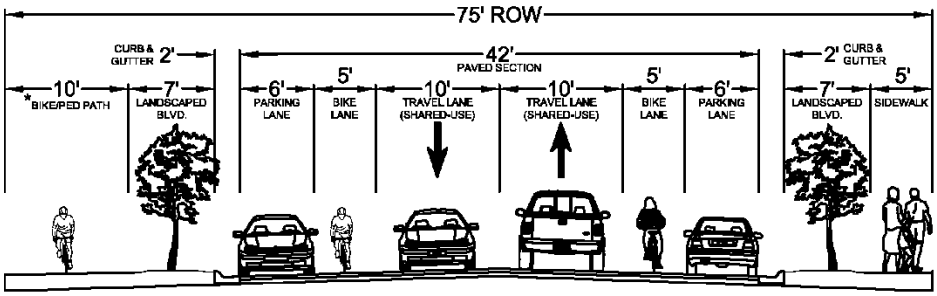


MINOR COLLECTOR ROAD ON BIKE ROUTES

(w/On-Street Parking)

PARKING MAY BE OPTIONAL ON ONE (1) OR BOTH SIDES

** OPTIONAL 10' BIKE/PED PATH IN LIEU OF BIKE LANE OR 5' SIDEWALK*



MAJOR COLLECTOR ROAD ON BIKE ROUTES

(w/On-Street Parking)

PARKING MAY BE OPTIONAL ON ONE (1) OR BOTH SIDES

** 10' BIKE/PED PATH ON BIKE ROUTES OR 5' SIDEWALK*

CITY OF HELENA ENGINEERING STANDARDS		***MINOR COLLECTOR MAJOR COLLECTOR***	***STANDARD DRAWING:*** **5-2**
REVISED: 12-30-2024	***SCALE:*** NONE		

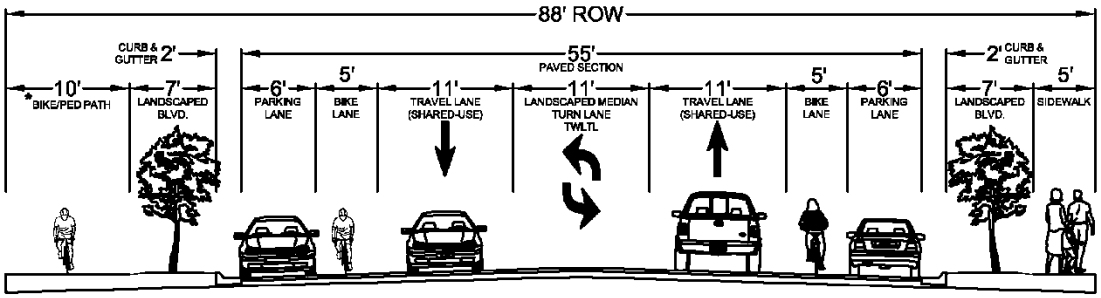
CITY OF HELENA
ENGINEERING STANDARDS

REVISED: 12-30-2024

SCALE: NONE

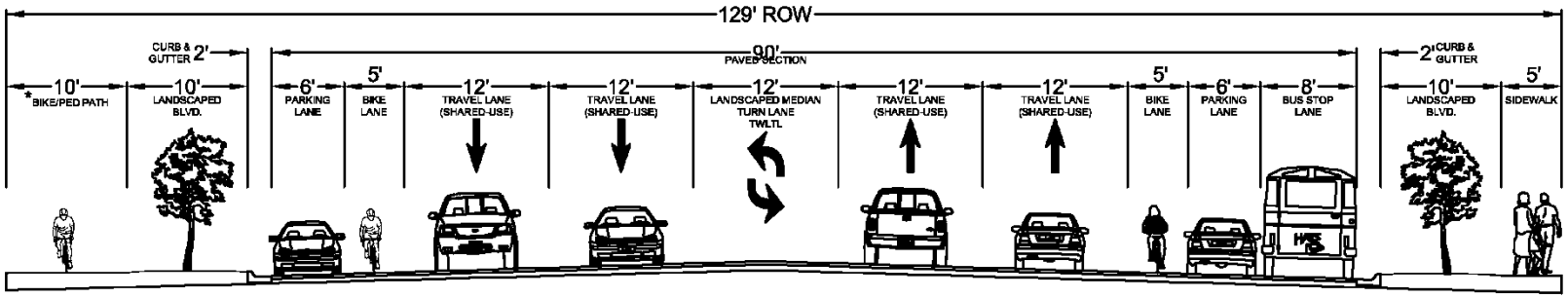
MINOR ARTERIAL
MAJOR ARTERIAL

STANDARD DRAWING: 5-3



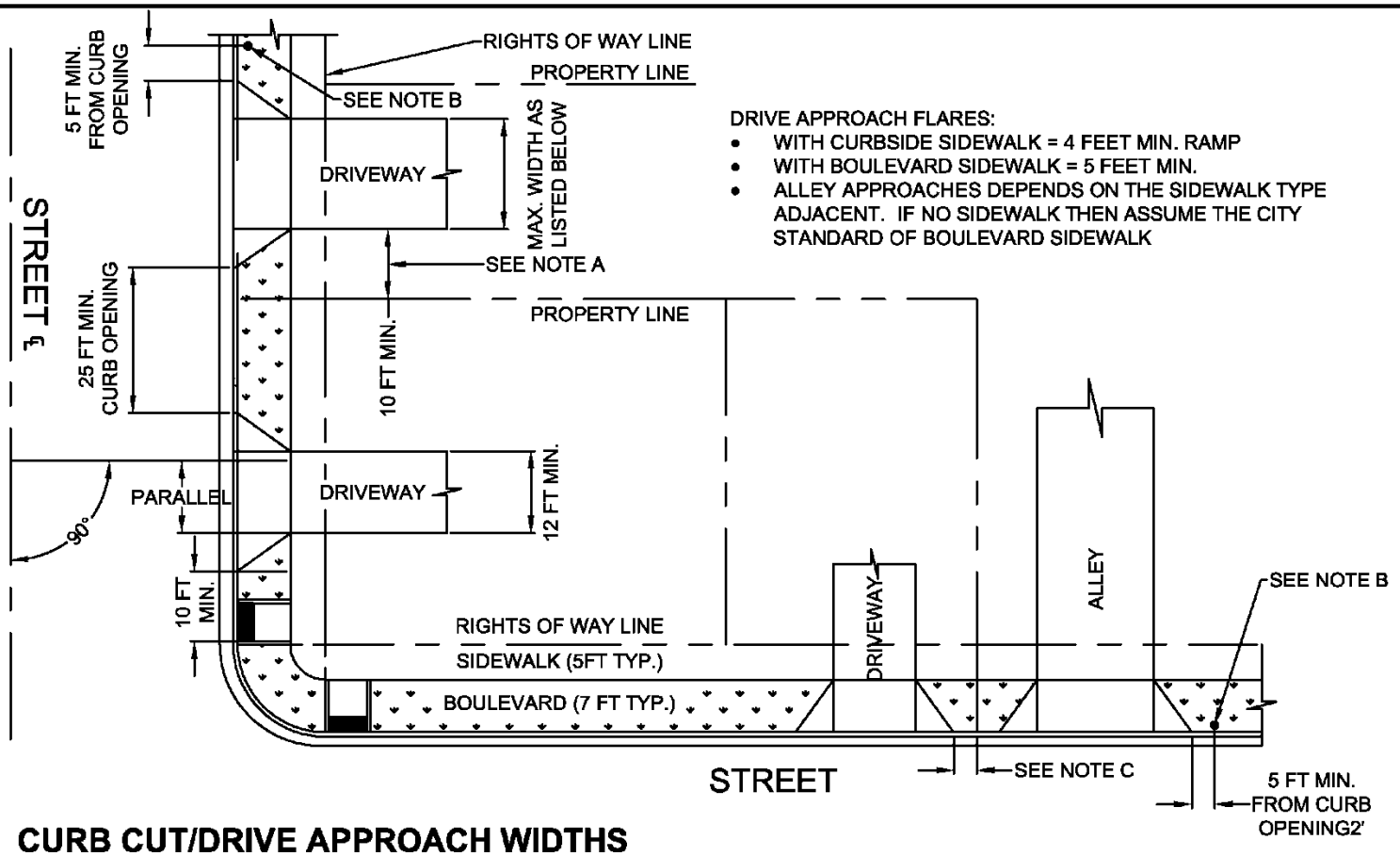
MINOR ARTERIAL (W/ON-STREET PARKING)

** 10' BIKE/PED PATH ON BIKE ROUTES*



MAJOR ARTERIAL (W/ON-STREET PARKING)

** 10' BIKE/PED PATH ON BIKE ROUTES*



DRIVE APPROACH FLARES:

- WITH CURBSIDE SIDEWALK = 4 FEET MIN. RAMP
- WITH BOULEVARD SIDEWALK = 5 FEET MIN.
- ALLEY APPROACHES DEPENDS ON THE SIDEWALK TYPE ADJACENT. IF NO SIDEWALK THEN ASSUME THE CITY STANDARD OF BOULEVARD SIDEWALK

CURB CUT/DRIVE APPROACH WIDTHS

- ALL DRIVE APPROACHES SHALL COMPLY WITH CURRENT ADA STANDARDS.
- ALL CURB CUTS AND DRIVEWAY APRONS ARE TO BE CONSTRUCTED OF PORTLAND CEMENT CONCRETE.
- SINGLE FAMILY RESIDENTIAL DISTRICTS (R-1, R-2) = 12 FOOT MIN. TO 24 FEET MAX.
- MULTIPLE FAMILY RESIDENTIAL ZONES (R-3) = 12 FOOT MIN. TO 30 FOOT MAX.
- RESIDENTIAL OFFICE (R-4, R-O, R-U), COMMERCIAL AND INDUSTRIAL DISTRICTS = 12 FOOT MIN. TO 40 FOOT MAX.
- TWO ADJOINING PROPERTIES OF 60 FEET OR LESS MAY SHARE A COMMON DRIVE = 12 FOOT MIN. TO 30 FOOT MAX.
- PROPERTIES MAY HAVE MORE THAN ONE CURB CUT FOR THE SAME PROPERTY IF SEPARATED BY 25 FEET OR MORE OF FULL HEIGHT CURB.
- FRONTAGE OF SIXTY FEET (60') OR LESS SHALL BE LIMITED TO ONE CURB CUT WITH NOT MORE THAN TWO (2) CURB CUTS TO BE PROVIDED TO ANY SINGLE TRACT OR BUSINESS ESTABLISHMENT, EXCEPT WHERE THE PROPERTY FRONTAGE EXCEEDS SIX HUNDRED FEET (600').

NOTE A:

- NO CURB CUT SHALL BE CONSTRUCTED CLOSER THAN 10 FEET FROM THE SIDE PROPERTY LINE EXCEPT IN RESIDENTIAL ZONES OR AS MAY BE REGULATED BY CITY SPECIFICATIONS IN EFFECT AT THE TIME OF SUCH WORK.

NOTE B:

- NO CURB CUT SHALL BE CLOSER THAN FIVE FEET (5') TO, NOR SHALL IT BE SO LOCATED AS TO INTERFERE WITH INTERSECTING SIDEWALKS, UTILITY FACILITIES, LIGHT STANDARDS, FIRE HYDRANTS, CATCH BASIN, STREET SIGNS, SIGNALS OR OTHER PUBLIC IMPROVEMENTS OR INSTALLATIONS.
- ANY NECESSARY ADJUSTMENTS TO SUCH UTILITY FACILITIES, LIGHT STANDARDS, FIRE HYDRANTS, CATCH BASINS, STREET SIGNS, SIGNALS, UNDERGROUND CONDUITS FOR STREET LIGHTING, FIRE ALARMS OR OTHER PUBLIC IMPROVEMENTS OR INSTALLATIONS SHALL BE ACCOMPLISHED WITHOUT COST TO THE CITY.

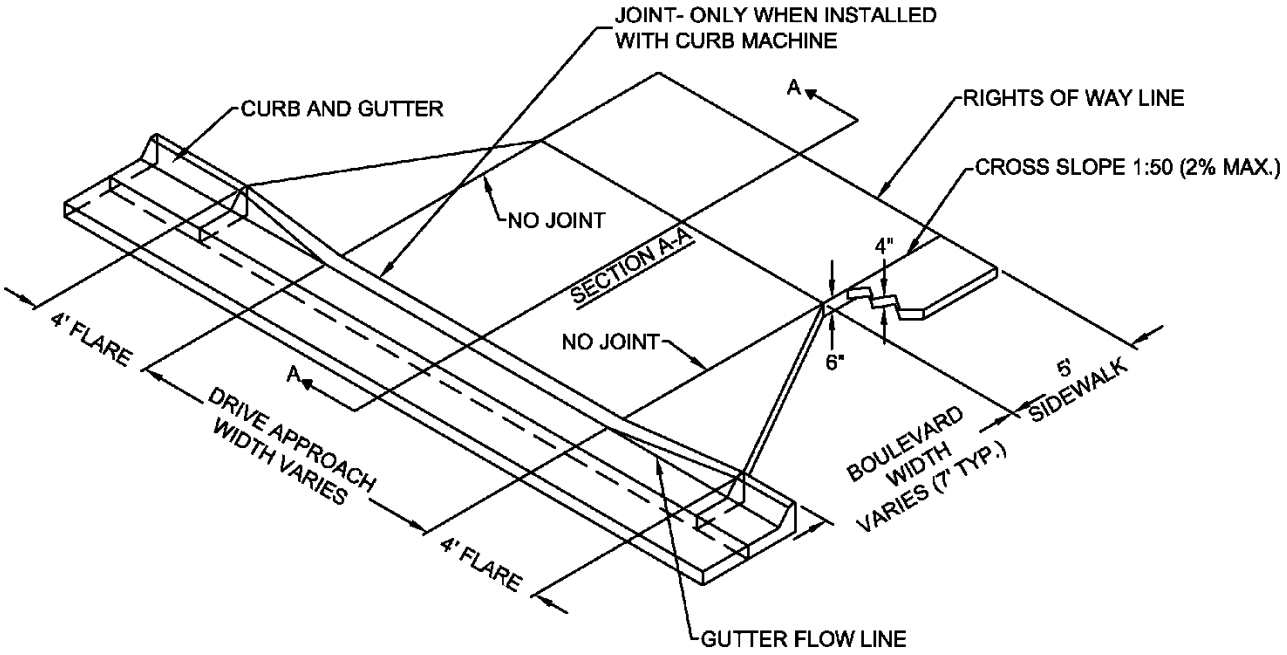
NOTE C:

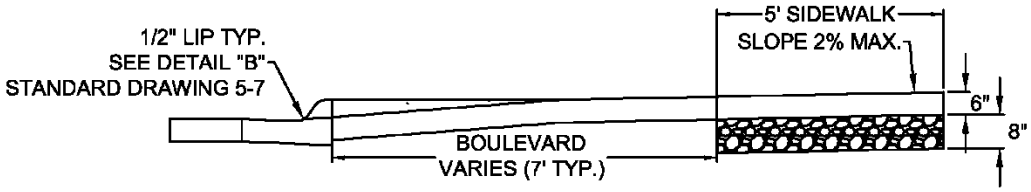
- THE LOT LINE SETBACK IS FIVE FEET (5') FOR ANY LOT LINE THAT ABUTS A DEDICATED PUBLIC RIGHT OF WAY THAT PROVIDES ONLY A SECONDARY MEANS OF ACCESS TO PROPERTY AND IS NOT INTENDED FOR GENERAL TRAVEL (E.G. ALLEYS).

INSTALLATION AND MAINTENANCE

- THE PROPERTY OWNER IS RESPONSIBLE FOR INSTALLATION AND MAINTENANCE OF DRIVE APPROACHES.
- COST OF ALLEY APPROACHES WILL BE ASSESSED AGAINST ALL PROPERTIES WITHIN THE BLOCK SERVED BY THE ALLEY ACCORDING TO THE RATIO OF EACH PROPERTY'S SQUARE FOOTAGE TO THE TOTAL SQUARE FOOTAGE WITHIN THE BLOCK.

CITY OF HELENA ENGINEERING STANDARDS		# CURB CUTS AND DRIVEWAYS	STANDARD DRAWING: 5-4
REVISED: 12-30-2024	**SCALE:** NONE		

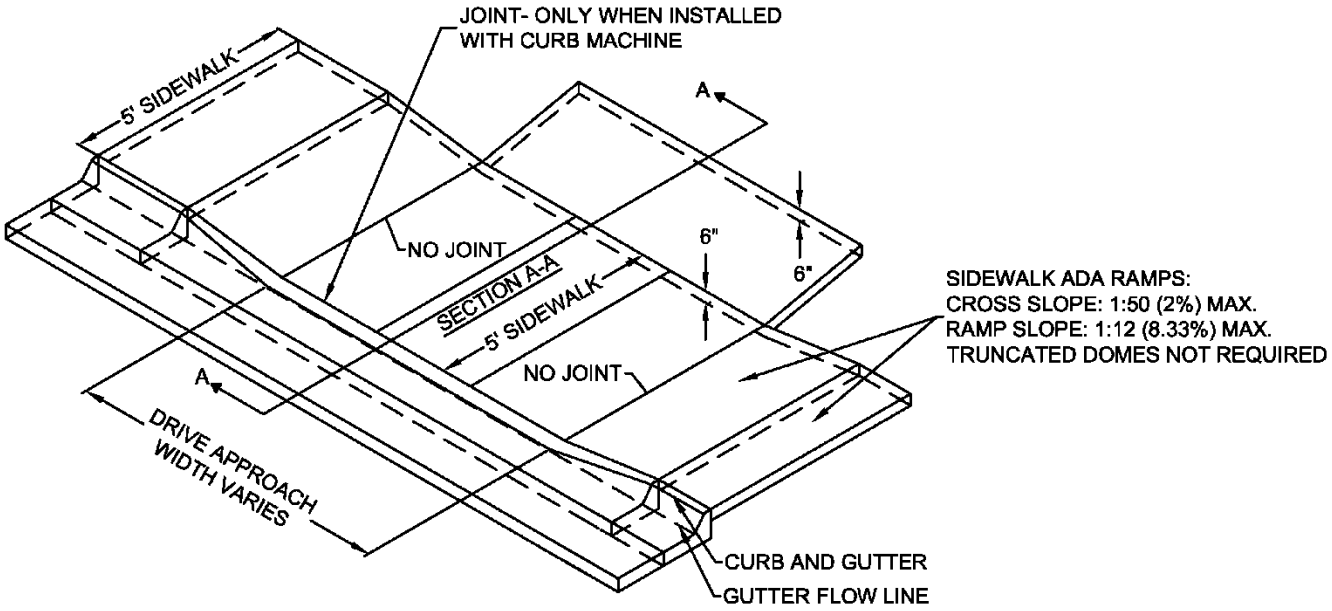


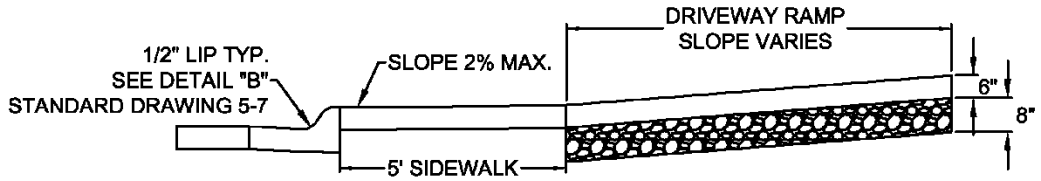


GENERAL NOTES:

- **ALL DRIVE APPROACHES SHALL COMPLY WITH CURRENT ADA/PROWAG STANDARDS.**
- MIN. 3/4" MINUS AGGREGATE; 4500 PSI CONCRETE SHALL BE USED FOR ALL CURB & GUTTER, SIDEWALKS, DRIVEWAYS, ETC.
- COMMERCIAL DRIVE APPROACHES (INCLUDING ALLEYWAYS) SHALL USE REINFORCED CONCRETE.
- 8 INCHES CRUSHED AGGREGATE BASE (CAB) SHALL BE 3/4", 1", OR 1 1/2" MINUS MATERIAL COMPACTED TO 95% AND SHALL COMPLY WITH AASHTO T99 OR ASTM D698; SUBMIT CAB GRADATION TO THE TRANSPORTATION SYSTEMS DEPARTMENT FOR APPROVAL.
- DRIVE APPROACH TO BE INSTALLED BEFORE ASPHALT CONCRETE PAVEMENT.
- APPROACH WILL BE PLACED MONOLITHICALLY EXCEPT WHEN CURB MACHINE IS ALLOWED BY THE TRANSPORTATION ENGINEER WITH DOWELED #4 REBAR AT 2 FT ON CENTER, 2 FT IN LENGTH. EXPANSION JOINTS SHALL BE 1/2" MASTIC OR AS DIRECTED BY THE TRANSPORTATION ENGINEER.
- PROVIDE RECTANGULAR JOINT PATTERN DEPENDENT ON WIDTH OF SLABS (CONTRACTION JOINT SPACING NOT TO EXCEED 10 LINEAL FT OR 100 S.F.).
- WHERE DRIVEWAYS EXCEED 16' IN WIDTH, A 1/2" MASTIC JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTER LINE.
- FLARES SHALL BE MIN. 4' IN WIDTH. STANDARD DRIVE APPROACH WIDTH DOES NOT CHANGE.

CITY OF HELENA ENGINEERING STANDARDS		**BOULEVARD DRIVEWAY APPROACH DETAIL (WITH FLARE SECTIONS)**	***STANDARD DRAWING:*** **5-5**
REVISED: 12-30-2024	***SCALE:*** NONE		

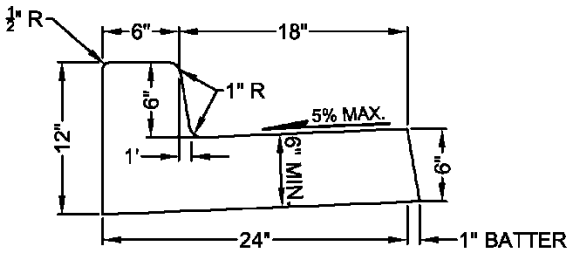




GENERAL NOTES:

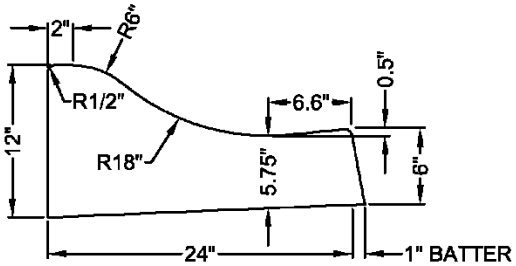
- **ALL DRIVE APPROACHES SHALL COMPLY WITH CURRENT ADA/PROWAG STANDARDS.**
- MIN. 3/4" MINUS AGGREGATE; 4500 PSI CONCRETE SHALL BE USED FOR ALL CURB & GUTTER, SIDEWALKS, DRIVEWAYS, ETC.
- COMMERCIAL DRIVE APPROACHES (INCLUDING ALLEYWAYS) SHALL USE REINFORCED CONCRETE.
- 8 INCHES CRUSHED AGGREGATE BASE (CAB) SHALL BE 3/4", 1", OR 1 1/2" MINUS MATERIAL COMPACTED TO 95% AND SHALL COMPLY WITH AASHTO T99 OR ASTM D698; SUBMIT CAB GRADATION TO THE TRANSPORTATION SYSTEMS DEPARTMENT FOR APPROVAL.
- DRIVE APPROACH TO BE INSTALLED BEFORE ASPHALT CONCRETE PAVEMENT.
- APPROACH WILL BE PLACED MONOLITHICALLY EXCEPT WHEN CURB MACHINE IS ALLOWED BY THE TRANSPORTATION ENGINEER WITH DOWELED #4 REBAR AT 2 FT ON CENTER, 2 FT IN LENGTH. EXPANSION JOINTS SHALL BE 1/2" MASTIC OR AS DIRECTED BY THE TRANSPORTATION ENGINEER.
- PROVIDE RECTANGULAR JOINT PATTERN DEPENDENT ON WIDTH OF SLABS (CONTRACTION JOINT SPACING NOT TO EXCEED 10 LINEAL FT OR 100 S.F.).
- WHERE DRIVEWAYS EXCEED 16' IN WIDTH, A 1/2" MASTIC JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTER LINE.
- FLARES SHALL BE MIN. 4' IN WIDTH. STANDARD DRIVE APPROACH WIDTH DOES NOT CHANGE.

CITY OF HELENA ENGINEERING STANDARDS		CURBSIDE SIDEWALK DRIVEWAY APPROACH DETAIL (WITH RAMP SECTIONS)	STANDARD DRAWING: 5-6
REVISED: 12-30-2024	SCALE: NONE		



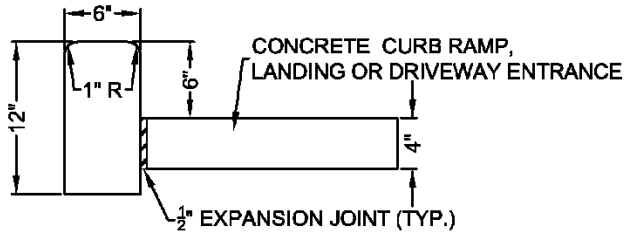
CONCRETE ROADWAY CURB AND GUTTER

A



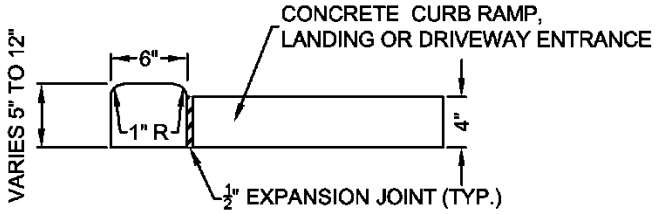
ROLL CURB SECTION AT DRIVEWAY ENTRANCES

B



CONCRETE PEDESTRIAN CURB

C



DEPRESSED CONCRETE PEDESTRIAN CURB AT CURB RAMPS, LANDINGS AND DRIVEWAY ENTRANCES

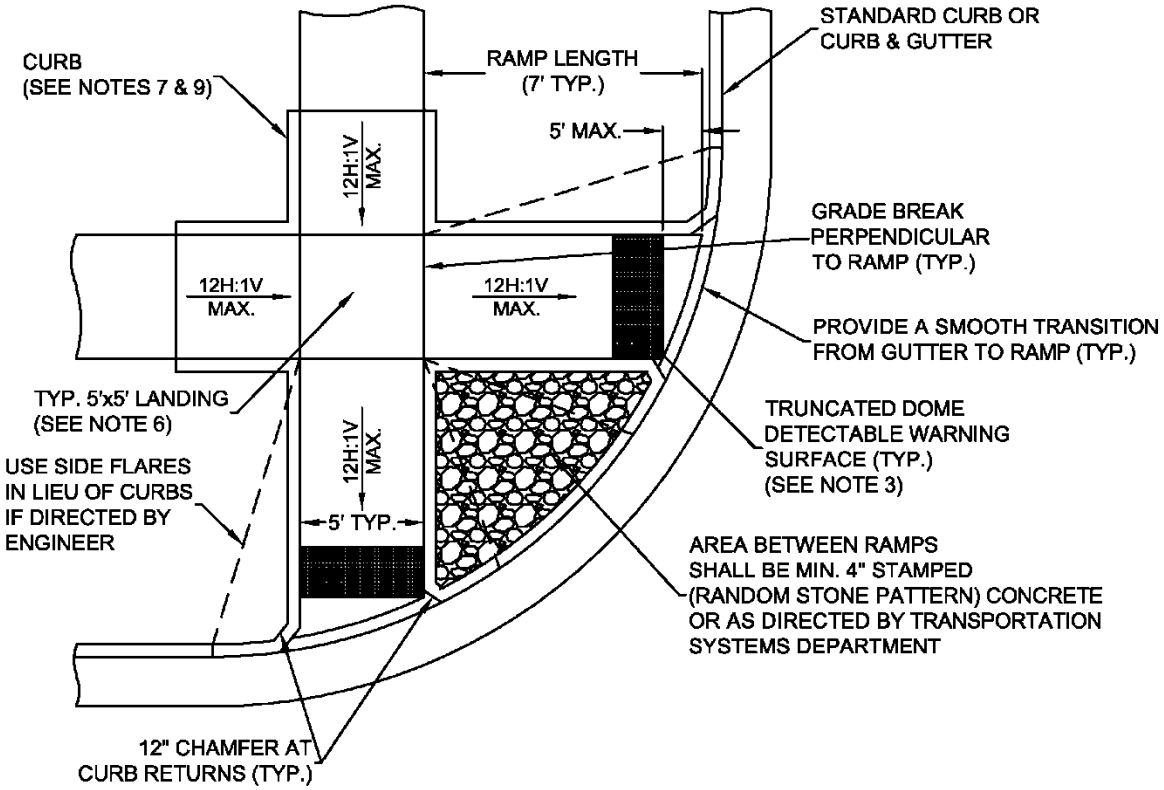
D

CITY OF HELENA ENGINEERING STANDARDS		CURB TYPES	STANDARD DRAWING: 5-7
REVISED: 12-30-2024	SCALE: NONE		

GENERAL SIDEWALK, DRIVEWAY, ADA RAMPS, FILLET AND VALLEY GUTTER NOTES

1. ANY DEVIATIONS FROM THE CITY OF HELENA ENGINEERING AND DESIGN STANDARDS REQUIRES A DEVIATION REQUEST TO BE SUBMITTED TO CITY STAFF FOR REVIEW PRIOR TO ANY CONSTRUCTION.
2. CURB RAMP LOCATION SHALL BE PLACED WITHIN THE WIDTH OF THE ASSOCIATED CROSSWALK, OR AS APPROVED BY THE CITY.
3. SIDEWALKS SHALL BE SIX-INCHES (6") THICK ACROSS DRIVEWAYS AND FOUR-INCHES (4") THICK ELSEWHERE WITH A MINIMUM EIGHT INCHES(8") OR SIX INCHES (6") CRUSHED AGGREGATE BASE COURSE, RESPECTIVELY.
4. CONTRACTION JOINT SPACING SHALL NOT EXCEED 10 LINEAL FEET.
5. ALL SIDEWALKS SHALL BE A MINIMUM WIDTH OF 5 FEET WITH A MAXIMUM CROSS-SLOPE OF 2%.
6. INTEGRAL CURB AND GUTTER SHALL BE USED ON ALL ROADWAYS WITH A MAXIMUM SLOPE OF 5% FROM THE LIP OF GUTTER TO THE FLOWLINE OF THE GUTTER.
7. PAVEMENT MUST BE INSTALLED FLUSH WITH THE GUTTER LIP.
8. ½" EXPANSION JOINTS SHALL CONFORM TO AASHTO M213.
9. WHERE "GRADE BREAK" IS CALLED OUT, THE ENTIRE LENGTH OF THE GRADE BREAK BETWEEN THE TWO ADJACENT SURFACE PLANES SHALL BE FLUSH.
10. DO NOT PLACE GRATINGS, JUNCTION BOXES, ACCESS COVERS OR OTHER APPURTENANCES IN FRONT OF THE CURB RAMP OR IN ANY PART OF THE CURB RAMP OR LANDING.
11. THE CURB RAMP MAXIMUM RUNNING SLOPE SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FEET TO AVOID CHASING THE SLOPE INDEFINITELY WHEN CONNECTING TO STEEP GRADES. WHEN APPLYING THE 15 FOOT MAXIMUM LENGTH, THE RUNNING SLOPE OF THE CURB RAMP SHALL BE AS FLAT AS FEASIBLE. A TECHNICAL INFEASIBILITY FORM MUST BE FILLED OUT, SIGNED AND APPROVED PRIOR TO APPROVAL OF PLANS OR CONSTRUCTION.
12. CURB RAMPS, LANDINGS AND FLARES SHALL RECEIVE BROOM FINISH.
13. THE DETECTABLE WARNING SURFACE SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP (EXCLUSIVE OF FLARES) OR THE LANDING.
14. THE DETECTABLE WARNING SURFACE SHALL BE PLACED AT THE BACK OF CURB, AND NEED NOT FOLLOW THE RADIUS.
15. THE ROWS OF TRUNCATED DOMES SHALL BE ALIGNED TO BE PERPENDICULAR TO THE GRADE BREAK AT THE BACK OF CURB.
16. THE ROWS OF TRUNCATED DOMES SHALL BE ALIGNED TO BE PARALLEL TO THE DIRECTION OF TRAVEL.
17. IF CURB AND GUTTER ARE NOT PRESENT, SUCH AS A SHARED-USE PATH CONNECTION, THE DETECTABLE WARNING SURFACE SHALL BE PLACED AT THE PAVEMENT EDGE.
18. SEE STANDARD DRAWINGS FOR SIDEWALK AND CURB RAMP DETAILS.
19. WHEN THE GRADE BREAK BETWEEN THE CURB RAMP AND THE LANDING IS LESS THAN OR EQUAL TO 5 FT. FROM THE BACK OF CURB AT ALL POINTS, PLACE THE DETECTABLE WARNING SURFACE ON THE BOTTOM OF THE CURB RAMP.

CITY OF HELENA ENGINEERING STANDARDS		***ADA CURB RAMP GENERAL NOTES***	***STANDARD DRAWING:*** **5-8**
REVISED: 12-30-2024	***SCALE:*** NONE		

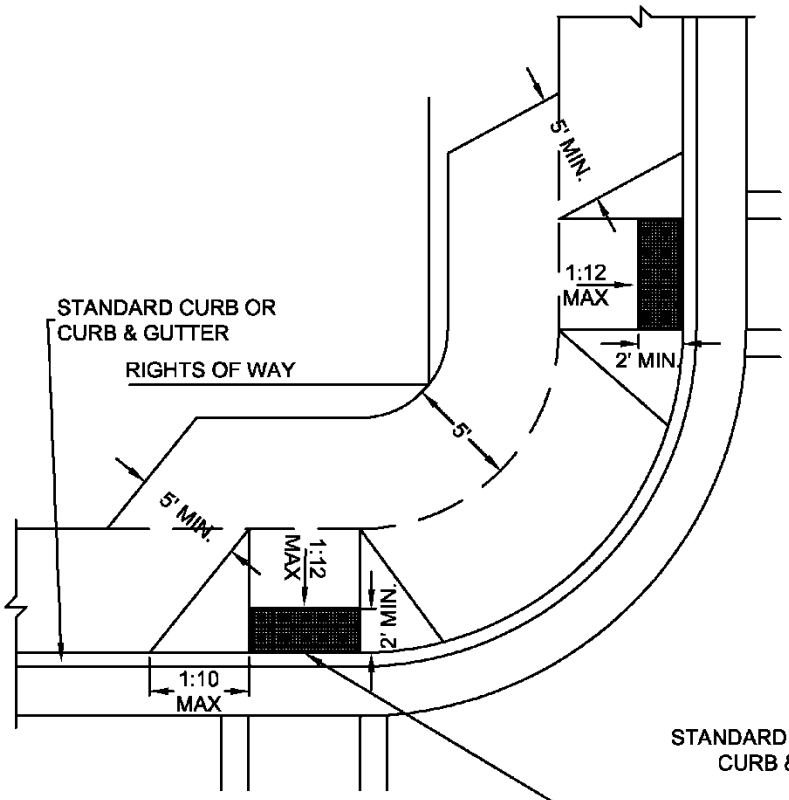


PREFERRED RAMP STYLE

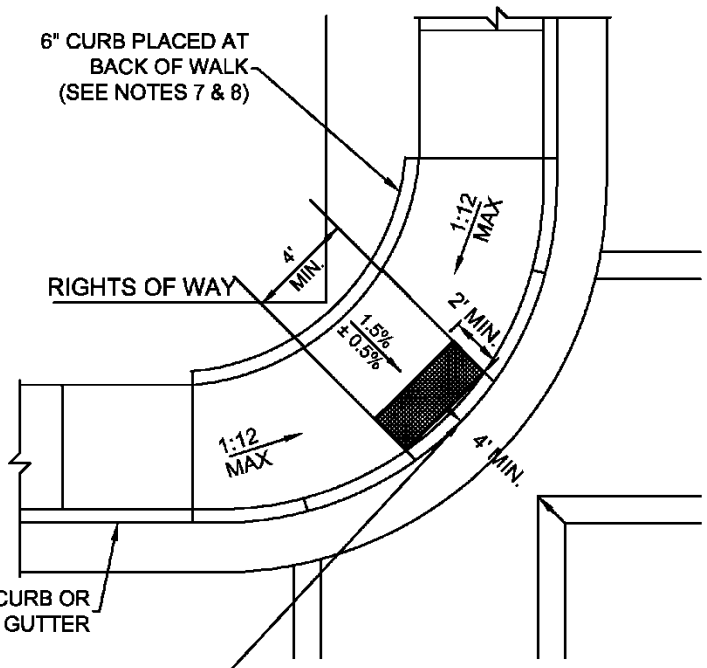
NOTES:

1. RAMP RUNNING SLOPE MEASURED ANYWHERE ON THE WIDTH OF THE RAMP SHALL NOT EXCEED 12 HORIZONTAL TO 1 VERTICAL (8.3%) AND A MINIMUM OF 3%. RAMP CROSS SLOPE SHALL BE 2% MAX.
2. INDIVIDUAL SITUATIONS MAY REQUIRE SPECIAL DESIGN CONSIDERATION TO ENSURE COMPLIANCE WITH UNITED STATES ACCESS BOARD STANDARDS.
3. PLACE TRUNCATED DOME DETECTABLE WARNING SURFACE AT BACK OF CURB AS ILLUSTRATED. SURFACE SHALL BE A MIN. OF 2-FEET DEEP IN THE DIRECTION OF TRAVEL AND EXTEND THE FULL WIDTH OF THE RAMP. TRUNCATED DOMES SHALL BE CAST IRON.
4. SAWCUT AND REMOVE THE EXISTING CURB RETURN TO THE NEAREST EXISTING JOINT.
5. SAWCUT AND REMOVE EXISTING SIDEWALK TO NEAREST FULL PANEL EDGE AS REQUIRED. ANY EXISTING HISTORIC SIDEWALK STAMPS SHALL BE PRESERVED AND INCORPORATED INTO THE NEW WORK WHERE ALL ADA REQUIREMENTS CAN BE MET.
6. A 5' x 5' LANDING IS REQUIRED AT THE TOP OF ANY RAMP. THE LANDING SHALL NOT BE NARROWER THAN THE INTERSECTING SIDEWALKS. TYPICALLY, THE LANDING SHALL BE THE SAME WIDTH OF THE SIDEWALK. PRIOR APPROVAL REQUIRED FOR WIDTHS NARROWER THAN 5'.
7. IF RIGHT-OF-WAY DOES NOT ALLOW ADEQUATE SPACE FOR PEDESTRIAN CURB TO BE PLACED OUTSIDE OF THE BACK OF WALK, INCORPORATE INTO SIDEWALK WIDTH OR AS DIRECTED BY THE TRANSPORTATION SYSTEMS DEPARTMENT.
8. CURBS SEPARATING LANDSCAPED AREAS FROM RAMPS ARE FOR RETAINING PURPOSES. WHERE APPROPRIATE GRADING MEASURES ARE TAKEN, CURBS MAY BE ELIMINATED WITH PRIOR APPROVAL OF THE TRANSPORTATION SYSTEMS DEPARTMENT.
9. PEDESTRIAN CURB OR SIDE FLARES WILL BE ALLOWED IN CONJUNCTION WITH BOULEVARDS WHERE DIRECTED BY THE CITY. SIDE FLARES SHALL BE USED WHEN THEY ARE A PART OF THE PATH OF TRAVEL. SIDE FLARES THAT ARE PART OF THE PATH OF TRAVEL SHALL BE A 10H:1V MAX. SLOPE (MEASURED PARALLEL TO THE CURB).

CITY OF HELENA ENGINEERING STANDARDS	**BOULEVARD SIDEWALK ADA CURB RAMP**	***STANDARD DRAWING:*** **5-9**
REVISED: 12-30-2024 / ***SCALE:*** NONE		



ALTERNATE RAMP STYLE CURBSIDE SIDEWALK



PROVIDE A SMOOTH TRANSITION FROM GUTTER TO RAMP

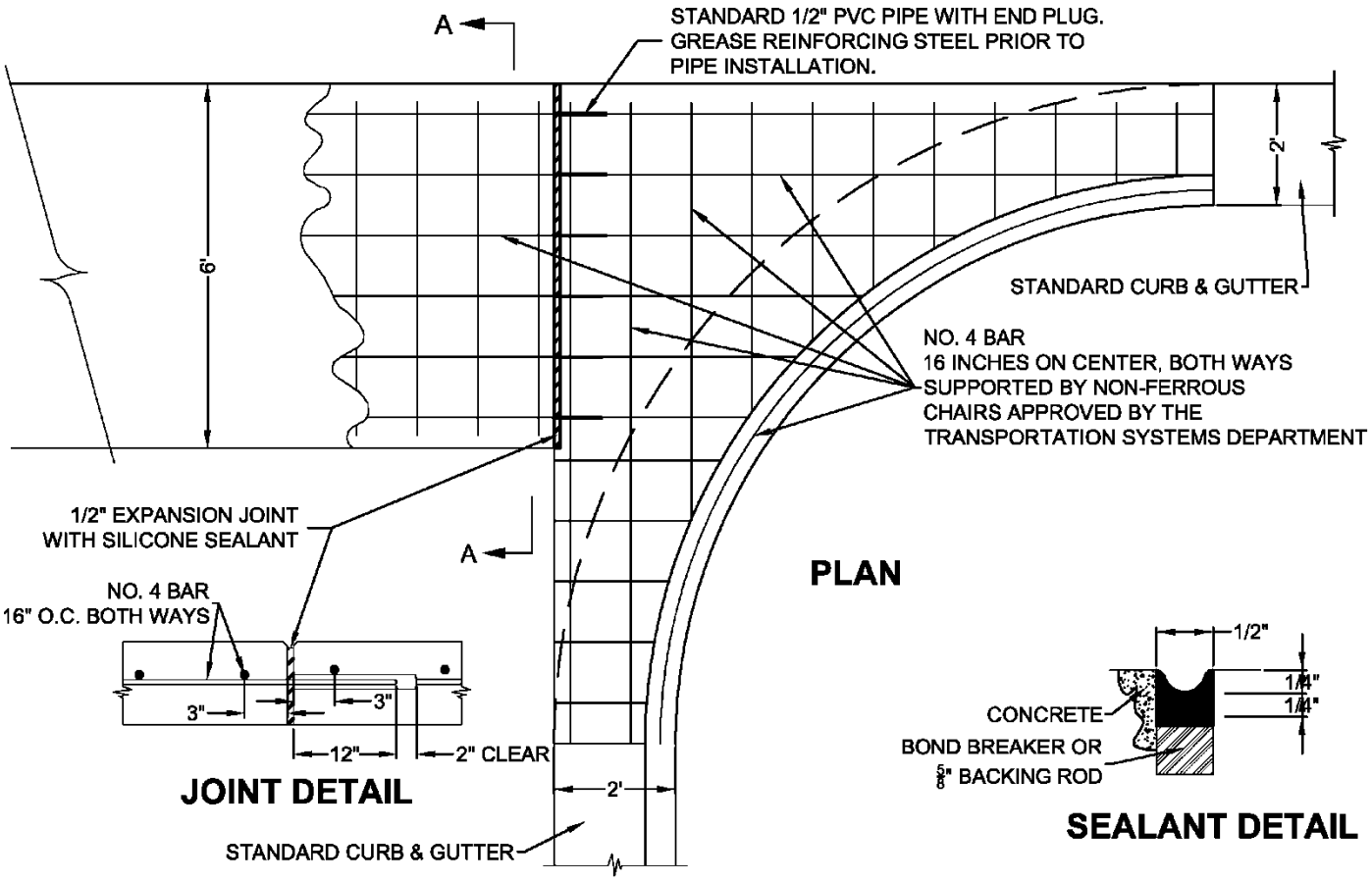
ALTERNATE RAMP STYLE CURBSIDE SIDEWALK

(USE IN ALTERATIONS ONLY WHEN SITE CONSTRAINTS PROHIBIT INSTALLING TWO RAMPS PRIOR WRITTEN APPROVAL REQUIRED)

NOTES:

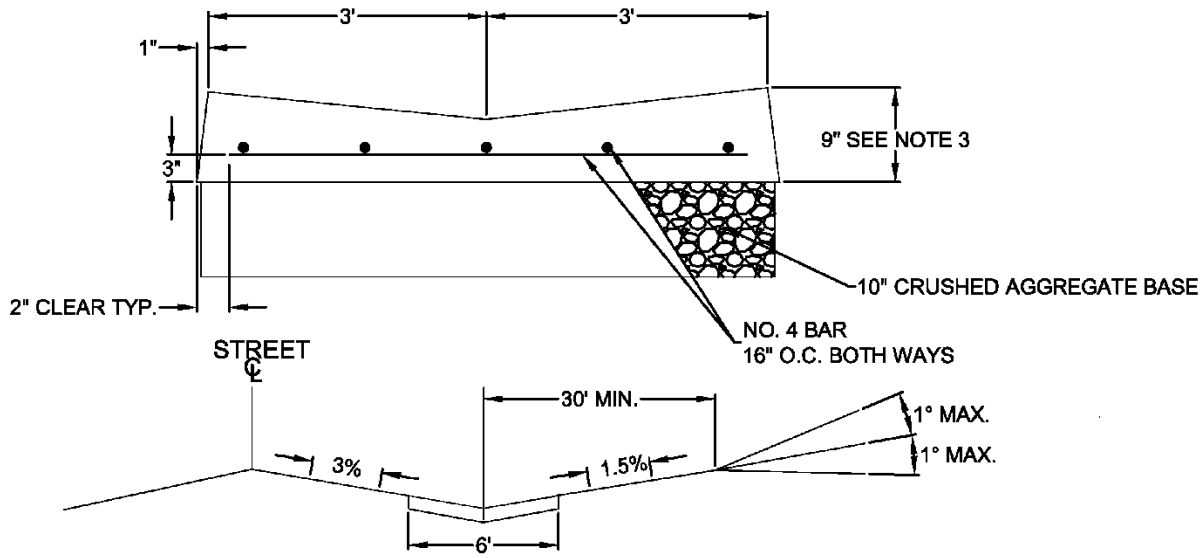
1. RAMP RUNNING SLOPE MEASURED ANYWHERE ON THE WIDTH OF THE RAMP SHALL NOT EXCEED 12 HORIZONTAL TO 1 VERTICAL (8.3%) AND A MINIMUM OF 3%. RAMP CROSS SLOPE SHALL BE 2% MAX.
2. INDIVIDUAL SITUATIONS MAY REQUIRE SPECIAL DESIGN CONSIDERATION TO ENSURE COMPLIANCE WITH UNITED STATES ACCESS BOARD STANDARDS.
3. PLACE TRUNCATED DOME DETECTABLE WARNING SURFACE AT BACK OF CURB AS ILLUSTRATED. SURFACE SHALL BE A MIN. OF 2-FEET DEEP IN THE DIRECTION OF TRAVEL AND EXTEND THE FULL WIDTH OF THE RAMP. TRUNCATED DOMES SHALL BE CAST IRON.
4. SAWCUT AND REMOVE THE EXISTING CURB RETURN TO THE NEAREST EXISTING JOINT.
5. SAWCUT AND REMOVE EXISTING SIDEWALK TO NEAREST FULL PANEL EDGE AS REQUIRED. ANY EXISTING HISTORIC SIDEWALK STAMPS SHALL BE PRESERVED AND INCORPORATED INTO THE NEW WORK WHERE ALL ADA REQUIREMENTS CAN BE MET.
6. A 5' x 5' LANDING IS REQUIRED AT THE TOP OF ANY RAMP. THE LANDING SHALL NOT BE NARROWER THAN THE INTERSECTING SIDEWALKS. TYPICALLY, THE LANDING SHALL BE THE SAME WIDTH OF THE SIDEWALK. PRIOR APPROVAL REQUIRED FOR WIDTHS NARROWER THAN 5'.
7. IF RIGHT-OF-WAY DOES NOT ALLOW ADEQUATE SPACE FOR PEDESTRIAN CURB TO BE PLACED OUTSIDE OF THE BACK OF WALK, INCORPORATE INTO SIDEWALK WIDTH OR AS DIRECTED BY THE TRANSPORTATION SYSTEMS DEPARTMENT.
8. CURBS SEPARATING LANDSCAPED AREAS FROM RAMPS ARE FOR RETAINING PURPOSES. WHERE APPROPRIATE GRADING MEASURES ARE TAKEN, CURBS MAY BE ELIMINATED WITH PRIOR APPROVAL OF THE TRANSPORTATION SYSTEMS DEPARTMENT.
9. PEDESTRIAN CURB OR SIDE FLARES WILL BE ALLOWED IN CONJUNCTION WITH BOULEVARDS WHERE DIRECTED BY THE CITY. SIDE FLARES SHALL BE USED WHEN THEY ARE A PART OF THE PATH OF TRAVEL. SIDE FLARES THAT ARE PART OF THE PATH OF TRAVEL SHALL BE A 10H:1V MAX. SLOPE (MEASURED PARALLEL TO THE CURB).

CITY OF HELENA ENGINEERING STANDARDS		# CURBSIDE SIDEWALK ADA CURB RAMP	STANDARD DRAWING: 5-10
REVISED: 12-30-2024	SCALE: NONE		



JOINT DETAIL

SEALANT DETAIL

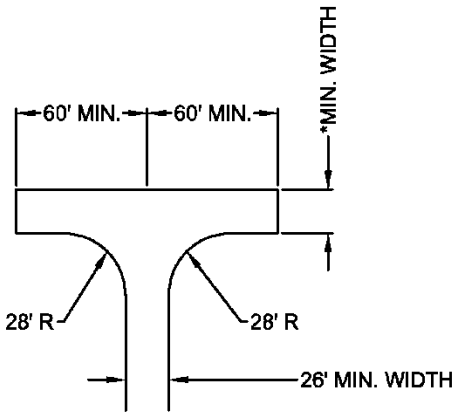


TYPICAL PROFILE AT LOCAL RESIDENTIAL STREET INTERSECTIONS

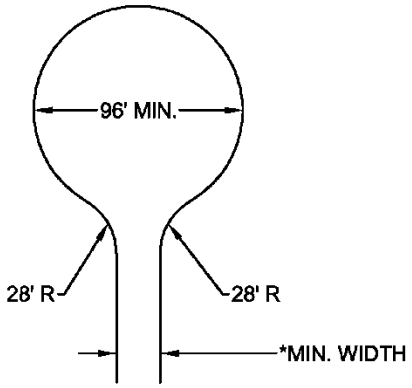
NOTES:

1. FINISHED ASPHALT SURFACE TO BE FLUSH WITH VALLEY GUTTER LIP.
2. CONSTRUCTION OF CROSS GUTTER IS NOT ALLOWED ACROSS COLLECTOR OR ARTERIAL STREETS.
3. ADJACENT SPANDREL SHALL BE 9" THICK CONCRETE WHERE APPLICABLE.
4. VALLEY GUTTER SHALL RECEIVE A BROOM FINISH WITH BRUSH STROKES PARALLEL TO THE CENTERLINE.

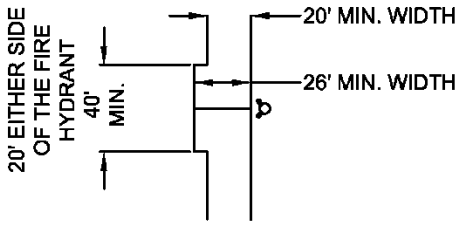
CITY OF HELENA ENGINEERING STANDARDS		VALLEY GUTTER AND FILLET	STANDARD DRAWING: 5-11
REVISED: 12-30-2024	SCALE: NONE		



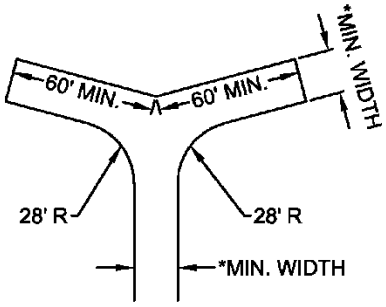
120' HAMMERHEAD



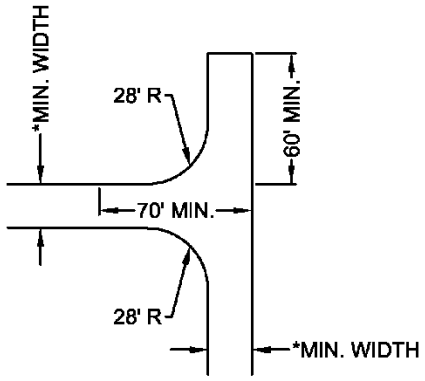
96' DIAMETER CUL-DE-SAC



MINIMUM CLEARANCE AROUND A FIRE HYDRANT



60' "Y"



ACCEPTABLE ALTERNATIVE TO 120' HAMMERHEAD

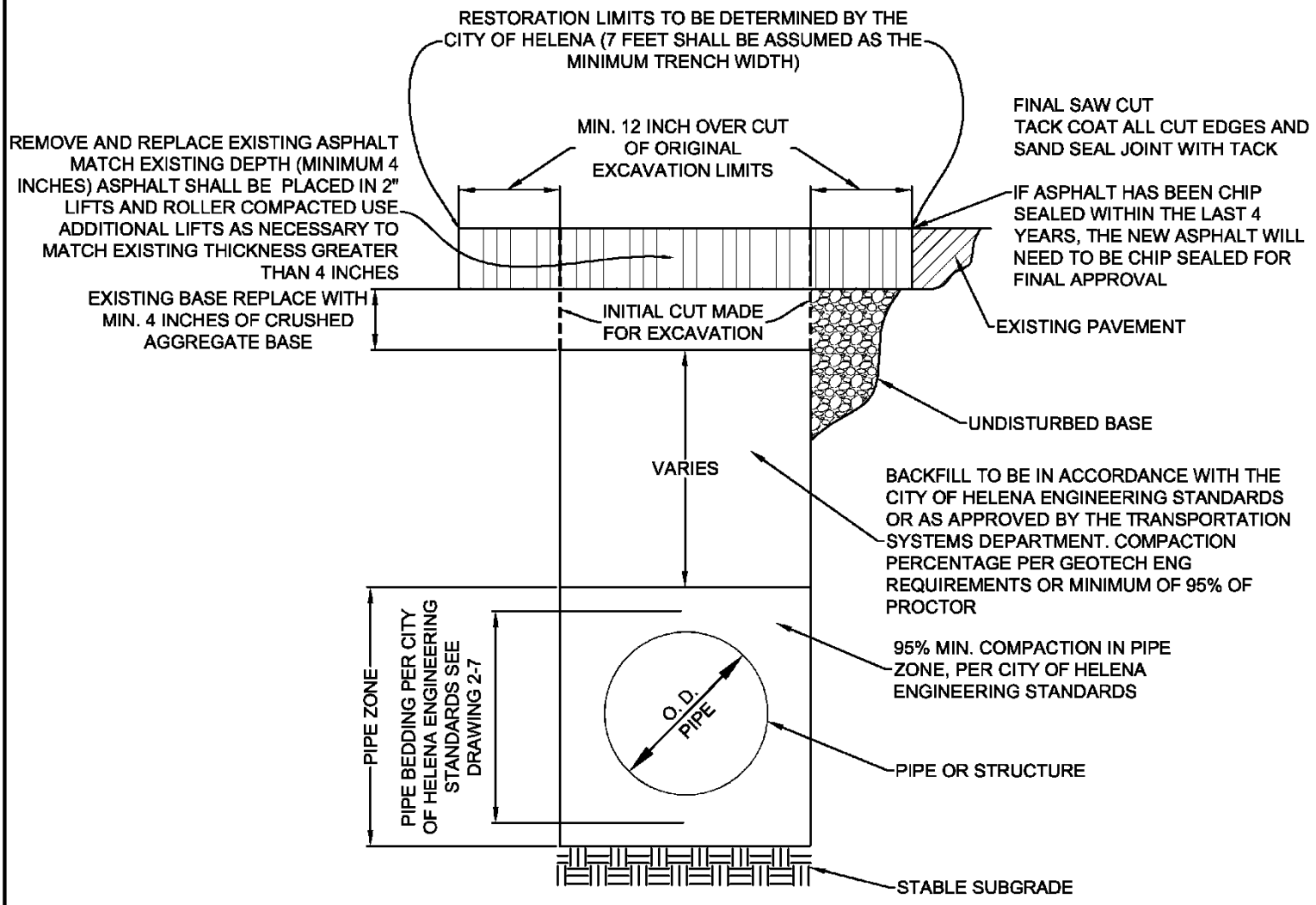
REQUIREMENTS FOR DEAD-END ROADS OR EMERGENCY ACCESS

LENGTH (FEET)	MIN. WIDTH (FEET)	TURNAROUNDS REQUIRED
0-150	20	NONE REQUIRED
151-500	20	120-FOOT HAMMERHEAD,60 FOOT "Y" OR 96-FOOT DIAMETER
501-750	26	CUL-DE-SAC OR OTHER APPROVED TURNAROUND
OVER 751	SPECIAL APPROVAL REQUIRED	

NOTES:

1. TURNAROUNDS ARE BASED ON THE INTERNATIONAL FIRE CODE (CURRENT EDITION).
2. ALL STREET DIMENSIONS ARE BASED ON CITY STREET STANDARDS AND ARE MEASURED FROM LIP OF CURB.
3. *MIN. WIDTH EQUALS THE WIDTH OF THE STREET CLASSIFICATION AS APPROVED.

CITY OF HELENA ENGINEERING STANDARDS		# ACCEPTABLE TURNAROUNDS	STANDARD DRAWING: 5-12
REVISED: 12-30-2024	SCALE: NONE		



TYPICAL TRENCH DETAIL

NOTES:

- PROJECT DRAWINGS SHALL BE SUBMITTED DEPICTING TRENCH WIDTH, LENGTH AND OTHER PERTINENT DETAILS FOR APPROVAL OF PERMIT
- INSTALLATION REQUIREMENTS INCLUDING CONTRACTOR COMPACTION TESTING BE IN ACCORDANCE WITH THE CITY OF HELENA ENGINEERING STANDARDS
- DEPTH OF COVER IS RELATED TO DESIGN REQUIREMENTS AND SHALL BE INDICATED ON THE PROJECT PLAN DRAWINGS
- **SLOPING, BENCHING AND/OR TRENCH SUPPORT SYSTEMS MUST CONFORM WITH OSHA REGULATIONS.**

CITY OF HELENA ENGINEERING STANDARDS	**STREET EXCAVATION (OPENING) TYPICAL DETAIL**	***STANDARD DRAWING:*** **5-13**
REVISED: 12-30-2024 / ***SCALE:*** NONE		


Est. 1881
City of
Helena